MDOT Use Only
Checked _____
Loaded _____
Keyed _____

12 -

SM No. CBWO2209490011

PROPOSAL AND CONTRACT DOCUMENTS

FOR THE CONSTRUCTION OF

12
Construction of Project Office, Storage Building, and Lot Work, known as State Project Nos. BWO-2209-49(001), BWO-2208-49(001), and LWO-2093-49(002) / 502399301, 302, & 303 in Montgomery County.

Project Completion: 07/31/2017

(STATE DELEGATED)

NOTICE

BIDDERS MUST PURCHASE A BID 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

JACKSON, MISSISSIPPI

BIDDER CHECK LIST
(FOR INFORMATION ONLY)

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

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

_____ 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.

_____ 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.

_____ Proposal bid sheet(s) of SECTION 905--PROPOSAL has been inserted into the proposal package.

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

_____ The Certification regarding Non-Collusion, Debarment and Suspension, etc. has been completed.

_____ 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.

_____ 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.

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

03/30/2016 01:09 PM

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, April 26, 2016, and shortly thereafter publicly opened on the Sixth Floor for:

Construction of Project Office, Storage Building, and Lot Work, known as State Project Nos. BWO-2209-49(001), BWO-2208-49(001), LWO-2093-49(002) / 502399301, 302, & 303 in Montgomery 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 purchased online at https://shopmdot.ms.gov. Specimen proposals may be viewed and downloaded online at no cost at http://mdot.ms.gov or purchased online. Proposals are available at a cost of Ten Dollars ($10.00) per proposal plus a small convenience fee. Cash or checks will not be accepted as payment.

Plans must be purchased online at https://shopmdot.ms.gov. Costs of plans will be on a per sheet basis plus a small convenience fee. If you have any questions, you can contact the MDOT Plans Print Shop at (601) 359-7460, or e-mail at plans@mdot.state.ms.us. Plans will be shipped upon receipt of payment. Cash or checks will not be accepted as payment.

Bid bond, signed or countersigned by a Mississippi Agent or Qualified Nonresident Agent, with Power of Attorney attached, 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
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. 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. 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. 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. 3612 **CODE: (SP)**

DATE: 08/10/2011

SUBJECT: Additional Erosion Control Requirements

Bidders are hereby advised of the following requirements that relate to erosion control activities on the project.

THE MAXIMUM TOTAL ACREAGE THAT CAN BE DISTURBED, AT ONE TIME, ON THE PROJECT IS NINETEEN (19) ACRES. THE CONTRACTOR SHALL BE REQUIRED TO STABILIZE DISTURBED AREAS PRIOR TO OPENING UP ADDITIONAL SECTIONS OF THE PROJECT. STABILIZED SHALL BE WHEN THE DISTURBED AREA MEETS ONE OF THE FOLLOWING CRITERIA:

- **THE AREA HAS BEEN GRASSED, EITHER TEMPORARY OR PERMANENT, AND MULCHED ACCORDING TO THE SPECIFICATIONS,OR**
- **A CRUSHED STONE COURSE OR A LIFT OF ASPHALT PAVEMENT HAS BEEN PLACED, OR**
- **THE AREA HAS BEEN CHEMICALLY TREATED USING PORTLAND CEMENT OR LIME-FLY ASH, AND SEALED.**

DISTURBED AREAS INCLUDE THE ROADBED, SLOPES AND REMAINING AREA OUT TO THE ROW LINE.

Clearing and Grubbing: Prior to beginning any clearing and grubbing operations on the project, controls shall be in place to address areas such as drainage structures, wetlands, streams, steep slopes and any other sensitive areas as directed by the Engineer. Clearing and grubbing should be limited to the minimum area necessary to construct the project. Grubbing operations should be minimized in areas outside the construction limits and stumps should be cut off flush with the existing ground elevations. A buffer area of at least fifteen (15) feet shall be in place adjacent to the right-of-way line and at least five (5) feet adjacent to stream banks. The buffer area can either be the existing vegetation that is left undisturbed or re-established by planting new vegetation if clearing and grubbing was required.

Unclassified Excavation: Cut sections shall be graded in accordance with the typical sections and plan grades. Permanent erosion control BMP's should be placed as soon as possible after the cut material has been moved. Fill sections that are completed shall have permanent erosion control BMP's placed. Fill sections that are not completed will be either permanently or temporarily grassed until additional material is made available to complete these sections. All unclassified excavation on the project will still be required to be moved prior to incorporating any borrow excavation on the project. The contractor may have to stockpile unclassified excavation in order to comply with the nineteen (19) acre requirement. No additional compensation will be made for stockpiling operations.

Disturbed areas that remain inactive for a period of more than fourteen (14) days shall be temporary grassed and mulched. Temporary grassing and mulching shall only be paid one time for a given area.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3893 **CODE: (SP)**

DATE: 04/10/2012

SUBJECT: Petroleum Products Base Prices

Bidders are advised that 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 be acknowledged by the Bidder and become part of the contract during the execution process.

Monthly Petroleum Products Base Prices can be viewed at:

http://sp.gomdot.com/Contract%20Administration/BidSystems/Pages/letting%20calendar.aspx

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 4214 **CODE: (IS)**

DATE: 11/29/2012

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".

More information regarding high visibility safety apparel can be found at the following sites.

http://www.gpo.gov/fdsys/pkg/CFR-2008-title23-vol1/pdf/CFR-2008-title23-vol1-sec634-1.pdf

http://ops.fhwa.dot.gov/wz/resources/policy.htm#hv

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904- NOTICE TO BIDDERS NO. 4473 **CODE: (SP)**

DATE: 04/08/2013

SUBJECT: Alternate Crushed Stone Base Bid Items

Bidders are advised that the Crushed Stone Base used on this project will be bid as an alternate pay item: ¾-inch and Down Crushed Stone Base, Size 825B Crushed Stone Base, or Size 610 Crushed Stone Base. Bidders must select one of the alternates at the time of bid. **The Contractor must use the selected crushed stone base throughout the entire project.**

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 4526 **CODE: (SP)**

DATE: 06/11/2013

SUBJECT: Electronic Addendum Process

Bidders are advised that hard copies of any addenda for this project will no longer be mailed to prospective bidders. All addenda for this project will be posted to the mdot.ms.gov webpage under the Proposal Addenda column for the current letting and appropriate call number. Bidders will have to download addenda from the webpage and process the addenda in the same manner as previous lettings. Addenda will be posted by 10:00 a.m. on Friday prior to the letting. It will be the Bidder's responsibility to check and see if any addenda have been posted for this project. Any questions regarding the downloading process of the addenda shall be directed to the Contract Administration Division at 601-359-7700. Any questions regarding the content of the addenda shall be submitted as a question in accordance with the Notice To Bidders entitled "Questions Regarding Bidding".

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 4565 **CODE: (SP)**

DATE: 06/27/2013

SUBJECT: Manual on Uniform Traffic Control Devices

Any reference in the Standard Specifications or contract documents to a particular Section of the Manual on Uniform Traffic Control Devices (MUTCD) it shall mean that Section of the latest version of the Manual on Uniform Traffic Control Devices.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 5044 **CODE: (SP)**

DATE: 05/13/2014

SUBJECT: Questions Regarding Bidding

Bidders are advised that all questions that arise regarding the contract documents (proposal) or plans on this project shall be directed to the www.gomdot.com current letting webpage. Click on the call number for this project to open an email form to submit your question. Questions must be submitted by 8:00 a.m. on the day prior to the letting. Answers to questions will be posted by 6:00 p.m. on the day prior to the letting. Answers can be viewed by clicking on Q&A link under the Proposal Addenda column.

It shall be the Bidders responsibility to familiarize themselves with the questions and answers that have been submitted on this project. Bidders are advised that by signing the contract documents for this project, they agree that the on-line Questions and Answers submitted on this project shall be added to and made part of the official contract.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 5053 **CODE: (SP)**

DATE: 06/03/2014

SUBJECT: Contractor Correspondence

Bidders are advised that all correspondence concerning this project, other than correspondence related to the execution of the contract and sub-contracting, shall be sent to the Project Engineer. The Project Engineer will then forward any necessary correspondence to the appropriate Division. This includes general correspondence, submittals, shop drawings, requests for advancement of materials, etc.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 5405 **CODE: (SP)**

DATE: 02/11/2015

SUBJECT: Traffic Control Devices

Bidders are advised of the following two changes regarding traffic control devices.

Flashing Arrow Panels

In Subsection 619.02.5 of the Standard Specifications, it states that flashing arrow panels shall meet the requirements of Section 6F.53 of the MUTCD. The new MUTCD has changed this reference to Section 6F.61. Flashing arrow panels on this project must meet the requirements of Section 6F.61 of the latest MUTCD.

Type III Barricade Rails

The use of 2-inch nominal thickness timber for rails on Type III barricades has not been approved by NCHRP as a crashworthy device. Therefore, the use of 2-inch nominal thickness timbers will not be allowed for rails on Type III Barricades. Timber rails for Type III Barricades shall be as follows.

- For barricades up to four feet (4') wide, the maximum thickness of timber rails shall be one inch (1") and the material shall be pine timber or ¾-inch ACX plywood.

- For barricades more than four feet (4') wide, timber rails shall be constructed of ¾-inch ACX plywood.

A list of crashworthy Type III Barricades can be found at the below FHWA website.

http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/wzd/

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 5412 **CODE: (SP)**

DATE: 02/18/2015

SUBJECT: Weight Limits

Bidders are hereby advised that all trucks hauling materials to and from this project shall comply with the legal weight limits as established by law. MDOT will not compensate the Contractor for any portion of a load delivered to the project in excess of the legal limit for that truck.

Vehicles relying on harvest permits are limited to hauling only those materials set forth in Section 27-19-81(4) of the Mississippi Code, as amended.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 5824 **CODE: (SP)**

DATE: 09/10/2015

SUBJECT: Adjustments for Bituminous Materials

Bidders are advised that Subsection 907-402.03.1.2, Tack Coat, in Special Provision 907-402, allows the Contractor several options for OGFC tack coat. Regardless of the tack coat used, the monthly material adjustment, as referenced in Section 109 of the Standard Specifications, will be made using the base and current prices of tack coat Grade PG 76-22.

Bidders are also advised that the specifications allow the use of RC-70, RC-250, RC-800, RS-1, RS-2, MC-30, MC-250, MS-2h, CMS-2h, LD-7, CQS-1h, ETAC-H, and NTSS-1HM in various other construction operations. If the Contractor uses one of these bituminous materials, the monthly material adjustment will be made using the base and current prices of the materials shown below.

Materials Used	Material Adjustment Made Based on Prices For
RC-70, 250, 800	MC-70
RS-1, 2	CRS-2
MC-30, 250	MC-70
MS-2h, CMS-2h	SS-1
LD-7, CQS-1h, ETAC-H, NTSS-1HM	CSS-1

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 5865 **CODE: (SP)**

DATE: 10/28/2015

SUBJECT: Non-Quality Control / Quality Assurance Concrete

Bidders are advised that the following concrete 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.

Section	Description
221	Paved Ditches
601	Minor Structures - manholes, inlets, catch basins, junction boxes, pipe headwalls, and pipe collars.
605	Edge Drain and Underdrain Outlet Pads
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. 5866 **CODE: (SP)**

DATE: 10/28/2015

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 IV 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 or 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 weekly. 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. 6212 **CODE: (SP)**

DATE: **03/02/2016**

SUBJECT: **Contract Time**

PROJECT: **BWO-2209-49(001) / 502399301, BWO-2208-49(001) / 502399302, & LWO-2093-49(002) / 502399303 -- Montgomery County**

The calendar date for completion of work to be performed by the Contractor for this project shall be **July 31, 2017,** 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 be **May 10, 2016** and the effective date of the Notice to Proceed / Beginning of Contract Time will be **July 11, 2016**.

Should the Contractor request a Notice to Proceed earlier than **July 11, 2016** 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.

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. 907-102-11 **CODE: (SP)**

DATE: 11/04/2015

SUBJECT: Bidding Requirements and Conditions

907-102.06--Preparation of Proposal. Delete the first, fifth, sixth, and seventh paragraphs of Subsection 102.06 on pages 17 & 18, and substitute the following.

The bidder's complete original proposal shall be submitted upon the forms (Certification of Performance, Certification Regarding Non-Collusion, etc.) furnished by the Department. In case of discrepancy between a unit price and the extension, the unit price will govern and the extension along with the total amount of the proposal will be corrected.

A completed proposal package, with all forms completed, will constitute the official bid and shall be signed on the last sheet of Section 905 and delivered to the Department in accordance with the provisions of Subsection 102.09. Bids submitted using any other form, format or means will result in an irregular bid.

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. 907-103-11 **CODE: (SP)**

DATE: 07/22/2015

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. 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. 907-104-5 **CODE: (IS)**

DATE: 05/01/2013

SUBJECT: Scope of Work

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

SPECIAL PROVISION NO. 907-104-6 **CODE: (SP)**

DATE: **11/20/2014**

SUBJECT: **Partnering Process**

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

907-104.01--Intent of Contract. At the end of Subsection 104.01 on Page 24, add the following:

907-104.01.1--Partnering Process.

COVENANT OF GOOD FAITH AND FAIR DEALING:

This contract imposes an obligation of good faith and fair dealing in its performance and enforcement.

The Contractor and the Department, with a positive commitment to honesty and integrity, agree to the following mutual duties:

A. Each will function within the laws and statutes applicable to their duties and responsibilities.

B. Each will assist in the other's performance.

C. Each will avoid hindering the other's performance.

D. Each will proceed to fulfill its obligations diligently.

E. Each will cooperate in the common endeavor of the contract.

The Mississippi Department of Transportation intends to encourage the foundation of a cohesive partnership with the contractor and its principal subcontractors and supplier. This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are effective and efficient contract performance and completion within budget, on schedule, and in accordance with plans and specifications.

FORMAL PARTNERING:

This partnership will be bilateral in make-up, and participation will be required by both MDOT and the Contractor. Any cost associated with effectuating this partnering will be agreed to by both parties and will be shared equally.

To implement this partnering initiative prior to starting of work in accordance with the requirements of Subsection 108.02 Notice to Proceed and prior to the preconstruction conference, the contractor's management personnel and MDOT's District Engineer, will initiate a partnering development seminar/team building workshop. The Contractor working with the assistance of the District and the State Construction Engineer will make arrangements to determine attendees for the workshop, agenda of the workshop, duration, and location. Persons required to be in attendance will be the MDOT key project personnel, the contractor's on-site project manager and key project supervision personnel of both the prime and principal subcontractors and suppliers. The project design engineers, FHWA and key local government personnel will be also be invited to attend as necessary. The contractors and MDOT will also be required to have Regional/District and Corporate/State level managers on the project team.

Follow-up workshops may be held periodically throughout the duration of the contract as agreed by the contractor and Mississippi Department of Transportation.

The establishment of a partnership charter on a project will not change the legal relationship of the parties to the contract nor relieve either party from any of the terms of the contract.

INFORMAL PARTNERING:

If the Contractor and MDOT does not choose to have a Formal Partnering process or the contract does not require a Mandatory Formal Partnering process, an informal partnering meeting shall be conducted on at least a monthly basis. It will be mandatory that the Project Engineer and Project Superintendent attend the meeting. It is recommended that MDOT Inspectors, foremen, and other project managers attend the meeting.

The Project Engineer will be responsible for taking minute of the meeting. As soon as practical after the meeting, the Engineer will send a copy of the minutes of the meeting to the Contractor, District Construction Engineer, and State Construction Engineer. The Contractor will have 30 days to dispute the contents of the minutes or they will become an official record of the project.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-105-8 **CODE: (SP)**

DATE: 11/20/2014

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.

907-105.04--Coordination of Plans, Specifications, Interim Specifications, Special Provisions and Notice to Bidders. Delete the second full paragraph of Subsection 105.04 on page 35, and substitute the following.

In case of a conflict between plan quantities, advertisement quantities, and/or bid sheet quantities, the bid sheet quantities shall prevail.

907-105.05--Cooperation by Contractor. Delete Subsection 105.05 on page 35 and substitute the following.

907-105.05--Cooperation by Contractor. The Contractor shall give the work the attention necessary to expedite its progress, and shall cooperate with the Engineer, inspectors and other Contractors in every possible way.

907-105.05.1--Project Superintendent. The Contractor shall have a competent and experienced full time resident superintendent who is capable of reading and understanding the plans and specifications for the particular work being performed. The superintendent shall be on the project site at any time work is being performed by the Prime Contractor or any Subcontractors. The superintendent shall advise the Project Engineer of an intended absence from the work and designate a person to be in charge of the work during such absence. The superintendent shall receive instructions from the Engineer or authorized representative. Upon issuance of the Notice to Award, the Contractor or duly appointed agent authorized to bind the Contractor shall file with the Executive Director the name and address of the superintendent who will supervise the work with copies to the Construction Engineer, Contract Administration Engineer, District Engineer and Project Engineer. The Executive Director shall be immediately notified in writing with copies to those stated when a change is made in the Contractor's superintendent or superintendent's address. The superintendent shall have full authority to execute orders or directives of the Engineer without delay and to promptly supply materials, equipment, labor and incidentals as may be required. Such superintendence shall be furnished irrespective of the amount of work sublet.

907-105.05.2--Certified Erosion Control Person. On projects that require an erosion control plan, 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.

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.

907-105.16--Acceptance. Delete Subsection 105.16 on pages 40 and 41, and substitute the following.

907-105.16--Acceptance.

907-105.16.1--Partial Acceptance of a Unit. When the Contractor has completed a unit of the work such as an interchange, a structure, a portion of the road or pavement or one project of a multi-project contract, the Contractor may request the Engineer to make a final inspection of that unit; or the Executive Director may order a final inspection of the unit if it is in the public's interest. If the Engineer finds upon inspection that the unit has been completed in compliance with the contract and it is a complete facility which can be made available to the public or made available for the prosecution of work under another contract, the Executive Director may conditionally accept the unit and conditionally relieve the Contractor of certain contractual responsibilities as defined in the release.

In the event items of work covered by such release are found to be defective or deficient as evidenced by unsatisfactory test reports of materials incorporated in the work or other engineering determination, the release shall terminate upon written notification to the Contractor. The Contractor shall make all corrections, restorations, constructions or reconstructions deemed necessary and shall resume all contractual responsibilities until all corrective measures have been made in accordance with the terms of the contract.

Partial acceptance does not constitute final acceptance of the work, or any part thereof, nor in any way void or alter any of the terms of the contract.

Relief from "certain contractual responsibilities" as indicated herein may, or may not, include:

(a) Further maintenance of the defined limits of the partially accepted work.
(b) Further public liability for the defined limits of the partially accepted work.
(c) Further liability for liquidated damages as applicable to the value of the partially accepted work when the quantities for the partially accepted work are separate quantities listed on the Summary of Quantities sheet of the plans, and the separate quantities and the total amounts thereof are listed on the Engineer's Estimate. Otherwise, no reduction in liquidated damages will be made because of such partial acceptance.

Unless specifically provided in the contract, the liability for liquidated damages shall not be reduced to less than that applicable under the contract for an amount of such work equal to at least fifty percent (50%) of the total amount of work under the contract.

907-105.16.2--Partial Maintenance Release of a Project. Upon written notice from the Contractor of presumptive completion of all the work and upon due notice from the Resident or Project Engineer, the Engineer will make an inspection.

If the inspection discloses any work as being unsatisfactory or incomplete, the Engineer will discuss in detail with the Contractor all discrepancies in the work. Upon correction of the work, another inspection will be made which shall constitute the final inspection provided the work has been satisfactorily completed.

However, if during the final inspection the Engineer determines that all work has been satisfactorily completed save that of growth and coverage of plant establishment on all or part of the work, the Engineer may recommend partial release of all work except items related to growth and coverage. Upon such recommendation, the Contractor will be given a partial release of maintenance and shall be released from further contractual liabilities for the completed work. The Contractor will retain responsibility for plant establishment and all maintenance and repairs appurtenant thereto until satisfactory growth and coverage is achieved.

907-105.16.3--Final Maintenance Release of a Project. Upon written notice from the Contractor of presumptive completion of all the work and upon due notice from the Resident or Project Engineer, the Engineer will make an inspection. If all work provided by the contract has been completed to the Engineer's satisfaction, the inspection will constitute the final inspection, and the Engineer will conditionally release the Contractor of maintenance.

As provided in the contract, in the event items of work are found to be deficient or defective as evidenced by unsatisfactory test reports of material incorporated into the work, the Contractor shall assume full responsibility for corrective measures, and shall reassume maintenance and public liability until such corrective measures are completed to the satisfaction of the Engineer.

907-105.16.4.--Final Acceptance of a Project. Upon evidence that the Contractor has fulfilled all obligations under the contract, the Executive Director will make final acceptance and notify the Contractor in writing. Final acceptance of the project will not be given until all obligations imposed under the contract, including but not limited to the final reporting of payrolls, final reporting of DBE payments, acceptable certifications and test reports of materials used, etc., have been fulfilled.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-107-13

DATE: 11/17/2015

SUBJECT: Permits, Licenses and Taxes

After the second paragraph of Subsection 907-107.02 on page 1, add the following.

Prior to commencing work on any Project, the Contractor shall obtain a Material Purchase Certificate number (MPC#) from the Mississippi Department of Revenue, pursuant to Miss. Code Ann. § 27-65-21, and Miss. Admin. Code 35.IV.10.01. Upon receipt of the MPC#, the Contractor must immediately provide the MPC# to the Contract Administration Division of the Department. Failure to obtain and submit a MPC# prior to commencing work shall result in the withholding of payment to the Contractor until such time that a MPC# is obtained and submitted to the Department.

Delete the last sentence of the last paragraph of Subsection 907-107.02 on page 1, and substitute the following.

The Department will notify the Mississippi Department of Revenue of the names and addresses of any Contractors or Subcontractors.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-107-13 **CODE: (IS)**

DATE: 05/01/2013

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 the following.

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) **Contractor's Liability - Railroad**, 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.

907-107.18--Contractor's Responsibility for Utility Property and Services. After the first sentence of Subsection 107.18 on page 63, add the following:

Prior to any excavation on the project, the Contractor shall contact MS 811 and advise them to mark all known utilities in the area of the excavation.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-107-14

DATE: **06/03/2014**

SUBJECT: **Contractor's Protection Plan**

907-107.22.1--Contractor's Erosion Control Plan. Delete the first sentence of the second paragraph of Subsection 907-107.22.1 on page 1, and substitute the following.

The time between the Notice of Award and Notice to Proceed/Beginning of Contract Time in the proposal, has been allowed 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.

After the last paragraph of Subsection 907-107.22.1 on page 2, add the following.

As soon as the ECP has been approved, a copy of the SWPPP (Narrative, ECP with updates) shall be available on the project at all times. The Contractor shall provide and install a weatherproof enclosure, such as a mailbox, on the project at a location that will be readily accessible to the Engineer or others who may want to review the project ECP. The cost of installing and maintaining this enclosure shall be included in the prices bid for the various erosion control pay items and no direct payment will be made for this work.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-107-14 **CODE: (IS)**

DATE: 05/22/2013

SUBJECT: Contractor's Protection 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. The plan shall utilize temporary measures and permanent erosion control features to provide acceptable controls during all stages of construction. If an early Notice to Proceed is desired, the Contractor's Erosion Control Plan should be submitted to the Engineer as soon as possible after award since an approved erosion control plan is required for an early Notice to Proceed.

Approximately 60 calendar days, the time between the Notice of Award and Notice to Proceed/Beginning of Contract Time in the proposal, has been allowed 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 on this project 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

SUPPLEMENT TO SPECIAL PROVISION NO. 907-108-37

DATE: **12/17/2015**

SUBJECT: **Prosecution and Progress**

Delete the first paragraph of Subsection 907-108.03.1 on pages 1 and 2, and substitute the following.

907-108.03.1--Progress Schedule. On working day projects, the Department will furnish the Contractor a progress schedule developed for the determination of contract time which may be used as the contract progress schedule, or the Contractor's own proposed progress schedule may be submitted for approval. If the Contractor elects to furnish a progress schedule for approval by the Engineer, it should be furnished promptly after award of the contract.

On completion date projects which include A + B projects, 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 Contractor prepared progress schedules and approve schedules as it relates to compliance with the specifications and logic. The progress schedule must be approved by the Engineer prior to commencing work. The progress schedule shall be a computer generated bar-chart type schedule 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.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-108-37 **CODE: (SP)**

DATE: 12/08/2014

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. On working day projects, the Department will furnish the Contractor a progress schedule developed for the determination of contract time which may be used as the contract progress schedule, or the Contractor's own proposed progress schedule may be submitted for approval. If the Contractor elects to furnish a progress schedule for approval by the Engineer, it should be furnished promptly after award of the contract. 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 progress 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.

This progress schedule shall provide a bar for each major phase of construction such as, but not limited to, clearing and grubbing, grading, drainage structures, bridges, base, shoulders, paving, etc. with an estimated start working day and completion working day for each bar, all within the specified contract time.

A revised progress schedule may be required within ten days of the occurrence of any one of the following conditions:

- when a major change occurs in the work
- when a time extension is granted
- when the progress schedule becomes unrealistic

The Engineer's approval of the aforementioned Progress Schedules does not waive any contract requirements.

In the event the Contractor has not submitted an approvable progress schedule by the beginning of contract time, the progress schedule prepared by the Department shall be the approved progress schedule and used to assess contract time.

An approved progress schedule shall be in effect until the date on which a revised schedule is approved. The approved progress schedule will be the basis for contract time assessment.

When a Critical Path Method (CPM) schedule is required in the proposal, this schedule will be used in lieu of the bar graph progress schedule in evaluating work progress. In such case, the same time frame noted in this subsection for the original submittal along with the update requirements will apply.

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--Based on Working Day Completion.

907-108.06.1.1--General. Contract Time will be established on the basis of an allowable number of Working Days, as indicated in the contract. A working day is defined as a day the Contractor worked or could have worked in accordance with the conditions set forth in Subsection 907-108.06.1.2, Subparagraphs (a) and (b), except during the months of December, January, and February.

During the months of December, January, and February, time will be assessed in the miscellaneous phase regardless of whether or not the Contractor actually works. The value for the time on any particular day will be determined by dividing the number of anticipated working day shown in the following table by the number of days in the particular month. This number will be expressed to three decimal places (0.000)

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".

907-108.06.1.2--Contract Time. The following TABLE OF ANTICIPATED WORKING DAYS indicates an average/anticipated number of working days per month.

TABLE OF ANTICIPATED WORKING DAYS

Month	Working 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

NOTE: The above Table is for informational purposes only. The actual working day total as assessed by the Project Engineer on Form CSD-765 shall govern.

Available working days will start being assessed at the original Notice to Proceed/Beginning of Contract Time date shown in the contract documents, regardless of whether or not the Contractor has been issued an early Notice to Proceed.

Available working 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.

An available working day will be assessed as follows:

(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 item(s) of work, as determined by the Engineer from the approved progress schedule. When the Contractor works or could work 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 the Contractor works or could work six or more consecutive hours during the day, one (1.0) available work day will be charged for that day, and

(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 item(s) of work, as determined by the Engineer from the approved progress schedule. 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 the 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.

Time will not be charged during any required waiting period for placement of permanent pavement markings as set forth in Subsection 618.03 provided all other work is complete except growth and coverage of vegetative items as provided in Subsection 210.01.

Each month the Engineer will complete, and furnish to the Contractor, an "Assessment Report of Working Days" (CSD-765). This report shows the number of working days assessed during the estimate period and the cumulative working days assessed 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.

The Contractor's progress will be determined monthly at the time of each progress estimate and will be based on the percentage of money earned by the Contractor compared to the percentage of elapsed time.

The percentage of money earned will be determined by comparing the total money earned to-date by the Contractor, minus any payment for advancement of materials, to the total dollar amount of the contract. The percentage of time elapsed will be determined by comparing the working days assessed to-date on Form CSD-765 to the total allowable working days for 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.

907-108.06.1.3--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.

An extension of contract time may be granted for unforeseen utility delays, abnormal delays caused solely by the State or other governmental authorities, or unforeseeable disastrous phenomena of nature of the magnitude of earthquakes, hurricanes, named tropical storms, tornadoes, or flooded essential work areas which are deemed to unavoidably prevent prosecuting the work.

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 Working 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.

Any extension of contract time will be on a working day basis.

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.

If the contract time 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 907-108.07 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.

907-108.06.1.4--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.

907-108.06.2--Based on Specified Completion Date.

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

For contracts in which a Specified Completion Date is indicated in the Contract, the span of Contract Time shall be between the date of the Beginning of Contract Time and the Specified Completion Date indicated in the Contract.

For contracts in which a Completion Date is determined by the Contractor (A + B Contracts), the span of Contract Time shall be between the date of the Beginning of Contract Time and the date representing the number of Calendar Days determined by the Contractor to complete the work.

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.

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 Contractor's progress will be determined monthly at the time of each progress estimate and will be based on the percentage of money earned by the Contractor compared to the percentage of elapsed time.

The percentage of money earned will be determined by comparing the total money earned to-date by the Contractor, minus any payment for advancement of materials, to the total dollar amount of the contract. The percentage elapsed time shall be calculated as a direct ratio of the expired Calendar Days to the total Calendar Days provided for 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.

907-108.06.2.2--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.

On all completion date contracts, an extension of contract time may be granted for unforeseen

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

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.

Any extension of contract time will be based on a calendar day basis, excluding Saturdays, Sundays or legal holidays recognized by the Department in Subsection 108.04.1.

If the contract time 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 907-108.07 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.

907-108.06.2.3--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.

907-108.07--Failure to Complete the Work on Time. Delete the Schedule of Deductions table in Subsection 108.07 on page 85, and substitute the following.

Schedule of Deductions for Each Day of Overrun in Contract Time

Original Contract Amount		Daily Charge
From More Than	To and Including	Per Calendar Day
$ 0	100,000	$ 150
100,000	500,000	360
500,000	1,000,000	540
1,000,000	5,000,000	830
5,000,000	10,000,000	1,200
10,000,000	20,000,000	1,800
20,000,000	----------	3,500

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. 907-109-8 **CODE: (SP)**

DATE: 09/10/2015

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.

After the second sentence of the fourth full paragraph of Subsection 109.01 on page 90, add the following.

Where loose vehicle measurement (LVM) is used, the capacity will be computed to the nearest one-tenth cubic yard and paid to the whole cubic yard. Measurements greater than or equal to nine-tenths of a cubic yard will be rounded to the next highest number. Measurements less than nine-tenths of a cubic yard will not be rounded to the next highest number. Example: A vehicle measurement of 9.9 cubic yards will be classified as a 10-cubic yard vehicle. A vehicle measurement of 9.8 cubic yards will be classified as a 9-cubic yard vehicle.

907-109.04--Extra and Force Account Work. Delete the first paragraph under Subsection 109.04 on page 91, and substitute the following.

When extra work results for any reason and is not handled as prescribed elsewhere herein, the Engineer and the Contractor will attempt to agree on equitable prices. When such prices are agreed upon, a Supplemental Agreement will be issued by the Engineer.

When the Supplemental Agreement process is initiated, the Contractor will be required to submit to the Engineer a detailed breakdown for Material, Labor, Equipment, Profit and Overhead. The total allowable markup (which includes Prime Contractor and Subcontractor work, if applicable) for Supplemental Agreement work shall not exceed 20%, which also includes tax and bond.

The requirement for detailed cost breakdowns may be waived when a Department's Bid Item History exists for the proposed item(s), and the Contractor's requested price, including mark-up, is within 20% of the Department's Bid History cost for that item(s). In any case, the Department reserves the right to request detailed cost breakdowns from the Contractor on any Supplemental Agreement request.

When equitable prices cannot be agreed upon mutually by the Engineer and the Contractor, the Engineer will issue a written order that work will be completed on a force account basis to be compensated in the following manner:

In the last sentence of subparagraph (b) in Subsection 109.04 on page 91, change "bond" to "bond(s)".

Delete the first and second paragraphs of subparagraph (d) in Subsection 109.04 on page 92 and substitute the following.

Equipment. For any machinery or special equipment, other than small tools, authorized by the Engineer, the Contractor will use the rates shown in 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, unless otherwise allowed by the Engineer. This book shall be used to determine equipment ownership and operating expense rates. These rates do not include allowances for operating labor, mobilization or demobilization costs, overhead or profit, and do not represent rental charges for those in the business of renting equipment. Operating labor and overhead cost will be allowed. Subject to advance approval of the Engineer, actual transportation cost for a distance of not more than 200 miles will be reimbursed for equipment not already on the project. The cost of transportation after completion of the force account work will be reimbursed except it cannot exceed the allowance for moving the equipment to the work.

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.

907-109.06.2--Advancement on Materials. Delete Subsection 109.06.2 on pages 94 & 95, and substitute the following.

907-109.06.2--Advancement on Materials. Partial payments may include advance payment for certain nonperishable or durable materials such as base aggregates, reinforcing steel, bridge piling, structural steel, prefabricated bridge components, traffic signal equipment, electrical equipment, fencing materials, and sign materials with approval of the Engineer. Advance payment may be requested for structural steel members provided fabrication has been completed and the members have been declared satisfactory for storage by a Department representative. The Contractor must make a written request to the Project Engineer for advanced payment and furnish written consent of the Surety. To qualify for advance payment, materials must be stored or stockpiled on or near the project or at other locations approved by the Engineer; or in the case of precast concrete members, treated timber, guard posts and other approved preprocessed durable and bulky materials, the materials may be stored at the commercial producer's yard provided it is located in Mississippi; or in the case of prestressed concrete members that may

require being produced at an out-of-state location, the prestress members shall be produced and may be stored at the commercial manufacturer's yard provided it is a PCI certified plant on the Department's List of Approved Prestress & Precast Plants and it is located within the continental United States; or in the case of structural steel members that may require fabrication at an out-of-state location, the fabricated members may be stored at the location of the commercial fabricator's yard provided it is located within the continental United States.

Advancements will not be allowed until the Project Engineer has received copies of material invoices and certified test reports or acceptable certificates of conformance, and in the case of materials stored at the commercial producer's/fabricator's yard, the material shall be positively identified for the specific project and a Certificate of Storage issued by the Department or a designated representative of the Department. Requests for advancements on fabricated structural steel members and prestress concrete members stored out-of-state will be denied when the Department does not have available a designated representative to issue a Certificate of Storage.

The Contractor shall make suitable arrangements to the satisfaction of the Engineer for storage and protection at approved sites or, in the case of materials stored at the commercial producer's yard located in Mississippi or, in the case of fabricated structural steel members stored at the commercial fabricator's yard or prestress concrete members stored at a commercial manufacturer's yard located within the continental United States, the Contractor shall make arrangements with the producer/fabricator for suitable storage and protection. If advanced payment is allowed and the materials are damaged, lost, destroyed or for any reason become unacceptable, the previous payments will be deducted from subsequent estimates until the materials are replaced or restored to an acceptable condition. In all cases, the Contractor shall save harmless the Commission in the event of loss or damage, regardless of cause.

An invoice or an accumulation of invoices for each eligible material must total $10,000 or more before consideration will be given for making advanced payment. When allowed, advance payment will be based on verified actual material cost plus transportation charges to the point of storage. Sales tax, local haul and handling costs shall not be included as material cost.

Advanced payment shall not exceed 100% of the invoice price or 75% of the total contract bid price for the pay item, whichever is less.

Advanced payment for a component of a pay item shall not exceed 95% of the invoice price or 75% of the total contract bid price for the pay item of which the material is a part, whichever is less.

Advanced payment will be made only on materials that will be incorporated permanently in the project.

No advanced payment will be made on minor material items, hardware, etc.

No advanced payment will be made for materials when it is anticipated that those materials will be incorporated into the project within 60 calendar days.

Advanced payment will be paid for those materials which are not readily available, and which can be easily identified and secured for a specific project and for which lengthy stockpiling periods would not be detrimental.

Where a storage area is used for more than one project, material for each project shall be segregated from material for other projects, identified, and secured. Adequate access for auditing shall be provided. All units shall be stored in a manner so that they are clearly visible for counting and/or inspection of the individual units.

Unless specifically provided for in the contract, advance payment will not be made on materials, except for fabricated structural steel members or prestress concrete members, stored or stockpiled outside of the State of Mississippi.

Materials for which an advanced payment has been allowed must be paid for by the Contractor within 60 days of the estimate on which the advanced payment was first allowed and proof of said payment must be verified by the supplier. If proof of payment is not furnished within the allowable 60 days, the advanced payment will be deducted on subsequent current estimates until such time proof of payment is furnished.

As the materials are incorporated into the work, proportionate reductions for advance payments shall be made from monthly estimates covering the work performed. Calculation of percentage of completion, or rate of progress, shall be based on completed work and no consideration will be given to stockpiled materials.

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."

Delete the last paragraph of Subsection 109.07 on pages 97 & 98, and substitute the following.

Adjustments herein provided shall not apply to fuels consumed or materials incorporated into the work during any monthly estimate period falling wholly after the expiration of contract time as defined in Subsection 101.02 of the applicable Mississippi Standard Specifications for Road and Bridge Construction, and as determined by checked final quantities.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-216-1 **CODE: (IS)**

DATE: 05/22/2013

SUBJECT: Solid Sodding

Section 216, Solid Sodding, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-216.04--Method of Measurement. Delete the third and fourth paragraphs of Subsection 216.04 on page 144.

907-216.05--Basis of Payment. Delete the first paragraph of Subsection 216.05 on pages 144 and 145, and substitute the following.

Solid sodding will be paid for at the contract unit price per square yard, which price shall be full compensation for all labor, equipment, materials, tools, ground preparation, fertilization, and all incidentals necessary to complete the work.

Add the "907" prefix to the pay items listed on page 145.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-225-5 **CODE: (SP)**

DATE: **02/10/2016**

SUBJECT: **Grassing**

Section 225, Grassing, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

Delete Section 225 on pages 158 thru 163, and substitute the following.

SECTION 907-225--GRASSING

907-225-01--Description. This work consists of furnishing, transporting, placing, plant establishment, and all work, including ground preparation, fertilizing, seeding, and mulching, necessary to produce a satisfactory and acceptable growth of grass.

At the Contractor's option, seeds and mulch may be incorporated using a hydraulically applied method under certain limitations. When hydraulically applied, it shall be performed in accordance with the requirements and methods addressed in Section 227. Under no circumstances shall fertilizer be incorporated hydraulically.

907-225.02--Materials.

907-225.02.1--Fertilizers. Fertilizers for purposes of this specification shall be understood to include standard manufactured products consisting of single or combination ingredients and agricultural limestone.

All fertilizer shall comply with the State fertilizer laws, Subsection 715.02, and the requirements of this specification.

907-225.02.2--Seeds. Seeds shall meet the requirements of Subsection 715.03, subject to the provisions of this subsection. The Contractor shall acquire seed from persons registered with the Mississippi Department of Agriculture and Commerce.

Except for the germination requirements, bags of seeds properly labeled or tagged according to law and indicating characteristics meeting or exceeding the requirements of Subsection 715.03 will be acceptable for planting.

The Contractor should provide adequate dry storage facilities for seeds, and shall furnish access to the storage for sampling stored seed.

907-225.02.3--Mulch.

907-225.02.3.1--Vegetative Mulch. The vegetative materials for mulch shall meet the

requirements of Subsection 215.02.

907-225.02.3.2--Hydraulically Applied Mulch (Hydromulch). Fibers for hydromulch shall be produced from wood, straw, cellulose, natural fibers, or recycled fibers which are free of non-biodegradable substances. The fiber shall disperse into a uniform slurry when mixed with water. Fibers shall be colored green, or other approved contrasting color, and shall not stain concrete or other surfaces. The use of tacifiers or activators will be allowed.

Hydromulch shall be listed on the Department's "Approved Sources of Materials".

907-225.02.3.2.1--Wood Fiber Mulch. Wood fiber mulch shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form a homogeneous slurry. The fibers shall intertwine physically to form a strong moisture-holding mat on the ground surface and allow rainfall to percolate the underlying soil. The fiber material shall be heat processed so as to contain no germination or growth-inhibiting factors. The mulch shall be dyed an appropriate color to facilitate the application of material using non-toxic dye.

907-225.02.3.2.2--Cellulose Fiber Mulch. Cellulose fiber mulch consist of recycled paper stock products which are shredded into small pieces particular for application by hydraulic seeding equipment. It shall mix readily and uniformly under agitation with water and blend with grass seed and fertilizer to form a homogeneous slurry. When applied to the ground surface, the material shall form a strong moisture-holding mat, allow rainfall to percolate the underlying soil, and remain in place until the grass root system is established. The material shall contain no growth inhibiting characteristic or organisms. The mulch shall be dyed an appropriate color to facilitate the application of material using non-toxic dye.

907-225.02.3.2.3--Wood/Cellulose Fiber Mulch. Wood/cellulose fiber mix hydroseeding mulch shall consist of a combination of the above wood and cellulose fibers at a ratio recommended by the manufacturer of the products.

907-225.02.3.2.4--Straw Mulch. Straw mulch shall consist of a natural straw fiber. This material shall be a minimum 90% straw and essentially free from plastic materials or other non-bio degradable substances. The material shall be disperse into a uniform mulch slurry when mixed with water.

907-225.02.3.2.5--Tackifier. The tackifier will serve the purpose of an adhesive to form a bond between the soil, fiber, and seed particles. It will also allow the soil to retain moisture. The tackifier shall be of the organic or synthetic variety.

907-225.03--Construction Requirements.

907-225.03.1--Ground Preparation. Ground preparation, light or standard, consists of plowing, loosening, and pulverizing the soil to form suitable beds for erosion control items in reasonably close conformity with the established lines and grades without appreciable humps or depressions. When grassing an area that has been previously planted with temporary grassing, a standard ground preparation will be required. The previously planted grasses shall be disked, tilled,

plowed, etc. to assure that the existing temporary grasses are thoroughly mixed into the soil.

Any equipment used for ground preparation shall be approved units suitable to perform the work and subject to the requirements of Subsection 108.05.

The Contractor shall take full advantage of weather and soil conditions, and no attempt shall be made to prepare soil when it is wet or in a condition which will not allow the soil to be properly tilled.

Light ground preparation should be used on areas where seeding is required to improve the coverage of partially vegetated areas.

Standard ground preparation should be used on areas designated to be solid sodded and unvegetated areas designated to be seeded.

Aerating, moistening, or otherwise bringing the soil to a suitable condition for ground preparation shall be considered as incidental to the work and will not be measured for separate payment.

907-225.03.1.1--Light Ground Preparation. Light ground preparation consists of scratching the surface with a close-tooth harrow, disk-harrow, or similar equipment. The depth of scratching should be at least three-quarters inch but not deep enough to damage existing grasses of the type being planted.

907-225.03.1.2--Standard Ground Preparation. Standard ground preparation consists of plowing or disk-harrowing and thoroughly pulverizing the areas immediately before the application of erosion control (vegetative) items. Unless otherwise specified, the pulverized and prepared seedbed should be at least four inches deep and shall be reasonably free of large clods, earthballs, boulders, stumps, roots and other objectionable matter. Incorporation of fertilizer and ground preparation may be performed simultaneously.

907-225.03.2--Fertilizing. Fertilizing consists of furnishing, transporting, spreading, and incorporating fertilizers. The Contractor shall furnish all equipment necessary to properly handle, store, uniformly spread, and incorporate the specified application of fertilizer.

The Contractor shall incorporate 13-13-13 commercial fertilizer at the rate indicated in the vegetation schedule in the plans. The equivalent rate of other type fertilizers will be allowed if the equivalent percentages of Nitrogen, Phosphorus and Potassium are obtained. The Contractor shall incorporate agricultural limestone at the rate indicated in the vegetation schedule in the plans. Fertilization shall be applied uniformly on the areas to be planted or seeded and uniformly incorporated into the soil.

Fertilizers should be applied on individual areas of not more than three (3) acres.

All fertilizer should be incorporated within 24 hours following spreading.

907-225.03.3--Seeding. Seeding consists of furnishing and planting seeds in a prepared seedbed, covering the seeds, and providing plant establishment on all areas seeded.

Prior to planting the seeds, ground preparation and fertilizing shall be satisfactorily performed.

The required type of seeds, minimum rates of application, and planting dates of seeds are shown in the vegetation schedule in the plans.

It is the Contractor's responsibility to apply an ample amount of each type of seed to produce a satisfactory growth of grass and of the seed type required. At the completion of the project, a satisfactory growth of grass will be required. Reference Section 210 for satisfactory growth and coverage of dormant seed.

Seeding should not be done during windy weather or when the ground is frozen, extremely wet, or in a condition which will not allow the soil to be properly tilled.

907-225.03.3.1--Conventional Application. Legume seeds should be treated in accordance with Subsection 715.03.4 immediately before sowing. Seeds should be uniformly sown over the entire area with mechanical seeders. Seeds of different sizes may necessitate separate sowing. When legume seeds become dry, they should be re-inoculated.

All seeds should be covered lightly with soil by raking, rolling, or other approved methods, and the area compacted with a cultipacker.

Mulching should be performed as soon as practicable after seeding.

907-225.03.3.2--Hydroseeding Application. Seeds may be applied using the hydroseeding method except during the months of June, July, August, and September. During these months, the seeding shall be incorporated in accordance with the above Conventional Application method.

The seed(s) shall be combined into a distribution tank with all required ingredients on the project site. The application of the seed(s) and all ingredients shall be performed in one operation.

Mulching should be performed simultaneously with or as soon as practicable after seeding.

907-225.03.3.3--Plant Establishment. The Contractor should provide plant establishment on all areas seeded until release of maintenance. At the completion of the project, a satisfactory growth of grass will be required. The Contractor should reference Subsection 210 for satisfactory growth and coverage of dormant seed.

Plant establishment should be provided for a minimum period of 45 calendar days after completion of seeding. In the event satisfactory growth and coverage has not been attained by the end of the 45-day period, plant establishment should be continued until a satisfactory growth and coverage is provided for at least one kind of plant as referenced in Section 210. The Contractor shall perform plant establishment on all areas of temporary seeding until the Engineer determines that the temporary seeding has served its purpose.

Plant establishment shall consist of preserving, protecting, watering, reseeding, mowing, and other work necessary to keep the seeded areas in satisfactory condition.

Areas requiring reseeding should be prepared and seeded and all other work performed as if the reseeding was the initial seeding. The types and application rates of fertilizer will be at the discretion of the Contractor.

907-225.03.3.4--Growth and Coverage. It shall be the Contractor's responsibility to provide satisfactory growth and coverage of grasses, legumes, or combination produced from the specified seeding.

Growth and coverage on seeded areas will be considered to be in reasonably close conformity with the intent of the contract when the type of vegetation specified, exclusive of that from seeds not expected to have germinated and shows growth at that time, has reached a point of maturity where stems or runners overlap adjacent similar growth in each direction over the entire area.

907-225.03.4--Mulching. Mulching consists of furnishing, transporting, and placing mulch on slopes, shoulders, medians, and other designated areas. Unless otherwise noted in the contract or directed by the Engineer, the Contractor has the option to place mulch by the conventional method or by the hydraulic method.

907-225.03.4.1--Vegetative Mulch.

907-225.03.4.1.1--Equipment. Mulching equipment should be capable of maintaining a constant air stream which will blow or eject controlled quantities of mulch in a uniform pattern.

Mulch stabilizers should consist of dull blades or disks without camber and approximately 20 inches in diameter. The disks should be notched, should be spaced at approximately 8-inch intervals, and should be equipped with scrapers. The stabilizer should weigh approximately 1000 to 1200 pounds, should have a working width of no more than eight feet, and should be equipped with a ballast compartment, so that weight can be increased.

907-225.03.4.1.2--Placement of Vegetative Mulch. Mulching should be placed uniformly on designated areas within 24 hours following seeding unless weather conditions are such that mulching cannot be performed. Placement should begin on the windward side of areas and from tops of slopes. In its final position, the mulch should be loose enough to allow air to circulate but compact enough to partially shade the ground and reduce erosion.

The baled material should be loosened and broken thoroughly before it is fed into the machine to avoid placement of unbroken clumps.

907-225.03.4.1.3--Anchoring Mulch. The mulch should be anchored by using a mulch stabilizer when not hydraulically applied. If a mulch stabilizer is used, the mulch should be punched into the soil for a minimum depth of one inch.

When mulch stabilizers are used, anchoring the mulch should be performed along the contour of the ground surface.

907-225.03.4.2--Hydromulch. Hydromulch shall be applied in accordance with the installation instructions and recommendations of the manufacturer. Hydromulch shall be uniformly applied

at the manufacturer's recommended application rate. In no case shall the application rate be less than one (1) ton per acre.

907-225.03.4.3--Protection and Maintenance. The Contractor should maintain and protect mulched areas until the Release of Maintenance of the project. The Contractor should take every precaution to prevent unnecessary foot and vehicular traffic.

The Contractor should mow, remove or destroy any undesirable growth on all areas mulched as soon as any undesirable growth appears. This will prevent competition with the desired plants and to prevent reseeding of undesirable growth.

907-225.03.5--Hydro Equipment. The equipment for hydraulically applying seed and mulch shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix slurry of the specified amount of fiber, seed, and water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles, which will provide even distribution of the slurry on the various areas to be seeded.

The mixture shall all be combined into the slurry tank for distribution of all ingredients in one operation as specified herein. The materials shall be combined in a manner recommended by the manufacturer. The slurry mixture shall be so regulated that the amounts and rates of application shall result in a uniform application of all materials at rates not less than the amounts specified. Using the color of the mulch as a guide, the equipment operator shall spray the prepared seedbed with a uniform visible coat. The slurry shall be applied in a sweeping motion, in an arched stream, so as to fall like rain, allowing the mulch to build upon each other until an even coat is achieved.

907-225.03.6--Vegetation Schedule. When a vegetation schedule is not shown in the plans or when the contract does not have an official set of plans, the following application rates shall be used, unless otherwise noted or approved by the Engineer.

Agricultural Limestone	1,000 pounds per acre	March 1 to September 1
13-13-13 Commercial Fertilizer	250 pounds per acre	March 1 to September 1
Vegetative Materials	2 tons per acre	
Bermudagrass	80 pounds per acre	March 1 to September 1
	20 pounds per acre	September 1 to March 1 *
Bahiagrass	80 pounds per acre	March 1 to September 1
	25 pounds per acre	September 1 to March 1
Tall Fescue	25 pounds per acre	March 1 to September 1
	100 pounds per acre	October 1 to March 1 **
Sericea Lespedeza	25 pounds per acre	March 1 to September 1
	25 pounds per acre	September 1 to March 1
Crimson Clover	20 pounds per acre	August 1 to April 1

* 80 pounds per acre in District 3 Delta
** 25 pounds per acre in District 3 Delta

907-225.04--Method of Measurement. Grassing will be measured by the acre. Acceptance will be based on a satisfactory growth and coverage of seeds planted.

Acceptable quantities of agricultural limestone will be measured by the ton.

Acceptable quantities for mulch will be measured by the ton. For vegetative mulch, the weight for measurement will be the product of the number of bales acceptably placed and the average weight per bale as determined on approved scales provided by the Contractor. Anchoring of vegetative mulch will not be measured for separate payment. The cost of anchoring shall be absorbed in the prices bid for other items of work. For hydromulch, the weight for measurement will be the dry weight of the packaged fibers used in the mixture. No payment will be allowed for water, additives, tackifier, or other liquids used in the mixture.

907-225.05--Basis of Payment. Grassing, measured as prescribed above, will be paid for at the contract unit price per acre, which will be full compensation for all required materials including seeding and fertilizers other than limestone, ground preparation, equipment, labor, testing and all work necessary to establish a satisfactory growth of grass.

Hard rock agricultural limestone will be paid for at the contract unit price per ton. Hard rock agricultural limestone with a relative neutralizing value (RNV), determined in accordance with Subsection 907-715-02.2.1.3, of between 60.0% and 62.9% will be paid for at half (½) the contract unit price per ton. No payment will be made for hard rock agricultural limestone with an RNV less than 60.0%.

Mulch, measured as prescribed above, will be paid for at the contract unit price per ton, which price shall be full compensation for all materials, equipment, labor, and incidentals necessary to complete the work.

Payment will be made under:

907-225-A:	Grassing	- per acre
907-225-B:	Agricultural Limestone	- per ton
907-225-C:	Mulch, Vegetative Mulch	- per ton
907-225-D:	Mulch, Hydromulch	- per ton

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-226-3 **CODE: (IS)**

DATE: 10/28/2014

SUBJECT: Temporary Grassing

Section 907-226, Temporary Grassing, is hereby added to and made part of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as follows:

SECTION 907-226 -- TEMPORARY GRASSING

907-226.0l--Description. This work consists of furnishing, transporting, placing, plant establishment and all work necessary to produce rapid-growing grasses, grains or legumes to provide an initial, temporary cover of grass. This work includes ground preparation, fertilizing, seeding and mulching necessary to establish a satisfactory growth of temporary grass. The Contractor may elect to place temporary grassing using the hydroseeding method as set out in Special Provision No. 907-227, as modified by this special provision.

The Engineer or the plans will designate areas to be temporarily grassed. Any other areas the Contractor desires to grass will be measured for payment only if agreed upon by the Engineer.

907-226.02--Materials.

907-226.02.1--Fertilizers. Fertilizers for purposes of these specifications shall be understood to include standard manufactured products consisting of a combination of ingredients.

All fertilizer shall comply with the State fertilizer laws and Subsection 715.02.

Agricultural limestone will not be requirement for temporary grassing.

907-226.02.2--Seeds. Seeds shall meet the requirements of Subsection 715.03, subject to the provisions of this subsection. The Contractor shall acquire seed from persons registered with the Mississippi Department of Agriculture and Commerce.

Except for the germination requirements, bags of seeds properly labeled or tagged according to law and indicating characteristics meeting or exceeding the requirements of Subsection 715.03 will be acceptable for planting.

The Contractor should provide adequate dry storage facilities for seeds, and shall furnish access to the storage for sampling stored seed.

907-226.02.3--Mulching. The vegetative materials for mulch shall meet the requirements of Subsection 715.05.

When used, bituminous material for mulch shall be Emulsified Asphalt, Grade SS-1, meeting the requirement of Subsection 702.07.

907-226.03--Construction Requirements. The rates of application shall not exceed the rates shown on the temporary vegetation schedule, unless otherwise approved by the Engineer. Any unauthorized overage due to increased application rates will not be measured for payment.

907-226.03.1--Ground Preparation. Any equipment used for ground preparation shall be approved units suitable to perform the work and subject to the requirements of Subsection 108.05.

Light ground preparation should be used on areas where seeding is required.

Light ground preparation consists of scratching the surface with a close-tooth harrow, disk-harrow, or similar equipment. The depth of scratching should be at least three-quarters inch but not deep enough to damage existing grasses of the type being planted.

Aerating, moistening, or otherwise bringing the soil to a suitable condition for ground preparation shall be considered as incidental to the work and will not be measured for separate payment.

907-226.03.2--Fertilizing. The Contractor shall furnish all equipment necessary to properly handle, store, uniformly spread, and incorporate the specified application of fertilizer.

The Contractor shall incorporate 13-13-13 commercial fertilizer at the rate shown in the vegetation schedule in the plans. The equivalent rate of other type fertilizers will be allowed if the equivalent percentages of Nitrogen, Phosphorus and Potassium are obtained. Fertilization shall be applied uniformly on the areas to be seeded and uniformly incorporated into the soil.

Fertilizer should be applied on individual areas of not more than three acres.

All fertilizer should be incorporated within 24 hours following spreading.

907-226.03.3--Seeding.

907-226.03.3.1--General. Prior to planting the seeds, ground preparation and fertilizing should have been satisfactorily performed.

The required type of seeds, recommended rates of application and recommended planting dates of seeds are shown in the vegetation schedule in the plans.

It is the Contractor's responsibility to apply an ample amount of each type of seed to produce a satisfactory growth of grass and of the seed type required.

Legume seeds should be treated in accordance with Subsection 715.03.4 immediately before sowing. Seeds should be uniformly sown over the entire area with mechanical seeders. Seeds of

different sizes may necessitate separate sowing. When legume seeds become dry, they should be reinoculated.

Seeding should not be done during windy weather or when the ground is frozen, extremely wet, or in an untillable condition.

All seeds should be covered lightly with soil by raking, rolling, or other approved methods, and the area compacted with a cultipacker.

907-226.03.3.2--Plant Establishment. Plant establishment shall consist of preserving, protecting, watering, reseeding, and other work necessary to keep the seeded areas in satisfactory condition.

Areas requiring reseeding should be prepared and seeded and all other work performed as if the reseeding was the initial seeding. The types and application rates of fertilizer will be at the discretion of the Contractor. No additional measurement and payment will be made for re-seeding when payment was made for the initial seeding.

907-226.03.3.3--Growth and Coverage. It shall be the Contractor's responsibility to provide satisfactory growth and coverage of grasses, legumes, or combination produced from the specified seeding.

Growth and coverage on seeded areas will be considered to be in reasonably close conformity with the intent of the contract when the type of vegetation specified, exclusive of that from seeds not expected to have germinated and shows growth at that time, has reached a point of maturity where stems or runners overlap adjacent similar growth in each direction over the entire area.

907-226.03.4--Mulching.

907-226.03.4.1--Equipment. Mulching equipment should be capable of maintaining a constant air stream which will blow or eject controlled quantities of mulch in a uniform pattern. If asphalt is used, a jet or spray nozzle for applying uniform, controlled amounts of asphalt to the vegetative material as it is ejected should be located at or near the discharge spout.

Mulch stabilizers should consist of dull blades or disks without camber and approximately 20 inches in diameter. The disks should be notched, should be spaced at approximately 8-inch intervals, and should be equipped with scrapers. The stabilizer should weigh approximately 1000 to 1200 pounds, should have a working width of no more than eight feet, and should be equipped with a ballast compartment, so that weight can be increased.

907-226.03.4.2--Placement of Vegetative Mulch. If required, mulching should be placed uniformly on designated areas within 24 hours following seeding unless weather conditions are such that mulching cannot be performed. Placement should begin on the windward side of areas and from tops of slopes. In its final position, the mulch should be loose enough to allow air to circulate but compact enough to partially shade the ground and reduce erosion.

The baled material should be loosened and broken thoroughly before it is fed into the machine to avoid placement of unbroken clumps.

907-226.03.4.3--Rates of Application and Anchoring Mulch. The recommended rate of application of vegetative mulch shall be as shown in the vegetation schedule in the plans. The mulch should be anchored by either the use of a mulch stabilizer or by tacking with bituminous material. If a mulch stabilizer is used, the mulch should be punched into the soil for a minimum depth of one inch. If bituminous material is used, the rate of application should be 150 gallons per acre.

Where steep slopes or other conditions are such that anchoring cannot be performed satisfactory with a mulch stabilizer, the Contractor may elect to use bituminous material applied at the time or immediately following the mulch placement.

When mulch stabilizers are used, anchoring the mulch should be performed along the contour of the ground surface.

907-226.03.4.4--Protection and Maintenance. The Contractor should take every precaution to prevent unnecessary foot and vehicular traffic.

907-226.03.5--Vegetation Schedule. When a temporary vegetation schedule is not shown in the plans or when the contract does not have an official set of plans, the following application rates shall be used, unless otherwise noted or approved by the Engineer.

Spring & Summer

Browntop Millet	20 pounds per acre	April 1 to August 31

Fall & Winter

Rye Grass	25 pounds per acre	September 1 to March 31
Oats	90 pounds per acre	September 1 to December 15

13-13-13 Commercial Fertilizer	250 pounds per acre
Vegetative Mulch	2 tons per acre

907-226.04--Method of Measurement. Temporary grassing will be measured by the acre. Acceptance will be based on a satisfactory growth and coverage of seeds planted.

907-226.05--Basis of Payment. Temporary grassing, measured as prescribed above, will be paid for at the contract unit price per acre, which will be full compensation for all required materials, equipment, labor, testing and all work necessary to establish a satisfactory growth of grass.

Payment will be made under:

907-226-A: Temporary Grassing - per acre

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-227-10 **CODE: (IS)**

DATE: 01/25/2012

SUBJECT: Hydroseeding

Section 907-227, Hydroseeding, is hereby added to and made part of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as follows:

SECTION 907-227--HYDROSEEDING

907-227.0l--Description. This work consists of furnishing, transporting, placing, plant establishment and all work necessary to produce a satisfactory and acceptable growth of grass. The seeds, fertilizers, tackifier, and mulch shall be incorporated using the hydroseeding process. These items shall be combined into a mixture and force-applied to the areas to be grassed.

907-227.02--Materials. The Contractor shall, prior to application, furnish the Engineer with invoices of all materials used in the grassing operation.

907-227.02.1--Fertilizers. Fertilizers for purposes of these specifications shall be understood to include standard manufactured products consisting of single or combination ingredients.

All fertilizers shall comply with the State fertilizer laws and Subsection 715.02.

907-227.02.2--Seeds. Seeds shall meet the requirements of Subsection 715.03, subject to the provisions of this subsection. The Contractor shall acquire seed from persons registered with the Mississippi Department of Agriculture and Commerce.

Except for the germination requirements, bags of seeds properly labeled or tagged according to law and indicating characteristics meeting or exceeding the requirements of Subsection 715.03 will be acceptable for planting.

The Contractor should provide adequate dry storage facilities for seeds, and shall furnish access to the storage for sampling stored seed.

907-227.02.3--Mulching. The rate of application of fiber mulch shall be as recommended by the manufacture of the fibers mulch.

907-227.02.3.1--Wood Fiber Mulch. Wood fiber mulch shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form a homogeneous slurry. The fibers shall intertwine physically to form a strong moisture-holding mat on the ground surface and allow rainfall to percolate the underlying soil. The fiber material shall be heat processed so as to

contain no germination or growth-inhibiting factors. The mulch shall be dyed an appropriate color to facilitate the application of material using non-toxic dye.

907-227.02.3.2--Cellulose Fiber Mulch. Cellulose fiber mulch consist of recycled paper stock products which are shredded into small pieces particular for application by hydraulic seeding equipment. It shall mix readily and uniformly under agitation with water and blend with grass seed and fertilizer to form a homogeneous slurry. When applied to the ground surface, the material shall form a strong moisture-holding mat, allow rainfall to percolate the underlying soil, and remain in place until the grass root system is established. The material shall contain no growth inhibiting characteristic or organisms. The mulch shall be dyed an appropriate color to facilitate the application of material using non-toxic dye.

907-227.02.3.3--Wood/Cellulose Fiber Mulch. Wood/cellulose fiber mix hydroseeding mulch shall consist of a combination of the above wood and cellulose fibers at a ratio recommended by the manufacturer of the products.

907-227.02.3.4--Straw Mulch. Straw mulch shall consist of a natural straw fiber. This material shall be a minimum 90% straw and essentially free from plastic materials or other non-bio degradable substances. The material shall be disperse into a uniform mulch slurry when mixed with water.

907-227.02.3.5--Tacifier. The tackifier will serve the purpose of an adhesive to form a bond between the soil, fiber, and seed particles. It will also allow the soil to retain moisture.

The tackifier shall be of the organic or synthetic variety.

907-227.03--Construction Requirements.

907-227.03.1--Ground Preparation. Light ground preparation consists of plowing, loosening, and pulverizing the soil to form suitable beds for seeding items in reasonably close conformity with the established lines and grades without appreciable humps or depressions. Unless otherwise specified, the pulverized and prepared seedbed should be at least four inches deep and shall be reasonably free of large clods, earth balls, boulders, stumps, roots and other objectionable matter. The Engineer may eliminate or alter the requirements for ground preparation due to site conditions.

907-227.03.2--Fertilizing. The Contractor shall furnish all equipment necessary to properly handle, store, uniformly spread, and incorporate the specified application of fertilizer.

The Contractor shall incorporate bag fertilizer at a rate of 1000 pounds per acre of 13-13-13 commercial fertilizer. The equivalent rate of other type fertilizers will be allowed if the equivalent percentages of Nitrogen, Phosphorus and Potassium are obtained. Any changes in the type or rate of application of the fertilizers shall be approved by the Engineer prior to being incorporated.

Agricultural limestone will be incorporated into the area and paid for in accordance with Section 213 of the Standard Specifications.

907-227.03.3--Seeding.

907-227.03.3.1--General. The Contractor shall use the vegetation schedule in the plan for the correct types of seed and application rates, unless otherwise noted or approved by the Engineer.

When a vegetation schedule for permanent grass is not shown in the plans, the following types of seed and application rates shall be used, unless otherwise approved by the Engineer.

Bermudagrass	20 pounds per acre
Bahiagrass	25 pounds per acre
Tall Fescue	15 pounds per acre
Crimson Clover	20 pounds per acre

At the completion of the project, a satisfactory growth of grass will be required. The Contractor should reference Subsection 210 for satisfactory growth and coverage of dormant seed.

907-227.03.3.2--Plant Establishment. The Contractor should provide plant establishment on all areas seeded until release of maintenance. Plant establishment shall consist of preserving, protecting, watering, reseeding, mowing, and other work necessary to keep the seeded areas in satisfactory condition.

Plant establishment should be provided for a minimum period of 45 calendar days after completion of seeding. In the event satisfactory growth and coverage has not been attained by the end of the 45-day period, plant establishment should be continued until a satisfactory growth and coverage is provided for at least one kind of plant. The Contractor should reference Section 210 of the Standard Specifications for more information.

907-227.03.3.3--Growth and Coverage. It shall be the Contractor's responsibility to provide satisfactory growth and coverage of grasses, legumes, or combination produced from the specified seeding.

Growth and coverage on seeded areas will be considered to be in reasonably close conformity with the intent of the contract when the type of vegetation specified, exclusive of that from seeds not expected to have germinated and shows growth at that time, has reached a point of maturity where stems or runners overlap adjacent similar growth in each direction over the entire area.

Final acceptance of the project will not be made until a satisfactory growth of grass has been acknowledged by the Engineer.

907-227.03.4--Mulching. At the Contractor's option, mulch may be wood fiber, cellulose fiber, a mixture of wood and cellulose fibers, or straw fiber. The mulch shall be applied at the rate recommended by the manufacturer in a mixture of water, seed and fertilizer. Any changes in the rate of application of the mulch shall be approved by the Engineer prior to its use.

907-227.03.5--Equipment. Hydraulic equipment shall be used for the application of fertilizers, seeds and slurry of the prepared mulch. This equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix slurry of the specified amount of fiber, fertilizer, seed and water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles, which will provide even distribution of the slurry on the various areas to be seeded.

The seed, fertilizer, mulch and water shall all be combined into the slurry tank for distribution of all ingredients in one operation as specified herein. The materials shall be combined in a manner recommended by the manufacturer. The slurry mixture shall be so regulated that the amounts and rates of application shall result in a uniform application of all materials at rates not less than the amounts specified. Using the color of the mulch as a guide, the equipment operator shall spray the prepared seedbed with a uniform visible coat. The slurry shall be applied in a sweeping motion, in an arched stream, so as to fall like rain, allowing the mulch to build upon each other until an even coat is achieved.

907-227.03.6--Protection and Maintenance. The Contractor should maintain and protect seeded areas until release of maintenance of the project. The Contractor should take every precaution to prevent unnecessary foot and vehicular traffic.

The Contractor should mow or otherwise remove or destroy any undesirable growth on all areas mulched to prevent competition with the desired plants and to prevent reseeding of undesirable growth.

907-227.04--Method of Measurement. Hydroseeding, complete and accepted, will be measured by the acre. No separate payment will be made for ground preparation, seeds, fertilizers, or mulch. Acceptance will be based on a satisfactory growth and coverage of seeds planted.

Agricultural limestone shall be measured and paid for under Section 213 of the Standard Specifications.

907-227.05--Basis of Payment. Hydroseeding, measured as prescribed above, will be paid for at the contract unit price per acre, which will be full compensation for all required materials, equipment, labor, testing and all work necessary to establish a satisfactory growth of grass.

Payment will be made under:

907-227-A: Hydroseeding - per acre

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. 907-237-4 **CODE: (SP)**

DATE: 03/13/2012

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 diameter of twelve inches (12") and a length adequate to meet field conditions. Wattles used at other locations shall have a diameter of twenty inches (20") and a length adequate to meet field conditions. The minimum diameter for the above wattle sizes shall be one inch (1") less than the specified diameter.

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. 907-242-27 **CODE: (SP)**

DATE: 03/08/2016

SUBJECT: Project Office and Storage Buildings

PROJECT: BWO-2209-49(001) / 502399301, BWO-2208-49(001) / 502399302, & LWO-2093-49(002) / 502399303 -- Montgomery County

Section 907-242, Project Office and Storage Buildings, 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-- PROJECT OFFICE AND STORAGE BUILDINGS

The following specifications are to be used ONLY for the construction of the Winona Project Office and Storage Buildings. The Mississippi Standard Specifications for Road and Bridge Construction shall be used for all other items of work.

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PROJECT: PROJECT OFFICE BUILDING & STORAGE BUILDING
AT WINONA, MONTGOMERY COUNTY, MISSISSIPPI

PROJECT NUMBER: BWO-2209-49(001) 502399
BWO-2208-49(001) 502399
LWO-2093-49(002) 502399

DATE: 2-29-16

DESCRIPTION A: This Work shall consist of all construction work necessary in constructing the Project Office Building for District Two at Winona, Montgomery County, Mississippi, MDOT Project No. BWO-2209-49(001) 502399, in accordance with these Specifications and conforming with the Drawings

DESCRIPTION B: This Work shall consist of all construction work necessary in constructing a Storage Building for the Project Office Building for District Two at Winona, Montgomery County, Mississippi, MDOT Project No. BWO-2208-49(001) 502399, in accordance with these Specifications and conforming with the Drawings.

The Site Improvements portion of this Work shall consist of site work outside and adjacent to the Work described for construction and renovation of the buildings for District Two at Winona, Montgomery County, Mississippi, Project No. LWO-2093-49(002) 502399. See Civil Drawings and Special Provisions for extent of this portion of the Work.

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 01 15 LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.01 LIST OF DRAWINGS

A. List of Drawings: Drawings for Special Provision 907-242-27 consist of the following Contract Drawings:

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A1.2	17	FLOOR FINISH PLAN
A1.3	18	REFLECTED CEILING PLAN
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PART 3 – EXECUTION (Not Used)

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SECTION 00 21 13 INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 QUESTIONS

A. Questions Regarding Bidding: Refer to Section 904 – Notice to Bidders No. 3980.

1.02 BIDDER'S QUALIFICATIONS

A. Prequalification of Bidders: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 102.01 – Prequalification of Bidders.

1.03 NON-RESIDENT BIDDER

A. Consideration of Proposals: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 103 – Award and Execution of Contract, Article 103.01 – Consideration of Proposal.

1.04 CONDITIONS OF WORK

A. Each Bidder must fully inform themselves 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.

1.05 EXAMINATION OF PROPOSAL AND SITE

A. Examination of proposal and Site: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 102.05 – Examination of Plans, Specifications, Special Provisions, Notice to Bidders and Site Work.

B. There will be no Pre-Bid Meeting, but failure to visit the site prior to submitting a bid will in no way relieve the successful Bidder from furnishing materials or performing work required to complete Work in accordance with Drawings and Project Manual (Proposal).

1.06 LAWS AND REGULATIONS

A. Laws and Regulations: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 107 – Legal Relations and Responsibility to Public, Article 107.01 – Laws to be Observed.

1.07 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.

1.08 METHOD OF BIDDING

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

1.09 PROPOSAL FORMS

A. Preparation of Proposal: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 907-102.06 – Preparation of Proposal (as amended).

1.10 TIME OF COMPLETION

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

1.11 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 25 00 entitled Substitution Procedures which covers procedures after the award of Contract.

1.12 ADDENDA

A. 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.

B. If the Proposal, Section 905, does not contain acknowledgement of receipt and addition to the Proposal and Contract Documents of all addenda issued prior to opening of bids will be considered irregular and may be rejected.

1.13 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 complete spelling of bidder's name and address – exact as recorded at the Secretary of State http://www.sos.state.ms.us/busserv/corp/soskb/csearch.asp which should be the same as you applied for at the Mississippi Board of Contractors http://www.msboc.us/search2.CFM.

C. Legal Address: The address appearing on the Proposal Form should be the same address exact as recorded at the Secretary of State http://www.sos.state.ms.us/busserv/corp/soskb/csearch.asp which should be the same as you applied for at the Mississippi Board of Contractors http://www.msboc.us/search2.CFM.

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.

1.14 BID SECURITY

A. Proposal Guaranty: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 907-102.08 – Proposal Guaranty (as amended).

1.15 POWER OF ATTORNEY

A. Power of Attorney: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 103 – Award and Execution of Contract, Article 103.05 – Requirement of Contract Bond.

1.16 SUBMITTAL

A. Delivery of Proposals: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 102.09 – Delivery of Proposal.

1.17 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.

1.18 OPENING OF BIDS

A. Public Opening of Proposal: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 102.12 – Public Opening of Proposal.

1.19 IRREGULARITIES

A. Irregular Proposals: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 102.07 – Irregular Proposal.

1.20 PROTEST

A. Any protest must be delivered in writing to the Owner prior to the Award Date.

1.21 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.

1.22 AWARD OF CONTRACT

A. Award of Contract: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 103 – Award and Execution of Contract, Article 103.02 – Award of Contract.

B. Consideration of Proposal: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 103 – Award and Execution of Contract, Article 907-103.01 – Consideration of Proposal (as amended).

1.23 FAILURE TO ENTER INTO A CONTRACT

A. Failure to Execute Contract: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 103 – Award and Execution of Contract, Article 103.08 – Failure to Execute Contract.

1.24 SECURITY FOR FAITHFUL PERFORMANCE

A. Requirements of Contract Bonds: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 103 – Award and Execution of Contract, Article 103.05 – Requirement of Contract Bond.

1.25 BIDDER'S CHECKLIST

A. Proposal Form:

1. Base Bid:
( ) Fill-in the amount of the base bid in numbers. The written word shall govern.
2. Alternates:
( ) Fill-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. - complete spelling of bidder's name and address – exact as recorded at the Secretary of State http://www.sos.state.ms.us/busserv/corp/soskb/csearch.asp which should be the same as you applied for at the Mississippi Board of Contractors http://www.msboc.us/search2.CFM.
( ) Legal address of the business listed above (at SOS and Contractor's Board).
( ) 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 equal to or 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.

D. Subcontractors' Name

1. Subcontractor:
( ) List Mechanical, Plumbing, and/or Electrical Subcontractor regardless of cost.
* List name even for under $50,000.
* Fire Protection Sprinkler Contractors do not have to be listed.
* If there is a separate HVAC/Plumbing Sub-Contractor, so notate as mentioned herein.
* If Mechanical, Plumbing, and/or Electrical Subcontractor is performed by the General Contractor, be sure the General has COR for said discipline.
* If there is no Mechanical, Plumbing, and/or Electrical Sub-Contractor listed, then use of Sub-Contractor to perform such scope will not be permitted.

E. Subcontractors' COR Number

1. Certificate of Responsibility
( ) List certificate of responsibility Number for all listed Sub-Contractors over $50,000.
* If under $50,000 – so notate on the COR line "under $50,000" (or can still show COR Number)

1.26 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:	Neal Dougherty – Contract Administration	(601) 359-7700
2.	Additional Prints:	Nathan Bruce – MDOT Plans Print Shop	(601) 359-7459
3.	Bid Forms:	Billy Owen – Contract Admin. Engineer	(601) 359-7730
4.	Specifications:	Earl Glenn – Assist. Construction Engr.	(601) 359-7301
5.	Drawings:	Earl Glenn – Assist. Construction Engr.	(601) 359-7301

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

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 00 22 13 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 INSTRUCTIONS TO BIDDERS

A. Instructions to Bidders for Project consist of the following:

1.02 WORK IN PROXIMITY OF HIGH VOLTAGE POWER LINES

A. Contractor's Responsibility for Utility Property and Services: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 107 – Legal Relations and Responsibility to Public, Article 107.18 – Contractor's Responsibility for Utility Property and services.

1.03 PLANT PEST QUARANTINES INFORMATION

A. Quarantine Information: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 107 – Legal Relations and Responsibility to Public, Article 107.22.7 – Quarantine Information.

1.04 PROMPT PAYMENT

A. General: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 108 – Prosecution and Progress, Article 108.01.1 – General.

1.05 ALTERATIONS IN BIDDING PROCESS

A. Preparation of Proposal: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 102 – Bidding Requirements and Conditions, Article 907-102.06 – Preparation of Proposal (as amended).

1.06 CONTRACT TIME

A. Refer to Section 904 – Notice to Bidders (Contract Time) for completion of Contract. Construction Schedule: Refer to Mississippi Standard Specifications for Road and Bridge Construction 2004 Edition Section 108 – Prosecution and Progress (as amended).

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

1.07 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. Building related Items, Materials, or Systems:
   a. Masonry Items.
   b. Cellulose Thermal Insulation
   c. Sheet Metal Roofing
   d. Thin-Set Ceramic Tiling
   e. Plumbing Items
   f. Heating, Ventilating and Air Conditioning Items
   g. Security and Surveillance Items
   h. Electrical Items

See Notice To Bidders for Specialty Items associated with the Site Improvements for this Project.

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

END OF SECTION

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.

END OF SECTION

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
PROJECT OFFICE IN WINONA, MONTGOMERY COUNTY, MISSISSIPPI

BWO-2209-49(001) 502399 / 301000
BWO-2208-49(001) 502399 / 302000
LWO-2093-49(002) 502399 / 303000

THE OWNER:
(Name, legal status and address)
MISSISSIPPI TRANSPORTATION COMMISSION
P O BOX 1850
JACKSON, MISSISSIPPI 39215-1850

THE ARCHITECT:
(Name, legal status and address)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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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. . 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.

§ 1.1.2 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. The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications

§ 1.1.8 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. In the event of a conflict between or among the Contract Documents, Contractor shall perform

Work and obligations of the higher quality, larger quantity, greater expense, tighter schedule and more stringent requirements, unless otherwise directed in writing by the Owner.

§ 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. 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.

§ 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.

§ 1.7 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.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 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.

§ 2.1.2 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 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 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).

§ 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.

§ 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 and any Work or material called for by either shall be provided as if called for by both, 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 and Professional shall be responsible for any resulting loss or damage.

§ 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 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. The Owner will furnish utilities for construction (electricity and water). Contractor must use "as- is" or pay for any necessary modifications.

§ 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.

§ 3.4.4 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.

§ 3.4.5 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.

§ 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 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 Supplemental Agreement (Change Order). The amount of the Supplemental Agreement (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.

§ 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 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. The 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.

§ 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.

§ 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. The Contractor agrees to defend, hold harmless and indemnify the Owner against all claims or demands caused by the Contractor's acts or omissions.

§ 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.

§ 4.1.4 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, provide Construction Documents and Construction Administration for this Project. These Consultants are advisors to the Project Engineer and MDOT Architect.

§ 4.1.5 The term "Project Engineer" as used in these Documents refers to the Mississippi Department of Transportation Executive Director's authorized representative. The Project Engineer shall be the Initial Decision Maker referenced in Article 15. The term "MDOT Architect" is the representative for the MDOT Architectural Services Unit and is an advisor to the Project Engineer.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide assistance to the Project Engineer and MDOT Architect for administration of the Contract as described in the Contract Documents and will be the Project Engineer's representative during construction until the date the Project Engineer issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Project Engineer 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 Project Engineer, 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 Project Engineer reasonably informed about the progress and quality of the portion of the Work completed, and report to the Project Engineer (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.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

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

§ 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 the Project Engineer will prepare State Estimates for Payment in such amounts.

§ 4.2.6 The Architect shall advise the Project Engineer to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will advise the Project Engineer 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 recommendation 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 Project Engineer, with recommendations from the Architect, will prepare Supplemental Agreements (Change Orders) and Advanced Authority (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 Project Engineer, MDOT Architect, and Architect will conduct inspections to determine the date or dates of Completion; determine Final Acceptance; receive and forward to the Project Engineer, for 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 Project Engineer 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 recommend 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.

§ 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 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 either in connection with other portions of the Project or other construction or operation on the site. In such event, the Contractor shall coordinate its activities with those of the Owner and of other Contractors so as to facilitate the general progress of all work being performed by all parties. Cooperation will be required in the arrangement for the storage of materials, and in the detailed execution of the work.

§ 6.1.2 The Contractor, including his subcontractors, shall keep informed of the progress and the detailed work of the Owner or other Contractors and shall immediately notify the Project Engineer and Architect of lack of progress or delays by other Contractors which are affecting Contractor's Work. Failure of Contractor to keep informed of the progress of the work of the Owner or other Contractors and / or failure of Contractor to give notice of lack of progress or delays by the Owner or other Contractors shall be deemed to be acceptance by Contractor of the status of progress by other Contractors for the proper coordination and completion of Contractor's Work. If, through acts or neglect on the part of the Contractor, the Owner or any other Contractor or subcontractor shall suffer loss or damage or assert any claims of whatever nature against the Owner, the Contractor shall defend, indemnify and hold harmless the Owner from any such claims or alleged damages, and the Contractor shall resolve such alleged damages or claims directly with the other Contractors or subcontractors.

§ 6.1.3 The Owner shall provide for coordination of the activities of the separate contractors 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.

(Paragraph deleted)

§ 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 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 Supplemental Agreement (Change Order), Advance Authority (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 Supplemental Agreement (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 Project Engineer.

§ 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 Supplemental Agreement (Change Order), Advance Authority (Construction Change Directive) or order for a minor change in the Work.

§ 7.2 SUPPLEMENTAL AGREEMENT (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.

§ 7.2.2 The maximum cost included in a Supplemental Agreement (Change Order) 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 comply passively without protest to the same requirements when participating in a Supplemental Agreement (Change Order).

§ 7.3 ADVANCE AUTHORITY (CONSTRUCTION CHANGE DIRECTIVES)

§ 7.3.1 Advance Authority (Construction Change Directive) is a written order prepared and signed by the Project Engineer, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Project Engineer may by Advance Authority (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 as Advanced Authority on changes to the Work where agreement has been reached prior to preparation of Supplemental Agreement (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
.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 Project Engineer will prepare a Supplemental Agreement (Change Order). Supplemental Agreements (Change Orders) shall be issued for all or any part of an Advance Authority (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.

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 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 Completion is the date certified by the Project Engineer and approved by the Owner 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 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 Project Engineer may determine, subject to the Owner's approval. The Contractor's sole and exclusive right and remedy for delay by any cause whatsoever is an extention of the Contract Time but no increase in the Contract Sum. 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.

§ 8.3.2 No delay, interference, hindrance or disruption, from whatever source or cause, in the progress of the Contractor's Work shall be a basis for an extension of time unless the delay, interference hindrance or disruption is (1) without the fault and not the responsibility of the Contractor, its subcontractors and suppliers and (2) directly affects the overall completion of the Work as reflected on the critical path of the updated Construction Schedule. The contractor expressly agrees that the Owner shall have the benefit of any float in the construction schedule and delay in construction activities which do not affect the overall completion of the work does not entitle the Contractor to any extension in the Contract Time.**§ 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.

(Paragraph deleted)

§ 8.3.4 This provision specifies the procedure for the determination of time extensions for unusually severe weather. In order for the Owner and Architect to award a time extension under this clause, the following conditions must be satisfied:

1. The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.
2. The unusually severe weather must actually cause a delay in the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

§ 8.3.5 The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's activity durations for inclusion in the progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

1. Adverse Weather Evaluation: The table below defines the monthly anticipated adverse weather in days for the project:

   Adverse Weather Table

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10	9	9	8	9	8	10	9	7	6	8	9

§ 8.3.6 Monthly anticipated adverse weather delay work days based on five (5) day work week.

§ 8.3.7 Upon acknowledgement of the Notice to Proceed (NTP) and continuing throughout the Contract, the Contractor shall record on the daily report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on the overall projects' critical activities for 50 percent or more of the Contractor's scheduled workday. The number of actual adverse weather days shall include days impacted by actually adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph 8.3.5 above, the Owner and the Architect will convert any qualifying delays to calendar days giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the Contract.

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, 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, MDOT Architect, or Project Engineer, 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. 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.

§ 9.3.1.1 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.

§ 9.3.1.3 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 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 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.

§ 9.3.2.1 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 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.

§ 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 recommend acceptance or state what portions should be modified to the Project Engineer for such amount as the Architect determines is properly due, or notify the Contractor and Project Engineer in writing of the Architect's reasons for modifications in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The recommendations for Payment will constitute a representation by the Architect to the Project Engineer, 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 Date of 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 recommendations for Payment will further constitute a representation that the Contractor is entitled to payment in the amount recommended. However, the recommendations 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 recommend to withhold 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 recommend 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 make recommendation for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also make recommendations to withhold Payment or, because of subsequently discovered evidence, may make recommendations to nullify the whole or a part of a Payment previously made, 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;

.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 recommendations to withhold Payment are removed, recommendations will be made for amounts previously withheld.

(Paragraph deleted)

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has reviewed the Application for Payment and made recommendations to the Project Engineer, the Project Engineer shall make payment in the manner and within the time provided in the Contract Documents.

§ 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.

§ 9.6.8 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

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

(Paragraph deleted)

§ 9.8.1 Substantial Completion shall not be recognized under this Contract. The Project Engineer shall determine when the building or designated portion is complete to the point it can be used for its intended purpose. This date shall be the Date of Completion. All Warranties and Extended Warranties shall use this date as the starting date of Warranty Period.

§ 9.8.2 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 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 Date of 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 agreement 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 agreement 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.

§ 9.11 LIQUIDATED DAMAGES

§ 9.11.1 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 D
$ 0	100,000	$ 150
100,000	500,000	360
500,000	1,000,000	540
1,000,000	5,000,000	830
5,000,000	10,000,000	1,200
10,000,000	20,000,000	1,800
20,000,000	----------	3,500

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.

§ 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 anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, or the 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 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.

(Paragraphs deleted)
§ 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 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.

§ 11.1.5 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 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 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

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 The Contractor 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.

(Paragraph deleted)

§ 11.3.1.3 If the property insurance requires deductibles, the Contractor 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 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.

(Paragraphs deleted)

§ 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 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 (5) days after occurrence of loss

§ 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 DATE OF 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 DATE OFCOMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of 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.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Date of Completion by the period of time between Date of 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.

§ 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;

.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.

§ 14.3.2 The Contract Time shall be adjusted for increases in the time caused by suspension, delay or interruption as described in Section 14.3.1. 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 ADVERSE WEATHER DELAYS

.1 The Contractor shall anticipate delays in the progress of the Work, due to adverse weather, during the stipulated Contract Time in the amount of days published in recognized official data. If documented evidence (from recognized official data) indicates weather delays in excess of this amount, then the Contractor may be granted an Extension of Time for each Work Day, in excess of the normal days, in which the weather prevented work on the Project Site for fifty (50) percent or more of the Contractor's "Normal Work Day", but only if such prevented work was critical to the timely completion of the project.

.2 Contractor's "Normal Work Day" shall be defined on the basis of a five (5) Day Work Week. Example: If the "normal" (regular) schedule is a five (5) Day Work Week, meaning Monday through Friday, then a rain on Sunday (since not a scheduled Work Day) will not necessarily delay the Work of the Project. However, site conditions, as a result of the rain, could partially or fully prevent scheduled outside work on Monday (and thereafter) thereby making the Contractor eligible to apply for a Weather Delay Extension of Time on the basis of the conditions stated in the paragraph above.

§ 15.1.5.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.5.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the causes of delay which may have concurrent or interrelated affects on the progress of the Work, or for concurrent delays due to the fault of the Contractor

§ 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 Project Engineer will serve as the Initial Decision Maker. 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.

§ 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.

(Paragraphs deleted)

§ 15.5 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 CONDITIONS PRECEDENT TO ARBITRATION

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.

§ 15.5.2 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 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 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 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 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 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 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.

(Paragraph deleted)

SECTION 00 91 13 ADDENDA

PART 1 - GENERAL

1.01 NOTICE TO BIDDERS

A. Addenda issued on this Project will become part of the Standard Form of the Agreement Between the Owner and the Contractor.

B. Addenda will be indicated on the second sheet of Section 905 (end of the Proposal/Project Manual) as addenda.

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 Project Office Building & Storage Building at Winona, Montgomery County, Mississippi. Separate Lump Sums as described in these Specifications and Drawings are to be given for each of the following separate descriptions:

1. Pay Item 907-242-A006 Project Office Building.
2. Pay Item 907-242-A006 Storage Building for Project Office.
3. Other Pay Items on Drawings Site Improvements.

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-Contractor 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 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 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.04 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Project Engineer will prepare a Letter of Partial Completion for portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.05 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Project Engineer not less than two days in advance of proposed utility interruptions.
2. Obtain Project Engineer’s written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Project Engineer not less than two days in advance of proposed disruptive operations.
2. Obtain Project Engineer’s written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

1.06 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Format: The Specifications are organized into Groups, Subgroups, Divisions and Sections using CSI/CSC's "MasterFormat" 2004 Edition numbering system.

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. 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.
3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 25 00 SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 33 00 “Submittal Procedures” for submittal requirements.
2. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.02 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.03 ACTION SUBMITTALS

A. The MDOT Architect and his Consultants WILL NOT consider requests for substitutions during bidding. ONLY ONE REQUEST per product will be allowed.

B. Substitution Requests: Within 30 days after Notice to proceed, submit four copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. Certificates and qualification data, where applicable or requested.
   g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. MDOT Architect's Action: If necessary, MDOT Architect will request additional information or documentation for evaluation within ten days of receipt of a request for substitution. MDOT Architect will notify Contractor through Project Engineer of acceptance or rejection of proposed substitution within 15 days of receipt of request, or ten days of receipt of additional information or documentation, whichever is later.
a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if MDOT Architect does not issue a decision on use of a proposed substitution within time allocated.

1.04 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals. ONLY ONE REQUEST per product will be allowed.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Contractor 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.
c. Cost data is complete and includes all related costs under his Contract.
d. Contractor waives all claims for additional costs related to substitution that consequently becomes apparent.

e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. ONLY ONE REQUEST per product will be allowed.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
   a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to MDOT Architect's Consultants for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
   b. Contractor 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.
   c. Cost data is complete and includes all related costs under his Contract.
   d. Contractor waives all claims for additional costs related to substitution that consequently becomes apparent.
   e. Requested substitution does not require extensive revisions to the Contract Documents.
   f. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   g. Requested substitution will not adversely affect Contractor's construction schedule.
   h. Requested substitution has received necessary approvals of authorities having jurisdiction.
   i. Requested substitution is compatible with other portions of the Work.
   j. Requested substitution has been coordinated with other portions of the Work.
   k. Requested substitution provides specified warranty.

PART 3 - EXECUTION

PRODUCT 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:_____

_____

Reason for Substitution:

_____

_____

3. Proposed change in Contract Sum:

   Credit to Owner: $_____

   Additional Cost to Owner: $_____

4. Effect of the proposed substitution on the Work:

   Contract Time: _____

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

MDOT 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 (Supplemental Agreements) 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 26 00 CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications (Supplemental Agreements) by the Project Engineer and the Contractor.

1.02 CHANGE ORDER (SUPPLEMENTAL AGREEMENT) 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 requested substitutions in accordance with Section 01 25 00 Substitution Procedures and Section 01 60 00 Product Requirements.

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 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 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.02 SCHEDULE OF VALUES

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 8 copies of the Schedule of Values will be reviewed as Submittal No.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 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, 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. 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.
4. Group line items to show subtotal of Description A and then Descriptions B-F with the same amounts indicated on the Bid Forms and a total equal to the Contract amount indicated on the Bid Form.

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

1.03 METHOD FOR PAYMENT

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.

1.04 APPLICATIONS 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 (Supplemental Agreement) as an extension on continuation sheet, listing Change Order (Supplemental Agreement) 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 five 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.

1.05 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. 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.

B. 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.

C. 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.

D. 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.

E. 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.

1.06 BASIS OF PAYMENT

A. This Work will be paid for by Contract Sum for the construction in District Two. The Work includes Project Office Building & Storage Building at Winona, Montgomery 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 buildings, 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 will be made under:

1.	Description A: MDOT Project No. BWO-2209-49(001) 502399 Project Office Building at Winona, Montgomery County, Mississippi.	lump sum
2.	Description B: MDOT Project No. BWO-2208-49(001) 502399 Storage Building at Winona, Montgomery County, Mississippi.	lump sum
	TOTAL PROJECT CONTRACT SUM	**LUMP SUM**

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 SUMMARY

A. Scope: Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Project Management.
2. Requests for Information (RFIs).
3. Project meetings.

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.

C. Related Requirements:

1. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.02 DEFINITIONS

A. RFI: Request from Project Engineer, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.03 INFORMATIONAL SUBMITTALS

A. Key Personnel List: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.

1. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers.
2. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project

B. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.04 DUTIES OF PROJECT COORDINATOR (SUPERINTENDENT)

A. General: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

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 questions.
3. Transmissions: 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 01: Coordinate and assist in the preparation of all requirements of Division 01 and specifically as follows:

1. Enforce safety requirements.
2. Schedule of Value: 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: 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 INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. MDOT Architect will return RFIs submitted to MDOT Architect by other entities controlled by Contractor 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 information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
14. RFI Forms: CSI Form 13.2A. Identify each page of attachments with the RFI number and sequential page number.

C. MDOT Architect's Action: MDOT Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by MDOT Architect 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 inaccurately prepared RFIs.
2. MDOT Architect's action may include a request for additional information, in which case MDOT Architect's time for response will date from time of receipt of additional information.
3. MDOT 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 Section 01 26 00 "Contract Modification Procedures."
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify MDOT Architect in writing within 7 days of receipt of the RFI response.

D. On receipt of MDOT 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.

E. 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 MDOT Architect's response was received.

F. On receipt of MDOT Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify MDOT Architect within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.08 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated. Project Meetings shall be held for the following reasons:

1. Establish an understanding of what is expected from everyone involved.
2. Enable an orderly Project review during the progress of the Work.
3. Provide for systematic discussion of problems and effect remedies and clarifications.
4. Coordination of the Work.
5. Review installation procedures and schedules.

B. Scheduling and Administration: 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.

C. Scheduling and Administration: 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 affected parties of result and include report of activities in next scheduled meeting.

D. Scheduling and Administration: 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.

E. Scheduling and Administration: Consultants may attend meetings to ascertain work is expedited consistent with Contract Documents and construction schedules.

F. Preconstruction Conference:

1. Schedule: Schedule Pre-Construction Meeting within 10 days after Notice to Proceed.
2. Location: A central site, convenient for all parties, designated by the Contractor and approved by the Project Engineer and the MDOT Architect.
3. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Distribute and discuss tentative construction schedule prepared by Contractor.
   b. Phasing.
   c. Critical work sequencing and long-lead items.
   d. Designation of key personnel and their duties.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for RFIs.
   g. Procedures for testing and inspecting.
   h. Procedures for processing Applications for Payment.
   i. Distribution of the Contract Documents.
   j. Submittal procedures.
   k. Preparation of record documents.
   l. Use of the premises.
   m. Work restrictions.
   n. Working hours.
   o. Owner's occupancy requirements.
   p. Responsibility for temporary facilities and controls.
   q. Procedures for moisture and mold control.
   r. Procedures for disruptions and shutdowns.
   s. Construction waste management and recycling.
   t. Parking availability.
   u. Office, work, and storage areas.
   v. Equipment deliveries and priorities.
   w. First aid.
   x. Security.
   y. Progress cleaning.
4. Minutes: Record and distribute meeting minutes.

G. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Project Engineer and MDOT Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility problems.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written instructions.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.
   s. Regulations of authorities having jurisdiction.
   t. Testing and inspecting requirements.
   u. Installation procedures.
   v. Coordination with other work.
   w. Required performance results.
   x. Protection of adjacent work.
   y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

H. Progress Meetings:

1. 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.
2. Place of Progress Meetings: Contractor’s Field Office except as otherwise agreed.
3. 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.
4. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule

revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

5. Minutes: Record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Site condition reports.

1.02 SUBMITTALS

A. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

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.

B. Construction Schedule Updating Reports: Submit with Applications for Payment.

C. Site Condition Reports: Submit at time of discovery of differing conditions.

1.03 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Form of Schedules: Prepare in form of horizontal bar chart. The following is a minimum requirement and other type schedules are acceptable with Project Engineer’s approval.

1. Provide separate horizontal bar column for each trade or operation.
2. Order: Table of Contents of Specifications.
   a. Identify each column by major Specification section number.
3. Horizontal Time Scale: Identify first work day of each week.
4. Scale and Spacing: To allow space for updating.

B. 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.

C. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

D. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the Contract Time.

E. 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.

2.02 REPORTS

A. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Project Engineer, MDOT Architect, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01 32 33 PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Periodic construction photographs.

1.02 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit (e-mail) image files on a weekly basis.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:
   a. Name of Project.
   b. Name of photographer.
   c. Name of Architect.
   d. Name of Contractor.
   e. Date photograph was taken.
   f. Description of vantage point, indicating location, direction (by compass point), and elevation of construction.
   g. Unique sequential identifier keyed to accompanying key plan.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Project Engineer / MDOT Architect.

C. Periodic Construction Photographs: Take photographs for each day that any substantial construction activity occurs at the job site. The number of photographs to be taken shall vary, depending on the construction activity that day. The purpose of the photographs is to document the installation of the work and verify that the work is being installed properly.

D. Project Engineer /MDOT Architect -Directed Construction Photographs: The Project Engineer / MDOT Architect may direct the Contractor to take certain photographs during his job site observation or at any time as directed.

END OF SECTION

SECTION 01 33 00 SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. 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 25 00 – Substitution Procedures and Section 01 60 00 – Product Requirements, for requirements concerning products that will be acceptable on this Project.

C. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.02 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require MDOT Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require MDOT Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.03 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by MDOT Architect and additional time for handling and reviewing submittals required by those corrections.

1. Acceptance of submittal items will not preclude rejection of these items upon discovery of defects in them prior to final acceptance of completed Work.

1.04 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. MDOT Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on MDOT Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. MDOT Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Partial submittals are NOT ACCEPTABLE, will be considered non-responsive, and will be returned without review.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 3 by 4 inches on label or beside title block to record Contractor's review and approval markings and action taken by MDOT Architect.
3. Include the following information for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Name of subcontractor.
    f. Name of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.
        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

4. Transmittal for Paper Submittals: 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. MDOT Architect will return without review submittals received from sources other than Contractor.
   a. Transmittal Form for Paper Submittals: Use AIA Document G810 or CSI Form 12.1A.
   b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Architect.
      6) Name of Contractor.
      7) Name of firm or entity that prepared submittal.
      8) Names of subcontractor, manufacturer, and supplier.
      9) Category and type of submittal.
      10) Submittal purpose and description.
      11) Specification Section number and title.
      12) Specification paragraph number or drawing designation and generic name for each of multiple items.
      13) Drawing number and detail references, as appropriate.
      14) Transmittal number**,** numbered consecutively.
      15) Submittal and transmittal distribution record.
      16) Remarks.
      17) Signature of transmitter.
      18) Contractor’s stamp, initialed or signed, certifying the review of submittal, verification of field measurements, and compliance with Contract Documents PRIOR to submitting to the MDOT Architectural Services Unit.

E. Electronic Submittals (Optional): Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by MDOT Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Project Engineer and MDOT Architect**,** containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Architect.

d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number**,** numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Options: Identify options requiring selection by MDOT Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from MDOT Architect's action stamp.

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, Architect’s File(as required) / 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. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from MDOT Architect's action stamp.

K. 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;
3. Other conditions became apparent which indicates acceptance of such substitute item to be in the best interest of the Owner.

PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Submit electronic submittals (optional-Preferred for 81/2 by 11 inches submittals only) via email as PDF electronic files.
   a. MDOT Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Action Submittals: Submit eight paper (required for all submittals over 81/2 by 11 inches in size) copies of each submittal with additional number of copies, if required, by Contractor for distribution. MDOT Architect will return four copies, unless indicated otherwise.
3. Informational Submittals: Submit three paper copies of each submittal unless otherwise indicated. MDOT Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.

g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file. (or)
   b. Submit eight paper copies of each submittal with additional number of copies, if required, by Contractor for distribution. MDOT Architect will return four copies, unless indicated otherwise

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions (required) established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
3. Submit Shop Drawings in the following format:
   a. PDF electronic file. (or)
   b. Submit eight paper copies of each submittal with additional number of copies, if required, by Contractor for distribution. MDOT Architect will return four copies, unless indicated otherwise.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.

   c. Sample source.
   d. Number and title of applicable Specification Section.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. MDOT Architect will return one sample with options selected.
   b. If a specified product color is discontinued, Contractor shall notify Project Engineer promptly to determine if it affects other color selections.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit four sets of Samples. Project Engineer and MDOT Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

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. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:
   a. PDF electronic file. (or)
   b. Four paper copies of product schedule or list unless otherwise indicated. Architect will return two copies.

G. Coordination Drawings Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

H. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

I. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures.

J. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

K. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

L. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

M. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

N. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

O. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

P. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

Q. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

R. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

S. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

T. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

U. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

V. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

W. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

X. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

Y. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

Z. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.02 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to MDOT Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file (optional) and eight paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to MDOT Architectural Services Unit.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

D. Notify the Project Engineer in writing at the time of submission, of deviations in submittals from requirements of Contract Documents.

E. 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.

F. Contractor’s responsibility for errors and omissions in submittals is not relieved by MDOT Architect’s / Consultant’s review of submittals.

G. Do not order materials or begin Work requiring submittals until the return of submittals bearing MDOT Architect / Consultant’s stamp and initials indicating review.

3.02 MDOT ARCHITECT'S / CONSULTANTS’ ACTION

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

B. Action Submittals: MDOT Architect / Consultants will review with reasonable promptness, each submittal for design concept of Project and information given in Contract Documents, make marks to indicate corrections or revisions required, and 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. MDOT Architect / Consultants will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action. Consultants will retain one copy of reviewed submittals.

C. Informational Submittals: MDOT Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. MDOT Architect will forward each submittal to appropriate party.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01 40 00 QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and -control services required by MDOT Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
3. Specific test and inspection requirements are not specified in this Section.

C. MDOT will provide the following inspections, sampling and testing at no cost to the Contractor:

1. Section 03 20 00 “Concrete Reinforcing”.
2. Section 03 30 00 “Cast-In-Place Concrete”.
3. Section 31 23 12 “Excavation, Fill and Grading”.

D. The Contractor shall provide and pay for all other required inspection, sampling and testing.

1.02 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Project Engineer. Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.03 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Project Engineer for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Project Engineer for a decision before proceeding.

1.04 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.05 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Materials will be inspected and sampled in accordance with current Mississippi Department of Transportation SOP pertaining to inspecting and sampling. Distribute copies of reports of inspections and tests to Project Engineer and one copy to the MDOT Architect. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.06 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329 and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

d. When testing is complete, remove test specimens, assemblies, and mockups do not reuse products on Project, unless indicated otherwise in other Sections.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Project Engineer, MDOT Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Project Engineer.
2. Notify Project Engineer and MDOT Architect three days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Project Engineer's and MDOT Architect's approval of mockups before starting work, fabrication, or construction.
   a. Allow ten days for initial review and each re-review of each mockup.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

L. Tolerances:

1. 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.
2. 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.
3. Concrete Floors: Tolerances for concrete floors and pavement are specified in Division 03.
4. Finished Floors: Level to within plus or minus 1/8 inch in 10 feet for resilient floor coverings.

M. Protection of Wood:

1. 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.
2. 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.

3. 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.
4. Wood materials or products which become wet from rain, dew, fog, or other source may be considered to have moisture damage and may 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.

N. Grout Fill: 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.

1.07 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports. The manufacturer shall inspect and approve the application or installation work at no additional cost to Contractor or the Owner..

1. 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.
2. The manufacturer’s authorized representative shall be present at the time any phase of this work is started.
3. The manufacturer’s authorized representative shall inspect and approve all surfaces over which, or upon which the manufacturer’s product will be applied or installed.
4. 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.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Project Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Project Engineer, MDOT Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.08 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency / special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:

B. Special Tests and Inspections: Conducted by a qualified testing agency / special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Project Engineer, MDOT Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Project Engineer, MDOT Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Project Engineer, MDOT Architect's reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 00 REFERENCES

PART 1 - GENERAL

1.01 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Reviewed": When used to convey MDOT Architect's action on Contractor's submittals, applications, and requests, "reviewed" is limited to MDOT Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": 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. “Experienced”: 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": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.02 INDUSTRY STANDARDS

A. Identification and Purpose:

1. 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.
2. 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.

B. Procedures and Responsibilities:

1. 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.
   a. Should specified reference standards conflict with regulatory requirements or the Contract Documents, request Project Engineer’s / MDOT Architect’s clarification before proceeding.
2. 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.
3. 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.

C. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated or when earlier editions are specifically required by Codes.

D. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.03 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AABC Associated Air Balance Council

AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute (Formerly: ACI International)
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AHAM	Association of Home Appliance Manufacturers
AHRI	Air-Conditioning, Heating, and Refrigeration Institute (The)
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
APA	APA - The Engineered Wood Association
ARI	Air-Conditioning & Refrigeration Institute (See AHRI)
ARI	American Refrigeration Institute (See AHRI)
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers)
ASSE	American Society of Safety Engineers (The)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
ATIS	Alliance for Telecommunications Industry Solutions
AWI	Architectural Woodwork Institute

AWPA	American Wood Protection Association (Formerly: American Wood-Preservers' Association)
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BOCA	BOCA (Building Officials and Code Administrators International Inc.) (See ICC)
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRI	Carpet and Rug Institute (The)
CRRC	Cool Roof Rating Council
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute (The)
CWC	Composite Wood Council (See CPA)
DASMA	Door and Access Systems Manufacturers Association
DHI	Door and Hardware Institute
ECA	Electronic Components Association
ECAMA	Electronic Components Assemblies & Materials Association (See ECA)
EIA	Electronic Industries Alliance (See TIA)
ESD	ESD Association (Electrostatic Discharge Association)
EVO	Efficiency Valuation Organization
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)
FSA	Fluid Sealing Association

GA	Gypsum Association
GANA	Glass Association of North America
HMMA	Hollow Metal Manufacturers Association (See NAAMM)
HPVA	Hardwood Plywood & Veneer Association
IAS	International Approval Services (See CSA)
ICBO	International Conference of Building Officials (See ICC)
ICC	International Code Council
ICEA	Insulated Cable Engineers Association, Inc.
ICPA	International Cast Polymer Alliance
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IES	Illuminating Engineering Society (Formerly: Illuminating Engineering Society of North America)
IESNA	Illuminating Engineering Society of North America (See IES)
IEST	Institute of Environmental Sciences and Technology
IGMA	Insulating Glass Manufacturers Alliance
IGSHPA	International Ground Source Heat Pump Association
Intertek	Intertek Group (Formerly: ETL SEMCO; Intertek Testing Service NA)
ISAS	Instrumentation, Systems, and Automation Society (The) (See ISA)
ISFA	International Surface Fabricators Association (Formerly: International Solid Surface Fabricators Association)
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association (See ISFA)
ITU	International Telecommunication Union
LMA	Laminating Materials Association (See CPA)
LPI	Lightning Protection Institute
MCA	Metal Construction Association

MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MMPA	Moulding & Millwork Producers Association (Formerly: Wood Moulding & Millwork Producers Association)
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAIMA	North American Insulation Manufacturers Association
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFPA	NFPA (National Fire Protection Association)
NFPA	NFPA International (See NFPA)
NFRC	National Fenestration Rating Council
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOMMA	National Ornamental & Miscellaneous Metals Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSPE	National Society of Professional Engineers
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)

PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing & Drainage Institute
RFCI	Resilient Floor Covering Institute
SBCCI	Southern Building Code Congress International, Inc. (See ICC)
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Door Institute
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SIA	Security Industry Association
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPIB	Southern Pine Inspection Bureau
SRCC	Solar Rating and Certification Corporation
SSPC	SSPC: The Society for Protective Coatings
SWI	Steel Window Institute
SWPA	Submersible Wastewater Pump Association
TCNA	Tile Council of North America, Inc.
TEMA	Tubular Exchanger Manufacturers Association, Inc.
TIA	Telecommunications Industry Association (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance)
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance (See TIA)
TMS	The Masonry Society
TPI	Truss Plate Institute
UBC	Uniform Building Code (See ICC)
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
WASTEC	Waste Equipment Technology Association
WCMA	Window Covering Manufacturers Association
WDMA	Window & Door Manufacturers Association

WI Woodwork Institute (Formerly: WIC - Woodwork Institute of California)

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

DIN Deutsches Institut fur Normung e.V.

IAPMO International Association of Plumbing and Mechanical Officials

ICC International Code Council

ICC-ES ICC Evaluation Service, LLC

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

DOC Department of Commerce
National Institute of Standards and Technology

DOE Department of Energy

EPA Environmental Protection Agency

OSHA Occupational Safety & Health Administration

USPS United States Postal Service

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

CFR Code of Federal Regulations
Available from Government Printing Office

FED-STD Federal Standard (See FS)

USAB United States Access Board

USATBCB U.S. Architectural & Transportation Barriers Compliance Board (See USAB)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 45 23 TESTING AND INSPECTION SERVICES - CONTRACTOR

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Laboratory selection and payment.
2. Laboratory duties.
3. Contractor's responsibilities.

B. Related Requirements:

1. Individual specifications sections contain specific tests and inspections to be preformed.
2. Section 01 45 29 – Testing Laboratory Services – MDOT.

1.02 REFERENCES

A. ASTM International (ASTM):

1. D3666 - Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials.
2. E329 - Standard Specification for Agencies Engaged in Construction Inspection and / or Testing.
3. E543 - Standard Specification for Agencies Performing Nondestructive Testing.

1.03 QUALITY ASSURANCE

A. Employment of Testing Laboratory shall in no way relieve Contractor of his obligations to perform work in accordance with Contract Documents.

B. Contractor shall employ and pay for services of an independent testing laboratory to perform specified testing and inspection.

C. Refer to the Conditions of the Contract for provisions related to special inspections and testing.

D. Qualifications of Laboratory:

1. Meet requirements of ASTM D3666, E329, and E543.
2. Authorized to operate in State of Mississippi

1.04 LABORATORY DUTIES

A. Cooperate with Project Engineer, Architect and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling, and testing of materials and methods of construction.

1. Comply with specified standards.
2. Ascertain compliance or noncompliance of materials with requirements of Contract Documents.

C. Promptly notify Project Engineer, MDOT Architect, Architect and Contractor of observed irregularities or deficiencies of Work or products.

D. Promptly submit written report of each test and inspection; submit electronically in Adobe PDF format to Project Engineer, Architect, MDOT Architect and Contractor.

E. Each report to include:

1. Date issued.
2. Project title and number.
3. Testing Laboratory name, address, and telephone number.
4. Name of Inspector and signature of individual in charge.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and specification section.
9. Location of sample or test in project.
10. Type of inspection or test.
11. Results of tests and compliance or noncompliance with Contract Documents.
12. Interpretation of test results when requested by Project Engineer, MDOT Architect, Architect or Contractor.

F. Perform additional tests when required by Project Engineer, MDOT Architect, Architect or Contractor.

G. Laboratory is not authorized to:

1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of work.
3. Perform duties of Contractor.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with Laboratory personnel, provide access to Work, and to manufacturer's operations.

B. When materials require testing prior to being incorporated into Work, secure and deliver to Laboratory adequate quantities of representative samples of materials proposed to be used.

C. Furnish copies of product test reports as required.

D. Furnish incidental labor and facilities:

1. To provide access to work to be tested.
2. To obtain and handle samples at site or at source of product to be tested.
3. To facilitate inspections and tests.
4. For safe storage and curing of test samples.

E. Notify Laboratory sufficiently in advance of operations to allow for Laboratory assignment of personnel and scheduling of tests.

F. Make arrangements with Laboratory and pay for additional samples and tests required for Contractor's convenience.

G. When tests or inspections cannot be performed after such notice, reimburse Owner for Laboratory personnel and travel expenses incurred due to Contractor's negligence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 45 29 TESTING AND INSPECTION SERVICES - MDOT

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. Refer to Section 01 45 23 Testing and Inspection Services – Contractor for additional testing and inspection services required to be provided by the Contractor

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. Section03 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 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, or fabricator
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 method specified 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 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.02 USE CHARGES

A. General: Installation and removal of temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Project Engineer, MDOT Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service: Provide water and sewer service with account placed in Owner's Name. . Water is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations

C. Electric Power Service: Provide electric power service with account placed in Owner's Name. Electric power is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.03 INFORMATIONAL SUBMITTALS

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

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.04 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.

1.05 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete bases for supporting posts.

2.02 TEMPORARY FACILITIES

A. Field Offices: 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.

B. Storage and Fabrication Sheds: 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.

2.03 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures".

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to system indicated as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Project Engineer schedules Final Completion inspection. Remove before Final Completion. Personnel remaining after Final Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. The drive is to remain open at all times. A flagman will be required to control traffic when construction vehicles are present.

D. Parking: Provide temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Unauthorized signs are not permitted.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Storm water Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.

1. 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.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Date of Completion. Perform control operations lawfully, using environmentally safe materials.

F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.05 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work.

1. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Discard or replace water-damaged and wet material.
4. Discard, replace, or clean stored or installed material that begins to grow mold.
5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Remove materials that cannot be completely restored to their manufactured moisture level within 72 hours.

3.06 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Burning of Trash: 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.

C. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Conduct of workers: 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.

F. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 01 60 00 PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements: Section 01 25 00 "Substitution Procedures" for requests for substitutions.

1.02 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.03 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. MDOT Architect's Action: If necessary, MDOT Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request.
2. MDOT Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or ten days of receipt of additional information or documentation, whichever is later.
3. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
4. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.04 QUALITY ASSURANCE

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

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.06 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," MDOT Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Products specified only by reference standards, select any product meeting standards by any manufacturer.
2. 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.
3. Products 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.
4. 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.
5. 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.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 00 EXECUTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Requirements:

1. Section 01 10 00 "Summary" for limits on use of Project site.
2. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Section 07 84 00 "Firestopping" for patching penetrations in fire-rated construction.

1.02 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

B. Certified Surveys: Submit three copies signed by land surveyor or professional engineer.

1.03 QUALITY ASSURANCE

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

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Project Engineer of locations and details of cutting and await directions from Project Engineer before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in MDOT Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to MDOT Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to local utility and the Project Engineer that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.03 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Project Engineer and MDOT Architect promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Project Engineer and MDOT Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Project Engineer and MDOT Architect.

3.04 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

3.05 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Final Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Project Engineer. Mounting heights shall comply with ADA and OSHA requirements.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.07 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Date Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Date of Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.08 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements"

3.09 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Date of Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Recycling nonhazardous construction waste.
2. Disposing of nonhazardous construction waste.

B. Related Requirements:

1. Section 04 20 00 "Unit Masonry" for disposal requirements for masonry waste.
2. Section 31 23 11 "Excavation, Fill and Grading for Building" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.02 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction including packaging.

B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.03 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 15 days of date established for the Notice to Proceed.

1.04 INFORMATIONAL SUBMITTALS

A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.05 QUALITY ASSURANCE

A. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination."

1.06 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan.

B. Waste Reduction Work Plan: List each type of waste and whether it will be recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within five days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.02 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.03 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.04 DISPOSAL OF WASTE

A. General: Except for items or materials to be recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00 CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Final completion procedures.
2. Warranties.
3. Final cleaning.
4. Repair of the Work.

B. Related Requirements:

1. Section 01 32 33 "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

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. 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 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: All Warranties and Extended Warranties shall use this Date of Completion as the starting date of Warranty Period.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.05 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

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 FINAL CLEANING

A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting Engineer and Architect final inspection.
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Sweep concrete floors broom clean in unoccupied spaces.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Leave Project clean and ready for occupancy.

B. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.

3.02 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting Final Inspection.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23 OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

1.02 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. MDOT Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to MDOT Architect.
   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.
2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. MDOT Architect will return one copy.

C. Manual Submittal: Submit each manual in final form prior to requesting Final Inspection and at least 15 days before commencing demonstration and training. MDOT Architect will return one copy with comments.

1. Correct or revise each manual to comply with MDOT Architect's comments. Submit two copies of each corrected manual within 15 days of receipt of MDOT Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.01 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

B. 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.

C. 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 and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

D. 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.

E. 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.

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents**,** and indicate Specification Section number(s) on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. 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 storage media for computerized electronic equipment.
4. 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. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.

3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.03 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. Use designations for systems and equipment indicated on Contract Documents.
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. Use designations for products indicated on Contract Documents.
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 MANUALS

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 MANUALS

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 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 video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Schedule 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.

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. 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.

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 01 78 39 "Project Record Documents."

F. Comply with Section 01 77 00 "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 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Project Manual (Proposal)
3. Record Product Data.

B. Related Requirements:

1. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.02 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:
   a. Submittal:
      1) Submit PDF electronic files of scanned record prints and two set(s) of marked-up record prints.
      2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Project Manual (Proposal): Submit two paper copies and one annotated PDF electronic files of Project Manual (Proposal), including addenda and contract modifications.

C. Record Product Data: Submit two paper copies and one annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

A. Record Prints: Maintain two sets of marked-up paper copies of the Contract Drawings (half-size) and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order (Supplemental Agreements) numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Final Completion review marked-up record prints with Project Engineer and MDOT Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Project Engineer and MDOT Architect for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Consulting Architect (if applicable).
   e. Name of Contractor.

2.02 RECORD PROJECT MANUAL (PROPOSAL)

A. Preparation: Mark Project Manual (Proposal) to indicate the actual product installation where installation varies from that indicated in the Technical Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders (Supplemental Agreements), record Product Data, and record Drawings where applicable.

B. Format: Submit record Project Manual (Proposal) as scanned PDF electronic file(s) of marked-up paper copy of Project Manual (Proposal).

2.03 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders (Supplemental Agreements)**,** record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Project Engineer’s and MDOT Architect’s reference during normal working hours.

C. The information, except Contract Drawings, shall be arranged and labeled by corresponding Specification Section, neatly bound in three ring binders, indexed, and all shop drawings readable without being removed or unstapled.

D. The name and address of each subcontractor and material supplier shall be listed in front of each binder along with the Project Manual (Proposal).

E. 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.

END OF SECTION

SECTION 01 79 00 DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SUMMARY

A. The Owner's facility staff (as well as occupants and service Subcontractors as needed), shall receive orientation and training on features, systems and equipment in this facility requisite with the complexity and criticality of the system and the Owner needs.

1.02 EQUIPMENT-SPECIFIC REQUIREMENTS

A. Additional training requirements may be found in specific equipment specification sections.

PART 2 - PRODUCTS

2.01 VIDEO RECORDING

A. The Subcontractor shall video record selected trainings, including audio, according to the following schedule:

1. HVAC and Controls: 16 hours
2. Plumbing: 4 hours
3. Electrical: 4 hours
4. Life Safety: 2 hours

B. Which portions of which training sessions are video recorded shall be at the discretion of the Commissioning Authority and Owner.

C. An introduction shall be made at the beginning of each recording, identifying what equipment is being illustrated, where it is located and who the trainer is.

D. Recording shall be accomplished with a tripod when possible and performed in an expert manner so that the issues discussed are clearly illustrated and instructions clearly audible. A high quality camera shall be used and additional light provided if ambient light is insufficient.

E. Media shall be clearly labeled with the equipment, date, trainer and segment duration.

F. Recording shall be in video tape format.

1. For larger equipment, not more than one training session shall be put on a single tape. Not more than three pieces of equipment shall be on any single tape, even if the tape is not filled. Small camera sized tapes are acceptable as the final submittal, if a standard VHS adapter tape is provided.

G. Provide an additional copy in digital recording format.

1. The digital recording shall be bookmarked for each training session with an index/table of contents provided and recorded on the CD/DVD. The bookmarks will clearly indicate which equipment is being presented and the format will allow search and go-to functions for rapidly locating training segments.

H. An original and one copy of the recordings shall be submitted to the Owner.

PART 3 - EXECUTION

3.01 GENERAL RESPONSIBILITIES

A. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed on all equipment per the Specifications.

B. The Commissioning Authority will be responsible for coordinating and approving the content and adequacy of the training of Owner's personnel for commissioned equipment.

1. The Commissioning Authority will develop an overall recommended training summary after meeting with the Owner and appropriate facility staff to determine needs and areas of emphasis for this project.
2. The Commissioning Authority will develop criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The Commissioning Authority recommends approval of the training to the Owner.

C. Training shall consist of, as needed and at the discretion of the Owner and Commissioning Authority, the installing technician, installing Subcontractor and the appropriate trade or manufacturer's representative on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment as installed in this project are required.

D. The controls Subcontractor shall attend and present at sessions in addition to the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

E. The mechanical and electrical design engineer and Architect, or the Commissioning Authority, may attend the first training session for each of the main or special systems and assemblies and present the overall system design. This presentation will include a review of all systems using the simplified system schematics (one-line drawings).

F. Unless otherwise required or approved, the training shall be given during regular business hours during a regular work week.

3.02 TRAINING AGENDAS

A. For each piece of equipment or system a written training agenda will be provided by the respective Subcontractor. The generic agenda has been provided for typical equipment at the end of this Section. A similar, but more in-depth agenda will be provided prior to training, for the controls system. The agenda shall cover the following elements:

1. Equipment (included in training).
2. Intended audience.
3. Location of training.
4. Objectives.
5. Subjects covered (description, duration of discussion, special methods, etc.).
6. Duration of training on each subject.
7. Instructor for each subject.
8. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.).
9. Instructor and qualifications.

3.03 TRAINING PROCESS AND CONTENT

A. The Training Process Shall:

1. As appropriate, normally start with classroom-type sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
2. During any demonstration, should the system fail to perform in accordance with the requirements of the operation and maintenance (O&M) manuals or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
3. Follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

B. Training Shall Include the Following:

1. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
2. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover, as applicable, and any emergency procedures.
3. The mechanical Subcontractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
4. Discussion of relevant health and safety issues and concerns.
5. Discussion of warranties and guarantees.
6. Common troubleshooting and maintenance issues, problems and solutions.
7. Explanatory information included in the O&M manuals and the location of all related plans and manuals in the facility.
8. Discussion of any peculiarities of equipment installation or operation.

9. The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1 is recommended, as applicable.
10. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
11. Training shall occur after functional testing and piping and equipment labeling are complete unless approved otherwise by the Owner.

3.04 DURATION OF TRAINING

A. The subcontractor shall provide training on each piece of equipment according to the following schedule. The subcontractor shall provide training and orientation for other equipment installed on the project not listed here.

Training Schedule	**Hours**
Mechanical Support Systems	
Energy Recovery Ventilator	1
Indoor Heat Pumps	2
Outdoor Heat Pump	1
Controls	8
Restroom exhaust system	0.5

Plumbing	
Domestic water system	1
Domestic water heating system	1

Electrical	
Wiring Devices (switches and outlets)	0.5
Switchgear	1
Fire Alarm	2
Lighting controls	1

3.05 SPECIAL RESPONSIBILITIES

A. HVAC Controls: The SUBCONTRACTOR shall have the following special training responsibilities relative to the HVAC control systems:

1. For the primary HVAC equipment, the controls Subcontractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
2. The standard operating manual for the system and any special training manuals shall be provided for and retained by each trainee. In addition, the system technical manual shall be demonstrated during training. Manuals shall include detailed description of the subject matter for each session. Manuals will be approved by the Commissioning Authority.
3. The trainings will be tailored to the needs and skill-level of the trainees and be oriented to the specific system installed in this project.
4. The trainers shall be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) shall be used. The Owner shall approve the instructor prior to scheduling the training.
5. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.
6. There shall be two training sessions:
   a. Training I - Control System: The first training shall be 4 hours in length. This training may be held on-site. Upon completion, each trainee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
   b. Training II - Building Systems: The second session shall be held on-site for a period of 4 hours of actual hands-on training after the completion of system commissioning. Training II shall be conducted in two separate sessions of 2 hours each. The session shall include instruction on:
      1) A review of the as-built drawings and O&M manuals, a walk-through of the facility to identify control panels and device locations.
      2) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
      3) Graphics generation.

TRAINING AGENDA and Sign-Off

Project:_____ Date:_____

Equipment / System:_____ Hours Required:_____

Spec Section:

1. Audience and General Scope
[Owner and/or Commissioning Authority to fill out the following box.]

Intended audience type (enter number of staff): __facility manager, __facility engineer, __facility technician, __project manager, __tenant, __other:_____

General objectives and scope of training: (check only one)

___ A. Provide only an overview of the purpose and operation of this equipment, including required interactions of trainees with the equipment.

___ B. Provide an overview plus technical information of the purpose, operation and maintenance at an intermediate level, expecting that serious malfunctions will be addressed by factory reps.

___ C. Provide an overview plus technical information (purpose, operation, troubleshooting and maintenance) at a very detailed level, expecting that almost all operation, service and repair will be provided by the trainees.

2. Instructors [Trainer fills out this section: ___prior to training & submits to CA, ___after training.]

ID	Trainer	Company	Position
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____

3. Agenda

__The responsible Subcontractors have their trainers fill out this section prior to conducting
training and submit to the commissioning authority for approval, OR

__The Owner and commissioning authority fill out this section prior to training and submit to Subcontractor for their use, OR

__This section is left blank until the training and the trainer fills it in as a record of what was covered in the training.

Training Date: _____

Agenda of general subjects covered

Duration	Instructor	Completed
(All subjects will be covered)		(√ when completed)

OVERVIEW

- Reason for system selection, layout and general purpose, unique features, general interactions with other systems, special O&M issues

_____ _____ _____

CONTROLS

- Integral controls (packaged): programming, troubleshooting, alarms

_____ _____ _____

- Review of control drawings (have copies for attendees) __A, __B

_____ _____ _____

- Building automation controls (BAS): programming, troubleshooting, alarms, manual operation, interface with integral controls) __A, __B

_____ _____ _____

A: This training to be done during equipment training. B: This training to be done during central BAS training.

OPERATION (describe and <u>demonstrate)</u>

_____ _____ _____

- Startup, loading, normal operation, unloading, shutdown, unoccupied operation, seasonal changeover, manual operation, etc., as applicable
- Interactions with other systems, operation during power outage and fire
- Relevant health and safety issues concerns and special safety features
- Energy conserving operation and strategies (if applicable)

TROUBLESHOOTING

_____ _____ _____

- Common troubleshooting issues and methods, control system warnings and error messages, including using the control system for diagnostics

MAINTENANCE

_____ _____ _____

- Service, maintenance, and preventative maintenance (sources, spare parts inventory, special tools, etc.)
- For associated piping and ducting, describe layout, location of isolation valves, zone dampers for handling leaks and repairs, etc.
- Any special issues to maintain warranty
- Special requirements of tenants for this equipment's function

QUESTION AND ANSWER PERIOD

_____ _____ _____

<u>Other subjects covered:</u>

_____

_____ _____ _____

Total duration of training (hrs) ----------> ☐

<u>Video-taping.</u> __Training shall be video recorded with audio, __digitally, __taped, __by Subcontractor, __by others, with copies provided to Government.

<u>Training methods that will be included (clarify as needed):</u> (Trainer checks all that apply)

_√_ Use of the O&M manuals, illustrating where the verbal training information is found in writing

_√_ Each attendee will be provided: 1) the control drawing schematic and sequence of operations;

2) a copy of this agenda.

_√_ Site demonstration of equipment operation

___Written handouts
___Manufacturer training manuals
___Classroom lecture
___Video presentation

4. Record of Training

Date(s) of Training:_____ Hours Spent: _____
Trainers:
_____
_____

Attendees

Printed Name	Signature
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

END OF SECTION

SECTION 01 91 00 GENERAL COMMISSIONING

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and mechanical and electrical systems are specified in Divisions 22, 23, and 26. Other divisions may be required to participate in the commissioning process.

B. These Division(s) covers the commissioning of mechanical, electrical, and plumbing systems

C. Commissioning is the systematic process of ensuring that all building mechanical and electrical systems perform interactively according to the Owner's project requirements and the operational requirements specified in other Divisions. The Commissioning Authority shall inspect the installation and coordinate equipment start-up, system performance, testing, adjusting and balancing, control system calibration, construction and system documentation, and Owner training.

D. Specific requirements of the commissioning process and responsibilities, duties, and obligations of the Commissioning Authority are described in this Section. To accomplish these duties, the Commissioning Authority shall coordinate his activities with other entities.

1.02 REFERENCES

A. ASHRAE Guideline 0-2005, The Commissioning Process.

B. ASHRAE Guideline 1.1-2007, HVAC&R Technical Requirements for the Commissioning Process.

C. Building Commissioning Association Ductwork Construction Checklist.

1.03 DEFINITIONS

A. The following terms are used in this Section:

1. Acceptance phase - phase of construction after initial start-up and check-out when functional testing, operational training, and operating and maintenance documentation development and review occurs.
2. Basis of design - the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the Owner's project requirements. The basis of design describes the intent of the project and the systems, components, conditions, and methods chosen to meet the Owner's project requirements.

3. Commissioning Authority - an independent entity not otherwise associated with the Contractor. The Commissioning Authority directs and coordinates the day-to-day commissioning activities. The Commissioning Authority does not have a construction oversight role.
4. Commissioning plan - an overall plan that provides the structure, schedule, and coordination planning for the commissioning process.
5. Commissioning team - the group responsible for accomplishing the commissioning process.
6. Data logging -monitoring flows, currents, status, and pressures of equipment using stand-alone recording equipment, separate from the control system. Additional monitoring may be provided through the capabilities of the control system.
7. Deferred functional tests - functional tests that are performed after the date of substantial completion due to partial occupancy, equipment and seasonal testing requirements, design, or other site conditions that do not allow meaningful testing of a system or piece of equipment during the normal commissioning sequence.
8. Owner's project requirements - a dynamic document prepared by the Owner that provides the explanation of the ideas, concepts and criteria that are considered to be critical to the Owner's expectations. It is initially the outcome of the programming and conceptual design phases.
9. Factory testing - testing of equipment at the factory (or on-site) by factory personnel with an Owner's representative present.
10. Functional tests - tests of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chilled water pump is tested interactively with the chiller functions to determine if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied modes, varying outside air temperatures, fire alarm modes, and power failure. The systems are run through the control system's sequences of operation and components are verified to respond properly. The Commissioning Authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is performed by the Contractor. Functional tests are performed after prefunctional checklists and start-up is complete.
11. Indirect indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed.
12. Manual tests - using hand-held instruments, immediate control system read-outs or direct observation to verify performance (as opposed to analyzing monitored data taken over time to make the "observation").
13. Monitoring - the recording of parameters (flow, current, status, or pressure) of equipment operation using data loggers or the trending capabilities of control systems.
14. Over-written value – manually overriding a sensor value in the control system to determine the response of a system (e.g., changing the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation). Also see "Simulated Signal."

15. Owner-contracted tests - tests paid for by the Owner which the Commissioning Authority does not oversee. These tests are not repeated during functional testing if properly documented.
16. Phased commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.
17. Pre-functional checklists - lists of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the Contractor to the Commissioning Authority. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels, labels affixed, gauges in place, sensors calibrated). However, some prefunctional checklist items may entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a 3-phase pump motor). The word prefunctional refers to testing to be accomplished prior to the formal functional testing of the installed equipment. Prefunctional checklists augment and are often combined with the manufacturer's start-up checklist. For most equipment, the Contractor will execute the checklists.
18. Retesting – testing due to the failure of a component or system due to part failure, incorrect installation, etc.
19. Sampling - functional testing of only a fraction of the total number of identical or near identical pieces of equipment.
20. Simulated condition – a condition that is artificially created for the purpose of testing the response of a system (e.g., applying a hair dryer to a space temperature sensor to determine the response of a variable volume terminal unit).
21. Simulated signal - disconnecting a sensor and using a signal generator to send an amperage, resistance, or pressure to the transducer and control system to simulate a sensor value.
22. Start-up - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.
23. Test, adjust, and balance - the process of measuring the actual flows of the air and hydronic systems, adjusting these flows to the values required by the construction documents, and documenting the results.
24. Trending -monitoring of equipment performance over a period of time, using data logging equipment or the building control system.

1.04 QUALITY ASSURANCE

A. Supervision, coordination, and documentation of the commissioning process shall be the direct responsibility of the Commissioning Authority, who shall work under the direct supervision of a licensed professional engineer or a certified member of the Building Commissioning Association, and have a minimum of 10 years experience in the design and/or construction of mechanical and electrical systems, or of automated building control systems. The Commissioning Authority shall become familiar with the Owner's project requirements and the basis of design documentation, and project documents, and shall assume responsibility for the overall system commissioning effort.

1.05 COORDINATION

A. The Commissioning Authority shall be hired by the Owner. The Commissioning Authority shall direct and coordinate the activities of the commissioning team.

B. The commissioning team shall consist of the Owner, Design Team, Commissioning Authority, Contractor, and associated subcontractors. The Contractor and Subcontractors shall appoint employees with the required experience and skill sets to work with the Commissioning Authority to demonstrate the required sequences of operation of the systems being commissioned.

C. Scheduling: the Commissioning Authority shall schedule the commissioning activities of the Project and shall coordinate this schedule with the Contractor.

1.06 COMMISSIONING PROCESS

A. The primary role of the Commissioning Authority shall be to develop and coordinate the execution of a commissioning plan; observe and document the installation, check-out, start-up, and testing of equipment and systems to establish that they are functioning in accordance with the requirements of the construction documents; and to assist in developing correct and complete documentation of the construction effort. The Commissioning Authority SHALL NOT be responsible for design concept, design criteria, compliance with codes, design, construction scheduling, cost estimating, construction management, or construction supervision. The Commissioning Authority may assist the Design Team with problem-solving, or the Contractor with the correction of non-conformance items or deficiencies. The Commissioning Authority is not responsible for providing tools required to start, check-out and perform functional tests of equipment and systems.

B. Design Phase: Ensure that the Project requirements are met and achieve the following specific objectives by date of substantial completion:

1. Review the contract documents for ability to commission, maintain, and service components and systems.
2. Provide comments and suggestion regarding ability to commission to the owner and the design team for incorporation into an addendum.

C. Construction phase: ensure that the Project requirements, as defined by the construction documents, are met, and achieve the following specific objectives:

1. Within 60 days of receipt of contract or purchase order: schedule, plan, and conduct a commissioning scoping meeting to review the commissioning process and the draft commissioning plan and schedule with the commissioning team. With the input of the commissioning team, revise the draft commissioning plan and develop the working commissioning schedule.

2. Coordinate and direct the commissioning activities in a logical, sequential, and efficient manner using centralized documentation, periodic communications, and consultations with the commissioning team. Schedule additional commissioning meetings to plan, scope, coordinate, schedule future activities, and resolve problems throughout construction. Commissioning meetings shall be scheduled as necessary. Record and distribute the meeting minutes for commissioning meetings. Meetings may be held electronically by teleconferencing and reports will be distributed electronically via email.
3. Be responsible for the continuous updating, maintenance, revision, and coordination of the commissioning activities as construction progresses, coordinate the commissioning work, and, with the Contractor, ensure that commissioning activities are included in the master project schedule.
4. Review submittals applicable to systems being commissioned, including the Contractor's proposed detailed start-up procedures, concurrent with the Engineer's reviews and provide comments to the Engineer and the Owner. The review shall be for compliance with commissioning needs, and to aid in the development of functional testing procedures and only secondarily to review for compliance with equipment specifications.
5. Request and review additional information as required to perform the assigned commissioning tasks, including review of operations and maintenance materials and Contractor start-up and check-out procedures. Incorporate into the documents checks for system maintainability and serviceability, and inspect for installation supporting, and not interfering with these requirements.
6. Develop specific functional test procedures and forms to document the proper operation, of each piece of commissioned equipment and system. Submit the proposed functional tests to the Architect for review and approval, and provide a copy of the proposed functional test procedures to the Contractor who shall review the proposed tests for feasibility, safety, and equipment warranty protection. Required performance testing may include control system trending, stand-alone data logger monitoring, and/or manual logging of system operation to demonstrate proper operation.
7. Functional test forms shall include (but not be limited to) the following information:
    a. Date
    b. Project name
    c. System and equipment or component name(s)
    d. Equipment location and identification number
    e. Unique test identification number and reference to unique prefunctional checklist and start-up documentation identification numbers for the piece of equipment
    f. Participating parties
    g. A reference to the specification describing the specific sequence of operations or
    h. Required pre-test field measurements
    i. Specific step-by-step procedures to execute the test, in a clear, sequential, and repeatable format
    j. Acceptance criteria of proper performance with provisions for clearly indicating whether or not proper performance of each part of the test was achieved

k. A section for comments
l. A signature and date block for the Commissioning Authority and participating parties

8. Review the Contractor's start-up and prefunctional testing reports and provide on-site observation of start-up and prefunctional testing as specified herein.
9. Review the proposed testing, adjusting, and balancing execution plan for completeness and requirements of the commissioning process and provide comments to the Contractor, Engineer, and Owner.
10. Perform site visits as required until prefunctional testing of equipment and systems begins, then as needed through the completion of the Project, to review component and system installations. Concurrently, schedule and conduct commissioning planning and coordination meetings to review the construction progress and to assist in resolving discrepancies or issues relating to the commissioning process. Include the owner's maintenance staff in as many meetings and inspections as possible.

E. Acceptance phase: demonstrate that the performance of the equipment and systems installed during the construction phase meets the requirements of the construction documents. Notify the Owner and Architect of deficiencies in results or procedures.

F. Commissioning activity shall achieve the following specific objectives:

1. Witness 10 percent of the HVAC piping testing and flushing procedures.
2. Witness 10 - 20 percent of the prefunctional test procedures for each type and/or size of equipment. If issues are discovered with the installation the installer shall correct the issues, and after the installer has re-inspected the systems, 25 percent of the systems shall be checked by the CxA. If 10 percent of the re-checked systems are discovered to have issues, all 100 percent of the systems will be re-inspected and the installing contractor shall bear the cost for the re-inspection.
3. After the Test, Adjust, and Balance has been completed, witness 10 - 25 percent of the functional test procedures for each type and/or size of equipment. If issues are discovered with the installation the installer shall correct the issues, and after the installer has re-inspected the systems, 25 percent of the systems shall be checked by the CxA. If 10 percent of the re-checked systems are discovered to have issues, all 100 percent of the systems will be re-inspected and the contractor shall bear the cost for the re-inspection.
4. Oversee the check-out, calibration, and functional testing of the control system and approve it for use for the testing, adjusting, and balancing effort before the test and balance procedures begin.
5. Oversee at least 10 percent of the test, adjust, and balance process by observing, at a minimum, the first test of each system type (e.g., air handling units, diffusers and grilles, terminal units, pumps), and spot testing a minimum of 10 percent of all TAB readings. Test subsequent equipment, sufficient to be confident that proper procedures were followed, and review of the Contractor's completed reports.

6. Coordinate, witness, and approve functional tests of equipment and systems performed by the Contractor. Review functional test reports and analyze any trend logs, data logger reports, and other monitoring data to evaluate equipment and system performance. Document the performance of the functional testing and provide a comparison to the required performance, as defined by the construction documents.
7. Coordinate retesting as necessary until satisfactory performance is demonstrated.
8. Maintain a master deficiency and resolution log and a separate testing record and provide written progress reports and test results with recommended corrective actions for observed deficiencies.
9. Compile and submit a commissioning report to the Owner and Architect documenting the results of the start-up, prefunctional testing, and functional testing.
10. Review the Contractor's proposed training of the Owner's operating personnel, and provide comments to the Architect and Owner.
11. Coordinate the Contractor-provided training sessions. Verify that the approved training has been properly completed.

G. Warranty period: assist the Owner in identifying defects in the installed equipment or system operation and in accomplishing the following specific objectives:

1. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
2. Verify that warranty items have been corrected properly.
3. Coordinate and supervise required seasonal or deferred testing and deficiency corrections, as specified or required by the commissioning plan.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Data logging equipment, monitoring devices, specialized equipment, and software not specified in other Divisions to be provided by the Contractor.

B. Test equipment shall be of the quality and accuracy required to test and/or measure system performance with the tolerances specified and shall have been calibrated within the last 12 months, or as specified herein. Equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates available on request.

1. Temperature sensors and digital thermometers shall have a certified calibration within the past 12 months and a resolution of plus or miss 0.1 degree F. Accuracy of temperature test equipment shall be at least twice that of the instrumentation being tested.
2. Humidity sensors shall have a certified calibration within the past 6 months and a resolution of plus or minus 1 percent. Accuracy of humidity test equipment shall be at least twice that of the instrumentation being tested.

3. Pressure sensors shall have a certified calibration within the 12 months and a resolution of 0.05 percent of sensor range. Accuracy of pressure test equipment shall be at least twice that of the instrumentation being tested.
4. Accuracy of other Commissioning Authority sensors shall be at least twice that of the installed sensors being tested.

PART 3 - EXECUTION

3.01 REPORTING

A. Provide regular reports to the Owner and members of the commissioning team as construction and commissioning progresses, keeping them apprised of commissioning progress and scheduling changes.

B. Provide periodic commissioning reports to the commissioning team beginning with the first site observation and continuing throughout the project duration. These reports shall include as a minimum the following:

1. List of upcoming commissioning activities, as noted on project schedule.
2. Copies of functional test requirements scheduled for the following 4 weeks.
3. A list of outstanding discrepancies and the party responsible for corrective action.

C. Provide a final commissioning report to the Owner. The final commissioning report shall contain at a minimum:

1. Copies of periodic commissioning reports.
2. Copies of prefunctional test reports.
3. Copies of functional test reports.
4. Copies of the training report.

3.02 SYSTEMS TO BE COMMISSIONED

A. The following shall be commissioned if applicable:

1. HVAC Systems
2. Building Automation Control System
3. Lighting Controls System
4. Domestic Hot Water System

B. The following systems including all components and controls shall be commissioned in this project: in addition to those mentioned in 3.02.A. .

1. Mechanical Equipment and/or Systems:
   a. Packaged Energy Recovery Ventilator
   b. Indoor Heat Pumps
   c. Outdoor Heat Pumps
   d. Heat Recovery Units
   e. Domestic water heating system
   f. Building automation control system
2. Electrical Equipment and/or Systems:
   a. Indoor Lighting Controls
   b. Outdoor Lighting Controls

3.03 START-UP, PREFUNCTIONAL CHECKLISTS, AND INITIAL CHECK-OUT

A. Contractor shall be responsible for the initial check-out and prefunctional testing of installed equipment and systems. The Commissioning Authority shall monitor the activities of the parties responsible for executing the required start-up, and prefunctional testing, as identified in the commissioning plan. The Commissioning Authority shall review the Contractor-furnished documentation of the start-up, initial check-out, and prefunctional test procedures for equipment and systems to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Construction Contractor shall furnish Operation and Maintenance manuals, minus the as-built drawings and post occupancy controls software prior to the generation of the pre-functional testing documents.

B. Observe the first prefunctional test procedures for each type and size equipment to ensure that the approved procedures are being followed.

3.04 FUNCTIONAL TESTING

A. Functional testing of equipment or systems shall be conducted only after prefunctional testing and start-up has been satisfactorily completed. The Commissioning Agent (CxA) shall schedule functional tests with the Contractor, and shall direct, witness, and document the functional testing of equipment and systems to be commissioned. The Contractor shall be responsible for the execution of the functional tests and shall supply any test equipment required to prove the performance of the installed equipment.

B. The functional testing shall demonstrate that each item of equipment and each system are operating according to the requirements of the construction documents. Each item of equipment and system undergoing functional testing shall be operated through all modes of operation where there is a required system response. Verify each action required in the sequences of operation has been accomplished according to the requirements.

C. Functional testing shall proceed from components to subsystems to systems. When the proper performance of interacting individual systems has been achieved, the interface or coordinated responses between systems shall be tested.

D. The proper and accurate operation of the control system shall be proven by functional testing and approved by the Commissioning Authority before it may be used for testing, adjusting and balancing activities or to verify performance of other components or systems. If authorized by the Commissioning Authority, portions of the control system may be tested and approved for these uses before the functional testing of the entire system is completed.

E. Testing, adjusting, and balancing work shall be completed and corrected as necessary before functional testing of air-related or water-related equipment or systems.

F. Test Methods:

1. Functional testing and verification shall be achieved by manual testing (direct manipulation of the equipment and observation of its response and performance) or by monitoring the performance using the control system's trend log capabilities or by stand-alone data loggers and analyzing the results. Functional test procedures shall specify which methods shall be used for each test. Determine which method is most appropriate for tests that do not have a method specified. The Commissioning Authority may substitute specified methods or require an additional method to be executed, other than that specified, if required to demonstrate the proper operation of the equipment or system being tested. Develop functional testing plans that define the allowable sampling procedures and that specify the procedures to be followed in the case of observed discrepancies or failures in the sample chosen for functional testing.
2. Sampling: multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy, as defined in the functional test procedures. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The following equipment serving individual suites may be sample tested: Indoor Heat Pumps, Lighting controls.
3. If 10 percent of the identical pieces of equipment (size alone does not constitute a difference) fail to perform to the requirements of the construction documents (mechanically or substantively) due to manufacturing defects or application error not allowing it to meet its performance specification, identical units may be considered unacceptable by the Commissioning Authority. In such case, the Contractor shall provide the Commissioning Authority with the following:
    a. Within 1 week of notification from the Commissioning Authority, the Contractor or manufacturer's representative shall examine other identical units making a record of the findings. The findings shall be provided to the Commissioning Authority within 2 weeks of the original notice.
    b. Within 2 weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, and proposed solution, including full equipment submittals for corrective or replacement equipment, if appropriate. The proposed solutions shall meet the specified requirements of the original installation.
    c. The Commissioning Authority shall evaluate the proposed solution and submit his recommendation of approval or disapproval to the Owner and Architect.
    d. When approved, 2 examples of the proposed solution shall be installed by the Contractor and the Commissioning Authority shall schedule and conduct functional testing of the proposed solution. Upon completion of the functional testing of the proposed solution, the Commissioning Authority shall recommend the acceptance or disapproval of the proposed solution to the Owner. The Commissioning Authority shall provide a copy of his recommendations to the Architect.
    e. Upon acceptance of the proposed solution by the Owner, the Contractor shall replace or repair identical items and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within 2 weeks of approval of the proposed solution.

4. Ensure that each functional test is performed under conditions that simulate actual operating conditions as closely as is practically possible.
5. Simulation of operating conditions (not by an overwritten value) shall be allowed, at the Commissioning Authority's discretion, though timing the testing to experience actual conditions is encouraged wherever practical. Simulation of conditions shall be accomplished by subjecting the equipment to actual operating conditions by artificial means whenever possible.
6. Where actually achieving a simulated operating condition is impractical, as determined by the Commissioning Authority or identified in the functional test procedure, a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants shall be used instead of using the sensor to act as the signal generator via simulated conditions or overwritten values. Signal generators or simulators shall be provided by the Contractor.
7. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be different than it really is, shall be allowed when approved by the Commissioning Authority, but shall be used with caution and avoided when possible. Simulation of the operating condition is preferable.
8. Altering set points: rather than overwriting sensor values, and when simulating conditions is difficult, altering set points shall be used to test a sequence.
9. Indirect indicators: relying on indirect indicators for responses or performance shall be allowed only after the Commissioning Authority has visually and directly verified that the indirect readings represent actual conditions and responses over the range of the tested parameters.

G. During the functional testing process, recommend solutions to deficiencies found.

3.05 RETESTING OF EQUIPMENT AND/OR SYSTEMS

A. Prior to retesting of any functional performance test found to be deficient, submit the data indicating that the deficient items have been completed and/or corrected to the Commissioning Authority. After review of the submitted data, if the corrective measures are acceptable, the Commissioning Authority shall schedule and conduct a recheck. If during the retesting it becomes apparent that the deficient items have not been completed and/or corrected as indicated in the data provided by the Contractor, the retesting shall be stopped. Costs for the commissioning team to further supervise the retesting of a functional performance test shall be the responsibility of the Contractor.

3.06 DOCUMENTATION, NONCONFORMANCE, AND APPROVAL OF TESTS

A. Documentation: witness and document the results of functional tests using the specific procedural forms developed for that purpose. Deficiencies or nonconformance issues shall be noted and reported with the test results. Include the completed test forms in the final commissioning report.

B. As functional testing progresses and a deficiency is identified, discuss the issue and attempt to resolve the discrepancy with the Contractor.

1. When there is no dispute about the deficiency and the Contractor accepts responsibility for correcting it, document the deficiency and the Contractor's response and intentions and the testing shall proceed, if possible. Corrections of minor deficiencies identified may be made by the Contractor during the functional testing, at the discretion of the Commissioning Authority. In such cases the deficiency and resolution shall be documented on the functional test form. Every effort shall be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the commissioning effort. When the Commissioning Authority determines that the required corrective actions will delay the testing process, document the observed deficiency and the proposed corrective action on the functional test form.
2. When the identified deficiency is corrected, the Contractor shall sign the statement of correction at the bottom of the noncompliance form, certifying that the equipment is ready to be retested, and return the form to the Commissioning Authority. The Commissioning Authority shall schedule the retest of the equipment or system involved.
3. If there is a dispute about an identified deficiency, document the deficiency and the Contractor's response, and submit the noncompliance report to the Owner and Architect, with a copy furnished to the Contractor. Every attempt shall be made to resolve the dispute at the lowest management level possible. Other parties shall be brought into the discussions by the Commissioning Authority, as needed. Document the resolution process. When the dispute resolution has been decided, the appropriate party shall correct the deficiency, sign the statement of correction on the noncompliance form and return the form to the Commissioning Authority. The Commissioning Authority shall schedule the retest of the equipment or system involved. Final interpretive authority for any issue in dispute shall be the Architect. Final acceptance authority shall be the Owner.
4. Retain the original nonconformance forms until the end of the Project. The completed forms shall be delivered to the Owner as a part of the final commissioning report.

C. Approval: note each satisfactorily demonstrated function on the functional test form. Formal approval of the functional tests shall be made after review of the test reports by the Commissioning Authority and Owner. Recommend acceptance of each test to the Owner.

3.07 DEFERRED TESTING

A. If any required prefunctional or functional test cannot be completed as scheduled, execution of checklists and functional testing may be delayed upon approval of the Architect and the Commissioning Authority. These deferred tests shall be conducted in the same manner as the seasonal tests as soon as possible.

B. Schedule and coordinate any required seasonal testing, tests delayed until weather or other conditions are suitable for the demonstration of the equipment or system's performance. Seasonal testing shall be executed, documented, and deficiencies corrected as specified herein for functional testing. Schedule deferred testing with the Contractor, the Architect, and the Owner.

3.08 OPERATION AND MAINTENANCE MANUALS

A. Prior to the beginning of the training program for systems commissioned, review the draft operations and maintenance manuals, equipment documentation, and as-installed drawings for systems that were commissioned and to verify compliance with the specifications. Communicate deficiencies in the manuals to the Owner and Contractor. When identified deficiencies have been corrected, recommend approval and acceptance of the operations and maintenance manuals to the Owner. Also, review each equipment warranty and verify that requirements needed to keep the warranty valid are clearly identified.

B. Review the Contractor's draft operations and maintenance manuals to ensure they include single-line system diagrams on sheets matching the size required in the project specifications. Drawings shall show major pieces of equipment and include control drawings.

C. Ensure that the Owner's project requirements and the basis of design are included in the first section of the operations and maintenance manuals. These narrative sections shall be updated to record status by the responsible parties.

D. Review all O & M manuals provided from the contractor to the owner as part of the project closeout for all components of commissioned systems.

E. At a minimum, the Operation and Maintenance Manuals shall contain:

1. Itemized Equipment List: Include maintenance schedule and detailed work description of each maintenance item.
2. Each item of Equipment and each System: Include description of unit or system and component parts.
3. Operating Procedures.
4. Maintenance Requirements.
5. Servicing and Lubricant schedule and a list of lubricants required.
6. Sequence of operation from BAS controls contractor: Include post occupancy software for all controls, BAS front end, and any software needed to operate or modify the BAS for daily operation.
7. Wiring diagrams and schematics for all systems, including life safety.
8. As-built control, and fire alarm wiring diagrams.
9. O&M manuals shall be provided in 3-ring binders and on CD's in PDF version.

3.09 TRAINING OF OWNER PERSONNEL

The Contractor shall be responsible for training coordination and scheduling, and ultimately for ensuring that training is completed. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

A. The CxA will interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the results to the GC, Subcontractors and Vendors who have training responsibilities.

B. Contractor shall provide training for Owner personnel in accordance with Section 01 79 00 Demonstration and Training.

C. In addition to these general requirements, specific training requirements of Owner personnel by Subcontractors and Vendors may also be specified in Divisions 22, 23 and 26.

END OF SECTION

SECTION 03 10 00 CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes all concrete formwork and other related items necessary to complete project indicated by Contract Documents unless specifically excluded.

B. Related Sections:

1. Section 03 20 00 – Concrete Reinforcing.
2. Section 03 30 00 – Cast-in-Place Concrete.

1.02 PROJECT CONDITIONS

A. Examine the substrate over which concrete forms are installed and advise the Project Engineer of conditions detrimental to the installation of concrete formwork. Do not proceed until unsatisfactory conditions have been corrected.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wood Forms: 3/4 inch exterior grade plywood on studs and joists.

B. Form Ties: Standard snap ties, 1-1/2 inch break-back.

C. Form Oil: Oil must not affect bonding of finishes on exposed concrete. Approved non-staining type as follows:

1. Nox-Crete Products Group Nox-Crete Form Coating EB.
2. SEI Form Release Gcc-100.
3. Dayton Superior Bio-Release EF.

PART 3 - EXECUTION

3.01 FORMWORK

A. Forms shall be properly aligned, adequately braced and mortar tight to produce concrete shapes required by Drawings.

1. Align forms so that the actual surface does not vary from true surface more than l/8 inch.
2. The surface shall be clean, undamaged, and free of offsets and irregularities at joints.
3. Adequately brace and frame to retain true shapes under vibration and placing strains without leaks, bowing, or deflection.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Studs, girts, and walls shall not be less than 2 by 4's, S4S, construction of standard grade Douglas fir, or equal, selected for straightness.

1. Walls shall consist of at least two 2 by 4's.
2. Studs shall not be spaced more than l6 inches, girts not more than 24 inches and ties not more than 27 inches, on center.

D. Lightly oil wood forms prior to placing reinforcing, and with oil not permitted on the reinforcing. Where oil form is used, remove excess before pouring concrete.

E. Unless indicated otherwise, chamfer exterior corners and edges of permanently exposed concrete.

F. Comply with recommendations of "Recommended Practice for Concrete Form work" ACI 347 unless indicated otherwise.

3.02 INSERTS AND FASTENING DEVICES FOR OTHER WORK

A. Provide for installation of inserts, hangers, metal ties, anchors, bolts, dowels, nailing strips, grounds and other fastening devices required for attachment of other Work

B. Locate partitions for other trades prior to pouring concrete in order that conduits, sleeves and inserts required by others will be installed in the proper locations.

C. Do not install sleeves in any concrete beams or piers except upon approval of the Project Engineer.

D. Do not install aluminum conduits in concrete.

3.03 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape. Refer to Section 07 26 00 – Vapor Retarders.

3.04 FORM REMOVAL

A. Grade beam and column forms may be removed 24 hours after a pour is completed.

B. Floor slab wood forms may be removed l0 days after pour, providing compressive strength has reached a minimum of 2500 psi based on job cast cylinders.

END OF SECTION

SECTION 03 20 00 CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes all concrete reinforcing and the related items necessary to complete the Project indicated by the Contract Documents unless specifically excluded.

B. Related Sections:

1. Section 03 10 00 – Concrete Forming and Accessories.
2. Section 03 30 00 – Cast-in-Place Concrete.

1.02 SUBMITTALS

A. Submit reinforcing steel shop drawings and materials list prior to placement for MDOT Architect's approval.

1. Shop drawings shall include complete DIMENSIONED placing plans including control joint locations, order lists, bend diagrams, and DETAILS SHOWING DIMENSIONS WITH CLEARANCES.
2. Submittals not including this requirement will be considered as an incomplete submittal and will be returned to Contractor for re-submittal.

B. Furnish mill certificates for steel bar reinforcement, to the Project Engineer certifying that each shipment meets specifications. The fabricator will furnish certificates with bar lists to designate location of shipment and the time steel is delivered to the project.

1.03 QUALITY ASSURANCE

A. Reinforcing bars shall conform to ASTM A 615 "Deformed Billet-Steel Bars for Concrete".

B. Mesh reinforcement shall conform to ASTM A 185 "Welded Steel Wire Fabric for Concrete Reinforcement".

C. Accessories shall conform to American Concrete Institute ACI 301 "Specifications for Structural Concrete for Buildings".

D. Placement shall be in accordance with approved shop drawings and ACI 318 "Standard Building Code Requirements for Reinforced Concrete".

E. Comply with ACI 315 "Manual of Standard Practice of Detailing Reinforced Concrete Structures".

1.04 DELIVERY, STORAGE, AND HANDLING

A. Reinforcing bar steel and mesh shall be handled, shipped and stored in a manner that will prevent distortion or other damage.

B. Materials shall be stored in a manner to prevent excessive rusting and fouling with dirt, grease, or other bond-breaking coatings.

1.05 PROJECT CONDITIONS

A. Examine the substrate over which concrete forms are installed and advise the Project Engineer of conditions detrimental to the installation of concrete formwork. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordinate placement of concrete reinforcing with installation of concrete formwork, vapor barriers, concrete inserts, conduit and all other items occurring in the area.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Bar Reinforcement: Bar reinforcement shall conform to ASTM A 615, grade 60, of domestic manufacture. Bars shall be new; free from rust, scale, oil, or other coatings that will prevent bond.

B. Welded Steel Wire Fabric: Fabric shall conform to ASTM A 185, new, free from rust and other coatings that will prevent bond.

C. Accessories: Metal accessories as required shall support reinforcing bars and comply with ACI 315. Chairs and bolsters for use in exposed concrete shall have plastic coated or stainless steel legs or shall be plastic.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Fabricate and place reinforcement in accordance with the latest requirements of the American Concrete Institute and the approved shop drawings. Fabrication shall not proceed until MDOT Architect's approval is obtained.

B. Reinforcing for one day's pour shall be completely placed and an inspection made by the Project Engineer / MDOT Architect prior to starting the pour.

C. Concrete Protection for Reinforcement: Minimum coverage shall be as follows unless shown otherwise on drawings:

1.	Footings (bottom of steel)	3 inches clear
2.	Slabs	1-1/2 inches clear top and 3/4 inch clear bottom
3.	Beams	1-1/2 inch clear to stirrups
4.	Walls	2-1/2 inches clear
5.	Columns	2 inches clear to verticals

D. Steel Dowels for successive work shall be wired in correct position before placing concrete. The "sticking" of dowels after placing concrete will not be permitted.

E. Lap all bars 24 bar diameters at corners, splices and intersections.

F. Interrupt Reinforcing steel at control joints in floor slabs.

G. Do not weld reinforcing steel unless specifically approved by the Project Engineer.

END OF SECTION

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, finishes, and other related items necessary to complete Project indicated by Contract Documents unless specifically excluded.

B. Related Sections:

1. Section 03 10 00 - Concrete Forming and Accessories.
2. Section 03 20 00 - Concrete Reinforcing.
3. Section 07 26 00 - Vapor Retarders.
4. Section 09 90 00 – Painting and Coating.

1.02 SUBMITTALS

A. Submit concrete mix design, concrete compression test reports and product data and manufacturer's installation instructions for concrete curing compound.

1.03 TESTING LABORATORY SERVICES

A. The Owner will provide testing as specified in Section 01 45 29.

1.04 QUALITY ASSURANCE

A. 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.

B. Mix Design: 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 and shall meet the compressive strength requirements for Class B concrete. 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.

C. 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 100 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*.

1. 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.
2. 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.
3. 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.
4. Copies of all test reports shall be furnished to the ready mixed concrete producer and as directed by the Project Engineer.

1.05 COORDINATION

A. Verify that all pipes under grade have been installed and tested before being covered. Check and verify materials and locations of inserts, anchors, and items required by other trades before pouring concrete. Concerned subcontractors shall be notified of date of pour in sufficient time to allow for completion of their work.

B. The Contractor shall notify the Project Engineer upon completing formwork and all reinforcing steel for the next intended pour, and shall not commence pouring operation until all forms and reinforcing steel are approved by the Project Engineer.

C. Project Engineer shall have free access to all materials used, and the required samples are to be furnished by the Contractor, as directed.

D. Inspection and written approval from the floor-covering subcontractor is required for slab finish receiving floor covering.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. 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.

B. All concrete, unless noted otherwise, shall be Class B.

C. Maximum slump for normal weight concrete shall be 4 inches. Sump may be increased to 8 inches with an approved water reducer.

2.02 CONCRETE MATERIALS

A. Portland Cement: ASTM C-150, Type I.

B. Water: From an approved source.

C. Structural Concrete Aggregate: Coarse aggregate size number 57 or 67 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.

2.03 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 BASF / Sonneborn, Safe-Cure, manufactured by Dayton Superior Corp. or approved equal. Compound shall not interfere with bonding or floor finish.

D. Non-Shrink Grout: Shall be one part Portland cement to 2-1/2 parts of fine aggregate or Cement grout ASTM C 387 Dry Package mixtures similar and equal to Masterflow 713 Plus, manufactured by BASF / Master Builders; Five Star Grout, U.S. Grout Company or approved equal.

2.04 CONCRETE MIXES

A. Ready-Mixed Concrete: 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.

1. 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.
2. 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.

PART 3 - EXECUTION

3.01 CONCRETE PLACEMENT

A. 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.

B. 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.

C. 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.

D. 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.

3.02 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.

3.03 CURING

A. 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.

3.04 PATCHING

A. 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.

3.05 FINISHES FOR FLATWORK

A. 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.

B. 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.

C. 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.

D. Exterior walks and ramps shall have smooth trowel and fine broom finish.

E. Exterior sign base shall have a Class 2, Rubbed Finish as follows:

1. After removal of forms, the Class 1 finish shall be completed and the rubbing of concrete shall be started as soon as its condition will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water for at least three hours.
2. Surface shall be rubbed with a medium course Carborundum stone using a small amount of mortar on its face. The mortar shall be composed of cement and sand mixed in the proportions used in the concrete being finished. Rubbing shall be continued until all form marks, projections, and irregularities have been removed, all voids filled, and a uniform surface has been obtained.
3. The final finish shall be obtained by rubbing with a fine Carborundum stone and water. This rubbing shall continue until the entire surface is a smooth texture and uniform color.
4. After the final rubbing is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and objectionable marks.

3.06 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.

1. 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.
2. 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 04 20 00 UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Brick veneer masonry work as indicated on the Drawings, schedules and accessories as specified in this Section.

B. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for furnishing steel lintels and shelf angles (where required) for unit masonry.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints.
3. Section 09 05 15 “Color Design” for brick type and mortar color.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Including specifications and other data for each type of masonry unit and accessory required. Include instructions for handling, storage, installation, cleaning and protection of each. Indicate by transmittal that the Installer has received a copy of each instruction.

B. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.

1.03 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product indicated. For masonry units include data on material properties.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.04 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

B. Fire-rated Masonry: Wherever a fire-resistance classification is shown or scheduled for unit masonry construction (4 hour, 3 hour, and similar designations), comply with the requirements for materials and installation established by the American Insurance Association and other governing authorities for the construction shown.

C. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

1. Prior to installation of masonry work, erect sample wall panel mock-up materials, bond and joint tooling shown or specified for final Work. Provide special features as directed for caulking and contiguous work. Build mock-up at the site, where directed, of full thickness and approximately 4 feet by 3 feet unless otherwise shown, indicating the proposed range of color, texture and workmanship to be expected in the completed Work.
2. Obtain Project Engineer / MDOT Architect's acceptance of visual qualities of the mock-up before start of masonry work. Retain mock-up during construction as a standard for judging completed masonry work. Do not alter, move or destroy mock-up until Work is completed. Provide mock-up panel for each type of exposed unit masonry work.

1.05 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

C. Protect partially completed masonry against weather, when Work is not in progress, by covering top of walls with strong, waterproof, non-staining membrane. Extend membrane a minimum of 2 inches down both sides of walls and anchor securely in place.

PART 2 - PRODUCTS

2.01 ACCEPTABLE BRICK MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Acme Brick Company, Jackson, Mississippi
2. Boral Brick, Hattiesburg, Mississippi
3. Cherokee Brick & Tile Company, Jackson, Mississippi
4. Columbus Brick, Columbus, Mississippi
5. Old South Brick & Supply Company, Jackson, Mississippi

B. Substitution shall fully comply with specified requirements of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 MASONRY UNITS, GENERAL

A. Obtain masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.03 BRICK, GENERAL

A. Unless otherwise indicated or specified, provide modular size brick (7-5/8 inches long x 2-l/4 inches high x 3-3/4 inches wide) for exposed vertical brickwork. At Contractor's option, provide solid or cored brick for vertical brickwork. Do not use cored brick with net cross-sectional area less than 75 percent of gross area in the same plane or with core holes closer than 3/4 inch from any edge. Use solid brick in locations where the cores in cored bricks are exposed to view.

B. Face Brick: Brick exposed to view ASTM C 2l6, Grade SW for exterior exposures.

C. Building (Common) Brick: Brick not exposed to view, ASTM C 62, Grade SW for exterior exposures and Grade MW for interior masonry which will be concealed by other work. Select from manufacturer's standard colors and textures.

2.04 MORTAR AND GROUT MATERIALS

A. Mortar mixes shall comply with the requirements of ASTM C 270 Standard Specification for Mortar for Unit Masonry. Type S mortar shall be used for exterior Work. Type N mortar shall be used for interior Work. Mortar color for face brick shall be as selected by the Project Engineer / MDOT Architect from manufacturer's standard colors. Mortar color for building (common) brick shall be natural color or white cement as required to produce the required standard mortar color.

B. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Sand: ASTM C l44, except for joints less than l/4 inch, use aggregate graded with 70 to l00 percent passing the No. 16 sieve.

E. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

F. Masonry Cement: ASTM C 91.

1. Equivalent products by the following manufacturers are acceptable:
   a. Ash Grove Packaging, Jackson, MS. Tel. (800) 467-0860.
   b. Holcim (US) Inc., Dundee, MI. Tel. (800) 831-9507.
   c. National Cement Company, Inc., Birmingham, AL. Tel. (205) 870-7680.

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Equivalent products by the following manufacturers are acceptable:
   a. Bayer Corp., Ind. Chemicals Div., Martinsville, WV. Tel. (800) 662-2927.
   b. Davis Colors, Los Angeles, CA. Tel. (800) 356-4848.
   c. Solomon Grind-Chem Services, Inc., Springfield, IL. Tel. (800) 624-0261.

H. Colored Cement Product: Packaged blend made from portland cement and lime, masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
4. Available Products:
   a. Colored Portland Cement-Lime Mix:
      1) Ash Grove Packaging, Jackson, MS. Tel. (800) 467-0860.
      2) Holcim (US) Inc., Dundee, MI. Tel. (800) 831-9507.
      3) Lehigh Cement Company, Allentown, PA. Tel. (610) 366-4600.
   b. Colored Masonry Cement:
      1) Ash Grove Packaging, Jackson, MS. Tel. (800) 467-0860.
      2) Holcim (US) Inc., Dundee, MI. Tel. (800) 831-9507.
      3) Lehigh Cement Company, Allentown, PA. Tel. (610) 366-4600.
      4) National Cement Company, Inc., Birmingham, AL. Tel. (205) 870-7680.

I. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

J. Aggregate for Grout: ASTM C 404.

K. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.

L. Water: Potable.

2.05 MASONRY ACCESSORIES

A. Brick Veneer Masonry Work: Provide adjustable wire ties conforming to ASTM A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement. The wire shall be a minimum of W1.7, 9 gage. Plate portions of adjustable ties shall be a minimum of 14 gage in thickness. Plate portion shall conform to ASTM A 366 Standard Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality. All tie components shall be hot-dip galvanized after fabrication and shall conform to ASTM A 153 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Class B-2.

B. Anchoring Devices for Masonry: Provide straps, bars, bolts and rods fabricated from not less than l6 gage sheet metal or 3/8 inch diameter rod stock, unless otherwise indicated.

C. Concrete Inserts for Masonry:

1. Furnish dovetail slots with filler strips, where masonry abuts concrete. Fabricate from 24 gage galvanized steel unless otherwise indicated.
2. For installation of concrete inserts, see concrete sections of these Specifications. Advise concrete installer of specific requirements regarding his placement of inserts, which are to be used, by the masonry installer for anchoring of masonry Work.

D. Flashing for Brick Veneer Walls: Provide concealed flashing, shown to be built into masonry, as specified in Section 07 65 00 - Flexible Flashing, unless otherwise indicated.

2.06 MASONRY MAT & WEEP VENTS

A. Manufacturer and Type: Products equal to CavClear Masonry Mat and CavClear Weep Vents as manufactured by Archovations, Inc., PO Box 241, Hudson, WI 54016. Telephone (888) 436-2620.

1. Description: Airspace maintenance, pressure equalization, and drainage system for masonry cavities to prevent mortar from making contact with the backup to ensure water management. The system shall be fluid conducting, non-absorbent, mold and mildew resistant polymer mesh consisting of 100 percent recycled polymer with PVC binder. Weep Vents shall have “M” notched bottom. Color to be selected by the MDOT Architect from full range of standard colors.
2. Mat size: 1-1/4 inch thick by 16 inches high by 8 feet long.
3. Weep Vent Size: 3/8 inch thick by 2-1/2 inches high by 3-1/2 inches wide.

B. Equivalent products by the following manufacturers are acceptable:

1. Advanced Building Products, Inc., Springvale, ME Tel: (800) 252-2306.
2. Colbond Geosynthetics, Enka, NC. Tel. (800) 664-6638.

C. Substitutions shall fully comply with specified requirements and Section 01 25 00- Substitution Procedures and Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.01 INSPECTION

A. Masonry installer must examine the areas and conditions under which masonry is to be installed and notify the Project Engineer and 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 masonry installer.

3.02 INSTALLATION

A. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Build chases and recesses as shown and as required for the work of other trades. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.

D. Cut masonry units with motor driving saw designed to cut masonry with clean, sharp, un-chipped edges. Cut units as required to provide pattern shown and to fit adjoining Work neatly. Use full units without cutting wherever possible.

E. Wet brick having ASTM C67 absorption rates greater than 0.025 oz. per sq. inch per minute. Determine absorption by drawing a circle the size of a quarter on typical units and place 20 drops of water inside the circle. Wet brick units only if water is absorbed within 1-1/2 minutes. The units shall be wetted thoroughly 3 to 24 hours prior to their use so as to allow moisture to become distributed throughout the unit. The units shall be surface dry when laid.

F. Frozen Materials and Work: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry, which is specified to be wetted, comply with the BIA recommendations. Do not use calcium chloride in mortar or grout.

G. Pattern Bond: Lay masonry work in a running bond unless indicated otherwise.

H. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns and offsets. Avoid the use of less-than half-size units at corner, jambs and wherever possible at other locations. Lay-up walls plumb and true and with courses level, accurately spaced and coordinated with other work.

I. Stopping and Resuming Work: Rack back l/2 masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted), and remove loose masonry units and mortar prior to laying fresh masonry.

3.03 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.04 MORTAR BEDDING AND JOINTING

A. Lay hollow brick as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Maintain joints widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8 inch joints.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

F. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units that have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar.

3.05 EXTERIOR BRICK VENEER WALLS

A. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches on center horizontally and 16 inches on center vertically.

1. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings.
2. At intersecting and abutting walls, provide ties at no more than 24 inches on center vertically.
3. Fasten ties to wood frame with corrosion-resistant nails that penetrate the sheathing and are driven a minimum of 1-1/2 inches into the studs.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Apply air barrier to face of backup wythe (plywood sheathing) to comply with Section 07 27 26 "Fluid-Applied Membrane Air Barriers."

3.06 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches on center vertically and 36 inches on center horizontally.

3.07 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.

3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches on center vertically and 24 inches on center horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.08 LINTELS

A. Install loose lintels of steel and other materials where shown.

3.09 CONTROL AND EXPANSION JOINTS

A. Provide vertical expansion, control and isolation joints in masonry. Build-in related masonry accessory items as the masonry work progresses. Rake out mortar in preparation for application of caulking and sealants

B. Control / Expansion Joint Spacing: If locations of control / expansion joints are not shown, place vertical joints spaced not to exceed 25'-0" on center. Locate control / expansion joints at points of natural weakness in the masonry work.

3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated. For pressure equalization, install weep vents at both top and bottom of wall.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches on center unless otherwise indicated.

D. Place cavity drainage material full height in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged or if units do not match adjoining units as intended. Provide new units to match units and install with fresh mortar or grout, pointed to eliminate evidence of replacement.

1. Protect the base of the wall from mud splashes and mortar droppings.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat uniform appearance, properly prepared for application of caulking or sealant compounds.

C. In-Progress Cleaning:

1. Good workmanship and job housekeeping practices shall be used to minimize the need for cleaning the masonry.
2. Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions. Muriatic acid is NOT acceptable.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.12 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 05 12 00 STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes structural steel framing members, support members, with required bracing, welds, fasteners, base plates, bearing plates, grout, anchor bolts and other related items necessary to complete Project indicated by Contract Documents unless specifically excluded.

B. Related Sections:

1. Section 09 05 15 “Color Design”.
2. Section 09 90 00 “Painting and Coating”

1.02 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.03 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components. Shop drawings shall conform to requirements of current AISC Specifications. Indicate sizes, spacing, connections, and location of structural members. Indicate net weld lengths and welded connections with AWS welding symbols.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and fabricator.

B. Welding certificates.

C. Mill test reports for structural steel, including chemical and physical properties.

D. Source quality-control reports.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer with a minimum of five (5) years experience.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. W-Shapes: ASTM A 992/A 992M

C. Channels, Angles, M or, S-Shapes: ASTM A 572/A 572M, Grade 50.

D. Plate and Bar: ASTM A 572/A 572M, Grade 50.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

G. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS

A. General: All bolts not indicated otherwise on the Drawings are 3/4 inch. All connections not noted otherwise on the Drawings shall be framed connections.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

C. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.

1. Configuration: Hooked.
2. Finish: Plain

D. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.

1. Finish: Plain

E. Threaded Rods: ASTM A 36/A 36M

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C

F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

2.03 PRIMER

A. Primer: Shop coat paint, ICI Devflex 4020, Rustoleum 769, Tnemec 99, Southern Coatings 476, or approved equal. Shop coat shall be compatible with finish coats specified in Section 09 90 00 Painting and Coating.

2.04 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

1. Grout shall have a 14-day compressive strength of 6000 psi when mixed to its flowable state.

2.05 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Fabrication shall not proceed until MDOT Architect’s approval is obtained.

2.06 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.07 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.08 SOURCE QUALITY CONTROL

A. Testing Agency: Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports required by AHJ and ICC Building Code.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.03 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 for type of bolt and type of joint specified.

1. Joint Type: Snug tightened

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

SECTION 05 50 00 METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. All miscellaneous metal work. The Work includes, but is not limited to, pipe bollards, steel lintels and miscellaneous framing & supports.

B. Related Sections:

1. Section 09 05 15 – Color Design.
2. Section 09 90 00 - Painting and Coating: Painting for all ferrous metal exposed to view and not covered by masonry or concrete.

1.02 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

B. Structural shapes shall be standard sections conforming to the American Society for Testing Materials Specification A-36. Punch and drill as necessary for work of others. Provide all bearing plates and all anchors, bolts, and etc. The Work shall be true and free of twists, bends and open joints between component parts. Materials shall be thoroughly straightened in the shop before laid off or worked in any way, care being used to avoid injury to the material.

C. Gray cast iron shall conform to ASTM A48-83, class 30. All castings shall be of uniform quality, free from blowholes, shrinkage defects, swells, cracks or other defects. Castings shall be free of fins, burrs and slag.

D. Expansion bolts shall be equal to Phillips Red Head or "cinch" bolts as manufactured by the National Lead Company. Hilti Fasteners, Rawlplug Company and Wej-it Corporation are acceptable manufacturers. Use toggle type bolts or similar for all anchorage into hollow construction.

E. Bolt or weld connections: Provide necessary lugs and brackets for anchorage. Welding shall be in accordance with current "Code of Fusion, Welding and Gas Cutting in Building Construction, Part A - Structural Steel" issued by the American Welding Society, both for fabrication and erection. All welders shall have certification, as a result of tests prescribed by the American Welding Society.

F. Detail metal Work for ample size, strength and stiffness and as indicated. Countersink and provide reinforcement where necessary; drill or punch holes for bolts and screws. At the proper time furnish the necessary templates, patterns and items of miscellaneous metal, such as sleeves, inserts and similar items to be built into adjoining Work.

G. Fabricate metal Work with sharp lines and angles, with smooth true surfaces and clean edges. Form exposed joints to exclude water. Furnish certificates from manufacturers stating that materials comply with the specification requirements.

H. Provide as necessary holes of proper number and spacing for the attachment of Work of other trades. Do not use cutting torch in field without permission of the Project Engineer.

I. Anchor bolts, washers, nuts and clamps shall be furnished where indicated on the Drawings and where necessary for properly securing Work in place. All bolts and anchors used on the exterior of the building or built into exterior walls shall be cadmium plated. Miscellaneous angles and plates not indicated or specified otherwise shall not be less than 1/4 inch thick.

J. Shop paint and field touch up shall be ICI Devflex 4020, Rustoleum 769, Tnemec 99, Southern Coatings 476, or approved equal. Shop coat shall be compatible with finish coats specified in Section 09 90 00 – Paints and Coatings

2.02 FASTENERS

A. General: Fastenings shall be invisible where possible. Where exposed, screws, bolts, and the like shall be vandal-proof. All welded exposed joints on steel manufactured items; etc. shall be ground smooth and filled to receive paint

B. Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
3. Provide stainless-steel fasteners for fastening nickel silver.
4. Provide bronze fasteners for fastening bronze.

C. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.03 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.

2.04 LOOSE LINTELS

A. Provide loose galvanized steel lintels for openings and recesses in masonry walls and partitions. Weld adjoining members together to form a single unit where indicated. Provide a minimum of 8 inches bearing at each side of openings.

2.05 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete Work.

B. Fabricate miscellaneous units to sizes, shapes, and profiles indicated, or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes, plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

C. Galvanize exterior miscellaneous frames and supports.

2.06 MISCELLANEOUS MATERIALS

A. Metal Primers: Where materials come in contact with dissimilar materials which may cause harmful reaction, where exposed to moisture, or such as aluminum to cement mortar or concrete, the surface shall be protected by zinc chromate primer, bituminous paint or other approved paint.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

D. 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.

E. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3500 psi.

2.07 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. 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.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches on center.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. 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.

B. 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.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING METAL BOLLARDS

A. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.03 INSTALLING 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.

C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Utility shelving.
6. Plywood backing panels.

B. Related Sections:

1. Section 03 10 00 - Concrete Forming and Accessories.
2. Section 06 16 00 – Sheathing.
3. Section 06 40 00 - Architectural Woodwork.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.03 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.

1.04 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.

1.05 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 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece] or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841 For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

C. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Roof framing and blocking.
4. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
5. Plywood backing panels.

2.04 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Standard, Stud, or No. 3 grade of any species.

B. Other Framing: Construction or No. 2 grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Southern pine; SPIB.
3. Douglas fir-larch; WCLIB or WWPA.
4. Mixed southern pine; SPIB.
5. Douglas fir-south; WWPA.
6. Hem-fir; WCLIB or WWPA.

7. Douglas fir-larch (north); NLGA.
8. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.05 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber of any species.

C. For utility shelving, provide lumber with 15 percent maximum moisture content of eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 3 Common grade; NELMA.
3. Northern species, No. 3 Common grade; NLGA.
4. Western woods, Standard or No. 3 Common grade; WCLIB or WWPA.

2.06 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Power-Driven Fasteners: NES NER-272.

C. Screws for Fastening to Metal Framing: ASTM C 1002 length as recommended by screw manufacturer for material being fastened.

2.08 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

D. Cut, join, and tightly fit framing around other Work. Do not splice structural members between supports unless otherwise indicated.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

3.02 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 16 00 SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Sheathing joint and penetration treatment.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

1.03 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

2.02 WOOD PANEL PRODUCTS

A. Plywood: DOC PS 1, unless otherwise indicated.

2.03 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction, Use Category UC3b for exterior construction.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.04 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat all plywood unless otherwise indicated.

2.05 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing. 1/2 inch minimum thickness.

2.06 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I sheathing, 3/4 inch minimum thickness.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.

2.08 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

B. Sheathing Tape for Plywood Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.09 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 06 17 53 SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Single plane, metal connected wood trusses fabricated from conventional dimensional lumber.
2. Design and fabricate wood trusses where shown on the Drawing and as needed for a complete and proper installation.

1.02 REFERENCES

A. The applicable portions of the current editions of the following standards are a part of these Specifications:

1. National Design Specifications for Wood Construction published by the National Forest Products Association.
2. Design Specifications for Metal Plate Connected Wood Trusses published by The Truss Plate Institute.
3. American Society for Testing and Materials (ASTM).
   a. ASTM A446 Grade A.
   b. ASTM A525 Coating Destination G60.
4. Timber Construction Manual published by American Institute of Timber Construction

1.03 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data, specifications, metal-plate connectors, metal truss accessories, fasteners, and installation instructions for hurricane clips prior to fabrication.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.
7. Shop Drawings Shall Bear The Seal Of A Professional Engineer Registered In The State Of Mississippi.

C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer (registered in the State of Mississippi) responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

1.05 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer (registered in the State of Mississippi).
3. Comply with provisions of all applicable standards and codes and the 2012 International Building Code.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in TPI BCSI**,** "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

1. Trusses, if stored prior to erection, shall be stored in a vertical position and protected from the weather. Handle with care to avoid damage.
2. Temporary construction loads that cause member stresses beyond design limits are not permitted.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer (Registered in the State of Mississippi), as defined in Section 01 40 00 "Quality Requirements," to design metal-plate-connected wood trusses.

B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

2.02 MATERIALS

A. Lumber: All truss members - No. 2 kiln dried Southern Yellow Pine having a maximum moisture content of 19 percent. Top and bottom chords members shall be 2 inches by 6 inches minimum.

B. Dimensional joist and truss lumber shall have the following minimum properties, unless noted otherwise on the Drawings:

1. Bending stress ---------- 1,000 psi
2. Horizontal shear stress ---------- 80 psi

C. Metal Connector Plates: Connector plates shall be a minimum thickness of 0.036 inches and shall be manufactured from steel meeting the requirements of ASTM A446 Grade A, and shall be hot dipped galvanized according to ASTM A525 Coating Designation G90. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.; an ITW company.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.; a Tembec/SGF Rexfor company.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. Truswal Systems Corporation; an ITW company.

D. Hurricane clips shall be equal to 18 gage galvanized steel framing anchor (Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.) Type TA-4as manufactured by Cleveland Steel Specialty Company or comparable product by one of the following:

1. Simpson Strong-Tie Co., Inc.
2. USP Structural Connectors.

2.03 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

2.04 DESIGN LOADS

A. The dimensional wood roof framing shall be designed for the following loads, unless noted otherwise on the Drawings:

1. Live load ---------- 20 psf
2. Top chord dead load ---------- 10 psf
3. Bottom chord bottom load ---------- 10 psf

2.05 FABRICATION

A. Trusses shall be manufactured by a company established to perform this Work. Manufacturing Company must have the Project Engineer's prior approval.

B. Size, stress and arrangement shall be determined by dimensions indicated on the Drawings. Each truss shall be custom designed to fit the dimensions indicated on the Drawings. Complete design calculations showing internal layout, member forces, and stress control points are to be furnished for each truss design. Design Calculations Shall Bear The Seal Of A Professional Engineer Registered In The State Of Mississippi.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.06 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Project Engineer.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the Work.

3.02 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.03 PREPARATION

A. Erection bracing in addition to specified bridging is to be provided to keep the trusses straight and plumb as required to assure adequate lateral support for the individual truss and entire system until the sheathing material has been applied. The Contractor will give one week notification prior to enclosing the trusses to provide opportunity for inspection of the installation by the manufacturer's representative and the Project Engineer.

3.04 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the Work of those trades for interface with the Work of this Section.

B. .Install the Work of this Section in strict accordance with the original design, pertinent requirements of agencies having jurisdiction, the Truss Plate Institute, and manufacturer's recommended installation procedures. Anchor all components firmly into position.

C. Hoist the trusses into position with proper bracing secured at designated lifting points. Exercise care to keep out-of-place bending of trusses to a minimum. Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing is installed. Install permanent bracing and related components prior to application of loads to trusses. Do not cut or remove any truss members

D. Roof truss anchorage shall be by hurricane clips. Clips shall allow horizontal nailing into the top plates. Hurricane slip type truss anchors shall be provided at each corner and at every truss bearing point. Where an anchored truss bears on an intermediate point, a truss anchor shall be installed at that bearing point.

E. Trusses to be set 24 inches on center maximum spacing.

F. Brace temporary and permanently to sustain a vertical position under construction and design loads. Block eaves and ridges to provide straight alignment of trusses.

G. Install wood trusses within installation tolerances in TPI 1.

H. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

I. Replace wood trusses that are damaged or do not meet requirements.

END OF SECTION

SECTION 06 40 00 ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: 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. Accessory materials.
7. Miscellaneous work.

C. Related Sections:

1. Section 05 50 00 – Metal Fabrications.
2. Section 06 10 00 – Rough Carpentry.
3. Section 09 05 15 – Color Design.
4. Section 09 90 00 – Painting and Coating

1.02 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

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, cabinet hardware and accessories with installation instructions and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Lumber for transparent finish, for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished cabinets.
3. Lumber and panel products with shop-applied opaque finish, for each finish system and color, with exposed surface finished.
4. Thermoset decorative panels, for each color, pattern, and surface finish.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.04 QUALITY ASSURANCE

A. Unless otherwise shown or specified, comply with specified provisions of the Architectural Woodwork Institute (AWI) and approved "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 FIELD CONDITIONS

C. Millwork fabricator shall comply with the following:

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. Comply with the indicated standards as applicable for the following types of architectural woodwork

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.

1.05 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.

1.06 FIELD 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. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.01 ARCHITECTURAL WOODWORK FABRICATORS

A. Fabricators: Subject to compliance with requirements available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Easley & Easley Millwork, Inc., Jackson, MS. Tel. (601) 372-8881.
2. Scanlon -Taylor Millwork Company, Jackson, MS. Tel. (601) 362-5333.
3. Southeastern Constructors, Inc., Brandon, MS. Tel. (601) 825-9791.

2.02 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.

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 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.

2.03 ARCHITECTURAL WOODWORK TYPES

A. Wood Cabinets: Custom Grade. On exposed portions provide solid wood and plywood (no plywood substitutes) meeting the requirements for the specified Quality Grade.

1. Exposed surfaces: Birch.
2. Semi-Exposed surfaces: Birch.
3. Concealed surfaces: Birch

B. Plastic Laminate Finished Casework: Grade: Premium, Plastic Laminate for Horizontal Surfaces: 0.050” thick, General Purpose Type (high pressure). Plastic Laminate for External Vertical Surfaces: 0.028” thick, General Purpose Type (high pressure).

C. 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 CABINETS 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. Closet Rods: Chrome pipe one inch in diameter, braced 4 feet on center maximum.
9. Closet Rod Support: Equal to Stanley No.7046.
10. Keyboard: Multi-Platform Articulating Keyboard Platform equal to Kensington Model KMW60067. Equivalent products by Fellows and Safco are acceptable.
11. Hardware finishes to be selected by the Project Engineer / MDOT Architect.

2.05 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. . Adhesives: Do not use adhesives that contain urea formaldehyde.

2.06 FABRICATION

A. Complete fabrication, including assembly**,** and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

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. 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.

B. 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.

C. 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.

D. 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 Quality Standards for joinery.

E. Countertops: Anchor securely to base units and other support systems as indicated.

F. Grommets: Provide at openings in countertops at knee spaces.

G. Keyboard: Install per manufacturer’s instructions at knee spaces.

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 28 CELLULOSE THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Building insulation for interior walls, exterior walls, and attics.

1. Pneumatically blown dry into attic assemblies.
2. Pneumatically sprayed damp into open wall cavities.

1.02 ACTION SUBMITTALS

A. Product Data: 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.

1.03 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

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.

1. 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 25 00- Substitution Procedures and Section 01 60 00-Product Requirements.

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.

1. Shall contain a EPA registered fungicide, be mold-resistant, non-toxic, and non-corrosive.
2. Shall not irritate normal skin.
3. Shall not give off odor during or after installation.
4. Shall not attract vermin or insects.
5. 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.

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.

2.04 ACCESSORIES

A. Attic Rafter Vents: 22-1/2 by 48 by 2 inches, rigid expanded polystyrene foam.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions where building insulation is to be installed and notify the Contractor and 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 Installer.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated. 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

3.03 INSTALLATION

A. 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.

B. Nu-Wool Insulation: Cellulose insulation shall be pneumatically blown dry into attic after mechanical, plumbing, electrical and other utility installations have been completed and in compliance with manufactures instructions.

C. 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 SUMMARY

A. Section Includes:

1. Vapor retarder under concrete floor slab.
2. Concrete curing paper on top of freshly poured concrete floor slab.
3. Floor protection paper used for positive protection of finished floors.

1.02 ACTION SUBMITTALS

A. Product Data: 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, Section 01 25 00-Substitution Procedures and Section 01 60 00-Product Requirements.

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

A. 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:

1. Unroll underslab vapor retarder over thoroughly compacted subgrade and turn down at inside perimeter of grade beams.
2. Seal joints watertight, with a pressure sensitive tape as recommended by manufacturer, allowing a minimum overlap of 6 inches.
3. Apply tape evenly over seams and rub out wrinkles formed during application.
4. Seal pipes and conduits passing through the membrane with Moistop boot and tape.
5. 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.
6. Comply with manufacturer’s recommendations and installation procedures as outlined in ASTM E-1643.

B. Curing Paper:

1. Unroll concrete curing paper over the entire surface once the concrete has set sufficiently hard to permit application without marring the surface.
2. Lap joints 4 inches and seal with pressure sensitive tape.
3. Apply tape evenly over seams and rub out wrinkles formed during application.
4. Ensure that all tears or penetrations are repaired.

C. Floor Protection Paper:

1. Apply floor protection paper immediately after floor covering is installed.
2. Do not remove until final completion and acceptance by the Project Engineer.
3. Lay paper in widest practical width with 6-inch laps to provide complete coverage of flooring.
4. 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

1.01 SUMMARY

A. This Section includes the following:

1. Materials and installation methods for fluid applied (fully adhered), vapor permeable air barrier membrane system located in the non-accessible part of the wall.
2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedded flashings.
2. Division 06 Section "Sheathing" for wall sheathings, wall sheathing joint-and-penetration treatments.
3. Division 07 Section "Self-Adhering Sheet Waterproofing."
4. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.
5. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.02 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.

1.03 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. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50 percent of the difference between the conditioned space and design ambient conditions.

C. The air barrier shall have the following characteristics:

1. It must be continuous, with all joints made airtight.
2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2178.
3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. It shall be durable or maintainable.
5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
   a. Foundation and walls.
   b. Walls and windows or doors.
   c. Different wall systems.
   d. Wall and roof.
   e. Wall and roof over unconditioned space.
   f. Walls, floor and roof across construction, control and expansion joints.
   g. Walls, floors and roof to utility, pipe and duct penetrations.
6. Penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.04 REFERENCES

A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.

B. American Society for Testing and Materials (ASTM):

1. C1193 Guide for Use of Joint Sealants
2. D412 Standard Test Methods for Rubber Properties in Tension
3. D570 Test Method for Water Absorption of Plastics
4. D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
5. D1876 Test Method for Peel Resistance of Adhesives
6. D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting
7. D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
8. D4258 Practice for Surface Cleaning Concrete for Coating
9. D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
10. ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
11. E96 Test Methods for Water Vapor Transmission of Materials
12. E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
13. E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
14. E2178 Standard Test Method for Air Permeance of Building Materials

15. E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
16. NPFA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.05 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to air barrier, including masonry, sealants, windows, 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, installation procedures, sequence of installation, and protection and repairs.

1.06 ACTION 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.

1.07 INFORMATIONAL SUBMITTALS

A. 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.

B. Qualification Data: For Applicator.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

D. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.11.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: Air barrier systems shall be manufactured by a firm with a minimum of 10 years experience in the production and sales of waterproofing and air barriers.

B. 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.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

C. Protect fluid-applied membrane components from freezing and extreme heat.

D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.10 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.

1.11 WARRANTY

A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.

1. Failures include, but are not limited to, the following:
   a. Failure to maintain air permeance rating not to exceed 0.02 L/s/sq. m. when tested per ASTM E2178, within specified warranty period.
   b. Failure to maintain a vapor permeance rating greater than 10 perms when tested in accordance with ATM E96, Method B.
2. Warranty Period: Five years from date of Completion.

PART 2 - PRODUCTS

2.01 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, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.02 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: synthetic polymer membrane.

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. Synthetic Polymer Membrane:
      1) Carlisle Coatings & Waterproofing Inc.
      2) Grace Construction Products; Perm-A-Barrier VPL. (Basis-of-Design)
      3) Henry Company.
      4) Tremco Incorporated, an RPM company.
2. Physical and Performance Properties:
   a. Membrane Air Permeance: ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa)
   b. Assembly Air Permeance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.04 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 when tested in accordance with ASTM E2357
   c. Water Vapor Permeance: ASTM E96, Method B: Greater then 10 perms.
   d. Pull Adhesion: ASTM D4541: minimum 20 psi or substrate failure to glass faced wall board, minimum 100 psi to concrete/CMU.
   e. Low temperature flexibility: ASTM D1970: Pass at minus 20 degrees Fahrenheit (at minus 29 degrees Celsius).
   f. Water resistance of in-place membrane: ASTM E331: Pass. No water penetration after 90 minutes @ 299 Pa (6.24 psf) tested over OSB and gypsum sheathing.
   g. Nail sealability: ASTM D1970: Pass UV Exposure Limit: Equal to or greater than 180 calendar days.
   h. Fire Resistance: Evaluated to NFPA 285 as part of various wall assemblies with and without foam plastic insulation.

2.03 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. Liquid Membrane for Details and Terminations: Provide Bituthene Liquid Membrane as manufactured by Grace Construction Products.

C. Wall Primer (for use with Through Wall Flashing and Tapes Applied to Substrate): Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

1. Flash Point: No flash to boiling point.
2. VOC Content: Not to exceed 10 g/l.
3. Application Temperature: 25 degrees F and above.
4. Freezing point (as packaged): 21 degrees F.
5. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products.

D. Flexible Membrane Wall Flashing: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
2. Water Absorption: ASTM D570: max. 0.1 percent by weight.
3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
4. Tear Resistance:
   a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
   b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.
5. Lap Adhesion at minus 4 degrees Celsius (25 degrees Fahrenheit): ASTM D1876: 880 N/m (5.0 lbs./in.) of width.
6. Low Temperature Flexibility ASTM D1970: Unaffected to minus 43 degrees Celsius (minus 45 degrees Fahrenheit)
7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200 percent.
9. Product: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

E. Joint Reinforcing Strip: Air barrier manufacturer's approved tape.

F. Transition Membrane: 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mils) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B; 2.9 ng/m2sPa (0.05 perms) maximum
2. Air Permeance: 75 Pa (0.3 in. water) pressure difference; 0.0006 L/s. sq. m (0.00012 cfm/ sq. ft.) maximum
3. Puncture Resistance: ASTM E154; 178 N (40 lbs.) minimum
4. Lap Adhesion: minus 4 degrees Celsius (25 degrees Fahrenheit): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
5. Low Temperature Flexibility: ASTM D1970; Unaffected to minus 43 degrees Celsius (minus 45 degrees Fahrenheit)
6. Tensile Strength: ASTM D412, Die C Modified; Minimum 2.7 MPa (400 psi)
7. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200 percent
8. Product: Perm-A-Barrier Detail Membrane manufactured by Grace Construction Products.

G. Transition Aluminum Membrane: 0.9 mm (35 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (5 mil) of aluminum film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Absorption: ASTM D570: max. 0.1 percent by weight
2. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
3. Lap Adhesion: Minus 4 degrees Celsius (25 degrees Fahrenheit), ASTM D1876 Modified: 880 N/m (5.0 lbs./in.) of width

4. Low Temperature Flexibility: ASTM D1970 Modified: Unaffected to minus 26 degrees Celsius (minus15 degrees Fahrenheit)
5. Tensile Strength: ASTM D412, Die C Modified; Minimum 4.1 MPa (600 Psi)
6. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200 percent
7. Product: Perm-A-Barrier Aluminum Flashing manufactured by Grace Construction Products.

H. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

I. Liquid Membrane for Details and Terminations and Substrate Patching: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two-part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L maximum VOC content.

J. Joint Sealant for Details, Final Terminations and Sheathing Joint Treatment: Grace S100 Sealant manufactured by Grace Construction Products: a one-part, neutral curing, ultra low modulus material designed for use with fluid-applied membranes, self-adhered membrane and tapes. 98 g/L maximum VOC content.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Refer to manufacturer’s literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier system.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 - 75mm (2-3 in.) wide, manufacturer's recommended self-adhesive tape. Gaps greater than 6mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied air barrier system. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

C. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

D. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application

E. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

F. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane 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. Plywood Sheathing: Fill joints greater than 1/4 inch 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 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane 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 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-milwet film thickness, 45-mil dry film thickness.

D. Do not cover air barrier until it has been inspected by Project Engineer/ MDOT Architect.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 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.

B. Apply primer to substrates to receive transition tapes at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Reprime areas exposed for more than 24 hours.

C. Connect and seal exterior wall air barrier membrane continuously to exterior glazing and window systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

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, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Repair punctures, voids, and deficient lapped seams in strips and transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches beyond repaired areas in strip direction.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspection: Air barrier materials and installation are subject to inspection for compliance with requirements.

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 E1186.

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 180 days.

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 46 46 FIBER-CEMENT SIDING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes fiber-cement siding and trim.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For fiber-cement siding and trim including related accessories.

1.03 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Research/evaluation reports.

D. Sample warranty.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.05 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 25 years (minimum) from Date of Completion.

PART 2 - PRODUCTS

2.01 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84. Equal to HardiePlank® Lap Siding.

1. Allura™ by Plycem, Houston, TX, Tel. (844) 425-5872
2. James Hardie Building Products, Mission Viejo, CA, Tel. (800) 274-3464
3. MaxiTile, Inc, Carson, CA, Tel. (800) 338-8453.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 5/16 inch.

D. Horizontal Pattern: Boards 6-1/4 inches wide in plain style.

1. Texture: Smooth.
2. Length: 12 feet.

E. Finish: Factory finish with ColorPlus® Technology in standard color as selected by MDOT Architect. Refer to Section 09 05 15 Color Design for color(s) selected.

2.03 ACCESSORIES

F. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

G. Flashing: Provide flashing complying with Section 07 62 00 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

H. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
2. For fastening fiber cement, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Install fasteners no more than 24 inches on center.

B. Install joint sealants as specified in Section 07 92 00 "Joint Sealants" and to produce a weathertight installation.

3.02 ADJUSTING AND CLEANING

C. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

D. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 07 61 00 SHEET METAL ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes factory formed, prefinished standing seam metal roof panels with concealed fasteners and related accessories, valleys, hips, ridges, eaves, corners, rakes, miscellaneous flashing, gutters, downspouts, underlayment and attaching devices as shown and / or required for a complete weathertight metal roofing system.

B. Related Sections: Section 09 05 15 – Color Design.

1.02 REFERENCES

A. ASTM A-525 General Requirements for Steel Sheet, Zinc-Coated (Galvanized).

B. ASTM A-653 Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process, Structural Physical Quality.

C. ASTM E-1646: Static Water Infiltration.

D. ASTM E-1680: Static Air Infiltration.

E. Spec Data Sheet - Galvalume Sheet Metal by Bethlehem Corp.

F. SMACNA - Architectural Sheet Metal Manual.

G. UL 90 Rating (minimum): Wind Uplift Approval Conforming to Underwriters Lab. (UL) Section 580 Specifications and Complying with 2012 International Building Code requirements and local codes, whichever are more stringent.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data and installation instructions for each type of roofing material and accessory required.

B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

1. Include details of weatherproofing terminations, and penetrations of metal work.
2. Indicate material type, thickness, finish and color.

C. Samples: For each type of metal panel indicated.

1. If not one of those specified, include a two-foot by two-foot representative sample of each type of panel and accessory indicating panels, standing seams, closure, edge trim and flashing complete with factory finish and color.

D. Warranties: Include sample copies of the Paint Finish Guarantee and Weathertightness Warranty prior to fabrication and installation for MDOT Architect's approval. DO NOT start roofing installation without MDOT Architect's approval of Guarantee and Warranty. Refer to Division 00 Sections for State of Mississippi requirements.

1.05 INFORMATIONAL SUBMITTALS

A. Include certification prepared, signed, and sealed by a Professional Engineer registered in the State of Mississippi, verifying that roof system meets or exceeds wind uplift requirements as specified herein.

B. Product test reports. Include results indicating compliance with minimum requirements of the Water Infiltration - ASTM E-1646 performance tests.

C. Include written proof from manufacturer that installer is approved to install their materials.

D. Warranties: Sample of special warranties.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Warranties: Include executed Warranty per Section 01 77 00 – Closeout Procedures for Owner's signature.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer 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.

1. Include 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.

B. Manufacture Qualifications: Company specializing in Architectural Sheet Metal Products with 10 years minimum experience.

1.08 DELIVERY, STORAGE AND HANDLING

A. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.

1. Panels should be stored on edge in a clean, dry place. One end shall be elevated to allow moisture to run off.

2. Panels with strippable film must not be stored in the open exposed to the sun.
3. Stack all materials to prevent damage and to allow for adequate ventilation.

1.09 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from Date of Completion.

B. Special Weathertightness Warranty: The entire installation (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, (No Dollar Limit) nor have exclusions that identify valleys, curbs, and flashings. Provide written warranty, signed by metal roofing manufacturer and his authorized installer, agreeing to replace / repair defective materials and workmanship during the warranty period with NO COST to the Owner.

1. Warranty period begins at the Date of Completion as determined by MDOT.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Petersen Aluminum Corp., 1005 Tonne Road, Elk Grove Village, IL 60007. Tel: (800) 323-1960.

B. Equivalent products by the following manufacturers are acceptable:

1. ACI Building Systems, Inc., Batesville, MS Tel. 662-563-3613.
2. Architectural Metal Systems, Eufaula, AL. Tel. (334) 687-2032
3. Englert, Inc., Perth Amboy, NJ, Tel: (732) 826-8614.
4. Firestone Metal Products/ Una-Clad, Jackson, MS. Tel: (800) 426-7737.
5. MBCI, Hernando, MS, Tel: (800) 206-6224.

C. Alternate manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00- Substitution Procedures and Section 01 60 00-Products Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Solar Reflectance Index: Not less than 29 when calculated according to ASTM E 1980.

C. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for steep-slope roof products.

D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: Complying with 2012 International Building Code requirements and local AHJ, whichever are more stringent.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

E. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

H. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A - 90.
2. Hail Resistance: SH.

I. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material.

2.03 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Sheet Steel shall be PAC-CLAD 24 gage-minimum, G-90 Galvanized ASTM A 653, or (24 gage-minimum, prefinished Galvalume ASTM 792 Grade 50B with an AZ-50 coating).
2. Film: Strippable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film shall be removed before installation.

2.04 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, consisting of slip-resistant, polyethylene-film top surface laminated

to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
   b. CertainTeed; Wintergard HT
   c. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT.
   d. Henry Company; Blueskin PE200 HT.
   e. Imetco; Dry Dek

B. Underlayment must be approved and warranted as part of the complete roofing system.

2.05 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

C. Gutters: Formed from 24 gage nominal-thickness, zinc-coated (galvanized G-90) steel

D. Sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating (Kynar 500 with 70 percent PVDF; finished to match roof fascia and rake trim. Box-shaped profile, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 20’-0” long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
   a. Provide supports spaced at maximum of 3’-0” on center.
2. Strainers: Aluminum wire ball type at outlets.

E. Downspouts: Formed from 24 gage nominal-thickness (smooth, not corrugated), zinc-coated (galvanized G90) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating (Kynar 500 with 70 percent PVDF). Fabricate in full-length long sections (rectangular-shaped), complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.
   a. Straps shall be spaced 5'-0" on center maximum (minimum of 3 required per downspout).
   b. Strap edges shall be rolled or smooth.

F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.06 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

1. Panels fabricated by a portable roll former will require Project Engineer / MDOT Architect's prior approval.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. All flashing, hem exposed edges on underside 1/2 inch.
2. All roof sections requiring flashing less than 25 feet should be continuous lengths.
3. Roof sections requiring closures greater than 25 feet shall be flashed using the fewest pieces possible.

2.07 PREFORMED METAL ROOFING SYSTEM

A. System shall be equal to Petersen Aluminum Corp. SNAP-CLAD panel system and shall include, but is not limited to, the following components:

1. Standing Seam Metal Roof Panels with Striations.
2. Preformed Metal Valley Flashing.
3. Preformed Metal Hip Flashing.
4. Preformed Metal Vented Ridge Cap.
5. Concealed fastening clips and fasteners.
6. Preformed Metal Gutters and Downspouts.
7. Solid and Vented Metal Soffit Panels.
8. Metal Fascia and Cladding.
9. Miscellaneous Metal Trim Necessary for a Complete System Installation.

B. Roof Panels: Equal to SNAP-CLAD roof panels with striations shall have 16 inches on center maximum seam spacing, roll-formed in continuous lengths from eave to ridge, with a minimum standing seam height of 1-3/4 inches.

C. Soffit Vents: Equal to PAC-750 soffit panels (Solid and Fully Vented as shown on Drawings) shall be 12-inches on center “V” grooved panels in .032 inch thick aluminum with Kynar 500 finish. Color shall be as indicated in Section 09 05 15 for color selection. Color design selected from standard colors of Peterson Aluminum. Substituted systems, if submitted, shall match selected color and profile.

2.08 FINISHES

A. Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621 Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.
3. Color: Shall be as indicated in Section 09 05 15 for color selection. Color design selected from standard and premium “Cool Colors” of Petersen Aluminum Corp. Substituted systems, if submitted, shall match selected color.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine wood trusses to ensure proper attachment to framing.

B. Inspect roof structure to verify deck is clean and smooth, free of depressions, waves or projections, properly sloped to valleys or eaves.

C. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

D. Installer shall examine substrate and conditions under which Work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.03 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment (Peel and Stick): Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 4 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Roof Deck: Apply over the entire roof surface.
2. Vent Pipes: Apply a 24 inch minimum square piece of underlayment lapping over roof deck underlayment; seal tightly to pipe.
3. Vertical Walls/Surfaces: Apply underlayment extending 6 inches minimum up the wall and 12 inches minimum on to the roof surface lapping over roof deck underlayment.
4. Metal Drip Edge: Apply metal drip edge flashing over roof deck underlayment; set tight to rake boards; lap joints 2 inches minimum and seal with plastic cement; secure with nails.

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

3.04 METAL PANEL INSTALLATION

A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Watertight Installation:
   a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
   b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
   c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

D. Gutter Supports: Space supports at maximum 36 inches on center, constructed of same material as gutters. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

E. Downspouts Straps: Space straps 60 inches on center maximum (minimum of 3 per downspout), constructed of same material as downspout.

1. Unless indicated otherwise, provide elbows at base of downspouts to direct water away from building.

3.05 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions.

1. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer.
2. Touch-up areas scarred during installation with a touch-up paint approved by panel manufacturer.
3. Only minor scratches and fastener heads shall be touched-up; all other damaged material shall be replaced.

B. Maintain in a clean condition during construction. Remove all scrap and construction debris from the site.

END OF SECTION

SECTION 07 62 00 SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Flashing and sheet metal work as indicated on the Drawings and provisions of this Specification. The types of work include the following:
   a. Metal flashing and counter flashing.

B. Related Sections:

1. Section 04 20 00 – Unit Masonry (For embedded masonry cavity wall flashing.)
2. Section 07 61 00 – Sheet Metal Roofing (Flashing that is part of Roofing System.)
3. Section 09 05 15 – Color Design. (For color selection.)

1.02 PREINSTALLATION MEETINGS

1.03 ACTION SUBMITTALS

A. Product Data: Manufacturer's product data, technical specifications, installation instructions and general recommendations for each specified sheet material and fabricated product for Project Engineer / MDOT Architect's approval.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Distinguish between shop- and field-assembled work.
3. Include identification of finish for each item.
4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, and connections to adjoining work.

C. Samples: Submit 2 samples, eight inch square, of specified sheet materials to be exposed as finished surfaces. Submit 2 twelve inches long, completely finished units of specified factory-fabricated products exposed as finished work. Submit 2 color charts of manufacturer's complete line of standard colors available.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit 2 copies for firms and persons that demonstrate capabilities and experience. Include a list with five (5) completed Project names and addresses, and name and addresses of Architects and Owners.

B. Product certificates.

C. Product test reports.

D. Sample warranty.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.07 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from Date of Completion as determined by MDOT.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 FLASHING AND SHEET METAL MATERIALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Thickness: 24 gage.
2. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by MDOT Architect from manufacturer's full range.
   a. Equal to Petersen Aluminum Corp., Tel. (800) 722-2523.
   b. Use galvanized finish where concealed from view only.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
2. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide and / or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.04 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate [wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws. Substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 - Joint Sealants.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.02 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 04 20 00 - Unit Masonry.

C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.03 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

E. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings, sheet metal work, and accessories during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

F. Flashings and sheet metal with cuts, abrasions, or imperfections will not be acceptable and is to be replaced.

END OF SECTION

SECTION 07 65 26 SELF-ADHERING SHEET FLASHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Self-adhesive flashing used to seal around exterior windows, doors, common through-wall penetrations such as hose bibbs, vents, electrical boxes, exterior lights, and where required to weatherproof the building.
2. Waterproof membrane flashing used to seal around exterior brick ledges, copings at masonry walls, and where required to waterproof the building.

B. Related Sections:

1. Section 07 27 26 – Fluid-Applied Membrane Air Barriers.
2. Section 07 62 00 – Sheet Metal flashing and Trim.

1.02 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, installation instructions and recommendations for product specified.

1.03 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.04 WARRANTY

A. Special Warranty: Provide Manufacturer's standard 10 year material and labor warranty.

1. Warranty period begins at the Date of Completion as determined by MDOT.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Fortifiber Corporation, Fernley, NV. Tel. (800) 773-4777.
2. Grace Construction Products, Cambridge, MA. Tel: (800) 444-6459 (Basis-of-Design).
3. Griffolyn® Division, Reef Industries, Inc., Houston, TX. Tel: (800) 231-6074.

B. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00- Substitution Procedures and Section 01 60 00-Products Requirements.

2.02 SELF-ADHEVISE FLASHING

A. Membrane shall be a self-adhering type equal to Grace Perm-A-Barrier Detail Membrane or Perm-A-Barrier Aluminum Flashing as manufactured by Grace Construction Products.

B. Prefabricated Corners for Windows and Doors: Shall be equal to VYCORner as manufactured by Grace Construction Products.

2.03 WATERPROOF MEMBRANE FLASHING

A. Grace PERM-A-BARRIER Wall Flashing system consists of a membrane component, a surface conditioner and mastic. It is designed to be used with Bituthene Mastic and Perma-A-Barrier Surface conditioner and Bituthene Prime 82 when needed.

1. Wall flashing is a 40 mil self-adhesive, cold applied sheet consisting of 32 mil of rubberized asphalt integrally bonded to an 8 mil, high density, and cross-laminated polyethylene film. The rolls are interwound with a disposable silicone-coated release sheet
2. Bituthene Mastic is rubberized, asphalt base mastic designed to be used at all laps, seams, top edges and cuts in the flashing, and around oil penetrations through the flashing. Bituthene Mastic should not be used in applications where it will be covered by wall flashing.
3. Surface Conditioner is a water based formula designed to prepare substrates for PERM-A-BARRIER Wall Flashing. Surface Conditioner is packaged ready-to-use and imparts an aggressive, high tack finish to the treated substrate. It is recommended when the flashing does not adhere to the substrate.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Visually determine that Project is ready to receive the work of this Section; beginning work indicates acceptance of conditions.

1. Verify items that penetrate surfaces to receive flashing are rigidly installed.
2. Do not apply flashing to damp, frozen, dirty, dusty, or other surfaces unacceptable to manufacturer.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive flashing.

1. Seal cracks and joints with recommended material and sealant. Remove projections.
2. Clean surfaces of foreign matter detrimental to installation of flashing.
3. Apply surface primer and adhesive in locations and at a rate recommended by manufacturer.

B. Whenever wall flashing is to be applied, the surface shall be smooth, clean, dry and free of voids, spalled areas, loose substrate, loose nails, sharp protrusions, or other matter that will hinder the adhesion or uniformity of the wall flashing installation. Clean loose dust or dirt from the surface by wiping with a clean dry cloth or a brush.

C. Manufacturer's Instructions: In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for phases of Work, including preparing substrate, applying materials, and protecting installed flashing.

D. Application to In-Place Construction: Provide accessory materials where necessary to secure sheet flashing assemblies to in-place construction.

3.03 INSTALLATION

A. Self-adhesive Flashing: Grace Perm-A-Barrier Detail Membrane or Perm-A-Barrier Aluminum Flashing, VYCORner and Grace PERM-A-BARRIER Wall flashing shall comply with manufacturers recommended installation instructions.

B. Apply Wall Flashing and accessories only in fair weather when air and surface temperatures are above 25 degrees F.

C. Pre-cut wall flashing to easily handled lengths. Peel release paper from roll to expose rubberized asphalt, then carefully position flashing to substrate. Press firmly into place with a steel hand roller or the back of a utility knife as soon as possible, fully adhering the flashing to the substrate to prevent water from migrating under the wall flashing. Form end dams at horizontal flashing terminations to prevent water entry. Overlap adjacent pieces 2 inches and roll overlap with a steel hand roller.

D. Cutting, Fitting, and Placement: Perform cutting and fitting required to properly install wall flashing adjoining finished surfaces measured from established lines and levels. Securely attach flashing in place with required accessories. Trim bottom edge 1/2 inch back from exposed face of wall and install metal drip with hemmed edge set in sealant.

3.04 CLEANING

A. Inspect membrane and substrate thoroughly and keep clean. Remove dirt, oils, mud, debris, etc. prior to installation.

END OF SECTION

SECTION 07 84 00 FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.
4. Joints in or between fire-resistance-rated constructions.
5. Joints in smoke barriers.

1.02 ACTION SUBMITTALS

A. Product Data: 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.

B. Product Schedule: For each firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular firestopping condition, submit illustration, with modifications marked, approved by firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.03 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

B. Product test reports.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration and fire-resistive joint system firestopping tests are performed by UL, Intertek ETL SEMKO, or FM Global.
   a. Qualified testing agency shall be acceptable to authorities having jurisdiction.

2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems bearing marking of qualified testing and inspection agency.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. 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:

1. Hilti, Inc. Tulsa, OK. Tel. (800) 879-8000.,
2. 3M Fire Protection Products, Saint Paul, MN. Tel. (800) 328-1687.
3. USG Corporation, Chicago, IL. Tel. (880) 874-4968.

2.02 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

2.03 FIRE- RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Ratings determined per ASTM E 1966 or UL 2079:

1. Fire - Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg or ASTM E 2307.

1. Fire - Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

D. Joints in Smoke Barriers: Ratings determined per UL 2079.

1. L- Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.

E. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

2.04 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. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, Joint configurations, substrates, and other conditions affecting performance of the Work.

B. Verify application required and location for each type of firestopping to be used and install firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

D. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, joints and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings, joints and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

E. Install approved metal sleeves with fireproof sealant at all communication and control wiring passing through rated walls throughout the entire project.

F. 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.

3.02 IDENTIFICATION

A. Identify firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.03 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or firestopping is damaged or removed because of testing, repair or replace firestopping to comply with requirements.

C. Proceed with enclosing firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.04 FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ, Category XHBN or Category XHDG

B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."

C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

D. Sealants: Equal to Hilti, Inc. FS-One.

E. Caulking and Putty: Equal to 3M Brand Fire Barrier CP- 25 Caulk and Putty 303.

F. Penetration Sealants: Equal to 3M Fire Barrier Penetration Sealing Systems 7902 and 7904 series as required.

G. Insulation: Equal to United States Gypsum Company “Thermafiber” Safing Insulation, 4 pcf density, unfaced.

H. Intumescent Firestopping: Equal to Hilti, Inc. FS-One, CP 642 and FS 657 Fire Block as required.

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. Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
4. 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).
5. Joints in pavement and walks.
6. 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. Whenever 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 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.05 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.

1.06 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each type of sealant required. Product data shall include chemical characteristics, limitations, and color availability.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.07 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Certificate.

B. Applicator’s experience documentation.

C. Product test reports.

D. Preconstruction field-adhesion test reports.

E. Field-adhesion test reports.

F. Warranties.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

B. Manufacturer’s Certificate: Provide manufacturer’s letter of certification that products meet or exceed specified requirements and are appropriate for uses indicated.

C. Applicator: Company specializing in the work of this Section with minimum 3 years documented satisfactory experience.

D. Preinstallation Conference: Conduct conference at Project site.

1.09 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.

1.10 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from Date of Completion as determined by MDOT.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from Date of Completion as determined by MDOT.

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. BASF Construction Chemicals, LLC, Building Systems. Shakopee, MN. Tel: (800) 243-6739.
2. Dow Corning Corporation, Midland, MI. Tel: (800) 322-8723.
3. GE Silicones, Waterford, NY. Tel: (518) 233-2639.
4. Tremco, Inc., Beachwood, OH. Tel: (800) 562-2728.

C. Alternate manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00- Substitution Procedures and Section 01 60 00-Products Requirements.

2.02 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.03 SILICONE JOINT SEALANTS

A. Silicone Joint Sealant: ASTM C 920.

2.04 URETHANE JOINT SEALANTS

A. Urethane Joint Sealant: ASTM C 920.

2.05 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.06 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

2.07 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.08 JOINT SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.09 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.03 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 5 tests for the first 500 feet of joint length for each kind of sealant and joint substrate.
   b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

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.

3.05 JOINT-SEALANT 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.

E. Type 5: Use for Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces. Pecora AC – 20 FTR.

END OF SECTION

SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes 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. Lead-lined exterior hollow metal door and frame at Nuclear gage Storage Room.
6. Factory prime painting of Work in this Section.

B. Related sections:

1. Section 06 10 00 - Rough Carpentry.
2. Section 08 14 29 - Prefinished Wood Doors.
3. Section 08 71 00 - Door Hardware.
4. Section 08 80 00 - Glazing.
5. Section 09 05 15 - Color Design.
6. Section 09 90 00 - Painting and Coatings.

1.02 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product, including schedule and manufacturer's technical product data / literature.

B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, glazing, anchor types and spacing, reinforcement, and other details.

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, and glazing beads.

D. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.05 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.

1.06 PRODUCT IDENTIFICATION

A. Deliver doors and frames and other work of this section properly tagged and identified.

1.07 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 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. Curries Co., Mason City, IA. Tel. (641) 423-1334.
4. Republic Builders Products, McKenzie, TN. Tel. (901) 352-3383.

C. Substitutions shall fully comply with specified requirements and Section 01 25 00-Substitution Procedures and Section 01 60 00-Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings[indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.03 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.

2.04 FRAMES

A. Frames Types:

1. Exterior Openings: Frames 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.
2. Interior Openings: Frames 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 inch 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.

2.05 HOLLOW METAL DOORS

A. General: 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.

B. Face Sheets:

1. 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.
2. Interior Doors: Shall be18 gage minimum.

C. 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 1-3/4 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.

D. Face Sheet Stiffeners: Stiffen 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.

E. Welding: 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.

F. Top and Bottom Edges: 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.

G. Edge Profile: 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.

H. 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. Reinforcement for all other surface mounted hardware - 16 gage.

I. 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.

J. 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.

K. Flatness: Doors shall maintain a flatness tolerance of 1/16 inch maximum in any direction, including a diagonal direction.

2.06 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.

2.07 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.

2.08 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.

5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
   b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on center and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
   c. Compression Type: Not less than two anchors in each frame.
   d. Post installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches on center.
6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.09 HARDWARE LOCATIONS

A. Hinges:

1. Top: 9-3/4 inches from head of frame to centerline of top hinge.
2. Bottom: 10-3/8 inches from bottom of frame to centerline of bottom hinge.
3. Intermediate centered between top and bottom hinges on Dutch Doors:
   a. 9-3/4 inches from head of frame to centerline of hinge.
   b. 10-3/8 inches from bottom of frame to centerline of bottom hinge.
   c. 5 inches from split line to top and bottom respectively of lower and upper intermediate hinges.
4. All lead-lined doors or doors over 7’-0” tall shall receive two pair of hinges per leaf or continuous hinges.

B. Locks and Latches:

1. Unit and integral type locks and latches – 3’- 2” to centerline of knob.
2. Deadlocks - 5’- 0” to centerline of cross bar.
3. Roller latches - 3’-9” to centerline.

C. Panic hardware – 3’-1” to centerline of cross bar.

D. Pulls and Push Plates:

1. Door pulls – 3’-6” to center of grip.
2. Push-pull bars – 3’-1” to centerline of bar.
3. Arm pulls – 3’-11” to centerline.
4. Push plates – 4’- 0” to centerline of plate.

E. All of the above dimensions from paragraph 2.09(B) through 2.09(D) are from finished floor and shall comply with ADA and AHJ requirements.

2.10 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: SDI A250.10.

2.11 CLEARANCES

A. Edge Clearances:

1. Between doors and frame, at head and jambs - 1/8 inch.
2. 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.

2.12 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.

2.13 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 INSTALLATION

A. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   b. Install frames with removable stops located on secure side of opening.
   c. Install door silencers in frames before grouting.
   d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on shop drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.

8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:
   a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
   c. At Bottom of Door:
      1) 1/4 inch, where no threshold or carpet.
      2) 1/8 inch, where with threshold or carpet.
   d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

C. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches on center and not more than 2 inches on center from each corner.

3.02 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 08 14 29 PREFINISHED WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: 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.

B. Related Requirements:

1. Section 08 71 00 “Door Hardware” for installation.
2. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.
3. Section 09 05 15 "Color Design" for colors.

1.02 ACTION SUBMITTALS

A. Product Data: Indicate door core material and construction; veneer species, type and characteristics. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.
8. Indicate by transmittal form that copy of each instruction has been transmitted to the installer.

C. Samples: For factory-finished doors.

1.03 INFORMATIONAL SUBMITTALS

A. Manufacturer’s sample warranty.

1.04 QUALITY ASSURANCE

A. Comply with the requirements of the following standards unless otherwise indicated:

1. Non-Fire Rated Wood Doors: WDMA I.S.1-A, "Architectural Wood Flush Doors."

1.05 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. Jeld-Wen Windows and Doors, Klamath Falls, OR. Tel. (541) 885-7412.
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 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 DOOR CONSTRUCTION, GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Regional Materials: Wood doors shall be manufactured within 500 miles of Project site.

C. Particleboard-Core Doors:

1. Provide 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.

D. Structural- Composite-Lumber-Core Doors:

1. Structural- Composite-Lumber: WDMA I.S.10.
   a. Screw Withdrawal, Face: 700 lbf.
   b. Screw Withdrawal, Edge: 400 lbf.

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.

F. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

2.03 VENEER-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.
   a. Provide door faces of compatible color and grain within each separate room or area of building.
9. Transom Match: Continuous match.
10. Exposed Vertical Edges: Same species as faces or a compatible species.
11. Core Non-rated: Particleboard.
12. Core Fire-rated: Mineral.
13. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is 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.

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.

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: Factory cut and trim openings through doors.

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 Section 08 80 00 "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. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-4 conversion varnish or WDMA TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Gloss, unless indicated otherwise.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer: 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.

3.02 PREPARATION

A. Condition doors to average prevailing humidity in installation area prior to hanging.

3.03 INSTALLATION

A. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

B. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
   a. Comply with NFPA 80 for fire-rated doors.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

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 31 13 ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 04 Section "Unit Masonry" for anchoring and grouting access door frames set in masonry construction.
2. Division 08 Section "Door Hardware" for mortise or rim cylinder locks and master keying.
3. Division 09 Section “Gypsum Board” for gypsum board ceilings.
4. Division 09 Section "Acoustical Ceilings" for suspended acoustical tile ceilings.
5. Division 23 Section "Duct Accessories" for heating and air-conditioning duct access doors.

C. References:

1. ITS (DIR) – Directory of Listed Products, Intertek Testing Services NA, Inc. current edition.
2. UL (FRD) – Fire Resistance Directory; Underwriters Laboratories Inc; current edition.
3. Warnock Hersey – Certification Listing.

1.02 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work. .

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.02 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Steel Sheet: Electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
   a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

E. Plaster Beads: Casing bead formed from 0.0299-inch zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

2.03 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. 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:

1. Babcock-Davis; A Cierra Products Co., Minneapolis, MN. Tel. (888) 412-3726.
2. J. L. Industries, Inc., Bloomington, MN. Tel. (800) 554-6077.
3. Larsen's Manufacturing Company, Minneapolis, MN. Tel. (800) 527-7367.
4. Milcor Inc., Lima, OH. Tel. (800) 528-1411.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.

1. Locations: Wall surfaces.
2. Door: Minimum 0.060-inch thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 0.060-inch thick sheet metal with 1-inch wide, surface-mounted trim.
4. Hinges: Continuous piano.
5. Latch: Self-latching bolt operated by screwdriver with interior release.
6. Lock: Mortise cylinder.
   a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)."

D. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch- thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead flange.
4. Hinges: Continuous piano.
5. Latch: Self-latching bolt operated by screwdriver with interior release.
6. Lock: Mortise cylinder.

   a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)."

E. Exterior Flush Access Doors and Frames with Exposed Trim: Weatherproof with extruded door gasket.

1. Locations: Wall surfaces.
2. Door: Minimum 0.040-inch- thick, metallic-coated steel sheet; flush panel construction with manufacturer's standard 2-inch- thick fiberglass insulation.
3. Frame: Minimum 0.060-inch- thick extruded aluminum.
4. Hinges: Continuous piano, zinc plated.
5. Lock: Dual-action handles with key lock.

F. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Latch: Self-latching device operated by flush key with interior release.
9. Lock: Self-latching device with mortise cylinder lock.
   a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)."

2.04 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces 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.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed. For cylinder lock, furnish two keys per lock and key all locks alike.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.02 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 41 13 ALUMINUM-FRAMED ENTRANCE AND STOREFRONT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: 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.

B. Related Sections:

1. Section 07 92 00 – Joint Sealants.
2. Section 08 71 00 – Door Hardware.
3. Section 08 80 00 – Glazing.
4. Section 09 05 15 - Color Design.
5. Section 12 21 31 - Horizontal Louver Blinds: Attachments to framing member.
6. Division 26 & 28 Sections for Electrical & Security Systems.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications for materials and fabrication of aluminum-framed entrance and storefront, and instructions and recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where a test method is indicated. Submit product data for door hardware and accessories.

B. Shop Drawings: Submit drawings showing adaptation of manufacturer's standard system to project; include typical unit elevations at 1/2 inch scale and details at 3 inch scale, to show dimensioning, member profiles, anchorage system, interface with building construction, and glazing. Show section moduli of wind-load-bearing members, and calculations of stresses and deflections for performance under design loading. Show clearly on shop drawings where and how manufacturer's system deviates from Contract Drawings and these Specifications.

C. Samples: Submit samples of each type and color of aluminum finish, on l2 inch long sections of extrusions of formed shapes and on 6 inch squares of sheet/plate. Include 2 or more samples in each set, showing near-limits of variations (if any) in color and texture of finish.

D. Delegated-Design Submittal: For glazed aluminum-framed entrance and storefront walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.

C. Field quality-control reports.

D. Sample warranties.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced to perform work of this section who has at least five years experience in the installation of work similar to that required for this project and who is acceptable to product manufacturer.

B. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.07 DELIVERY, STORAGE AND HANDLING

A. Ordering Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.

B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect material against damage from elements, construction activities, and other hazards before, during and after installation.

1.08 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Final Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 20 years from date of Final Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazed aluminum curtain walls.

B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum-framed entrance and storefront walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum-framed entrance and storefront walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Uniform Loads:

1. A static air design load of 40 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2 percent of their clear spans shall occur.

D. Air Infiltration:

1. The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft^2 at a static air pressure differential of 6.24 pounds per square foot.

E. Water Resistance, (Static):

1. The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 12 pounds per square foot as defined in AAMA 501.

F. Water Resistance, (Dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 pounds per square foot as defined in AAMA 501.

G. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 73 for frame.

H. Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement of 1.5 x the design displacement.

I. Sound Transmission Loss: When tested to ASTM E90, the Sound Transmission Class (STC) shall not be less than 34 based upon one inch insulating glass (1/4 inch glass, 1/2 inch air space, 1/4 inch glass).

2.02 MANUFACTURERS

A. Drawings and Specifications are based on products as manufactured by Kawneer Company, Inc., 555 Guthridge Court, Norcross, GA 30092. Tel. (770) 449-5555.

B. Equivalent products by the following manufacturers are acceptable:

1. EFCO Corporation, Monett, MO. Tel. (800) 221-4169.
2. Oldcastle Building Envelope, Terrell, TX. Tel. (866) 653-2278.
3. Traco, Cranberry Township, PA. Tel. (724) 776-7000.

C. Substitutions shall fully comply with specified requirements and Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Aluminum-framed 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.

1. Material Standard: Extruded Aluminum, ASTM B 221, 6063-T5 or 6063-T6 alloy and temper.
2. Member Wall Thickness: Each framing member shall have a wall thickness sufficient to meet the specified structural requirements
3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront wall members are nominal and in compliance with AA Aluminum Standards and Data.

2.04 ACCESSORIES

A. Fasteners: Where exposed, shall be Stainless Steel.

B. Gaskets: Glazing gaskets shall comply with ASTM C 864 and be extruded of a silicone compatible EPDM rubber that provides for silicone adhesion.

C. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

D. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides for silicone adhesion.

2.05 ENTRANCES

A. Aluminum entrance doors shall be equal to 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.

2.06 HARDWARE

A. Refer to Section 08 71 00 – Door Hardware for requirements for hardware items other than those indicated herein to be provided by manufacturer of aluminum entrances.

B. Provide door manufacturer's standard heavy-duty hardware units as shown, schedule, or required for operation of each door, including the following items of size, number, and type recommended by manufacturer for service required, finish to match door, unless otherwise indicated:

1. Top, Bottom, and Intermediate Pivots: Cast aluminum ally with steel pins and oilite bearings (ball-bearing bottom pivots).
2. Overhead Closers: Equal to LCN 4040 Parallel Arm with Cush-N-Stop and custom powder coat metal cover.
3. Deadlocks: Mortised maximum security type, with 1 inch minimum length pivoted bolt, stainless steel strike box.
4. Keyed Cylinders: 5-pin tumbler, with cast aluminum face.
5. Magnetic Locks: Refer to Division 28 Sections for Security Systems.
6. Pull Handles: Equal to Kawneer style CO-12 stainless steel US 32D.
7. Panic Device: Equal to Dor-O-Matic RXEL 1690 NL, EPT-10 electric power transfer, PS 873-2B power supply.
8. Thresholds: Extruded aluminum in clear anodized finish, complete with anchors and clips, coordinate with pivots. Size and shape of thresholds as indicated on the Drawings.

2.07 FABRICATION

A. General:

1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
2. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
3. Prepare components to receive anchor devices. Fabricate anchors.
4. Arrange fasteners and attachments to conceal from view.

2.08 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Color and Gloss: As selected by Architect from manufacturer's full range. Refer to Section 09 05 15 - Color Design for color selection.

2.09 SOURCE QUALITY CONTROL

A. Source Quality: Provide aluminum-framed entrance and storefront specified herein from a single source.

1. Building Enclosure System: When aluminum-framed entrance and storefront are part of a building enclosure system, including entrances, entrance hardware, windows, storefront framing and related products, provide building enclosure system products from a single source manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer’s acceptable tolerances.

1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.02 INSTALLATION

A. General: Install aluminum-framed entrance and storefront systems plumb, level, and true to line, without warp or rack of frames with manufacturer’s prescribed tolerances and installation instructions. Provide support and anchor in place.

1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9” on center.
3. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

3.03 PROTECTION AND CLEANING

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum-framed entrance and storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions. Clean units and glazing again no more than one week prior to Substantial Completion. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 08 51 11 ALUMINUM WINDOW-SLIDING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of aluminum windows is shown on Drawings and in Schedules. Types of aluminum windows required include horizontal sliding window.

B. Related Sections:

1. Section 08 80 00 – Glazing for glazing requirements of aluminum windows, including windows specified herein shall be factory pre-glazed.
2. Section 07 92 00 – Joint Sealants.
3. Section 09 05 15 – Color Design for selected colors.

1.02 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's sample warranty, specifications, standard details, and installation recommendations for components of aluminum window units required for project, including independent laboratory certified test reports that products tested comply with performances requirements.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, clearances, and details of installation, including anchor, and sealant installation.

C. Samples: Two samples for each exposed product and for each color specified, 2 by 4 inches in size.

D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.03 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.04 QUALITY ASSURANCE

A. Manufacturer: Provide aluminum window units and framing system produced by a single firm with minimum of 5 years successful experience in fabricating types required for this Project.

1.05 DEVIVERY, STORAGE, AND HANDLING

A. Store and handle windows in strict compliance with the manufacturer’s instructions.

B. Protect windows and all accessory materials adequately against damage from the elements, construction activities and other hazards before, during and after installation.

1.06 SPECIAL PROJECT WARRANTY

A. Provide written warranty signed by Manufacturer, Installer, and Contractor, agreeing to replace aluminum windows which fail in materials or workmanship within 2 years of Date of Completion.

1. Failure of materials or workmanship includes, excessive deflections, faulty operation of sashes, deterioration of finish or construction in excess of normal weathering, and defects in hardware, weather-stripping, and other components of the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Drawings and Specifications are based on Series 700 Horizontal Slider aluminum windows as manufactured by Boyd Aluminum Manufacturing Company., Springfield, MO, Tel. (800) 737-2800.

B. Equivalent products by the following manufacturers are acceptable:

1. All Seasons Windows & Door Mfg., Longview, TX. Tel. (800) 752-7274.
2. AJ Manufacturing, Inc., Bloomer, WI. Tel. (800).328-9448.

C. Substitutions shall fully comply with specified requirements and Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 ALUMINUM WINDOW MATERIALS

A. Aluminum Members: Extrusions shall comply with ASTM B 221 and tolerances shall be in accordance with the Aluminum Association's "Drafting Standards for Aluminum Extruded and Tubular Products".

1. Extrusions. shall not be less than a nominal .062 inch thick at any location for main frame and sash members with an exception of main frame sill which shall be no less than a nominal .078 inch.
2. Sheet shall comply with ASTM B 209, alloy and temper recommended by manufacturer appropriate for specified finish.

B. Fasteners: Provide stainless steel fasteners, corrosion resistant and compatible with aluminum.

1. Reinforcement: When fasteners screw into aluminum less than a nominal .062 inch thick, utilize nuts or washers of design having means to reinforce interior aluminum surfaces and prevent disengagement.
2. Exposed Fasteners: Provide concealed fasteners wherever possible.

C. Weatherstripping: Material shall be compatible with aluminum, resistant to weather and ultraviolet degradation, and be replaceable.

1. Provide woven pile weatherstripping with wool, a center semi-rigid strip of polypropylene, and a resin impregnated backing strip complying with AAMA 701.2.

D. Trim: Provide extruded aluminum trim of the type and configuration required by the architect with a minimum nominal wall thickness of .050 inches.

1. Provide extruded aluminum trim clips, with a minimum nominal wall thickness of .050 inch, to allow attachment of the trim to the window units and/or openings.
2. Finish trim to match window units.

2.03 HORIZONTAL-SLIDING WINDOWS

A. Window Criteria:

1. Sash: Provide window units with operable and fixed sash that can be removed from inside for cleaning without deglazing.
2. Main Frame Depth: 2-3/4" minimum depth.
3. Provide operating sash with a continuous integral draw pull at the meeting rail.
4. Overall Glazing Thickness: 5/8 inch maximum.

B. Hardware:

1. Sash Rollers: Operating sash panels to have (2) adjustable steel wheel, ball bearing roller hardware.
2. Lock: Locking hardware shall be located at the operating sash meeting rail.
   a. Locking hardware to have a keeper attached to the fixed sash meeting rail and a sweep lock attached to the operating sash meeting rail.

C. Weatherstripping: Provide sliding-type weatherstripping.

1. Place weatherstripping into extruded grooves.
   a. Provide two rows of weatherstripping at fixed sash meeting rail.
   b. Provide three rows of weatherstripping at main frame head and jambs

D. Glazing: Fixed and operable sash shall be channel glazed with continuous perimeter vinyl marine glazing gasket. Glazing to the main frame is not acceptable.

2.04 FABRICATION

A. Fabricate components in accordance with manufacturer's tested assemblies. Remove burrs and ease edges.

1. Shop fabricate to greatest extent practicable to minimize field assembly.
2. Disassemble only to the extent necessary for shipping and handling limitations.

2.05 ALUMINUM FINISHES

A. High-Performance Organic Finish (Two-Coat Fluoropolymer): Thermocured system consisting of inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight complying with AAMA 2605-98.

1. Color and Gloss: Finish to be selected by Project Engineer / MDOT Architect from manufacturer's full range of standard colors available.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that the opening into which the windows will be installed is the correct size to permit installation of the new windows according to the manufacturer's installation instructions.

B. Do not install windows until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions and approved shop drawings for installing windows, hardware, accessories, and other components. .

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

D. After installation, windows and glazing shall be inspected and adjusted to provide smooth operation and a weathertight window system.

E. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

SECTION 08 52 17 ALUMINUM-CLAD WOOD DOUBLE HUNG WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Aluminum-clad wood double hung windows.

B. Related Sections:

1. Section 07 27 26 - Fluid-Applied Membrane Air Barriers.
2. Section 07 92 00 - Joint Sealants.
3. Section 12 21 14 - Horizontal Louver Blinds-Metal.

1.02 REFERENCES

A. American Architectural Manufacturer Association (AAMA)

1. ANSI/AAMA/NWWDA 101/I.S.2 /NAFS; Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
2. AAMA 2605; Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings an Aluminum Extrusions and Panels.

B. National Fenestration Rating Council (NFRC)

1. NFRC 100; Procedure for Determining Fenestration Thermal Properties.
2. NFRC 200; Solar Heat Gain Coefficient and Visible Transmittance.

C. Window and Door Manufacturers Association (WDMA): WDMA I.S.4; Water Repellent Preservative Non-Pressure Treatment for Millwork.

1.03 ACTION SUBMITTALS

A. Product Data: Submit window manufacturer's current product literature, including installation instruction.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, 3 copies, 2 by 4 inches in size.

D. Product Schedule: For aluminum-clad wood double hung windows. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Quality Assurance Submittals:

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer's Instructions: Provide manufacturer's written installation instructions.

B. Sample warranties.

C. Closeout Submittals: Refer to Section 01 77 00 Closeout Procedures.

1.05 QUALITY ASSURANCE

A. Certifications: WDMA Hallmark certification label indicating windows meet the design requirements.

B. Pre- installation Meeting: Refer to Section 01 31 19 Project Meetings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver windows materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store windows as recommended by manufacturer.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard warranty indicating that the window unit will be free from material and workmanship defects from the Date of Completion for the warranty time periods indicated below:

1. Window: 5 years.
2. Glazing Units, Insulated Glass: 10 years against seal breakage.
3. Aluminum-Cladding Finish: 10 years against peeling, cracking caulk or color change.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Andersen Corporation; 100 Fourth Avenue North; Bayport, MN 55003, USA; Phone (888) 888-7020.

B. Basis-of-Design Product: Window units are based on the Andersen E-Series Aluminum-Clad Wood Double Hung Windows.

C. Other Acceptable manufacturer's include:

1. Eagle Window and Door, Inc., Dubuque, IA. Tel. (800) 324-5354.
2. Marvin Windows and Doors, Warroad, MN. Tel. (800) 346-3363.
3. Pella Corporation, Pella, Iowa. Tel. (641) 621-1000.

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 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 WINDOW PERFORMANCE REQUIREMENTS

A. Provide windows capable of complying with requirements indicated, based on testing manufacturer's window that are representative of those specified and that are of test size required by ANSI/AAMA/NWWDA 101 I.S.2/NAFS.

B. Structural Requirements – Provide windows capable of complying with DP-50 design pressure requirements.

C. NFRC Requirements – Provide windows capable of complying with the following total window ratings:

1. U-factor: Center of Glass U-Factor (Btu/hr/ft²/°F) Argon: 0.24 in accordance with NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): 0.26 in accordance with NFRC 200.
3. Visible Transmittance (VT): 38 percent in accordance with NFRC 200.

2.03 MATERIALS

A. Exterior Wood: Pine treated wood.

B. Interior Wood: Mixed Grain Douglas Fir.

2.04 MANUFACTURED UNITS

A. Frame:

1. Select kiln-dried pine treated wood.
2. Cladding: 0.050 inch extruded aluminum.
3. Jamb Width: As indicated on Drawings.

B. Sash:

1. Select kiln-dried pine treated wood.
2. Cladding: 0.050 inch extruded aluminum.
3. Sash Thickness: 1-7/16 inch.

C. Exterior Trim:

1. Factory Applied Casing Option: Extruded Aluminum Brickmold.

D. Factory Applied Extension Jambs: Provide at all four sides of frame interior.

1. Double Hung: As indicated on Drawings.

E. Weatherstripping:

1. Double Hung: Dual bulb at head and sill, thermoplastic rubber bulb at check rail, rigid vinyl water stops at sill.
2. Jamb Liner Color: White or tan as selected by the MDOT Architect.

F. Hardware for Double Hung Windows:

1. Balance: Dual block and tackle.
2. Lock: Recessed cam action.
3. Finish: Oil-rubbed bronze, unless indicated otherwise.

2.05 INSULATING GLASS

A. Material: 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 with Argon
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 "Bronze" by Cardinal Glass Industries.
8. Interior Pane: Clear with MSVD (Sputter) LoĒ³-366 on 3rd (air space) surface.
9. Unit Performance Requirements for "Bronze" with LoĒ³-366.
   a. Light Transmission (visible): 38 percent.
   b. Center of Glass U-Factor (Btu/hr/ft²/°F) Argon: 0.24
   c. SHGC: 0.26.
   d. Shading Coefficient: 0.30.
10. Warranty: Manufacturer's standard as listed above in Article1.07.

2.06 WINDOW ACCESSORIES

A. Exterior Insect Screen: Material Charcoal fiberglass screen cloth (18 by 16 mesh) set in roll formed aluminum frame.

2.07 FABRICATION

A. Fabrication; General: Aluminum cladding corners are cope jointed.

B. Double Hung Windows:

1. Frame: Head corner joints mechanically fastened over silicone injected nylon corner key. Sill corner joints sealed with foam gasket and screw boss construction.
2. Sash: Corner joints slot-and-tenoned, and mechanically fastened.
3. Glass: Mounted using silicone glazing compound and secured with interior applied profiled wood stops.

2.08 FINISH

A. Interior: Standard unfinished, unless indicated otherwise.

B. Exterior: 0.050 thick extruded aluminum cladding with fluoropolymer (70 percent Kynar 500), 3-coat finish in accordance with AAMA No.2605.

1. Standard Color: As selected by Project Engineer / MDOT Architect. (Refer to Section 09 05 15-Color Design).

PART 3 - EXECUTION

3.01 GENERAL

A. Install windows in accordance with manufacturer's installation guidelines and recommendations.

3.02 EXAMINATION

A. Inspect window prior to installation.

B. Inspect rough opening for compliance with window manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.03 PREPARATION

A. Form sheet metal sill pan in accordance with manufacturer's recommendations.

B. Prepare windows for installation in accordance with manufacturer's recommendations.

3.04 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

3.05 CLEANING AND PROTECTION

A. Clean exposed surfaces immediately after installing windows.

1. Remove excess sealants, glazing materials, dirt, Preserve® film and other substances.
2. Clean the exterior surface and glass with mild soap and water.

B. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Protect installed windows from damage.

3.06 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Field inspections.

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.

B. 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. Closers
7. Stripping and seals
8. Thresholds

C. 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.

1. Labeled doors shall be fitted with labeled hardware.

D. Modifications of hardware required by reason of construction characteristics shall provide the proper operation or functional features.

1. 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.
2. Hardware for application to metal shall be made to standard templates.
3. Furnish template information 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.

E. Hardware shall be free from defects affecting appearance and serviceability.

1. Working parts shall be well fitted and smooth working without unnecessary play.
2. 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 REFERENCES

A. Coordinate with the following Sections for the installation of finish hardware:

1. Section 08 11 13 - Hollow Metal Doors and Frames.
2. Section 08 14 29 - Pre-finished Wood Doors.
3. Section 08 41 13 - Aluminum Framed Entrances and Storefronts.
4. Divisions 26 and 27 Sections for electronic door hardware.

1.03 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data, roughing-in diagrams, and Installation instructions for each type of hardware.

1. Include operating instructions, maintenance information and spare part sources.

B. Shop Drawings: Details of electrified door hardware.

C. Samples: Submit samples for color of finishes (Black WILL NOT Be Acceptable In Lieu Of Antique Bronze Oiled Finish) and such samples as required by the Project Engineer / MDOT Architect for approval. Do not deliver hardware until approval is obtained.

D. Templates: Provide templates and / or physical hardware to trades as required and in sufficient time to prevent delay in the execution of the Work.

E. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
   b. Content: Include the following information:
      1) Identification number, location, hand, fire rating, size, and material of each door and frame.
      2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
      3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
      4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.
3. Approval of schedule will not relieve Contractor of responsibility for furnishing all necessary hardware.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, MDOT Architect and Project Engineer (Owner’s Representative) about door hardware and keying.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:

1. For door hardware, an Architectural Hardware Consultant (AHC).

C. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

G. Keying Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

B. Packing and Marking: 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.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Completion, unless otherwise indicated.
   a. Electromagnetic Locks: Five years from date of Completion.
   b. Exit Devices: Two years from date of Completion.
   c. Manual Closers: 10 years from date of Completion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Hinges – Hager, Ives, McKinney.
2. Continuous Hinges – Hager, Ives, Markar.
3. Cylinders – Best, Corbin/Russwin, Sargent, Schlage.
4. Flushbolts and Accessories – Hager, Ives, Rockwood.
5. Locksets – Baldwin, Corbin/Russwin, Sargent, Schlage.
6. Deadbolts – Baldwin, Corbin/Russwin, Sargent, Schlage.
7. Exit Devices – Precision, Sargent, Von Duprin.
8. Door Closers – Corbin/Russwin (DC3000), LCN (1460), Sargent (1430).
9. Protective Plates – Hager, Ives, Rockwood.
10. Door Stops – Hager, Ives, Rockwood.
11. Overhead Stops / Holders – Glynn Johnson, Rixson, Sargent.
12. Magnetic Hold Opens – LCN, Rixson, Sargent.
13. Gasketing and Thresholds – National Guard Products, Pemko, Reese.
14. Silencers – Hager, Ives, Rockwood.
15. Power Supplies – Schlage Electronics, Securitron, Von Duprin.

B. Substitutions: Comply with specified requirements and Section 01 25 00 – Substitution Procedures and Section 01 60 00 – Product Requirements.

2.02 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled **on** Drawings to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.03 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.

1. Master Key System: Change keys and a master key operate cylinders.
2. Keyed Alike: Key all cylinders to same change key.

B. Removable Cores: 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.

C. Keys: Brass.

1. Quantity: In addition to one extra key blank for each lock, provide the following:
   a. Cylinder Change Keys: Three.
   b. Master Keys: Six.

2.04 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.

B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.

C. Astragals: BHMA A156.22.

2.05 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:
   a. Wood or Machine Screws: For the following:
      1) Hinges mortised to doors or frames.
      2) Strike plates to frames.
      3) Closers to doors and frames.
   b. Steel Through Bolts: For the following unless door blocking is provided:
      1) Surface hinges to doors.
      2) Closers to doors and frames.
      3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.06 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

C. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

G. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying schedule.
2. Furnish permanent cores to Owner for installation.

H. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

I. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Project Engineer / MDOT Architect.

1. Configuration: Provide [one power supply for each door opening] [least number of power supplies required to adequately serve doors] with electrified door hardware.

J. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."

1. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hairline joints.
2. 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.
3. Do not plug drainage holes or block weeps.
4. Remove excess sealant.

K. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

L. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

M. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

N. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

O. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Lubricate moving parts with type lubrication recommended by manufacturer (graphite-type if no other recommended).

3.02 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

3.03 DOOR HARDWARE SCHEDULE

HW1 (For Aluminum Storefront Door)
Each Opening Shall Have:

2 – Each Cylinders Best 1E72/1E74 (as required) 613
(Balance of Hardware by Door Manufacturer)

HW2 (For Exterior Hollow Metal Door)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X NRP X 641
1 – Lockset	Schlage	ND50RD Rhodes X 613
1 – Closer	LCN	P1460/1460 AL X TBGN X 695
1 – Kickplate	Rockwood	8 X 2 LDW 0.050 X 613 (Mounted push side)
1 – Threshold	Pemko	2005DV
1 – W/Strip	Pemko	303DV
1 – Door Bottom	Pemko	2211DV (for Hollow Metal Doors)
1 – Stop		(As Required)
3 – Silencers		

HW3 (For Interior Wood Door @ Reception to Corridor)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X 641
1 – Exit Device	Von Duprin	98NL - 996 - NL R/V - 06 X 613
1 – Electric Strike	Hes	9600 12/24 VDC X 613
1 – Cylinder	Best	E72 X 613
1 – Closer	LCN	1460 AL X TBGN X 695 @ Rated Walls & as indicated
1 – Kickplate	Rockwood	8 X 2 LDW 0.050 X 613 (Mounted push side)
1 – MOP plate	Rockwood	6 X 1 LDW 0.050 X 613 (Mounted pull side)
1 – Stop	Rockwood	440 X 613
3 – Silencers		

HW4 (For Interior Wd Door @ Public Toilet, Break & Crew Rooms)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X 641
1 – Passage	Schlage	ND10S Rhodes X 613
1 – Closer	LCN	1460 AL X TBGN X 695
1 – Kickplate	Rockwood	8 X 2 LDW 0.050 X 613 (Mounted push side)
1 – Mop Plate	Rockwood	6 X 1 LDW 0.050 X 613 (Mounted pull side)
1 – Stop	Rockwood	440 X 613
3 – Silencers		

HW5 (For Interior Wood Door @ Offices, & Conference Room)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X 641
1 – Lockset	Schlage	ND50RD Rhodes X 613
1 – Cylinder	Best	As Required
1 – Stop	Rockwood	440 X 613
3 – Silencers		

HW6 (for Exterior Dbl Hollow Metal Doors @ Equip. & Mech. Rooms)
Each Opening Shall Have:

6 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X NRP X 641
1 – Lockset	Schlage	D80RD Rhodes X 613
1 – Cylinder	Best	As Required
2 – Flushbolts	Rockwood	555-12” X 613
1 – Threshold	Pemko	2005DV X Required Length
1 – W/Strip	Pemko	303DV
2 – Door Bottom	Pemko	2211DV (for Hollow Metal Doors)
2 – Stops	Rockwood	473 X 613
2 – Silencers		

HW7 (For Interior Wood Dbl. Doors @ Supply Closet)
Each Opening Shall Have:

6 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X 641
1 – Lockset	Schlage	ND50RD Rhodes X 613
1 – Cylinder	Best	As Required
2 – Flushbolts	Rockwood	555-12” X 613
1 – Stop	Rockwood	440 X 613 (Overhead Stop as Required)
2 – Silencers		

HW8 (For Interior Wood Door @ Janitor’s Closet & Survey Storage)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X 641
1 – Lockset	Schlage	ND50RD Rhodes X 613
1 – Cylinder	Best	As Required
1 – Kickplate	Rockwood	8 X 2 LDW 0.050 X 613 (Mounted push side)
1 – Mop Plate	Rockwood	6 X 1 LDW 0.050 X 613 (Mounted pull side)
1 – Stop	Rockwood	440 X 613
3 – Silencers		

HW9 (For interior Wood Dbl. Doors @ Electric & Telephone Rooms)
Each Opening Shall Have:

6 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X 641
1 – Lockset	Schlage	ND50RD Rhodes X 613
1 – Cylinder	Best	As Required
2 – Flushbolts	Rockwood	555-12” X 613
1 – Stop	Rockwood	440 X 613 (Overhead Stop as Required)
2 – Silencers		

HW10 (for Interior Wood Door @ Mech. Room)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X 641
1 – Lockset	Schlage	ND50RD Rhodes X 613
1 – Cylinder	Best	As Required
1 – Closer	LCN	1460 AL X TBGN X 695
1 – Stop	Rockwood	440 X 613
3 – Silencers		

HW11 (for Exterior Dbl Hollow Metal Doors @ Storage Building)
Each Opening Shall Have:

6 – Each Hinges	Hager	BB1279 4 1/2 X 4 1/2 X NRP X 641
1 – Lockset	Schlage	D80RD Rhodes X 613
1 – Cylinder	Best	As Required
2 – Flushbolts	Rockwood	555-12” X 613
1 – Closer	LCN	P1460 AL X TBGN (Mounted Active Leaf)
2 – Kickplates	Rockwood	8 X 2 LDW 0.050 X 613 (Mounted push side)
1 – Threshold	Pemko	2005DV X Required Length
1 – W/Strip	Pemko	303DV
2 – Door Bottoms	Pemko	2211DV (for Hollow Metal Doors)
2 – Stops	Rockwood	473 X 613
2 – Silencers		

END OF SECTION

SECTION 08 80 00 GLAZING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Glass and glazing for Aluminum-Clad Wood Framed Entrances and Storefronts, doors, windows and other glazed openings, interior and exterior locations.

B. Related Sections:

1. Section 08 11 13 - Hollow Metal Doors and Frames.
2. Section 08 14 29 - Prefinished Wood Doors.
3. Section 08 41 13 – Aluminum-Framed .Entrance and Storefront.
4. Section 08 52 17 - Aluminum-Clad Wood Double Hung Windows.

1.02 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.03 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.05 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. Prime Glass Standard: FS DD-G-45l.
2. Heat-Treated Glass Standard: FS DD-G-l403.
3. Safety Glass Standard: CPSC l6 CFR l20l.

4. GANA Publications: GANA's "Glazing Manual."
5. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect glass during transit, storage and handling to prevent scratching or breakage of glass. Replace broken glass.

1.07 PROJECT CONDITIONS

A. Schedule meeting with Glazier and other trades affected by glass installation, prior to beginning of installation.

1. Do not perform work under adverse weather or job conditions.
2. Install liquid sealant when temperatures are within lower or middle third of temperature range recommended by manufacturer.

1.08 WARRANTY

A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Completion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following prime glass manufacturers are acceptable:

1. Arch Aluminum & Glass Co., Inc., Columbus, OH. Tel No. (800) 870-2519.
2. Cardinal Glass Industries, Eden Prairie, MN. Tel. (952) 229-2600.
3. PPG Industries, Inc., Pittsburgh, PA. Tel. (800) 377-5267.
4. Safti First, San Francisco, CA. Tel. (888) 653-3333.
5. Viracon, Inc., Owatonna, MN. Tel. (800) 533-2080.
6. Zeledyne Tulsa, OK. Tel. (800) 331-2607.

B. Substitutions shall fully comply with specified requirements and Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.03 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

2.04 INSULATING GLASS

A. Material: 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 with Argon.
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 “Bronze” by Cardinal Glass Industries.
8. Interior Pane: Clear with MSVD (Sputter) LoĒ³-366 on 3rd (air space) surface. .
9. Unit Performance Requirements for “Bronze” with LoĒ³-366.
    a. Light Transmission (visible): 38 percent.
    b. Center of Glass U-Factor (Btu/hr/ft²/°F) Argon: 0.24.
    c. Solar Heat Gain Coefficient (SHGC): 0.26
    d. Shading Coefficient: 0.30

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 necessary primers, sealants, channels, setting blocks, etc. with items to be glazed. Conform to requirements set forth in FGJA Glazing Manual.

2.07 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.01 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.

1. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.02 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. 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.

J. 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.

3.03 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.

E. Door Lites: Install glass in frames in sizes as shown on the Drawings. Where fire ratings are indicated for doors, frames shall comply with applicable U.L. fire rating standards.

3.04 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.

3.05 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

1. Cure sealant for high early strength and durability

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

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. Manufacturer'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.

B. If no selection is listed herein for products, the Project Engineer / MDOT Architect shall be contacted for a color selection.

C. 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. Color samples shall be submitted for approval prior to applying or installing finishes or items that are 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. 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 / MATERIALS	MANUFACTURER / NUMBER & COLOR NAME	COLOR DESCRIPTION
• 03 33 00 - Concrete Floor	H&C HC#157 Sandstone	(dark tan)
• 04 20 00 - Brick (Lower)	Cherokee Velour Maroon	(dark red)
• 04 20 00 - Brick (Above windows)	Cherokee Velour Maroon	(dark red)
• 04 20 00 - Brick (Upper)	Cherokee Light Gray	(tan)
• 04 20 00 - Mortar	Gray Mortar	(light gray)
• 04 20 00 - Weep Vents	CavClear Match Mortar Color	(light gray)
• 05 50 00 - Misc. Steel	S/W #7065 Argos	(gray)
• 06 40 00 - Arch. Wdwrk. (Painted)	S/W #6109 Hopsack	(dark tan)
06 40 00 - Plastic Lam Countertop	Formica #7708-58 Flax Gauze-Matte	(multi-tan)
07 46 46 - Fiber-Cement Siding	HardiePlank Countrylane Red	(dark red)
• 07 61 00 - Sheet Metal Roofing	Pac Clad Musket Gray	(dark gray)
• 07 61 00 - Met Trim, Gutters & DS	Pac Clad Musket Gray	(dark gray)
• 07 61 00 - Soffit Panels	Pac Clad Stone White	(off white)
• 07 92 00 - Joint Sealants	Pecora-Match adjacent lighter color	
• 08 11 13 - HM Drs & Frames (Ext)	S/W #7065 Argos	(gray)
• 08 11 13 - HM Frames (Interior)	S/W #6111 Kaffee	(dark brown)
• 08 14 29 - Prefinished Wood Doors	Graham #700 Dark Brown	(brown)
• 08 41 13 - Framed Entr & Storeft	Kawneer Dove Gray	(light gray)
• 08 51 11 - Alum Windows-Sliding	Body Medium Bronze	(dark brown)
• 08 52 17 - Al-Clad Wd DH Windows	Andersen Dove Gray	(light gray)
• 08 71 00 - Door Hardware (Proj Ofc)	Antique Bronze Oiled	(bronze)
• 08 71 00 - Door Hardware (Stor Bldg)	Satin Chrome	(silver)
• 09 29 00 - Gypsum Board(Walls)	S/W #6106-Kilim Beige	(light tan)
• 09 29 00 - Gypsum Board(Ceilings)	S/W #7007 Ceiling Bright White	(white)
• 09 31 13 - Ceramic Tile Floor	Mohawk Trove Canvas Beige 12” x 24”	(tan-brown)
• 09 31 13 - Ceramic Tile Wall (Field)	Mohawk Trove Canvas Beige 12” x 24”	(tan-brown)
• 09 31 13 - Ceramic Tile Wall (Accent)	Bliss Glass & Stone 5/8”x5/8” Cotton Wood	(tan-brown)
• 09 31 13 - Grout (Floors)	Laticrete #56 Desert Khaki	(dark tan)
• 09 31 13 - Grout (Walls)	Laticrete #23 Antique White	(off-white)
• 09 65 00 - Lux Vinyl Flr Plank	Shaw-Uncommon Ground #2710 Heritage	(tan)
• 09 65 00 - Rubber Base	Johnsonite #167 Fudge	(bronze)
• 09 68 00 - Carpeting	Alladin- Point Guard 886 Coffee Bean	(brown variegated)
• 09 72 15 - Vinyl Wall Covering	SW Wall Express #64-1144	(light tan)
• 10 11 00 - Tackboard	Claridge Cork #1110 Fawn	(tan)
• 10 14 00 - Exterior Signs (Wall)	Met Art Dark Gray	(dark gray)
• 10 14 00 - Exterior Signs (Sign)	Met Art Gray	(gray)
• 10 14 00 - Spec Signs (Int-border)	Mohawk 105 Black	(black)
• 10 14 00 - Spec Signs (Int-bckground)	Mohawk 180 Taupe	(med gray / tan)
• 10 14 99 - Spec Signs (Int-copy)	Mohawk-226 Beige	(beige)

• 10 21 15 - Toilet Partition	Scranton Mocha	(dark tan)
• 10 26 13 - Corner Guards	C/S Group #253 Parchment	(light tan)
• 10 51 13 - Metal Lockers	Penco #012 Tawny Tan	(tan)
• 10 73 26 - Walkway Coverings	Mapes #40-7126 Gray	(gray)
• 11 31 15 - Appliances (Range)	GE- Stainless Steel	(silver)
• 11 31 15 - Appliances (Microwave)	GE- Stainless Steel	(silver)
• 11 31 15 - Appliances (Refrigerator)	GE- Stainless Steel	(silver)
• 11 31 15 - Appliances (Exh Hood)	GE- Stainless Steel	(silver)
• 12 21 13 - Horiz Lvr Blinds (Windows)	Hunter Douglas #C270-Linen	(off white)
• 12 48 43 - Floor Mats	C/S Group-Carpet #7304 Sandstone	(tan)
• 12 48 43 - Floor Mats	C/S Group-Rails Bronze Anodized	(brown)
• 23 37 13 - Louvers	C/S Group #563 Seawolf Gray	(gray)

PART 3 - EXECUTION

3.01 INSTALLATION / APPLICATION, GENERAL

A. Refer to execution requirements specified in other Sections of this Specification for the specific products listed. 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

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Gypsum board work with a tape-and-compound joint treatment system known as "drywall finishing" work.

B. The types of Work required include the following:

1. Gypsum board applied to wood framing and furring.
2. Gypsum backing boards for application of other finishes.
3. Drywall finishing (joint tape-and-compound treatment).
4. Lead-Laminated gypsum board applied to wood framing at Nuclear gage Storage Room.

1.02 REFERENCES

A. American Society of Testing and Materials (ASTM) B749 – Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

1.03 ACTION SUBMITTALS

A. Product Data: Manufacturer’s technical product data, installation instructions and recommendations for products specified.

1.04 QUALITY ASSURANCE

A. Fire Resistance: Where work is indicated for fire resistance ratings, including those required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL.

B. Industry Standard: Comply with applicable requirements of GA-216 "Application and Finishing of Gypsum Board" by the Gypsum Association, except where more detailed or more stringent requirements are indicated including the recommendations of the manufacturer.

C. Allowable Tolerances: 1/8 inch offsets between planes of board faces, and 1/4 inch in 8 ft. for plumb, level, warp and bow.

D. Manufacturer: Obtain gypsum boards, framing and fasteners, trim accessories, adhesives and joint treatment products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver gypsum drywall materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type and grade; store in a dry, well ventilated space, protected from the weather, under cover and off the ground.

1.06 PROJECT CONDITIONS

A. Installer must examine the substrates and the spaces to receive gypsum drywall, and the conditions under which gypsum drywall is to be installed; and shall notify the Contractor, in writing, of conditions detrimental to the proper and timely completion of the work.

1. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Maintain ambient temperatures at not less than 55 degrees F., for the period of 24 hours before drywall finishing, during installation and until compounds are dry.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Obtain gypsum board, framing and fasteners, trim accessories, adhesives and joint treatment products from one of the following:

1. CertainTeed Corporation, PA Tel: (800) 233-8990.
2. Georgia-Pacific Corp, Atlanta, GA, Tel. (800) 327-2344.
3. National Gypsum Company, Charlotte, NC, Tel. (800) 343-4893.
4. United States Gypsum Company, Chicago, IL, Tel. (800) 874-4968.

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.03 GYPSUM BOARD PRODUCTS

A. Furnish gypsum board products in maximum lengths available to minimize end-to-end butt joints. To the extent not otherwise indicated, comply with GA-216, as specified and recommended.

B. Exposed gypsum board shall be Type X, fire rated type with tapered long edges and as follows:

1. Edge Profile: Special rounded or beveled edge.
2. Sheet Size: Maximum length available that will minimize end joints.
3. Thickness: 5/8 inch, except where otherwise indicated.
4. Water-resistant Type (WR-1): Provide at exterior walls and at “Wet” areas without ceramic tile; equal to 5/8 inch thick DensArmor Plus Fireguard by G-P Gypsum.
5. Cement Board: Provide water-resistant cement based backer board as a base for all ceramic wall tiles, equal to 5/8 inch thick Durock by USG.

C. Lead-Laminated Gypsum Board: Single unpierced layer of sheet lead laminated to back of gypsum board, ASTM C1396/1396M; gypsum core wall panel with additives to enhance fire resistance of core and surfaced with paper on front, back, and long edges; Type X, UL rated. Install on interior wall surfaces at Survey Storage Closet.

1. Size: 48 inch wide gypsum board sheets by height indicated.
2. Thickness: 5/8 inch.

2.04 LEAD MATERIALS

A. Lead Sheets: 99.9 percent pure unpierced virgin lead, free from dross, oxide inclusions, scale, laminations, blisters, and cracks.

B. Sheet Lead shall meet or exceed the Federal Specification QQL-201 F Grade C and ASTM B749-03 Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products, see NCRP reports #33, #35 and #49.

C. Thickness: As determined by Radiation Protection Survey, or not less than 1/8 inch if not indicated otherwise.

D. Variation in sheet thickness: Not to exceed 3 percent.

2.05 TRIM ACCESSORIES

A. Manufacturer's standard galvanized steel beaded units with flanges for concealment in joint compound including corner beads, edge trim and control joints; except provide semi-finishing type (flange not concealed) where indicated.

B. Where metal moldings are specifically called out on the Drawings, provide the appropriate item from below:

1. Edge Trim: USG No. 200-A.
2. Control Joint: USG No. 093.

2.06 ACCESSORIES FOR LEAD MATERIALS

A. Screw Fasteners: Type S Bugle Head, length as required.

B. Lead Strips: 2 inches wide, unless indicated otherwise, by same thickness as sheet lead laminated on gypsum board.

C. Lead Discs: 3/8 diameter lead discs for use with screw heads.

D. Adhesive: Acceptable to radiation protection product manufacturer and capable of adhering lead sheets where required.

2.07 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper, perforated type.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound: On interior work provide chemical hardening type for bedding and filling, ready-mixed vinyl-type or non-case in-type for topping. On exterior work provide water- resistant type.

2.08 MISCELLANEOUS MATERIALS

A. Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board. Gypsum board fasteners shall comply with GA-216. Provide anti-corrosive type at exterior applications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Install supplementary framing, runners, furring, blocking and bracing at opening and terminations in the Work, and at locations required to support fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported directly on gypsum board alone.

3.02 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

A. Meet at the project site with the installers of related work and review the coordination and sequencing of work to ensure that everything to be concealed by gypsum drywall has been accomplished, and that chases, access panels, openings, supplementary framing and blocking and similar provisions have been completed. In addition to compliance with GA-216 and ASTM C 840, comply with manufacturer's instructions and requirements for fire resistance ratings (if any), whichever is most stringent.

B. Install wall / partition boards vertically to avoid end- butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

C. Install sound attenuation blankets and insulation as indicated, prior to gypsum board unless readily installed after board has been installed.

D. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board with "floating" internal corner construction, unless isolation of the intersecting boards is indicated or unless control or expansion joints are indicated.

E. Space fasteners in gypsum boards in accordance with manufacturer's recommendations.

3.03 SPECIAL GYPSUM BOARD APPLICATIONS

A. Where drywall is base for thin set ceramic tile and similar rigid applied wall finishes, install water-resistant cement based backing board.

B. At toilets, showers, labs, janitor closets, drinking fountains and similar "wet" areas without ceramic tile, install water-resistant gypsum board.

C. Apply with uncut long edge at bottom of work, and space l/4 inch above fixture lips. Seal ends, cut-edges and penetrations of each piece with water-resistant sealant before installation.

3.04 INSTALLATION OF DRYWALL TRIM ACCESSORIES

A. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.

B. Install metal corner beads at external corners of drywall work.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U- type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints.) Install metal control joint (beaded type) where indicated or required for proper installation.

3.05 INSTALLATION OF DRYWALL FINISHING

A. Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare Work for decoration. Pre-fill open joints and rounded or beveled edges, using type of compound specified herein and recommended by manufacturer.

B. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.

C. Apply joint compound in 3 coats (not including pre-fill of openings in base), and sand between last 2 coats and after last coat.

D. Base for Ceramic Tile: Do not install drywall finishing where ceramic tile and similar rigid applied finishes are indicated.

E. Unless otherwise indicated, install drywall finishing at all gypsum board exposed to view and to receive finishes as specified. Where not exposed to view and above ceilings, sanding is not required.

F. Finishing Gypsum Board Assemblies: Level 4 finish, unless otherwise indicated; Level 1 finish for concealed areas, unless a higher level of finish is required for fire-resistance-rated assemblies and Level 2 finish where panels form substrates for tile, Level 5 finish is required in areas with a gloss or epoxy finished coating.

3.06 INSTALLATION OF LEAD-LAMINATED GYPSUM BOARD

A. Comply with manufacturer's recommendations.

B. Adhere lead strips on face of studs at joints in lead-laminated gypsum board, including inside and outside corners. Use 2 inches wide strips by same thickness as sheet lead laminated on gypsum board.

C. Shim studs and other framing members as necessary to provide flat, flush finished surfaces.

D. Install lead-laminated gypsum board on framing with screws spaced not more than 8 inches on center along edges of board and 12 inches on center in field of board.

E. Adhere lead discs to fastener heads. In each case, use method that provides continuous radiation shielding.

3.07 PROTECTION OF WORK

A. Installer shall advise Contractor of required procedures for protection of the gypsum dry-wall Work from damage and deterioration during the remainder of the construction period.

END OF SECTION

SECTION 09 31 13 THIN-SET CERAMIC TILING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Thin-set ceramic mosaic floor tile, glazed cove base, wall tile and accessories.

B. Related Sections:

1. Section 07 26 00 - Vapor Retarders (for floor protection paper).
2. Section 09 29 00 - Gypsum Board (for cement based backer board).
3. Section 09 05 15 - Color Design (for color selections).

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturer’s product data and written instructions for recommended installation and maintenance practices for each type of product indicated.

B. Samples:

1. Two samples of each type and composition of tile and for each color and finish required.
2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
   a. Mount on 24 Inches square plywood or hardboard backing.
3. Stone thresholds in 6-inch lengths.

C. Contract Closeout: Provide Maintenance Data and Manufacturer's recommendations on cleaning.

1.03 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.04 QUALITY ASSURANCE

A. Furnish tile conforming to the Standard Grade Requirements of ANSI A137.1.

1. Coefficient of Friction: Slip resistant in accordance with the Ceramic Tile Institute, i.e. a static coefficient of friction of not less than 0.60 when tested in accordance with ASTM C 1028-89 as modified by the Ceramic Tile Institute

B. Provide materials obtained from only one source for each type of tile, grout and color to minimize variations in appearance and quality.

1.05 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.

1. Maintain 50 degrees F. temperature continuously during and after installation as recommended by tile manufacturer but not less than 7 days.

B. Maintain a minimum lighting level of 50 fc during installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Basis of design is around products manufactured by Mohawk, Calhoun, Georgia.

B. Equivalent tile products by the following manufacturers are acceptable:

1. American Olean Tile Company, Lansdale, Pennsylvania.
2. Dal-Tile Corporation, Dallas, Texas.
3. Florida Tile Industries, Lakeland, Florida.

C. Alternate manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. General: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

B. Ceramic Floor Tile: 12 inches by 24 inches by 3/8 inch, cushioned edge, unglazed, color to be selected from standard colors available.

C. Glass Mosaic Wall Tile: 5/8 inch by 5/8 inch by 8mm.

D. Glazed Wall Tile: Size 12 inches by 24 inches by 3/8 inch, cushioned edge, bright glaze, colors to be selected from standard colors available.

E. 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. External Corners: Bullnose shapes, with a radius of not less than 3/4 inch, unless otherwise shown.
2. Internal Corners: Field-butted square, except use square corner, combination angle and stretcher type cap.

F. 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. White or gray colors will not be acceptable.

G. 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.

H. 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.
2. Color of grout to be selected by the MDOT Architect from manufacturer's full range of standard colors.

I. Accessories: Three way cove-shaped profiles made of recycled rigid PVC for inside wall corners equal to Schluter®-DILEX-EKE.

1. Equivalent products by Blanke Corp are acceptable.
2. Color to be selected by the MDOT Architect from manufacturer's full range of standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.02 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.03 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 America's "Handbook for Ceramic Tile Installation", latest edition.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glass Mosaic Wall Tile: 1/16 inch.
2. Glazed Wall Tile: 3/16 inch.
3. Floor Tile: 3/16 inch.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).

J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

K. Accessories: Comply with manufacturer’s installation instructions.

L. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

M. Color Pattern: 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.

3.04 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.

1. 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.
2. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning.
3. 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.

1. Protect installed tile Work by covering with floor protection paper during the construction period to prevent damage and wear.
2. Prohibit all foot and wheel traffic from using tiled floors for 7 days after installation.
3. 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 SUMMARY

A. Section includes:

1. Lay-in acoustical panels (2 ft. by 2 ft. grids) and exposed suspension systems for ceilings.
2. Suspended metal grid system complete with wall trim.

B. Related Sections:

1. Section 07 21 00 – Thermal Insulation.
2. Section 09 29 00 – Gypsum Board.
3. Division 23 for Mechanical Requirements.
4. Division 26 for Electrical Requirements.

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturer's product specifications, 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.

1. 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.

B. Samples: For each exposed product and for each color and texture specified.

1.03 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Evaluation reports.

C. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.05 QUALITY ASSURANCE

A. Installer: A company with not less than 3 years of documented successful experience in installation of acoustical ceilings similar to requirements for this Project.

1. References required for approval.

1.06 PROJECT CONDITIONS

A. Do not install 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.

1.07 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. Additional components required shall be furnished and installed by this contractor.

1.08 MAINTENANCE STOCK

A. At time of completing installation, deliver stock of maintenance material to Owner.

1. Furnish full size units matching units installed, packaged with protective covering for storage, and identified with appropriate labels.
2. Furnish amount equal to 3 percent of acoustical units and exposed suspension installed.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.02 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

C. Acoustical Panel Standard: Comply with ASTM E 1264.

D. Metal Suspension System Standard: Comply with ASTM C 635.

E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.03 ACOUSTICAL PANELS

A. Manufacturers: 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 ft. by 2 ft. grid-size panels, with white washable finish.

B. Mineral Fiber Acoustical Tile: Provide units that are sag resistant and with 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. 1728 Fine Fissured Square Edge; Armstrong World Industries, Inc.
2. Van-157 Vantage 10 Trim Edge; CertainTeed Corp.
3. No. 2210 Radar ClimaPlus Square Edge; U.S. Gypsum Co.

2.04 METAL SUSPENSION SYSTEM

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. Armstrong World Industries, Inc.
   b. CertainTeed Corp.
   c. Chicago Metallic Corp.
   d. USG Interiors, Inc.

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, color white, unless otherwise selected by MDOT Architect.

2.05 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.

1. 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.

1. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling.
2. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.04 INSTALLATION

A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to the Work.
2. Hangers: Support only from building structural members.
   a. 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.
   b. 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.

3. Edge Molding: install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
   a. 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.
4. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members.
   a. Scribe and cut panels to fit accurately at borders and at penetrations.
   b. 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.

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

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.

1. 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 SUMMARY

A. Section Includes: Luxury Vinyl Plank (LVP), rubber base, and accessories.

B. Related Sections:

1. Section 07 26 00 – Vapor Retarders (for floor protection paper).
2. Section 09 05 15 – Color Design (for color selection).

1.02 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data (Not MSDS) and written instructions for recommended installation and maintenance practices for each type of resilient flooring and accessories.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples: Full-size units of each color and pattern of floor tile required.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance data.

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 company 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.

1. Maintain 70 degrees F. temperature continuously during and after installation as recommended by flooring manufacturer but not less than 48 hours.
2. Maintain a minimum lighting level of 50 fc during installation.

1.06 WARRANTY

A. Special Warranty for LVP: Manufacturer agrees to repair or replace components of LVP installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Warranty Period: Limited 10 year commercial wear from date of completion Commercial Warranty and limited 5 year from date of completion under bed warranty (when installed with Shaw 4100 or S150 adhesive).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Shaw Commercial Hard Surface, Dalton, GA 30722, Tel. No. (800) 241-2073.

B. Equivalent products by the following manufacturers are acceptable:

1. Armstrong Commercial Flooring, Lancaster, PA. Tel. No. (800) 292-6308.
2. Johnsonite, Chagrin Falls, OH. Tel. No. (800) 899-8916.
3. Patcraft, Dalton, GA. Tel. No. (800) 241-4014.
4. Mannington Commercial, Calhoun, GA. Tel. No. (800) 241-2262.

C. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 FLOOR PLANK

A. Style / Number: Uncommon Ground 6 inch / 0188V.

B. Construction: High Performance Luxury Vinyl Plank.

C. Class / ASTM F-1700: Class III Printed Film Vinyl Tile.

D. Finish: ExoGuard™ Quartz Enhanced Urethane.

E. Nominal Dimensions: 6 inches wide, by 36 inches long.

F. Pattern: “Row by Row fashion” (Refer to Drawing for directions).

G. Overall Thickness: Nominal 1/8 inch.

H. Wearlayer Thickness: 0.020 inches.

I. Installation Method: Glue down.

J. Adhesive: Shaw 4100 or S150.

K. Color: Color to be selected by Project Engineer / MDOT Architect from manufacturer’s full range of colors. Refer to Section 09 05 15 – Color Design for color selection.

L. Testing:

1.	Slip Resistance (ASTM D-2047):	ADA Compliant.
2.	Heat Stability (ASTM F-1514):	Passes.
3.	Light Resistance (ASTM F-1515):	Passes.
4.	Stain & Chemical Stability (ASTM F-925):	Passes.
5.	Flooring Radiant Panel (ASTM E-648):	≥ 0.45 watts/cm², NFPA Class I.
6.	N.B.S. Smoke Chamber (ASTM E-662):	< 450, Passes.
7.	FloorScore Indoor Air Quality:	SCS Certified.

2.03 ACCESSORIES

A. Rubber Base: Comply 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.

1. 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.

2.04 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by luxury vinyl plank floor and adhesive manufacturer to suit luxury vinyl plank floor, rubber wall base and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:
   a. Vinyl Composition Tile Adhesives: 50 g/L or less.
   b. Rubber Floor Adhesives: 60 g/L or less.

C. 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.

1. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 PREPARATION

A. Prepare substrates according to luxury vinyl plank floor manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by luxury vinyl plank floor manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by luxury vinyl plank floor manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to luxury vinyl plank floor manufacturer's written recommendations, but not less stringent than the following:
   a. Perform anhydrous calcium chloride test according to ASTM F-1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
5. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.03 FLOOR PLANK INSTALLATION

A. Comply with manufacturer's written instructions for installing floor plank.

B. 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.

C. Scribe, cut, and fit floor planks to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend floor planks into toe spaces, door reveals, closets, and similar openings. Extend floor planks to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor planks as marked on substrates. Use chalk or other nonpermanent marking device.

F. Install floor planks on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere floor planks to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.04 ACCESSORIES INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. 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.

C. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surfaces.

D. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at all unprotected edges of flooring, unless otherwise shown.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor plank and wall base.

B. Initial Cleaning: Remove excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer.

C. Maintenance Immediately After Installation:

1. Do not wash or scrub the floor for 5 days after installation to allow the floor planks 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. Sweep or vacuum thoroughly, and remove residual adhesive with a clean white cloth dampened with cleaners as recommended by flooring manufacturer.

D. Protection: Protect installed flooring from damage by covering with floor protection paper. Protect completed Work from traffic and damage until acceptance by the Owner

END OF SECTION

SECTION 09 68 00 CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes broadloom carpet of cut and loop construction, tufted.

B. Related Sections:

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 ACTION SUBMITTALS

A. Product Data: For each type of product including manufacturer's installation instructions.

1.03 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warrant: Sample of special warranty.

C. Installer: Qualifications data.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.05 EXTRA MATERIALS

A. Furnish Owner with overage stock of 5 percent of Carpets.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.08 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

1.09 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
3. Warranty Period: Lifetime.

PART 2 - PRODUCTS

2.01 TUFTED CARPET

A. Products: Subject to compliance with requirements, provide the following:

1. Manufacturer: Aladdin Commercial by Mohawk

Style Name & Color:	Point Guard 886 Coffee Bean
Pile Construction	Tufted
Surface Appearance	Loop Graphic
Gauge	1/10”
Tufted Weight:	22 Ounces
Density	6,712
Dye Method	78% Solution Dyed / 28% Yarn Dyed
Fiber Type	Colorstrand Nylon
Stain Release Technology	Mohawk Protection Plus Stain
Soil Release Technology	Mohawk Protection Plus Soil
Primary Backing	Woven Polyprorylene
Secondary Backing	Woven Synthetic
Indoor Air Quality	Green Label Plus Certified #8216
Width	12’ Width
Pattern Repeat	.4” (W) x .8” (L)
Flammability	ASTM E 648 Class 1 (Glue Down)
Smoke Density	ASTM E 662 Less than 450
Static Propensity	AATCC-134 Under 3.5 KV
Warranties	Lifetime Limited Wear Warranty Lifetime Limited Static Protection 10 Year Limited Stain Resistance (Food & Beverage Only)

B. Source: Mahawk Flooring, Alladin Commercial Carpet, Tel (800)-266-4295.

C. Equivalent products by the following manufacturers are acceptable:

1. Designweave, Santa Fe Springs, CA. Tel. (888) 393-2830.
2. Patcraft Commercial Carpet, A Berkshire Hathaway Co., Tel. (800) 241-4014.

D. Alternate manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

1. Use adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Contact Adhesive: Compatible with carpet material; resealable type.

1. 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 INSTALLATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Preparation: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

E. Installation: Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:

1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."

F. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

G. Do not bridge building expansion joints with carpet.

H. 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.

I. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

J. 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.

K. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

L. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

M. Protect installed carpet to comply with CRI 104, Section 16, "Protecting Indoor Installations."

N. 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 adhesive manufacturers.

END OF SECTION

SECTION 09 72 15 VINYL WALL COVERING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Vinyl coated fabric wallcovering as shown on the Drawings and Schedules. Provide type as selected by the Project Engineer / MDOT Architect. Types to be located as shown on the Drawings or as directed by the Project Engineer.

B. Related Sections:

1. Section 09 29 00 – Gypsum Board.
2. Section 09 05 15 – Color Design (for color selection).

1.02 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of wallcovering and installation materials including adhesives. Transmit additional copy of each instruction to the installer.

B. Samples: Submit samples of each type of wallcovering to illustrate the range of color and pattern variation. Review of samples will be for design, color, texture and pattern only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1.03 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

1. Test data certifying that the products meet the flame spread ratings and smoke development values specified herein in accordance with ASTM E – 84 TUNNEL TEST. (Surface burning characteristics of building materials) CLASS "A" FIRE RATED: Flame Spread 0-25 inclusive; Smoke Developed 0-50 inclusive.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1. Include name of manufacturer, material brand name, color and texture designation, and precautions for the use of cleaning materials and methods that could damage the wallcovering

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer, 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.

B. Interface with Other Sub-Systems: Coordinate all components with adjacent or pertinent components of other systems to assure workable details, connections, clearances and tolerances. Before starting the Work and from time to time as Work progresses, examine shop drawings and installation of others insofar as it applies to work in this section. Notify the Project Engineer/Architect immediately in writing if any conditions exist which will prevent satisfactory results of the installation. Should Work start without such notification, it shall be construed as acceptance by the Contractor of all claims or questions as to the suitability of others to receive the Work.

C. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 50 or less.

1.07 PROJECT CONDITIONS

A. Maintain a constant minimum temperature of 60 degrees F. at areas of installation for a minimum of 72 hours before, and 48 hours after the application of wallcovering.

1.08 DELIVERY, STORAGE AND HANDELING

A. Comply with the manufacturer’s instructions and recommendations and as herein specified.

1. Deliver materials to the project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.
2. Store materials in original undamaged packages or containers.
3. Do not store wallcovering in an upright position.
4. Do not store wallcovering in an upright position.

B. Store in an approved cool, dry location. Maintain temperature above 40 degrees F.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and and specifications are based on products manufactured by Illusion and Excursions, Jackson, MS.

B. Equivalent products by the following manufacturers are acceptable:

1. Eykon Wallcovering Source, Memphis, TN. Tel. (800) 222-7866.
2. Len-Tex Corporation, North Walpole, NH. Tel. (603) 445-2342
3. Versa, Louisville, KY, Tel. (502) 458-1502.

C. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Provide materials bearing the UL label and markings; with Class “A” Fire Rating.

B. Comply with GSA Federal Specifications CCC-W408A&C for the type and class required. Comply with CFFA-W-101A&B Quality Standard for Vinyl Coated Fabric Wallcovering. Comply with the requirements of ASTM D 1308 b for determining stain resistance.

C. Wallcovering color, pattern and texture as selected by the Project Engineer/Architect from Type I, Light Duty or Type II, Medium Duty. Refer to Room Finish Schedule on the Drawing for types required. Three or less patterns shall be selected from the same manufacturer.

D. Provide rolls of each type of wall covering from same print run or dye lot.

2.03 ADHEVISE

A. Provide manufacturer’s recommended strippable type adhesive, primer and sealer, manufactured expressly for use with the selected wallcovering. Materials shall be mildew resistant and nonstaining. Adhesive shall permit removal of wallcovering from gypsum drywall surfaces without damage to paper facing.

2.04 VINYL WALL COVERING – VWC

A. Vinyl Wall-Covering Standards: Provide mildew-resistant products complying with the following:

1. Manufacturer: Excursions Wallcovering
2. Style: 2RO164 Misty Stripe
3. Weight: 20 ounces
4. Width: 54 inches
5. Rating: Class “A”

B. This vinyl wall-covering is for walls in all interior Corridors

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine the areas and conditions under which wallcovering is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work.

1. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
2. Install specified materials only when normal temperature and humidity conditions approximate the interior conditions that will exist when building is occupied.

3.02 PREPARATION

A. Remove wallcovering materials from its packaging and allow to acclimatize to the area of installation 24 hours before application.

1. Remove switch plates, wall plates, and surface mounted fixtures, where wallcovering is to be applied.
2. Prime and seal substrates in accordance with the wallcovering manufacturer's recommendations for the type of substrate material to be covered.

3.03 INSTALLATION

A. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

B. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Painted Surfaces: Treat areas susceptible to pigment bleeding.

C. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

D. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

E. Install strips in same order as cut from roll.

F. Install reversing every other strip.

G. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

H. Match pattern 72 inches above the finish floor.

I. Install seams vertical and plumb at least 6 inches from corners No horizontal seams are permitted.

J. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

K. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

L. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

M. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

3.04 CLEANUP

A. Clean up all adhesive, finger marks, and dirt off exposed surfaces wherever it occurs. Absolutely no loose wallcovering with glue on face will be permitted.

B. Upon completion of work, remove surplus materials, rubbish and debris resulting from wallcovering installation and leave areas of work in a neat, clean condition.

END OF SECTION

SECTION 09 90 00 PAINTS AND COATINGS

PART 1 - GENERAL

1.01 SUMMARY

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.

1. 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.
2. “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.
3. 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.

B. Related Sections: Section 09 05 15 – Color Design.

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 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including basic materials analysis and application instructions for each coating material specified.

B. Samples for Initial Selection: For each type of topcoat product indicated. 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 or provide "Custom" color if not match.

C. Samples for Verification: For each type of paint system and each color and gloss/sheen of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Comply with Articles 3.7 and 3.8 indicating each type of primer, intermediate coat and topcoat required for each substrate by product name and number.
2. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

E. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer / supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product / color / finish was used, product data pages, Material Safety Data sheets (MSDS), care and cleaning instructions, including touch-up procedures.

F. Substitutions for Convenience: Architect will consider formal written requests from Contractor for substitution of products in place of those specified if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect. 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.

1.04 QUALITY ASSURANCE

A. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
   b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on benchmark samples.
   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.05 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 not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.06 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. 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.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gallon of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Company, Montvale, NJ. Tel. (800) 344-0400.
2. Farrell-Calhoun Paint, Memphis, TN. Tel. (901) 526-2211.
3. PPG Paints, Inc., Pittsburgh, PA. Tel (412) 434-3131.
4. Rust-Oleum, Vernon Hills, IL. 60061. Tel. (800) 323-3584.
5. Sherwin-Williams Company, Cleveland, OH 44115. Tel. (800) 321-8194.

B. Substitutions shall fully comply with specified requirements and Section 01 25 00-Substitution Procedures and Section 01 60 00-Product Requirements.

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. Colors 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 acceptable. 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.

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. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. 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.

1. 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.
2. Remove, if necessary, for the complete painting of the items and adjacent surfaces.
3. Following completion of painting of each space or area, re-install the removed items by workmen skilled in the trades involved.
4. Clean surfaces to be painted before applying paint or surface treatments.
5. Remove oil and grease prior to mechanical cleaning.
6. 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 applications 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 Paint: 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 Mechanical, Plumbing 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 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements.
4. Contractor shall remove non-complying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials.
5. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.06 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 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.

3.07 EXTERIOR PAINTING SCHEDULE

A. Provide the following Benjamin Moore paint systems for the various substrates, as indicated:

1. Ferrous and Zinc Coated Metal
   a. Prime Coat: Super Spec HP P04 Acrylic Metal Primer
   b. Intermediate Coat: Super Spec HP P29 D.T.M. Acrylic Semi-gloss
   c. Topcoat: Super Spec HP P29 D.T.M. Acrylic Semi-gloss

B. Provide the following Ferrell-Calhoun paint systems for the various substrates, as indicated:

1. Ferrous and Zinc Coated Metal
   a. Prime Coat: F/C #5-56 Waterborne 100% Acrylic All Purpose Metal Primer (1.8 mils DFT)
   b. Intermediate Coat: F/C Tuff-Boy 8000 Line Waterborne 100% Acrylic DTM (1.7 mils DFT)
   c. Topcoat: F/C Tuff-Boy 8000 Line Waterborne 100% Acrylic DTM (1.7 mils DFT)

C. Provide the following PPG Paints, Inc. paint systems for the various substrates, as indicated:

1. Ferrous and Zinc Coated Metal
   a. Prime Coat: PPG Pitt Tech DTM Acrylic Primer Finish, 90-712 Series (2.0-3.0 mils dry)
   b. Intermediate Coat: PPG Pitt Tech DTM Acrylic Gloss Enamel, 90-374 Series (2.0-3.0 mils dry)
   c. Topcoat: PPG Pitt Tech DTM Acrylic Gloss Enamel, 90-374 Series (2.0-3.0 mils dry)

D. Provide the following Rust-Oleum paint systems for various substrates, as indicated:

1. Ferrous and Zinc Coated Metal
   a. Prime Coat: Rust-Oleum Universal Primer, (1.0-2.0 mils dry)
   b. Intermediate Coat: Rust-Oleum 3700 Series DTM Acrylic, (2.0-3.0 mils dry)
   c. Topcoat: Rust-Oleum 3700 Series DTM Acrylic, (2.0-3.0 mils dry)

E. Provide the following Sherwin-Williams paint systems for the various substrates, as indicated:

1. Ferrous and Zinc Coated Metal
   a. Prime Coat: S-W ProCryl® Universal Primer, B66-310 Series (2.0-4.0 mils dry)
   b. Intermediate Coat: Sher-Cryl™ HPA Acrylic, B66-350 Series (2.5-4.0 mils dry)
   c. Topcoat: Sher-Cryl™ HPA Acrylic, B66-350 Series (2.5-4.0 mils dry)

3.08 INTERIOR PAINTING SCHEDULE

A. Provide the following Benjamin Moore paint systems for the various substrates, as indicated:

1. Gypsum Drywall (Semi-Gloss)
   a. Prime Coat: #N534 Ultra Spec 500 Interior Latex Primer
   b. Intermediate Coat: #N539 Ultra Spec 500 Interior Semi-gloss Enamel
   c. Topcoat: #N539 Ultra Spec 500 Interior Semi-gloss Enamel
2. Gypsum Drywall(Egg Shell)
   a. Prime Coat: #N534 Ultra Spec 500 Interior Latex Primer
   b. Intermediate Coat: #N538 Ultra Spec 500 Interior Eggshell Enamel
   c. Topcoat: #N538 Ultra Spec 500 Interior Eggshell Enamel
3. Gypsum Drywall (Epoxy)
   a. Prime Coat: #253 Super Spec Latex Primer Undercoater
   b. Intermediate Coat: #V341 Waterborne Epoxy
   c. Topcoat: #V341 Waterborne Epoxy
4. Gypsum Drywall (in wet areas)
   a. Prime Coat: #N534 Ultra Spec 500 Interior Latex Primer
   b. Intermediate Coat: #V341 Waterborne Epoxy
   c. Topcoat: #V341 Waterborne Epoxy
5. Gypsum Drywall (Under vinyl wall covering)
   a. Prime Coat: #203 Universal Wall Grip Primer
6. Ferrous and Zinc Coated Metal
   a. Prime Coat: P04 Super Spec HP Acrylic Metal Primer
   b. Intermediate Coat: #N539 Ultra Spec 500 Interior Semi-Gloss Enamel
   c. Topcoat: #N539 Ultra Spec 500 Interior Semi-Gloss Enamel
7. Painted Woodwork
   a. Prime Coat: #N534 Ultra Spec 500 Interior Latex Primer Sealer
   b. Intermediate Coat: #N539 Ultra Spec 500 Interior Semi-Gloss Enamel
   c. Topcoat: #N539 Ultra Spec 500 Interior Semi-Gloss Enamel
8. Stained Woodwork
   a. Prime Coat: Old Masters 240 VOC Stains
   b. Intermediate Coat: #30531 All Pro Waterborne Polyurethane
   c. Topcoat: #30531 All Pro Waterborne Polyurethane
9. Concrete Floor Stain & Sealer (Opaque Color)
   a. Prime Coat:TuffCrete Solvent Acrylic Stain
   b. Topcoat:TuffCrete Solvent Acrylic Stain; Zinsser Skid Tex Anti-Slip Additive. Note-New concrete must be etched prior to application.
10. Concrete Floor Sealer (Clear)
   a. Prime Coat: TuffCrete Solvent Acrylic Stain Clear
   b. Topcoat: TuffCrete Solvent Acrylic Stain Clear.

B. Provide the following Ferrell-Calhoun paint systems for the various substrates, as indicated:

1. Gypsum Drywall (Semi-Gloss)
   a. Prime Coat: F/C #380 Perfik-Seal Interior Latex Primer/Sealer (1.8mils DFT)
   b. Intermediate Coat: F/C #3300 Line Evergreen “Zero Voc” Acrylic Int/Ext Semi-Gloss Enamel (2.0 mils DFT)
   c. Topcoat: F/C #3300 Line Evergreen “Zero Voc” Acrylic Int/Ext
   d. Semi-Gloss Enamel (2.0 mils DFT)
2. Gypsum Drywall(Egg Shell)
   a. Prime Coat: F/C #380 Perfik-Seal Interior Latex Primer/Sealer (1.8mils DFT)
   b. Intermediate Coat: F/C #3900 Line Evergreen “Zero Voc” Acrylic Int/Ext Latex Eggshell Enamel (2.1 mils DFT)
   c. Topcoat: F/C #3900 Line Evergreen “Zero Voc” Acrylic Int/Ext Latex Eggshell Enamel (2.1 mils DFT)
3. Gypsum Drywall (Epoxy)
   a. Prime Coat: F/C #380 Perfik-Seal Interior Latex Primer/Sealer (1.8mils DFT)
   b. Intermediate Coat: F/C #1200WB Tuff-Boy 100% Acrylic Waterborne Epoxy
   c. (2.0 mils DFT)
   d. Topcoat: F/C #1200WB Tuff-Boy 100% Acrylic Waterborne Epoxy
   e. (2.0 mils DFT)
4. Gypsum Drywall (in wet areas)
   a. Prime Coat: F/C#235 Interior/Exterior 100% Acrylic Latex Undercoater (1.7 mils DFT)
   b. Intermediate Coat: F/C #3300 Line 100% Acrylic Interior Semi-Gloss Enamel (1.6 mils DFT)
   c. Topcoat: F/C #3300 Line 100% Acrylic Interior Semi-Gloss Enamel (1.6 mils DFT)
5. Gypsum Drywall (Under vinyl wall covering)
   a. Prime Coat: F/C #699 Waterborne 100% Acrylic Enamel Undercoater (1.6 mils DFT)
6. Ferrous and Zinc Coated Metal
   a. Prime Coat: F/C #5-56 100% Acrylic All Purpose Metal Primer (1.8 mils DFT)
   b. Intermediate Coat: F/C #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel (1.9 mils DFT)
   c. Topcoat: F/C #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel (1.9 mils DFT)
7. Painted Woodwork
   a. Prime Coat: F/C #699 Waterborne 100% Acrylic Enamel Undercoater (1.6 mils DFT)
   b. Intermediate Coat: F/C #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel (1.9 mils DFT)
   c. Topcoat: F/C #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel (1.9 mils DFT)
8. Stained Woodwork
   a. Prime Coat: F/C #1500 Line Wood Kraft Waterborne Penetrating Wiping Stains
   b. Intermediate Coat: FC #1900 Line Wood Kraft Waterborne Acrylic-Polyurethane Varnish (1.2 mils DFT)
   c. Topcoat: FC #1900 Line Wood Kraft Waterborne Acrylic-Polyurethane Varnish (1.2 mils DFT)

9. Concrete Floor Stain & Sealer (Opaque Color)
   a. Prime Coat: Rust-Oleum S6511 System Penetrating Prime & Sealer
   b. Topcoat: Rust-Oleum 8000 System Overcrete S (Anti-Skid Safety Surface when used in conjunction with a broadcasted aggregate)
10. Concrete Floor Sealer (Clear)
   a. Prime Coat: F/C #1106 Tuff-Boy Clear Acrylic Waterproofing Sealer
   b. Topcoat: F/C #1106 Tuff-Boy Clear Acrylic Waterproofing Sealer: Add Skid-Tex Slip Resistant to topcoat.

C. Provide the following PPG Paints, Inc. paint systems for the various substrates, as indicated:

1. Gypsum Drywall (Semi-Gloss)
   a. Prime Coat: PPG Pure Performance Zero VOC Interior Latex Primer, 9-900 (1.4 mils dry)
   b. Intermediate Coat: PPG Pure Performance Zero VOC Interior Latex Semi-Gloss, 9-500 (1.4 mils dry)
   c. Topcoat: PPG Pure Performance Zero VOC Interior Latex Semi-Gloss, 9-500 (1.4 mils dry)
2. Gypsum Drywall(Egg Shell)
   a. Prime Coat: PPG Pure Performance Zero VOC Interior Latex Primer, 9-900 (1.4 mils dry)
   b. Intermediate Coat: PPG Pure Performance Zero VOC Interior Latex Eggshell, 9-300Xl (1.4 mils dry)
   c. Topcoat: PPG Pure Performance Zero VOC Interior Latex Eggshell, 9-300Xl (1.4 mils dry)
3. Gypsum Drywall (Epoxy- in Lab)
   a. Prime Coat: PPG Speedhide Interior Latex Primer, 6-2 Series (1.0 mils dry)
   b. Intermediate Coat: PPG Pitt Glaze Waterborne Acrylic Epoxy, 16-551 Series (2.0-3.0 mils dry)
   c. Topcoat: PPG Pitt Glaze Waterborne Acrylic Epoxy, 16-551 Series (2.0-3.0 mils dry)
4. Gypsum Drywall (in wet areas)
   a. Prime Coat: PPG Pure Performance Zero VOC Interior Latex Primer, 9-900 (1.4 mils dry)
   b. Intermediate Coat: PPG Pitt Glaze Waterborne Acrylic Epoxy, 16-551 Series (2.0-3.0 mils dry)
   c. Topcoat: PPG Pitt Glaze Waterborne Acrylic Epoxy, 16-551 Series (2.0-3.0 mils dry)
5. Gypsum Drywall (Under vinyl wall covering)
   a. Prime Coat: PPG Seal Grip Interior Acrylic Primer Finish, 17-951 (1.2 mils dry)
6. Ferrous and Zinc Coated Metal
   a. Prime Coat: PPG Pitt-Tech DTM Acrylic Primer Finish, 90-712 (2.0 to 3.0 mils dry)
   b. Intermediate Coat: PPG Interior Exterior Semi-Gloss Acrylic Metal Finish, 7-374 (1.5 to 2.0 mils dry)
   c. Topcoat: PPG Interior Exterior Semi-Gloss Acrylic Metal Finish, 7-374 (1.5 to 2.0 mils dry)

7. Painted Woodwork
   a. Prime Coat: PPG Seal Grip Interior Acrylic Primer Finish, 17-951 (1.2 mils dry)
   b. Intermediate Coat: PPG Interior Exterior Semi-Gloss Acrylic Metal Finish, 7-374 (1.5 to 2.0 mils dry)
   c. Topcoat: PPG Interior Exterior Semi-Gloss Acrylic Metal Finish, 7-374 (1.5 to 2.0 mils dry)
8. Stained woodwork
   a. Prime Coat: PPG Olympic Interior Oil Based <250 Wood Stain.
   b. Intermediate Coat: PPG Olympic Interior Water Based Polyurethane Varnish, 42784 (Gloss) 42786 (Satin) (0.8 to 1.1 mils dry)
   c. Topcoat: PPG Olympic Interior Water Based Polyurethane Varnish, 42784 (Gloss) 42786 (Satin) (0.8 to 1.1 mils dry)
9. Concrete Floor Stain & Sealer Waterborne (Opaque Color)
   a. Prime Coat: PPG Perma Crete Color Seal WB Waterborne Acrylic Concrete Stain, 4-4210.
   b. Topcoat: PPG Perma Crete Color Seal WB Waterborne Acrylic Concrete Stain, 4-4210; Anti Slip Additive to the topcoat. Note-New concrete must be etched prior to application.
10. Concrete Floor Sealer (Clear)
   a. Prime Coat: PPG Perma Crete Plex Seal WB Waterborne Clear Acrylic Concrete Sealer, 4-6200.
   b. Topcoat: PPG Perma Crete Plex Seal WB Waterborne Clear Acrylic Concrete Sealer, 4-6200; Anti Slip Additive to the topcoat. Note-New concrete must be etched prior to application.

D. Provide the following Rust-Oleum paint systems for the various substrates, as indicated:

1. Gypsum Drywall (Semi-Gloss)
   a. Prime Coat: Rust-Oleum Zinsser Dry Wall Primer (1.0-1.5 mils dry)
   b. Intermediate Coat: Rust-Oleum Zinsser Perma White Interior Acrylic Semi-Gloss, (1.5-2.0 mils dry)
   c. Topcoat: Rust-Oleum Zinsser Perma White Interior Acrylic Semi-Gloss, (1.5-2.0 mils dry)
2. Gypsum Drywall(Egg Shell)
   a. Prime Coat: Rust-Oleum Zinsser Dry Wall Primer (1.0-1.5 mils dry)
   b. Intermediate Coat: Rust-Oleum Zinsser Perma White Interior Acrylic Satin, (1.5-2.0 mils dry)
   c. Topcoat: Rust-Oleum Zinsser Perma White Interior Acrylic Satin, (1.5-2.0 mils dry
3. Gypsum Drywall (Epoxy- in Lab)
   a. Prime Coat: Rust-Oleum Zinsser Dry Wall Primer (1.0-1.5 mils dry)
   b. Intermediate Coat: Rust-Oleum 5300 Series WB Epoxy (2.5-3.0 mils dry)
   c. Topcoat: Rust-Oleum 5300 Series WB Epoxy (2.5-3.0 mils dry)
4. Gypsum Drywall (in wet areas)
   a. Prime Coat: Rust-Oleum Zinsser Dry Wall Primer (1.0-1.5 mils dry)
   b. Intermediate Coat: Rust-Oleum 5300 Series WB Epoxy (2.5-3.0 mils dry)
   c. Topcoat: Rust-Oleum 5300 Series WB Epoxy (2.5-3.0 mils dry)
5. Gypsum Drywall (Under vinyl wall covering)
   a. Prime Coat: Rust-Oleum Zinsser Shieldz Universal Wallcovering Primer (1.0-1.5 mils dry)

6. Ferrous and Zinc Coated Metal
   a. Prime Coat: Rust-Oleum Universal Primer, (1.0-2.0 mils dry)
   b. Intermediate Coat: Rust-Oleum Zinsser Perma White Interior Semi Gloss Acrylic (1.5-2.0 mils dry)
   c. Topcoat: Rust-Oleum Zinsser Perma White Interior Semi Gloss Acrylic (1.5-2.0 mils dry)
   d. Topcoat: Rust-Oleum 5100 Series Waterborne Acrylic Dry Fall Flat
7. Painted Woodwork
   a. Prime Coat: Rust-Oleum Zinsser Bulls Eye 123 Acrylic Primer (1.0-1.5 mils dry)
   b. Intermediate Coat: Rust-Oleum Zinsser Perma White Interior Acrylic Semi Gloss, (1.5-2.0 mils dry)
   c. Topcoat: Rust-Oleum Zinsser Perma White Interior Acrylic Semi Gloss, (1.5-2.0 mils dry
8. Stained woodwork
   a. Prime Coat: Rust-Oleum Varathane 250 VOC Alkyd Stains
   b. Intermediate Coat: Rust-Oleum Varathane WoodClassics Waterborne Polyurethane Varnish, (1.0 mils dry)
   c. Topcoat: Rust-Oleum Varathane Waterborne Polyurethane Varnish, (1.0 mils dry)
9. Concrete Floor Stain & Sealer (Opaque Color)
   a. Prime Coat: Rust-Oleum Epoxy Shield 1 Part Concrete Paint
   b. Topcoat: Rust-Oleum Epoxy Shield 1 Part Concrete Paint; Slip Resistant Additive to the topcoat. Note-New concrete must be etched prior to application.
10. Concrete Floor Sealer (Clear)
    a. Prime Coat: Rust-Oleum® Natural Look Concrete Sealer – Clear
    b. Topcoat: Rust-Oleum® Natural Look Concrete Sealer – Clear; Slip Resistant Additive to the topcoat.

E. Provide the following Sherwin-Williams paint systems for the various substrates, as indicated:

1. Gypsum Drywall (Semi-Gloss)
   a. Prime Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (1.0 mils dry)
   b. Intermediate Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 (1.6 mils dry)
   c. Topcoat: S-W Harmony Low Odor Interior Latex Semi-Gloss, B10 Series (1.6 mils dry)
2. Gypsum Drywall(Egg Shell)
   a. Prime Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (1.0 mils dry)
   b. Intermediate Coat: S-W ProMar 200 Zero VOC Interior Latex EgShel, B20-2600 (1.6 mils dry)
   c. Topcoat: S-W ProMar 200 Zero VOC Interior Latex EgShel, B20-2600 (1.6 mils dry)
3. Gypsum Drywall (Epoxy- in Lab)
   a. Prime Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (1.0 mils dry)
   b. Intermediate Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (2.5-3.0 mils dry)
   c. Topcoat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (2.5-3.0 mils dry)

4. Gypsum Drywall (in wet areas)
   a. Prime Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (1.0 mils dry)
   b. Intermediate Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (2.5-3.0 mils dry)
   c. Topcoat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (2.5-3.0 mils dry)
5. Gypsum Drywall (Under vinyl wall covering)
   a. Prime Coat: S-W Multi-Purpose Interior / Exterior Primer / Sealer, B51W450 (1.2 mils dry
6. Ferrous and Zinc Coated Metal
   a. Prime Coat: S-W ProCryl® Universal Primer, B66-310 Series (2.0-4.0 mils dry)
   b. Intermediate Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (2.0-3.0 mils dry)
   c. Topcoat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (2.0-3.0 mils dry)
7. Painted Woodwork
   a. Prime Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (1.0 mils dry)
   b. Intermediate Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (2.4-3.0 mils dry)
   c. Topcoat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (2.4-3.0 mils dry)
8. Stained woodwork
   a. Prime Coat: S-W Minwax 250 VOC Stains
   b. Intermediate Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series (1.0 mils dry)
   c. Topcoat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series (1.0 mils dry)
9. Concrete Floor Stain & Sealer (Opaque Color)
   a. Prime Coat: H&C Concrete Stain Solid Color Water Based
   b. Topcoat: H&C Concrete Stain Solid Color Water Based; H&C SharkGrip Slip Resistant Additive to the topcoat. Note-New concrete must be etched prior to application.
10. Concrete Floor Sealer (Clear)
    a. Prime Coat: H&C Concrete Stain Solid Color Water Based - Clear
    b. Topcoat: H&C Concrete Stain Solid Color Water Based - Clear; H&C SharkGrip Slip Resistant Additive to the topcoat. Note-New concrete must be etched prior to application.

END OF SECTION

SECTION 10 11 00 VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes tackboards.

B. Related Sections:

1. Section 09 05 15 – Color Design (for color selections).
2. Division 26 Sections (for visual aid board electrical requirements).

1.02 ACTION SUBMITTALS

A. Product Data: For manufacturer's technical data and installation instructions for each material and component parts, including data substantiating materials comply with requirements.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of panel joints.
2. Include sections of typical trim members.
3. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: 3 copies of full range of color samples for each exposed product and for each color and texture specified.

1. Furnish 12-inch square samples of sheet materials and 12-inch lengths of trim members for color verification after selections have been made.

1.03 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

B. Warranties: Sample of special warranties.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Unless otherwise acceptable to Project Engineer / MDOT Architect, furnish all visual display boards by one manufacturer for entire project.

B. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication where possible, to ensure proper fitting of Work. However, allow for trimming and fitting wherever taking of field measurements before fabrication might delay Work.

C. 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.

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. Best-Rite Manufacturing, Temple, TX, Tel. (800) 749-2258.
2. Marsh Industries, Inc., New Philadelphia, OH, Tel. (800) 426-4244.
3. PolyVision Corporation, Suwanee, GA, Tel. (800) 620-7659.

C. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Tackboard: Equal to Claridge Series # 1 type “CO” factory built tackboard.

1. Tackboard is Claridge 1/4-inch Cork on 1/4 inch Hardboard, color as selected by Project Engineer / MDOT Architect from manufacturer’s standards.
2. Size: 4 feet by 6 feet.
3. 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. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

B. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation. Comply with Manufacturer's written installation instructions.

1. If units are not shown on Drawings, install units in location(s) as directed by Project Engineer.

3.03 ADJUSTING AND CLEANING

A. Verity accessories required for units are properly installed and operating units are adjusted and properly functioning.

B. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room. Cover and protect visual display surfaces.

END OF SECTION

SECTION 10 14 00 SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Signage for room identification system.
2. Informational and directional signage.
3. Free standing Signage.
4. Ground mounted sign.

B. Related Sections: Section 09 05 15 – Color Design (for color selection).

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data and installation instructions for each type of signage required.

B. Shop Drawings: For dimensional letter signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples: Submit 3 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.

1. When requested, furnish full-size samples of specialty sign materials.

D. Sign Schedule: Use same designations (Room numbers) specified or indicated on Drawings or in a sign schedule.

1.03 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.05 QUALITY ASSURANCE

A. Provide each type of sign as a complete unit produced by a single manufacturer including necessary mounting accessories, fittings and fastenings.

1.06 DELIVERY,STORAGE, AND HANDLING

A. Deliver components correctly packed to prevent damage. Store in secure area out of weather. Handle per manufacturer's instructions.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Completion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications for interior and exterior signage 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. Gemini Incorporated, Cannon Falls, MN. Tel. (800) 538-8377.
2. Matthews International Corp., Pittsburgh, PA. Tel. (800) 628-8439.
3. Mohawk Sign Systems, Inc., Schenectady, NY. Tel. (518) 370-3433.
4. Scott Sign Systems, Inc., Sarasota, FL. Tel. (800) 237-9447.

C. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENT SIGN SYSTEM

A. Exterior Signage: Wall mounted LC Series, Helvetica and Helvetica Medium styles, size and location(s) as shown on Drawings. Text shall be center justified unless shown otherwise.

B. Interior Signage: Wall or desktop mounted WS Series with rounded corners. Design so that paper insert can be installed from each end. Comply with 2010 ADA requirements.

C. Truss Emblem Signage (Exterior): Wall mounted, Helvetica Medium styles, size as shown on Drawings.

2.03 COMPONENTS - EXTERIOR SIGNAGE

A. Materials: Cast aluminum, projected mount with sleeve and stud.

B. Finish: Baked enamel in manufacturer's standard color.

2.05 COMPONENTS – INTERIOR SIGNAGE

A. Window Inserts: Laser printed paper insert with MDOT watermark will be furnished by Owner. Text will be left justified unless noted otherwise.

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 No. 1: 10 inches wide by 3 inches high.
2. Type No. 2: 6 inches wide by 9 inches high.
3. Type No. 3: 9 inches wide by 8 inches high.
4. Type No. 4: 10 inches wide by 3 inches high.

2.06 BRAILLE AND TACTILE COPY

A. Comply with requirements of the Americans with Disabilities Act 2010. 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.

2.07 FINISHES – INTERIOR SIGNAGE

A. Color: Selected by Project Engineer / MDOT Architect from manufacturer's standard.

B. Surface Texture: Matte.

2.08 FONT

A. Font Type: Helvetica Medium, unless noted otherwise.

PART 3 - EXECUTION

3.01 EXANIMATION

A. Contractor, with Installer present, shall examine the substrates and conditions under which the specialty signs are to be installed and notify the Project Engineer / MDOT Architect in writing of conditions detrimental to the proper and timely completion of the Work.

1. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 INSTALLATION – GENERAL

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions. Comply with ADA 2010 requirements.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.03 INSTALLATION – INTERIOR SIGNAGE

A. Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. 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.
2. 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 / MDOT Architect.
3. Position sign on wall surface 2 inches from strike side of doorframe. Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest tactile character and 60 inches maximum above the finish floor or ground surface, measured from baseline of the highest tactile character (comply with 2010 ADA requirements).

B. Mounting Method-Double Sided Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear strips of tape symmetrically to face of substrate. Place sign in position, and push to engage adhesive tape strips.

C. Mounting Method-Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.04 INSTALLATION – EXTERIOR SIGNAGE

A. Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Method - Projected Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

1. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.

3.05 INSTALLATION – TRUSS EMBLEM SIGNAGE

A. Install signs using mounting methods indicated and according to manufacturer's written instructions.

B. Permanently affix emblem to the exterior of the building to the left of the main entrance door at a height of 5'-0" above the finish floor or grade.

C. Mounting Method-Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

3.06 SCHEDULES – INTERIOR SIGNAGE

A. Sign Type No. 1: Offices, Single Occupant
Conference / Break Room
Storage Room
Mechanical Room

B. Sign Type No. 2: Toilet Room

C. Sign Type No. 3 Offices, Multiple Occupants

D. Sign Type No. 4: Office (Desktop at Secretary / Receptionists)

3.07 SCHEDULES – EXTERIOR SIGNAGE

A. Building Letters: Flat – Letter style will be determined by Project Engineer / MDOT Architect from all styles available.

1. 10 inches high, 13 Letters: on wall of Project Office (Refer to West Elevation Drawing No. A2.1)

PROJECT
OFFICE

2. Exterior Free Standing Sign: (Centered on sign wall-Refer to Detail 7/S5.1)
MDOT 12 inches high, 4 Letters:
MISSISSIPPI DEPARTMENT, 5 inches high, 20 Letters
OF TRANSPORTATION, 5 inches high, 16 Letters

END OF SECTION

SECTION 10 21 15 SOLID PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Solid-plastic (polymer) toilet compartments, floor-mounted and overhead braced.
2. Solid-Plastic wall-hung urinal screens.

B. Related Sections: Section 09 05 15 – Color Design (for color selected).

1.02 ACTION 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.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

C. 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.

D. 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: Furnish a written warranty covering all plastic components against breakage, warping, corrosion and delamination for a period of 25 years.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Scranton Products Inc., 801 East Corey Street, Scranton, PA 18505. Tel. (800) 445-5148.

B. Equivalent products by the following manufacturers are acceptable:

1. Bradley Corp / Mills Partitions, Menomonee Falls, WI. Tel (414) 354-0100.
2. General Partitions Mfg. Corp., Erie, PA. (814) 833-1154.
3. Knickerbocker Partition Corp, Freeport, NY. Tel. (516) 546-0550.

C. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. Doors, partitions, pilasters and urinal screens shall be fabricated from High Density Polyethylene (HDPE) material manufactured under high pressure forming a single component section which is waterproof, non- absorbent and has a self-lubricating surface that resists marring with pens, pencils or other writing utensils. All to arrive at job site with special protective plastic covering.

C. Characteristics: Dual component compression molded High Density Polyethylene (HDPE) of solid virgin resin materials in colors that extend throughout the surface; doors, partitions and pilaster shall have (HDPE) as the core material).

1. Doors, partitions, pilasters and urinal screens shall be a minimum of 1 inch thick and all edges machined to a radius of 0.250 inch 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 82 inches high 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 Scranton Products. Color of doors and pilasters to be selected by the Project Engineer / MDOT Architect from Manufacturer's Classic and Mosaic color collection with orange peel texture.
6. Aluminum (heat sinc) edging strips to be fastened to the bottom edge of all doors and panels using vandal proof stainless steel fasteners.

2.03 HARDWARE

A. Door Hardware:

1. Hinges: Aluminum continuous for door height.
2. Each door shall be supplied with one coat bumper / hook made of chrome plated zamak. Each handicapped door to include one door pull and one wall stop.
3. Door Strike and Keeper: fabricated from heavy-duty aluminum extrusion (6463-T5 alloy).
   a. Finish: Clear anodized finish.
   b. Length of Strike" 6 inches.
   c. Fasteners: Wrap around flange surface mounted and through bolted to pilaster with one-way sex bolts.
4. Door Latch: Housing: Fabricated from heavy-duty aluminum extrusion (6463-T5 alloy).
   a. Finish: Clear anodized finish.
   b. Fasteners: Surface mounted and through bolted to door with one-way sex bolts.
   c. Slide Bolt and Button: Heavy aluminum with a black anodized finish.

B. Wall Brackets: Full-length continuous aluminum. Brackets shall be used for all panel to pilaster and pilasters to wall connections.

1. Attach brackets to adjacent wall construction with No. 14 by 1-1/2 inch stainless steel Phillips head screws.
2. 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. Headrail: Heavy-duty extruded aluminum (6463-T5 alloy) with anti-grip design.

1. Finish: Clear anodized finish.
2. Fasteners: Fastened to the headrail bracket by a stainless steel, torx head sex bolt, and fastened to the tops of pilasters with stainless steel, tamper resistant torx screws.

D. Handrail Brackets: Headrail brackets shall be 16-gage stainless steel with a satin finish, and secured to the wall with #14 stainless steel screws.

E. Accessories: Furnish units with chromium-plated finish, unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

B. Clearances: Maximum 1/2 inch between pilasters and panels; 1 inch between panels and walls. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 1/4 inch.

3.02 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

3.03 CLEANING

A. 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 26 13 CORNER GUARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Vinyl / Acrylic surfaced mounted Corner Guards.

1.02 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for corner guards.

B. Samples: Submit 3 samples of material finishes, profiles and colors for corner guards.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

PART 2 - PRODUCTS

2.01 CORNER GUARDS

A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90 degree turn to match wall condition. Install full height, unless height indicated otherwise on the Drawings, at all outside corners in corridors and elsewhere as shown on the Drawings.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties, Inc. Model SSM-20 or comparable product by one of the following:
   a. Arden Architectural Specialties, Inc.
   b. IPC Door and Wall Protection Systems; Division of InPro Corporation.
   c. Korogard Wall Protection Systems; a division of RJF International Corporation.
2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; in dimensions and profiles indicated on Drawings.
   a. Color and Texture: As selected by Project Engineer / MDOT Architect from manufacturer's full range. Refer to Section 09 05 15 – Color Design (for color selected).
3. Retainer: Minimum 0.060-inch- thick, one-piece, extruded aluminum.
4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install impact-resistant corner guards level, plumb, and true to line without distortions. Comply with manufacturer's written installation instructions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant corner guards in locations and at mounting heights indicated on Drawings.
2. Provide mounting hardware, anchors, and other accessories required for a complete installation.

B. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

C. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 10 28 13 TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

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 ACTION SUBMITTALS

A. Product Data: 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.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.03 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.05 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.

1.06 DELIVERY, STORAGE AND HANDLING

A. Upon receipt of toilet accessories and other materials, examine the shipment for damage and completeness. Materials shall be stored in a clean, dry place. Stack all materials to prevent damage.

1.07 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Completion.

PART 2 - PRODUCTS

2.01 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings (Bradley Washroom Accessories Division, P.O. Box 309, Menomonee Falls, WI 53051. Tel. (414) 354-0100) or comparable product by one of the following:

1. A & J Washroom Accessories, Inc., 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. Tel. (800) 475-8629.
4. TCI Products. Hillsboro, OR. Tel. (866) 533-4273.
5. Truebro, Inc., Ellington, CT. Tel. (800) 340-5969.

B. 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.

C. 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.

D. Grab Bars: Provide 1-1/2 inch diameter horizontal 2 wall stainless steel grab bars with safety-grip non-slip finish and concealed mounting equal to Bradley model 8122. Locate at toilets where indicated at heights shown. Contractor shall provide at each water closet one 36-inch horizontal grab bar one 42-inch horizontal grab bar and one 18-inch vertical grab bar; installation must meet all ADA requirements.

E. 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.

F. 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.

G. 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.

H. Mop 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.

I. 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.

2.02 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which toilet accessories are to be installed.

1. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Installation General: Comply with all ADA requirements including proper mounting heights.

B. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Use concealed fastenings wherever possible.
2. Provide theft-resistant fasteners for all accessory mountings.
3. Install concealed mounting devices and fasteners fabricated of the same material as the accessories, or of galvanized steel, as recommended by manufacturer.
4. Install exposed mounting devices and fasteners finished to match the accessories.

C. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

END OF SECTION

SECTION 10 44 16 FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Portable multi-purpose, dry-chemical and class K wet chemical fire extinguishers including cabinets, accessories and mounting brackets.

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data and installation instructions for all portable fire extinguishers required.

1.03 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.04 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

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. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

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 Cabinet Mounting: Equal to J.L. Industries Cosmic 10E, UL rated 4A-80BC, 10 lb. nominal capacity.

C. Class K Wet Chemical for Cabinet Mounting: Equal to J.L. Industries Saturn 15, UL rated 2-A: 1-B: C: K, 6 liters nominal capacity. Locate in Kitchen.

2.03 MOUNTING BRACKETS

A. Mounting Brackets: 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 EXTINGUISHER CABINETS

A. Equal to J.L. Industries Cosmopolitan 1032F17 with ADAC option. Provide Fire-FX option where located in a fire rated wall. Cabinet shall accommodate the Cosmic 10E extinguisher. Provide black die-cut letters, vertical.

B. Equal to J.L. Industries Cosmopolitan stainless steel cabinet with return trim, rolled edge recessed model 2032F17 including ADAC option with flush pull handle. Provide Fire-FX option where located in a fire rated wall. Cabinet shall accommodate the Saturn 15 extinguisher. Provide black die-cut letters, vertical.

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 ADA and applicable regulations of governing authorities.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.

D. 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 six units are required unless additional units are indicated otherwise on Drawings. Units shall be required within 20 ft. of all Mechanical Rooms and exits. Type K units shall be required in all Kitchens.

END OF SECTION

SECTION 10 51 13 METAL LOCKERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: 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 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's installation instructions and product data on locker types, sizes and accessories.

B. Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and locker identification system and numbering sequence.

C. Samples: Furnish 3 samples of materials, texture, color and finishes available for Project Engineer / MDOT Architect's selection.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data.

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. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.03 SELECTED UNIT

A. Vanguard Model 6235V Double Tier Locker with standard louvered doors. Size: 72 inches overall height by 12 inches width by 18 inches depth. Provide closed bases and finished end panels. Twelve units are required, unless additional units are indicated otherwise on the Drawings.

2.04 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.

2.05 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), three single-prong wall hooks and one double-prong ceiling hook.

2.06 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 locker bodies and doors in contrasting colors as selected by the Project Engineer / MDOT Architect from manufacturer’s standard range of 17 colors. Refer to Section 09 05 15-Color Design.

2.07 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

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.

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. Comply with manufacturer's written instructions.

END OF SECTION

SECTION 10 56 13 METAL STORAGE SHELVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Metal storage shelving as indicated on the Drawings.

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.

B. Color Charts: For (3 copies) each exposed product.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. 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:

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 that fully meet or exceed the specified requirements may be considered under provisions of Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 STORAGE SHELVING

A. Metal Storage Shelving: Heavy Duty Hi-Performance open type prefinished metal shelving complete with hardware and end kit. Equal to Penco Model No. 1H7026, 36 inches wide, 18 inches deep, and 87 inches high with 6 shelves.

B. Finish: Manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

1. Color will be selected from standard color chart by Project Engineer / MDOT Architect. Refer to Section 09 05 15 – Color Design for color selected.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install units plumb and level, in locations and with mountings as indicated.

B. Securely attach all components together in accordance with manufacturer's installation instructions.

1. Securely fasten units to adjacent units and to wall as required so that units will 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 SUMMARY

A. Section Includes: Wall mounted tubular steel hat and coat racks.

B. Related Sections: Section 06 10 00 – Rough Carpentry (for wall blocking).

1.02 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE 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 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

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 Project Engineer. A minimum of one unit is required, unless additional units are indicated on the Drawings. 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

SECTION 10 73 26 WALKWAY COVERINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extruded aluminum free standing style walkway coverings as shown on the Drawings and specified herein.

B. Related Sections:

1. Section 03 30 00 - Cast-in-Place Concrete.
2. Section 07 92 00 - Joint Sealants.
3. Section 09 05 15 - Color Design.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Showing fabrication and installation of walkway coverings including plans, elevations and details of components and attachments. Indicate materials, profiles of each metalwork member and fitting, joinery, finishes, fasteners, anchorage and accessory items.

C. Samples: Samples for initial selection purposes (3 required) in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors and other finish characteristics available for each item indicated below:

1. Include 6-inch long samples of linear shapes.
2. Include 6-inch square samples of plates.
3. Include full-size samples of castings and forgings.

1.03 DELIVERY, STORAGE AND HANDLING

A. Store materials in clean, dry location, away from polyethylene sheeting in a manner that permits air circulation within covering. Handle metalwork on site to a minimum; exercise care to avoid damaging metal finishes.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Installed products shall comply with the International Building Code, include structural computations, material properties, and other information needed for structural analysis which has been prepared by, or under the supervision of, a qualified professional engineer registered in the State of Mississippi.

2.02 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Mapes Industries, Inc., 2929 Cornhuskers Hwy, Lincoln, NE 68504. Tel. (800) 228-2391.

B. Equivalent products by the following manufacturers are acceptable:

1. Architectural Covers & Enclosures, LLC, Cordova, TN. Tel. (901) 355-2180.
2. Ballew's Aluminum Products, Inc., Greenville, SC. Tel (800) 231-6666.
3. Dittmer Arch. Alum., Winter Springs, FL. Tel (800) 822-1755.
4. Mason - Florida, LLC, Leesburg, FL. Tel. (877) 577-0300.

C. Substitutions shall fully comply with specified requirements and Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Equal to "Super Lumideck" Walkway Cover (free standing style) decking, beams, posts and fascia shall be extruded aluminum, alloy 6063-T6 in profile and thickness shown in current Mapes brochures. Fasteners shall be stainless steel or cadmium plated as provided by the manufacturer.

2.04 MANUFACTURED UNITS

A. Support columns and gutter beams shall be designed such that the columns will be notched to create a "saddle" that will receive and secure the gutter beams.

B. Post and beams shall be mechanically assembled utilizing 3/16 fasteners with a minimum shear stress of 350 lb.

C. Decking shall be designed with interlocking extruded members with mechanical fasteners field applied to provide structural integrity for the complete assembly.

D. Concealed Drainage: Water shall drain from covered surfaces into integral gutter beams and directed to ground level discharge via one or more support posts as designated by the manufacturer on the shop drawings.

2.05 FINISHES

A. Standard powder coated finish. Color to be selected by the Project Engineer / MDOT Architect from manufacturer's complete selection of standard colors. Refer to Section 09 05 15 – Color Design for color selected.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of metalwork. Do not delay job progress; allow for adjustments and fitting where taking of field measurements before fabrication might delay work.

B. Installation:

1. Installation shall comply with manufacturer’s instructions.
2. Installer: Erection shall be performed by the manufacturer or manufacturer’s approved installer.
3. Extreme care shall be taken to prevent damage or scratching. Workmanship must be of the very best with neat miters and fitted joints.

3.02 REPAIR AND PROTECTION

A. Protect exiting materials from damage during the installation process. When installation is complete, repair or replace any items damaged. Replacement items are to match the original.

3.03 CLEAN-UP

A. After work is complete, remove all waste materials and dispose of it off the owner's property.

END OF SECTION

SECTION 10 75 00 FLAGPOLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Aluminum flagpoles, ground mount, halyards and accessories.

B. Related Sections: Section 03 30 00 Cast-in-Place Concrete: Concrete base construction.

1.02 REFERENCES

A. AASHTO M-36 - Corrugated Metal Culvert Pipe.

B. ANSI/ASTM B221 – Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

1.03 SYSTEM DESCRIPTION

A. Type: Ground set fixed type.

B. Pole Design: Cone tapered.

C. Nominal Height: 30 feet measured from ground (Single section pole).

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Pole without flag: Resistant without permanent deformation, 90 miles per hour wind velocity, non-resonant, safety design factor of 2.5.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product indicated (pole, accessories, and configurations).

B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, imposed loads, and manufacturer’s installation instructions.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.07 DELIVERY, STORAGE AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories on site from damage or moisture.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by American Flagpole, P.O. Box 547, Abingdon, VA 24210. Tel. (540) 628-4188.

B. Equivalent products by the following manufacturers are acceptable:

1. Concord Industries, Inc., Addison, TX. Tel. (972) 380-8186.
2. Eder Flag Mfg., Oak Creek, WI. Tel. (414) 764-3522.
3. Morgan-Francis Flagpoles, Arlington, IN. Tel. (800) 814-9568.
4. Pole-Tech, Flagpoles, Arlington, IN. Tel. (800) 633-6733.

C. Substitutions shall fully comply with specified requirements and Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 POLE MATERIALS

A. Aluminum; ANSI / ASTM B221; 6063 alloy, T6 temper.

2.03 COMPONENTS AND ACCESSORIES

A. Finial Ball: Aluminum; 6 inches diameter.

B. Trunk Assembly: Cast aluminum; double revolving; stainless steel ball bearings, non-fouling.

C. Cleats: Two 9-inch size, cast aluminum, each attached with two 5/16-inch stainless steel screws.

D. Halyard: 5/16-inch diameter polypropylene, braided, white.

E. Connecting Sleeves for Multiple Section Pole: Aluminum, 6063alloy, T6 temper, precision fit for field assembly of pole, concealed fasteners.

F. Primer: Zinc chromate type.

2.04 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M-36, corrugated 16-gage steel, galvanized, depth as indicated.

B. Pole Base Attachment: Tube; with base cover.

C. Lightning Ground Rod: 18-inch long rod, 3/4-inch diameter.

D. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.05 POLE FABRICATION

A. Outside Butt Diameter: 6 inches.

B. Outside Tip Diameter: 3-1/2 inches.

C. Nominal Thickness: 0.188 inches.

2.06 FINISHES

A. Metal Surfaces in Contact with Concrete: Asphaltic paint.

B. Concealed Steel Surfaces: Prime paint.

C. Exposed to view Steel Surfaces: Galvanized to 2.0 oz. per sq. ft.

D. Aluminum: Clear anodized.

E. Finial: Gold anodized finish.

PART 3 - EXECUTION

3.01 FLAGPOLE INSTALLATION

A. General: Install flagpoles plumb and level, at location(s) shown on Drawings or if not shown, as directed by the Project Engineer. A minimum of one unit is required, unless additional units are indicated on the Drawings.

1. Installation shall comply with manufacturer's written instructions.
2. Tolerances: Maximum Variation from Plumb; One inch.

B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Install flagpole, plumb, in foundation tube. Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

1. Electrically ground flagpole installation.

3.02 ADJUSTING AND CLEANING

A. Adjust operating devices so that halyard functions smoothly.

B. After installation is complete, clean surfaces.

END OF SECTION

SECTION 11 31 15 RESIDENTIAL APPLIANCES AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Electric Range.
2. Refrigerator.
3. Microwave.
4. Overhear Exhaust Hood
5. Ice Machine.

1.02 ACTION SUBMITTALS

A. Product Data: 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.

1.03 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. 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:

1. General Electric Company (GE), 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 Brands LLC (Kenmore). Hoffman Estates, IL. Tel. (847) 286-2994.
7. Whirlpool Corporation, Benton, MI, Tel. (800) 253-1301.

B. Substitutions shall fully comply with specified requirements and Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 APPLIANCES

A. Electric Range: 30 inch slide-in electric range equal to GE® Model JS630SFSS, stainless steel, Cooktop Burner radiant smoothtop, cooktop surface black ceramic glass, self-clean oven, with Optional Backguard JXS32SS. Approx. Dimensions (HxWxD) 36-1/4 inches by 31-1/4 inches by 28-1/2 inches.

B. Refrigerator: 24.7 cu. ft. capacity Side-By-Side with Dispenser equal to GE® Model GSE25ESHSS with factory-installed icemaker, Stainless steel. Approx. Dimensions (HxWxD) 69-3/4 inches by 35-3/4 inches by 33-5/8 inches.

C. Microwave: 2.2 cu. ft. oven capacity, 1100 watts countertop type, equal to GE® Model PEB7226SFSS, stainless steel, with GE Deluxe built-in trim kit Model JX7230SFSS. Approx. Dimensions (HxWxD) 14 inches by 24-1/8 inches by 19-3/4 inches.

D. Overhead Exhaust Hood: 30” Deluxe Range Hood equal to GE® JV348LSS, stainless steel, complete with 120V, 2.5 amp power/rating, convertible venting type, incandescent cooktop lighting, removable grease filter, single mesh and carbon, JXHC1 Cord Kit, optional power supply connection. Fan and light controls shall be ADA compliant. Approx. Dimensions (HxWxD) 5-1/2 inches by 29-7/8 inches by 17-1/2 inches.

E. 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, GENERAL

A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

D. Utilities: Comply with plumbing and electrical requirements.

3.03 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.

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. Prepare test and inspection reports.

3.05 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 SUMMARY

A. Section Includes: Horizontal louver blinds with aluminum slats at windows.

1.02 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of blind unit required.

1. Include methods of installation for each type of opening and supporting structure.
2. Transmit copy of instructions and recommendations to the installer.

B. Samples: Submit (3 copies) samples of each exposed metal finish, cords, tapes and tassels required. Architect's review of samples will be for design, color, and finish only.

1. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.04 QUALITY ASSURANCE

A. Provide each blind as a complete unit produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.

1. 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 ACCEPTABLE MANUFACTURERS

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. Equivalent products by the following manufacturers are acceptable:

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 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.02 HORIZONTAL LOUVER BLINDS

A. Manufacturer: Hunter Douglas Commercial Lightlines Aluminum Blinds 1" de-Light Model DL88.

1. Color to be selected by the Project Engineer / MDOT Architect from manufacturers' full line of standard colors.
2. Refer to Section 09 05 15 – Color Design for color selected.

2.03 MATERIALS AND COMPONENTS

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Standard head rail, channel-shaped section fabricated from minimum 0.040 inch thick aluminum.

1. Increase metal thickness as recommended by the manufacturer for large blind units. Cross-brace for extra rigidity.
2. 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.

C. Bottom Rail: Standard tubular steel bottom rail designed to withstand twisting or sagging.

1. Contour top surface to match slat curvature, with flat or slightly curved bottom.
2. Close ends with manufacturer's standard metal or plastic end caps of the same color as rail.
3. Finish rails the same color as slats, unless otherwise indicated.

D. Slats: Standard, spring tempered aluminum slats not less than 0.008 inches thick.

1. Provide l inch narrow slats, with other components sized to suit.

E. Braided Ladders: Standard polyester support cords with integrally braided ladder rungs.

1. Provide cord size and rung spacing as required for each type of blind shown.

F. Tilter: Standard enclosed, lubricated, tilting mechanism which will tilt and securely hold the tilting rod, slats and bottom rail at any set angle.

1. Furnish wand (or rod) type tilter consisting of standard tilter mechanism adopted for rotating wand operation.
2. Furnish manufacturer's standard plastic or aluminum rod of proper length to suit blind installation.

G. Cords: 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.

H. Hardware: Furnish standard brackets, supports and internal reinforcement as required to suit blind type and size.

1. Finish exposed hardware and accessories to match rail color.

I. Finish: Prime aluminum slats with chromate conversion coating, followed by manufacturer's standard glass-smooth, baked-on synthetic resin enamel finish.

1. Refer to Section 09 05 15 – Color Design for color selection.

2.04 FABRICATION AND OPERATION

A. Prior to fabrication, verify actual opening dimensions by accurate site measurements.

1. Adjust blind dimensions for proper fit in all openings.
2. 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.

1. Space supporting tapes or cords in accordance with manufacturer's standards, unless otherwise indicated.
2. 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.
   a. 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.
   a. Place pull cords on right-hand side of blind units.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.

1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
2. Install mounting and intermediate brackets to prevent deflection of headrails.
3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.03 ADJUSTING AND CLEANING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

B. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

END OF SECTION

SECTION 12 48 43 FLOOR MATS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Metal-rails, tapered vinyl-frame, surfaced mounted, removable, carpeted floor roll-up mats for Building Entrances.

B. Related Sections: Section 09 05 15 – Color Design (for color selection).

1.02 ACTION SUBMITTALS

A. Product Data: For manufacturers' product and technical data indicating compliance with these specifications and recommended maintenance practices.

B. Shop Drawings: Materials description, component dimensions and details. Show plan view that clearly indicates traffic direction and size of mat.

C. Samples: Submit 3 samples of manufacturer's full range of available colors (minimum 20 for carpet) and finishes for materials exposed to view.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance data.

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 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

2.02 ACCEPTACLE MANUFACTURERS

A. 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:

1. Arden Architectural Specialties, Inc., Saint Paul, MN. Tel. (651) 631-1607.
2. C/S Group, Muncy, PA. Tel. (888) 834-4455.

3. J. L. Industries, Inc. Bloomington, MN. Tel. (612) 835-6850.,
4. Musson Rubber Company, Akron, OH. Tel. (330) 773-7651.

B. Substitutions shall fully comply with specified requirements and Section 01 25 00 - Substitution Procedures and Section 01 60 00 - Product Requirements.

2.03 ROLL-UP RAIL MATS

A. Roll-up, Aluminum-Rail Hinged Mats: Equal to C/S Group “Pedimat” Surface-Mounted Floor Mat, Model M1-D-HD-SM.

1. Carpet Tread Inserts: 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.
2. Carpet Colors: As selected by Project Engineer / MDOT Architect from full range of manufacturer’s 25 standard colors.
3. Rails: Extruded aluminum 6063-T52 as selected by Project Engineer / MDOT Architect from full range of manufacturer’s 7 optional anodized colors.
4. Surface-Mounted Frames: Tapered vinyl with mitered corners. Color as selected by Project Engineer / MDOT Architect from full range of manufacturer’s six standard colors.
5. Mat 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.

2.04 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.

1. Install mats after Final Cleaning of Project Floor.

3.02 CLEANING AND PROTECTION

A. At Project Completion, clean surfaces in accordance with manufacturer’s instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 22 05 10 PLUMBING GENERAL REQUIREMENTS

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 plumbing 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 appropriately apply to work specified in this division.

1.02 CODES, ORDINANCES, AND PERMITS:

A. All plumbing materials and workmanship shall comply with the following codes and standards as applicable:

1. The National Electric Code (2011 Edition)
2. The International Building Code (2012 Edition)
3. The International Plumbing Code (2012 Edition)
4. The International Fuel Gas Code (2012 Edition)
5. ASHRA E/IES Standard 90.1-2010 Edition

B. Applicable Publications: 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 Standard (2006)
8. Underwriters Laboratories Inc. (UL)

C. All work done under this Contract shall comply with all state and local code authorities having jurisdiction and with the requirements of the Utility Companies whose services may be used. All modifications required by these codes and entities shall be used 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. Where applicable, N.F.P.A. requirements shall be met.

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 shall 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.).

1.03 APPLICABILITY

A. The work specified herein shall include all labor, materials, equipment, tools, supplies and supervision required to install and place in operation the plumbing systems and appurtenances specified herein and/or indicated on the drawings or reasonably implied as necessary for completion of the various systems.

1.04 COORDINATION OF PLUMBING DOCUMENTS

A. The plumbing work listed in these documents shall be coordinated with the work indicated on all other drawings, schedules, schematics, and specifications that are part of these construction documents. Should a conflict occur, the contractor shall submit a request for clarification to the engineer prior to bid opening. NO ALLOWANCES shall be made for any assumptions made by the contractor or any sub-contractors that are indirect conflict with the intent of the construction documents; in the event a conflict is discovered after construction has commenced, the resolution of the conflict shall be decided by the Engineer of Record, whose interpretation of the documents shall be final.

1.05 WELDERS QUALITY ASSURANCE

A. All welders shall be certified by ANSI B31.1.0-1967 “Standard Qualification Welding Procedures, Welders and Welding Operators” or “Qualification Tests” in Section IX, ASME Boiler and Pressure Vessel Code. Welder performance qualification tests shall be made in strict accordance with the above codes. Welders shall be certified for the type of pipe material specified herein. All costs incident to procedures and welder’s qualification tests shall be assumed by the Contractor. Two copies of the qualification test report and certification with the welder’s identification number, recommendation letter, etc. shall be delivered to the Architect before any welding commences.

PART 2 - PRODUCTS

2.01 COORDINATION OF PRODUCTS

A. The products of particular manufacturers have been used as the basis of design in preparation of these documents. Any modifications to the plumbing 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 shop drawing submittals and shall be clearly indicated on the shop drawings. Any related modifications shall be the responsibility of the contractor and shall be performed without any additional cost to the Contract.

2.02 DESCRIPTION

A. All components of the plumbing systems shall be new. All equipment and products for which independent laboratory testing and labeling is applicable and/or required shall bear the Underwriter’s Laboratories, Inc. (UL) label.

PART 3 - EXECUTION

3.01 GENERAL:

B. The Contractor shall provide and prepare all openings for plumbing work as required in walls, roof, ceilings, etc.; he shall also do all painting as may be required. He shall coordinate the installation of all plumbing equipment in the exterior wall and roof.

B. The plumbing plans do not give exact elevations or locations of lines, nor do they show all the offsets, control lines, or other 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, coordinated and satisfactorily operating installation.

C. If the Contractor proposes to install equipment and piping 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, including plans, sections, elevations, etc., sufficient to indicate that the revised layout will fit and allow for required access to clearance.

D. The Contractor is 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, cores, etc.

E. The Contractor shall so coordinate the work of the several various trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interference 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.

F. Except where otherwise noted, all piping in finished areas shall be installed in chases, furred spaces, above ceilings, etc. In all cases, pipes shall be installed as high as possible. Runs of piping shall be grouped whenever it is feasible to do so.

G. The Electrical Contractor shall bring adequate power to and make final connections to all equipment furnished under this contract. All control wiring shall be by the Controls Contractor.

H. Piping and equipment shall not be installed in electrical equipment rooms except as serving only those rooms. Outside of 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.
4. Provide access to equipment and apparatus requiring operation, service or maintenance within the life of the system. Including, but not limited to, motors, valves, filters, dampers, shock absorbers, etc. Equipment located above lay-in type ceilings is considered accessible.

3.02 ELECTRICAL WORK

A. All electrical equipment provided under this Division shall comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 26.

3.03 PROTECTION OF EQUIPMENT

A. Store equipment, including pipe and valves, off the ground and under cover. For storage outdoors, minimum 4-mil thick plastic shall be fitted to withstand splattering, ground water, precipitation and wind.

B. Plug ends of pipe when work is stopped and close ends of ducts with plastic taped in place until work resumes.

C. Damaged equipment shall be repaired or replaced at the option of the Engineer of Record.

3.04 PAINTING

A. Factory painted equipment that has been scratched or marred shall be repainted to match original factory color.

B. All un-insulated black ferrous metal items exposed to sight inside the building, such as piping, equipment hangers and supports not provided with factory prime coat, shall be cleaned and painted with one coat of rust inhibitor primer. In addition, such items in finished spaces shall also be painted with two coats of finish paint in a color to match adjacent surfaces or as otherwise selected by the Architect.

C. Black ferrous metal items exposed outside the building, such as equipment support beams, un-insulated pipe and pipe supports not provided with factory prime coat, shall be cleaned and painted with one coat of rust inhibiting primer and two coats of an asphalt base aluminum paint. Insulated pipes outside the building shall be cleaned and painted with one 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. Labels shall also be protected from becoming illegible due to weathering.

F. Galvanizing broken during construction shall be re-coated with cold galvanizing compound.

3.05 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. Schedule work so existing systems will not be interrupted when they are required for normal usage of the existing building. Obtain approval from the Architect at least 7 days prior to any interruption to service of utilities.

3.06 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.

B. All surfaces shall be patched to the condition of the adjacent surfaces.

C. The Contractor shall make suitable provisions for adequately water-proofing at his floor penetrations of water proof membrane floors. This shall include but not be limited to floor drains, open sight drains, hub drains, clean-outs, and sleeves for the various piping. This also applies to membrane roofing systems.

3.07 SLEEVES, FLOOR AND CEILING PLATES

A. The Contractor shall install, as required, 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, except as otherwise indicated, and/or frames shall be installed flush with finished surfaces and grouted in place. Surfaces around opening 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 3 inches above finished floor. Where pipes pass through walls, sleeves shall be standard weight black steel pipe or 20-gage galvanized sheet metal with ends flush with wall surfaces.

D. Each pipe passing through walls, floors, ceilings or partitions shall be provided with sleeves having internal diameter one inch larger than the outside dimensions of insulated pipes.

E. All pipe sleeves through floors, roofs and masonry walls shall be built in place as the affected walls, floors, and roofs are built.

F. All penetrations through rated walls and floors shall be packed, sealed and encapsulated per the applicable U.L. details(s).

G. Sleeves through exterior wall shall be steel or cast iron pipe, flush with the exterior surfaces, and with the space between the pipe and the sleeves caulked watertight in an approved manner.

H. Inserts shall be cast iron or galvanized steel individual type, with accommodations for removable nuts and threaded rods up to ¾” diameter, and permitting lateral adjustment.

3.08 ESCUTCHEONS:

A. Escutcheons shall be installed on all pipes where they pass through floors, ceilings, walls, or partitions in finished 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, stamped brass type designed to fit the pipe, and to cover the terminating pipe sleeve, in chrome plated finish unless otherwise specified, with securing device to hold the escutcheon tight to the pipe.

3.09 CLEANING:

A. Flush new water piping systems until water runs clean. Mild chemical cleaning may be required. If so, flush all cleaning chemicals out of the piping system before recharging with water.

B. Remove all stickers, rust, stains, labels, and temporary covers before final acceptance.

C. The exterior surfaces of all mechanical equipment, piping, etc., shall be cleaned of all grease, oil, paint, dust and other construction debris.

D. Bearings that require lubrication shall be lubricated in accordance with the manufacturer's recommendations. Provide written certification of lubrication.

E. Equipment rooms shall be left broom clean.

F. End of open pipes shall be covered during construction except when working directly on such one prohibits covering.

G. Clean and polish identification plates.

3.10 EQUIPMENT, MATERIALS AND BID BASIS

A. It is the intention of these Specifications to indicate a standard of quality for all material incorporated in this work. 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 named manufacturers, although acceptable as manufacturers, must prove their product will perform satisfactorily and will meet space requirements, etc., and shall obtain pre-approval of their equipment, before submitting shop drawings, when their equipment achieves the required results in a manner different than that of the first named manufacturer. Where only one manufacturer is named, unless the Specifications state otherwise, manufacturers of similar quality products will be considered. Such unnamed manufacturer's products will, however, be considered as substitutions and shall not be used as a basis for bidding. In the event the Contractor wishes to submit substitutions to the Architect for review, he shall furnish descriptive catalog material, text data, samples, etc., as well as any other pertinent data necessary to demonstrate that the proposed substitutions are acceptable equals to the specified product. No substitutions shall be made without the written consent of the Architect.

B. The use of one named manufacturer in the schedules on the Drawings is for guide purposes. The provisions of the above paragraph will govern in the selection of products to be used.

3.11 GUARANTEE: All systems and components shall be provided with a one year guarantee from the time of final acceptance or beneficial occupancy (Coordinate with the Architect). The guarantee shall cover all materials and workmanship. During this guarantee period, all defects in materials and workmanship shall be corrected by repair or replacement without incurring additions to the Contract.

3.12 FOUNDATIONS

A. All concrete foundations required by equipment furnished under the Plumbing Division shall be constructed in conformance with the recommendations of the manufacturer of the respective equipment actually applied, and with the approval of the Architect. All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") 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, if necessary. After removal of the forms, the surface of the foundation shall be rubbed. Unless otherwise noted, foundations shall be 4 inches - 6 inches high. All concrete work performed shall conform entirely to the requirements of the General Specifications that describe this class of work.

3.13 RECORDS AND INSTRUCTIONS FOR OWNER

A. The Contractor shall accumulate during the job's progress the following data in triplicate prepared in neat brochures or packet folders and turned over to the Architect/Engineer for check and subsequent delivery to the Owner:

1. Provide all warranties and guarantees, manufacturer's directions and material covered by the Contractor.
2. Provide approved fixture brochures, wiring diagrams, and control diagrams.
3. Provide copies of approved shop drawings.
4. Three sets of operating instructions for plumbing equipment and systems. Operating instructions shall also include recommended periodic maintenance and suggested procedures in 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, etc., by mark number from 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.

B. All of the above data shall be submitted to the Architect/ Engineer for approval at such time as the Contractor asks for his last estimate prior to his final estimate, but in no case, less than two weeks before final inspection.

C. The Contractor shall also give not less than 1 day 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 written operating instructions referred to in paragraph above shall be used as a basis for this on-the-job instruction.

3.14 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 buried or concealed work. In addition, 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. The "Record Drawings" shall consist of a set of mylar sepia prints 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 mylar sepia prints to be used for the "Record Drawings".

B. Record dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two (2) dimensions to permanent structures.

C. The Contractor shall mark all "Record Drawings" on the front lower right hand corner with a rubber stamp impression that states the following:

"RECORD DRAWINGS – “3/8" high letters to be used for recording field deviations,
and "5/16" high letters to be used for dimensional data only.

3.15 INSTALLATION

A. All equipment shall be installed in strict conformance with manufacturer's recommendations, as specified herein. If any conflict arises between these instructions, notify the Engineer immediately for clarification.

3.16 ACCESS DOORS

A. Furnish and install access doors at each point required to provide access to concealed valves, cleanouts, and other devices requiring operation, adjustment, or maintenance. Access doors shall be 16 gauge steel, prime coat finish, with mounting straps, concealed hinge and screwdriver locks, designed for the doors to open 180 degrees.

B. Access doors installed in firewalls or partitions shall be UL Labeled to maintain the fire rating of the wall or partition.

C. Access doors shall be provided under this section of the specifications and furnished to the General Contractor to be installed.

D. Access doors shall be MILCOR or approved equal in accordance with the following:

1. Style AT Door for Acoustical Tile Ceilings
2. Style AP Door for Acoustical Plaster Ceilings
3. Style K Door for Plastered Wall and Ceiling Surfaces
4. Style DW Door for Drywall
5. Style ATR for Suspended Drywall Ceilings
6. Style M Door for Masonry, Ceramic Tile, Etc.
7. Fire-Rated 1-1/2 hr. (B-label) Door where required.

E. Size and type shall be as required for proper service and/or as may be directed by the Architect.

F. Access door finish shall be chemically bonded to steel with a prime coat of baked on electrostatic powder. Color shall be as selected by Architect.

3.17 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

A. Materials and adhesives used throughout the mechanical and electrical systems for insulation, and 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. (Note: Materials need not meet these requirements where they are entirely located outside of a building and do not penetrate a wall or roof, and do not 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)".

3.18 EQUIPMENT FURNISHED BY OWNER:

A. The contractor shall unload, uncrate, assemble, and connect 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, set in place, connected, tested, adjusted, and placed into operation.

3.19 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 specification Division 22. Any requirements for such are beyond the scope of this contract and shall be done only by those persons contracted to do so.

END OF SECTION

SECTION 22 05 11 PLUMBING SUBMITTAL DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions, and Section 22 05 10 Plumbing General Requirements, apply to all work herein.

1.02 QUALITY ASSURANCE

A. 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. The Contractor shall submit to the MDOT Architect a sufficient number of copies of all such shop drawings or catalog data to provide him with as many reviewed copies as he may need, plus three (3) copies for retention; one by the Project Engineer, MDOT Architect and by the Engineer.

B. Before submitting shop drawings to the MDOT 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 shop drawings before submitting them. The Contractor's review of the shop drawings is not intended to take the place of the official review by the MDOT Architect. Shop drawings which have not been reviewed by the MDOT Architect shall not be used in fabricating or installing the work.

C. The review of shop drawings or catalog data by the MDOT Architect shall not relieve the Contractor from responsibility for deviations from the Drawings and Specification unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the MDOT Architect. Also, it shall not relieve him from responsibility for error of any kind in shop drawings. When the contractor does call such deviations to the attention of the MDOT Architect, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, 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.

PART 2 - PRODUCTS

2.01 GENERAL

A. All products shall be new and bear all labels which are identified by the applicable Specification Section and Contract Documents.

PART 3 - EXECUTION

3.01 SUBMITTAL DATA

E. 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. 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 where required, accessories specified, manufacturer, make and model number, weights where specified, starters where required by Division 22, 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 the 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.
3. Plumbing submittal data shall be bound into separate volumes, each plumbing volume shall contain one copy of all specified equipment/shop drawing submittals. Each bound copy shall be provided with an index of materials and 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. FAILURE to provide **BOUND AND IDENTIFIED SUBMITTALS** will result in the **AUTOMATIC REJECTION** of the submittal data with **NO EXCEPTION.**

F. The bound submittals are to be submitted for review within 30 days after the Contract is awarded. No submittal will be checked until ALL required submittals have been received by the Engineer. Only piping fabrication drawings may be submitted after the completed bound submittal is reviewed and accepted by the Engineer.

G. The Contractor shall submit with the bound and 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 has been fully coordinated with the electrical contractor. No submittal data 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 performed without any additions to the Contract Sum. Submit attachment and fastening methods for piping and equipment to the Structural Engineer for approval. Shop Drawings shall be submitted for each of the following:

1. Backflow Preventers
2. Cleanouts
3. Disconnect Switches
4. Drains
5. Hydrants
6. Insulation
7. Meters

8. Motor Starters
9. Pipe Hangers and Supports
10. Piping
11. Plumbing Drains
12. Plumbing Fixtures, Carriers and Fittings
13. Starters
14. Strainers
15. Thermometers, Gauges, etc.
16. Vacuum Breakers
17. Valves
18. Vibration Isolators (to be submitted with equipment being isolated)
19. Water Hammer Arrestors
20. Water Heaters
21. Water Supplies and Stops

3.02 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Description:

1. Complete operating and maintenance instructions shall be provided to the Owner. Two (2) separate copies shall be provided, and each copy shall be bound in separate volumes. 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 instruction 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 instruction.
3. Prior to final acceptance or beneficial occupancy, provide the services of a competent representative to instruct the Owner in the operation of all systems for a period of not less than one (1) day. This instruction shall include a complete walk-through of all equipment and systems. The Architect reserves the right to attend any such meeting and shall be duly notified.

3.03 OTHER SUBMITTALS – CLOSEOUT DOCUMENTS

A. Submit two copies of the following prior to occupancy of the project by the Owner. See contract close-out requirements in Division 01.

1. As built drawings for plumbing systems.
2. Request for final payment.
3. Letter or “Release of Liens”.
4. Letter of “Guarantee”.
5. Submit two (2) copies of welder’s certificate.
6. Consent of Surety Company to final payment.
7. Certify disinfection of domestic water service.
8. Power of Attorney.
9. Contractor’s Affidavit of Payment of Debts and Claims.

END OF SECTION

SECTION 22 05 29 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions, and Specifications Section 22 05 10 “Plumbing General Requirements” apply to work of this section.

1.02 DESCRIPTION OF WORK

A. 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.

B. "C" CLAMPS may be used as point of attachment to building structure for pipe hangers and/or all-thread rods; however, piping shall not be supported directly by “C” clamps.

C. Do not pierce waterproofing with support bolts.

D. All ferrous metal hangers and supports, not otherwise coated, shall be provided with a field-applied coat of zinc chromate primer prior to any installation. In lieu of field painting, the contractor may furnish cadmium plated, or galvanized hangers and supports.

1.03 QUALITY ASSURANCE

A. Hangers, supports, anchors, and guides shall be in accordance with the American National Standard Code for Pressure Piping, ANSI B31.1 with addenda 31.1 OA-69.

B. Provide an adequate suspension system in accordance with recognized engineering practices, using where possible, standard commercially accepted pipe hangers and accessories. Submit fastening methods to the Engineer for approval and as approved copy to the engineer.

C. 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.

D. For the purpose of this Specification, Anvil International product figure numbers are given. Equal products by B-Line and Michigan Hanger Co. (M-Co) are acceptable.

1.04 DESIGN:

A. Supporting steel not shown for the equipment will be designed, supplied and erected by the Contractor; the supporting steel is that steel which is connected to the structural steel shown on the Drawings and carries the weight of the mechanical items. This supporting steel design must carry the dead weight and dynamic load imposed by the equipment, piping and other mechanical components.

B. The supporting steel shall be connected to the structural steel in such a manner as not to overload the structural steel. It is the responsibility of the General Contractor, Mechanical Contractor and the steel fabricator to verify that this purpose is accomplished. It is the responsibility of the General Contractor to call to the attention of the MDOT Architect-Engineer deficiencies prior to bidding.

C. Where thermal movement in the pipe line will occur, the pipe hanger assembly must be capable of supporting the line in all operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger in order to prevent excessive stress in either pipe or connected equipment.

PART 2 - PRODUCTS

2.01 UPPER ATTACHMENTS:

A. New Concrete Construction:

1. Support piping in new concrete construction with adjustable type inserts, Anvil Fig. 282. Where the pipe load exceeds the recommended load of the insert, use two inserts with a trapeze-type connecting member below the concrete.
2. Where hangers are required between structural members, (beams) provide side beam brackets, Anvil Fig. 202, 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 and shall receive a field coat of zinc chromate primer.

B. Existing Concrete Construction:

1. Support piping in existing concrete construction with Cadmium plated, malleable iron, expansion case, Anvil Fig. 117.
2. Where hangers are required between structural members (beams) side beam brackets Anvil Fig. 202, attached to the upper 1/3 of the beam, and all auxiliary steel for the installation of the pipe hanger. Supports shall be designed in accordance with the AISC Steel Handbook and shall receive a field coat of zinc chromate primer.

C. Steel Construction:

1. Support piping in steel construction with adjustable beam clamps and tie rods, Anvil Fig. 218, or side beam brackets bolted or welded to the side of the beam.
2. Where hangers are required between structural members (beams or joist) provide all auxiliary steel for the installation of the pipe hanger. Supports shall be designed in accordance with the AISC steel Handbook and shall receive a field coat of zinc chromate primer.

D. Wood Construction:

1. Support piping in wood construction with Side Beam Bracket, Anvil Fig. 202 or Hanger Flange, Anvil Fig 128R, using lag screws.

2.02 WALL SUPPORTS

A. Where piping is run adjacent to walls or steel columns welded steel brackets Anvil Fig. 195 and 199 may be used. The bracket shall be bolted to the wall and a back plate of such size and thickness as to properly distribute the weight.

2.03 FLOOR SUPPORTS

A. Where pipe lines are located next to the floor and no provision for expansion are required support piping with Anvil Fig. 258, pipe rest with nipple and floor flange.

B. Where provisions for expansion are required support piping with Anvil adjustable pipe stand Fig. 274, or pipe roll stand Fig. 271.

C. Vertical piping shall be supported at every other floor using riser clamps Anvil Fig. 261, for steel and cast iron pipe, and copper clad riser clamp Anvil Fig. CT-121 for all copper piping.

2.04 SUPPORTS FOR PIPING OUTSIDE THE STRUCTURE

A. Support piping outside the structure on adjustable pipe supports Anvil Fig. 264.

2.05 INTERMEDIATE ATTACHMENTS

A. Supports for horizontal piping shall be all-thread galvanized steel rods, ASTM A-107, Anvil Fig. 146, of the following sizes:

Pipe Size	Hanger Rod Diameter
2" and smaller	3/8"
2-1/2" and 3"	1/2"
4" and 5"	5/8"
6"	3/4"
8" to 12"	7/8"
14" and 16"	1"

2.06 PIPE ATTACHMENTS

A. Hangers for insulated pipe shall be sized to bear on the outside of the insulation.

B. Hangers for steel and cast-iron horizontal piping where provision for expansion are not required shall be Anvil Fig. 260, clevis type with vertical adjustment.

C. Hangers for uninsulated copper pipe 4 inches and smaller shall be copper plated adjustable band hangers Anvil Fig. CT. 99C, for pipe sizes over 4 inches provide Anvil copper clad clevis type hanger with a copper clad saddle at each hanger location.

D. Hanger for PVC pipe shall be Anvil Fig. CT. 99, adjustable band hanger.

E. Hangers for steel and copper piping where provisions for expansion are required shall be Anvil Fig. 171 or Fig. 181, adjustable roller hanger with Anvil Fig. 160, pipe covering protection saddles.

F. Support hot and cold water piping in spaces behind plumbing fixtures with plastic coated

brackets and plastic coated U-bolts.

G. Pipe guide shall be Anvil Fig. 256.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Support horizontal equipment such as in-line pumps, strainers, air separators, independently of the piping system.

B. Hang pipe from substantial building structure. Pipe shall not be hung from other piping.

C. Support each horizontal length of NO-HUB cast iron pipe within 2-1/2 feet of each joint and a maximum of 5'-0" on centers.

D. Provide a hanger within one foot of each elbow.

E. Provide a hanger within one foot of each riser in addition to the riser clamp support at every other floor.

F. Unless specified otherwise, provide the following support spacing.

1. Pipe Size	Support Spacing
1" and smaller	5’-0”
1-1/4" and larger	10’-0”

END OF SECTION

SECTION 22 05 53 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 APPLICABILITY

A. All work specified in this Section shall comply with Section 22 05 10 “Plumbing General Requirements”.

B. All above ground piping inside the building shall be identified with color bands at each shut-off valve, each piece of equipment, branch take-off, and 40'-0" maximum spacing on exposed straight pipe runs.

C. All underground plastic sewer and water piping outside the building shall have No. 14-copper (TW) tracer wire attached to pipe. Install directly above pipe a continuous 6-inch wide vinyl plastic tape with printing identifying buried service, 12 inches below finished grade, during backfilling operation.

PART 2 - PRODUCTS

2.01 PIPE MARKINGS

A. Pipe markings shall be manufactured preprinted markings in accordance with the following:

1. No tape or self-adhering markers will be allowed.
2. Snap on pipe markers, W. H. Brady Co. or approved equal are acceptable.
3. Markers shall be strapped on with nylon fasteners.
4. Markers will be non-corrosive, non-conductive, mildew resistant and impervious to moisture.

2.03 BAND AND LETTER SIZE: Band and letter sizes shall conform to the following table:

O.D. of Pipe	Width of Color Band	Size of Letter/Numbers
1-1/4” and smaller	8”	1/2”
1-1/2” to 2”	8”	3/4”
2-1/2” to 6”	12”	1-1/4”
6” to 10”	24”	2-1/2”
Over 10”	32”	3-1/2”

2.04 IDENTIFICATION:

A. Band legend and color and letter color shall conform to the following table:

Piping Band	Legend	Letters	Band Color
Cold Water (Domestic)	CW (Dom)	White	Green
Hot Water (Domestic)	HW (Dom)	Black	Yellow
Hot Water Circulation (Domestic)	HWC (Dom)	Black	Yellow
Compressed Air	AIR	Black	Royal Blue
Drain	D	Black	Green

B. All equipment, such as water heaters, pumps, etc., furnished by this Contractor, shall be permanently labeled, in an approved manner, corresponding to the mark or name shown on the drawings and/or specifications, or Owners' sequences.

C. For applications where existing color schemes may already be in place, all new work requiring identification and color coding shall match the existing color schemes.

PART 3 - EXECUTION

3.01 EXECUTION:

A. Locate pipe identification in the following areas:

1. Each riser and each valve,
2. One on each side where piping pass thru walls and floors,
3. Locate at or near each change in direction,
4. Every 40 feet along continuous runs,
5. Located within 4 feet of exit or entrance to a vessel or tank.

B. Indicate pipe content flow direction with arrows of matching style and placed so the arrow points away from the legend.

END OF SECTION

SECTION 22 07 00 PLUMBING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Specification section 22 05 10 “Plumbing General Requirements” apply to work of this section.

1.02 DESCRIPTION

A. All insulation products used outside of mechanical rooms 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.** All insulation shall be installed in accordance with the insulation manufacturer's recommendations. Insulation 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 Foamglass Insulation, Calcium Silicate or Perlite and shall be 2 inches longer than the pipe shields. Pipe shoes welded to the pipe shall be used for roll type hangers.

D. All required tests of the relevant section of pipe or equipment 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. Vents from pressure relief valves.
4. Chrome plated piping at plumbing fixtures.

H. Clean and dry all surfaces to be insulated from loose scale, dirt, oil, moisture and other foreign matter.

I. Insulate completely all metal surfaces of piping and equipment other than hangers.

J. Surface finishes shall present a tight smooth appearance.

K. Permit expansion and contraction without causing damage to insulation or surface finish.

L. Surface finish shall be extended to protect all surfaces, ends, and raw edges of insulation.

M. Vapor barriers must be continuous and uninterrupted throughout the system where specified except where insulation is interrupted for fire dampers. See details for special conditions.

1.03 PIPING

A. Insulate all valves, strainers and fittings. For the purposes of this Specification, fittings include unions and flanges. Use premolded material where available. Insulate valves up to and including bonnets.

B. Pipe Hangers that are installed in direct contact with the surface of the pipe, such as a pipe clamp shall have the insulation applied over the hanger as well as the pipe. Provide a rain shield on piping supported on hangers outdoors to prevent bulk water from entry.

1.04 QUALITY ASSURANCE:

A. 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.

B. 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. Material shall be furnished to the job bearing the manufacturer's label.

C. Insulation products shall be as manufactured by Johns Manville, Pittsburgh Corning Corporation, Owens-Corning, Certainteed or Armstrong.

PART 2 - PRODUCTS

2.01 PRE-MOLDED FIBERGLASS PIPE INSULATION:

A. Insulation shall be heavy density, one- piece insulation made from inorganic glass fibers bonded with a thermosetting resin and accurately molded to conform to the outside diameter of the pipe. Insulation shall be one piece snap-on or self-sealing type with white all service jacket. Insulation shall be suitable for use on either hot or cold water pipes with temperature range of plus 20 degrees to 400 degrees F. Thermal conductivity shall not exceed 0.23 at 75 degrees F. mean temperature.

B. Safe burning characteristics shall be UL Classified and shall not exceed 25 flame spread, 50 smoke developed when tested in accordance with ASTM E84, NFPA 255 and UL723.

C. Insulation jacket shall have a water vapor transmission of 0.02 perms or less as tested by ASTM E96, Procedure A.

D. All pipe fittings and accessories insulated with fiberglass shall be fitted with heavy gauge PVC covers and jackets as manufactured by Johns Manville Zeston 300 Series. Fitting covers shall be two-piece PVC made for short and long radius elbows in shapes for 45 degrees and 90 degrees bends. Covers and jackets to have a white glossy finish and UV resistant. Material thickness shall be minimum 30 mil and carry a flame spread of 25 or less with a smoke development of 50 or less.

E. Pre-molded fiberglass insulation shall be used on the following pipe systems. Pipe insulation shall be equal to Johns Manville Fiberglass Micro-Lok AP-T Plus.

INSULATION THICKNESS IN INCHES FOR PIPE SIZES

	Temperature Up to	Up to 1"	1-1/4" to 2"	2-1/2" to 3-1/2"	4" & Over
Cold Water	50º-65ºF	1/2"	1"	1"	1"
Hot Water and Hot Water Circulating	200ºF	1/2"	1"	1"	1-1/2"
Indirect Refrigerator Waste	40º-55ºF	1/2"	1"	1"	1- 1/2"
Drains Connecting A/C Equipment	40º-55ºF	1/2"	1"	1"	1- 1/2"

2.02 FOAMED PLASTIC SHEET AND TUBING

A. Sheet Insulation shall be equal to Armstrong Armaflex. Minimum of 4.5 lbs. per cu. ft. Thermal conductivity shall not exceed 0.28 at 75 degrees F mean temperature.

B. Insulate the following piping system as indicated:

1. Water cooler waste and trap with 1/2 inch thick foamed plastic tubing
2. Domestic hot water piping below ground with 1/2 inch thick foamed plastic tubing.

C. Piping outside the building shall be insulated with 1 inch thick flexible foamed plastic insulation with weatherproof aluminum as hereinafter specified.

2.03 ADHESIVES, MASTIC, COATINGS:

A. Products from the following manufacturers are acceptable: Benjamin Foster, Childers, Insul-Coustic, EPOLUX, and Minnesota Mining and Manufacturing Co.

B. Treatment of pipe jackets to impart flame and smoke safety shall be permanent. The use of water-soluble treatments is prohibited.

C. Vapor barriers shall have a perm rating of not more than 0.05 perms. Adhesives, coatings and mastics shall have a perm rating of not more than 0.25 perms.

2.04 TAPE

A. Wherever tape is used for sealing purposes, it shall be of the type and shall be applied as recommended by the non-conductive covering manufacturer. Where recommendation is lacking, the tape used shall be sealed with Minnesota Mining Adhesive EC-1329.

2.05 WEATHERPROOFING

A. Protect exposed water piping from freezing down to 0 degrees F in unheated areas with self-regulating heater cable with built-in thermostat. Cable shall be installed in contact with pipe and beneath pipe insulation. Protect piping insulation with Pabco insulating division aluminum sheets of 0.016 thickness and aluminum formed elbows with leak-proof beads and epoxy coated interior.

PART 3 - EXECUTION

3.01 GENERAL:

A. Surfaces to be insulated shall be clean, dry, and free of foreign material, such as rust, scale and dirt when insulation is applied. Perform pressure tests required by other Sections before applying insulation.

B. Where existing insulation is damaged due to the new work, repair damage to match existing work or replace damaged portion with insulation specified for new work.

3.02 INSULATION FOR ALL PIPING SYSTEMS:

A. Insulate pipe, fittings, flanges, unions and valves.

B. Install insulation materials with smooth and even surfaces, jackets drawn tight and cemented down smoothly at longitudinal seams and end laps. Do not use scrap pieces of insulation where a full length section will fit.

C. Install insulation, jackets and coatings continuous through wall and floor openings and sleeves.

D. Fittings, valves and flanges shall be insulated with field fabricated multiple mitered segments of molded fiberglass insulation of the same thickness as adjoining pipe insulation. Secure fitting insulation segments with 20 gauge galvanized steel wire and apply a smoothing coat of insulating cement. White fabric and mastic shall be used on exposed fittings.

E. Application of all materials shall be in accordance with the manufacturer's instructions.

F. Butt all joints of pipe insulation together and secure all jacket laps with lap adhesive. Seal all butt joints with joint straps furnished with insulation.

G. Care shall be taken so as not to place insulation over vent and drain inlets and outlets.

H. Staples are not permitted on pipe insulation.

END OF SECTION

SECTION 22 08 00 COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The purpose of this section is to specify the Contractor's responsibilities and participation in the commissioning process relative to Division 22.

B. Commissioning testing shall be performed by this division Contractor and documented by the Commissioning Authority. Commissioning is primarily the responsibility of the Commissioning Authority, with start-up, testing and support for commissioning the responsibility of the Contractors. The commissioning process does not relieve the Contractor from participation in the process or diminish the role and obligations to complete all portions or work in a satisfactory and fully operational manner.

C. Work of Division 22 includes:

1. Testing and start-up of the plumbing equipment, with special emphasis on the domestic hot water system.
2. Assistance in functional testing to verify equipment/system performance.
3. Providing qualified personnel to assist in commissioning tests.
4. Completion and endorsement of Pre-functional Construction Checklists provided by the Commissioning Authority to assure that Division 22 equipment and systems are fully operational and ready for functional testing.
5. Providing equipment, materials and labor necessary to correct deficiencies found during the commissioning process which fulfill contract and warranty requirements.
6. Providing operation and maintenance information and as-built drawings to the Commissioning Authority for review prior to distribution.
7. Providing assistance to the Commissioning Authority to develop, edit and document system operation descriptions.
8. Providing training for the systems specified in this Division.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

1. Shop Drawings
2. Completed Pre-Functional Construction Checklists

1.03 RELATED WORK

A. All installation, testing and start-up procedures and documentation requirements specified within Division 22.

B. Section 01 91 00 COMMISSIONING.

C. Commissioning Functional Test Procedures that require participation of the Division 22 Contractors.

D. Cooperate with the Commissioning Authority in the following manner:

1. All testing and start-up procedures and documentation requirements specified within Division 1 and Division 22 and related portions of this project.
2. Allow sufficient time before final completion dates so mechanical systems start-up, test and balance, and commissioning can be accomplished.
3. Provide labor and material to make corrections when required without undue delay.
4. Put all plumbing equipment into full operation and continue the operation of the same during each working day of the testing, balancing and commissioning.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Standard test equipment for commissioning will be provided by the Contractor.

B. Division 22 Contractor shall provide standard and specialized test equipment as necessary to test and start up the plumbing systems.

C. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment through the installing contractor. Manufacturer shall provide the test equipment, demonstrate its use and assist the Commissioning Authority in the commissioning process.

PART 3 - EXECUTION

3.01 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so the systems can be energized, started, tested and otherwise commissioned. Division 22 has primary start-up responsibilities with obligations to complete systems, including all sub-systems, so they are functional.

B. A commissioning Plan will be developed by the commissioning Authority. Upon request of the commissioning Authority, the Contractor shall provide assistance and consultation. The Contractor is obligated to assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. Specific pre-commissioning responsibilities of Division 22 are as follows:

1. The Contractor shall perform pre-functional construction checklists on the systems to be commissioned to verify that all aspects of the work are complete in compliance with the plans and Specifications. Contractor start-up forms may be substituted for the pre-functional test forms with prior approval by the Commissioning Authority.
2. Notify Commissioning Authority when systems are ready for functional testing.

C. Commissioning is to begin upon completion of a system. Commissioning may proceed prior to the completion of systems and/or sub-systems, if expediting this work is approved by the Commissioning Authority. Commissioning activities and schedule will be coordinated with the Contractor. Start of Commissioning before system completion will not relieve the Contractor from completing those systems as per the schedule.

3.02 PARTICIPATION IN COMMISSIONING

A. Commissioning testing shall be performed by this division Contractor and documented by the Commissioning Authority. Provide skilled technicians to start up and debug all systems within this division of work. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, times required for testing, etc., will be requested by the Commissioning Authority and coordinated by the Contractor. Contractor will ensure the qualified technician(s) are available and present during the agreed-upon schedules and of sufficient duration to complete the necessary tests, adjustments and/or problem resolutions.

B. System problems and discrepancies may require additional technician time, Commissioning Authority time, redesign and/or reconstruction of systems and system components. The additional technician time shall be made available for the subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to judge the appropriateness and qualifications of the technicians relative to each item or equipment, system and/or sub-system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment and an attitude/willingness to work with the Commissioning Authority to get the job done. A liaison or intermediary between the Commissioning Authority and qualified factory representative does not constitute the availability of a qualified technician for purpose of this work.

3.03 WORK TO RESOLVE DEFICIENCIES

A. In some systems, maladjustments, misapplied equipment, and/or deficient performance under varying loads will result in a system that does not meet the original design intent. Correction of work will be completed under direction of the architect, with input from the Contractor, equipment supplier and Commissioning Authority. Whereas all members will have input and the opportunity to discuss, debate and work out problems, the Architect/ Engineer of Record will have final jurisdiction on the necessary work to be done to achieve performance.

3.04 ADDITIONAL COMMISSIOING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The Contractor, suppliers and Commissioning Authority shall include a reasonable reserve to complete this work as part of the standard contractual obligations.

B. The cost of compensation of the Commissioning Authority for repeat testing or troubleshooting due to systems that do not meet specified performance shall be borne by the Contractor.

C. Corrective work shall be completed in a timely fashion to permit the timely completion of the commissioning process. Experimentation to render system performance will be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely to the commissioning process, the Commissioning Authority will notify the Architect/ Engineer of Record indicating the nature of the problem, expected steps to be taken and the deadline for completion of activities. If the deadline passes without resolution of the problem, the Owner reserves the right to supplementary services and equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner will be the Contractor's responsibility.

3.05 SYSTEMS TO BE COMMISSIONED

A. Domestic hot water system

3.06 TRAINING

A. Per the specifications, the Contractor will be required to participate in the training of the Owner personnel for each system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

B. Contractor shall provide training to building occupants per Sections 01 79 00 Demonstration and Training, 01 91 00 General Commissioning and Division 22 requirements.

C. Provide a training syllabus fourteen (14) calendar days prior to the training to the Commissioning Agent for approval.

D. Provide a Training attendance sheet to the Commissioning Agent with names, company names, and contact information of training attendees.

END OF SECTION

SECTION 22 10 00 PLUMBING PIPING AND PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section of the Specifications and related drawings describe requirements pertaining to the plumbing piping and equipment.

B. Refer to the following sections for related work:

22 05 11	Plumbing Submittal Data
22 05 29	Hangers and Supports for Plumbing Piping and Equipment
22 05 53	Identification for Plumbing Piping and Equipment
22 33 00	Electric Domestic Water Heaters
22 42 00	Commercial Plumbing Fixtures

1.02 RECORD DOCUMENTS

A. Provide corrected Record Documents in accordance with the Project Record Documents Sections and the Mechanical General Section.

1.03 GENERAL PROVISIONS AND BASIC MATERIALS

A. The requirements of Plumbing General Requirements Section 22 05 10 apply to this work.

1.04 CODE

A. The work shall comply with the International Plumbing Code; acceptability under the codes shall not authorize any substitution, smaller size, lighter weight or less durable materials for the items specified.

B. The Contractor shall obtain and pay for all required permits and inspections and shall deliver one copy of each inspection certificate to the MDOT Architect before the date of Completion.

PART 2 - PRODUCTS

2.01 WATER PIPING

A. Aboveground piping 3 inches and smaller: Type "L" copper tubing with tin-antimony soldered joints and wrought copper socket fittings.

B. Underground piping 3 inches and smaller: Type "K" hard drawn copper tubing, with 95-5 silver soldered joints and wrought copper socket fittings.

C. Underground piping outside building all sizes: Polyvinyl chloride (PVC) plastic piping Schedule 40, ASTM D-1785 with 150 PSI minimum pressure rating. Fittings shall conform to ASTM D-2466 with solvent weld joints conforming to ASTM D-2564.

D. Underground piping 1 inch and smaller below building slab: Below slab Type "L" soft drawn copper tubing, with no joints.

2.02 BASIC PIPING SPECIALTIES

A. Unions:

1. Unions shall be the same material and working pressure as the fittings specified for the piping system. Unions on piping 2-1/2 inches in size and larger shall be bolted flanged joint and on smaller than 2-1/2 inches shall be screwed connection.
2. Unions and flanges provided between copper and ferrous pipe connections shall be insulating (dielectric) type to electrically separate dissimilar metal connections in piping system.

B. Dielectric Adapters:

1. Dielectric adapters shall be the union type for pipes 2 inches in size and larger. Adapters shall have working pressure of 250 psi for union type and 165 psi for flanged type. The insulating gaskets shall have an operating range of 40 degrees F to 240 degrees F and shall limit the galvanic corrosion to a maximum of 1 percent of the short circuit current. Dielectric adapters shall be Ebco, Crane or Capitol.
2. Provide a dielectric adapter between any ferrous and copper connection including piping and equipment.

C. Pressure Gauges:

1. Pressure gauges shall be connected to the piping system with threaded brass pipe and screwed brass fittings. Gauges shall be flangeless type and shall have 4-1/2 inch dials, cast aluminum cases, stainless steel rotary gear movements, phosphor bronze bourdon types, forged brass rod sockets and tips, 1/2 percent accuracy of scale range, plexiglass dial covers, safety blow-out disc and 1/4 inch lower connections. Gauges shall be Weksler Type AA1, Trerice No. 500X Series or Weiss Series PG.
2. Each gauge shall be provided with a needle valve type gauge cock suitable for the pressure and temperature of the system in which it is installed, and compatible with the gauge to which it attaches. Gauge cocks shall be Weksler Type A, Trerice No. 880 or Weiss Type LC.
3. Gauges in pump suction lines shall be the compound type. Gauges in all other locations shall be the plain pressure type. Select to operate at midpoint of scale during normal system operation.
4. Gauge cocks shall consist of a brass lever handle cock connected to the piping system with threaded brass pipe and screwed brass fittings. Gauge cocks shall be Weksler Type A, Trerice No. 880 or Weiss Type LC.

D. Thermometers:

1. Thermometers shall be the red-reading mercury filled adjustable angle type. Thermometers shall be adjustable to any angle through a 180 degree arc and shall be provided with a locking device. Thermometers shall have V-cast aluminum case with baked enamel finish and 9 inch scale. Thermometers shall be provided with separable sockets and, where installed on insulated pipes, sockets shall be extended neck type. Thermometer scale range shall be 0 to 160 degrees F. Thermometers shall be Weksler Adjust-Angle Series Type AA-5, Trerice Adjustable Angle Series Type BX, or Weiss Vari-Angle Series Type VS.

E. Pipe Sleeves:

1. The Contractor shall install, as required, 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, equipment and devices furnished under each section of the Specification.
2. 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, except as otherwise indicated, and/or frames shall be installed flush with finished surfaces and grouted in place. Surfaces around opening shall be left smooth and finished to match surrounding surface.
3. Where pipes pass through floor slabs, sleeve shall be standard weight black steel pipe with top of sleeve 3" above finished floor. Where pipes pass through walls, sleeves shall be standard weight black steel pipe or 20-gage galvanized sheet metal with ends flush with wall surfaces.
4. Each pipe passing through walls, floors, ceilings or partitions shall be provided with sleeves having internal diameter one inch larger than the outside dimensions of insulated pipes.
5. All pipe sleeves through floors, roofs and masonry walls shall be built in place as the affected walls, floors, and roofs are built.
6. All penetrations through rated walls and floors shall be sealed with a fire rated sealant as manufactured by 3M, Hilti, or Pecora Corp.
7. Sleeves through exterior wall shall be steel or cast iron pipe, flush with the exterior surfaces, and with the space between the pipe and the sleeves caulked watertight in an approved manner.
8. Inserts shall be cast iron or galvanized steel individual type, with accommodations for removable nuts and threaded rods up to 3/4 inch diameter, and permitting lateral adjustment.

F. Floor, Wall and Ceiling Plates:

1. Escutcheons shall be installed on all pipes where they pass through floors, ceilings, walls, or partitions in finished areas.
2. The interior of closets, adjacent to finished areas, shall be considered as finished for the intent of these Specifications.
3. Escutcheons shall be split, hinged, stamped brass type designed to fit the pipe, and to cover the terminating pipe sleeve, in chrome plated finish unless otherwise specified, with securing device to hold the escutcheon tight to the pipe.

2.05 BACKFLOW PREVENTERS

A. Reduced Pressure Principle: Provide reduced pressure principle backflow preventer assembly including shutoff valves on inlet and outlet, and strainer on inlet. Backflow preventer shall include test cocks, air-gap drain funnel, and pressure-differential relief valve located between two (2) positive seating check valves. Assembly shall be constructed in accordance with ASSE Standard 1013 and University of Southern California (USC) Foundation for Cross-Connection Control and Hydraulic Research. Extend drain to nearest floor drain.

B. Double Check Valve: Provide double check valve backflow preventer assembly including shutoff valves on inlet and outlet, and strainer on inlet. Backflow preventer shall include test cocks, and shall be suitable for supply pressures up to 175 psi. Assembly shall be constructed in accordance with ASSE Standard 1013 and University of Southern California (USC) Foundation for Cross-Connection Control and Hydraulic Research.

C. Provide backflow preventers as indicated on Drawings. Backflow preventers shall be Watts or approved equal by Wilkins, or Febco as follows:

Size	Double Check	Reduced Pressure Zone
1/2” to 3”	007QT-S	009QT-S
4” to 10”	709NRS-S	909NRS-S

2.06 WATER HAMMER ARRESTORS: Water hammer arrestors shall be piston operated, type "K" copper, pressure rated for 250 psi, tested and certified in accordance with PDI standard WH-201; Precision Plumbing Products, Inc., or approved equal by Zurn, or Sioux Chief.

2.07 VALVES:

A. All shutoff valves shall be gate or ball valves unless otherwise noted. All drain valves shall be globe or angle valves unless otherwise noted.

B. Gate valves 2 inches and smaller shall be of Class 125, body and bonnet shall be of ASTM B-62 cast bronze composition, solid disc, copper-silicon alloy stem, brass packing gland, solder ends, Teflon-impregnated packaging, and malleable handwheel; NIBCO S-11 or approved equal by Apollo Valves, or Crane.

C. Class 150 valves meeting the above specifications shall be used where pressure requires; NIBCO S-134 or approved equal by Apollo Valves, or Crane.

D. Ball 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, solder ends with extended solder cups; NIBCO S-580-BR-R-70 or approved equal by Apollo Valves, or Crane.

E. Gate valves 2-1/2 inches and larger shall be Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged ends, with Teflon-impregnated packing and two-piece packing gland assembly; NIBCO F-617-0 or approved equal by Apollo Valves, or Crane.

F. Globe valves 2 inches and smaller shall be of Class 125, body and bonnet of ASTM B-62 cast bronze composition, solder ends, copper silicon alloy stem, brass packing gland, Teflon-impregnated packing and malleable handwheel; NIBCO S-235-Y or approved equal by Apollo Valves, or Crane.

G. Globe valves 2-1/2 inches and larger shall be of Class 125 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; NIBCO F-178-B or approved equal by Apollo Valves, or Crane.

H. Check valves 2 inches and smaller shall be of Class 125, solder ends, with bodies and caps conforming to ASTM B-62 cast bronze composition, swing type disc; NIBCO S-413-BYW or approved equal by Apollo Valves, or Crane.

I. Check valves 2-1/2 inches and larger shall be iron body, bronze mounted, with body and cap conforming to ASTM A-126 Class B cast iron, flanged ends, swing type disc; NIBCO F-918-B or approved equal by Apollo Valves, or Crane.

J. Calibrated Balancing Valve 4 inches and smaller shall be of Class 125 at 150 Degree 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 have an attached calibrated nameplate to indicate degree of closure; Taco CS or approved equal by Nibco, or Bell & Gossett.

2.08 PLUMBING SYSTEM INSULATIONS

A. All water piping shall be insulated in accordance with specification section 22 07 00 “Plumbing Insulation”.

2.09 WEATHERPROOFING

A. Protect exposed water piping from freezing down to 0° degrees F in unheated areas with self-regulating heater cable with built-in thermostat. Cable shall be installed in contact with pipe and beneath pipe insulation. Protect piping insulation with Pabco insulating division aluminum sheets of .016 thickness and aluminum formed elbows with leak-proof beads and epoxy coated interior or approved equal by PermaTherm, or Amerisafe.

2.10 PIPE HANGERS AND SUPPORTS

A. Provide pipe hangers and supports in accordance with Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment”.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install piping and make all joints in accordance with the pipe manufacturer's recommendations. Make provisions for thermal expansion and contraction.

B. Rough-in for fixtures in accordance with the fixture manufacturer's roughing-in drawings to provide the heights and locations indicated on the Architectural drawings or as specified.

. Install piping and pipe supports as specified. Keep pipe ends closed except for vent and drain openings; protect vent and drains from the entrance of materials that could cause stoppage.

D. Install shut-off valves where indicated on the drawings and required by the code including valves at all fixture groups, and equipment.

E. Install drain valves at low points of all new water piping except buried piping.

3.02 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform all excavation, trenching and backfilling for work under Division 22. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfilling shall be re moved and disposed of. Grading shall be done to prevent surface water from flowing into trenches and other excavation and any water accumulating therein shall be removed by pumping. All excavations shall be made by open cut. No tunneling shall be done.

B. Bottom of trench shall be uniformly graded to provide firm support and even bearing surface for pipe.

C. Pipe shall be laid on firm soil, laid in straight lines and on uniform grades. Provide bell holes so that barrels of pipe rest evenly on bottom of trench along entire length of pipe.

D. Pipe shall be inspected and tested prior to backfilling. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. Trench shall be hand filled to a minimum of 12 inches above the top of the pipe with clean earth and tamped to 95 percent compaction after first layer using the modified Proctor test method of compaction.

3.03 TESTS OF PIPING

A. Install temporary connections and plugs or valves at all points necessary for venting air from the piping, filling, holding test pressure, draining and flushing the piping.

B. Test all new pressure piping roughing hydrostatically to show zero leakage in eight (8) hours at the following pressures measured at the low points: Domestic water (C.W., and H.W.), 125 psi.

3.04 FLUSHING AND STERILIZING

A. Flush all new water piping after pressure tests and repairs are completed by draining from the low points; refill with clean water.

B. Sterilize the above ground water piping after fixtures and equipment are installed with 50 ppm chlorine solution distributed throughout all C.W. and H.W. piping; let stand for 24 hours, then flush enough water at drinking fountains and lavatories to reduce the residual chlorine content to less than one (1) ppm. Domestic water heater shall have the heat source shut off while sterilization is in progress.

C. Furnish three copies of a Certificate of Performance of Complete Sterilization to the MDOT Architect before final inspection of the work, all certified by a registered chemical engineer.

3.06 WATER TESTS

A. The Contractor shall have representative water samples from the fixtures tested by the local Health Department or a laboratory approved by the Health Department. If the tests do not indicate potable water, the sterilizing procedure and the test shall be repeated. Submit test report to the Architect.

3.07 START-UP, ADJUSTMENT, INSTRUCTIONS

A. Start-up, lubricate, adjust and test equipment installed under this Section and furnish instructions to the Owner as specified in the Mechanical General Section.

3.08 OPERATIONAL TESTS

A. When installation and adjustment of all fixtures and equipment is complete, perform operational tests of all plumbing system components at normal operating pressures as specified under the Plumbing General Requirements Section and includes the following tests:

1. Operate all manual and automatic valves at least one full open-closed cycle; examine for stem leakage, failure to close or other malfunction.

END OF SECTION

SECTION 22 13 00 FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section of the Specifications and related Drawings describe requirements pertaining to the sanitary sewerage piping and drainage accessories.

B. Refer to the following sections for related work:

22 05 11	Plumbing Submittal Data
22 05 29	Hangers and Supports for Plumbing Piping and Equipment
22 05 53	Identification for Plumbing Piping and Equipment

1.02 RECORD DOCUMENTS

A. Provide corrected Record Documents in accordance with the Project Record Documents Sections and the Plumbing General Requirements Section.

1.03 GENERAL PROVISIONS AND BASIC MATERIALS

A. The requirements of Section 22 05 10 “Plumbing General Requirements” apply to this work.

1.04 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. Josam Mfg. Co.
2. Smith (Jay R.) Mfg. Co.
3. Wade Div., Tyler Pipe
4. Zurn Industries, Hydromechanics Div.

1.05 CODE

A. The work shall comply with the International Plumbing Code; acceptability under the codes shall not authorize any substitution, smaller size, lighter weight or less durable materials for the items specified.

B. The Contractor shall obtain and pay for all required permits and inspections and shall deliver one copy of each inspection certificate to the Architect before the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS FOR DRAINAGE SYSTEMS

A. Drainage piping all sizes except within return air plenums: Polyvinyl chloride pipe (PVC) ASTM D2665, PVC Type DWV fittings with solvent weld joints.

B. Above ground piping all sizes within return air plenums: Service weight (SV) No-hub cast iron soil pipe and fittings manufactured in compliance with CISPI 301 and certified by NSF. Heavy duty couplings shall be “husky” heavy duty couplings in compliance with ASTM C1543, with neoprene gaskets in compliance with ASTM C564. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.

C. Condensate Drain Piping: Polyvinyl chloride pipe (PVC) ASTM D2665, PVC Type DWV fittings with solvent weld joints.

D. All traps shall have brass cleanout plug except where buried.

2.02 ROOF FLASHING:

A. Vent pipes passing through roof shall be flashed with a one piece pipe flashing unit constructed of E.P.D.M. rubber with an aluminum reinforcing ring suitable for a temperature range of minus 25 degrees F to 250 degrees F as manufactured by Butler Manufacturing Company or approved equal by Protech, or Aztec Master Flash. Flashing shall be installed in accordance with metal building manufacturer recommendations. Vents shall offset in roof joist area or ceiling cavity if necessary so that no vent shall be closer than 4'-0" from outside wall line.

2.03 DRAINAGE ACCESSORIES

A. Provide factory fabricated drainage piping products of the size and type as indicated on drawings, including features as specified herein. Where not indicated, provide proper selection as determined by installer to comply with installation requirements and governing regulations.

B. Floor drains shall be provided with trap primer connections where indicated on drawings.

C. All floor drains without trap primers shall be provided with deep seal "P" traps.

D. All floor drains and floor sinks located on elevated floors shall be provided with seepage holes and flashing collar or clamping rings to provide for leak proof installation.

2.04 CLEANOUTS

A. Vertical and horizontal lines exposed - Test Tee – Equal to Smith 4510.

B. Vertical lines concealed – Equal to Smith 4472 with stainless steel access cover.

C. Horizontal lines under unfinished floors – Equal to Smith 4405.

D. Finished floors – Equal to Smith 4023 cast iron adjustable floor level cleanout assembly with round polished bronze top.

E. Finished Floors - Linoleum, Terrazzo or Tile – Equal to Smith 4143 cast iron adjustable floor level cleanout assembly with round polished bronze top. Top depression to be covered with surrounding floor pattern bonded with waterproof adhesive.

F All lines outside of building - Equal to Smith 4400.

G. Finished floors - Carpet Equal to Smith 4023-Y cast iron adjustable floor level cleanout assembly with nickel bronze top and a 1-1/2 inches diameter stainless steel carpet marker.

Carpet shall cover top of cleanout with carpet marker exposed above carpet to serve as cleanout locator.

2.05 BASIC PIPING SPECIALTIES

A. Pipe Sleeves:

1. The Contractor shall install, as required, 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, equipment and devices furnished under each section of the Specification.

2. 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, except as otherwise indicated, and/or frames shall be installed flush with finished surfaces and grouted in place. Surfaces around opening shall be left smooth and finished to match surrounding surface.

3. Where pipes pass through floor slabs, sleeve shall be standard weight black steel pipe with top of sleeve 3 inches above finished floor. Where pipes pass through walls, sleeves shall be standard weight black steel pipe or 20-gage galvanized sheet metal with ends flush with wall surfaces.

4. Each pipe passing through walls, floors, ceilings or partitions shall be provided with sleeves having internal diameter one inch larger than the outside dimensions of insulated pipes.

5. All pipe sleeves through floors, roofs and masonry walls shall be built in place as the affected walls, floors, and roofs are built.

6. All penetrations through rated floors and walls shall be sealed with an approved, fire rated sealant as manufactured by 3M, Hilti, or Pecora Corp.

7. Sleeves through exterior wall shall be steel or cast iron pipe, flush with the exterior surfaces, and with the space between the pipe and the sleeves caulked watertight in an approved manner.

8. Inserts shall be cast iron or galvanized steel individual type, with accommodations for removable nuts and threaded rods up to 3/4 inch diameter, and permitting lateral adjustment.

B. Floor, Wall and Ceiling Plates:

1. Escutcheons shall be installed on all pipes where they pass through floors, ceilings, walls, or partitions in finished areas.

2. The interior of closets, adjacent to finished areas, shall be considered as finished for the intent of these Specifications.

3. Escutcheons shall be split, hinged, stamped brass type designed to fit the pipe, and to cover the terminating pipe sleeve, in chrome plated finish unless otherwise specified, with securing device to hold the escutcheon tight to the pipe.

2.06 PIPE HANGERS AND SUPPORTS

A. Provide pipe hangers and supports in accordance with Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment".

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install soil and vent piping pitched to drain at minimum slope of 1/4 inch per foot (2 percent) for piping 3 inches and smaller, and 1/8 inch per foot (1 percent) for piping 4 inches and larger.

B. Install piping and make all joints in accordance with the pipe manufacturer's recommendations. Make provisions for thermal expansion and contraction.

C. Install cleanouts on drainage piping where indicated on the drawings and as required by the code, and at every change in direction of more than 45 degrees in horizontal piping. Locate wall cleanouts as low as possible but high enough for the cover plate to clear the base. Locate test tees where necessary to separate sections of piping for testing.

D. Rough-in for fixtures in accordance with the fixture manufacturer's roughing-in drawings to provide the heights and locations indicated on the Architectural drawings or as specified.

E. Set floor cleanouts so that the top rims are level and flush with the finished floor surface and so that square and rectangular tops are parallel to the walls, unless otherwise noted.

F. Install piping and pipe supports as specified. Keep pipe ends closed except for vent and drain openings; protect vent and drains from the entrance of materials that could cause stoppage.

G. Vents shall terminate at 1'-0" above roof.

3.02 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform all excavation, trenching and backfilling for work under Division 22. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfilling shall be re moved and disposed of. Grading shall be done to prevent surface water from flowing into trenches and other excavation and any water accumulating therein shall be removed by pumping. All excavations shall be made by open cut. No tunneling shall be done.

B. Bottom of trench shall be uniformly graded to provide firm support and even bearing surface for pipe.

C. Pipe shall be laid on firm soil, laid in straight lines and on uniform grades. Provide bell holes so that barrels of pipe rest evenly on bottom of trench along entire length of pipe.

D. Pipe shall be inspected and tested prior to backfilling. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. Trench shall be hand filled to a minimum of 12 inches above the top of the pipe with clean earth and tamped to 95 percent compaction after first layer using the modified Proctor test method of compaction.

3.03 TESTS OF PIPING

A. Install temporary connections and plugs or valves at all points necessary for venting air from the piping, filling, holding test pressure, draining and flushing the piping.

B. Test all new soil, waste and vent piping under 10 feet head of water (except for the uppermost 10 feet) as required by the Plumbing Code, with zero leakage allowed. The test pressure shall be maintained for at least 30 minutes before inspection starts and maintained for the time necessary to inspect all joints but not less than 15 minutes.

3.04 OPERATIONAL TESTS

A. When installation and adjustment of all fixtures and equipment is complete, perform operational tests of all plumbing system components at normal operating pressures include the following tests:

1. Pour at least five (5) gallons of water into every floor drain to test for pipe stoppage.

B. All floor drain strainers shall be securely fastened to drain body.

C. During construction drains shall be kept covered so that traps, sediment buckets and dome type strainers are kept free from debris and trash.

END OF SECTION

SECTION 22 33 00 ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All work specified in this section is subject to the provisions of Section 22 05 10 “Plumbing General Requirements”.

B. Refer to the following sections for related work in connection with electric water heaters:

22 05 11	Plumbing Submittal Data
22 05 29	Hangers and Supports for Plumbing Piping and Equipment
22 05 53	Identification for Plumbing Piping and Equipment
22 10 00	Plumbing Piping and Pumps

1.02 DESCRIPTION OF WORK

A. The number and size of the electric water heaters are indicated on the drawings and schedules.

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. Provide water heaters which comply with ASHRAE/IESNA 90.1-2013 for energy efficiency.

C. U.L. and NEMA Compliances - Provide electrical components required as part of electric water heaters, which have been listed and labeled by Underwriters Laboratories and comply with NEMA Standards.

D. 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 plumbing equipment 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. Refer to schedule for heater size, capacity, electrical characteristics and element operation.

2.02 ELECTRICAL STORAGE TYPE WATER HEATER:

A. Tank Materials - Tank shall be welded steel construction, 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 factory insulated and provided with steel enclosure with baked enamel finish.

E. Controls - Adjustable thermostat, high temperature cut off and low water cut off.

F. Accessories - Provide the following water heater accessories:

Magnesium anode
ASME combination temperature and pressure relief valve.
Brass tank blowdown drain valve.
Thermometer
Automatic air vent
Watts No. 530 adjustable bleeder pressure relief valve.

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:

A.O. Smith
Lochinvar
Rheem
Ruud
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.

B. Connections - Make connections between water heaters and domestic water piping shutoff valves with unions or flanges as indicated. Provide dielectric isolation at all tank connections.

C. Pipe heater drain and relief valve drain, full size to mop sink.

D. Install bleeder pressure relief valve in tank drain line, set 25 psi below relief valve setting.

E. Where water heaters are indicated to be suspended above floor either above or below ceiling install heaters as detailed on drawings. Provide all necessary hanger rods, bolts, plates and miscellaneous steel as required.

F. Drain Pans - Provide drain pans constructed of 20 gauge galvanized sheet metal for all water heaters suspended above finished floor. Provide a minimum 1 inch drain from bottom of pan to nearest floor drain.

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.

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.

END OF SECTION

SECTION 22 42 00 COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. All work specified in this Section is subject to Section 22 05 10 “Plumbing General Requirements”.

1.02 DESCRIPTION OF WORK

A. Extent of plumbing fixtures and trim work is indicated by drawings and schedules, and by requirements of this section.

B. Refer to Division-26 sections for electrical connections to water coolers and other plumbing fixtures; not work of this section.

1.03 QUALITY ASSURANCE

A. Manufacturing: Firms shall be regularly engaged in the manufacturing of plumbing fixtures of the type, style and configuration required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Comply with applicable portions of the Plumbing Code, latest edition, pertaining to materials and installation of plumbing fixtures.

C. Comply with applicable ANSI standards pertaining to plumbing fixtures and systems, and bathtub units.

D. Comply with ANSI A117.1 standard and the Americans with Disabilities Act (ADA) pertaining to plumbing fixtures for handicapped.

E. Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

F. Provide water coolers which are rated and certified in accordance with applicable Air Conditioning and Refrigeration Institute standards and are listed by Underwriter's Laboratories.

1.04 SUBMITTALS

A. Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished, roughing-in dimensioned drawings, templates for cutting substrates, fixture carriers, and installation instructions.

B. Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in maintenance manual.

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.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES

A. Provide factory-fabricated fixtures of type, style and material scheduled on drawings. 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. 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.

B. 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, discoloration, 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. At locations where water is supplied (by manual, automatic or remote control), 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 shut-down of water supply piping systems.

B. Include removable P-traps where drains are indicated for direct connection to drainage system.

C. Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

D. Where fixture supplies and drains penetrate walls in exposed locations, provide chrome plated cast-brass escutcheons with set screw.

E. Provide aerators on all faucet sets of types approved by Health Departments having jurisdiction.

F. Comply with additional fixture requirements contained in fixture schedule.

2.04 MANUFACTURERS:

A. Subject to compliance with requirements, provide plumbing fixtures and trim of one of the following:

1. Plumbing Fixtures:
American Standard, U.S. Plumbing Products
Eljer Plumbing-ware Division, Wallace-Murray Corporation
Kohler Company

2. Plumbing Trim:
American Standard, U.S. Plumbing Products
Chicago Faucet Company
Eljer Plumbing-ware Division, Wallace-Murray Corporation
Kohler Company
Delta Commercial Faucet Co.
T & S Brass and Bronze Works, Inc.
Eastman Brasscraft
McGuire Manufacturing Co.

3. Flush Valves:
Coyne & Delaney Company
Sloan Valve Company
Zurn Industries, Inc., Hydromechanics Div.

4. Fixture Seats:
Bemis Mfg. Co.
Beneke Corp., Div. of Beatrice Foods
Church
Olsonite Corp., Olsonite Seats

5. Water Coolers:
Oasis
Elkay Mfg. Co.
Halsey Taylor Div.
Haws Drinking Faucet Co.

6. Mop Sinks:
Fiat Products, Unit of Mark Control Corp.
Stern-Williams Co., Inc.
Acorn Engineering Co.

7. Stainless Steel Sinks
American Standard, U.S. Plumbing Products
Elkay Mfg. Co.
Just Mfg. Co.
Kohler Co.

8. Fixture Carriers
Josam Mfg. Co.
J.R. Smith
Wade
Zurn Industries, Inc., Hydromechanics Div.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the Plumbing Code pertaining to installation of plumbing fixtures.

C. Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement.

D. Where fixtures are mounted against or abut walls, caulk along fixture.

3.02 CLEAN AND PROTECT

A. Clean plumbing fixtures of dirt and debris upon completion of installation.

B. Protect installed fixtures from damage during the remainder of the construction period.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match shall be judged by Architect. Remove cracked or dented units and replace with new units.

3.04 EXTRA STOCK

A. Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one (1) device for every ten (10) units.

END OF SECTION

SECTION 23 05 10 HVAC GENERAL REQUIREMENTS

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, and heating 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 appropriately apply to work specified in this division.

1.02 CODES, ORDINANCES, AND PERMITS

A. All heating, ventilating and air conditioning materials and workmanship shall comply with the following codes and standards as applicable:

1. The National Electric Code (2011 Edition)

2. The International Fuel Gas Code (2012 Edition)

3. The International Building Code (2012 Edition)

4. The International Mechanical Code (2012 Edition)

5. Energy Code ASHRAE/IES Standard 90.1-2010 Edition

B. Applicable Publications: 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 Standard (NFPA)
8. Sheet Metal and Air Conditioning Contractor's National Association Inc. (SMACNA)
9. Underwriters Laboratories Inc. (UL)

C. All work done under this Contract shall comply with all state and local code authorities having jurisdiction and with the requirements of the Utility Companies whose services may be used. All modifications required by these codes and entities shall be used 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. Where applicable, N.F.P.A. requirements shall be met.

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 shall 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.).

1.03 APPLICABILITY

A. The work specified herein shall include all labor, materials, equipment, tools, supplies and supervision required to install and place in operation the mechanical systems and appurtenances specified herein and/or indicated on the drawings or reasonably implied as necessary for completion of the various systems.

1.04 TEMPORARY HVAC

A. New HVAC equipment, i.e. air handling units, fans, etc. shall not be placed into service until the facility has been turned over to the Owner. All HVAC equipment warranties shall start on the day of the Owner's acceptance of the facility.

NOTE: The temporary use of the building HVAC systems during the construction period SHALL NOT be permitted with the following exceptions:

1. HVAC systems may be placed in operation only when temperature and humidity control is critical for the installation of final finishes, i.e. interior painting, lay-in ceilings, hardwood floors, paneling, etc. All air systems must be equipped with heavy duty, high efficiency air filters. Each air system shall be checked on a daily basis to determine the filter status.
2. HVAC systems must be operational during the time required for the TAB Sub-contractor to do the final testing, adjusting and balancing.

The above exceptions shall be permitted only at a point in time when the building has been cleared of all debris and swept clean and all air systems are fitted with high quality, construction grade air filters. The Architect and/or Engineer shall also be notified of any and all temporary use of the HVAC systems and shall be documented by the General Contractor. NO EXCEPTIONS.

NOTE: HVAC systems SHALL NOT be in operation when sheet rock sanding is being performed.

B. If space conditioning is required before the above conditions are satisfied, such space conditioning shall be the responsibility of the Contractor. If the Contractor elects to utilize the permanently installed building HVAC systems to provide the space conditioning, it shall be the responsibility of the General Contractor to ensure that the required warranty periods for all equipment provided are effective from the date of acceptance of the project.

1.05 COORDINATION OF HVAC DOCUMENTS

A. The HVAC work listed in these documents shall be coordinated with the work indicated on all other drawings, schedules, schematics, and specifications that are part of these construction documents. Should a conflict occur, the contractor shall submit a request for clarification to the engineer prior to bid opening. NO ALLOWANCES shall be made for any assumptions made by the contractor or any sub- contractors that are in direct conflict with the intent of the construction documents; in the event a conflict is discovered after construction has commenced, the resolution of the conflict shall be decided by the Engineer of Record, whose interpretation of the documents shall be final.

1.06 WELDERS QUALITY ASSURANCE

A. All welders shall be certified by ANSI B31.1.0-1967 “Standard Qualification Welding Procedures, Welders and Welding Operators” or “Qualification Tests” in Section IX, ASME Boiler and Pressure Vessel Code. Welder performance qualification tests shall be made in strict accordance with the above codes. Welders shall be certified for the type of pipe material specified herein. All costs incident to procedures and welder’s qualification tests shall be assumed by the Contractor. Two copies of the qualification test report and certification with the welder’s identification number, recommendation letter, etc. shall be delivered to the Architect before any welding commences.

PART 2 - PRODUCTS

2.01 COORDINATION OF PRODUCTS

A. 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 shop drawing submittals and shall be clearly indicated on the shop drawings. Any related modifications shall be the responsibility of the contractor and shall be performed without any additional cost to the Contract.

2.02 DESCRIPTION

A. All components of the mechanical systems shall be new. All equipment and products for which independent laboratory testing and labeling is applicable and/or required shall bear the Underwriter’s Laboratories, Inc. (UL) label.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall provide and prepare all openings for ducts and other HVAC work as required in walls, roof, ceilings, etc.; he shall also do all painting as may be required. He shall coordinate the installation of all mechanical equipment in the exterior wall and roof.

B. The HVAC plans do not give exact elevations or locations of lines, nor do they show all the offsets, control lines, or other 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, coordinated and satisfactorily operating installation.

C. 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, including plans, sections, elevations, etc., sufficient to indicate that the revised layout will fit and allow for required access to clearance.

D. The Contractor is 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, cores, etc.

E. The Contractor shall so coordinate the work of the several various trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interference 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.

F. Except where otherwise noted, all piping and ductwork in finished areas shall be installed in chases, furred spaces, above ceilings, etc. In all cases, pipes and ducts shall be installed as high as possible. Runs of piping shall be grouped whenever it is feasible to do so.

G. The Electrical Contractor shall bring adequate power to and make final connections to all equipment furnished under this contract. All control wiring shall be by the Controls Contractor.

H. Piping, equipment, or ductwork shall not be installed in electrical equipment rooms except as serving only those rooms. Outside of 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.
4. Provide access to equipment and apparatus requiring operation, service or maintenance within the life of the system. Including, but not limited to, motors, valves, filters, dampers, shock absorbers, etc. Equipment located above lay-in type ceilings is considered accessible.

3.02 ELECTRICAL WORK

A. Electrical equipment provided under this Division shall comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 26.

3.03 PROTECTION OF EQUIPMENT

A. Store equipment, including pipe and valves, off the ground and under cover. For storage outdoors, minimum 4-mil thick plastic shall be fitted to withstand splattering, ground water, precipitation and wind.

B. Protect air handling units coil by use of protective sheet metal panels or plywood.

C. Plug ends of pipe when work is stopped and close ends of ducts with plastic taped in place until work resumes.

D. Damaged equipment shall be repaired or replaced at the option of the Engineer of Record.

3.04 PAINTING

A. Factory painted equipment that has been scratched or marred shall be repainted to match original factory color.

B. All un-insulated black ferrous metal items exposed to sight inside the building, such as piping, equipment hangers and supports not provided with factory prime coat, shall be cleaned and painted with one coat of rust inhibitor primer. In addition, such items in finished spaces shall also be painted with two coats of finish paint in a color to match adjacent surfaces or as otherwise selected by the Architect.

C. Black ferrous metal items exposed outside the building, such as cooling tower support beams, un-insulated pipe and pipe supports not provided with factory prime coat, shall be cleaned and painted with one coat of rust inhibiting primer and two coats of an asphalt base aluminum paint. Insulated pipes outside the building shall be cleaned and painted with one 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. Labels shall also be protected from becoming illegible due to weathering.

F. Galvanizing broken during construction shall be re-coated with cold galvanizing compound.

G. All ductwork, piping, insulation, conduit or other appurtenances visible from finished spaces through grilles, diffusers or other such required openings shall be painted flat black.

3.05 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. Schedule work so existing systems will not be interrupted when they are required for normal usage of the existing building. Obtain approval from the Architect at least 7 days prior to any interruption to service of utilities.

3.06 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.

B. All surfaces shall be patched to the condition of the adjacent surfaces.

C. The Contractor shall make suitable provisions for adequately water-proofing at his floor penetrations of water proof membrane floors. This shall include but not be limited to floor drains, open sight drains, hub drains, clean-outs, and sleeves for the various piping. This also applies to membrane roofing systems.

3.07 SLEEVES, FLOOR AND CEILING PLATES

A. The Contractor shall install, as required, 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, except as otherwise indicated, and/or frames shall be installed flush with finished surfaces and grouted in place. Surfaces around opening 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 3 inches above finished floor. Where pipes pass through walls, sleeves shall be standard weight black steel pipe or 20-gage 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 diameter one inch larger than the outside dimensions of insulated pipes or ducts.

E. Pipe sleeves through floors, roofs and masonry walls shall be built in place as the affected walls, floors, and roofs are built.

F. Penetrations through rated walls and floors shall be packed, sealed and encapsulated per the applicable U.L. details(s).

G. Sleeves through exterior wall shall be steel or cast iron pipe, flush with the exterior surfaces, and with the space between the pipe and the sleeves caulked watertight in an approved manner.

H. Inserts shall be cast iron or galvanized steel individual type, with accommodations for removable nuts and threaded rods up to 3/4 inch diameter, and permitting lateral adjustment.

3.08 ESCUTCHEONS

A. Escutcheons shall be installed on pipes where they pass through floors, ceilings, walls, or partitions in finished 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, stamped brass type designed to fit the pipe, and to cover the terminating pipe sleeve, in chrome plated finish unless otherwise specified, with securing device to hold the escutcheon tight to the pipe.

3.09 CLEANING

A. Remove all stickers, rust, stains, labels, and temporary covers before final acceptance.

B. The exterior surfaces of all mechanical equipment, piping, ducts, etc., shall be cleaned of all grease, oil, paint, dust and other construction debris.

C. Ducts, plenums and casings shall be cleaned of debris and blown free of particles of rubbish and dust before installing outlet faces.

D. Bearings that require lubrication shall be lubricated in accordance with the manufacturer's recommendations. Provide written certification of lubrication.

E. Equipment rooms shall be left broom clean.

F. Fans operated during construction shall have temporary filters. Temporary filters shall be changed regularly to prevent contamination of the equipment and duct systems. Permanent filter shall be installed prior to final inspection.

G. End of open ducts and pipes shall be covered during construction except when working directly on such one prohibits covering. Cover with minimum four (4) mil thick polyethylene taped, tied or wired in place.

H. Clean and polish identification plates.

3.10 EQUIPMENT, MATERIALS AND BID BASIS

A. It is the intention of these Specifications to indicate a standard of quality for material incorporated in this work. 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 named manufacturers, although acceptable as manufacturers, must prove their product will perform satisfactorily and will meet space requirements, etc., and shall obtain pre-approval of their equipment, before submitting shop drawings, when their equipment achieves the required results in a manner different than that of the first named manufacturer. Where only one manufacturer is named, unless the Specifications state otherwise, manufacturers of similar quality products will be considered. Such unnamed manufacturer's products will however, be considered as substitutions and shall not be used as a basis for bidding. In the event the Contractor wishes to submit substitutions to the MDOT Architect for review he shall furnish descriptive catalog material, text data, samples, etc., as well as any other pertinent data necessary to demonstrate that the proposed substitutions are acceptable equals to the specified product. Refer to Section 01 25 00 “Substitution Procedures” for requirements. No substitutions shall be made without the written consent of the MDOT Architect.

B. The use of one named manufacturer in the schedules on the Drawings is for guide purposes. The provisions of the above paragraph will govern in the selection of products to be used.

3.11 GUARANTEE

A. Systems and components shall be provided with a one year guarantee from the time of final acceptance or beneficial occupancy (Coordinate with the MDOT Architect). The guarantee shall cover materials and workmanship. During this guarantee period, defects in materials and workmanship shall be corrected by repair or replacement without incurring additions to the Contract.

B. Air conditioning compressors shall be guaranteed for an additional four years. This additional guarantee shall be non-prorated on all parts, refrigerant, and labor.

3.12 FOUNDATIONS

A. Concrete foundations required by equipment furnished under the HVAC Division shall be constructed in conformance with the recommendations of the manufacturer of the respective equipment actually applied, and with the approval of the MDOT Architect. Corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") 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, if necessary. After removal of the forms, the surface of the foundation shall be rubbed. Unless otherwise noted, foundations shall be six inches (6”) high. Concrete work performed shall conform entirely to the requirements of the General Specifications that describe this class of work.

3.13 RECORDS AND INSTRUCTIONS FOR OWNER

A. The Contractor shall accumulate during the job's progress the following data in triplicate prepared in neat brochures or packet folders and turned over to the MDOT Architect/Engineer for check and subsequent delivery to the Owner:

1. Provide all warranties and guarantees, manufacturer's directions and material covered by the Contractor.
2. Provide approved fixture brochures, wiring diagrams, and control diagrams.
3. Provide copies of approved shop drawings.
4. Three sets of operating instructions for heating and cooling and other mechanical systems. Operating instructions shall also include recommended periodic maintenance and seasonal changeover procedures, and suggested procedures in 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, etc., by mark number from 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.

B. All of the above data shall be submitted to the MDOT Architect/ Engineer for approval at such time as the Contractor asks for his last estimate prior to his final estimate, but in no case, less than two weeks before final inspection.

C. The Contractor shall also give not less than 1 day 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 written operating instructions referred to in paragraph above shall be used as a basis for this on-the-job instruction.

D. A competent technician employed by the Temperature Control Subcontractor shall be required to instruct the Owner in proper operating procedures and shall explain the significance of the temperature control literature filed in the maintenance manual over a period of 6 hours while the system is in continuous operation as specified above.

3.14 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 buried or concealed work. In addition, 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. The "Record Drawings" shall consist of a set of mylar sepia prints of the Contract Drawings.

B. Record dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two (2) dimensions to permanent structures.

C. The Contractor shall mark all "Record Drawings" on the front lower right hand corner with a rubber stamp impression that states the following:

"RECORD DRAWINGS – “3/8" high letters to be used for recording field deviations,
and "5/16" high letters to be used for dimensional data only.

3.15 INSTALLATION

A. All equipment shall be installed in strict conformance with manufacturer's recommendations, as specified herein. If any conflict arises between these instructions, notify the Engineer immediately for clarification.

3.16 ACCESS DOORS

A. Furnish and install access doors at each point required to provide access to concealed valves, clean-outs, fire dampers and other devices requiring operation, adjustment, or maintenance. Access doors shall be 16 gauge steel, prime coat finish, with mounting straps, concealed hinge and screwdriver locks, designed for the doors to open 180 degrees.

B. Access doors installed in firewalls or partitions shall be UL Labeled to maintain the fire rating of the wall or partition.

C. Access doors shall be provided under this section of the specifications and furnished to the General Contractor to be installed.

D. Access doors shall be MILCOR or approved equal in accordance with the following:

1. Style AT Door for Acoustical Tile Ceilings
2. Style AP Door for Acoustical Plaster Ceilings
3. Style K Door for Plastered Wall and Ceiling Surfaces

4. Style DW Door for Drywall
5. Style ATR for Suspended Drywall Ceilings
6. Style M Door for Masonry, Ceramic Tile, Etc.
7. Fire-Rated 1-1/2 hr. (B-label) Door where required.

E. Size and type shall be as required for proper service and/or as may be directed by the MDOT Architect / Project Engineer.

F. Access door finish shall be chemically bonded to steel with a prime coat of baked on electrostatic powder. Color shall be as selected by MDOT Architect.

3.17 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

A. Materials and adhesives used throughout the mechanical and electrical systems for insulation, and 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. (Note: Materials need not meet these requirements where they are entirely located outside of a building and do not penetrate a wall or roof, and do not 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)".

3.18 EQUIPMENT FURNISHED BY OWNER

A. The contractor shall unload, uncrate, assemble, and connect 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, set in place, connected, tested, adjusted, and placed into operation.

3.19 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 specification Division 23. Any requirements for such are beyond the scope of this contract and shall be done only by hose persons contracted to do so.

3.20 PROTECTION OF EXPOSED PIPING

A. All piping exposed to freezing shall be heat traced as per manufacturer’s recommendations per Section 23 05 33 “Heat Tracing for HVAC Piping” and insulated per Section 23 07 00 “HVAC Insulation”.

END OF SECTION

SECTION 23 05 11 HVAC SUBMITTAL DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions, and Section 23 05 10 HVAC General Requirements, apply to all work herein.

1.02 QUALITY ASSURANCE

A. 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. The Contractor shall submit to the Architect a sufficient number of copies of all such Shop Drawings or catalog data to provide him with as many reviewed copies as he may need, plus three (3) copies for retention; one by the Project Engineer, MDOT Architect and one by the Engineer.

B. Before submitting shop drawings to the MDOT 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 of the official review by the MDOT Architect. Shop drawings which have not been reviewed by the MDOT Architect shall not be used in fabricating or installing the work.

C. The review of shop drawings or catalog data by the MDOT Architect shall not relieve the Contractor from responsibility for deviations from the Drawings and Specification unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the MDOT Architect. Also, it shall not relieve him from responsibility for error of any kind in shop drawings. When the Contractor does call such deviations to the attention of the MDOT Architect, he shall state in his letter whether or not such deviations involve extra cost. If this is not mentioned, 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.

PART 2 - PRODUCTS

2.01 GENERAL: Products shall be new and bear all labels which are identified by the applicable Specification Section and Contract Documents.

PART 3 - EXECUTION

3.01 SUBMITTAL DATA

E. General

1. The submittal data to be furnished for this project shall comply with the Specifications and Contract Documents in their entirety. 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. Shop drawings will be returned unchecked unless the following information is included:
   a. 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 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.
   b. 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.
   c. Submitted equipment shall be identified on shop drawings with the same "Mark Numbers" as identified on Drawings or in Specifications.
   d. Pertinent data such as accessories shall also be marked.
   e. Deviations from the Contract Documents shall be clearly and completely highlighted.
3. HVAC submittal data shall be bound into separate volumes, each HVAC volume shall contain one copy of all specified equipment/shop drawing submittals. Each volume shall be provided with an index of materials and 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. FAILURE to provide BOUND AND IDENTIFIED SUBMITTALS will result in the AUTOMATIC REJECTION of the submittal data with NO EXCEPTION.

F. The bound submittals are to be submitted for review within 30 days after the Contract is awarded. NO submittal will be checked until ALL required submittals have been received by the Engineer. Only Automatic Temperature Controls, ductwork and piping fabrication drawings may be submitted after the completed bound submittal is reviewed and accepted by the Engineer.

G. The Contractor shall submit with the bound and 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 has been fully coordinated with the electrical contractor. No submittal data will be checked until this letter is submitted. Changes to the electrical requirements from the Contract Documents resulting from alternate equipment being submitted shall be performed without additions to the Contract Sum. Submit attachment and fastening methods for piping and equipment to the Engineer for approval. Shop drawings shall be submitted for each of the following:

1. Air Conditioning Units with fan, filter, and coil data
2. Automatic Temperature Controls

3. Coils
4. Compressors
5. Condensers/ Condensing Units
6. Disconnect Switches
7. Distilled Water System
8. Ductwork Accessories and Details
9. Evaporators
10. Fans
11. Furnaces
12. Gas Cocks
13. Grilles, Registers and Diffusers
14. Heaters
15. Insulation
16. Louvers
17. Motor Starters
18. Refrigerant Piping Diagrams and Layouts approved by the compressor Mfg.
19. Starters
20. Test, Adjusting and Balancing Reports and Forms
21. Thermometers, Gauges, etc.
22. Valves
23. Vibration Isolators (to be submitted with equipment being isolated)

D. The Contractor shall submit three copies of a letter, signed by an officer of the company, which states that the items listed below meet or exceed the criterion of the plans and specifications. This letter is to include a listing of each item to be used on the project along with the manufacturer name and model numbers.

1. Flexible Duct
2. Flexible Connectors
3. Ductwork Access Doors and Panels
4. Automatic Air Vents
5. Level Gauges
6. Filters
7. Pipe Guides
8. Flow Measuring Devices
9. Dampers
10. Draft Control Equipment
11. Louvers
12. Roof Curbs
13. Pipe Hangers and Supports

3.02 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Description:

1. Complete operating and maintenance instructions shall be provided to the Owner. Two (2) separate copies shall be provided, and each copy shall be bound in a separate volumes. 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 instruction 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 instruction.

3. Prior to final acceptance or beneficial occupancy, provide the services of a competent representative to instruct the Owner in the operation of all systems for a period of not less than one (1) day. This instruction shall include a complete walk-through of all equipment and systems. The Architect reserves the right to attend any such meeting and shall be duly notified.

3.03 OTHER SUBMITTALS – CLOSEOUT DOCUMENTS

A. Submit two copies of the following prior to occupancy of the project by the Owner. See contract close-out documents in Division 01 of specifications.

1. As built drawings for HVAC systems.
2. Request for final payment.
3. Letter or “Release of Liens”.
4. Letter of “Guarantee”.
5. Submit two (2) copies of welder’s certificate.
6. Consent of Surety Company to final payment.
7. Power of Attorney.
9. Manufacturer's representative shall certify that HVAC equipment and valves are installed in accordance with the manufacturer's recommendations.
10. Contractor’s Affidavit of Payment of Debts and Claims.

END OF SECTION

SECTION 23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. Electrical work specified in this section shall comply with the provisions of Division 26. Mechanical work specified shall be in accordance with Division 23.

B. Motors shall be provided as noted herein.

C. A motor starter shall be provided under this section for each motor including package units which shall be furnished with integral starters. Motor starters shall be installed either in a motor control center or separately mounted adjacent to the motor served as shown, indicated and/or required. Motor starters not provided in the motor control center under Electrical Specifications Division 26, shall be provided.

D. Motor power wiring is defined as those conductors between the energy source and the motor. This power wiring shall be terminated at motor terminals and will be provided under Division 26 work.

E. All control wiring required for automatic starting and stopping of motors shall be provided under this Division unless specifically shown on the Electrical Drawings.

F. Power wiring will be connected through all line voltage control devices such as firestats and thermostats by Division 26 work.

G. Smoke detectors by Division 26.

H. System power wiring to be under Division 26.

PART 2 - PRODUCTS

2.01 STARTERS

A. The mechanical contractor shall provide for each and every motor that is a part of his equipment, a properly sized motor starter. This includes, but is not limited to the following: Air handling unit motors, chiller starters, pumps, boilers, system controls, variable speed control devices, cooling towers, pilot lights, push button controls, etc., and shall be furnished complete as a part of the motor apparatus which it operates. Components shall be in conformance with the requirements of the National Electrical Codes (NEC) and Division 26 of this Specification. Starters for fractional horsepower motors shall be furnished and installed under Division 26 and as noted herein.

B. Motor starters shall be turned over to the electrical contractor for installation with the following exceptions:

1. Starters for all motors that are 1/2 horsepower and smaller and are 120 volts, single phase shall be provided and installed by the electrical contractor.
2. Motor starters and motor control devices will be furnished and installed in Division 26 where motor control centers are provided by the Electrical Contractor.

C. Manual operated motor with magnetic controllers shall be pushbutton type. Automatic controlled motors shall have automatic (H.O.A.) switches. Magnetic starters shall have red and green pilot lights on cover. Power wiring and control circuits shall be run in rigid conduit and shall conform to the NEC standards.

D. Poly-phase motors and motors that are automatically controlled shall be furnished with magnetic starters, full voltage, non-reversing type, complete with necessary auxiliary contacts for controls unless otherwise noted. Heaters shall be of the melting alloy type, sized to the exact nameplate running current of the motor. Overloads shall have visual trip indicators and shall be trip-free with reset button held in. All magnetic motor starters or controllers shall be equipped with one overload element in each phase. All starters for 3-phase motors, 3hp/3kw and larger, shall include protection against loss of one phase or phase reversal and voltage fluctuations.

E. Starters for motors 1/3 horsepower or smaller shall be manual unless remote or automatic starting is required, in which case the starters shall be magnetic, full voltage, non-reversing, single speed, unless otherwise indicated.

F. Each starter for a three-phase motor shall be combination magnetic type with circuit breaker and shall be furnished with three (3) overload relays sized for the full load running current of the motor actually provided. Provide an external “RESET” button or “HAND-OFF-AUTO” selector switch as scheduled with red “RUNNING” light. Provide a green pilot light to indicate motor “STOPPED”. Each pilot light shall have a legend plate indicating reason for signal.

G. Each overload relay shall have normally open alarm contact which will close only when actuated by an overload (not to be confused with N.O. or N.C. auxiliary contacts). These contacts shall be properly wired to their respective blue pilot light provided on the starter front cover and having a “TRIPPED” legend plate.

H. Provide two sets each of normally open and normally closed auxiliary contacts for all magnetic starters. See equipment schedules on plans for voltage requirements.

I. Individually mounted motor starters shall be in a NEMA Type 1 general purpose enclosure in unfinished areas and shall be flush mounted in finished areas. Each starter shall have a laminated nameplate to indicate Division 23 unit number, function and circuit number. Outdoor starters shall be rain-tight weatherproof.

J. All motor starters, push buttons and pilot lights shall be of the same manufacture as the switchboard.

K. Combination Starters: Combination starters shall consist of a circuit breaker and a motor starter mounted in a common NEMA Type 1 general purpose enclosure. The circuit breaker component shall be a minimum 22,000 RMS interrupting capacity and shall be as required in the Electrical Division.

2.03 MOTORS

A. Unless specifically noted otherwise in other sections of this Specification, motors and motor controllers shall meet the requirements specified in this Section. Motors shall be built in accordance with the current applicable IEEE and NEMA standards, and shall have voltage, phase, frequency and service as scheduled.

B. Each motor shall be suitable for the brake horsepower of the driven unit, rated with 1.15 minimum service factor and shall be NEMA design B. The motor temperature rise shall not exceed 104 degrees F. for drip proof motors, 122 degrees F. for splash proof motors and 131 degrees F for totally enclosed or explosion proof motors. The motor shall be capable of operating continuously at such temperature rises, and shall be capable of withstanding momentary overloads of 25 percent 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, shaft capacities, etc.

E. Motors larger than 1/2 horsepower shall have bearings with pressure grease lubrications fittings.

F. Motors connected to drive equipment by belt shall be furnished with adjustable slide rail bases except for fractional horsepower motors, which shall 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.

H. Unless otherwise indicated, motors smaller than 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 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. Variable speed motors operating over an adjustable range of speeds shall be motors specifically designed and rated for this duty.

J. 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 and shall then coordinate the change and shall pay all additional charges in connection with the change.

2.04 IONIZATION SMOKE DETECTORS:

A. Provide and install ionization smoke detectors in all air handling units. Detectors are to be installed in both the supply and return air duct connections at each unit. Detectors are to be installed by the mechanical contractor and furnished and wired by the electrical contractor in Division 26.

B. Detectors shall de-energize air systems when and if particles of combustion are detected in the air stream. Detectors shall be fitted with sampling tubes that are sized to fit duct widths. Provide a manual reset switch and interlock with the building fire alarm system if such exists.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide control wiring and install motor starters, unless integrally factory mounted on a piece of equipment.

B. Provide control wiring to motors except packaged units that are prewired between the starter and motor.

C. Where line voltage control devices are mounted at or inside a unit, such as aquastats, firestats for single phase devices, etc., the power wiring to the unit shall be connected through such a control device by the work of Division 26.

D. On final inspection, it shall be demonstrated to the Engineer or his representative that each overload relay control circuit is properly wired and functioning correctly by manually tripping each overload relay individually, one at a time. This inspection procedure shall not involve removal of wiring or disconnecting current carrying parts.

E. Standard minimum one-year warranty on electrical equipment provided herein shall apply.

3.02 ELECTRICAL WORK

A. Electrical equipment provided under this Division shall comply with the electrical system characteristics indicated on the Electrical Drawings and specified in Division 26.

B. Power wiring and final power connections to the system shall be provided under Division 26.

C. Control wiring (120V. and less) shall be provided under Division 23 and extended from the 120V power circuits indicated on the Electrical Drawings. All wiring for voltages higher than 30 volts shall be done by a licensed electrician.

D. All electrical characteristics shall be taken from the Electrical Drawings and Specifications and coordinated before equipment is ordered or submitted.

END OF SECTION

SECTION 23 05 15 DESIGN CONDITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The requirements of the General Conditions, Supplementary conditions, and Section 23 05 10 ”HVAC General Requirements” apply to work herein.

PART 2 - PRODUCTS

2.01 DESIGN CONDITIONS

A. Outside conditions are as follows:

	Dry Bulb Deg. F.	Wet Bulb Deg. F.
Summer Outside Air Temperature	98	80
Winter Outside Air Temperature	0	

B. The indoor design condition for cooling is 72 deg. F. dry bulb/50 percent relative humidity.

C. The indoor design condition for heating is 72 deg. F. dry bulb.

D. Range of indoor design goals for HVAC sound control:

1. Occupied space shall have a Noise Criterion (NC) curve range not to exceed NC 30.

E. Building envelope design criteria - these values are repeated here to alert the General Contractor to the properties of materials used in the calculation of heating and cooling loads for this project. It shall be the responsibility of the General contractor to notify the Project Engineer, MDOT Architect, and Engineer if materials with properties other than those stated below are used in the construction of this project:

1. Typical vision glass shading coefficient - 1.0
2. Typical vision glass "U" values - 1.08
3. Insulated exterior walls transmission coefficient-0.075 BTU(hr.) (F deg.)(sq.ft.)
4. Roof heat transmission coefficient - 0.05 Btu/(hr.)(F deg.)(sq. ft.)

2.02 QUALITY ASSURANCE

A. 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 govern.

PART 3 - EXECUTION

3.01 PRESSURE TESTING / RECORDING

A. Pressure tests shall be observed by the Engineer. He may delegate others, i.e. Project Engineer, MDOT Architect, General Contractor, Clerk of Works, etc., to observe tests in his absence. Said tests and time duration shall be recorded and posted onto the pipe segments as indicated on the project set of construction documents.

END OF SECTION

SECTION 23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions, and Specifications Section 23 05 10 “HVAC General Requirements” apply to work of this section.

1.02 DESCRIPTION OF WORK

A. 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.

B. "C" CLAMPS may be used as point of attachment to building structure for pipe hangers and/or all-thread rods; however, piping shall not be supported directly by “C” clamps.

C. Do not pierce waterproofing with support bolts.

D. Ferrous metal hangers and supports, not otherwise coated, shall be provided with a field-applied coat of zinc chromate primer prior to installation. In lieu of field painting, the Contractor may furnish cadmium plated, or galvanized hangers and supports.

1.03 QUALITY ASSURANCE

A. 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-69.

B. Provide an adequate suspension system in accordance with recognized engineering practices, using where possible, standard commercially accepted pipe hangers and accessories. Submit fastening methods to the Engineer for approval and as approved copy to the engineer.

C. 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.

D. For the purpose of this specification, Anvil International product figure numbers are given. Equal products by B-Line and Michigan Hanger Co. (M-Co) are acceptable.

1.04 DESIGN

A. Supporting steel not shown for the equipment will be designed, supplied and erected by the Contractor; the supporting steel is that steel which is connected to the structural steel shown on the Drawings and carries the weight of the mechanical items. This supporting steel design must carry the dead weight and dynamic load imposed by the equipment, piping and other mechanical components.

B. The supporting steel shall be connected to the structural steel in such a manner as not to overload the structural steel. It is the responsibility of the General Contractor, mechanical contractor and the steel fabricator to verify that this purpose is accomplished. It is the responsibility of the General Contractor to call to the attention of the MDOT Architect-Engineer any deficiency prior to bidding.

C. Where thermal movement in the pipe line will occur, the pipe hanger assembly must be capable of supporting the line in operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger in order to prevent excessive stress in either pipe or connected equipment.

PART 2 - PRODUCTS

2.01 UPPER ATTACHMENTS

A. Wood Construction: Support piping in wood construction with Side Beam Bracket, Anvil International Fig. 202 or Hanger Flange, Anvil International Fig 128R, using lag screws.

2.02 WALL SUPPORTS

A. Where piping is run adjacent to walls or steel columns welded steel brackets Anvil International Fig. 195 and 199 may be used. The bracket shall be bolted to the wall and a back plate of such size and thickness as to properly distribute the weight.

2.03 FLOOR SUPPORTS

A. Where pipe lines are located next to the floor and no provision for expansion are required support piping with Anvil International Fig. 258, pipe rest with nipple and floor flange.

B. Where provisions for expansion are required support piping with Anvil International adjustable pipe stand Fig. 274, or pipe roll stand Fig. 271.

C. Vertical piping shall be supported at using riser clamps Anvil International Fig. 261, for steel and cast iron pipe, and copper clad riser clamp Anvil International Fig. CT-121 for copper piping.

2.04 SUPPORTS FOR PIPING OUTSIDE THE STRUCTURE

A. Support piping outside the structure on adjustable pipe supports Anvil International Fig. 264.

2.05 INTERMEDIATE ATTACHMENTS

A. Supports for horizontal piping shall be all-thread galvanized steel rods, ASTM A-107, Anvil International Fig. 146, of the following sizes:

Pipe Size	Hanger Rod Diameter
2" and smaller	3/8"
2-1/2" and 3"	1/2"
4" and 5"	5/8"
6"	3/4"
8" to 12"	7/8"

14" and 16"	1"

2.06 PIPE ATTACHMENTS

A. Hangers for insulated pipe shall be sized to bear on the outside of the insulation.

B. Hangers for steel and cast-iron horizontal piping where provision for expansion are not required shall be Anvil International Fig. 260, clevis type with vertical adjustment.

C. Hangers for uninsulated copper pipe 4 inches and smaller shall be copper plated adjustable band hangers Anvil International Fig. CT. 99C, for pipe sizes over 4 inches provide Anvil International copper clad clevis type hanger with a copper clad saddle at each hanger location.

D. Hanger for PVC pipe shall be Anvil International Fig. CT. 99, adjustable band hanger.

E. Hangers for steel and copper piping where provisions for expansion are required shall be Anvil International Fig. 171 or Fig. 181, adjustable roller hanger with Anvil International Fig. 160, pipe covering protection saddles.

F. Pipe guide shall be Anvil International Fig. 256.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Support horizontal equipment such as in-line pumps, strainers, expansion tanks, independently of the piping system.

B. Hang pipe from substantial building structure. Pipe shall not be hung from other piping.

C. Provide a hanger within one foot of each elbow.

D. Provide a hanger within one foot of each riser in addition to the riser clamp support at every other floor.

E. Unless specified otherwise, provide the following support spacing.

1.

Pipe Size	Support Spacing
1" and smaller	5’-0”
1-1/4" and larger	10’-0”

END OF SECTION

SECTION 23 05 53 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 APPLICABILITY:

A. Work specified in this Section shall comply with Section 23 05 10 “HVAC General Requirements”.

B. Above ground piping inside the building shall be identified with color bands at each shut-off valve, each piece of equipment, branch take-off, and 40'-0" maximum spacing on exposed straight pipe runs.

PART 2 - PRODUCTS

2.01 PIPE MARKINGS

A. Pipe markings shall be manufactured preprinted markings in accordance with the following:

1. No tape or self-adhering markers will be allowed.
2. Snap on pipe markers, W. H. Brady Co. or approved equal are acceptable.
3. Markers shall be strapped on with nylon fasteners.
4. Markers will be non-corrosive, non-conductive, mildew resistant and impervious to moisture.

2.03 BAND AND LETTER SIZE

A. Band and letter sizes shall conform to the following table:

O.D. of Pipe	Width of Color Band	Size of Letter/Numbers
1-1/4” and smaller	8”	1/2”
1-1/2” to 2”	8”	3/4”
2-1/2” to 6”	12”	1-1/4”
6” to 10”	24”	2-1/2”
Over 10”	32”	3-1/2”

2.04 IDENTIFICATION

A. Band legend and color and letter color shall conform to the following table:

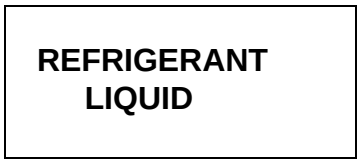
Piping Band	Legend	Letters	Band Color
Refrigerant Liquid	RL	Black	Yellow
Refrigerant Suction	RS	Black	Yellow
Refrigerant Discharge	RD	Black	Yellow
Drain	D	Black	Green

B. Equipment, such as air units, condensing units, fans, etc., furnished by this contractor shall be permanently labeled in an approved manner corresponding to the mark or name shown on the Drawings and/or Specifications.

C. For applications where existing color schemes may already be in place, new work requiring identification and color coding shall match the existing color schemes.

2.05 PIPE MARKING LOCATIONS

A. The following are examples of types of identification to be used for piping located above ceilings:



PART 3 - EXECUTION

3.01 EXECUTION

A. Locate pipe identification in the following areas:

1. Each riser and each valve,
2. One on each side where piping pass thru walls and floors,
3. Locate at or near each change in direction,
4. Every 40 feet along continuous runs,
5. Located within 4 feet of exit or entrance to a vessel or tank.

B. Indicate pipe content flow direction with arrows of matching style and placed so the arrow points away from the legend.

END OF SECTION

SECTION 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification Sections apply to work in this section.

1.02 SUMMARY

A. This Section specifies the requirements and procedures total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the quantities of the mechanical systems as required to meet design Specifications, and recording and reporting the results.

B. Test, adjust, and balance the following mechanical systems:

1. Airside systems: Supply air, return air, relief air, exhaust air, and outside air systems, all pressure ranges; verify temperature control systems operations.

C. This Section does not include:

1. Specifications for materials for patching mechanical systems; specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.

1.03 SCOPE OF WORK

A. A Test and Balance Agency that is independent of contractor or manufacturer shall perform the testing, adjusting and balancing and prepare reports, and deliver them to the MDOT Architect. The independent Test and Balance Agency shall be a certified member of the Associated Air Balance Council (AABC). The Test and Balance Agency contract shall not be assigned to Subcontractor; the Agency shall work directly under the General Contractor.

B. Total System Balance shall be performed in accordance with the latest edition of the AABC National Standards for Total System Balance, and in accordance with the scope of work defined by the Contract Documents.

C. Testing and Balance Agency as part of its contract shall act as an authorized inspection agency, responsible to the Owner's Representative, and shall, during the test and balance, list systems that are installed incorrectly, require correction, or have not been installed in accordance with Contract Drawings and Specifications.

D. Upon the completion of the test and balance work, the Agency shall compile the test data and submit the specified number of copies of the complete report to the Owner's Representative for his evaluation and approval.

E. Test, adjust and balance the air systems. After testing, adjusting, and balancing is complete, the Contractor shall visit the job during the heating cycle and during the cooling cycle to make adjustments to provide uniform temperatures throughout the building. Schedule the trips during the months of December through February for the heating cycle, and June through August for the cooling cycle. Obtain signed statements from the Using Agency acknowledging these two trips and subsequent adjustments. Submit statements to the Project Engineer and MDOT Architect.

F. General Contractor shall furnish test and balance contracting agency for this project. The Test and balance agency shall work under the direction of the Professional.

1.04 DEFINITIONS

A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:

1. The balance of air systems;
2. Adjustment of total system to provide design quantities;
3. Electrical measurement;
4. Verification of performance of all equipment and automatic controls;

B. Test: To determine quantitative performance of equipment.

C. Adjust: To regulate the specified air patterns as applicable at the terminal equipment (e.g., reduce fan speed, throttling).

D. Balance: To proportion flows within the distribution system (sub-mains, branches, and terminals) according to specified design quantities.

E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.

F. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.

G. Terminal: The point where the controlled air enters or leaves the distribution system. These are supply inlets and return outlets on air terminals and exhaust or return inlets on air terminals such as fans, furnaces, registers, grilles, diffusers and louvers.

H. Main: Duct containing the system's major or entire air flow.

I. Sub-main: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.

J. Branch Main: Duct serving two or more terminals.

K. Branch: Duct serving a single terminal.

1.05 SUBMITTALS:

A. Agency Data:

1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.

B. Certified Representative and Technicians Data:

1. Submit proof that the Test and Balance certified representative assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.

C. Certified Reports: Submit testing, adjusting, and balancing reports bearing the certified seal and signature of the Test and Balance representative. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:

1. Draft reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 3 complete sets of draft reports. Only 1 complete set of draft reports will be returned.
2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 4 complete sets of final reports.
3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
   a. General Information and Summary
   b. Air Systems
   c. Temperature Control Systems
   d. Special Systems
4. Report Contents: Provide the following minimum information, forms and data:
   a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Owner, Owner's Representative, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance registered representative. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.
   b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

D. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.06 QUALITY ASSURANCE

A. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency

meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems specified to produce the design objectives.

2. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

B. The independent testing, adjusting, and balancing agency certified by Associates Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one registered in the State in which the services are to be performed, certified by AABC as a Test and Balance representative.

C. Codes and Standards:

1. AABC: "National Standards for Total System Balance".
2. ASHRAE: ASHRAE Handbook, HVAC Applications, Testing, Adjusting, and Balancing.

1.07 FINAL INSPECTION:

A. All systems, when completed, shall be operated by the organization to test the performance as directed by and to the satisfaction of the Using Agency.

B. Systems shall be balanced within the stated tolerances at the design conditions. The Owner's Representative may request or perform a check reading on up to 10 per cent of the outlets and duct traverses. If any reading varies beyond the stated tolerances, the system will be considered out of balance and the entire system be readjusted and a new report prepared at no additional cost to the Owner.

C. Heating, ventilation and air conditioning systems shall maintain uniform temperatures without drafts through the normal change of seasons. The Owner's Representative may request new design settings on up 20 per cent of the air outlets and coil connections for final adjustment of the system during the first year of operation at no additional cost to the Owner.

D. Air ducts shall circulate without excessive noise.

E. All defects demonstrated by inspections and tests shall be remedied immediately to the Architect' satisfaction.

1.08 PROJECT CONDITIONS

A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS:

A. Except as otherwise indicated, use same products as used by original Contractor for patching holes in insulation, ductwork, and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

PART 3 - EXECUTION

3.01 REQUIRED DOCUMENTS

A. The Contractor shall provide the following, in a timely fashion, to the Test and Balance Agency:

B. Contract drawings (complete set)

C. Applicable specifications (Div. 23 & 26, as a minimum)

D. Related addenda

E. Related change orders

F. Related reviewed shop drawings

G. Related reviewed equipment manufacturer's submittal data

H. Reviewed equipment control drawings

3.02 COOPERATION

A. The Contractor and his subcontractors shall cooperate fully with the Test and Balance Agency and provide:

1. Completely operable systems
2. The right to adjust the systems
3. Access to systems components

3.03 BELT DRIVES

A. Adjustable speed drives are to be adjusted by the Test and Balance Agency. In cases where the specified capacities cannot be obtained with the original adjustable sheave or original fixed drive sheave, the Agency is to report to the Contractor the sheave size required to obtain the specified capacity.

B. Where larger or smaller sheave sizes are required, the Contractor shall provide new sheaves and, if required, new belts at no additional cost to the Owner.

3.04 CONTROL PERFORMANCE CHECK

A. The results produced by the operation of rooftop and fan systems controls shall be checked by the testing agency; controls requiring adjustment shall be listed and reported to the Contractor. This does not reduce the responsibility of the Contractor for the checking and adjustment required for a fully operational control system. The Test and Balance Agency is responsible only for final settings; the Contractor is responsible for completeness and correctness of all the control systems.

3.05 SETTINGS

A. The Test and Balance Agency shall permanently mark the settings of all dampers, valves and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall be set and locked.

3.06 MEASUREMENTS

A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

B. Provide instruments meeting the specifications of the referenced standards.

C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

D. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.

E. Take all reading with the eye at the level of the indicated value to prevent parallax.

F. Take measurements in the system where best suited to the task.

3.07 PERFORMING TESTING, ADJUSTING, AND BALANCING

A. Cut insulation and ductwork, for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

B. Patch insulation, ductwork, and housings, using materials identical to those removed. Seal ducts, and test for and repair leaks. Seal insulation to re-establish integrity of the vapor barrier.

C. Mark equipment settings, including damper control positions, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

D. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.08 RECORD AND REPORT DATA

A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.

B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.09 REPORT

A. The following items shall be tested, recorded, and incorporated in the test and balance report. The report shall not be limited to these items, but shall include these tests as minimum requirements.

1. Record each equipment manufacturer, model numbers and serial numbers.
2. Test, adjust and record required and measured total CFM for each air system and component. Test and record quantity of exhaust or relief air in CFM.
3. Test, adjust and record all required and measured outside air quantities and return air CFM.

4. Test and record required and measured system static pressures; filter differential, and fan total static pressure. Test and record pressure drop through the air system units.
5. Record all installed fan drive assemblies; fan sheaves, motor sheaves, and belts.
6. Record each installed motor manufacturer.
7. Record each installed motor horsepower.
8. Test and record each motor name plate and measured voltage and full load amperage.
9. Test, adjust, and record each blower RPM.
10. Test and adjust the CFM delivery of each diffuser, grille, and register.
11. Identify the location of each diffuser, grille, and register.
12. Record the size, type, and manufacturer of each grille, register and diffuser.
13. Data obtained for each diffuser, grille and register shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
14. All diffusers, grilles, and registers shall be adjusted to minimize drafts.
15. All tests shall be made with supply, return, relief and exhaust systems operating, and all doors, windows, etc. closed or in their normal operating condition.
16. All damper positions shall be permanently marked after air balancing is complete.
17. The final balanced condition of each area shall include the testing and adjusting of pressure conditions. Front doors, exits, etc., should be checked for air flow so that exterior conditions do not cause excessive abnormal pressure conditions.
18. Indicate on floor plans the locations and results of the sound measurements taken.

3.10 SYSTEM BALANCING REQUIREMENTS

A. Testing, adjusting and balancing shall be provided for all airside systems and equipment specified and indicated in the Contract Documents.

END OF SECTION

SECTION 23 07 00 HVAC INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Specification section 23 05 10 “HVAC General Requirements”, apply to work of this section.

1.02 DESCRIPTION

A. All insulation products used outside of mechanical rooms 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 shall be installed in accordance with the insulation manufacturer's recommendations. Insulation 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 Foamglass Insulation, Calcium Silicate or Perlite and shall be 2" longer than the pipe shields. Pipe shoes welded to the pipe shall be used for roll type hangers.

D. Required tests of the relevant sections of pipe, ductwork, or equipment 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. Exhaust Ducts
2. Vents from pressure relief valves.
3. Ducts with internal lining or factory insulated ducts.

H. Clean and dry surfaces to be insulated from loose scale, dirt, oil, moisture and other foreign matter.

I. Insulate completely metal surfaces of piping, ductwork and equipment other than hangers.

J. Surface finishes shall present a tight smooth appearance.

K. Permit expansion and contraction without causing damage to insulation or surface finish.

L. Surface finish shall be extended to protect surfaces, ends, and raw edges of insulation.

M. Vapor barriers shall be continuous and uninterrupted throughout the system where specified, except where insulation is interrupted for fire dampers. See Drawing details for special conditions.

1.03 PIPING

A. Insulate valves, strainers and fittings. For the purposes of this Specification, fittings include unions and flanges. Use premolded material where available. Insulate valves up to and including bonnets.

B. Pipe Hangers that are installed in direct contact with the surface of the pipe, such as a pipe clamp shall have the insulation applied over the hanger as well as the pipe. Provide a rain shield on piping supported on hangers outdoors to prevent bulk water from entry.

1.04 DUCTWORK

A. Insulation shall cover standing seams and metal surfaces. Materials shall be applied subject to their temperature limits.

1.05 QUALITY ASSURANCE

A. 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.

B. 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. Material shall be furnished to the job bearing the manufacturer's label.

C. Insulation products shall be as manufactured by Pittsburgh Corning Corporation, Resolco, Owens-Corning, Certainteed or Armstrong.

PART 2 - PRODUCTS

2.01 EXTERIOR WRAP FOR ROUND DUCTWORK

A. Insulation equal to Johns Manville Duct Wrap. Insulate externally, all round ductwork with 2 inch thick blanket fiberglass duct insulation. Seams shall be taped with pressure sensitive tape and banded with nylon ties on 3'-0" centers.

B. The board type shall have a minimum 3 lbs. density, 1-1/2 inch thick with ASJ jacket. Insulation board shall have an average conductivity not to exceed 0.27 BTU/inch/ square foot/degree F / hour at a mean temperature of 75 degrees F.

2.02 ACOUSTICAL DUCT LINER

A. Duct liner shall be equal to Johns Manville "Permacote" Duct Liner. Acoustical duct liner shall be a flexible type with a minimum 1 inch thickness using long fiberglass with a smooth firmly bonded fire-resistant surface to prevent erosion of the insulation. Surface not to exceed 25 flame spread and 50 smoke development. Thermal conductivity shall not exceed 0.26 at 75° F. mean temperature.

B. Noise reduction coefficient (NRC) shall not be less than .60 based on acoustical materials test, Mounting No. 6. Completely coat all duct surfaces with Benjamin Foster 85-15 adhesive. Neoprene coated side on liner shall face air stream. Sections shall be jointed by coating the edges with Foster 30-36. Secure liner to duct system with self-adhering pins adhered to clean surface and secure with self locking washers, space pins not more than 4 inches from the edges and not more than 16 inches on centers. Lining shall meet National

Board of Fire Underwriters' Standards for Internal Duct Application and shall have a minimum density of 3 lbs. per cu. ft. All duct liner shall be marked with the density located so as to be visible on the exposed surface of the liner. Air friction correction factor shall not exceed 1.40 at 2000 FPM and 1.5 at 4000 FPM.

C. Insulate rectangular supply, return, and outside air ductwork internally as described in Paragraphs A and B.

2.03 FOAMED PLASTIC SHEET, AND TUBING

A. Sheet Insulation shall be equal to Armstrong Armaflex. Minimum of 4.5 lbs. per cu. ft. Thermal conductivity shall not exceed 0.28 at 75 degrees F mean temperature.

B. Insulate following piping with 3/4 inch Armstrong Armaflex foam plastic insulation:

1. Refrigerant Piping
2. Condensate drain Piping

2.04 ADHESIVES, MASTIC, COATINGS

A. Acceptable manufacturers include, but not limited to the following: Benjamin Foster, Childers, Insul-Coustic, EPOLUX, Minnesota Mining and Manufacturing Co.

B. Treatment of pipe jackets and duct facings to impart flame and smoke safety shall be permanent. The use of water-soluble treatments is prohibited.

C. Vapor barriers shall have a perm rating of not more than 0.05 perms. Adhesives, coatings and mastics shall have a perm rating of not more than 0.25 perms.

2.10 TAPE

A. Wherever tape is used for sealing purposes, it shall be of the type and shall be applied as recommended by the non-conductive covering manufacturer. Where recommendation is lacking, the tape used shall be sealed with adhesive equal to Minnesota Mining Adhesive EC-1329.

2.11 INSULATING CEMENT

A. Insulating cement shall be equal to O-C 110 mineral wool Benjamin Foster or Minnesota Mining, all purpose cement. Where insulating cement is applied to pipe fittings in concealed locations, it shall be "one-coat" cement.

PART 3 - EXECUTION

3.01 GENERAL

A. Surfaces to be insulated shall be clean, dry, and free of foreign material, such as rust, scale and dirt when insulation is applied. Perform pressure tests required by other Sections before applying insulation.

3.02 INSULATION FOR ALL PIPING SYSTEM

A. Insulate pipe, fittings, flanges, unions and valves.

B. Install insulation materials with smooth and even surfaces, jackets drawn tight and cemented down smoothly at longitudinal seams and end laps. Do not use scrap pieces of insulation where a full length section will fit.

C. Install insulation, jackets and coatings continuous through wall and floor openings and sleeves.

D. Application of all materials shall be in accordance with the manufacturer's instructions.

E. Butt all joints of pipe insulation together and secure all jacket laps with lap adhesive. Seal all butt joints with joint straps furnished with insulation.

F. Care shall be taken so as not to place insulation over vent and drain inlets and outlets.

G. Staples are not permitted on pipe insulation.

H. Insulate refrigerant piping appurtenances subject to sweating, such as thermometer wells, gauge cocks, and valve stems with preformed and mitered fiberglass pipe insulation. Finish with white vapor barrier mastic.

3.03 INSULATION FOR DUCT SYSTEM:

A. Secure insulation to duct with Benjamin Foster 85-15 adhesive applied in 4 inch strips around the duct on 8 inch centers. Nylon cord shall be used to secure the insulation. Where ductwork is 36 inches wide or more secure insulation to the bottom of the duct using self adhering pins and self locking washers placed not more than 18 inches on center. Insulation shall overlap lining and factory applied insulation a minimum of 2 inches. Vapor barrier at all butted joints or breaks shall be sealed with 4" inch wide foil reinforced tape adhered with Benjamin Foster 82-07.

B. Insulate ductwork exposed to the weather that is not lined with glass fiber semi-rigid board insulation 1-1/2 inch thick, 3 lbs. per cubic feet density. Secure to metal with self-adhering pins with self locking washers. Finish with standard weight glass cloth set in 1/16 inch weatherproof mastic similar to Seal-Kote. After drying, apply a 1/16 inch finish coat of waterproof mastic. Butt insulation joints and seal with mastic.

3.04 INSULATION FOR EQUIPMENT:

A. Secure insulation with insulation hangers and self locking washers, copper weldwire or galvanized bands. Miter to insure a tight fit. Seal joints with mineral wool insulating cement. Finish with standard weight glass cloth set between two 1/16 inch coats of white mastic. Insulate flanged ends of strainers, pumps, removable head sections, access plates and coupling with a removable 18-gage aluminum casing, lined with foamed plastic sheeting adhered to the inside of all surfaces subject to sweating. Casing shall be fabricated in two sections and joined with galvanized steel bolts. Casing shall be removed and reinstalled without damage to surrounding insulation. Attention is called to the fact that external duct insulation is required at Fire/Smoke dampers sleeves where dampers occur in lined ductwork.

END OF SECTION

SECTION 23 08 00 COMMISSIONING OF HVAC

PART 1 - GENERAL

1.01 DESCRIPTION

A. The purpose of this section is to specify the Contractor's responsibilities and participation in the commissioning process relative to Division 23.

B. Commissioning testing shall be performed by this division Contractor and documented by the Commissioning Authority. Commissioning is primarily the responsibility of the Commissioning Authority, with start-up, testing and support for commissioning the responsibility of the Contractors. The commissioning process does not relieve the Contractor from participation in the process or diminish the role and obligations to complete all portions or work in a satisfactory and fully operations manner.

C. Work of Division 23 includes:

1. Testing and start-up of the HVAC equipment.
2. Assistance in functional testing to verify equipment/system performance.
3. Providing qualified personnel to assist in commissioning tests, including seasonal testing.
4. Completion and endorsement of Pre-functional Construction Checklists provided by the Commissioning Authority to assure that Division 23 equipment and systems are fully operations and ready for functional testing.
5. Providing equipment, materials and labor necessary to correct deficiencies found during the commissioning process which fulfill contract and warranty requirements.
6. Providing operation and maintenance information and as-built drawings to the Commissioning Authority for review prior to distribution.
7. Providing assistance to the Commissioning Authority to develop, edit and document system operation descriptions.
8. Providing training for the systems specified in this Division.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

1. Shop Drawings
2. Completed Pre-Functional Construction Checklists
3. Preliminary TAB Report

1.03 RELATED WORK

A. All installation, testing and start-up procedures and documentation requirements specified within Division 23.

B. Section 01 91 00 COMMISSIONING.

C. Commissioning Functional Test Procedures that required participation of the Division 23 Contractors.

D. Cooperate with the Commissioning Authority in the following manner:

1. All testing and start-up procedures and documentation requirements specified within Division 01 and Division 23 and related portions of this project.
2. Allow sufficient time before final completion dates so mechanical systems start-up, test and balance, and commissioning can be accomplished.
3. Provide labor and material to make corrections when required without undue delay.
4. Put all heating, ventilation and air conditioning systems and equipment into full operation and continue the operation of the same during each working day of the testing, balancing and commissioning.
5. Include the costs of the dampers, replacement sheaves and belts, as required, to obtain satisfactory system performance as requested by the test and balance contractor or the Commissioning Authority.
6. Provide test holes in ducts and plenums where directed or necessary for pitot tubes for taking air measurements and to balance the air systems. Test holes shall be provided with an approved removable plug or seal. At each location where ducts or plenums are insulated, test holes shall be provided with an approved extension with plug fittings.
7. Provide pressure/temperature taps where directed or necessary for taking measurements to test and balance systems.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Standard test equipment for commissioning will be provided by the HVAC subcontractor.

B. HVAC contractor shall provide standard and specialized test equipment as necessary to test and start up the HVAC systems.

C. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment through the installing contractor. Manufacturer shall provide the test equipment, demonstrate its use and assist the Commissioning Authority in the commissioning process.

D. The contractor shall provide equipment, software and test programming support as necessary to start up, calibrate, debug and verify proper function of the control/facility management system. This equipment and software shall be provided for use by both the test and balance contractor and Commissioning Authority.

PART 3 - EXECUTION

3.01 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so the systems can be energized, started, tested and otherwise commissioned. Division 23 has primary start-up responsibilities with obligations to complete systems, including all sub-systems, so they are functional. This includes the complete installation of all equipment, materials, raceways, wire, terminations, controls, etc., per the Contract Documents and related directives, clarifications, change orders, etc.

B. A commissioning Plan will be developed by the commissioning Authority. Upon request of the commissioning Authority, the HVAC contractor shall provide assistance and consultation. The HVAC contractor is obligated to assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. If HVAC contractor-initiated system changes have been made that alter the commissioning process, the Commissioning Authority will notify the Project Engineer and MDOT Architect, and the HVAC contractor may be obligated to compensate the Commissioning Authority to test the revised product or confirm the suitability/unsuitability of the substitution or revision.

C. Specific pre-commissioning responsibilities of Division 23 are as follows:

1. Normal start-up services required for bringing each system into a fully operational state. This includes motor rotational check, cleaning, lug tightening, control sequences of operation, etc. The Commissioning Authority will not begin the commissioning process until each system is complete, including normal contractor start-up and debugging.
2. The HVAC contractor shall perform pre-functional construction checklists on the systems to be commissioned to verify that all aspects of the work are complete in compliance with the plans and Specifications. HVAC contractor start-up forms may be substituted for the pre-functional test forms with prior approval by the Commissioning Authority.
3. Notify Project Engineer, MDOT Architect, and Commissioning Authority when systems are ready for functional testing.

D. Commissioning is to begin upon completion of a system. Commissioning may proceed prior to the completion of systems and/or sub-systems, if expediting this work is approved by the Project Engineer and MDOT Architect. Commissioning activities and schedule will be coordinated with the HVAC contractor. Start of Commissioning before system completion will not relieve the Contractor from completing those systems as per the schedule.

3.02 PARTICIPATION IN COMMISSIONING

A. Commissioning testing shall be performed by this Division subcontractor and documented by the Commissioning Authority. Provide skilled technicians to start up and debug all systems within this division of work. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, times required for testing, etc., will be requested by the Commissioning Authority and coordinated by the HVAC contractor. HVAC contractor will ensure the qualified technician(s) are available and present during the agreed-upon schedules and of sufficient duration to complete the necessary tests, adjustments and/or problem resolutions.

B. System problems and discrepancies may require additional technician time, Commissioning Authority time, redesign and/or reconstruction of systems and system components. The additional technician time shall be made available for the subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to judge the appropriateness and qualifications of the technicians relative to each item or equipment, system and/or sub-system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment and an attitude/willingness to work with the Commissioning Authority to get the job done. A liaison or intermediary between the Commissioning Authority and qualified factory representative does not constitute the availability of a qualified technician for purpose of this work.

D. The test, adjust and balance subcontractor shall provide a preliminary TAB report with final test measurements to the Commissioning Authority and shall provide qualified technicians and instruments needed for balancing to demonstrate a sample up to 10 percent of measurements until specified results are achieved.

3.03 WORK TO RESOLVE DEFICIENCIES

A. In some systems, maladjustments, misapplied equipment, and/or deficient performance under varying loads will result in a system that does not meet the original design intent. Correction of work will be completed under direction of the architect, with input from the HVAC contractor, equipment supplier and Commissioning Authority. Whereas all members will have input and the opportunity to discuss, debate and work out problems, the Architect/ Engineer of Record will have final jurisdiction on the necessary work to be done to achieve performance.

3.04 ADDITIONAL COMMISSIOING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The Contractor, subcontractor(s), suppliers and Commissioning Authority shall include a reasonable reserve to complete this work as part of the standard contractual obligations.

B. The cost of compensation of the Commissioning Authority for repeat testing or troubleshooting due to systems that do not meet specified performance shall be borne by the HVAC contractor.

C. Corrective work shall be completed in a timely fashion to permit the timely completion of the commissioning process. Experimentation to render system performance will be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely to the commissioning process, the Commissioning Authority will notify the Project Engineer and MDOT Architect indicating the nature of the problem, expected stems to be taken and the deadline for completion of activities. If the deadline passes without resolution of the problem, the Owner reserves the right to supplementary services and equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner will be the HVAC contractor’s responsibility.

3.05 SYSTEMS TO BE COMMISSIONED

A. Indoor Heat Pumps

B. Outdoor Heat Pumps

C. Packaged Energy Recovery Ventilator

D. Energy Management Controls System

3.06 SOFTWARE

A. This HVAC subcontractor shall supply the Commissioning Authority with two (2) debugged printouts of all facility management systems software, including all user's manuals. Included in the printouts, though not limited to, shall be the following:

1. Point data base
2. All parameters required for proper operation of BAS control and utility firmware such as start/stop routines, etc.
3. System graphics

B. The software printout shall be fully documented for ease of interpretation by the Commissioning Authority and Owner without assistance from the HVAC contractor. English language description shall be either integrated with or attached to the BAS printout. The following shall be specifically documented:

1. All point names, I/O and virtual.
2. Sequences of operations.
3. Set-points

3.07 TRAINING

A. Per the specifications, the Contractor will be required to participate in the training of the Owner personnel for each system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

B. Contractor shall provide training to building occupants per Sections 01 79 00 Demonstration and Training, 01 91 00 General Commissioning and Division 23 requirements.

C. Provide a training syllabus fourteen (14) calendar days prior to the training to the Commissioning Agent for approval.

D. Provide a Training attendance sheet to the Commissioning Agent with names, company names, and contact information of training attendees.

END OF SECTION

SECTION 23 23 00 REFRIGERANT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions, and Section 22 05 10 HVAC General Requirements, apply to all work herein.

B. Refer to Specification Section 23 05 29 “Hangers and Supports for HVAC Piping and Equipment” for specification and installation requirements of the pipe support system.

C. Refer to Specification Section 23 07 00 “HVAC Insulation” for specification and installation of thermal insulation for the various types of pipe, fittings, and accessories specified in this section.

1.02 DESCRIPTION OF WORK

A. Extent of the piping systems work is indicated on the Drawings and schedules, and by the requirements of this section.

B. The construction requirements herein shall include appurtenant structures and buildings to which the piping system is to be connected.

1.03 QUALITY ASSURANCE

A. 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.

B. Firms regularly engaged in manufacture of piping products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years are approved.

C. Certify brazing procedures, brazes and operators in accordance with Section IX ASME Boiler and Pressure Vessel Code (ANSI B31.5). Two copies of the qualification test report and certification shall be submitted to the Architect.

1.04 DEFINITIONS: Pipe sizes listed are for outside diameter of the pipe (O.D.).

PART 2 - PRODUCTS

2.01 REFRIGERANT PIPE

A. All Pipe Sizes:

1. Type: Copper tubing of the pipe sizes listed.
2. Class: ACR Type L hard drawn tubing, ASTM B-88
3. Fitting: Sweat type wrought copper.
4. Joints: Socket brazed with 95-5 tin-antimony

B. Accessories: The refrigeration system shall include all accessories for complete and operable system. Accessories shall include, but not limited to: oil traps, filter dryers, expansion valves, sight glasses, solenoid valves, liquid charging, valves and strainers.

PART 3 - EXECUTION

3.01 GENERAL PIPE SYSTEM

A. Nonferrous Metallic Pipe: Where nonferrous metallic pipe, e.g., copper tubing, crosses ferrous piping material, a separation must be maintained between pipes.

B. Cut pipe accurately to measurements, and ream free of burrs and cutting splatter. Carefully align and grade pipe, and work accurately into place. Fittings shall be used for any change in direction. Provide for expansion at every building expansion joint. Protect open pipe ends to prevent trash being placed in the lines during installation. Clean all dirt and cutting debris from pipes before making the next joint.

C. Install piping so as to preserve access to all valves, air vents, and other equipment and to provide the maximum headroom possible.

D. Joints shall be made with nitrogen gas in the pipes to prevent oxidation. All piping shall be installed parallel to or at right angles with building walls, columns, and partitions.

E. Clean inside of refrigerant lines with methyl alcohol before assembly and take care thereafter to prevent foreign matter from entering and being sealed in. Cut pipe ends square and de-burr. Clean pipe and fitting with #00 steel wool before joining.

3.02 TESTS

A. Test refrigerant piping, equipment, valves and fittings at a pressure of 245 psi on the low side and 300 psi on the high side by introducing refrigerant and dry carbon dioxide ($C0_2$) or nitrogen throughout the refrigerant circuit. Bubble test joints with soap lather, clean joints of soap and leak-test with a halide torch. The system shall be pumped out and the entire circuit placed under 27 inches of vacuum and allowed to stand sealed off for a period of 8 hours, without any loss of vacuum.

B. Submit an affidavit signed by the Architect's representative and the Contractor's representative stating they have witnessed and approved the dehydration test.

3.03 SUBMITTALS

A. Submittals shall include but shall not be limited to a diagram approved by the compressor manufacturer, to include the size and length of the refrigerant piping, all offsets and elbows required for the installation location of all valves, filter dryers, moisture and liquid indicators and flexible connectors where required.

END OF SECTION

SECTION 23 30 00 HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work specified in this Section is subject to Section 23 05 10 “HVAC General Requirements”.

B. Ductwork shall be provided to meet the minimum capacities indicated, shall meet constraints of construction, and shall comply with Specification Sections.

C. See Section 23 07 00 “HVAC Insulation” for ductwork insulation (duct wrap and liner).

D. No ductwork shall be fabricated until fabrication shop drawings have been prepared, submitted and reviewed. Ductwork installed before shop drawings are reviewed is entirely at the risk and expense of the contractor.

PART 2 - PRODUCTS

2.01 DUCTWORK - GENERAL

A. SMACNA Standards indicated shall mean standard published by the Sheet Metal and Air Conditioning Contractor's National Association, Inc. Ductwork shall be constructed in complete conformance with the latest edition of the SMACNA Manual. Duct classification shall be:

1. Low pressure: 2 inches static pressure, Class A Seals
2. Exhaust ductwork: 1 inch S.P., Class B Seals

B. Ductwork shall be constructed of G90 galvanized sheet steel unless otherwise specified herein. Rectangular ductwork shall be lined. Ductwork shall be round, oval or rectangular as indicated. Sizes given shall be considered to be the clear inside dimension.

C. Turning vanes shall be installed in all 90 degree square and rectangular elbows and at other locations shown. The turning vanes shall be double thickness type, with vanes secured to the runners and runners secured to the duct. Elbows in round ductwork and other radius elbows shall have an inside radius equal to the diameter of the duct.

D. Low pressure round ducts up to including 12 inches in diameter shall be longitudinal lock seam construction. Round ducts larger than 12 inches shall be spiral lock seam construction.

1. Girth joints in ducts up to and including 12 inches shall be beaded crimp type and each joint shall be fastened with sheet metal screws, equally spaced, not more than 8 inches on centers and with a minimum of 3 screws in each joint. The beaded-crimp joint shall provide at least a 1 inch lap to accommodate the sheet metal screws.

2. Girth joints in ducts larger than 12 inches shall be the beaded sleeve type. The beaded sleeve joints shall be fabricated of the same gauge galvanized sheet steel and the duct shall be a minimum of 4 inches in length. Each section of duct shall be fastened to the sleeve with sheet metal screws equally spaced, not more than 8 inches on centers and with a minimum of 3 screws in each section.

E. Duct hangers and supports shall be in accordance with Section V (pages 5-1 thru 5-13) HANGERS AND SUPPORTS of the referenced SMACNA Standard, except:

1. Hangers shall be spaced not over 8'-0" on centers.
2. For rectangular ducts with longest dimensions up through 60", hangers shall be the galvanized steel strap type; with the longest dimension 61 inches and larger, hangers shall be trapeze type constructed of galvanized steel angles with round hanger rods. Sizes for strap hangers and trapeze angles and rods shall be based on duct size as scheduled in the SMACNA Standard, Table 5-1 (page 5-8) for strap hangers and Table 5-3 (page 5-10) for trapeze hangers.
3. For round ducts, hangers shall be galvanized steel strap hangers. Sizes and number of strap hangers shall be based on duct size as scheduled in the SMACNA Standard, Table 4-2 (page 4-9). For duct sizes requiring 2 hangers, the hanger supports shall be minimum 3/8" round steel hanger rods.

2.02 MANUAL DAMPERS AND DAMPER HARDWARE

A. Splitter dampers shall be constructed of not less than 20 gage galvanized steel sheet. The length of the damper blade shall be the same as the width of the widest duct section at the split, but in no case shall blade length be less than 12inches.

B. Volume Control Dampers:

1. Dampers shall be single blade butterfly type in ducts up to and including 12 inches by 12 inches size; for ducts larger than 12 inches by 12 inches, in either or both dimensions, the dampers shall be the multi-blade type. All dampers in O.A. ductwork shall shut tightly and have vinyl edge seals and stainless steel jamb seals.
2. Single blade butterfly dampers shall be constructed of not less than 16 gage galvanized steel blades mounted in a galvanized steel frame. For rectangular dampers, the top and bottom edges of the blade shall be crimped to stiffen the blade. Damper shall be provided with an extended rod to permit installation of a damper regulator.
3. Dampers larger than 12 inches in either direction shall be multi-blade dampers and shall be the opposed blade type, constructed of not less than 16 gage galvanized steel blade mounted in galvanized steel channel frame. Blade spacing shall not exceed 6 inches and the top and bottom edges of the blade shall be crimped to stiffen the blades. Damper blades shall be interconnected by rods and linkages to provide simultaneous operation of all blades. Damper shall be provided with an extended rod to permit installation of a damper regulator.

C. Hardware for Manual Dampers:

1. Splitter damper hardware - When neither dimension of a damper exceeds 18 inches, the damper shall be provided with a ball joint bracket attached to the outside of the duct. The bracket shall have a set screw for securing damper rod in position. The damper operating rod shall be not less than 1/4 inch diameter steel rod and shall be secured to the damper blade with a clip. When either dimension of a damper exceeds 18 inches, the damper shall be provided with 2 ball joint brackets and rods. The rods shall be located at quarter points on the damper.
2. Duct mounted regulators with operating handle and locking quadrant shall be provided on manual volume control dampers.
3. Damper hardware shall be Ventfabrics, Young Regulator or Duro-Dyne, provided the equipment meets or exceeds the requirements of the Contract Documents.

D. Acceptable manufacturers of dampers are Ruskin, Air Balance, or Louvers and Dampers Inc., provided the equipment meets or exceeds the requirements of the Contract Documents.

2.03 FLEXIBLE DUCTWORK

A. Flexible ductwork shall be Class 1, UL 181-air duct with an aluminized mylar or polyester inner liner laminated to a corrosion resistant steel wire helix. Aluminum helix is not acceptable. Flexible ductwork shall comply with NFPA 90A and 90B.

B. A 1 inch thick, one (1) pound density fiberglass insulation and vinyl outer jacket shall cover the wire helix.

C. The maximum allowable length of low pressure flexible ductwork shall be 4'-0" and shall be limited to short run-outs and end runs connected to round neck ceiling supply diffusers. Provide a spin-in fitting with integral volume damper at all flexible run-out connections in low-pressure ductwork.

D. The maximum allowable length of medium pressure flexible ductwork shall be 1'-0" and shall be limited to short run-outs connecting FPB and VAV units to medium pressure sheet metal ductwork.

E. Flexible ductwork shall be designed for pressures up to 4 inches W.G. for low-pressure ductwork and 10 inches W.G. for medium pressure ductwork.

F. Flexible ductwork insulation shall be fiberglass and have a minimum insulation R-value of 6.0.

G. Low pressure and medium pressure flexible ductwork shall be equal to FlexMaster Model 5B or Thermaflex Model M-KE.

2.04 FLEXIBLE DUCT CONNECTIONS

A. Flexible duct connections shall be non-combustible, installed at all belt-driven equipment and where shown. Material shall be glass fabric double coated with neoprene (30 0z. per square yard minimum) and shall be Vent Fabrics, Duro-Dyne or Young Regulator, provided the equipment meets or exceeds the Contract Documents. Provide duct supports on each side of flexible connections.

2.05 STAND-OFF MOUNTING BRACKETS

A. Locking-type quadrant operators for dampers, when installed on ducts to be externally insulated, shall be provided with stand-off mounting brackets bases or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer.

2.06 DUCT INSTRUMENT TEST HOLES

A. Provide for each system four (4) test holes; two (2) in supply duct and two (2) in return air plenum at opposite ends near air handling units with screwed caps.

2.07 REGISTER AND GRILLE CONNECTION

A. Where take-offs are on side of a duct, clinch lock short tee sections onto trunk. Install collars with slip joints and 3/4 inch flange at outlet end. At plastered surfaces set collars exactly flush with plaster surface (mechanic must be on job to make adjustments during plaster application). Set flange face so as to receive register gasket, and be concealed by register flange. Collars may be deleted where mounting frames are furnished with registers.

B. Install boots above lay-in ceilings simultaneously with ceiling work; mechanic must be on job during this phase of construction work.

C. At return relief and exhaust grilles 48 inches or more in either dimension, collars shall be 1 inch by 2 inches by 1/8 inch steel angle frames with corners mitered, welded and ground smooth. Frames in ceilings shall be independently suspended from the ceiling structure, or the duct shall have special reinforcing to prevent sagging of the boot.

D. Interior of ductwork visible through grilles and diffusers shall be painted flat black.

2.08 ACCESS DOORS:

A. Provide in duct wall at each splitter, fire, fire/smoke and motorized damper, at each end of coils, in plenums and elsewhere indicated. Size and position shall provide access to bearings, fire links, etc. Typical doors shall be double metal faced, internally insulated same as duct provided with gasket seal, and held in place with four or more sash locks. Minimum size shall be 16 inches by 12 inches, maximum duct size for smaller ducts.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install ductwork and accessories as shown and in accordance with applicable SMACNA standards.

B. Duct liner shall be cut to provide overlapped and compressed longitudinal corner joints. Liner shall be installed with coated surface facing the air stream. Duct liner shall be adhered to the ductwork with 100 percent coverage of the sheet metal surfaces using a fire retardant adhesive applied by spraying. Coat all exposed leading edges and all transverse joints with
airfoils.

C. Splitter Dampers:

1. Fabricate blades of same thickness galvanized steel as the duct where used (min. 20 ga.), securely attached to a rod at the air leading edge to present a round nose to air flow. Length shall be sufficient to close either branch duct.
2. Anchor splitters at the air entering edge by 3/16 inch adjustable galvanized steel rods that pass through set screw clamps on the outside of duct. Use one (1) rod and clamp on splitters with leading edge up to 15 inches, (2) rods up to 30 inches, and on 15 inch centers above 30 inches. See typical details on plans.
3. When splitter dampers occur above other than lay-in ceilings, provide Young Model No. 890-A damper assembly complete with supports, bearings and Young No. 1 regulators with an additional end bearing and chromium plated ceiling.

D. Joints in all low pressure ductwork shall be sealed with a water based gray vinyl acrylic sealant. Sealant shall be U.L. listed Class 1 classified adhesive with flame spread and smoke developed ratings of O. Sealant shall be applied to surfaces relatively free of dirt, oil and grease after ductwork has been installed. Sealant shall be Hardcast, Inc. "Iron Grip" IB-601 or approved equal.

END OF SECTION

SECTION 23 34 00 HVAC FANS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section is subject to the provisions of Section 23 05 10 “HVAC General Requirements”.

B. Fans shall be provided to meet the minimum capacities scheduled at the indicated conditions and shall meet all constraints of construction and shall comply with all specification Sections.

C. Fans shall be tested and rated in accordance with the Air Moving and Conditioning Association, Inc., Standard No. 210, Test Code for Air Moving Devices and bear the AMCA Seal.

D. Fan motor enclosure shall be the drip-proof type unless specifically indicated otherwise.

E. Roof-mounted fans shall be waterproof design so that water cannot enter the building through the fan housing, whether or not the fan is operating.

F. Centrifugal fan wheels shall be statically and dynamically balanced.

1.02 COORDINATION

A. Fans of specific manufacturers have been used as the basis of design. Modifications to controls, electrical connections, structural supports, etc., that result from the use of equipment by any other manufacturer, shall be coordinated with all other trades; this coordination shall occur before delivery of the equipment from the manufacturer. Modifications shall be performed without incurring additions to the Contract.

PART 2 - PRODUCTS

2.01 DESCRIPTION

A. Cabinet Fans:

1. Ceiling cabinet fans as indicated on Drawings shall have acoustically insulated housings and shall not exceed sound level ratings shown.
2. Fans shall bear the AMCA Certified Ratings Seal and U.L. Label.
3. Integral backdraft damper shall be chatterproof.
4. Fans shall have true centrifugal wheels.
5. Face grille shall be of aerodynamic white egg crate design and provide 85 percent free area.
6. Manufacturers shall submit vibration amplitudes and magnetic motor hum in decibels.
7. Fans shall be provided with cord, plug, and receptacle inside the housing.
8. Entire fan, motor and wheel assembly shall be removable without disturbing the housing.
9. Fan motors shall be suitably grounded and mounted on vibration isolators.
10. Fans shall be Greenheck or approved equal by Cook, Acme or Penn.

PART 3 - INSTALLATION

3.01 INSTALLATION

A. Fans shall be installed in complete conformance with the manufacturer's recommendations and the Contract Documents. Coordinate the actual units to be provided with all trades.

3.02 ADJUSTMENT

A. The fans shall be tested and adjusted to provide the scheduled capacities.

END OF SECTION

SECTION 23 37 00 AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Extruded aluminum stationary wall louvers.
2. Extruded aluminum stationary brick wall vents.
3. Extruded aluminum combination wall louvers.

B. Related Sections:

1. Section 09 05 15 – Color Design.
2. Section 23 05 10 – HVAC General Requirements.

C. References:

1. AAMA 605.2 - High Performance Organic Coatings on Architectural Extrusions and Panels.
2. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
3. AMCA 511 - Certified Ratings Program for Air Control Devices.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's specifications; certified test data, where applicable; and installation instructions for required products, including finishes.

B. Shop Drawings: Submit shop drawings for the fabrication and erection of louver 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.

C. Samples: Submit 6-inch square samples of each required finish. Prepare samples on metal of same gage and alloy to be used in Work. Where normal color and texture variations are to be expected, include two or more units in each sample showing limits of such variations.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. The manufacturer shall have implemented the management of quality objectives, continual improvement, and monitoring of customer satisfaction to assure that customer needs and expectations are met.
2. Manufacturer shall be International Organization for Standardization (ISO) 9000 accredited.

B. Installer Qualifications:

1. Verify size, location and placement of louver units prior to fabrication, wherever possible.
2. Coordinate field measurements and Shop Drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Pre-assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

C. Product Qualifications:

1. Louvers licensed to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 511 and comply with AMCA Certified Ratings Program.
2. AMCA Certified Ratings Seal applies to air performance and water penetration ratings.

D. SMACNA Recommendations: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.

C. Handling: Protect materials and finishes during handling and installation to prevent damage.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 - PRODUCTS

2.02 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Ruskin Manufacturing, Kansas City, MO. Tel. (816) 761-7476.

B. Equivalent products by the following manufacturers are acceptable:

1. Construction Specialties, Inc., 49 Meeker Ave., Cranford, NJ 07016. Tel. (908) 272-5200
2. All-Lite Louvers, Mineral Wells, WV. Tel. (304) 489-8113.

C. Substitutions shall fully comply with specified requirements and Section 01 25 13-Product Substitution Procedures.

2.03 EXTRUDED ALUMINUM STATIONARY WALL LOUVERS

A. Fabrication:

1. Model: ELF6375DX as manufactured by Ruskin Company.
2. Performance Ratings: AMCA licensed.
3. Frame:
   a. Material: Extruded aluminum, Alloy 6063-T5.
   b. Wall Thickness: 0.081 inch (2.1 mm), nominal.
   c. Depth: 6 inches (152 mm).
   d. Downspouts and caulking surfaces.
4. Blades:
   a. Style: Drainable.
   b. Material: Extruded aluminum, Alloy 6063-T5.
   c. Wall Thickness: 0.081 inch (2.1 mm), nominal.
   d. Angle: 37.5 degrees.
   e. Centers: 5-29/32 inches (150 mm), nominal.
5. Bird Screen:
   a. Material: Aluminum, [3/4 inch x 0.051 inch (19 mm x 1.3 mm), expanded, flattened] [1/2 inch mesh x 0.063 inch (13 mm mesh x 1.6 mm), intercrimp].
   b. Frame: Removable, rewireable.
6. Gutters: Drain gutter in head frame and each blade.
7. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.
8. Vertical Supports: Hidden vertical supports to allow continuous line appearance up to 120 inches (3,048 mm).
9. Sill: Steeply angled integral sill eliminating areas of standing or trapped moisture where mold or mildew may thrive and effect indoor air quality.
10. Assembly: Factory assemble louver components. All welded construction.

B. Performance Data:

1. Based on testing 48 inch x 48 inch (1,219 mm x 1,219 mm) size unit in accordance with AMCA 500.
2. Free Area: 57 percent, nominal.
3. Free Area Size: 9.08 square feet (0.84 m^2).
4. Maximum Recommended Air Flow Thru Free Area: 1,023 feet per minute (312 m/min).
5. Air Flow: 9,289 cubic feet per minute (263 m^3/min).
6. Maximum Pressure Drop: 0.15 inches w.g. (3.8 mm w.g.).
7. Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/m^2) of free area at an air flow of 1,023 feet per minute (312 m/min) free area velocity when tested for 15 minutes.

2.04 EXTRUDED ALUMINUM STATIONARY BRICK WALL VENTS

A. Fabrication:

1. Model: BV100 as manufactured by Ruskin Company.
2. Frame:
   a. Material: Extruded aluminum, Alloy 6063-T5.
   b. Wall Thickness: 0.100 inch (2.5 mm), nominal.

c. Frame Construction: 4 inches (102 mm) frame depth with three 1/8 inch (3 mm) mortar ribs at perimeter.

3. Frame Size:
   a. 15-5/8 inches by 7-3/4 inches (397 mm by 197 mm).
4. Blades:
   a. Style: Straight.
   b. Material: Formed aluminum, Alloy 6063-T5.
   c. Thickness: 0.100 inch (2.5 mm), nominal.
   d. Angle: 48 degrees.
   e. Centers: Blades overlap.
5. Assembly:
   a. Factory assembled vent components. Mechanically fastened construction.

B. Performance Data:

1. Performance Ratings:
   a. Based on testing 48 inch by 48 inch (1219 mm by 1219 mm) size unit in accordance with AMCA 500.
2. Free Area: 39 percent, nominal.
3. Maximum Recommended Air Flow through Free Area: Not rated.

2.05 EXTRUDED ALUMINUM COMBINATION WALL LOUVERS

A. Fabrication: Mullion style.

1. Model: ELC6375DAX as manufactured by Ruskin Company.
2. Frame:
   a. Frame Depth: 6 inches (152 mm).
   b. Material: Extruded aluminum, Alloy 6063-T5.
   c. Wall Thickness: 0.125 inch (3.2 mm), nominal.
3. Front Blades:
   a. Style: Drainable “AF”.
   b. Material: Extruded aluminum, Alloy 6063-T5.
   c. Wall Thickness: 0.081 inch (2.1 mm), nominal.
   d. Angle: 37.5 degrees.
   e. Centers: 6-1/8 inches (156 mm), nominal.
4. Rear Blades:
   a. Style: Airfoil shape, adjustable.
   b. Material: Extruded aluminum, Alloy 6063-T5.
   c. Wall Thickness: 0.140 inch (3.6 mm) double wall, nominal, for single section widths through 60 inches (1524 mm).
   d. Linkage: Concealed in frame.
   e. Bearings: Stainless steel sleeve pressed into frame.
   f. Axles: 1/2 inch (13 mm) plated steel hex.
5. Actuator:
   a. Electric, 120 V, 60 Hz, two-position, spring-return.
6. Gutters: Drain gutter in head frame and each blade.
7. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.
8. Sill: Steeply angled integral sill eliminating areas of standing or trapped moisture where mold or mildew may thrive and effect indoor air quality.
9. Fabrication:

a. Mullion Style – Design incorporates visible mullions or frames at the perimeter of the louver and also at certain intervals within the louver perimeter to support the louver blades.
b. Louver blade sightlines are interrupted at the mullion locations.
c. No rear-mounted blade supports are utilized.

10. Assembly:
a. Factory assembled louver components.
b. Mechanically fastened construction.

B. Performance Data:

1. Performance Ratings: AMCA licensed.
a. Based on testing 48 inch by 48 inch (1219 mm by 1219 mm) size unit in accordance with AMCA 500.
2. Free Area: 47 percent, nominal.
3. Maximum Recommended Air Flow through Free Area: 1169 feet per minute (356 m/min).
4. Air Flow: 8744 cubic feet per minute (249 cu. m/min).
5. Maximum Pressure Drop: 0.15 inches w.g. (37.35 Pa).
6. Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/sm) of free area at an air flow of 1169 feet per minute (356 m/min) free area velocity when tested for 15 minutes.
7. Air Leakage: Maximum of 1.3 cubic feet per minute (0. 037 cu. m/min) air leakage per square foot of louver face area at 0.50 inches w.g. (0.125 kPa) pressure drop.

2.06 FABRICATION, GENERAL

A. Provide louvers and accessories of design, materials, sizes, depth, arrangement, and metal thickness indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; air leakage; strength; durability; and uniform appearance.

B. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealant in joints between louvers and adjoining Work.

C. Include supports, anchorage, and accessories required for complete assembly.

D. Provide hidden vertical mullions of type and at spacing indicated but not further apart than recommended by manufacturer or 72 inches on center, whichever is less. At horizontal joints between louver units provide horizontal mullions except where continuous vertical assemblies are indicated.

E. Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior. Setback dimension is 3-3/4 inches to 6 inches.

F. Join frame members to one another and to stationary louver blades. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

G. Finish: Kynar 500 (70 percent PVDF) finish to be selected by MDOT Architect from full range of standard and premium colors. Refer to Section 09 05 15 for color.

2.07 LOUVER SCREENS

A. Provide removable screens for exterior louvers. Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated. Provide frames consisting of U-shaped metal for permanently securing screen mesh.

B. Use insect screens of 18X14 aluminum mesh and additional 1/2 inch sq. mesh, 0.050-inch aluminum wire bird screen. Locate screens on inside face of louvers, unless otherwise indicated. Secure screens to louver frames with machine screws, spaced at each corner and at 12 inches on center between.

C. Use bird screen only for louvers that are connected to duct work or fans.

PART 3 - EXECUTION

3.02 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorage. Coordinate delivery of such items to Project Site.

3.03 INSTALLATION

A. Locate and place louver 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 and to make a weather-tight connection.

B. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealant and joint fillers, as indicated.

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 shop, make required alterations and refinish entire unit, or provide new units, at Contractor'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. Refer to Section 07 92 00 for sealant in connection with installations of louvers.

END OF SECTION

SECTION 23 37 13 DIFFUSERS, REGISTERS AND GRILLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section is subject to the provisions of Section 23 05 10 “HVAC General Requirements”.

B. Grilles, registers and diffusers shall be provided to meet the minimum capacities indicated on the Drawings and shall meet all constraints of construction.

1.02 COORDINATION

A. The grilles, registers and diffusers of one manufacturer have been used as the basis of design. Any modifications to ductwork, controls, building structure, etc., that result from the use of any other units shall be coordinated with all trades. This coordination shall occur before delivery of equipment from the manufacturer. Any modifications shall be performed without incurring any additional costs to the Contract.

1.03 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed below are acceptable. Approved equal products which are ADC tested, rated and certified may be Price, Metalaire or Titus.

B. All devices selected must meet or exceed all the requirements of these contract documents.

PART 2 - PRODUCTS

2.01 DESCRIPTION

A. Color of all grilles, registers and diffusers are to be selected by MDOT Architect. Also, ceiling mounted items shall be selected to fit the ceiling in which they are applied.

B. Air distribution devices shall be as follows:

1. Exhaust air register shall have a fixed core of 1/2 inch by 1/2 inch by 1/2 inch aluminum squares. Register shall have opposed blade dampers. Registers shall be as scheduled on plans or equal.
2. Return air grilles (ceiling mounted) shall have a fixed core of 1/2 inch by 1/2 inch by 1/2 inch aluminum squares. Grilles shall be as scheduled on plans or equal. Finish shall be white baked enamel.
3. Supply air diffusers (square) shall be extruded aluminum rectangular to round neck diffusers with T-Bar flange frames. Diffusers shall be as per scheduled on plans or approved equal.
4. Sidewall air registers shall have 1 inch framed border and aluminum face bars on 1/2 inch centers. Unit shall be extruded aluminum with natural anodized finish. Sidewall registers shall be as scheduled on plans or approved equal.
5. Linear slot diffusers shall be extruded aluminum with adjustable pattern controller. Linear diffusers shall be as per scheduled on plans or approved equal.

C. The Contractor shall verify that all air distribution devices are suitable for the ceiling and wall types in which they are installed.

D. Air distribution devices shall be shown in grille, register and diffuser schedule.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Grilles, registers and diffusers shall be installed as indicated in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades.

B. Grilles, registers and diffusers shall be selected and submitted at a NC level of 35 or less.

C. The grilles, registers and diffusers shall be tested and adjusted to provide the scheduled capacities.

END OF SECTION

SECTION 23 41 00 PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.01 GENERAL

A. Work specified in this Section is subject to the provisions of Section 23 05 10 “HVAC General Requirements”.

1.02 COORDINATION

A. The filters of one manufacturer (Farr) have been used as the basis of design. Modifications to ductwork, building structure, etc., that result from the use of any other units shall be coordinated with all trades; this coordination shall occur before delivery of equipment from the manufacturer. Modifications shall be performed without incurring additional cost to the Owner.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed below are acceptable:

1. Farr
2. American Air Filter
3. Flanders

B. Devices selected shall meet or exceed all the requirements of the Contract Documents.

2.02 FILTER

A. Filter media shall have an average efficiency of 35-35 percent on ASHRAE Test Standard 52-76. It shall have an average arrestance of not less than 97 percent on that standard. Filters shall be listed by Underwriter's Laboratories as Class 2.

PART 3 - EXECUTION

3.01 SPARES

A. Provide one (1) complete set of replacement filters as recommended by the manufacturer.

END OF SECTION

SECTION 23 72 00 AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Manufacturer shall clearly define exceptions made to the Drawings and Specifications. Mechanical subcontractor is responsible for expenses that occur due to exceptions made.

B. Unit shall be specifically designed for outdoor installation. Unit casing shall be leak-proof and constructed to withstand suction pressure of 3.0 inch wg.

1.02 RELATED DOCUMENTS

A. Requirements of the General Conditions, Supplementary Conditions, and Section 23 05 10, “HVAC General Requirements” apply to work specified in this Section.

B. Refer to Specification Section 23 05 11 titled "HVAC Submittal Data" for the submittal and approval requirements regarding the piping system.

C. Provide required equipment, appurtenances, and accessories for a complete Air to Air Energy Recovery System.

D. V-belt drives shall be designed for not less than 150 percent of connected driving capacity and motor sheaves shall be adjustable to provide not less than 20 percent speed variation.

1. Sheaves shall be selected to drive the fan at a speed to produce the scheduled capacity indicated on the Drawings when set at the approximate midpoint of the sheave adjustment.
2. Motors with V-belt drives shall be provided with adjustable bases.

E. Fan motor enclosure shall be the drip-proof type unless specifically indicated otherwise.

F. Roof-mounted ERV shall be waterproof design so that water cannot enter the building through the fan housing, whether or not the fan is operating.

G. Belt driven power assemblies shall be mounted on vibration isolators.

H. Centrifugal fan wheel shall be statically and dynamically balanced.

1.03 APPLICABLE STANDARDS

A. Fans and power exhausters shall be listed in the current edition of AMCA and shall bear the AMCA seal.

B. Fan performance criteria shall be as indicated on the schedules on the Contract Drawings.

1.04 APPROVED MANUFACTURERS

A. ERV units shall be equal to models as manufactured by Greenheck, Semco, Wing, or as approved by the engineer.

PART 2 – PRODUCTS

2.01 COORDINATION

A. Units of one manufacturer have been used as the basis of design. Modifications to electrical connections, building structure, etc., that result from the use of another manufacturer shall be coordinated with other trades.

1. This coordination shall occur before delivery of equipment form the manufacturer.
2. Modifications shall be performed without incurring additional cost to the Contract.

B. Energy Recovery Ventilator shall be equal to "Greenheck", provided all specifications are met. Greenheck Model ERV equipment is used as the basis of design.

1. Units shall be UL listed and bear the UL label.
2. Energy transfer ratings shall be in accordance with ASHRAE Standard 84.
3. Ventilators shall bear the AMCA Certified Rating Seals for air performance.
4. Performance shall be as scheduled on Drawings.
5. Outdoor air shall not mix with exhaust air in a common plenum.
6. Exhaust discharge and outside air intake shall not be located on the same side on roof top units.

2.02 UNIT CASING AND FRAMES

A. Unit shall be of internal frame type construction of G-90 galvanized steel.

1. Panels exposed to the weather shall be a minimum of 20 gage galvanized steel.
2. Where top panels are joined there shall be a standing seam to insure positive weather protection.
3. Exterior metal-to-metal seams shall be sealed with closed cell neoprene gasketing, requiring no caulking at job site.
4. Unit base shall be designed for curb mounting.
5. Unit base shall over hang the curb.
6. Curb is to be recessed under the unit for a positive seal against water run-off.
7. Components shall be easily accessible through large removable access panels for both exhaust and supply compartments.
8. Energy recovery wheel shall be mounted in a slide-out track for ease of inspection, removal and cleaning.
9. Access to be provided in each individual section where blowers, filters and motorized damper are required.

2.03 WEATHER HOODS

A. Weather hoods shall be of the same finish as the unit.

1. Supply weather hood shall incorporate a moisture eliminator.
2. Moisture eliminator shall be of aluminum, consisting of corrugated mesh to eliminate water penetration into unit.
3. Exhaust weather hood shall include an automatic backdraft damper.

2.04 ENERGY RECOVERY WHEEL:

A. Wheel shall be of the enthalpy type for both sensible and latent heat recovery, and be designed to insure laminar flow.

1. Desiccant shall be silica gel for maximum latent energy transfer.

2. Wheel shall be constructed of lightweight polymer media to minimize shaft and bearing loads.
3. Polymer media shall be mounted in a stainless steel rotor for corrosion resistance.

B. Wheel design shall consist of removable segments on wheels greater than 26 inches diameter for ease of service and/or cleaning.

1. Segments shall be removable without the use of tools.
2. Silica gel desiccant shall be permanently bonded to wheel media to retain latent heat recovery after cleaning.
3. Wheels with sprayed on desiccant coatings are not acceptable.
4. Wheels with desiccant applied after wheel formation are not acceptable.

2.05 INSULATION

A. Unit casing to be insulated with 1 inch - 3 lbs. rigid board fiberglass with fire-resistant Foil-Scrim-Kraft facing. Insulation shall be in accordance with NFPA 90A and tested to meet UL 181 erosion requirements and to be secured to unit with waterproof adhesive and permanent mechanical fasteners.

2.06 FAN SECTIONS

A. Centrifugal fans shall be double width, double inlet, single fans to be forward curved type.
1. All blower wheels shall be statically and dynamically balanced.
2. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage, phase and enclosure.
3. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks.
4. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds.
5. Blowers shall be quiet running, forward curved type and enable independent balancing of exhaust and supply airflows by providing separate motors for exhaust and supply blowers with adjustable sheaves.

2.07 MOTORS AND DRIVES

A. Motors shall be minimum horse power scheduled 1800 RPM-single speed ball bearing, rigid base, T-frame, ODP.
1. Motors shall operate on 480 volts, three phase, 60 Hz and be factory mounted to an adjustable motor plate having two heavy duty adjusting bolts for alignment and belt tension.
2. Drives shall be sized for a minimum of 150 percent of driven horsepower.
3. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts.
4. 15 horse power and less shall be supplied with an adjustable drive.

2.08 ELECTRICAL

A. Internal electrical components shall be prewired for single point power connection.

1. Electrical components shall be UL listed, approved or classified where applicable and wired in compliance with the National Electrical Code.
2. Weather proof disconnect switch and motor starters shall be supplied as standard components.
3. Control box shall include motor starters, control circuit fusing, control transformer for 24 VAC circuit and safety disconnect.

4. Motor starters shall consist of a contactors and Class 20 adjustable overload protection and shall be provided for motors in the unit.
5. Coordinate with Electrical Division 26 Sections.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor and this subcontractor, prior to installing equipment, shall examine the conditions under which the equipment is to be installed, and shall notify the Project Engineer and MDOT Architect of conditions detrimental to the proper installation of the equipment.

B. Equipment shall be installed in accordance with the latest manufacturer's written instructions, and in accordance with governing codes and recognized industry standards and practices.

C. Equipment shall be protected from damage. Damaged equipment shall be replaced without additional cost.

3.02 START-UP

A. An authorized representative of the equipment manufacturer shall make the initial start-up. The balancing contractor shall be responsible for final verification and reporting of airflows.

3.03 ADJUSTMENT

A. The equipment shall be tested and adjusted to ensure the scheduled capacities as indicated. All controls shall be tested and adjusted.

END OF SECTION

SECTION 23 81 50 VARIABLE-REFRIGERANT SPLIT-SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.01 System Description: The VRF (Variable Refrigerant Flow) system shall be an LG Multi V IV simultaneous cooling and heating heat pump. The simultaneous heating and cooling VRF system shall consist of an outdoor unit, high efficiency heat recovery units designed for minimum piping and maximum design flexibility, indoor units, and controls by the equipment manufacturer. Every indoor unit shall be independently capable of operating in either heating or cooling mode regardless of the mode of other indoor units. The system shall be capable of changing mode of individual indoor units (cooling to heating or heating to cooling) within a maximum time of 5 minutes to ensure indoor temperature can be properly maintained.

1.02 RELATED DOCUMENTS:

A. Requirements of the General Conditions, Supplementary Conditions, and Section 23 05 10 “HVAC General Requirements” apply to work specified in this section.

B. Refer to Specification Section 23 05 11 “HVAC Submittal Data” for the submittal and approval requirements. Submittals shall include components, equipment, capacities, pipe sizes and detailed schematic design of complete VRF system.

C. Provide required equipment, appurtenances, and accessories for a complete VRF system.

1.03 QUALITY ASSURANCE:

A. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

B. Wiring shall be in accordance with the National Electrical Code (NEC).

C. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

1.04 STORAGE AND HANDLING: VRF equipment shall be stored protected from weather, extreme temperature, etc. as recommended by the manufacturer. VRF equipment shall be moved, lifted, etc. as recommended by the manufacturer.

1.05 APPROVED MANUFACTURERS: VRF system shall be equal to systems as manufactured by LG, Samsung, or Daikin.

1.06 WARRANTY:

A. VRF equipment shall be warranted by the manufacturer’s limited warranty for a period of one year from date of installation. An extended warranty including 2 years parts and 6 years compressor shall be granted upon submission to the manufacturer and acceptance by the manufacturer of proper installation with documentation including:

1. Selection output and layout of the VRF system.
2. 150 minutes of operational history upon commissioning from the VRF service tool.
3. Completed commissioning report as per the VRF equipment manufacturer.

B. During this period, parts failing to function properly due to faulty workmanship or material shall be repaired or replaced at the VRF equipment manufacturer's discretion and shall not include labor.

PART 2 – PRODUCTS

2.01 SIMULTANEOUS HEATING AND COOLING OUTDOOR UNIT:

A. General:

1. The outdoor unit shall be used with VRF components of the same manufacturer consisting of the outdoor unit, high efficiency heat recovery units, indoor units, Y-branches, and controls that allow for long communication wiring to support long piping runs totaling up to 3280 feet.
2. System components shall be of the same manufacturer or as recommended by the manufacturer of the VRF equipment.
3. Unit control boards shall perform all functions required to effectively and efficiently operate the VRF system and communicate in a daisy chain configuration from outdoor unit to heat recovery and indoor units via RS485.
4. The outdoor unit shall be completely factory assembled, piped and wired.
5. Each outdoor unit shall be run tested at the factory.
6. The sum of connected capacity of all indoor air handlers shall range from 50 percent to 130 percent of outdoor rated capacity to ensure the VRF system will have sufficient capacity to handle the building space loads.
7. Outdoor unit shall have a sound rating no higher than <61> ±3dB(A). Refrigerant lines from the outdoor unit to the heat recovery unit and from the heat recovery unit to the indoor units shall be field insulated.
8. The outdoor unit shall have an accumulator.
9. The outdoor unit shall have a high pressure safety switch
10. The outdoor unit shall have over-current protection.
11. The outdoor unit shall have the ability to operate with an elevation difference of up to 328 feet above or below the indoor units.
12. The outdoor unit shall allow up to a total equivalent refrigerant piping length of 3280 feet.
13. The maximum length from outdoor unit to indoor unit shall be up to 656 feet without traps.
14. The outdoor unit shall be capable of operating in heating down to minus 13 degrees F and up to 61 degrees F ambient temperature without additional low ambient controls.
15. The outdoor unit shall be capable of operating in cooling down to 14 degrees F and up to 122 degrees F ambient temperature.
16. The outdoor unit shall be capable of operating in simultaneous heating and cooling mode down to 14 degrees F and up to 86 degrees F ambient temperature.
17. The outdoor unit shall have an oil separator and controls to ensure sufficient oil supply is maintained for the compressor.
18. Shall use R410A refrigerant.
19. All refrigerant lines from the outdoor unit to the indoor units shall be field insulated

B. Frame: Shall be constructed with galvanized steel, bonderized and have be finished with a powder coat baked enamel paint.

C. Compressor:

1. Each 6, 8, 10 ton cabinet shall be equipped with one hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressor.
2. The 12 and 14 ton cabinet shall be equipped with two hermetically sealed, inverter driven, HSS controlled scroll compressors.
3. Each inverter driven, HSS scroll compressor shall be capable of operating in a frequency range from 15 Hz to 150 Hz with control in 0.5 Hz increments.
4. The compressor(s) shall be equipped with a 60 Watt crankcase heater.
5. The compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.
6. The compressor bearing(s) shall have Teflon™ coating.
7. The compressor(s) shall be protected with:
   a. High Pressure switch
   b. Over-current /under current protection
   c. Phase failure
   d. Phase reversal
8. Standard, non-inverter driven compressors shall not be permitted

D. Fan:

1. Each 6 ton cabinet shall be equipped with one direct drive variable speed propeller fan with Brushless Digitally Controlled (BLDC) motor with a vertical air discharge.
2. Each 8 to 14 ton cabinet shall be equipped with two direct drive variable speed propeller fan(s) with BLDC motor(s) with a vertical air discharge.
3. The fan(s) blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material.
4. The fan(s) motor shall be equipped with permanently lubricated bearings.
5. The fan motor shall be variable speed with a maximum operating speed of 1050 RPM.
6. The fan shall have a raised guard to help prevent contact with moving parts.
7. The cabinet shall have option to change the discharge air direction from vertical to horizontal using optional factory provided air guides.
8. The cabinet shall have DIP switch setting to raise external static pressure up to 0.32 in-wg.

E. Coil:

1. The outdoor unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. The copper tubes shall have inner groves.
3. The aluminum fins shall have factory applied corrosion resistant GoldFin™ material.
4. Hydrophilic Coil coating shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours
5. The outdoor unit coil shall be tested to a pressure of 551 psig.
6. The coil for each cabinet shall have 14 Fins per Inch (FPI).
7. All the outdoor units shall have a 3 rows heat exchanger.
8. The cabinet shall have a coil guard.

F. Electrical:

1. The outdoor unit shall be capable of satisfactory operation within voltage limits of plus or minus 10 percent rated voltage.
2. The outdoor unit shall be controlled by integral microprocessors.

3. The control circuit between the indoor units, heat recovery box and the outdoor unit shall be 24VDC completed using a 2-conductor, stranded, shielded cable for the RS485 daisy chain communication.

2.02 HEAT RECOVERY UNITS FOR SIMULTANEOUS HEATING AND COOLING SYSTEMS:

A. General:

1. Heat recovery units shall be designed for use with VRF equipment of the same manufacturer.
2. Heat recovery units shall have factory installed control boards that interface to the VRF equipment controls system and shall perform all functions to effectively and efficiently control the simultaneous heating and cooling VRF system.
3. Heat recovery units shall be completely factory assembled, internally piped and wired.
4. Heat recovery units shall be run tested at the factory.
5. Heat recovery units shall be designed for indoor installation.
6. Shall use R410A refrigerant.
7. All refrigerant lines from the outdoor unit to the indoor units shall be field insulated.

B. Heat Recovery Unit Construction:

1. Galvanized steel housing.
2. The heat recovery unit contains piping, valves and controls to divert refrigerant for optimum efficiency.
3. The unit houses one double spiral tube-in-tube heat exchanger per port of the heat recovery unit.

C. Refrigerant System: R410A refrigerant shall be required for all VRF equipment and components including indoor units, outdoor units, refrigerant piping, valves, Y-branches, headers, heat recovery units, etc. as applicable.

D. Refrigerant valves:

1. The unit shall have 2, 3 or 4 ports. Each port shall be capable of connecting from 1 to 8 indoor units to a maximum nominal capacity of 54.0 MBH.
2. Maximum nominal capacity per HR unit shall not exceed 192MBh.
3. Indoor units greater than 54MBh nominal capacity shall be twinned using a reverse Y-branch.
4. Full Port Schrader Isolation valves shall be field provided and installed for ease of service to the heat recovery unit without evacuating the entire system refrigerant charge.

E. Electrical:

1. Units shall be capable of satisfactory operation within plus or minus 10 percent of nominal voltage.
2. The heat recovery unit shall be controlled by integral microprocessors from the main control in the outdoor unit.
3. The control circuit between the indoor units, heat recovery box and the outdoor unit shall be 24VDC completed using a 2-conductor, stranded and shielded cable for the RS485 daisy chain communication.

2.03 4-WAY CEILING CASSETTE INDOOR UNIT:

A. General:

1. Four-way cassette indoor units shall recess into the ceiling with a ceiling grille. All 2 foot by 2 foot four-way ceiling cassettes shall have ceiling grilles that do not exceed 24 inches by 24 inches.
2. Shall be designed for use with R410a refrigerant.
3. Shall be capable to be installed with heat pump or heat recovery or cooling VRF system
4. The wall mounted indoor unit shall communicate with the outdoor unit via RS485 daisy chain communication.

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested.
2. The indoor unit shall be factory wired and piped with its own electronic expansion device, control circuit board, fan and motor.
3. The indoor unit shall have
   a. self-diagnostic function
   b. auto restart function
   c. test run switch
4. Indoor unit refrigerant circuit shall be filled with a dry nitrogen gas charge from the factory.

C. Unit Cabinet:

1. The four-way ceiling cassette cabinet shall be designed to be recessed in the ceiling.
2. The cabinet panel shall have provisions for a field installed and filtered outside air intake.
3. Branch ducting shall be allowed from cabinet for units 24MBh and greater.
4. Four-way grille shall be fixed to bottom of the cabinet allowing two, three or four-way air flow.
5. Grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space.

D. Filter: Return air shall be filtered with a removable, washable filter.

E. Fan:

1. The indoor fan shall be an assembly with one turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced.
3. Motor shall have permanently lubricated bearings.
4. In cooling mode, the indoor fan shall have the following settings: Super Low, Low, Med, High, Power Cool and Auto.
5. In heating mode, the indoor fan shall have the following settings: Super Low, Low, Med, High and Auto.
6. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.
7. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

8. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.
9. The indoor unit vanes shall have 6 fixed positions
10. The indoor unit vanes shall be capable of automatically swinging the vanes up and down for uniform air distribution. Vanes shall also be capable of being stopped at any position during swing operation.
11. The indoor unit shall have a random vane setting in the heating or cooling mode that shall randomly cycle the vanes up and down to evenly heat or cool the space.

F. Coil:

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
1. The tubing shall have inner grooves for high efficiency heat exchange.
2. The coils shall be pressure tested at the factory.
3. A condensate drain pan shall be factory installed below the coil.
4. Refrigerant lines to the indoor units shall be field insulated.

G. Condensate Pump: The unit shall include a factory installed condensate pump that will be able to raise drain water 27.5 inches above the ceiling cassette face.

H. Electrical:

1. The system shall be capable of satisfactory operation within voltage limits of plus or minus 10 percent.

2.04 HIGH STATIC CEILING-CONCEALED DUCTED INDOOR UNIT:

A. General:

1. High static ceiling concealed duct indoor unit shall be a high-performance indoor unit that mounts fully concealed within the ceiling.
2. Shall be designed for use with R410a refrigerant.
3. Shall be capable to be installed with heat pump or heat recovery or cooling VRF system.
4. The wall mounted indoor unit shall communicate with the outdoor unit via RS485 daisy chain communication.

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested.
2. The indoor unit shall be factory wired and piped with its own electronic expansion device, control circuit board, fan and motor.
3. The indoor unit shall have
   a. self-diagnostic function
   b. auto restart function
   c. test run switch
4. Indoor unit refrigerant circuit shall be filled with a dry nitrogen gas charge from the factory.

C. Unit Cabinet: The cabinet shall be ceiling-concealed and ducted.

D. Filter:

1. Return air shall be filtered with a removable, washable filter.
2. Provide with factory return filter box with high-efficiency filter. Filter shall be factory provided and field installed. Equal to LG ZFBXBG01A.

E. Fan:

1. The indoor unit fan shall be an assembly with two Sirocco fans direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced.
3. The fan motor shall be Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.
4. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.
5. In cooling mode, the indoor fan shall have the following settings: Low, Med, High and Auto.
6. In heating mode, the indoor fan shall have the following settings: Low, Med, High and Auto.
7. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.
8. Each of the settings can be field adjusted from the factory setting (RPM/ESP).
9. Unit shall be designed for high speed air volume against an external static pressure of up to 1.0” water gauge.

F. Coil:

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. The coils shall be pressure tested at the factory.
4. A condensate drain pan shall be factory installed below the coil.
5. Refrigerant lines to the indoor units shall be field insulated.

G. Condensate Pump: The unit shall include a factory installed condensate pump that will be able to raise drain water 27.5 inches above the ceiling cassette face.

H. Electrical: The system shall be capable of satisfactory operation within voltage limits of plus or minus 10 percent.

2.05 CONTROL SYSTEM

A. Description: The LG AC Smart IV Central Controller shall be capable of monitoring and control of up to 128 indoor units or 130 Input/Outputs points through its touchscreen interface and embedded web browser. The LG AC Smart IV shall provide multiple energy management schemes and control of third-party equipment when paired with associated I/O controllers. Additionally, the LG AC Smart IV Central Controller shall be capable of providing daily, weekly, yearly, and holiday programmable scheduling of Occupied/Unoccupied settings, On/Off, Mode of Operation, set point and fan speed based on the available functions of the connected system.

B. Contractor to provide a static IP communication to AC Smart. Communication wiring to be provided and installed by mechanical contractor from I.T. room router.

C. General:

1. The LG AC Smart IV Central Controller shall communicate to the LG Multi V™ VRF indoor unit via the VRF RS-485 daisy-chain communication protocol.
2. The LG AC Smart IV Central Controller shall have a 10.2" backlit touchscreen LCD display screen.
3. The LG AC Smart IV Central Controller shall have web access with user control.
4. The LG AC Smart IV Central Controller shall be able to generate an operation and error history log with reporting capabilities.
5. The LG AC Smart IV Central Controller shall be able to control up to 128 indoor units in a group or as a single zone.
6. The LG AC Smart IV Central Controller shall support two digital input and two digital outputs for device interlock.
7. The LG AC Smart IV Central Controller shall have two set point auto changeover.
8. The LG AC Smart IV Central Controller shall have occupied/unoccupied set point control.
9. The LG AC Smart IV Central Controller shall have remote controller lock (All, Setpoint, Mode, and Fan Speed).
10. The LG AC Smart IV Central Controller shall have error e-mail notification.
11. The LG AC Smart IV Central Controller shall have visual floor plan navigation.

Basic Functions:

Function	Description	Monitor	Control
On/Off	On/Off operation for group	X	X
Mode of Operation	Mode of Operation for group (Heat/Cool/Fan/Auto/Dry)	X	X
Set Point	Space temperature setpoint for group. Setting temperature range 64°F-84°F depending on operation mode and connected equipment.	X	X
Space Temperature	Display measured space temperature	X	
Fan Speed	Select fan speeds Hi-Mid1-Mid2-Low-Auto	X	X
Airflow Direction	Select air direction settings Auto/Swing/Fixed	X	X
Group Control	Control and Monitor a group or multiple groups	X	X
Operational and Event Log History	Record system operation and fault code history	X	
Language Selection	Choice of multiple languages		X

Available functions/features may differ based on connected system.

Advanced Functions:

Function	Description	Monitor	Control
Schedule	Daily, Weekly, Yearly and Holiday programmable schedule Minimum of five events per day with On/Off, Occupied/Unoccupied, Mode, Set temperature, and Fan	X	X
Timed Override	Timed override of Unoccupied settings	X	X
Occupied/Unoccupied Setting	Ability to have different settings for both modes	X	X
Energy Use Display	Display actual operational time and power consumption.	X	X
Operation Run Time Limit	Limit the run time of an indoor unit	X	X
Two setpoint auto operation	Automatically manage room temperature for heating and cooling	X	X
Error E-Mail Notification	Send E-Mail when a system failure has been detected	X	X
Peak/Demand Control	Control and Limit power consumption of external devices	X	X
Temperature setpoint range limit	Ability to limit heating and cooling setpoint ranges	X	X
Remote controller Lock setting	Ability to lock out operation of the controller	X	X

Available functions/features may differ based on connected system.

12. The control system shall be designed such that each mechanical system will be able to operate under stand-alone control. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to independently operate under control.

D. Type of System:

1. The controls shall be composed of an independent, standalone, microprocessor-based system control panel. The system panel shall provide centralized control for distributed standalone unit controllers located on each indoor unit. The panel shall monitor and communicate with each outdoor and indoor unit and provide for scheduling, diagnostic or alarm messages, and coordination of occupied and unoccupied setpoints.
2. Power shall be 24 VAC or 12 VDC. The control system shall contain its own on-board isolation transformer or a dedicated transformer shall be provided.

H. Variable Refrigerant Flow (VRF) HVAC Systems:

1. Split System Unit
   a. The system control panel shall be capable of communicating with each individual indoor and outdoor unit and monitoring various points. Each indoor unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and communicate with the outdoor unit over an RS485 daisy chain.

2. Each indoor unit shall be provided with a programmable wired remote sensor that has the following features:
   a. The LG Programmable Wired Remote Controller shall be compatible with LG Multi V™ VRF indoor units.
   b. The LG Programmable Wired Remote Controller shall communicate to the VRF indoor unit via the VRF RS-485 daisy chain communication protocol.
   c. The LG Programmable Wired Remote Controller shall have a 4-1/4" backlit LCD display with screen saver capability.
   d. The LG Programmable Wired Remote Controller shall have an internal time clock and calendar.
   e. The LG Programmable Wired Remote Controller shall be able to display temperature in °F or °C based on user settings.
   f. The LG Programmable Wired Remote Controller shall be able to monitor and control up to sixteen indoor units (one group) as a single zone.
   g. Up to 2 LG Programmable Wired Remote Controllers shall be connectable to a single group and operate in a master/slave configuration.

I. Basic Functions:

Function	Description	Monitor	Control
On/Off	On/Off operation for group	X	X
Mode of Operation	Mode of Operation for group (Heat/Cool/Fan/Dry/Auto)	X	X
Set Point	Space temperature setpoint for group. Setting temperature range 64-84°F. Separate Heat/Cool setpoints settings for Auto Mode. *Set Point ranges dependent on operation mode and connected equipment.	X	X
Space Temperature	Display measured space temperature	X	
Fan Speed	Select fan speeds Hi-Mid1-Mid2-Low-Auto	X	X
Airflow Direction	Select air direction settings Auto/Swing/Fixed	X	X
Lock setting	Ability to lock out operation of the controller	X	X
Filter check	Notification to change dirty filter	X	
Dehumidification	Ability to remove moisture from the air	X	X
Temperature setpoint range limit	Ability to limit heating and cooling setpoint ranges	X	X

Available functions/features may differ based on connected system.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. The Contractor with this subcontractor, prior to installing equipment, shall examine the conditions under which the equipment is to be installed, and shall notify the Project Engineer and MDOT Architect and Engineer of conditions detrimental to the proper installation of the equipment.

B. Equipment shall be installed in accordance with the latest manufacturer's written instructions, and in accordance with governing codes and recognized industry standards and practices.

C. Equipment shall be protected from damage. Damaged equipment shall be replaced without additional cost.

D. The VRF system shall be installed by an installer trained by the VRF equipment manufacturer. Installation and commissioning training shall be required and performed by the manufacturer.

3.02 START-UP: An authorized representative of the equipment manufacturer shall make the initial start-up. The balancing contractor shall be responsible for final verification and reporting all airflows and other required test and balance data.

3.03 ADJUSTMENT: The equipment shall be tested and adjusted to ensure the scheduled capacities are as indicated in the equipment schedules. All controls shall be tested and adjusted.

3.04 COMMISSIONING:

A. Commission the VRF system per manufacturer's general requirements and as required for extended warranties.

B. Submit reports to the manufacturer; refer to Specification Section 23 05 11 "HVAC Submittal Data" for additional submittal and approval requirements.

END OF SECTION

SECTION 26 05 10 ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. This Division and the accompanying Electrical Drawings cover furnishing all labor, equipment and materials and performing all operations in connection with the installation of a complete and operational electrical system.

B. There are many interfaces between the work involved with this Division and the work in other Divisions, particularly with Divisions 22 & 23. Be aware of the responsibilities at the interfaces. The exact locations of apparatus, fixtures, equipment and raceways shall be ascertained from all concerned and the work shall be installed accordingly. In addition, coordinate with equipment suppliers and other trades to verify the actual installation requirements prior to rough-ins.

C. The Drawings and Specifications are considered cooperative and complimentary. Where one contradicts the other the specifications shall govern. Contact the Project Engineer / MDOT Architect for clarification prior to installation.

D. Applicable portions of the General, Special Conditions, and Division 01 Sections are included herein by reference.

1.02 DEFINITIONS

A. Install: Receive, store, place, fix in position, secure, anchor, etc., including necessary appurtenances and labor so the equipment or installation will function as specified and intended.

B. Furnish: Purchase and supply equipment and components, including shipping and receiving.

C. Provide: Furnish, install, connect, test, demonstrate and leave operational.

D. Wiring: Wire or cable installed in raceway with all required boxes, fittings, connectors, etc.

E. Work: Materials completely installed, including the labor involved.

F. Or approved equal: Equal in type, design, quality and appearance, as determined by the Architect.

G. Raceway: Galvanized rigid steel conduit (GRC), electrical metallic tubing (EMT), intermediate metal conduit (IMC), schedule 40 Polyvinyl Chloride (PVC), flexible steel (FLX), sheathed flexible steel (SLT), code gauge wireway (WW).

1.03 CODES AND REGULATIONS

A. All work shall comply with all local laws, ordinances and regulations applicable to the electrical and fire alarm/life safety system installation, NFPA, OSHA, ANSI, IBC 2012 Edition, ANSI/ASHRA E/IES Standard 90.1-2010 Edition, municipal ordinances governing electrical work, and with the requirements of the latest edition of the National Electrical Code.

B. Where different sections of any of the aforementioned codes and regulations, the Specifications or the Drawings require different materials, methods of construction, or other requirements, the most restrictive or stringent shall govern. Conflict between a general provision and a special provision, the special provision shall govern.

C. Obtain permits and licenses, and pay fees as required for execution of the Contract. Arrange for necessary inspections required by the Project Engineer / MDOT Architect, city, county, state and other local authorities having jurisdiction (LAHJ) and present certificates of approval to the Project Engineer / MDOT Architect or his designated representative.

D. Under no circumstances will asbestos, or asbestos related materials, be allowed on this project.

E. Communicate with required utility offices to meet utility schedules and regulations. Coordinate the local utility requirements with the requirements of these Contract Documents. Should conflicts arise, notify the Project Engineer / MDOT Architect immediately. Acquire services to avoid project delays. Conform to regulations of the local utility company with respect to metering, service entrance and service access.

1.04 SITE VISIT

A. ALL PARTIES SHALL VISIT THE SITE and thoroughly familiarize themselves with the local conditions and existing conditions which may affect the cost of the Work prior to project activity or submission of bids. NO ALLOWANCES will be made for lack of knowledge of existing job conditions which could reasonably be identified during site visit.

B. Where work under this Division requires extension, relocation, reconnection or modifications to the existing equipment or systems, the existing equipment or systems shall be restored to their original condition prior to completion of this Project.

C. Verify the service entrance voltage and short circuit contribution with the serving power utility and provide written confirmation of same to the Project Engineer / MDOT Architect prior to submitting shop drawings or ordering materials for use in the building served. Provide service entrance equipment fully rated to interrupt the available fault current from the serving utility.

1.05 DRAWINGS AND SPECIFICATIONS

A. The Electrical Drawings are diagrammatic, and are not intended to show the exact location of raceways, outlets, boxes, bends, sleeves, fire sealant, couplings or other such elements except where dimensions are noted. Provide required offsets, extensions or pull boxes required for a fully coordinated and operational system.

B. The Drawings and Specifications shall both be considered as part of the Contract. Work or material shown in one and omitted in the other, or which may fairly be implied by both or either, shall be provided in order to give a complete job.

C. Should conflicts exist between the Drawings and Specifications, notify the Project Engineer / MDOT Architect for clarification prior to installation.

D. Refer to the Architectural (Interiors), Structural, Mechanical, and Civil Drawings in conjunction with other project construction and shop drawings for dimensions, and properly fit the work to conform to the details of building construction.

E. The right is reserved to shift switch, receptacle, ceiling outlet or other outlet which has been roughed-in a maximum of 10'-0" from its location as shown before it is permanently installed, without incurring additions to the Contract in time or cost. In addition, refer to the Architectural Drawings for exact location of devices and equipment.

F. Conduit and wiring shown on the Electrical Drawings shall be provided under this Division regardless of its function.

G. Review the drawings and specifications provided for other systems such as Sound System, Computer, Landscape, etc., for additional work which may be required under this Division. Provide service to and make connections to all such equipment requiring electrical service.

H. Equipment configuration is based upon one manufacturer's product. Where the equipment selected by the Contractor for use on this Project differs from the configuration shown, the Contractor shall be responsible for coordinating space requirements, connection arrangements, interfaces with mechanical and plumbing equipment and all other affected trades and providing access for future maintenance and repair. Submit proposed revisions for approval by the Project Engineer / MDOT Architect.

1.06 DEVIATIONS

A. No deviations from the Drawings and Specifications shall be made without the full knowledge and consent of the Project Engineer and MDOT Architect.

B. If it is found that existing conditions make desirable a modification in requirements covering a particular item(s), report such item to the Project Engineer / MDOT Architect for their review and instructions.

1.07 EQUIPMENT CONNECTIONS

A. Coordinate with other trades and review the Drawings of other Divisions and provide suitable control equipment and feeders/branch circuits so that the above requirements shall be met without incurring additions to the Contract in time or cost. Conform to UL Listing and nameplate requirements for equipment furnished. Such adjustments shall be subject to the approval of the Project Engineer and MDOT Architect.

B. Provide suitable overcurrent protection and disconnecting means in conformance with the requirements of the NEC, for all items or equipment utilized on the project no matter how, or by whom, furnished. However, duplication, or redundancy, is not required. Coordinate said requirements with equipment furnished and with applicable trades.

C. Branch circuits supplying control panels and other equipment master and local unit locations and quantities shall be coordinated at the submittal stage and provided under Division 26. Provide emergency power where required to accomplish emergency equipment operations in accordance with Divisions 22 & 23 requirements. All control wiring for plumbing and heating, ventilation and air conditioning systems shall be installed under Divisions 22 & 23. Review Division 22 & 23 specifications and shop drawings for control systems to assure system compatibility between equipment furnished under Division 26 and system wiring and controls furnished under Divisions 22 & 23.

D. Motor controllers shall be furnished and installed by Division 26 where automatic control of equipment is required, unless specified to be furnished as an integral part of packaged equipment. Provide the number and type of auxiliary contacts and relays necessary to interlock the equipment and provide the specified control sequence, reserving spare NO and NC contacts for future use. Power wiring to motors and motor controllers and between motors and controllers shall be furnished under Division 26.

E. Where Drawings indicate or Specifications require equipment to be controlled by line voltage interlock, safety device or control, provide line voltage control wiring in Division 26.

F. For each electrical connection required, provide pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire connectors, and other items required to complete splices and terminations of the necessary types. Cover splices or terminations with electrical insulation equivalent to insulation of conductors terminated.

PART 2 - PRODUCTS

2.01 STANDARDS FOR MATERIALS AND WORKMANSHIP

A. Material shall be new and shall bear the inspection label of Underwriter's Laboratories, Inc. (UL).

B. The published standards and requirements of the National Electrical Manufacturer's Association (NEMA), Underwriters' Laboratories (UL), Electrical Testing Laboratories (ETL), American National Standards Institute (ANSI), Institute of Electrical and Electronic Engineers (IEEE), Insulated Cable Engineers Association (ICEA), National Fire Protection Association (NFPA), Occupational safety Health Association (OSHA) and the American Society for Testing and Materials (ASTM) shall govern and apply where such have been established for the particular material in question.

C. Specified catalog numbers and trade or manufacturers names are intended to describe the material, devices, or apparatus desired for type, construction features, electrical characteristics, ratings, operating functions, style and quality. Similar materials of other manufacturers, not less than specified quality, capacity or character may be substituted in conformity with the provisions of the General and Supplementary Conditions. Materials of the same type shall be the product of one manufacturer. Refer to shop drawing requirements.

D. Provide materials specified herein or indicated on the Drawings.

E. Work shall be installed in a practical and workmanlike manner by competent workmen, licensed and skilled in their trade.

2.02 SHOP DRAWINGS

A. Furnish complete electrical characteristics for equipment.

1. Submit for approval data of the materials and equipment to be incorporated into the Work.
2. Submittals shall include descriptive materials, catalog cuts, diagrams, performance characteristics, and charts published by the manufacturer indicating conformance to the Specification and Drawing requirements; model numbers alone will not be acceptable.
3. Submittals shall be made by Specification section number, tabbed, within three ring binders, grouped and submitted in packages as indicated below.
4. Submittals for lighting fixtures shall include full photometric data.

B. Shop drawings shall be submitted for the following equipment and items suitably bound, and marked:

1. Package I:
   Section 26 05 19 Low-Voltage Electrical Power Conductors and Cables
   Section 26 05 33 Raceway and Boxes for Electrical Systems
   Section 26 27 26 Wiring Devices

2. Package II:
   Section 26 24 16 Panelboards
3. Package III:
   Section 26 51 13 Interior Lighting Fixtures, Lamps, and Ballasts
4. Package IV:
   Section 28 31 00 Fire Detection and Alarm System

C. Shop drawings and/or catalog data submittals on all items of equipment and materials shall be submitted in conformity with requirements of the General and Supplementary Conditions and Division 01 Sections. Do not submit more than the required number of sets as indicated in Division 01. Do not submit equipment or materials not requested in the Specifications.

D. All material lists and shop drawing submittals shall include a stamped indication by the Contractor signifying that the submittals have been previously reviewed for complete compliance with the Contract Documents, that all coordination required between trades prior to field installation has occurred and that the material being submitted is approved for installation. The stamped indication shall include the name of the contracting firm, the date of the review and the signature of the contractor. The Engineer will not review the shop drawing submittals without the contractor's stamped approval already on the shop drawings. The responsibility of complying with the Contract Documents will not be relieved by the MDOT Architect’s and Engineer’s review.

E. Pricing is to be based upon the products, manufacturers, and processes described in the Contract Documents. Requests for approval of substitutions shall be written and delivered to the MDOT Architect's/Engineer's office in conformity with the provisions of the General and Supplemental Conditions. Do not submit shop drawing or product data that does not conform to the Contract Documents.

F. Resubmittals, if necessary, shall be made as specified above. Resubmittals will highlight and indicate revisions made there to and will include the following text " Resubmittal #___", typed in a prominent location on the cover sheet.

G. Furnish with the shop drawing submittal dimensioned layouts of electrical rooms and spaces using the equipment he intends to furnish / provide. Switchboard, panelboards, distribution panels, etc., WILL BE REJECTED without dimensioned room layouts.

H. Samples of materials proposed for use shall be presented to the MDOT Architect/Engineer for his approval when requested.

I. Submittals shall be noted with deviations, alterations or limitations of product from the specified materials. The product will be REJECTED upon failure to indicate this information. Conflict or failure to perform comparably to the originally specified materials will result in product rejection. It will be the Contractor's responsibility to replace the alternate material or equipment with the originally specified one and to demolish, replace, repair and retest the equipment, including repair or replacement of component of the building, finishes or other systems affected by said replacement, at no additional costs to the Owner.

2.03 SUPPORT FASTENER DEVICES

A. Anchors for cast in place concrete shall be insert type expansion shields and bolts, lead shields and bolts or self drilling expansion shields and bolts. Powder actuated pins of 1500 pound pull out strength may be utilized in concrete, only with written approval by the Project Engineer.

B. Anchors for wood construction shall be lag bolts or power driven wood screws.

C. Anchors in hollow masonry shall be toggle bolts.

D. Anchors for steel attachment shall be machine screws, bolts, or beam clamps.

E. Equipment mounted to drywall construction shall be secured to power channel (13/16 inch by 1 5/8 inch minimum). Secure channel to a minimum of two (2) dry wall studs with drywall screws and washers.

2.04 SUPPORTS

A. Provide under this contract angle iron, channel iron, rods, threaded rod, supports or hangers required to install or mount electrical equipment, material or related devices. Conduit shall not be supported from roof decking, bridging, ceiling or ceiling support wires.

2.05 IDENTIFICATION

A. All equipment or devices specified in Division 26 shall be identified with an engraved plastic nameplate. Identification of flush equipment shall be on the inside of the cover. Surface equipment shall be identified on the outside. Plastic nameplates shall be multicolored laminated plastic with engraved lettering. Nameplates shall be provided as scheduled:
   1. 240/120 volt normal power equipment shall be white faceplate/black core (1-1/2 inch by 6 inches with 3/8 inch high letters).
   2. 240/120 volt emergency power equipment shall be white faceplate/red core (1-1/2 inch by 8 inches with 1/2 inch high letters). Face plate shall read “Emergency - 120 Volts”.
   3. Computer power equipment (i.e. UPS, isolated ground, etc.) shall be orange faceplate/white core (1-1/2: inch by 8 inches with 3/8 inch. Faceplate shall read “Computer - _____ Volts”.
   4. Provide 3 inches high by (length as required) for electrical switchboards.
   5. Junction boxes for emergency power, lighting, fire alarm systems, etc. shall have circuit numbers indicated and labeled as required.
   6. Junction boxes for general power, lighting and misc., systems etc. shall have circuit numbers indicated and voltage (system) labeled as required.

2.06 AS-BUILT (RECORD) DRAWINGS

A. Maintain on the job site at all times during construction a set of "As-Built" mylar sepias with all changes during construction marked thereon. This set shall be utilized for no other purpose. Include addenda, change orders, field orders, project sketches or "marked-up" drawing prints as may be generated on the job site to assist in recording the changes.

B. The "As-Built" sepias shall show changes and deviations from the Contract Drawings including relocation of outlets, conduit and equipment. Record final dimensioned locations of switchboards, panelboards, transformers, disconnect switches, etc. Make sufficient measurements to locate underground conduit. Show exact locations of underground cable and conduits, both interior and exterior, fully dimensioned from building column lines or permanent exterior structures. These drawings shall be available for reference at the time of final inspection.

C. At the completion of construction, all changes noted above shall be incorporated thereon by the Contractor. The reproducible drawings, with one set of blueline prints thereof and the original sketches and marked-up "As-Built" prints shall be presented to the Owner.

2.07 MAINTENANCE AND INSTRUCTION MANUALS

A. Submit to the Architect/Engineer/Owners Representative upon completion of the work and prior to final inspection, copies of maintenance and instruction manuals for equipment provided as outlined below:

   1. Three sets of the following data are required:
      a. Operating and maintenance instructions.
      b. Spare parts list.
      c. Copies of approved submittal data.

d. Copies of panelboard circuit directories reflecting all field changes.
e. Test reports of all tests performed.
f. Contact names and phone numbers for parts suppliers of submitted equipment.

B. Arrange each set of data in a orderly way and bind each set in a separate 3-ring hard-cover binder with appropriate label identifying the Project, Architect, Engineer, Contractor, Subcontractor and Date.

2.08 SUBMISSION OF DRAWINGS

A. Submission of Architect's drawings for shop drawings and unaltered Architect's drawings for "As-Built" will not be acceptable.

PART 3 - EXECUTION

3.01 COORDINATION

A. Before piping, conduit, outlets, equipment or lighting fixtures are located in area, coordinate the space requirements with other trades. Such shall be arranged so that space conditions will allow trades to install their work, and will also permit access for future maintenance and repair. Coordinate the installation of recessed electrical equipment with concealed ductwork, piping, insulation, structural appurtances and wall thickness.

B. Piping, ductwork, conduit and equipment installed at variance with the above requirements shall be relocated and/or revised to conform with the above requirements without incurring additional cost to the Contract.

C. Coordination of space requirements with other trades shall be performed so that:

1. No piping or ductwork, other than electrical, shall be run within 42 inches of panelboards, switchboards, and transformers.

2. No pipes or ducts that operate at a temperature in excess of 120 degrees F. shall be installed nearer than 3 inches to electrical conductor.

D. Do not scale Drawings. Obtain dimensions for layout of equipment from the Architectural Drawings unless noted on the Electrical Drawings.

E. Subcontractor for work under this Division shall be fully responsible for determining in advance of purchase that proposed equipment and materials for installation shall fit into the confines indicated and allow sufficient clearance for maintenance and service of equipment including other trades.

F. Clearances in front of electrical switchboards, panelboards, motor starters, bus plugs etc. (equipment requiring maintenance while energized) shall be installed in accordance with N.E.C. 110-162 condition number 2.

3.02 PROTECTION OF MATERIALS

A. Refer to the general requirements section of the Specifications for storage, protection and handling requirements.

B. Provide dry, weathertight staging and storage for materials and equipment requiring protection from weather and moisture in accordance with manufacturer's recommendations. Install temporary lighting or heat sources to prevent moisture accumulation. Provide protection against direct sunlight, precipitation, wind, ice, fire or excessive heat. Store materials in original undamaged packaging with manufacturer's

labels and seals intact. Containers which are broken, damaged or watermarked are not acceptable and will be rejected.

C. Materials and equipment shall not be installed until the environmental conditions of the project are suitable to protect them in accordance with manufacturer's recommendations. Equipment and materials damaged and subjected to moisture, precipitation, direct sunlight, cold and heat are not acceptable and shall be removed from the project and replaced at no additional costs to the Owner.

D. Conduit and other openings shall be kept protected to prevent entry of foreign matter and construction debris. Fixtures, equipment, and apparatus shall be kept covered for protection against dirt, water, chemical, and mechanical damage before and during construction.

E. The original finish, including shop coat of paint of fixtures, apparatus and equipment that has been damaged shall be restored without incurring additions to the Contract in time or price.

3.03 HOUSEKEEPING PADS

A. Provide 4 inches minimum height concrete pad, integral with floor, under floor mounted electrical equipment and apparatus.

3.04 CUTTING AND PATCHING

A. The Contractor and subcontractor are responsible for all cutting and patching, including escutcheon plates where necessary, whether or not such cutting and patching is indicated.

3.05 CLEANING AND PAINTING

A. Remove foreign materials, drywall compound, overspray, oil, dirt and grease from raceway, fittings, supports, boxes, cabinets, pull boxes, panelboard trims and equipment to provide clean surfaces for painting. Remove surface oxidation and restore galvanized surfaces with cold process galvanizing compounds. Touchup marred or scratched surfaces of fixtures, panelboard and cabinet trims, motor control centers, switchboards, cabinets, and equipment enclosures with paint furnished by the equipment manufacturer specifically for that purpose. When touchup is required, provide one base coat over imperfection and subsequent coat over entire side or surface of equipment.

B. Do not paint trim hinges, latches, clamps, locks, device covers or trim covers. Mask or remove such items prior to finishing.

C. Unless otherwise noted herein, painting shall conform to the "Painting" Section of the Specifications.

D. Where plywood backboards are utilized to mount electrical or electronic equipment provided under Division 26, finish same with two (2) coats of light gray semi-gloss paint.

3.06 ACCESS TO ELECTRICAL ITEM

A. Install concealed electrical equipment, junction and pull boxes, apparatus, and devices so as to maintain access for maintenance, operations and replacement. Access doors or covers shall be provided where required by NEC or LAHJ and shall be installed in accordance with manufacturer's instructions. Locate each access unit accurately in relation to electrical work requiring access.

3.07 EQUIPMENT CONNECTIONS

A. Review Divisions of Specifications, where equipment requiring electrical service is specified, to determine the complete scope of work under this Division of the Specifications. Provide electrical connections and service to equipment specified elsewhere requiring such connections and service.

B. Connect equipment requiring electrical connections, in accordance with the equipment manufacturer's requirements. Where equipment connections require specific locations, determine and coordinate same with submittals. Provide concealed service to central plant equipment locations and pads.

3.08 NAMEPLATES AND IDENTIFICATION

A. Provide nameplates for transformers, switchboards, switchgear, power and lighting panels, disconnect switches, time switches, pull boxes, junction boxes, fire alarm equipment, contactors, relays and other unit equipment. Nameplates shall be affixed with epoxy cement. Refer to this Section 26 05 10-2.5 for additional requirements.

B. Install nameplates plumb and level.

C. Provide sleeve type wire markers on conductors at termination points and access points. Branch circuit identification (as LP-21") shall be installed on hot and neutral conductors. Dedicated circuits and isolated ground technical power circuits shall have wire markers installed on ground conductor. Label junction and pull box covers with circuit numbers contained therein.

3.10 EXCAVATION AND BACKFILLING

A. Provide and perform excavation required to install conduit, ductbanks and manholes indicated on the Drawings and/or specified. Trenches shall be of uniform width required with minimum 8 inches clearance on both sides. Remove and dispose of materials not used for backfill. Maintain dry excavations for electrical work, by removing water. Grade areas to prevent surface water from entering excavation. Remove accumulated water by pumping. Perform excavation by open cut. Excavate with vertical-sided excavations where possible. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations. 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 LAHJ. No tunneling shall be permitted.

B. The bottom of trenches and excavation shall be graded to provide uniform bearing surface for conduits and ductbanks on undisturbed soil at every point along entire length. Tamp over-excavation with specified backfill materials. Remove unstable materials unsuitable for supporting equipment and installation and replace with specified materials for a minimum of twelve (12) inches below invert of equipment or installation.

C. Specified materials shall be utilized for backfilling, in not more than six (6) inch layers and tamped until the installation has cover of not less than the adjacent grade and not more than two (2) inches above same. Remove sheeting and cross-bracing during backfilling wherever such removal would not endanger the work or other property. Equalize backfilling operation to avoid shifting of materials and equipment installed. Compaction of backfill materials shall be at least equal to surrounding undisturbed material. Backfill trenches with concrete where excavations pass within 18" of footings or other utility lines. Do not settle backfill with water. Conform to compaction requirements and methods specified elsewhere.

D. Electrical duct shall be installed a minimum of 24 inches below finished grade with bottom of duct below geographic frost line. Duct cark shall not be in direct contact with building structure (slab) except for vertical riser supports.

3.11 TESTS AND CERTIFICATIONS

A. Upon completion of the electrical work and prior to final inspection, conduct an operating test in the presence of the Project Engineer / MDOT Architect or his designated representative.

B. The installation shall be demonstrated to operate in accordance with the Contract Documents. Material and workmanship which does not meet with the approval of the Project Engineer / MDOT Architect shall be removed, repaired or replaced as directed without incurring additions to the Contract in time or cost. Electrical systems shall be tested for compliance with the Specifications.

C. Furnish all instructions, tools, test equipment and personnel required for the test. Have sufficient tools and personnel available to remove equipment covers, coverplates, etc., as required for review of internal wiring and proper inspection. Provide hand tools, flashlights, ladders, outlet testers, VOM, meters and keys required to access and observe system operation and characteristics. Turn circuits on and off as directed and demonstrate operation of equipment as directed.

D. This subcontractor shall test wiring and connections for continuity and grounds by megger testing. Upon indication of defective insulation, remove and replace the defective conductor and demonstrate by testing that the new conductor is acceptable. Record feeder load currents and line voltages measured at each transformer, switchboard and panelboard after installation of equipment and lighting. Adjust transformer taps as required to provide optimum voltage levels. Adjust single phase load connections to balance feeder load and document on as-built drawings. Provide the Owner with full documentation of all testing for future reference.

E. Refer to the individual Specification Sections and the electrical systems testing Section of the Specifications for specific testing requirements.

3.12 TEMPORARY WIRING

A. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the construction requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary work shall be installed in accordance with the National Electrical Code, Article 305, and as required by OSHA or applicable local safety codes, rules and regulations.

3.13 WARRANTY

A. Systems and components shall be furnished with a one-year warranty from the time of final acceptance. The warranty shall cover defects in materials, design and workmanship. During this warranty period, defects in materials and workmanship shall be corrected without incurring additional cost to the Contract. The correction shall include removing the defective part(s), replacing and installing the new parts (including shipping and handling), all required cutting, patching, repainting, and other work involved, including repair or restoration of damaged sections and parts of the premises resulting from fault included in the warranty, entirely at the expense of the Contractor.

B. In addition to this general warranty, present to the Project Engineer / MDOT Architect other guarantees and warranties from equipment or system manufacturers. These supplemental guarantees and warranties shall not invalidate the general warranty.

END OF SECTION

SECTION 26 05 11 ELECTRICAL SUBMITTAL DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions, Division 01 Sections, and Section 26 05 10 Electrical General Requirements, apply to work herein.

1.02 QUALITY ASSURANCE

A. Shop drawings and fully descriptive catalog data shall be submitted for items of material and equipment provided under this contract. Submit to the Project Engineer / MDOT Architect a sufficient number of copies of such shop drawings and catalog data to provide him with as many reviewed copies as he may need, plus three (3) copies for retention; one by the Project Engineer, one by the MDOT Architect, and one by the Engineer.

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 of the official review by the Architect. Any 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 and catalog data by the MDOT Architect and Engineer shall not relieve the Contractor from responsibility for deviations from the Drawings and Specification unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the MDOT Architect. Also, it shall not relieve him from responsibility for error(s) in shop drawings. When the Contractor does call such deviations to the attention of the MDOT Architect, he shall state in his letter whether or not such deviations involve extra cost. If this is not mentioned, 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 and submittal, shall be the sole responsibility of the Contractor.

E. Reproduction of Design Documents for use in a submittal is not acceptable.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Products shall be new and bear all labels which are identified by the applicable Specification Section, Contract Documents and Contract Drawings

PART 3 - EXECUTION

3.01 SUBMITTAL DATA

A. General

1. The submittal data to be furnished for this project shall comply with the Specifications, Contract Documents, and Contract Drawings in their entirety. submittals herein scheduled are a minimum only and shall not be construed to limit the submittal data required within the individual Sections of these Specifications.
2. 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 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. Submitted equipment must be identified on shop drawings with the same "Mark Numbers" as identified on Drawings or in Specifications. Complete pertinent data such as accessories shall also be marked. Deviation from the Contract Documents shall be clearly and completely highlighted.
3. Electrical submittal data shall be bound into separate 3-ring binders, each volume shall contain one copy of specified equipment/shop drawing submittals. Each binder shall be provided with an index of materials and 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. FAILURE to provide BOUND AND IDENTIFIED SUBMITTALS will result in the AUTOMATIC REJECTION of the submittal data with NO EXCEPTION.

B. The bound submittals are to be submitted for review within 30 days after the Contract is awarded. No submittal will be checked until ALL required submittals have been received by the Engineer.

C. Submit with the bound and identified submittal data a letter signed by the Contractor's Project Manager (or higher level officer of the firm) stating that electrical characteristics of the mechanical equipment to be supplied has been fully coordinated with the mechanical subcontractor. No submittal data will be checked until this letter is submitted. Changes to the electrical requirements from the Contract Documents resulting from alternate equipment being submitted shall be performed without additions to the Contract Sum. Shop drawings shall be submitted for each of the following:

1. Disconnect Switches
2. Starters

3.02 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Description:

1. A system wiring and control diagram shall be included in the operating and maintenance instruction.

2. Prior to final acceptance or beneficial occupancy, furnish the services of a competent representative to instruct the Owner in the operation of systems for a period not less than three (3) days. This instruction shall include a complete walk-through of equipment and systems. The Project Engineer, MDOT Architect, Commission Agent, and Engineer reserves the right to attend such meeting and shall be duly notified.

3.03 OTHER SUBMITTALS – CLOSEOUT FORMS

A. Submit two copies of the following prior to occupancy of the project by the Owner. See Contract Closeout Forms – Section 00 65 00.

1. As built drawings for the electrical systems.

2. Request for final payment.

3. Letter or “Release of Liens”.

4. Letter of “Guarantee”.

5. Consent of Surety Company to final payment.

END OF SECTION

SECTION 26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. This Section covers the furnishing, installation and connections of the building wiring system. Interior wiring, power distribution, lighting, appliance and equipment, motor and exterior wiring systems extending beyond the building are included. The wiring system shall be complete from electrical service entrance to every electrical device requiring an electrical connection.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Conductors shall be copper of 98 percent conductivity, soft temper, 600 volt insulation. Sizes specified are American Wire Gage (AWG) for No. 4/0 and smaller and thousand circular mils (kcmil) for all sizes larger than No. 4/0. Service entrance conductors shall be 600 volt, type XHHW.

B. Conductors No. 10 and smaller shall be solid and type "THHN" / THWN" insulation. No. 8 and larger shall be stranded and type "THHN" / "THWN" or “XHHW” insulation.

C. Wire and cable shall be U. L. Listed and shall bear the U. L. Label.

D. Conductors shall have size, grade of insulation, voltage and manufacturer’s name permanently marked on the exterior at maximum 24 inch intervals.

E. Conductor size shall be a minimum of No. 12 AWG. Conductor size shall be not less than indicated on the Drawings. The minimum size of emergency circuits shall be No. 10 AWG.

F. Fixture wire shall be No. 14 AWG silicone rubber insulated, stranded fixture wire, Type THAN (90 degrees C.).

G. Control conductors for use on 120 volt control wiring shall be No. 14 AWG stranded Type THHN/THWN, unless indicated otherwise on the Drawings or as required for compliance with voltage drop requirements.

H. Where cables are used for switch leg, the white conductor shall be permitted to supply the switch, but not as a return to the fixture.

2.02 PREFABRICATED CABLE ASSEMBLIES

A. Metal clad cable type MC may be utilized for concealed branch circuit wiring only as permitted by local authority having jurisdiction. Insulated ground conductor shall be provided.

2.03 CONNECTORS

A. Terminations and connections shall be made with U. L. Listed connectors applied in accordance with manufacturer's recommendations.

B. Connections of No.10 AWG and smaller size power and lighting branch circuit conductors shall be made with insulated spring steel wire nut connectors. Size No.8 AWG and larger connections shall be made with hydraulically applied compression type connectors with insulated covers.

C. Connections of special system conductors shall be made via dedicated terminal strips labeled to indicate wire number and system type. Wire nut connections in system junction box are not acceptable.

2.04 ACCEPTABLE MANUFACTURERS

A. Wire and Cable products:

1. Southwire Co.
2. Rome Cable
3. Alcan Cable
4. Carol Cable
5. AFC Cable Systems
6. American Insulated Wire
7. Cerro Wire & Cable
8. General Cable
9. Triangle PWC
10. Cabelec
11. Okonite

B. Signal Cable products:

1. Belden
2. Continental
3. Dekoron
4. West Penn

C. Connector products:

1. AMP
2. Burndy
3. Eagle
4. Gould
5. Ideal
6. Joslyn
7. O-Z Gedney
8. Thomas & Betts

9. Ilsco
10. Buchanan
11. King

D. Wire management products:

1. AMP
2. Thomas & Betts
3. Panduit
4. Wieland

E. Wire & Cable identification products:

1. Thomas & Betts SM series
2. Wieland C type
3. Brady type XC

F. Wire Pulling lubrication products:

1. Ideal Yellow 77
2. Electro Y ER EAS
3. Burndy Silkon

PART 3 - EXECUTION

3.01 WIRING

A. Conductors shall be installed in conduit, unless noted otherwise. Conductors shall be pulled in at the same time. No conductors shall be pulled into the conduit until the conduit system is complete and drywall construction has dried. Clean, swab and evacuate conduit system before pulling in conductors. Do not exceed the manufacturer's maximum pulling tension.

B. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. Splices and joints shall be carefully and securely made to be mechanically and electrically solid with proper U. L. Listed connectors. Where connection is made to terminals of more than 30 amperes capacity and where conductors larger than No. 10 are connected to terminal, copper terminal lugs shall be secured to the conductors. Where multiple connections are made to the same terminal, individual lugs for each conductor shall be used.

C. Each conduit shall have a minimum of three (3) conductors pulled in unless that particular conduit is noted as being for systems other than electrical circuitry and/or future use or unless noted otherwise. Grounding conductors are not shown in wire count, but are required from circuit origin to last device.

D. Conductors for lighting and receptacle circuits shall have color coded jackets. The wiring shall be color coded with the same color used with its respective phase through the entire job as follows:

1. 208/120 Volt Systems

a.	Black	Phase A
b.	Red	Phase B
c.	Blue	Phase C
d.	White	Neutral
e.	Green	Ground
f.	White/Green Stripe	IG Neutral
g.	Green/White Stripe	IG Ground

E. The feeder and service entrance conductors shall be color coded by the use of one (1) inch wide colored plastic tape applied within 6 inches of each conductor end.

F. Branch circuit conductors shall not be smaller than No. 12 and where the home run from panel to first device exceeds 60'-0", the conductors from home run outlet to panel shall be No. 10 minimum.

G. Branch circuit wiring which supplies more than one fluorescent fixture through wireway of other fixtures shall be rated for use at 105 degrees C.

H. For branch circuits terminating in outlet without device, leave minimum of 12 inches of slack wire coiled for connection of equipment.

I. Conductors shall be identified with proper circuit numbers at access points, terminals, and junction boxes and at panelboards within 6 inches of conductor ends.

J. Special systems conductors shall be color coded in accordance with system manufacturer's recommendations or in a manner approved by the Engineer.

K. Furniture system branch circuits shall have minimum No.10 neutral home run conductors pulled to system junction box.

L. Maintain phase rotation established at service entrance point throughout entire project.

M. Taps and splices, where permitted by these Specifications, shall be performed with an encapsulating watertight connection kit which insulates and moisture seals the connection.

N. Grounding conductors are not indicate in the wire count shown on the Drawings, but are required in branch circuit and feeder installations. Provide insulated ground conductor (sized per NEC requirements) in all raceways.

3.02 CONTROL WIRING

A. Control wiring is defined as the wiring which provides connections between control circuit elements and does not provide the power circuit.

B. Generally, control wiring is specified in Divisions 22 & 23; however, where a control device such as a push-button, thermostat, firestat, etc. is to be installed in the power circuit, these devices shall be received, stored and installed as part of the work of this Division. Control wiring, conduit etc. shall be coordinated with Divisions 22 & 23 and provided as required.

3.03 CONNECTIONS

A. Connectors shall be U.L. Listed and shall be utilized in full accordance with manufacturer's requirements.

B. Splices shall be made only where specifically approved by the Engineer. Conductors shall be continuous from origin to first outlet box or manhole. Splices made exterior to the structure, or below grade, shall be compression type connections with insulated, waterproof covers. Submit splicing requests for review and approval prior to installation.

C. Termination lugs shall be applied to single cables No. 8 and larger, and shall be compression type fittings. The use of mechanical type lugs, kerneys or other pressure type connections will not be permitted.

D. Compression connections shall be long barrel type installed using hydraulic tools designed for the purpose.

E. Insulated spring steel wire nut connectors shall be used for branch circuit connections of No. 10 and smaller conductors. Connections of No. 8 and larger sizes shall be made with compression type connections with insulated covers. Where exposed to moisture or corrosion spring steel wire nut connectors shall be silicone filled.

F. Control and special system riser and junction boxes shall be fitted with terminal strips and conductors shall be labeled per system requirements. The installation of wirenuts in special system riser and junction boxes is not acceptable.

G. Phase rotation at service equipment shall be maintained throughout entire project, color coding of conductors shall be consistent for feeders and branch circuits through out entire project.

3.04 IDENTIFICATION

A. Conductors shall be identified with full circuit number at access points, boxes, and at panelboards within 6 inches of conductor end. Identification shall be permanently marked PVC split sleeve or tubing type

B. Tape or laminated type wire markers are not acceptable

C. Permanently mark the junction box cover with the circuit numbers for conductors contained within. Utilize black marker for normal power and red marker for emergency power and fire alarm.

3.05 WIRE MANAGEMENT

A. Power and control wiring within special system cabinets and enclosures, and within switchboards and electrical equipment shall be bundled or routed within slotted wiring duct in a workmanlike manner.

B. Knockout, cutout and slot containing wiring shall be fitted with bushing or continuous grommet strip to avoid fraying and abrasion.

C. Train and lace conductors within panelboard and control enclosures with cable ties or spiral wrapping.

D. Spare conductors installed shall be identified and capped.

END OF SECTION

SECTION 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. This Section covers providing the building grounding system. The grounding system shall be established with equipment grounding conductors; the use of metallic raceways as the only method of equipment grounding is not acceptable.

C. In addition, this Section covers ground fault protection for the main service entrance equipment.

PART 2 - PRODUCTS

2.01 GROUNDING CONDUCTORS

A. Grounding electrode conductors shall be bare or green insulated copper conductor sized as indicated on the Drawings.

B. Equipment grounding conductors shall be green insulated type THHN/THWN, or XHHW conductors sized as indicated on the Drawings. Where size is not indicated on the Drawings, conductor size shall be determined from the National Electrical Code table on sizes of equipment grounding conductors.

C. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code tables for grounding electrode conductors.

2.02 PANELBOARDS, MOTOR CONTROLLERS, AND DISCONNECT SWITCHES

A. Provide each low voltage distribution and branch circuit panelboard with a copper equipment grounding bar brazed or riveted to the associated enclosures or cabinet and an insulated neutral bar.

B. Provide a conductor termination grounding lug bonded to the enclosure of each equipment item.

2.03 DEVICES

A. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame.

2.04 GROUND RODS

A. Ground rods shall be 3/4 inch by 10'-0 copper clad steel.

B. Sectional ground rods shall be hot dip galvanized 5/8 inch by 10 ft. sections with an internal stainless steel splined coupling pin.

2.05 HYDRAULIC AND MECHANICAL TERMINATIONS

A. Acceptable manufacturers for hydraulically applied terminations are Square D, Burndy and Thomas and Betts (T & B).

B. Acceptable manufacturers for mechanically applied terminations are Ideal, Burndy and Thomas and Betts (T & B).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground non-current carrying parts of the electrical system, i.e. raceways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, to provide a low impedance path for potential grounded faults.

B. Service entrance and separately derived electrical systems, grounding electrode system:

1. The neutral conductor of the electrical service serving the premises wiring system shall be grounded to the ground bus bar in the service equipment which shall be grounded to the cold water system, the ground rod system, and other grounding electrodes specified herein or indicated on the Drawings. Grounding electrode conductors shall be installed in rigid, nonmetallic conduit to point of ground connection, unless subject to physical damage in which case it shall be installed in galvanized rigid steel. Where metallic conduit is permitted, bond conduit at both ends to grounding electrode conductor with a U.L. bonding busing.
2. Make connection to main water line entering the building. Make connections ahead of any valve or fittings whose removal may interrupt ground continuity. Install a bonding jumper of the same size as the grounding conductor around the water meter.
3. Bond together the following systems to form the grounding electrode system. System connections shall be made to the electrodes as close as possible to the service entrance equipment and each connected at the service entrance equipment ground bus. Do not connect electrode systems together except at ground bus.
   a. Ground rod system
   b. Main rebar in foundation footing
   c. Building structural steel components.
4. Grounding Electrode connections to structural steel, reinforcing bars, ground rods, or where indicated on the drawings shall be with chemical exothermic weld connection devices recommended for the particular connection type. Connections to piping shall be with U.L. listed mechanical ground clamps.
5. Bonding shall be in accordance with the National Electrical Code.
6. Install ground rods where indicated on the drawings with the top of the ground rods 12 inches below finished grade.

C. Equipment Grounding Conductor:

1. Grounding conductors for branch circuits are not shown on the Drawings; however, grounding conductors shall be provided in all branch circuit raceways and cables. Grounding conductors shall be the same AWG size as branch circuit conductors.
2. Grounding conductors for feeders are typically indicated on the drawings and the raceway is sized to accommodate grounding conductor shown. Where grounding

conductor size is not indicated on the drawings, conductor shall be in accordance with the equipment grounding conductor table of the National Electrical Code.

3. A grounding conductor shall be installed in all flexible conduit installations. For branch circuits, grounding conductor shall be sized to match branch circuit conductors.
4. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related cabinet grounding bar.
5. The equipment grounding conductor shall be attached to equipment with bolt or sheet metal screw used for no other purpose. Where grounding conductor is stranded, attachment shall be made with lug attached to grounding conductor with crimping tool.
6. Ground all motors by drilling and tapping the bottom of the motor junction box and attaching the equipment grounding conductor to the box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of lug attached to conductor with crimping tool.
7. Equipment grounding conductors shall terminate on panelboard, switchboard, or motor control center grounding bus only. Do not terminate on neutral bus. Provide a single terminal lug for each conductor. Conductor shall terminate in the same section as the phase conductors originate. Do not terminate neutral conductors on the ground bus or equipment grounding conductors on the neutral bus.

D. Other Grounding Requirements:

1. Each telephone backboard shall be provided with a No. 6 grounding conductor. When backboard is located in vicinity of electrical service equipment, the "point of grounding" of this conductor shall be the main cold water service with connections made ahead of any valves or joints. Remote backboards shall use building steel as "point of ground". Terminate conductor by stapling to backboard.
2. At each building expansion joint flexible copper bonding jumpers shall be attached to building structure by chemical weld process. Install bonding jumpers in concealed locations that will not subject connections or jumpers to physical abuse. Install 100 feet on centers across expansion joints.
3. Bond all metal at pools or fountains to grounding electrode system per NEC requirements.

3.02 TESTING

A. Upon completion of the ground rod installation, test the grounding resistance. Grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within forty-eight hours of rainfall. Results of ground resistance readings shall be forwarded, in writing, immediately to the Project Engineer.

B. If the resistance to ground exceeds 5 ohms, additional rods shall be driven and bonded together, until a reading of 5 ohms or less to ground is obtained. After completion of the grounding system, measure the system ground resistance with a "Megger Earth Tester". Submit directly to the Project Engineer two (2) copies of each test report certified by the testing technician and the electrical subcontractor.

C. Grounding electrode conductors and ground bus shall be measured for objectionable levels of current, and to detect inadvertent connection of neutral to ground.

D. If the ground current exceeds 10 percent of the rating of the conductor ampacity, devices on that feeder or circuit shall be rechecked for proper connection.

E. Grounding system connections shall be rechecked at final checkout for correct wiring termination methods and mechanical strength.

END OF SECTION

SECTION 26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. This Section covers the installation of all interior and exterior conduit and raceway systems, outlet boxes, pull boxes, junction boxes and wiring troughs or other boxes throughout the wiring system, including supports.

C. Outlets are located diagrammatically on the Drawings. Outlets shall be located so as to be symmetrical with Architectural details.

PART 2 - PRODUCTS

2.01 GENERAL MATERIAL REQUIREMENTS

A. Boxes shall be U. L. Listed and labeled.

B. Boxes shall be of one-piece construction, fabricated from NEC gage galvanized steel, unless rustproof cast metal boxes are specified or required by NEC, or unless otherwise shown on the Drawings.

2.02 CONDUIT

A. Galvanized rigid steel conduit (GRC) shall be low carbon, hot-dipped zinc galvanized steel to meet U.L. 6 Standards, ANSI C80.1 and shall have NPT (ANSI B1.20.1) full cut threaded joints, galvanized after forming. IMC shall carry U. L. Label. Conduit with integral couplings may be utilized for 2.5 inch sizes and above provided it conforms to U. L. Safety Standard #514-B.

B. Intermediate metal conduit (IMC) shall be premium hardened steel conforming to ASTM-A568, hot galvanized with zinc chromate exterior with polymer sealcoat to meet U.L. 1242 and ANSI C80.6 standards. Interior shall be finished with corrosion inhibiting organic coating. Both coatings shall conform to ANSI C80.6 requirements. IMC shall have NPT (ANSI B1.20.1) full cut threaded joints, galvanized after forming. Conduit with integral couplings may be utilized for 2.5 inch sizes and above provided it conforms to U. L. Safety Standard #514-B. IMC shall carry U. L. Label.

C. Electrical metallic tubing (EMT) shall be high grade mild ductile steel, hot galvanized exterior with a clear organic polymer topcoat to meet U.L. 797 Standards and ANSI C80.3. Interior shall be finished with corrosion inhibiting clear organic coating. Conduit with integral set screw couplings may be utilized for 2.5 inch sizes and above provided it conforms to U. L. Safety Standard #514-B.

D. Plastic conduit (PVC) shall be schedule 40 PVC heavy wall type for 4 inches and smaller, Schedule 20 for 5 inches and larger. PVC shall be U.L. Listed, NEMA TC 2, sunlight resistant and suitable for use with 90 degree C conductors.

E. Flexible metal conduit (FLX) shall be extra flexible, extra strength galvanized steel conduit tubing and shall meet U. L. Standard for Flexible Steel Conduit and U.L. Standard for Safety No. 1. The use of aluminum flexible conduit is not permitted.

F. Liquid-tight flexible metal conduit (WFX) shall be UL Listed with galvanized steel core of square locked or interlocked design, integral ground conductor and thermoplastic PVC (polyvinyl chloride) cover. The use of aluminum core or non-metallic types is not permitted.

G. Electrical non-metallic tubing (ENT) shall be UL Listed and manufactured to the requirements of NEMA TC-13. This raceway is permitted to be utilized with concrete encasement or unexposed installations only. Do not install exposed in plenums or other open areas. Utilize steel outlet boxes in all partition construction. Utilize plastic boxes only in concrete encasement.

H. Steel conduit approved manufacturers are Allied, Triangle, Republic, Wheatland and Pittsburg.

I. Flexible conduit approved manufacturers are Anamet (Anaconda), Southwire, and Republic.

J. PVC conduit approved manufacturers are Carlon, Triangle, and Johns-Manville.

K. PVC coated metallic conduit approved manufacturers are Robroy, Permacote, and Occidental.

2.02 CONDUIT FITTINGS

A. GRC and IMC conduit fittings shall be zinc-coated, ferrous metal and taper threaded type, U. L. Labeled.

B. EMT fittings shall be zinc-coated steel and shall be Type 1 or 2 (raintight compression or concrete tight set-screw type). EMT connectors shall have insulated throats. Die cast, malleable iron or pressure cast material will not be accepted. Fittings shall bear U. L. Label. Two (2) inch and larger fittings shall be compression type or shall utilize dual set screws for each side of fitting.

C. PVC fittings, elbows and cement shall be NEMA TC3, produced by the same manufacturer. All joints shall be solvent welded in accordance with the manufacturer's recommendations.

D. Conduit connections to switchboards, motor control centers, transformers, panels, cabinets, and pull boxes shall have locknuts designed to bite into the metal.

E. Each conduit end shall be provided with either an insulated throat connector or separate locknut and insulated bushing. Bushing shall be installed before any wire is pulled.

F. Expansion fittings shall be provided in all conduits which crosses an expansion joint either in, across, or through same. Fittings shall be U.L. 467 and 514 Listed. Fittings shall contain an internal flexible metal braid to maintain system ground continuity.

G. Flexible conduit fittings shall be cast malleable iron or stamped steel type with integral fastener. Fittings shall be U.L. Listed for the application. The use of “squeeze” type cast or stamped steel connectors is not permitted.

H. Liquidtight flexible metal conduit fittings shall be liquidtight with neoprene bushing, nylon gland, tapered hub threads and outlet bushing. Fittings shall be U.L. Listed for the application. The use of non-metallic or thermo-plastic insert connectors is not permitted.

1. EMT conduit fittings approved manufacturers are Raco, Steel City, Crouse-Hinds, O.Z Gedney, Thomas & Betts, Efcor and Appleton.
2. GRC and IMC fittings approved manufacturers are Appleton, Crouse-Hinds, O.Z. Gedney or Thomas & Betts.

2.03 SMOKE AND FIRE STOP FITTINGS

A. If and where required, smoke and fire stop fittings shall be U.L. listed for that purpose.

1. The fittings used to seal conduit either on the outside of the conduit or cable or internally shall have heat activated intumescent material which expands to fill all voids and shall be O.Z./Gedney "FIRE-SEAL" or Dow Corning silicone RTV foam with an hourly fire-rating equal to or higher than the rating of the floor, ceiling or wall through which the cable or conduit passes.
2. The seals for conduit shall be of the flanged type.
3. Penetration of fire rated wall, floor, or ceiling shall use Through-Penetration Firestop Systems described in the current Underwriters Laboratories Building Materials Directory.

2.04 RACEWAY SUPPORTS

A. Raceways and systems shall be supported independent of any other equipment or appurtenances except the building structure. Suspended ceiling systems will not be considered as structure for support purposes, even if so rated by the manufacturer.

B. Support components shall be zinc-coated or have equivalent corrosion protection. Unprotected components shall be removed and replaced at no additional costs to the Owner.

C. Conduit support straps shall be single-hole cast malleable iron or dual hole stamped steel type with zinc coating sized for type of raceway used.

1. Conduit clamps for single conduit support shall be stamped steel with bolt & nut fastener and threaded rod support.
2. Multiple conduit support channel straps shall be galvanized stamped steel two piece clamps with bolt & nut fasteners.

D. Conduit support channel shall be minimum 1-5/8 inch by 1-5/8 inch by 12 gage roll-formed pre-galvanized steel or painted steel conforming to ASTM A-570 Grade 33 or ASTM A-446 Grade A requirements.

1. Channel cross section shall be increased to provide higher load bearing capability, if required by this installation.
2. Channel shall have elongated holes at two (2) inch centers.

E. Drop wire type hangers will not be permitted. Hangers which may distort the ceiling support structure will not be permitted. Lathers channel and chain are not acceptable for conduit hangers.

F. Furnish and install under this contract angle iron, channel iron, rods, threaded rod, supports or hangers required to install or mount electrical equipment, material or related devices. Conduit shall NOT be supported from steel decking, roof decking, bridging, ceiling or ceiling support wires.

G. Before piping, conduit, outlets, equipment and lighting fixtures are located in areas, coordinate the space requirements with other trades. Such shall be arranged so that space conditions will allow trades to install their work, and will also permit access for future maintenance and repair. Coordinate the installation of recessed electrical equipment with concealed ductwork, piping, insulation, structural appurtances and wall thickness.

H. Support branch circuit conduits and raceways at intervals not exceeding ten (10) feet and within three (3) feet of each termination. Support feeder conduit and raceway at intervals not exceeding twelve (12) feet and within three (3) feet of each termination.

I. Piping, ductwork, conduit and equipment installed at variance with the above requirements shall be relocated and/or revised to conform with the above requirements without incurring additions to the Contract.

J. Raceway installed within reinforcing steel of elevated or slab on grade concrete construction shall be tied to the re-steel at intervals not exceeding three (3) feet.

2.05 SUPPORT FASTENER DEVICES

A. Anchors for cast in place concrete shall be insert type expansion shields and bolts, lead shields and bolts or self drilling expansion shields and bolts. If approved by the Project Engineer, Powder actuated pins of 1500 pound pull out strength may be utilized in concrete.

B. Anchors for wood construction shall be lag bolts or power driven wood screws.

C. Anchors in hollow masonry shall be toggle bolts.

D. Anchors for steel attachment shall be machine screws, bolts, or beam clamps.

E. Equipment mounted to drywall construction shall be secured to power channel (13/16 inch by 1-5/8 inch minimum). Secure channel to a minimum of two (2) dry wall studs with drywall screws and washers.

F. Under no circumstance will nylon or composition type tie wraps or straps be permitted for use in supporting electrical raceway. Utilize galvanized tie wire or prefabricated steel clips for such support.

2.06 OUTLETS

A. Outlet boxes and covers shall be of such form and dimensions as to be adapted to their specified usage, locations, size and quantity of conduit, and size and quantity of conductors entering the boxes.

B. Outlet boxes for flush mounted light fixtures shall be four inch square boxes 1-1/2 inch deep, with blank cover, installed adjacent to fixture served. Connection to fixture shall be with flexible steel conduit and fixture wire.

C. Flush ceiling outlets for surface or pendant mounted lighting fixtures shall be one-piece 4 inches square or octagonal pressed steel boxes, minimum two (2) inch depth.

D. Boxes for devices in unfinished masonry walls or stud walls shall be 4 inches square boxes with a square cornered tile wall cover (plaster ring), set flush with masonry or drywall construction.

1. Where only one conduit enters box or one wiring device is provided, 2-3/4 inches deep box may be used.
2. Outlet boxes for dimmers, GFI outlets, and other conditions shall be full depth.
3. Use multigang boxes where more than one device is mounted together under common coverplate. Do not use sectional switch boxes.

E. Boxes in concrete ceiling slab shall be octagonal, concrete-tight two (2) inch deep concrete boxes. Welded boxes are not acceptable.

F. Outlet boxes in plaster, drywall, stucco or masonry walls or ceiling shall be provided with plaster rings.

G. Junction boxes and outlets not indicated as containing wiring devices or lighting fixtures shall have covers. Covers for outlets in walls shall be as specified for wall switches and receptacles.

H. Outlet boxes exposed to the weather, under raised floor, used in exterior wiring system and outlet boxes for vaportight lighting fixtures and devices shall be of cast corrosion resistant type.

I. In special "Fire Rated" partitions, outlets shall comply with ASTM No. E119 and maintain fire barrier ratings.

J. Utility (handy) boxes with matching covers may be used in mechanical and electrical spaces for switches and 15A/120V receptacles.

K. Where special purpose devices are utilized and require larger outlet box than specified herein, provide outlet box suitable for specific device. These outlet boxes shall be of the same type as specified herein for the installation required. Coordinate requirements prior to rough-in installation.

2.07 JUNCTION AND PULL BOXES

A. Dimensions of pull boxes and junction boxes shall not be less than those dimensions required by the National Electrical Code (NEC) article 370-18 for the number, size and position of conductors and raceway entering the box. Only a single extension ring shall be permitted on a box to increase the volume.

B. Pull boxes required in finished spaces shall be installed out of sight lines and located in accordance with the Project Engineer / MDOT Architect’s direction. Box shall be flush mounted cabinets provided with trim, hinged door and flush latch and lock to match panel trim for flush mounted electrical panelboard.

C. Pull boxes for installation of vertical riser conductors shall be provided with red seal type VVC or approved supports for all conductors as required by the NEC.

D. Pull boxes for horizontal feeders containing more than one feeder (not including parallel conductors) shall be provided with reinforced flange shall be compartmented by barriers (or feeder conductors shall be fire-taped) and provided with minimum 1-5/8 inch by 1-5/8 inch fiberglass channel strut (removable) for support of conductors. Wood supports within pull boxes are not acceptable.

E. Provide box covers for junction and pull boxes of same materials and construction as box. Identify feeder or branch circuit conductors contained within on outside of cover for surface mounted boxes and within cover on flush mounted boxes.

2.08 EXTERIOR PULL BOXES & HANDHOLES

A. Exterior pull boxes shall be Quazite “PC” style Gasketed boxes, resistant to sunlight exposure, weathering and chemicals, with solid base, penta-head security bolts, heavy duty rated cover with logo to suit purpose, with compressive strength of 11,000 psi, or approved equal. Size shall be minimum 12 inches wide by 18 inches deep by 12 inches high unless noted otherwise. Set assembly at final finished grade elevation.

B. Exterior handholes shall be Quazite “PG” style stackable service box assemblies resistant to sunlight exposure, weathering and chemicals, with solid base, penta-head security bolts, heavy duty rated cover with logo to suit purpose, with compressive strength of 11,000 psi, or approved equal. Size shall be minimum 24 inches wide by 36 inches deep by 18 inches high unless noted otherwise. Provide extensions as required to bring assembly to final finished grade elevation.

2.09 CONDUIT BODIES & FITTINGS

A. Conduit bodies and fittings shall be NEMA FB-1 zinc coated steel or malleable iron, taper threaded type, of material matching conduit type with gasketed cover containing captive screws.

2.10 WIRING TROUGH

A. Wiring trough shall be NEMA 1, unless noted otherwise, hinged cover with captive screws, grey enamel finished inside and outside, 16 or 14 gage steel as per NEC requirements. Size of trough based on NEC requirements.

2.11 PULL BOXES & ENCLOSURES

A. Pull boxes for feeder and power conductors shall be NEMA 1 with 14 or 12 gage galvanized steel bodies and 12 or 10 gage galvanized steel screw covers. Seams shall be continuously welded and ground smooth. Cover screws shall be captive, stainless steel type. Provide oil-resistant gasket and adhesive. Size pullboxes as specified.

B. Enclosures for termination of special systems wiring shall be NEMA 1 panel enclosures with 14 gage steel bodies and removable hinged doors. Provide back panel of 14 gage steel construction and wiring terminal blocks. Enclosures shall be painted ANSI 61 and panels shall be white enamel. Size enclosures for quantity of terminations required plus 25 percent spare capacity.

2.12 ACCEPTABLE MANUFACTURERS

A. Outlet boxes:

1. Steel City
2. Hubble/RACO
3. Crouse-Hinds
4. Appleton

B. Floor boxes:

1. Steel City
2. Walker
3. Hubbell
4. American Electric

C. Poke-through devices:

1. Hubbell
2. Walker
3. Raceway Components
4. Thomas & Betts

D. Exterior junction boxes & handholes:

1. Quazite
2. Nelson
3. Killark
4. Associated Plastics

E. Conduit bodies & fittings:

1. Adalet-PLM
2. Myers
3. O-Z Gedney
4. Appleton
5. Efcor
6. Crouse-Hinds

F. Wiring troughs:

1. Electromate
2. Square D
3. Universal
4. Hoffman
5. Wiegmann
6. General Metals
7. Keystone

G. Pull boxes & enclosures:

1. Hoffman
2. Electromate
3. Wiegmann
4. Universal

5. American Electric
6. Crouse-Hinds
7. Square D

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide galvanized steel or cast type boxes for outlets, and for junction or pull boxes. Boxes shall be accessible and sized per NEC requirements. Provide access panels in non-accessible spaces to allow access to boxes installed.

B. Provide an UL listed outlet box for each ceiling mounted fan assembly shown.

C. Where outlet boxes are used to support lighting fixtures, as junction boxes, or device outlet boxes, the box shall be anchored to the structural members of the building in compliance with NEC 370-13.

D. Outlet boxes shall be flush mounted unless they are specifically shown as being used with exposed conduit or are located above a ceiling.

E. Where outlets are supplied from conduit run in or below floor slabs, the conduit shall be stubbed up at the location shown and the wall built up around the conduit.

F. Cuts for outlet boxes in masonry walls shall be made so that the coverplate will completely cover the cut. The mounting height of switch, receptacle and other outlets may be varied slightly, with the Architect's approval, so that the outlet box, top or bottom, will occur at a masonry joint.

G. The edge of outlet boxes shall be flush with the surface in which they are recessed.

1. The devices that fit into the outlet boxes shall be screwed tight before the cover plate is installed and the coverplate shall not be used as a means of tightening the devices in place.
2. Provide box extensions as required to permit the above.
3. Coordinate fabric panels, finishes and woodwork provisions in order to determine exact requirements.

H. Where outlets are shown as being adjacent and different mounting heights are specified for each, they shall be mounted one directly over the other, on the centerline of the group.

I. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed sixteen square inches. Clearances between such outlet boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than sixteen square inches so as not to interfere with the wall rating.

J. Where low voltage devices are to be installed in common boxes with line voltage devices (or devices of different operating voltage), provide insulated barrier within boxes to establish separate compartments.

K. Remove only knockouts required and plug unused openings in accordance with NEC 370-18/373-4 requirements.

L. Extend branch circuit grounding conductor to each box. Provide grounding pigtail via dedicated fastener.

M. Outlet boxes in the same wall shall not be mounted back-to-back but shall be offset a minimum of six (6) inches, except in acoustical rated walls where 24 inches is required.

N. Install pull boxes only in unfinished spaces or concealed above accessible ceilings. Provide pull boxes when the following conditions apply:

1. Where indicated on the Drawings.
2. Where conduit run exceeds 150 feet from access point to access point.
3. Where conduit run contains in excess of 360 degrees bend or offset.
4. To facilitate conductor installation or to insure that manufacturer's maximum pulling tension is not exceeded.
5. Where requirements of the special system or telephone installer/vendor dictate raceway access or provisions.

O. Do not splice conductors in pull boxes. Splices are NOT PERMITTED in pull boxes except where specifically approved in writing by the Engineer. Where splices are permitted, make splices as specified in Wire & Cable Specifications.

P. Where pull boxes are required, multiple circuits within pull box shall:

1. Circuit conductors and feeders shall be individually laced with nylon straps and nylon identification tabs. Conduits shall enter pull box in such manner that conduits enter and exit in the same plane (both horizontal and vertical).
2. Feeder circuits shall be separated by full height and length sheet metal (NEC gage) or polyester resin barrier secured with angle brackets.

Q. Where exterior junction or pull boxes are required, install in the following manner:

1. Exterior junction or pull boxes shall be mounted flush with finished grade, unless noted otherwise. Coordinate with the final grade elevation.
2. Heavy traffic rated covers shall be provided in sidewalks, paved areas or within six (6) feet of same.
3. Seal conduit entries into boxes with duct seal to prevent entrance of water, after conductors are installed.
4. Taps and splices, where permitted by these Specifications, shall be performed with an encapsulating watertight connection kit which insulates and moisture seals the connection.

R. After completion, clean work of dirt, construction debris, paint and refuse.

3.02 COVERS:

A. Junction boxes, outlet boxes, multi-gang switch boxes, utility boxes, etc., shall be covered with a coverplate. The coverplate shall be a finished plate as specified elsewhere unless designated otherwise.

B. Coverplates shall be mounted vertically unless designated otherwise.

C. Permanently mark each junction box and pull box cover with the circuit numbers for conductors contained within. Utilize indelible ink black marker for normal power and red marker for emergency power and fire alarm.

D. Junction boxes and pull boxes for wiring systems above 600 volts shall be painted red and identified with high voltage warning labels in accordance with OSHA standards. Raceway shall be identified with the same labels installed every twenty (20) linear feet.

3.03 EQUIPMENT ANCHORING

A. Support boxes from structure:

1. Secure to wood with wood or sheet metal screws.
2. Secure to light gage metal with sheet metal screws.
3. Secure to heavy gage metal with bolts or clamps.
4. Anchors for concrete shall be self-drilling or insert expansion shields with bolts.
5. Where box is suspended below structure, support from structure with threaded steel rod secured with double nuts. Pull boxes larger than 18 inches by 18 inches by 8 inches shall be supported from power strut and threaded steel rod suspension. Provide seismic bracing where required by local authority.

B. Items of electrical equipment, such as enclosures, panels, troughs, pull boxes, etc., shall be securely anchored to the building structure. The anchoring shall be accomplished by utilizing a minimum size of 3/8 inch steel anchor bolts in the structure and to the item of equipment. A minimum of two (2) anchor bolts shall be provided on each side of each item of equipment with the following exceptions:

1. Exception No. 1: If the equipment manufacturer includes more than two (2) anchor holes per side in the base or base frame of the equipment item, then there shall be one anchor for each anchor hole.
2. Exception No. 2: If the equipment manufacturer recommends a particular quantity greater than two (2) per side, then that quantity of anchors shall be provided.

3.04 CONDUIT

A. Rigid galvanized conduit or intermediate metal conduit shall be used for service entrance and feeders and branch circuits where exposed to damage and also moist conditions.

B. EMT shall be used for feeders, branch circuits, fire alarm and telephone when not underground or in concrete in contact with the earth. Raceway underground or in concrete in contact with the earth shall be rigid galvanized conduit, intermediate metal conduit or Schedule 40 PVC. Conduit exiting elevated slabs or slab on grade shall be IMC. PVC conduit exiting slab is not permitted.

C. Conduit shall be continuous from outlet to outlet, from outlet to cabinet, junction box and pull box. Conduit shall enter and be secured to all boxes, etc., in such a manner that each system will be electrically continuous from service to all outlets. Conduit from cabinets and junction boxes shall terminate in approved outlet box or conduit fittings. Conduit connections to box which has no threaded hub shall be double-lock-nutted and bushing installed.

D. Provide junction boxes or pull boxes where shown and where necessary to avoid excessively long runs or too many bends between outlets. The conduit sizes shown may be increased if desired to facilitate the pulling of cables.

E. Conduit shall be concealed unless indicated otherwise. Install exposed conduit parallel with or at right angles to the building walls and support from walls or ceilings at intervals required by Code with approved galvanized malleable iron or stamped steel clamps or hangers. Concealed conduit above the ceiling shall be supported independent of ceiling construction. Where ceilings of lay-in type are used, conduit must be installed minimum six (6) inches above ceiling structure to permit removal of ceiling panels and lighting fixtures.

F. Use threaded rods and hangers consisting of double-nutted threaded rods and channel or angles of 12 gage minimum steel for supporting multiple conduit. Refer to Drawing details.

G. Minimum size conduit for exposed branch circuits shall not be smaller than 1/2 inch. Raceway installed in concrete slabs shall be minimum 3/4 inch.

1. Home runs shall extend from outlets shown to panel designated.
2. Home runs shown shall not be combined. Home run conduit shall not be smaller than 3/4 inch.

H. Type GRC and IMC conduit shall be cut and threaded with similar die heads. Deburr outside of all cuts prior to cutting threads.

1. Cut threads one thread short so that they meet in the coupling and all threads are covered when wrench tight.
2. Deburr inside of end after cutting threads.
3. Right and left hand couplings shall not be used; conduit couplings of the Erikson Type shall be used at locations requiring such joints.
4. Utilize only rigid type hand benders, “Chicago” type benders or power benders with required IMC shoes. DO NOT attempt to bend IMC with “hickey” type hand benders.
   a. Such bends will be replaced at no additional costs to the Owner.
5. Utilize only U.L. Listed conduit fittings, elbows and junction boxes (IMC or GRC types).

I. Conduit for future use and for special systems such as telephone, data or TV wire shall be left with No. 16 gage wire or approved pull cord pulled in them.

J. Expansion fittings shall be installed in conduit penetrations through, around or in expansion joints, and straight runs in excess of 150 feet. Watertight flexible metallic conduit, connectors and couplings may be utilized for exposed transitions. U.L. 467 & 514 Listed fittings are required in slab.

K. Provide non-hardening elastic type duct seal compound, Neer No. DC, 3M Co. "Scotchfil,", RectorSeal, or Gardner Bender duct seal for conduit entering the building from outside, for conduit entering refrigerated spaces, for conduit entering exterior equipment and for conduit passing from one space into another which is normally at a lower temperature. Conduits entering refrigerated spaces shall be IMC.

L. Provide intermediate metal conduit and watertight conduit hubs on conduit terminating in a box or cabinet exposed to the weather or damp locations.

M. Space in sleeves or around conduit that pass through fire resistive or fire rated walls, partitions, floors or ceilings shall be closed by packing with an U.L. labeled fire resistive material, or provide mechanical fire stop fittings that will maintain the rating of the barrier penetrated. Conform to local authority requirements and UL Building Materials Directory.

N. Coordinate the conduit routing and installation location with the actual electrical equipment furnished. Review submittals for termination locations.
   1. Coordinate with other Specification Divisions and submittals to determine termination and access locations.
   2. Coordinate installation sequence with other trades to avoid conflicts and provide the fastest overall installation schedule.

O. Dented, malformed, and flattened conduits are NOT permitted and shall be removed and replaced.

P. Protect conduits against dirt, plaster, and construction debris with the use of conduit plugs. Tape is NOT acceptable. Plugs shall remain in place until all masonry or/and drywall construction is complete. Protect conduit stubups during construction from damage, and replace bent conduits.

Q. Separate raceway systems shall be provided for power systems and for control, signal and communications systems. Do not install above systems cables in the same raceway as branch circuit or feeder cables.

R. Service entrance and fire pump feeders shall be installed “Outside” of the building as defined by NFPA and the N.E.C. Provide concrete encasement where required to conform with Code requirements.

S. Conduits installed exposed shall be IMC to a minimum elevation of ten (10) feet AFF. Exposed boxes shall be type FS cast metal.

T. Where hazardous locations, as classified by the National Electrical Code, exist, all raceway and fittings and the installation of these materials shall comply with Article 500 requirements.

U. Conduits for interior wiring systems operating above 600 volts shall be galvanized rigid conduit, painted red at access points and labeled per OSHA requirements.

V. Maintain minimum three (3) inch clearance when raceway crosses piping and/or systems operating above 75 degrees F and provide twelve (12) inches separation when installed parallel to hot piping, flues and appliances operating above 75 degrees F.

W. Nonmetallic fittings shall be applied with compatible solvent welding cement and shall be fitted while solvent is liquid. Overwrap fittings used in concrete encasement with suitable tape. Provide o-rings at terminal points to provide watertight seal.

3.05 FLEXIBLE CONDUIT

A. Watertight flexible metallic conduit shall be used in making short flexible connections to motors, transformers, bus duct switches, kitchen equipment and rotating or vibrating machinery or equipment.

   1. The flexible conduit at these locations shall be as short as possible, but shall have a minimum length of 12 inches.
   2. Flexible metallic conduit shall be used in making connections to heaters, fixed equipment or flush mounted light fixtures.

B. A green stranded bonding jumper shall be installed inside of all flexible conduit that extends directly from a non-flex conduit to a rotating or vibrating machine. Where a junction box is used, the green stranded bonding jumper shall be installed inside the flexible conduit and attached to the junction box and to the machine

3.06 CONDUIT PROTECTION

A. Threaded joints in galvanized rigid conduit that is encased in concrete shall have a U.L. listed joint compound applied.
   1. Conduit installed outside the building underground shall be buried a minimum of 30 inches below finished grade but in no case shall be buried deeper than 48 inches.
   2. Where conduit inside building is installed below the floor slab, the vapor barrier shall be run below the conduit concrete encasement.
      a. Conduit installed in slab, where permitted above, shall be above the bottom steel and below the top steel.
   3. No conduit shall be spaced less than 3 inches apart.
   4. Submit conduit layout to Project Engineer / MDOT Architect for review and approval prior to rough-in.

B. Conduit shall be secured in place and protected where necessary to prevent damage to work during construction.

   1. The ends of conduit shall be plugged with suitable caps (not tape) to avoid filling with foreign matter.
   2. Conduit shall be blown out and swabbed clear of water and trash prior to pulling wire.

C. Provide identifying marker tape the entire length of each conduit installed in the ground outside the building. The tape shall be constructed of inert polyethylene, resistant to acids, alkalis, etc., in the soil, and shall be a minimum 4 mil thickness.

   1. The tape shall be yellow, 6 inches wide, and shall have the words, "CAUTION - ELECTRIC LINE BURIED BELOW," imprinted with contrasting permanent ink.
   2. The imprint shall repeat itself for the entire length of the tape.
   3. The tape shall be buried at a maximum of 18 inches below finished grade, above a portion of the earth fill.
   4. Identify underground and underslab conduit locations on as-built drawings for future reference.

D. Damaged, oxidized, warped or improperly stored raceway shall be removed from the jobsite and replaced with new materials. Non-metallic conduit stored on site prior to installation shall be stored on a flat surface off the ground and shall be protected from direct sunlight and debris.

3.07 CORING, CUTTING AND PATCHING

A. Perform coring, cutting and patching of existing walls and floors in order to install the work.

   1. Set sleeves for conduit accurately before the concrete floors are poured, or set boxes on the forms so as to leave openings in the floors in which the required sleeves can be subsequently located.
   2. Fill in the voids around the sleeves with concrete.

B. Should the performance of this preliminary work be neglected and should cutting be required in order to install conduit, then the expense of the cutting and restoring of surfaces to their original conditions shall be accomplished without incurring additions to the Contract.

3.08 BELOW GRADE RACEWAY INSTALLATION

A. Provide and perform excavation required to install conduit, ductbanks and manholes indicated on the Drawings and/or specified.

1. Trenches shall be of uniform width required with minimum 8 inches clearance on both sides.
2. Remove and dispose of materials not to be used for backfill.
3. Maintain dry excavations for electrical work, by removing water.
4. Grade areas to prevent surface water from entering excavation.
   a. Remove accumulated water by pumping.
   b. Perform excavation by open cut.
   c. Excavate with vertical-sided excavations where possible.
5. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations.
6. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
7. Establish requirements for trench shoring and bracing to comply with local codes and LAHJ.
8. No tunneling will be permitted.

B. The bottom of trenches and excavation shall be graded to provide uniform bearing surface for conduits and ductbanks on undisturbed soil at every point along entire length.

1. Tamp over-excavation with specified backfill materials.
2. Remove unstable materials unsuitable for supporting equipment or installation and replace with specified materials for a minimum of twelve (12) inches below invert of equipment or installation.

C. Specified materials shall be utilized for backfilling, in not more than six (6) inch layers and tamped until the installation has cover of not less than the adjacent grade and not more than two (2) inches above same.

1. Remove sheeting and cross-bracing during backfilling wherever such removal would not endanger the work or other property.
2. Equalize backfilling operation to avoid shifting of materials and equipment installed.
3. Compaction of backfill materials shall be at least equal to surrounding undisturbed material.
4. Backfill trenches with concrete where excavations pass within 18 inches of footings or other utility lines.
5. Do not settle backfill with water.
6. Conform to compaction requirements and methods specified elsewhere.

D. Concrete encased underground ductbanks shall be installed where indicated on the Drawings. Ductbank conduits shall be non-metallic type EB, thin wall PVC with concrete encasement.

1. Stagger couplings of adjacent conduit runs by a minimum of two (2) feet. Provide pre-fabricated conduit supports installed per manufacturer's recommendation. Anchor ductbank assembly in trench to avoid "floating" during concrete pour.
2. Changes in direction shall be made by the installation of long sweep bends of minimum twenty-five (25) foot radius. All 90 degree ells shall be long sweep type of minimum twenty-four (24) inch radius.
3. Below all paving and traffic areas, ductbank shall be reinforced with the installation of No. 5 rebar six (6) inches on center at each corner and on sides, parallel to duct, and with continuous No. 3 rebar perpendicular to duct on sixteen (16) inch centers.
4. Concrete cover for reinforced ductbanks shall be minimum six (6) inches with at least three (3) inches above rebar.
5. Reinforcing of duct bank shall continue at least ten (10) feet to each side of required areas.

6. Ductbanks shall be sloped to drain toward manholes and shall be laid with minimum grade of four (4) inches per hundred feet.

END OF SECTION

SECTION 26 08 50 COMMISSIONING OF LIGHTING SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section outlines the requirements of Division 16 subcontractors to participate in the commissioning process as a commissioning team member as described in Section 01 91 00.

B. Related Work.

1. Description of Work in Division 26.
2. General Commissioning Process in Section 01 91 00.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. As indicated in Section 01 91 00 and in Division 26.

PART 3 - EXECUTION

3.01 COMMISSIONING PROCESS REQUIREMENTS

A. Refer to Section 01 91 00 and related sections for information on meetings, start-up plans, functional testing, operation and maintenance data, training requirements, and other Commissioning activities.

3.02 TESTING REQUIREMENTS

A. Provide a testing plan using the construction documents and the submittal data provided for the equipment installed on the project to the Commissioning Agent for review and approval. The start-up plan will be submitted to the design team and after approval shall be implemented as directed by the Commissioning Agent. Incorporate changes into the testing plan as directed by the Commissioning Agent and design team. Testing of the lighting control equipment will be witnessed by the Commissioning Agent. The testing plan will include the following:

1. Date and time of the test.
2. Procedures for performing the test.
3. Description of any issues or deficiencies.
4. Signatures of the person performing the test and the Commissioning Agent who witnessed the test.

B. Performance Test Requirements

1. The Electrical subcontractor is to perform the functional testing of all lighting equipment as directed by the Commissioning Agent. The operation of the lighting system are to be documented and verified as part of the test.
2. Using the plan as submitted by the Electrical Contractor and approved by the Commissioning Agent and the design team, test all components of the lighting system and the lighting controls.

3. Testing Conditions – Occupancy Sensors

   a. Verify the operation of all occupancy sensors and timer controls.
   b. Verify that sensor durations are set per design documents.
   c. Verify that over-ride features function per design documents.
   d. Verify that the sequences of operation match the design documents.

4. Testing Conditions – Day conditions: Confirm that lights are on or off at the appropriate times.
5. Testing Conditions – Night Operation
   a. Confirm that lights are off per design schedule.
   b. Confirm that appropriate lights are on when sensors detect movement.

3.03 TRAINING

A. Per the specifications, the Contractor will be required to participate in the training of the Owner personnel for each system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

B. Contractor shall provide training to building occupants per Sections 01 79 00 Demonstration and Training, 01 91 00 General Commissioning and Division 26 requirements.

C. Provide a training syllabus fourteen (14) calendar days prior to the training to the Commissioning Agent for approval.

D. Provide a Training attendance sheet to the Commissioning Agent with names, company names, and contact information of training attendees.

3.04 DOCUMENTATION

A. Provide as-built drawings of the lighting controls to the Owner and to the Commissioning Agent. Electronic form preferred.

B. Provide Operation and Maintenance documents to the Owner as specified in Division 26, along with one copy of all O&M data to the Commissioning Agent for inclusion in the Commissioning Manual.

END OF SECTION

SECTION 26 24 16 PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. This section covers lighting, appliance panelboards, and load centers.

PART 2 - PRODUCTS

2.01 PANELBOARDS

A. Panelboards (panels) shall be general purpose enclosures and shall be surface or flush mounted as indicated.

1. Panels shall be of the automatic circuit breaker type, factory assembled by the manufacturer of the circuit breakers.
2. Panels shall be rated for the voltage indicated with the quantity of poles and ampacity of circuit breakers shown.

B. Boxes and trim shall be made from code gage steel. Boxes shall be of sufficient size to provide a minimum gutter space of 4 inches on all sides. Boxes shall be minimum 20 inches wide and 5-3/4 inches deep.

C. Hinged door covering device handles shall be included in panel trim.

1. Doors shall have flush-type cylinder lock and catch, except that doors over 48 inches in height shall have auxiliary fasteners at top and bottom of door in addition to flush-type cylinder lock and catch.
2. Door hinges shall be concealed.
3. Locks shall be keyed alike.
4. Directory frame and card having a transparent cover shall be furnished with each panel door.

D. Trims for flush panels shall overlap the box by at least 3/4 inch all around.

1. Surface trims shall have the same width and height as the box.
2. Trims shall be mountable by a screwdriver without the need for special tools.
3. After installation, trim mounting mechanism or hardware shall not be accessible when panel door is closed and locked.

E. Exterior and interior steel surfaces of the trim shall be cleaned and finished with gray paint over a rust-inhibiting phosphatized coating.

F. Interiors shall be completely factory assembled with protective devices, wire connectors, and shall be so designed that devices may be changed without machining, drilling or tapping.

G. Interiors shall be so designed that devices can be replaced without disturbing adjacent units and without removing the main bus connectors.

H. Bus bars for the mains shall be of copper in accordance with U.L. Standards.

1. Full size bars shall be included.
2. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices.
3. Phase bussing shall be full height without reduction.
4. Cross and center connectors shall be of the same material as the bus.

I. The neutral bus shall have 100 percent rating and utilize set-screws to bond the neutral wire to the neutral bus through holes drilled in the neutral bar.

1. A sheet copper neutral bus utilizing flathead screws to hold the neutral wires will not be acceptable.
2. Ground bus shall be sized in accordance with U.L. standards.

J. Spaces for future devices shall be molded case, included as indicated and shall be bussed for the maximum rated device that can be fitted into them.

K. Circuit breakers shall be manually operated, thermal-magnetic, automatic, of the ampacity and poles as indicated.

1. They shall be quick-make, quick-break, both in manual and automatic operation.
2. Breakers shall be over-the-center toggle operating type, with the handle going to a position between ON and OFF to indicate automatic tripping.
3. Multi-pole breakers shall have internal common trip.
4. Breakers shall have a minimum of 10,000 RMS symmetrical amperes interrupting capacity unless designated otherwise.

L. The breakers furnished shall be determined by the Specifications and by the minimum U.L. labeled RMS symmetrical amperes interrupting capacity at circuit voltage. All circuit breakers shall be bolted on and rigidly braced.

M. Panels having sub-feed lugs for feeding through shall have 8 inches minimum extra gutter space at the lug end and on one side.

N. Each panel as a complete unit shall have a short-circuit current rating equal to or greater than the equipment rating indicated.

O. Acceptable manufacturers are Square D, Siemens or Cutler Hammer.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Provide a typewritten directory under plastic for panelboards with spares left blank.

B. Provide necessary hardware to secure panelboards to structure as required by the manufacturer's instructions. Make electrical connections for supply and load circuits and leave in operating condition.

C. Clean enclosure of panelboards of foreign matter, including dust.

D. Bond separate ground bars to panelboard boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors.

E. Provide six circuit breaker handle lock-on devices for each lighting panelboard for circuits as directed by the Project Engineer to prevent unauthorized personnel from turning off circuits to controls, unit heaters, clocks, night lights, etc. Turn spare lock-on devices over to the Owner for his use.

END OF SECTION

SECTION 26 27 00 LOW-VOLTAGE DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section shall comply with the provisions of Section 26 05 10.

B. This Section describes the Electrical service entrance requirements to the building from the power company transformer.

C. Electric service shall be obtained from the local Electrical Utility Company having jurisdiction.

D. Primary service shall be provided and installed as directed by the Electric Utility Company rules, regulations and installation guide.

E. Electric service shall be 208/120 Volts, 3 Phase, 4 Wire, 60 Hertz AC, Ampacity as indicated on the Drawings.

F. Electrical subcontractor shall make arrangements with the Electric Utility that are necessary to obtain electrical service, both temporary and permanent.

G. Metering and current transformers shall be provided and installed as directed by the Electric Utility Company. This subcontractor shall make provisions necessary for the installation of the Electric Utility metering equipment in accordance with utility company.

H. Electrical subcontractor shall make arrangements for temporary electrical service to the site during the construction phase, and maintain electric service to existing facilities as required.

PART 2 PRODUCTS

2.01 SERVICE ENTRANCE CABLES

A. Install service entrance cables as shown on Drawings and as specified herein.

B. Materials and methods of construction for service provisions shall comply with the Electric Utility Company requirements.

PART 3 - DISTRIBUTION

3.01 INSTALLATION

A. Obtain necessary standards and detail drawings from the Electric Utility Company before building construction or excavation adjacent to service equipment is started.

B. Coordinate service and connections with the Electric Utility Company.

END OF SECTION

SECTION 26 27 26 WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. This Section covers wiring devices and cover plates including receptacles, switches, dimmer controls, plugs, plug connectors, floor outlets, concealed service floor outlets and poke-through device assemblies.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Wiring devices & cover plates:

1. Arrow-Hart
2. Sierra
3. Eagle
4. Hubbell
5. Leviton
6. Pass & Seymour
7. Square D
8. TayMac

B. Wall dimmers:

1. Lutron
2. Prescolite
3. Hunt
4. Lightolier

C. Plugs & connectors:

1. Arrow-Hart
2. Eagle
3. Hubbell
4. Leviton
5. Pass & Seymour

D. Floor outlets & concealed service floor outlets:

1. Steel City
2. Hubbell
3. Walker

E. Poke through assemblies:

1. Steel City
2. Hubbell
3. Raceway Components
4. Walker

2.02 MANUFACTURED WIRING DEVICES

A. Provide manufactured wiring devices and cover plates, in types, colors, and electrical ratings for applications indicated and complying with NEMA Standard WD 1.

1. Where types and grades are not indicated, provide specification grade selection as determined to fulfill wiring requirements, and complying with NEC and NEMA standards for wiring devices.
2. Provide white color devices and cover plates except as noted otherwise.
3. Color selection shall be verified with the Architect prior to purchase and installation.

B. The devices specified herein are the products of one manufacturer. Provide heavy-duty specification grade devices selected from approved manufacturer listing.

2.03 WALL SWITCHES

A. Wall switches shall be Institutional, heavy-duty specification grade, plastic body, nylon or lexan toggle, totally enclosed base & cover, quiet type, self-grounding, back wired, 277 volts AC and 20A rating.

1. Single Pole: Hubbell No. 1221
2. Double Pole: Hubbell No. 1222
3. Three-way: Hubbell No. 1223
4. Four-way: Hubbell No. 1224

B. Flush motor switches shall have a red pilot light and overload protection for actual fractional horsepower motors furnished. Square D FSJ-1P or approved equal.

2.04 WALL DIMMERS

A. Wall dimmer switches shall be totally enclosed, solid state type, self-grounding, vertical slide type, semi-flush mounted, with square law dimming characteristics. Lamp debuzzing coils shall be provided for each circuit.

B. Dimmers shall be sized to continuously carry the indicated maximum loads shown and shall be rated to serve the load. Dimmers shall not require de-rating when gang mounted.

C. Where wiring devices are indicated adjacent to, and mounted with wall dimmers, provide wiring devices matching dimmer in appearance and by same manufacturer under common cover plate.

D. Dimmers indicated on the drawings to serve low voltage incandescent lamps shall be the same as specified for incandescent lamps and, in addition, shall be specifically rated for the low voltage (transformer or solid state type as required) loads. Dimmer shall be UL Listed for use with low voltage fixtures.

2.05 RECEPTACLES

A. Duplex receptacles shall be heavy-duty specification grade, plastic base, nylon face, two-pole, three wire, self-grounding, back/side wired, 125 volts AC and NEMA 5-15R (15A) or NEMA 5-20R (20A) rating as indicated on Drawings.

1.	Duplex NEMA 5-15R	Hubbell CR5262
2.	Duplex NEMA 5-20R	Hubbell CR5362

B. Isolated ground duplex receptacles shall be orange heavy-duty specification grade, plastic base, nylon face, two-pole, three wire, self-grounding, back/side wired, 125 volts AC and NEMA 5-15R (15A) or NEMA 5-20R (20A) rating as indicated on Drawings.

1.	Duplex IG NEMA 5-15R	Hubbell IG5262
2.	Duplex IG NEMA 5-20R	Hubbell IG5362

C. Ground fault circuit interrupting (GFCI) duplex receptacles shall be heavy-duty, specification grade, plastic base, nylon face, two-pole, three wire, supplied with pre-stripped wire leads, feed-through protection, 125 volts AC and NEMA 5-15R (15A) or NEMA 5-20R (20A) rating as indicated on Drawings.

1.	Duplex GFCI NEMA 5-15R	Hubbell GFR5262
2.	Duplex GFCI NEMA 5-20R	Hubbell GFR5362

D. Single receptacles shall be heavy-duty specification grade, plastic base, nylon face, two-pole, three wire, self-grounding, back/side wired, 125 volts AC and NEMA 5-20R (20A) rating.

1.	Single NEMA 5-20R	Hubbell 5361

E. Special purpose outlets shall be heavy-duty specification grade, plastic base, nylon face, poles as noted, wires as noted, grounding type, back/side wired, with voltage and capacity rating noted. Conform to NEMA configuration requirements.

F. Exterior flush-mounted duplex outlets shall be GFCI heavy-duty, industrial specification grade, plastic base, nylon face, two-pole, three wire, supplied with pre-stripped wire leads, feed-through protection, 125 volts AC and NEMA 5-15R (15A) recessed mounted in TayMac gasketed enclosure model Masque 72206 or approved equal.

1. Unit assembly shall protrude no more than 1/2 inch and shall be rainproof in use per NEC 410-57.
2. Provide color as specified by the MDOT Architect.

2.06 COVERPLATES

A. Cover-plates for flush mounted devices shall be one piece standard size high impact smooth nylon surface. Color shall match wiring device finishes. Device plates for masonry walls shall be jumbo type.

B. Telephone/data outlet cover-plates shall be the same finish as above and have two (2) modular jack openings with blank fillers as required. All Computer Lab cover-plates shall have four (4) modular jack openings.

C. Cover-plates for flush mounted GFCI devices shall be engraved “GFCI PROTECTED”.

D. Cover-plates for flush mounted IG devices shall be engraved “ISOLATED GROUND”.

E. Cover-plates for flush mounted EMERGENCY POWER devices shall be engraved “EMERGENCY” and additionally shall have the panel name and circuit engraved on it.

F. Cover-plates for flush mounted UPS POWER devices shall be engraved “COMPUTER ONLY”.

2.07 PLUGS & CONNECTORS

A. Plugs and connectors shall be of nylon construction, heavy duty specification grade, brass contacts and terminations, conforming to UL 94 & 498, with cord grips, 600 VAC working range, straight blade or locking type and NEMA type as noted.

2.08 FLOOR OUTLETS

A. Where installation of floor mounted device box requires penetration of a fire rated floor slab, the installation shall be made with a fire rated floor fitting, U. L. Listed for use in this specific fire rated floor design. Fire barrier shall be rated to prohibit passage of smoke when heat is not present.

B. If and where required, floor outlets shall be single gang floor boxes or as listed on the Drawing sheets, equal to Steel city No. 601 Series, complete with cast iron body, vertical angular adjustment, with brass frame, brass floor-plate (#P60-CACP for duplex receptacle and #P60-3/4-2-CACP for phone/data) and gasket.

1. Larger than standard tappings shall be furnished where required.
2. Adjacent boxes shall be installed on minimum 7 inch centers.

PART 3 - EXECUTION

3.01 STANDARDS COMPLIANCE

A. Installation and provision of all specified equipment shall be in accordance with:

1. National Electrical Code NFPA 70
2. Underwriters Laboratories (UL) UL 20, 498, 943
3. National Electrical Manufacturer’s Association (NEMA) NEMA STDS WD 1, 2, 5

3.02 INSTALLATION - GENERAL

A. Coordinate installation rough-in requirements with architectural and structural features, equipment installed under other portions of these specifications, and electrical equipment.

B. Coordinate the installation of switches and wall dimmers with the door swings to insure that the devices are located on the strike side of the door.

C. Review the architectural and/or interiors drawings and elevations for devices requiring specific locations.

D. Coordinate access to poke-through assembly junction boxes such that these are readily accessible after completion of construction.

E. The mounting height of devices is indicated in the legend on the drawings and is intended to mean the bottom of the device above the finished floor unless otherwise noted.

F. Mount all devices within outlet boxes to allow device cover-plates to be in contact with wall on all sides. Verify all outlet boxes in grouping are at the same elevation.

G. Install vertically mounted receptacles with the ground connection up.

H. Install switches with “Off” position down.

3.03 WIRING DEVICES

A. Install wiring devices as indicated, in compliance with manufacturer’s written instructions, applicable requirements of NEC and NECA’s “Standard of Installation”, and in accordance with recognized standard industry practices to fulfill project requirements.

B. Where more than one wiring device is indicated at a location, the devices shall be gang-mounted in combined multi-gang boxes and covered jointly by a common cover-plate. Provide barriers as required by the devices and voltages being used.

C. Install wiring devices only in electrical outlet boxes which are clean, free from construction debris, drywall compound and dirt. At final inspection all wiring devices shall be clean, free of paint overspray, unbroken and in new condition.

D. Ground all wiring devices by electrically continuous, pigtail connection such that removal of device does not open grounding path to any downstream device. Connect the grounding screw of each device to the equipment grounding conductor.

E. Prior to energizing circuits, test wiring system for electrical continuity, freedom from faults, and proper polarity of connections. After energizing circuits, test wiring devices to demonstrate compliance with these requirements.

3.04 COVER-PLATES

A. All junction boxes, outlet boxes, multi-gang switch boxes, utility boxes, etc., shall be covered with a cover-plate. The cover-plate shall be a finished plate as specified unless designated otherwise.

B. Cover-plates shall be mounted vertically unless designated otherwise.

C. Do not install cover-plates until after painting and/or other finish work is complete.

D. Where the cover-plate does not completely cover the wall opening, replace the plate with an oversized (midi or jumbo) plate or repair the wall opening. Where one oversize plate is used, replace all cover-plates in the room with the oversize plates.

E. Remove concrete protectors and clean all floor boxes after concrete pour. Adjust boxes to be flush with finish floor elevation.

F. At final inspection, all wiring devices and cover-plates shall be clean, without paint overspray, undamaged and unscratched or broken.

END OF SECTION

SECTION 26 29 10 MOTOR CONTROLS AND WIRING

PART 1 - GENERAL

1.01 SCOPE

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. Motors shall be provided under Divisions 22 & 23.

C. Motor starters shall be furnished under Division 26 for each motor except for package units, which will be furnished with integral starters. Motor starters shall be installed either in a Motor Control Center or separately mounted adjacent to the motor served, as indicated on Drawings.

D. Motor power wiring is defined as those conductors between the energy source and the motor. This power wiring shall be terminated at the motor terminals.

E. Control wiring required for automatic starting and stopping of motors shall be provided under Division 23 unless specifically shown on the Electrical Drawings.

F. Power wiring shall be connected through all line voltage control devices such as firestats and thermostats provided by Division 23.

PART 2 - PRODUCTS

2.01 MOTOR STARTERS

A. Starters for motors 1/3 horsepower or smaller shall be manual unless remote or automatic starting is required, in which case the starters shall be magnetic, full voltage, non-reversing, single-speed, unless otherwise indicated. Refer to Mechanical Drawings, Specifications and schedules to determine which motors are not remote started. All other starters shall be magnetic.

B. Starter for a three-phase motor shall be furnished with three (3) overload relays sized for the full load running current of the motor actually provided.

1. Provide an external "RESET" button or "HAND-OFF-AUTO" selector switch as scheduled with red "RUNNING" light.
2. Provide a green pilot light to indicate motor "STOPPED."
3. Each pilot light shall have a legend plate indicating reason for signal.

C. Overload relay shall have a normally open alarm contact which will close only when actuated by an overload (not to be confused with N.O. or N.C. auxiliary contacts). These contacts shall be properly wired to their respective blue pilot light provided on the starter front cover and having a "TRIPPED" legend plate.

D. Individually mounted motor starters shall be in a NEMA Type 1 general purpose enclosure in unfinished areas and shall be flush mounted in all finished areas.

1. Starters shall have a laminated nameplate to indicate Division 23 unit number, function and circuit number.
2. Starters installed outdoors shall be NEMA 3R.

E. Motor starters, push buttons and pilot lights shall be of the same manufacture as the switchboard and shall be Westinghouse-Cutler Hammer, GE, or ITE/Siemens.

2.02 COMBINATION STARTERS

A. Combination starters shall consist of a circuit breaker or fused switch and a motor starter mounted in a common NEMA Type 1 general purpose enclosure.

B. The motor starter components shall be as specified in paragraph 2.01 for motor starters.

C. The circuit breaker component shall be a minimum 22,000 RMS interrupting capacity and shall be as required in Section 26 24 16 “Panelboards”.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide power wiring to and install motor starters, unless integrally factory mounted on a piece of equipment.

B. Provide power wiring to motors except packaged units that are prewired between the starter and motor.

C. Where line voltage control devices are mounted at, on or inside a unit, such as aquastats, firestat for single phase devices, etc., the power wiring to the unit shall be connected through such a control device.

D. On final inspection, it shall be demonstrated to the Project Engineer / MDOT Architect or his representative that each overload relay control circuit is properly wired and functioning correctly by manually tripping each overload relay individually, one at a time. This inspection procedure shall not involve removing of wiring or disconnecting current carrying parts.

END OF SECTION

SECTION 26 32 13 AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

1.02 QUALITY ASSURANCE

A. The following specifications and standards are incorporated into and become a part of this Specification by reference. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements, and errata on the date of invitation for bids, shall apply). In text, such specifications and standards are referenced by basic designation only.

1. National Fire Protection Association (NFPA): NFPA-110 - Emergency and Stand-By Power Systems.
2. Electrical Generating Systems Association: (ESGA) Standards:
   a. EGS A CEP2 - Codes for Emergency Power by States and Major Cities
   b. EGS A TSS1 - Performance Standard for Transfer Switches for use with Engine Generator Sets
3. Institute of Electrical and Electronics Engineers (IEEE) Standards:
   a. IEEE 446 - IEEE Recommended practices for Emergency and Standby Power Systems
   b. IEEE 472 - Voltage Surge Withstand Capabilities
4. National Electric Manufacturers Association (NEMA) Standards:
   a. ICSI-109 - Test and Test Procedures for Automatic transfer Switches
   b. ICS2-447 - A.C. Automatic Transfer Switch
5. Underwriters Laboratories Inc. (U.L.) Publications: UL 1008 - Automatic Transfer Switches
6. American National Standards Institute (A.N.S.I.): C37.90a - Voltage Surge Withstand Capability

1.03 SUBMITTALS

A. Refer to Section 26 05 10 for submittal requirements.
B. Manufacturer's Product Data: Submit material specifications and installation data for products specified under Section 2 - Products to include:

1. Product data for the transfer switch shall contain not less than the information listed as follows:
   a. List of accessories contained in the control panel.
   b. Withstand rating in RMS symmetrical amperes.

C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract drawings. Include layout of all equipment.

D. Submittals shall include the nearest location of permanent parts outlet from which parts may be obtained and written assurance that trained service personnel will be available on 24 hours' notice.

E. Operation and Maintenance Data: Include in each operation and maintenance manual, one set of operating, maintenance, and parts manuals covering all components. Provide instructions to the owner in operation and maintenance of his equipment, both in written form and with on-site personnel.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products of the following manufacturers, which comply with these specifications, are acceptable:

1. Transfer Switches: ASCO, Russelectric, Zenith

2.02 AUTOMATIC TRANSFER SWITCHES

A. Furnish and install automatic transfer switches with number of poles, ampere rating, voltage and withstand ratings as shown in plans.

1. This system shall be the product of one manufacturer.
2. The system shall be listed to the latest requirements of Underwriters' Laboratories Standard UL-1008 and rated for Total System Load.

B. Electrical operation shall be accomplished by a momentarily energized single solenoid operating mechanism which receives power from the source to which the load is being transferred.

1. Fuse or thermal protection of the main operator is prohibited.
2. The operating transfer time shall be one-sixth of a second or less.
3. Mechanical locking in each position shall be accomplished without the aid of permanent magnets, latching solenoid, or motor operators.

C. Operation shall be inherently double-throw whereby all contacts move simultaneously and with no programmed delay in a neutral position.

1. Electrical spacing shall be equal to or exceed those listed in table 15.1 of UL-1008.
2. Only those main contact structures specifically manufactured for transfer switch service shall be acceptable.
3. An overload or short circuit shall not cause the switch to go to a neutral position.

D. Inspection of all contacts (movable and stationary) shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

1. A manual operating handle shall be provided for maintenance purposes.
2. The maintenance handle shall permit the operator to stop the contacts at any point throughout the entire travel to properly inspect and service the contacts when required.

E. The transfer switch shall have fully rated neutral transfer contacts which momentarily interconnect the neutrals of the sources and load for 100 milliseconds maximum, during the transfer/ retransfer operation.

1. The neutrals shall remain so interconnected until the line contacts close on the alternate source.

2. Line and neutral contacts shall be driven by a single main operator.

F. The automatic transfer switch shall include a separately mounted control panel with adjustable solid state sensing and timing functions. The following operational characteristics shall be provided:

1. Time delay on momentary dips in normal source (0.5-6.0 seconds) factory set at 1.0 second.
2. Time delay on transfer to emergency for controlled loading of generator (0-5 minutes), factory set at 0 minutes or as shown on plans.
3. Time delay on retransfer to normal (0-30 minutes), factory set at 0 minutes.
4. Toggle switch to manually bypass the time delay on the retransfer.
5. Time delay on engine shutdown after retransfer to normal (0-5 minutes), factory set at 5 minutes.
6. Close differential voltage sensing of all normal source phases (pickup 85-100% of nominal and dropout 75-98%), factory set at 85% dropout and 95% pickup of nominal.
7. Independent single phase voltage (85-100%) and frequency (90-100% pickup) sensing of the emergency source to prevent premature transfer, factory set at 90% voltage and 95% frequency of nominal.
8. Test switch (momentary type). To simulate failure of normal source.
9. Gold plated 10 amp contact which closes to initiate engine starting.
10. Pilot lights to indicate switch positions.
11. Auxiliary contacts (1 closed on "Normal" and 1 closed on "Emergency") rated 10 amps, 480 VAC.
12. An in-phase monitor shall be provided.
    a. The monitor shall control transfer/retransfer operation between live sources so that closure on the alternate source will occur only when the two sources are approaching synchronism and the two sources are within 15 electrical degrees maximum so that inrush currents do not exceed normal starting currents.
    b. The monitor shall function over a frequency difference range of up to plus 2.0 Hz. with a maximum operating transfer time of one-sixth of a second.
    c. If the voltage of the load-carrying source falls below 70 percent, the in-phase function shall be automatically bypassed.
    d. The monitor shall not require inter-wiring with the generator controls, or active control of the governor.
13. All time delay and sensing functions shall be adjustable over the ranges indicated and operated with minimum drift (not to exceed 3 percent) over minus 20 degrees C. to plus 70 degrees C.
    a. The control panel shall be provided with a protective cover.
    b. The control panel shall not draw more than 15 volt-amperes continuously under normal operating conditions.

G. The switch must comply with UL-1008 and NEMA Std. Pub. ICS2-447. In addition, the switch must meet or exceed the following requirements and if so requested, by verified by certified laboratory test report:

1. Temperature Rise: Measurements shall be made after the overload and the endurance tests.
2. Withstand: UL listed to withstand the magnitude of fault current available at the switch terminals when coordinated with respective protective devices as shown on the plans at an X/R ratio or 6.6 or less. The main contacts of the transfer switch shall not trip open or weld when subjected to fault currents.

3. Dielectric: Test, following the with stand current rating test, at 1960 VAC rms minimum.
4. Transient Withstandability: Control panel voltage surge withstand capability test per IEEE Std. 472-1974 and voltage impulse withstand test per NEMA Std. Pub. ICS-1-109.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Installation: Transfer switch shall be installed, including all connections, at locations and as indicated on drawings, and in accordance with approved shop drawings, manufacturer's instructions, and manufacturer's standard specification and dimension sheets.

B. Instruction, Drawings, Parts and Operation Information: Two copies of complete instructions shall be in booklet form and shall consist of operating and maintenance of the equipment and major components supplied.

C. Owner Orientation: A representative of the supplier shall meet with representative of the Owner at the time of final acceptance tests, shall review the operation and parts books, correct starting and control methods, and recommend preventive maintenance procedure.

3.02 TRAINING

A. The engine manufacturer's representative shall provide on-site training to Owner. Training shall include maintenance, parts ordering, safety, automatic operation, manual operation, engine safeties, protective relaying, complete system operation, troubleshooting, and a complete review of operation and service manuals.

END OF SECTION

SECTION 26 43 13 SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work specified in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. This section describes the electrical and mechanical requirements for a modular, high-energy surge protective device (abbreviated as SPD throughout), formerly known as TVSS. The system shall provide protection for sensitive electronic devices against the harmful effects of surges, transients and electrical line noise.

C. Provide SPD unit at each location noted on Drawings; at minimum, one device at the load side of the service entrance, if not shown.

1.02 STANDARDS

A. The most recent edition of the specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:

1. ANSI/IEEE C62.41.1-2002, C62.41.2-2002 and C62.45-2002
2. Canadian Standards Association (CSA)
3. Federal Information Processing Standards Publication 94 (FIPS PUB 94)
3. National Electrical Manufacturers Association (NEMA) LS-1.
4. National Fire Protection Association (NFPA 20)
5. National Electric Code, Article 285
6. Underwriters Laboratories (UL 1449 and 1283)
7. Institute of Electrical and Electronic Engineers (IEEE)
8. Occupational Safety and Health Act (OSHA)

B. The system shall be UL listed and labeled under UL 1449 (Third Edition) Standard for Transient Voltage Surge Suppression including UL listed short circuit (fault) current rating and the ratings shall be permanently affixed to the SPD. The units shall also be listed and labeled to UL1283 Standard for Electromagnetic Interference Filters.

1.03 QUALITY

A. The system shall meet the following requirements:

1. Protection Modes: In accordance with NEMA Standard LS 1, the unit shall provide protection in all modes. Wye-configured systems shall provide Line-to-Neutral, Line-to-Ground, and Neutral-to-Ground protection. Delta-configured systems shall provide Line-to-Line protection in ungrounded systems and Line-to-Line and Line-to-Ground protection in grounded systems.
2. The manufacturer shall own and operate a surge simulation system which creates an IEEE C62.41.2-2002 Category C3 (20 KV/10 KA) surge event. Testing to be performed to UL 1449 (Third Edition) requirements of a Voltage Protection Rating (VPR) of 6kV/3kA.

3. The SPD system shall meet or exceed the following criteria:

   Minimum per phase (L-N, L-G) surge capacity

	High Exposure	Low Exposure
Service Entrance or Transfer Switch	320KA/phase	200KA/phase
Distribution Panels	200KA/phase	150KA/phase
Branch Panels	120KA/phase	80KA/phase

4. T
   The UL 1449 Voltage Protection Rating (VPR) for each mode of protection shall not exceed the following:

System Voltage	VPR			
	L-N	N-G	L-G	L-L
120/208Y	800 volts	800 volts	800 volts	1200 volts
277/480Y	1200 volts	1200 volts	1200 volts	1800 volts

5. The unit shall be UL 1283 listed as an electromagnetic interference filter. The system shall provide 50-dB insertion loss from 100 kHz to 100 MHz when used in a coordinated facility system.
6. The SPD and all components in the suppression path (including all current diversion components) maximum continuous operating voltage (MCOV) shall be 150 volts for 120/208Y systems and 320 volts for 277/480Y systems.
7. The operating frequency range of the system shall be at least 47 - 63 Hz.
8. At service entrance, a UL listed rotary handle disconnect switch shall be provided as a means of disconnect.
9. The SPD shall be modular in design. Modules shall be fused with a surge rated fuse and incorporate a thermal cutout device.

1.04 SUBMITTALS

A. Equipment Manual: The manufacturer shall furnish with each unit delivered an equipment manual that details the installation, operation and maintenance instructions for the specified unit.

B. Shop Drawings: Electrical and mechanical drawings shall be provided by the manufacturer with the submittal and with each unit delivered that show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.

C. UL 1449 Listing documentation shall include:

1. Short Circuit Current Rating (SCCR)
2. Voltage Protection Ratings (VPR) for all modes.
3. Maximum Continuous Operating Voltage rating (MCOV).
4. I-nominal rating (I-n).
5. Type 1 Device Listing.

1.05 WARRANTY

A. The manufacturer shall furnish a full ten-year parts and labor warranty from date of shipment against part(s) failure when installed in compliance with manufacturer's written instructions, UL Listing requirements and applicable national, state and local electrical codes. Direct factory trained technician, shall be available for 48-hour assessment. A 24-hour 800 number shall be available to support warranty.

PART 2 - PRODUCT

2.01 ACCEPTABLE MANUFACTURERS

A. The unit shall be designed and manufactured in the USA by a qualified manufacturer of the suppression filter system equipment. The qualified manufacturer shall have engaged in the commercial design and manufacture of such products for a minimum of five (5) years.

B. Acceptable manufacturers are Current Technology, Siemens/APT, Liebert, United Power, Eaton Electrical, and Leviton.

2.02 LABELING

A. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

B. SPD shall be UL labeled as Type 1, intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls.

C. SPD shall be UL labeled with 20kA I-nominal (I-n) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

2.03 ENCLOSURE

A. The SPD enclosure shall be designed for wall mounting and shall be rated NEMA 12.

1. Enclosures that have disconnects shall have type "J" replaceable fuses combined with the disconnect and the system designed so that when the disconnect is in the energized position, the door cannot be opened.
2. Provide integral disconnect switch where 3-pole breaker is not provided.

2.04 STANDARD FEATURES

A. The SPD shall include an 8 digit surge event counter with 10 yr. batteries to maintain accurate counts in the event of total loss of power.

B. The SPD shall have electrically isolated Form C dry contacts, one normally open and one normally closed to allow connection to the building management system.

2.05 STATUS INDICATION

A. The SPD shall be provided with a monitoring panel complete with mounting bezel and an integral status panel containing externally visible LED status indicators that separately monitor the on-line status of each phase of the unit.

1. An audible alarm (with silence function) shall be provided.
2. Provide diagnostic testing feature.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. External mounted SPD shall follow manufacturer's recommendation with lead lengths as short (less than 24 inches) and straight as possible and gently twisted together. Re-arrange breaker locations, where required, to minimize lead lengths.

B. Units integral to the switchgear shall not be allowed.

C. Disconnect switch (or external circuit breaker) shall operate such that the protected panel remains energized during service of SPD.

D. Before energizing, installer shall verify service and separately derived system neutral-to-ground bonding jumpers per NEC.

END OF SECTION

SECTION 26 50 00 LIGHTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work in this Section shall comply with the provisions of Section 26 05 10 “Electrical General Requirements”.

B. The equipment and materials specified in this Section shall contain no asbestos or PCBs.

C. The work of this Section shall include the careful examination of the Architect/Structural and Mechanical drawings so as to become acquainted with the structural features of the building and the location of pipe and ductwork which would alter the location and spacing of outlets for fixtures. Where conflicts develop, same shall be referred to the A/E for a decision as to the proper location. The work of the Section shall also include responsibility for the proper reinforcement of ductwork necessary to carry the added weight of lighting fixtures where same must be supported by such ductwork.

1.02 JOB CONDITIONS

A. Verify the compatibility of recessed lighting fixtures with the ceiling in which each fixture is to be located.

1.03 PRODUCT HANDLING

A. Deliver fixtures sufficiently in advance of installation to prevent delay of work.

B. Store materials in a closed building, in original packaging, and protect from damage and the elements.

1.04 SUBMITTALS

A. Shop Drawings: Show fixture locations and support details. Materials shall not be purchased until approved. Include copy of ballast warranty for each type of ballast required.

B. Product Data:

1. Provide lighting fixture submittals in a single, bound and indexed assembly for all lighting fixtures. Incomplete submittals will be returned without processing.
    a. Fixture submittals shall contain manufacturer's name and catalog illustration and number, dimensions and details, ballast and diffuser information, metal gages,pre-treatment and paint data, UL-ETL approval, and connection details.
    b. Provide photometric data for fixture with lamp and ballast specified.
    c. Provide information on adjustable fixtures if such type fixture is required.
    d. Provide fuse type and size when specified.
2. Provide complete ballast submittals of the exact ballast to be used for each fixture. Provide sound rating of ballast.
3. Provide complete lamp submittals of the exact lamp to be used including color temperature,color rendering index and rated lamp life.
4. Some fixtures may be required with multiple ballasts for two-level switching.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES

A. Fixtures shall bear U.L. and manufacturer's label. Furnish and install lighting fixtures as indicated and specified, complete with lamps, required ballasts and accessories.

B. Recessed incandescent fixtures shall comply with Article 410-65,(C) of the N.E.C.

C. Each lighting fixture shall have been tested and certified for proper operation by the fixture manufacturer for the type mounting and ceiling on/in which it is installed.

D. Confirm exact locations of all lighting fixtures by coordination with the Architectural/Engineerural Reflected Ceiling Plans and mechanical equipment above or on the ceiling. Confirm ceiling types before ordering lighting fixtures. Each recessed lighting fixture shall have a trim to match the type of ceiling (plaster, exposed grid, concealed spline, exposed panel, etc.) in which it is being installed, regardless of catalog number given.

E. Most lighting fixtures are lettered or groups of fixtures are indicated by a letter. The lighting fixtures that are indicated by the letters shall be as indicated on the Lighting Fixture Schedule. No substitutions for fixtures in the light fixture schedule shall be allowed without written permission of the Engineer.

F. Fixtures shall be supplied with the necessary straps, supports, hangers, and other miscellaneous materials and devices to install them in a satisfactory manner and to conform to the Architectural/Engineerural treatment in the areas in which they are to be installed. The Electrical subcontractor shall consult Architectural/Engineerural Drawings in order that he may familiarize himself with all the necessary details for the various units to be installed throughout the building. Failure to do this WILL NOT relieve him of the responsibility of furnishing necessary materials, to perform the function intended for the lighting system shown on the Drawings.

G. Unless specified otherwise, prismatic diffusers for lighting fixtures shall be prismatic acrylic KSH K12 with a thickness of 0.2 inch, measured from the back side to the peak of the prism. Wraparound lenses shall be virgin acrylic, one-piece and injection molded.

H. Fixtures with highly polished reflective surfaces shall not be handled with bare hands, but with clean, grease-free cotton gloves. Surfaces found with finger prints shall be cleaned or replaced with new fixtures.

I. Fixtures shall be furnished with special anodized finishes and colors as indicated in the Lighting Fixture Schedule. Fixtures with special factory applied baked enamel finish shall conform to a color sample supplied by the Architect/Engineer. Full-size finished samples of each fixture with special finish and/or color shall be delivered to the MDOT Architect for written approval when requested.

J. Prior to the application of finish, metal parts of fixtures shall be protected by a rust-inhibiting process. The rust-inhibiting process shall be chemical. No type of sprayed, painted, or dipped primer may be used as the basic rust inhibitor. Fixtures and /or parts of fixtures which shall have begun to show signs of rusting or corroding at the time of completion of the job shall be removed and replaced by properly protected metal parts.

K. Fixtures shall be constructed to provide continuous operation when installed in air plenums, or when surrounded with restrictive enclosures. Where space above ceiling is used as an air plenum changer for either supply or return air, the fixture shall be factory wired in accordance with Article 300-22 of the NEC.

2.02 LAMPS

A. General:

1. The type lamps shall be as specified for each lighting fixture in the Lighting Fixture Schedule.
2. The lamp performance with energy conserving ballasts furnished under this Section shall be certified by a nationally recognized independent testing laboratory.
3. Contractor shall replace lamps damaged during shipping and installation with lamps of like manufacturer to those installed in the fixture. Lamps used during construction shall be replaced with new lamps prior to final inspection.

B. LED Lamps shall be as specified in the Lighting Fixture Schedule. Refer to Section 01 25 00 “Substitution Procedures” and Section 01 60 00 “Product Requirements” for subsititution request.

PART 3 - EXECUTION

3.01 SUPPORT OF LIGHTING FIXTURES

A. Lighting shall be supported from the building structure. The fixtures shall be supported in a manner that will ensure the fixture's weight being equally distributed from each support and the fixture remaining in a level position.

B. Suspended fixtures shall be supported as detailed on the Drawings.

END OF SECTION

SECTION 28 16 00 INTRUSION DETECTION

PART 1 - GENERAL

1.01 GENERAL

A. Conductors shall be installed in conduit where feasible. Provide raceway to frames as required and utilize same for “raceway” for door intrusion detection.

B. See Section 26 05 10 “Electrical General Requirements” for additional requirements.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. The system shall include: door switches, keypads, control station/panel, motion detectors, glass breakage detectors, interior and exterior sirens, interconnecting cable.

B. Interlock keypad with electric lock at entry door.

C. Provide security breach signal to external horn (minimum of 10 ft. AFG) located as shown on plans. This signal shall also be routed to internally located horns.

D. The following components are suggested as standard for quality with all system components:

1.	Glass Breakage Detector	C & K FG730
2.	Motion detector	IS-290CM-N (Long Range – Ceiling Mount)
3.	Panel	Ademco Vista 20SE
4.	Keypad	Ademco 6128 Alpha Numeric Back Lit
5.	Zone Expander	Ademco 4219
6.	Auxiliary Power Supply	Moose MP-CH12A
7.	Door switch	GRI # 29A
8.	Interior Siren	Ademco Wave II
9.	Outdoor Siren	Moose/Ariteck 44 Watt
10.	Battery Backup	Yuasa 7.0 Amp Hour

F. Horns for combination fire and burglary are allowable if the shared horn has distinct signals for each.

G. Provide 120 volt dedicated power circuit for the system, as required.

H. The system shall be equipped with a backup battery for loss of power situations.

PART 3 - EXECUTION

3.01 FIELD INSTALLATION

A. Field locate security panel and keypads where indicated on drawings.

3.02 FIELD QUALITY CONTROL

A. Provide wiring diagrams and labeling charts to properly identify all wiring.

B. If corrections are needed, the Contractor shall perform the needed corrections in a timely fashion.

3.03 DEMONSTRATION - TRAINING

A. An authorized service representative shall train MDOT's maintenance personnel to adjust, operate, and maintain security system.

END OF SECTION

SECTION 28 31 00 FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 SUMMARY

A. Fire Detection and Alarm wiring shall be installed in conduit. Conduit and wiring though not shown shall be furnished and installed to accomplish the intent of the system as shown on the Drawings by symbols and this Specification.

1.02 INSTRUCTIONS

A. Fire Alarm System shall consist of an addressable general alarm system with automatic and manual detectors.

B. Actuation of any initiation device shall cause the following actions:

1. Activate general alarms (audible & visual)
2. Activate associated zone indicators (audible & visual)
3. Turn off power to all air supply units.

C. The system shall have the capacity to transmit signal to a Central Fire reporting station. Furnish all necessary hardware required to accomplish this function and coordinate installation including the proper polarity reversing relays, if required.

D. System wiring shall be Class B as defined by NFPA. Any system circuit wiring ground or open, or any system component failure shall cause all trouble signals to operate. System components shall be protected against transient over voltages.

E. A photoelectric smoke detector shall be located as indicated on plans. Each detector shall be equipped with an integral 135 degree, heat sensing element. No radioactive material shall be used.

F. Manual stations shall be non-coded, dual action stations located as shown on drawings, ensure that one manual station is located at each egress door. Stations shall be red in color and fabricated of high impact Lexan.

G. Main terminal cabinet shall be equipped with a drill switch which, when activated, shall cause only the general alarm audible and visual signals to activate but no other general alarm functions shall be affected.

H. Main terminal cabinet shall have battery standby complete with metered charger. Batteries shall be maintenance free sealed type capable of operating system for 24 hours. Charger shall be rated for recovery of batteries from full discharge to full charge in 24 hours or less.

I. Main terminal cabinet shall contain proper devices and circuitry to cause the general alarm bells to sound for (5) minutes and then silence. Other alarm functions will not be affected.

PART 2 - PRODUCTS

2.01 SYSTEM COMPONENTS

A. Components shall be equal to the following as manufactured by Simplex:

Item	Cat. No.	Box
Main terminal cabinet, 4 zone max.	4001 Series	With device
Smoke detector, photo electric	2098 Series	4 inches octagon
Heat detector	2098 Series	4 inches octagon
Manual Station	2099 Series	4 inches Sq. with Lgg raised cover
Audible & visual signal	4903 Series	4 inches square
Visual signal	4904 Series	4 inches square

B. Products of the following manufacturers, which comply with these specifications, are acceptable: Simplex, Edwards Signaling, and Notifier as approved by MDOT Architect/Engineer.

PART 3 - EXECUTION

3.01 TESTING

A. The entire Fire Alarm System shall be tested and certified in compliance with state, local, and NFPA codes and standards. Provide copies of certification reports to the Owner and design engineer.

END OF SECTION

SECTION 31 31 16 TERMITE CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Soil treatment for control of all species of subterranean termites including Formosan termites.

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical product data and application instructions prior to application for Project Engineer's approval. Include the EPA-Registered Label for termiticide products.

B. Sample Warranty: 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 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Soil Treatment Application Report: Include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

1.04 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. Installer Qualifications: 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.

1. 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.
2. 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.

C. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

D. Comply with Mississippi Regulations Governing Pest Control Operators in following the labels of the termiticide.

E. Preinstallation Conference: Conduct conference at Project site.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

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.

1.06 WARRANTY

A. Soil Treatment Special Warranty: Furnish 3 copies of written warranty 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 damage caused by termite infestation WITHOUT EXPENSE to the Owner.

1. Warranty Period: Provide warranty for a period of 5 YEARS from the date of treatment, signed by the Applicator and the Contractor.

1.07 MAINTENANCE SERVICE

A. Continuing Service: Beginning at Final Completion, provide 12 months' continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, terms for agreement period, and terms for future renewal options.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT SOLUTION

A. Termiticide: 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 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.02 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.03 APPLYING SOIL TREATMENT

A. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

B. 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.

1. Post warning signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

C. Application: Mix soil treatment termiticide solution to a uniform consistency. Use COLOR DYE MARKING AGENT to insure the area is treated. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

D. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

1. Allow a minimum of 12 hours for drying after application, before beginning concrete placement or other construction activities.

E. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

F. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

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. 907-304-13 **CODE: (SP)**

DATE: **06/06/2012**

SUBJECT: **Granular Courses**

Section 907-304, Granular Courses, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-304.02--Materials. After the first paragraph of Subsection 304.02.1 on page 183, add the following.

Crushed concrete meeting the requirements of Subsection 907-703.04.3 may be used in lieu of granular courses or crushed stone courses specified in the contract. This applies to base courses, shoulders, or other required construction on a prepared foundation.

907-304.03--Construction Requirements.

907-304.03.5--Shaping, Compacting and Finishing. Delete the sixth paragraph of Subsection 304.03.5 on page 185.

Delete the first table in Subsection 304.03.5 on page 186 and substitute the following.

Granular Material Class	Lot Average	Individual Test
7,8,9 or 10	97.0	93.0
5 or 6	99.0	95.0
3 or 4	100.0	96.0
1 or 2	102.0	98.0
Crushed Courses*	99.0	95.0

* When placed on filter fabric on untreated subgrade, the individual tests and the average of the five (5) tests shall equal or exceed the following values.

Lot Average	Individual Test
96.0	92.0

907-304.05--Basis of Payment. Add the "907" prefix to the pay items listed on page 187.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-401-7

DATE: 03/22/2016

SUBJECT: Asphalt Pavements

Delete subparagraph 4 of Subsection 907-401.02.6.4.1 on page 16, and substitute the following.

4. For all pavements on new construction except shoulders that are untreated, the required lot density for all lifts shall be 93.0 percent of maximum density. For all pavements on shoulders that are untreated, the required lot density for all lifts shall be 92.0 percent of maximum density.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-401-7 **CODE: (SP)**

DATE: 12/02/2014

SUBJECT: Asphalt Pavements

Section 401, Hot Mix Asphalt (HMA) - General, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby deleted and replaced as follows.

SECTION 907-401 - ASPHALT PAVEMENT -- GENERAL

907-401.01--Description. These specifications include general requirements that are applicable to all types of asphalt whether producing Hot Mix Asphalt (HMA) mixtures or Warm Mix Asphalt (WMA) mixtures. These specifications also include the specific requirements for each particular mixture when deviations from the general requirements are necessary.

This work consists of the construction of one or more lifts of asphalt pavement 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.

907-401.01.1--Definitions.

Maximum Sieve Size - Maximum sieve size is the smallest sieve size at which 100 percent of the aggregate passes.

Nominal Maximum Sieve Size - The nominal maximum sieve size is one sieve size larger than the first sieve to retain more than 10 percent of the aggregate.

Maximum Density Line - The maximum density line is a straight line plot on the FHWA 0.45 power gradation chart which extends from the zero origin point of the chart through the plotted point of the combined aggregate gradation curve on the nominal maximum sieve size.

Mechanically Fractured Face - An angular, rough, or broken surface of an aggregate particle created by crushing as determined by ASTM Designation: D 5821.

907-401.02--Materials.

907-401.02.1--Component Materials.

907-401.02.1.1--General. Component materials will be conditionally accepted at the plant subject to later rejection if incorporated in a mixture or in work which fails to meet contract requirements.

907-401.02.1.2--Aggregates. The source of aggregates shall meet the applicable requirements of Section 703.

907-401.02.1.2.1--Coarse Aggregate Blend. Mechanically fractured faces by weight of the combined mineral aggregate coarser than the No. 4 sieve:

Mixture	Percent Fractured Faces, minimum
25-mm	70, one-face
19-mm *	80, one-face
12.5-mm	90, two-face
9.5-mm	90, two-face
4.75-mm	90, two-face

* When used on routes requiring polymer modified asphalt, the top intermediate lift (19-mm mixture), including travel lane and adjacent lane, shall have at least 90 percent two fractured faces minimum. When placed on an existing Portland Cement Concrete surface, all intermediate lifts (19-mm mixture) shall have at least 90 percent fractured two faces minimum.

The maximum percentage by weight of flat and elongated particles, for all mixes other than 4.75-mm, maximum to minimum dimension greater than 5, shall not exceed 10% for all mixtures. This shall be determined in accordance with ASTM Designation: D 4791, Section 8.4, on the combined mineral aggregate retained on the 3/8" sieve.

907-401.02.1.2.2--Fine Aggregate Blend. Of all the material passing the No. 8 sieve and retained on the No. 200 sieve, not more than 60 percent shall pass the No. 30 sieve.

Uncrushed natural sand shall pass the 3/8" sieve and may be used, excluding the content in RAP, in the percentages of the total mineral aggregate by weight set out in the following table:

Mixture	Maximum Percentage of Natural Sand by Total Weight of Mineral Aggregate		
	HT	MT	ST
25-mm	10	10	20
19-mm	10	10	20
12.5-mm	10	10	20
9.5-mm	10	10	10
4.75-mm	25	30	35

907-401.02.1.2.3--Combined Aggregate Blend.

Design Master Range

Mixture:	25-mm	19-mm	12.5-mm	9.5-mm	4.75-mm
Nominal Maximum Sieve Size:	1 inch	3/4 inch	1/2 inch	3/8 inch	1/4 inch
Sieve Size	Percent Passing				
1½ inch	100				
1 inch	90-100	100			
¾ inch	89 max.	90-100	100		
½ inch	-	89 max.	90-100	100	100
3/8 inch	-	-	89 max.	90-100	95-100
No. 4	-	-	-	89 max.	90-100
No. 8	16-50	18-55	20-60	22-70	-
No. 16	-	-	-	-	30-60
No. 200	4.0-9.0	4.0-9.0	4.0-9.0	4.0-9.0	6.0-12.0

For MT and HT mixtures, the combined aggregate gradation of the job mix formula, when plotted on FHWA 0.45 power chart paper, shall fall entirely below the Maximum Density Line on all sieve sizes smaller than the No. 4 sieve. However, MT and HT mixtures having a minimum fine aggregate angularity index of 44.0, per ASTM Designation: C1252, Method A, may be designed above the maximum density line.

The 9.5-mm mixtures shall have a minimum fine aggregate angularity of 44.0 for HT and MT mixtures and 40.0 for ST mixtures when tested on combined aggregate in accordance with ASTM Designation: C1252 Method A. The 4.75-mm mixtures shall have a minimum fine aggregate angularity of 45.0 for all design levels when tested on combined aggregate in accordance with ASTM Designation: C 1252, Method A.

The minus No. 40 fraction of the combined aggregate shall be non-plastic when tested according to AASHTO Designation: T 90. The clay content for the combined aggregate for underlying layers shall not exceed 1.0 percent, and for the top layer shall not exceed 0.5 percent by weight of the total mineral aggregate when tested according to AASHTO Designation: T 88.

907-401.02.1.3--Bituminous Materials. Bituminous materials shall meet the applicable requirements of Section 702 for the grade specified.

Tack coat shall be the same neat grade asphalt cement used in the mixture being placed or those materials specified for tack coat in Table 410-A on the last page of Section 410. Emulsified asphalt shall not be diluted without approval of the Engineer.

907-401.02.1.4--Blank.

907-401.02.1.5--Hydrated Lime. Hydrated lime shall meet the requirements of Subsection

714.03.2 for lime used in soil stabilization.

907-401.02.1.6--Asphalt Admixtures. Additives for liquid asphalt, when required or permitted, shall meet the requirements of Subsection 702.08.

907-401.02.1.7--Polymers. Polymers for use in polymer modified asphalt pavements shall meet the requirements of Subsection 702.08.3.

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.

907-401.02.3--Composition of Mixtures.

907-401.02.3.1--General. Unless otherwise specified or permitted, the asphalt shall consist of a uniform mixture of asphalt, aggregate, hydrated lime and, when required or necessary to obtain desired properties, antistripping agent and/or other materials.

The total amount of crushed limestone aggregate for mixtures, excluding shoulders, when used in the top lift, shall not exceed 50 percent of the total combined aggregate by weight.

Hydrated lime shall be used in all asphalt at the rate of one percent (1%) by weight of the total dry aggregate including aggregate in RAP, if used. The aggregate, prior to the addition of the hydrated lime, shall contain sufficient surface moisture. If necessary, the Contractor shall add moisture to the aggregate according to the procedures set out in Subsection 907-401.03.2.1.2.

The Contractor shall obtain a shipping ticket for each shipment of hydrated lime. The Contractor shall provide the District Materials Engineer with a copy of each shipping ticket from the supplier, including the date, time and weight of hydrated lime shipped and used in hot mix asphalt production. An amount equal to twenty-five percent (25%) of the total value of asphalt items performed during the initial estimate period in which the Contractor fails to submit the hydrated lime shipping tickets to the District Materials Engineer will be withheld from the Contractor's earned work. Non-conformance with this specification for successive estimate period(s) will result in the total value (100%) of asphalt items performed during this period(s) being withheld from the Contractor's earned work. Monies withheld for this non-conformance will be released for payment on the next monthly estimate following the date the submittal of hydrated lime shipping tickets to the District Materials Engineer is brought back into compliance with this specification.

Mixtures will require the addition of an antistripping agent when the Tensile Strength Ratio (MT-63) and/or the Boiling Water Test (MT-59) fail to meet the following criteria.

Tensile Strength Ratio (TSR - MT-63)
Wet Strength / Dry Strength ..... 85 percent minimum
Interior Face Coating ..... 95 percent minimum
Boiling Water Test (MT-59)
Particle Coating ..... 95 percent minimum

Reclaimed asphalt pavement (RAP) materials may be used in the production of asphalt in the percentages of the total mix by weight set out in the following table:

Asphalt Mixture	Maximum Percentage of RAP by total weight of mix
4.75-mm	0
9.5-mm	20 *
12.5-mm Surface Lift	20 *
12.5-mm Underlying Lift	30
19-mm	30
25-mm	30

* At a minimum, RAP shall be processed and/or screened such that the RAP material size does not exceed the nominal maximum sieve size for the mixture specified.

During asphalt production, the RAP shall pass through a maximum 2-inch square sieve located in the asphalt plant after the RAP cold feed bin and prior to the RAP weighing system.

Crushed reclaimed concrete pavement may be used as an aggregate component of all asphalt pavements. When crushed reclaimed concrete pavement is used as an aggregate component, controls shall be implemented to prevent segregation. Crushed reclaimed concrete pavement aggregate shall be separated into coarse and fine aggregate stockpiles using the 3/8-inch or 1/2-inch sieve as a break-point unless otherwise approved by the Engineer in writing.

907-401.02.3.1.1--Mixture Properties.

ALL MIXTURES	Percent of Maximum Specific Gravity (Gmm)
N_{Design}	96.0
$N_{Initial}$	Less than 90.0
$N_{Maximum}$	Less than 98.0

VMA CRITERIA	Minimum percent
25-mm mixture	12.0
19-mm mixture	13.0
12.5-mm mixture	14.0
9.5-mm mixture	15.0
4.75-mm mixture	16.0

Mixtures with VMA more than two percent higher than the minimum may be susceptible to

flushing and rutting; therefore, unless satisfactory experience with high VMA mixtures is available, mixtures with VMA greater than two percent above the minimum should be avoided.

The specified VFA range for 4.75-mm nominal maximum size mixtures for design traffic levels >3 million ESAL's (HT Mixtures) shall be 75 to 78 percent, for design traffic levels of 1.0 to 3 million ESAL's (MT mixtures) 65 to 78 percent, and for design traffic levels of <1.0 million ESAL's (ST mixtures) 65 to 78 percent.

DUST/BINDER RATIO for 4.75-mm mixtures
Percent Passing No.200 / Effective Binder Percent ..... 0.9 to 2.0

DUST/BINDER RATIO for 9.5-mm, 12.5-mm, 19-mm & 25-mm mixtures
Percent Passing No.200 / Effective Binder Percent ..... 0.8 to 1.6

907-401.02.3.2--Job Mix Formula. The job mix formula shall be established in accordance with Mississippi Test Method: MT-78, where N represents the number of revolutions of the gyratory compactor.

Compaction Requirements:	$N_{Initial}$	N_{Design}	$N_{Maximum}$
High Type (HT) Mixtures 19-mm, 12.5-mm, 9.5-mm & 4.75-mm	7	85	130
Medium Type (MT) Mixtures 19-mm, 12.5-mm, 9.5-mm & 4.75-mm	7	65	100
All Standard Type (ST) Mixtures; 25-mm HT & MT Mixtures	6	50	75

At least 10 working days prior to the proposed use of each mixture, the Contractor shall submit in writing to the Engineer a proposed job-mix formula or request the transfer of a verified job-mix formula as set forth in the latest edition of MDOT's Field Manual for HMA and SOP TMD-11-78-00-000. The proposed job-mix formula shall indicate whether the mixture will be produced as HMA or WMA. The process or product used to produce WMA should also be noted on the proposed documentation for the job-mix formula. The job-mix formula shall be signed by a Certified Mixture Design Technician (CMDT).

The Department will perform the tests necessary for review of a proposed job-mix formula for each required mixture free of charge one time only. A charge will be made for additional job-mix formulas submitted by the Contractor for review.

Review of the proposed job-mix formula will be based on percent maximum specific gravity at $N_{Initial}$, N_{Design}, and $N_{Maximum}$, VMA @ N_{Design}, resistance to stripping, and other criteria specified for the mixture.

The mixture shall conform thereto within the range of tolerances specified for the particular

mixture. No change in properties or proportion of any component of the job-mix formula shall be made without permission of the Engineer. The job-mix formula for each mixture shall be in effect until revised in writing by the Engineer.

A job-mix formula may be transferred to other contracts in accordance with conditions set forth in the Department's Field Manual for HMA.

The Contractor shall not place any asphalt prior to receiving "tentative" approval and a MDOT design number from the Central Laboratory.

When a change in source of materials, unsatisfactory mixture production results (such as segregation, bleeding, shoving, rutting over ⅛", raveling & cracking) or changed conditions make it necessary, a new job-mix formula will be required. The conditions set out herein for the original job-mix formula are applicable to the new job-mix formula.

In the event the Contractor wishes to change from an approved HMA job-mix formula to WMA or an approved WMA job-mix formula to HMA, the Contractor shall submit the proposed change in writing to the Engineer at least 10 working days prior to the proposed change. If no changes (other than the plant production temperature) are to be made to the job-mix formula, a new MDOT design number will be assigned by the MDOT Central Laboratory.

907-401.02.4--Substitution of Mixture. The substitution of a one (1) size finer mixture for an underlying lift shall require written permission of the State Construction Engineer, except no substitution of a 4.75-mm mixture will be allowed. A 9.5-mm mixture may be substituted for the 12.5-mm mixture designated on the plans as the top lift or pre-leveling. The 19-mm mixture may be substituted for the 25-mm mixture in trench widening work. Any substitution of mixtures shall be of the same type. No other substitutions will be allowed. The quantity of substituted mixture shall be measured and paid for at the contract unit price for the mixture designated on the plans. The substitution of any mixture will be contingent on meeting the required total structure thickness and maintaining the minimum and/or maximum laying thickness for the particular substituted mixture as set out in the following table.

Mixture	Single Lift Laying Thickness Inches	
	Minimum	Maximum
25-mm	3	4
19-mm	2¼	3½
12.5-mm	1½	2½
9.5-mm	1	1½
4.75-mm	½	¾

907-401.02.5--Contractor's Quality Management Program.

907-401.02.5.1--General. The Contractor shall have full responsibility for quality management

and maintain a quality control system that will furnish reasonable assurance that the mixtures and all component materials incorporated in the work conform to contract requirements. The Contractor shall have responsibility for the initial determination and all subsequent adjustments in proportioning materials used to produce the specified mixture. Adjustments to plant operation and spreading and compaction procedures shall be made immediately when results indicate that they are necessary. Mixture produced by the Contractor without the required testing or personnel on the project shall be subject to removal and replacement by the Contractor at no additional cost to the State.

907-401.02.5.2--Personnel Requirements. The Contractor shall provide at least one Certified Asphalt Technician-I (CAT-I) full-time during asphalt production at each plant site used to furnish material to the project. Sampling shall be conducted by a certified technician or by plant personnel under the direct observation of a certified technician. All testing, data analysis and data posting will be performed by the CAT-I or by an assistant under the direct supervision of the CAT-I. The Contractor shall have a Certified Asphalt Technician-II (CAT-II) available to make any necessary process adjustments. Technician certification shall be in accordance with MDOT SOP TMD-22-10-00-000, MDOT HMA Technician Certification Program. An organizational chart, including names, telephone numbers and current certification, of all those responsible for the quality control program shall be posted in the Contractor's laboratory while the asphaltic paving work is in progress.

907-401.02.5.3--Testing Requirements. As a minimum, the Contractor's quality management program shall include the following:

(a) Bituminous Material. Provide Engineer with samples in a sealed one quart metal container at the frequency given in MDOT SOP TMD-20-04-00-000.

(b) Mechanically Fractured Face. Determine mechanically fractured face content of aggregates retained on the No. 4 sieve, at a minimum of one test per day of production.

(c) Mixture Gradation. Conduct extraction tests for gradation determination on the mixture. Sample according to the frequency in paragraph (i) and test according to Mississippi Test Method MT-31.

(d) Total Voids and VMA. Determine total voids and voids in mineral aggregate (VMA), at N_{Design}, from the results of bulk specific gravity tests on laboratory compacted specimens. Sample according to the sampling frequency in paragraph (i) and test according to the latest edition of MDOT's Field Manual for HMA.

(e) Asphalt Content. Sample according to the sampling frequency in paragraph (i). Determine the asphalt content using one of the following procedures.

(1) Nuclear gauge per Mississippi Test Method MT-6.
(2) Incinerator oven per AASHTO Designation: T 308, Method A.

(f) Stripping Tests. Conduct a minimum of one stripping test at the beginning of each job-

mix production and thereafter, at least once per each two weeks of production according to Mississippi Test Method: MT-63 and one stripping test per day of production according to Mississippi Test Method: MT-59. Should either the TSR (MT-63) or the boiling water (MT-59) stripping tests fail, a new antistrip additive or rate shall be established or other changes made immediately that will result in a mixture which conforms to the specifications; otherwise, production shall be suspended until corrections are made.

(g) Density Tests. For 25-mm, 19.5-mm, 12.5-mm & 9.5-mm mixtures, conduct density tests as necessary to control and maintain required compaction according to Mississippi Test Method: MT-16, Method C (nuclear gauge), or AASHTO Designation: T 166. Note - The nuclear gauge may be correlated, at the Contractor's option, with the average of a minimum of five pavement sample densities. For 4.75-mm mixtures, conduct density tests as necessary to control and maintain required compaction according to AASHTO Designation: T 166.

(h) Quality Control Charts. Plot the individual test data, the average of the last four tests and the control limits for the following items as a minimum:

Mixture Gradation (Percent Passing) Sieves:
1/2-inch, 3/8-inch, No. 8, No. 16, No. 30 and No. 200.
Asphalt Content, Percent
Maximum Specific Gravity, G_{mm}
Total Voids @ N_{Design}, Percent
VMA @ N_{Design}, Percent

NOTE: For 4.75-mm mixtures, Quality Control Charts for mixture gradation are not required on the No. 8 and No. 30 sieves. For 4.75-mm mixtures, as a minimum, Quality Control Charts for mixture gradation shall be kept on the 3/8-inch, No. 16 and No. 200 sieves. For all mixtures other than 4.75-mm, Quality Control Charts for mixture gradation are not required on the No. 16 sieve.

Keep charts up-to-date and posted in a readily observable location. Charts may be kept on a computer, however, the charts shall be printed out a minimum of once each production day and displayed in the laboratory. Note any process changes or adjustments on the Air Voids chart.

(i) Sampling Frequency. Conduct those tests as required above at the following frequency for each mixture produced based on the estimated plant tonnage at the beginning of the day.

Total Estimated Production, tons	Number of Tests
50-800	1
801-1700	2
1701-2700	3
2701+	4

NOTE: Material placed in a storage silo from a previous day's production shall be randomly sampled and tested when removed for placement on the roadway. Such sample(s) shall be independent of the day's production sampling frequency and shall be used in calculating the four (4) sample running average.

(j) Sample Requirements. Obtain the asphalt mixture samples from trucks at the plant. Obtain aggregate samples from cold feed bins or aggregate stockpile. Save a split portion of all mixture samples at the laboratory site in a dry and protected location for 14 calendar days. At the completion of the project, the remaining samples may be disposed of with the approval of the Engineer.

The above testing frequencies are for the estimated plant production for the day. If production is discontinued or interrupted, the tests will be conducted at the previously established sample tonnage points for the materials that are actually produced. If the production exceeds the estimated tonnage, sampling and testing will continue at the testing increments previously established for the day. A testing increment is defined as the estimated daily tonnage divided by the required number of tests from the table in Subsection 907-401.02.5.3 paragraph (i).

In addition to the above program, the following tests shall be conducted on the first day of production and once for every eight production samples thereafter, with a minimum of one test per production week.

Aggregate Stockpile Gradations per AASHTO Designations: T-11 and T-27.

Reclaimed Asphalt Pavement (RAP) Gradation per Mississippi Test Method MT-31.

Fine Aggregate Angularity for all 4.75-mm and 9.5-mm mixtures and all MT and HT mixtures designed above the maximum density line per ASTM Designation: C 1252, Method A.

Testing of the aggregate and RAP stockpiles during production will be waived provided the Contractor provides the Engineer with gradation test results for the materials in the stockpile determined during the building of the stockpiles. The test results provided shall represent a minimum frequency of one per one thousand tons of material in the stockpile. If the Contractor continues to add materials to the stockpile during asphalt production, the requirements for gradation testing during production are not waived.

907-401.02.5.4--Documentation. The Contractor shall document all observations, records of inspection, adjustments to the mixture, and test results on a daily basis. All tests conducted by the Contractor in accordance with Subsection 907-401.02.5.3(h) shall be included in the running average calculations. If single tests are performed as a check on individual asphalt properties, between regular samples, without performing all tests required in Subsection 907-401.02.5.3(h), the results of those individual tests shall not be included in the running average calculations for that particular property. The Contractor shall record the results of observations and records of inspection as they occur in a permanent field record. The Contractor shall record all process

adjustments and job mix formula (JMF) changes on the air void charts. The Contractor shall provide copies of all test data sheets and the daily summary reports on the appropriate Mississippi DOT forms to the Engineer on a daily basis. The Contractor shall provide a written description of any process change, including blend proportions, to the Engineer as they occur. Information provided to the Engineer must be received in the Engineer's office by no later than 9:00 AM the day after the asphalt is produced. Fourteen days after the completion of the placement of the asphalt, the Contractor shall provide the Engineer with the original testing records and control charts in a neat and orderly manner.

907-401.02.5.5--Control Limits. The following control limits for the job mix formula (JMF) and warning limits are based on a running average of the last four data points.

Item	JMF Limits	Warning Limits
Sieve - % Passing		
1/2-inch	± 5.5	± 4.0
3/8-inch	± 5.5	± 4.0
No. 8	± 5.0	± 4.0
No. 16, for 4.75-mm mixtures ONLY	± 4.0	± 3.0
No. 30	± 4.0	± 3.0
No. 200	± 1.5	± 1.0
Asphalt Content, %	-0.3 to +0.5	-0.2 to + 0.4
Total Voids @ N_{Design}, %	± 1.3	± 1.0
VMA @ N_{Design}, %	– 1.5	– 1.0

907-401.02.5.6--Warning Bands. Warning bands are defined as the area between the JMF limits and the warning limits.

907-401.02.5.7--Job Mix Formula Adjustments. A request for a JMF adjustment signed by a CAT-II may be made to the Engineer by the Contractor. Submit sufficient testing data with the request to justify the change. The requested change will be reviewed by the State Materials Engineer for the Department. If current production values meet the mixture design requirements, a revised JMF will be issued. Adjustments to the JMF shall conform to the latest edition of MDOT's Field Manual for HMA. Adjustments to the JMF to conform to actual production shall not exceed the tolerances specified for the JMF limits. Regardless of such tolerances, any adjusted JMF gradation shall be within the design master range for the mixture specified. The JMF asphalt content may only be reduced if the production VMA meets or exceeds the minimum design VMA requirements for the mixture being produced.

907-401.02.5.8--Actions and Adjustments. Based on the process control test results for any property in question, the following actions shall be taken or adjustments made when appropriate:

(a) When the running average trends toward the warning limits, the Contractor shall consider taking corrective action. The corrective action, if any, shall be documented. All tests shall be part of the contract files and shall be included in the running average

calculations.

(b) The Contractor shall notify the Engineer whenever the running average exceeds the warning limits.

(c) If two consecutive running averages exceed the warning limit, the Contractor shall stop production and make adjustments. Production shall only be restarted after notifying the Engineer of the adjustments made.

(d) If the adjustment made under (c) improves the process such that the running average after four additional tests is within the warning limits, the Contractor may continue production with no reduction in payment.

(e) If the adjustment made under (c) does not improve the process and the running average after four additional tests stays in the warning band, the mixture will be considered unsatisfactory. Reduced payment for unsatisfactory mixtures will be applied starting from the stop point to the point when the running average is back within the warning limits in accordance with Subsection 907-401.02.6.3.

(f) Failure to stop production and make adjustments when required shall subject all mixture produced from the stop point to the point when the running average is back within the warning limits to be considered unsatisfactory. Reduced payment for unsatisfactory mixtures will be applied in accordance with Subsection 907-401.02.6.3.

(g) If the running average exceeds the JMF limits, the Contractor shall stop production and make adjustments. Production shall only be restarted after notifying the Engineer of the adjustments made.

(h) All materials for which the running average exceeds the JMF limits will be considered unacceptable and shall be removed and replaced by the Contractor at no additional cost to the State. The Engineer will determine the quantity of material to be replaced based on a review of the individual testing data which make up the running average in question and an inspection of the completed pavement. If the Engineer decides to leave the mixture in place because of special circumstances, the quantity of mixture, as defined above, will be paid for in accordance with Subsection 907-401.02.6.3.

(i) Single test results shall be compared to 1.7 times the warning and JMF limits. If the test results verified by QA testing (within allowable differences in Subsection 907-401.02.6.2) exceed these limits, the pay factor provided in Subsection 907-401.02.6.3 will apply for the quantity of material represented by the test(s). Single test limits will be used for the acceptance of projects when insufficient tonnage is produced to require four (4) Contractor's tests.

(j) The above corrective action will also apply for a mixture when the Contractor's testing data has been proven incorrect. The Contractor's data will be considered incorrect when; 1) the Contractor's tests and the Engineer's tests do not agree within the allowable differences given in Subsection 907-401.02.6.2 and the difference can not be resolved, or 2) the Engineer's tests indicates that production is outside the JMF limits and the results have been verified by the Materials Division. The Engineer's data will be used in place of the Contractor's data to determine the appropriate pay factor.

907-401.02.6--Standards of Acceptance.

907-401.02.6.1--General. Acceptance for mixture quality (VMA and total voids @ N_{Design}, gradation, and asphalt content) will be based on random samples tested in accordance with the

latest edition of MDOT's Field Manual for HMA. Pavement densities and smoothness will be accepted by lots as set out in Subsections 907-401.02.6.4 and 907-401.02.6.5.

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 907-401.02.5.8(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.

907-401.02.6.3--Acceptance Procedure for Mixture Quality. All obviously defective material or mixture will be subject to rejection by the Engineer. Such defective material or mixture shall not be incorporated into the finished work. If the defective material has already been placed in the work, the material shall be removed and replaced at no additional cost to the State.

The Engineer will base final acceptance of the asphalt mixture production on the results of the Contractor's testing for total voids and VMA @ N_{Design}, gradation, and asphalt content as verified by the Engineer in the manner hereinbefore described and the uniformity and condition of the completed pavement. Areas of pavement that exhibit non-uniformity or failures, materials or construction related, such as but not limited to segregation, bleeding, shoving, rutting over ⅛", raveling, slippage, or cracking will not be accepted. Such areas will be removed and replaced at no additional cost to the State.

Bituminous mixture placed prior to correction for deficiencies in VMA and total voids @ N_{Design}, gradation, or asphalt content, as required in Subsection 907-401.02.5.8 and determined by the Engineer satisfactory to remain in place will be paid for in accordance with the following pay factors times the contract unit price per ton.

Pay Factor for Mixture Quality *

Item	Produced in Warning Bands	Produced Outside JMF Limits, Allowed to Remain in Place
Gradation	0.90	0.75
Asphalt Content	0.85	0.75
Total Voids @ N_{Design}	0.70	0.50
VMA @ N_{Design}	0.90	0.75

* The minimum single payment will apply.

907-401.02.6.4--Acceptance Procedure for Density. Each completed lift will be accepted with respect to compaction on a lot to lot basis from density tests performed by the Department. For normal production days, divide the production into approximately equal lots as shown in the following table. When cores are being used for the compaction evaluation, randomly obtain one core from each lot. When the nuclear density gauge is being used for compaction evaluation, obtain two random readings from each lot and average the results. See Chapter 7 of the latest edition of MDOT's Field Manual for HMA for more details. Additional tests may be required by the Engineer to determine acceptance of work appearing deficient. The Contractor shall furnish and maintain traffic control for all compaction evaluations, including coring, required in satisfying specified density requirements.

Lot Determination

Daily Production - Tons	Number of Lots
0 - 300	1
301 - 600	2
601 - 1000	3
1001 - 1500	4
1501 - 2100	5
2101 - 2800	6
2801+	7

907-401.02.6.4.1--Roadway Density. The density requirement for each completed lift on a lot to lot basis from density tests performed by the Department shall be as follows:

1. For all leveling lifts, when full lane width and with a thickness as specified in the table in Subsection 907-401.02.4, 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.

When it is determined that the density for a lot is below the required density (93.0 percent or 92.0 percent) but not lower than 91.0 or 90.0 percent of maximum density, respectively, the Contractor will have the right to remove and replace the lot(s) not meeting the specified density requirements in lieu of accepting reduced payment for the lot(s).

When it is determined that the density for a lot is above 96.0 percent, the Engineer shall notify the Contractor who will make plant adjustments to resolve the problem.

When it is determined that the density for a lot is below 91.0 or 90.0 percent, respectively, the lot(s), or portions thereof shall be removed and replaced in accordance with Chapter 7 of the latest edition of MDOT's Field Manual for HMA at no additional cost to the State. A corrected lot will be retested for approval. No resampling will be performed when pavement samples are used for determining density.

At any time the average daily compaction (the total of the percent compaction for the lots produced in one day divided by the total number of lots for the day) does not meet the required percent compaction or more for two consecutive days, the Contractor shall notify the Engineer of proposed changes to the compactive effort. If the average daily compaction does not meet the

required percent compaction or more for a third consecutive day, the Contractor shall stop production until compaction procedures are established to meet the specified density requirements.

Each lot of work found not to meet the density requirement of 92.0% or 93% of maximum density, respectively, may remain in place with a reduction in payment as set out in the following tables:

PAYMENT SCHEDULE FOR COMPACTION OF 92.0 PERCENT OF MAXIMUM DENSITY

Pay Factor	Lot Density ** % of Maximum Density
1.00	92.0 and above
0.90	91.0 - 91.9
0.70	90.0 - 90.9

** Any lot or portion thereof with a density of less than 90.0 percent of maximum density shall be removed and replaced at no additional cost to the State.

PAYMENT SCHEDULE FOR COMPACTION OF 93.0 PERCENT OF MAXIMUM DENSITY

Lot Density *** Pay Factor	% of Maximum Density
1.00	93.0 and above
0.90	92.0 - 92.9
0.70	91.0 - 91.9

*** Any lot or portion thereof with a density of less than 91.0 percent of maximum density shall be removed and replaced at no additional cost to the State.

The compaction pay factors and mixture quality pay factor, as described in Subsection 907-401.02.6.3, will each apply separately. However, the combined pay factor shall not be less than 0.50 for any mixture allowed to remain in place.

907-401.02.6.4.2--Trench Widening Density. The density for trench widening on a lot to lot basis shall be determined from density tests performed by the Department using pavement samples (cores).

When it is determined that the density for a trench widening lot is below 89.0 percent but not lower than 88.0 percent of maximum density, the Contractor will have the right to remove and replace the lot(s) not meeting the specified density requirements in lieu of accepting reduced payment for the lot(s).

When it is determined that the density for a trench widening lot is above 95.0 percent, the Engineer shall notify the Contractor who will make plant adjustments to resolve the problem.

When it is determined that the density for a trench widening lot is below 88.0 percent, the lot(s), or portions thereof shall be removed and replaced in accordance with Chapter 7 of the latest edition of MDOT's Field Manual for HMA at no additional cost to the State. A corrected lot will be retested for approval. No resampling will be performed when pavement samples are used for determining density.

At any time the daily compaction (the total of the percent compaction for the lots produced in one day divided by the total number of lots for the day) does not meet 89.0 percent compaction or more for two consecutive days, the Contractor shall notify the Engineer of proposed changes to the compactive effort. If the average daily compaction does not meet 89.0 percent compaction or more for a third consecutive day, the Contractor shall stop production until compaction procedures are established to meet the specified density requirement.

Each lot of trench widening work found not to meet the density requirement of 91.0 percent of maximum density may remain in place with a reduction in payment as set out in the following table:

PAYMENT SCHEDULE FOR COMPACTION
TRENCH WIDENING WORK

Pay Factor	Lot Density *** % of Maximum Density
1.00	89.0 and above
0.50	88.0 - 88.9

*** Any lot or portion thereof with a density of less than 88.0 percent of maximum density shall be removed and replaced at no additional cost to the State.

The compaction pay factors and mixture quality pay factor, as described in Subsection 907-401.02.6.3, will each apply separately. However, the combined pay factor shall not be less than 0.50 for any mixture allowed to remain in place.

907-401.02.6.5--Blank.

907-401.02.6.6--Blank.

907-401.02.6.7--Surface Correction. Corrective work to sections exceeding short continuous interval thresholds reported by ProVal, as described in Subsection 907-403.03.2.1, shall consist of diamond grinding in accordance with these specifications or methods approved by the Engineer. All surface areas corrected by grinding shall be sealed with a sealant approved by the Engineer.

907-401.02.6.7.1--Diamond Grinding. Grinding of asphalt surfaces shall consist of diamond

grinding the existing asphalt pavement surface to remove surface distortions to achieve the specified surface smoothness requirements.

907-401.02.6.7.2--Equipment. The grinding equipment shall be a power driven, self-propelled machine that is specifically designed to smooth and texture pavement surfaces with diamond blades. The effective wheel base of the machine shall not be less than 12.0 feet. It shall have a set of pivoting tandem bogey wheels at the front of the machine and the rear wheels shall be arranged to travel in the track of the fresh cut pavement. The center of the grinding head shall be no further than 3.0 feet forward from the center of the back wheels.

The equipment shall be of a size that will cut or plane at least two feet (2') wide. It shall also be of a shape and dimension that does not encroach on traffic movement outside of the work area. The equipment shall be capable of grinding the surface without causing spalls at joints, or other locations.

907-401.02.6.7.3--Construction. The construction operation shall be scheduled and proceed in a manner that produces a uniform finish surface. Grinding will be accomplished in a manner to provide positive lateral drainage by maintaining a constant cross-slope between grinding extremities in each lane.

The operation shall result in pavement that conforms to the typical cross-section and the requirements specified in Subsection 907-401.02.6.7.4. It is the intent of this specification that the surface smoothness characteristics be within the limits specified.

The Contractor shall establish positive means for removal of grinding residue. Solid residue shall be removed from pavement surfaces before it is blown by traffic action or wind. Residue shall not be permitted to flow across lanes used by public traffic or into gutters or drainage facilities, but may be allowed to flow into adjacent ditches.

907-401.02.6.7.4--Finished Pavement Surface. The grinding process shall produce a pavement surface that is smooth and uniform in appearance with a longitudinal line type texture. The line type texture shall contain parallel longitudinal corrugations that present a narrow ridge corduroy type appearance. The peaks of the ridges shall not be more than 1/16 inch higher than the bottoms of the grooves.

The finished pavement surface will be measured for riding quality. The grinding shall produce a riding surface which does not exceed either the specified profile index or the specified bump and dip limit.

907-401.02.6.8--Acceptance Procedure for Pavement Smoothness Using Mean Roughness Index (MRI). When compaction is completed, the lift shall have a uniform surface and be in reasonably close conformity with the line, grade and cross section shown on the plans.

The smoothness of the surface lift will be determined by using an Inertial Profiling System (IPS) to measure and record roughness data in each designated location. Roughness data for each longitudinal profile will be reported as a Mean Roughness Index (MRI). MRI is calculated by

averaging the International Roughness Index (IRI) values from the two individual wheelpath profiles. The surface shall be tested and corrected to a smoothness index as described herein with the exception of those locations or specific projects that are excluded from smoothness testing with an IPS.

The smoothness of the surface lift will be determined for traffic lanes, auxiliary lanes, climbing lane and two-way turn lanes. Areas excluded from a smoothness test with the IPS are acceleration and deceleration lanes, tapered sections, transition sections for width, shoulders, crossovers, ramps, side street returns, etc. The roadway pavement on bridge replacement projects having 1,000 feet or less of pavement on each side of the structure will be excluded from a smoothness test. Pavement on horizontal curves having a radius of less than 1,000 feet at the centerline and pavement within the super elevation transition of such curves are excluded from smoothness testing. Smoothness testing shall terminate 264 feet from each transverse joint that separates the pavement from a bridge deck, bridge approach slab or existing pavement not constructed under the contract. This shall apply to any other exceptions including, but not limited to, railroad crossings and manholes. Segments containing a considerable amount of encroachments such as intersections, manholes, curb and gutter sections, etc. may be excluded at the Project Engineer's discretion.

Initial smoothness measurements shall take place no more than 72 hours following placement of surface and must be performed at the posted speed limit or 50 miles per hour (±5 mile per hour), whichever is lower. This speed requirement will be waived for all lightweight profilers. Measurements will be made in both wheel paths of exterior and interior lanes. The wheel paths shall be designated as being located three feet (3') and nine feet (9') from centerline or longitudinal joint, respectively. Beginning and ending latitude and longitude coordinates shall be required on each smoothness surface test. Testing will also be required on sections that have been surface corrected. No smoothness testing shall be performed when there is moisture of any kind on the pavement surface. Any additional testing shall meet the requirements of Subsection 907-403.03.2.

The surface lift will be accepted on a continuous interval basis for pavement smoothness. Continuous reporting is based upon all MRI values for a specified running interval. These values are averaged and presented at the midpoint of the specified running interval. The last 15 feet of a day's lift may not be obtainable until the lift is continued and for this reason may be included in the subsequent section.

Areas of localized roughness exceeding the continuous 25-foot interval threshold described in Subsection 907-403.03.2.1 shall be corrected regardless of the 528-foot interval MRI value of the section. Surface correction by grinding shall be performed in accordance with Subsection 907-401.02.6.7. The Contractor shall also make other necessary surface corrections to ensure that the final mean roughness index of the section meets the requirements of Subsection 907-403.03.2.

Continuous sections exceeding the accepted long interval MRI value shall be corrected as specified in Subsection 403.03.4. All such corrections shall be performed at no additional costs to the State. Scheduling and traffic control will be the responsibility of the Contractor with

approval of the Engineer. All tests and corrections shall be in accordance with AASHTO R 54-10, Accepting Pavement Ride Quality When Measured Using Inertial Profiling Systems.

907-401.02.6.9--High Speed Inertial Profiling System.

907-401.02.6.9.1--General. The IPS, furnished and operated by the Contractor under the supervision of the Engineer or the Engineer's representative, shall be a dual laser high speed or lightweight vehicle meeting the requirements of AASHTO M 328-10, Standard Specification for Inertial Profiler.

907-401.02.6.9.2--Mechanical Requirements. The IPS should function independent of vehicle suspension and speed with an operational range of 15-70 mph (for high speed profilers only) and must collect data at a sample interval of no more than three inches (3"). All IPSs, operators, and combinations thereof shall be verified in accordance with AASHTO R 56-10, Standard Practice for Certification of Inertial Profiler Systems and AASHTO R 57-10, Operating Inertial Profiler Systems.

907-401.02.6.9.3--Computer Requirements. The computer measurement program must be menu driven, Windows compatible, and able to produce unfiltered profiler runs in any one of the following file formats: University of Michigan's Transportation Research Institute's (UMTRI) Engineering Research Division (*.erd) file, ProVAL's Pavement Profile (*.ppf) file, or Ames Engineering's (*.adf) file format. The computer shall have the ability to display and print data on site for verification and shall have the ability to save and transfer data via Universal Serial Bus (USB) flash drive, which shall be provided by the Contractor.

All profiler runs must be named in the following format for acceptance by the Project Engineer:

- County_Route_Direction_Lane_BeginStation_EndStation

In addition to manufacturers software; the latest version of FHWA's ProVAL software shall be installed on the IPS computer. ProVAL software is available for free download at http://www.roadprofile.com.

907-401.02.7--Nuclear Gauges.

907-401.02.7.1--Nuclear Moisture-Density Gauge. The nuclear gauge unit used to monitor density shall contain a full data processor which holds all calibration constants necessary to compute and directly display wet density, moisture, and dry density in pounds per cubic foot. The data processor shall compute and display the percent moisture and percent density based on dry weight.

907-401.02.7.2--Nuclear Asphalt Content Gauge. The Contractor shall furnish and calibrate, unless designated otherwise in the contract, a Troxler Nuclear Asphalt Content Gauge Model 3241 or updated model, or a Campbell Nuclear Asphalt Content Gauge Model AC-2 or an approved equal.

907-401.03--Construction Requirements. Mississippi DOT has adopted the "Hot-Mix Asphalt

Paving Handbook" as the guideline for acceptable asphalt construction practices.

907-401.03.1--Specific Requirements.

907-401.03.1.1--Weather Limitations - General. The mixture shall not be placed when weather conditions prevent the proper handling and finishing or the surface on which it is to be placed is wet or frozen.

When paving operations are discontinued because of rain, the mixture in transit shall be protected until the rain ceases. The surface on which the mixture is to be placed shall be swept to remove as much moisture as possible and the mixture may then be placed subject to removal and replacement at no additional cost to the State if contract requirements are not met.

907-401.03.1.1.1--Weather Limitations For HMA. At the time of placement, the air and pavement surface temperature limitations shall be equal to or exceed that specified in the following table.

TEMPERATURE LIMITATIONS

Compacted Thickness	Temperature
Less than 1½ inches	55°F
1½ inches to 2 inches	50°F
2¼ inches to 3 inches	45°F
Greater than 3 inches	40°F

907-401.03.1.1.2--Weather Limitations For WMA. 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. Tack coat shall be applied to previously placed asphalt 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.

907-401.03.1.3--Blank.

907-401.03.1.4--Density. 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 907-401.02.4, the required lot density shall be 92.0 percent of maximum

density. If a job-mix formula adjustment is made during the day which affects the maximum specific gravity, calculate a new average maximum density for the lot(s) placed after the change.

Pavement core samples obtained for determining density which has a thickness less than two times the maximum size aggregate permitted by the job-mix formula will not be used as a representative sample.

Preleveling, wedging (less than fifty percent of width greater than minimum lift thickness), ramp pads, irregular shoulder areas, median crossovers, turnouts, and other areas where an established rolling pattern cannot be obtained shall be compacted to refusal densification.

907-401.03.2--Bituminous Mixing Plants.

907-401.03.2.1--Plant Requirements.

907-401.03.2.1.1--Cold Aggregate Storage. The cold storage for hydrated lime shall be a separate bulk storage bin with a vane feeder or other approved feeder system which can readily be calibrated. The system shall provide a means for easy sampling of the hydrated lime additive and verifying the quantity of lime dispensed. The feeder system shall require a totalizer.

The hydrated lime additive equipment shall be interlocked and synchronized with the cold feed controls to operate concurrently with the cold feed operation which will automatically adjust the hydrated lime feed to variations in the cold aggregate feed. A positive signal system shall be installed which will automatically shut the plant down when malfunctions cause an improper supply of hydrated lime or water.

The plant shall not operate unless the entire hydrated lime system is functioning properly.

907-401.03.2.1.2--Cold Aggregate Feed. The hydrated lime shall be dispensed dry or as a slurry directly onto the composite aggregate between the cold feed and the dryer. The slurry shall consist of 1 part hydrated lime to 3 parts water.

When hydrated lime is introduced dry, a spray bar or other approved system capable of spraying all aggregate with water shall be installed in order to maintain all aggregate at the moisture condition set out in Subsection 907-401.02.3.1 prior to addition of the hydrated lime. An alternate system for spraying the coarse aggregate stockpiles may be allowed when approved by the Engineer. The approved equipment and methods shall consistently maintain the aggregate in a uniform, surface wet condition. The moisture content of the aggregate-hydrated lime mixture, following spraying and mixing, shall be introduced into the automatic moisture controls of the plant.

The aggregate-hydrated lime mixture shall be uniformly blended by some mechanical means such as a motorized "on the belt" mixer or pug mill located between the cold feed and the dryer. Other mixing devices may be used subject to approval by the Engineer.

A maximum of forty five (45) percent of the total aggregate blend may be fed through any single

cold feed bin. If the JMF calls for more than forty five (45) percent of a specific aggregate, that aggregate must be fed through two (2) or more separate cold feed bins.

907-401.03.2.1.3--Dryer. The efficiency of drying aggregates shall be such that the moisture content of the top asphalt mixture shall not exceed 0.50 percent by weight of the total mixture, and the moisture content of all the underlying mixtures shall not exceed 0.75 percent by weight of the total mixture being produced.

907-401.03.2.1.4--Blank.

907-401.03.2.1.5--Control of Bituminous Material and Antistripping Agent. Specified bituminous materials from different manufacturers or from different refineries of a single manufacturer shall not be mixed in the plant's asphalt cement supply system storage tank and used in the work without prior written approval of the Engineer. Approval is contingent upon the Engineer's receipt of three copies of the manufacturer's certified test report(s) from the Contractor showing that the bituminous material blend conforms to the specifications.

A satisfactory method of weighing or metering shall be provided to ensure the specified quantity of bituminous material. Provisions shall be provided for checking the quantity or rate of flow. Weighing or metering devices shall be accurate within plus or minus one-half percent.

The antistripping agent shall be injected into the bituminous material immediately prior to the mixing operation with an approved in-line injector system capable of being calibrated so as to ensure the prescribed dosage.

An in-line spigot for sampling of asphalt shall be located between the asphalt storage tank and the antistripping agent in-line injector.

907-401.03.2.1.6--Thermometric Equipment. An armored thermometer of adequate range and calibrated in 5°F increments shall be fixed at a suitable location in the bituminous line near the charging valve of the mixer unit.

The plant shall be equipped with an approved dial-scale, mercury-actuated thermometer, pyrometer or other approved thermometric instrument placed at the discharge chute of the dryer to measure the temperature of the material.

When the temperature control is unsatisfactory, the Engineer may require an approved temperature-recording apparatus for better regulation of the temperature.

907-401.03.2.1.7--Screens. A scalping screen shall be used.

907-401.03.2.1.8--Dust Collector. The plant shall be equipped with a dust collector constructed to waste or return collected material. When collected material is returned, it shall be returned through a controlling device which will provide a uniform flow of material into the aggregate mixture.

907-401.03.2.1.9--Safety Requirements. A platform or other suitable device shall be provided so the Engineer will have access to the truck bodies for sampling and mixture temperature data.

907-401.03.2.1.10--Blank.

907-401.03.2.1.11--Truck Scales. The specifications, tolerances and regulations for commercial weighing and measuring devices as recommended by the National Bureau of Standards [National Institute of Standards and Technology (NIST) Handbook 44] shall govern truck scales used in the State of Mississippi, except weighing devices with a capacity of ten thousand (10,000) pounds or more used to weigh road construction materials (i.e. sand, gravel, asphalt, fill dirt, topsoil and concrete) shall have a tolerance of one-half of one percent (1/2 of 1%) in lieu of the requirements of Handbook 44 and shall be regulated by the Mississippi Department of Transportation.

Scales shall be checked and certified by a scale company certified in heavy truck weights by the Mississippi Department of Agriculture and Commerce. In the case of scales used for measurement of materials on Department of Transportation projects, certification shall be performed in the presence of an authorized representative of the Department or a copy of the certification may be furnished for scales that have been checked and certified within the last six months for use on other Department of Transportation projects and are still in the position where previously tested. Scales that have not been checked and certified under NIST Handbook 44 guidelines, except for the herein modified tolerances allowed, shall be so checked and certified prior to use for measurement of materials on Department of Transportation projects. Tests shall be continued on six month intervals with the test conducted in the presence of an authorized representative of the Department.

Truck scales shall be accurate to one-half of one percent of the applied load, shall be sensitive to 20 pounds, and shall have a graduation of not more than 20 pounds.

The Contractor may use an electronic weighing system approved by the Engineer in lieu of truck scales. The system shall be equipped with an automatic print out system which will print a ticket for each load with the following information:

> MDOT, Contractor's name, project number, county, ticket number, load number, pay item number, item description of the material delivered, date, time of day, haul vehicle number, gross weight, tare weight, net weight and total daily net weight.

When approved by the Engineer and materials are measured directly from a storage bin equipped with load cells, exceptions may be made to the gross and tare weight requirements.

The ticket shall also have a place for recording the temperature of asphalt mixtures, if applicable, and the signatures of MDOT's plant and roadway inspectors. The load numbers for each project shall begin with load number one (1) for the first load of the day and shall be numbered consecutively without a break until the last load of the day. The Contractor shall provide MDOT with an original and one copy of each ticket. When the ticket information provided by the Contractor proves to be unsatisfactory, MDOT will use imprinter(s) and imprinter tickets to

record load information. All recorded weights shall be in pounds and shall be accurate to within one-half of one percent of the true weight, and the system shall be sensitive to 20 pounds. The Engineer will require random loads to be checked on certified platform scales at no cost to the Department.

When an electronic weighing system utilizes the plant scales of a batch plant, the system may be used only in conjunction with a fully automatic batching and control system.

907-401.03.2.2--Additional Requirements for Batching Plants.

907-401.03.2.2.1--Plant Scales. The plant batch scale weight shall not exceed the platform scale weight by more than one percent (1.0%).

907-401.03.2.3--Additional Requirements for Drum Mixing Plants.

907-401.03.2.3.1--Plant Controls. The plant shall be operated with all the automatic controls as designed and provided by the plant manufacturer. If the automatic controls malfunction, brief periods of manual operations to complete the day's work or to protect the work already placed may be conducted with the approval of the Engineer. During manual operation, the Contractor must continue to produce a uniform mixture meeting all contract requirements.

907-401.03.2.3.2--Aggregate Handling and Proportioning. A screening unit shall be placed between the bins and the mixer to remove oversized aggregate, roots, clayballs, etc.

907-401.03.2.4--Surge or Storage Bins. Surge and/or storage systems may be used at the option of the Contractor provided each system is approved by the Department prior to use. Surge bins shall be emptied at the end of each day's operation. Storage silos may be used to store mixtures as follows:

19-mm & 25-mm mixtures ..... 24 hours
9.5-mm & 12.5-mm mixtures ..... 36 hours

The storage silos must be well sealed, completely heated and very well insulated. The mixture when removed from the storage silo shall be tested to ensure that it meets all the same specifications and requirements as the mixture delivered directly to the paving site. See Subsection 907-401.02.5.3, subparagraph (i) for sampling and testing requirements.

907-401.03.3--Hauling Equipment. The inside surfaces of each vehicle bed shall be coated with a light application of water and thin oil, soap solution, lime water solution or other approved material to prevent the mixture from sticking. Diesel fuel or gasoline shall not be used to lubricate vehicle beds. Truck beds shall be raised to drain excessive lubricants before placing mixture in the bed. An excess of lubricant will not be permitted.

907-401.03.4--Bituminous Pavers. The screed or strikeoff assembly shall be capable of vibrating and heating the full width of the mixture being placed and shall lay the lift with an automatic control device to the specified slope and grade without tearing, pulling or gouging the

mixture surface.

907-401.03.5--Rollers. All rollers shall be self-propelled units capable of maintaining a smooth and uniform forward and reverse speed as required for proper compaction. They shall be equipped with adjustable scrapers, water tanks, mats and a device for wetting the wheels or tires to prevent the mixture from sticking. Adhesion of the mixture to the rollers will not be permitted. The use of diesel fuel or gasoline for cleaning roller wheels or tires or to aid in preventing the mixture from sticking to the wheels or tires is prohibited.

All rollers shall be in good mechanical condition, free from leaking fuels and lubricants, loose link motion, faulty steering mechanism, worn king bolts and bearings. They shall be operational at slow speeds to avoid displacement of the mixture and capable of reversing direction smoothly and without backlash.

907-401.03.6--Preparation of Grade. The foundation upon which asphalt pavement is to be placed shall be prepared in accordance with the applicable Section of the Standard Specification.

Unless otherwise directed, tack coat shall be applied to the underlying surface on which the mixture is to be placed. Emulsions, if used, must be allowed to "break" prior to placement of the bituminous mixture.

Bituminous mixture shall not be placed against the edge of pavements, curbs, gutters, manholes and other structures until sprayed with a thin uniform tack coating. The tack coat shall be protected until the mixture has been placed.

Existing asphalt pavements that require preliminary leveling or patching in advance of placing the bituminous mixture shall be sprayed with a tack coat material and then brought as nearly as practicable to uniform grade and cross section. The material shall be placed by hand or machine in one or more compacted layers approximately two (2) inches or less in compacted thickness.

907-401.03.7--Blank.

907-401.03.8--Preparation of Mixture.

907-401.03.8.1--Preparation of Mixture For HMA. The temperature of the mixture, when discharged from the mixer, shall not exceed 340°F.

907-401.03.8.2--Preparation of Mixture For WMA. 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.

907-401.03.9--Material Transfer Equipment. 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 asphalt 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.

907-401.03.10--Spreading and Finishing. Grade control for asphalt pavements shall be established by stringline at least 500 feet ahead of spreading, unless placement is adjacent to curb and gutter, concrete pavement, or other allowed grade control.

The mixture shall be spread to the depth and width that will provide the specified compacted thickness, line, grade and cross section. Placing of the mixture shall be as continuous as possible. On areas where mechanical spreading and finishing is impracticable, the mixture may be spread, raked and luted by hand tools.

Immediately after screeding and prior to compaction, the surface shall be checked by the Contractor and irregularities adjusted. When the edge is feathered as in a wedge lift, it may be sealed by rolling. Irregularities in alignment and grade along the edges shall be corrected before the edges are rolled.

Hauling, spreading and finishing equipment shall be furnished that is capable of and operated in such a manner that the rolling operation will satisfactorily correct any surface blemishes.

The longitudinal joint in the subsequent lift shall offset that in the underlying lift by approximately six (6) inches. However, the joint in the top lift shall be at the centerline or lane line.

907-401.03.11--Compaction. After the mixture has been spread and surface irregularities corrected, it shall be thoroughly and uniformly compacted to the required line, grade, cross section and density.

907-401.03.12--Joints. Joints between previously placed pavement and pavement being placed shall be so formed as to insure thorough and continuous bond.

Transverse construction joints shall be formed by cutting the previously placed mixture to expose the full depth of the lift.

The contact surface of transverse joints and longitudinal joints, except hot joints, shall be sprayed

with a thin uniform tack coating before additional mixture is placed against the previously placed material.

Longitudinal joints shall be formed by overlapping the screed on the previously placed material for a width of at least one (1) inch and depositing the quantity of mixture to form a smooth, tight joint.

Joint Sealant. When a pay item for 907-403-S, Joint Sealant, is included in the contract, the contact surface of transverse joints and longitudinal joints in the surface lift, except hot joints, shall be sealed by spraying a thin, uniform coat of Pavon™, Crafco™ Pavement Joint Adhesive No. 34524, Dura-Fill Cold Joint Adhesive, or approved equal, prior to placement of additional asphalt against the previously placed material. Manufacture's recommendations shall be followed if the material needs to be re-heated, and when placing the thin, uniform coat.

Prior to application of the sealant, the face of the joint shall be thoroughly dry and free from dust or any other material that would prevent proper sealing. All joints shall be swept or blown free of loose material, dirt, vegetation, and other debris by means of compressed air or a power sweeper.

Truck and vehicle traffic shall not drive across a sealed joint until it has dried sufficient to prevent damage from tracking.

The Contractor shall furnish the Engineer three copies of the manufacturer's certification stating that the material used meets the requirement of the specifications.

907-401.03.13--Pavement Samples. The Contractor shall cut samples from each lift of asphalt at the time and locations designated by the Engineer. The samples shall be taken for the full depth of each lift and shall be of a size approved by the Engineer but not to exceed 120 square inches. Tools used for cutting or coring of samples shall be of the revolving blade type such as saw or core drill. Cores shall be taken using a 4.0 to 6.0-inch inside diameter coring bit. The sample hole shall be filled, compacted and finished by the Contractor to conform with the surrounding area. No additional compensation will be allowed for furnishing samples and repairing the areas with new pavement.

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. 907-403-14 **CODE: (SP)**

DATE: 12/02/2014

SUBJECT: Asphalt Pavements

Section 403, Asphalt Pavements, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is deleted and replaced as follows.

SECTION 907-403 - ASPHALT PAVEMENTS

907-403.01--Description. This work consists of constructing one or more lifts of asphalt pavement meeting the requirements of Section 907-401 on a prepared surface in accordance with the requirements of this section and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer. This work shall also include applicable in-grade preparation of the underlying course in accordance with Section 321.

The Contractor must select one of the asphalt mixture processes (HMA or WMA) to be used on this project.

907-403.02--Material Requirements. Materials and their use shall conform to the applicable requirements of Subsection 907-401.02.

907-403.03--Construction Requirements.

907-403.03.1--General. Construction requirements shall be as specified in Subsection 907-401.03, except as otherwise indicated in this section or applicable special provisions.

907-403.03.2--Smoothness Tolerances. Except as noted herein, the finished smoothness of each lift shall conform to the designated grade and cross section within the following tolerances from grade stakes or other grade reference points set at 25-foot intervals:

	Lower* & Leveling Lifts	Lower* Intermediate Lift	Top Intermediate Lift	Surface Lift
Maximum deviation from grade and cross section at any point	1/2"	3/8"	1/4"	1/4"
Maximum deviation from A 10 foot straight edge.....	3/8"	1/4"	1/8"	1/8"

Note: Where more than four (4) lifts of asphalt are required, all lifts, excluding the top three (3) lifts, shall meet the requirements of the lower lift.

* When tested longitudinally from a stringline located equidistant above points 50 feet apart, the distance from the stringline to the surface at any two points located 12½ feet apart shall not vary one from the other more than the maximum deviation allowed above from a 10-foot straight edge.

Grade stakes or other grade reference points set at 25-foot intervals and maximum deviation from grade and cross section will not be required provided an approved profile averaging device is furnished and properly used for the four conditions set forth herein; however, all other surface requirements are applicable.

(a) Overlays with one overall lift.

(b) Overlays with two or more overall lifts -- for each lift above the first overall lift provided each underlying overall lift is within the allowable tolerances.

(c) Surface lift of new construction provided the underlying lift is within the allowable tolerances.

(d) Full-depth asphalt construction for lifts above the lower lift provided the lower lift is within the specified tolerances for the lower intermediate lift.

In the placement of full depth asphalt pavement, where the chemically treated base is constructed, graded and/or trimmed, full lane width, to a surface tolerance of ±3/8 inches from design grade, stringline grade controls may be eliminated for the placement of the asphalt drainage course and all asphalt lifts. In addition, where the base course is crushed stone or crushed concrete and is constructed to a surface tolerance of ±3/8 inches from design grade using a stringline controlled spreader, stringline grade controls may be eliminated for the placement of the asphalt drainage course and all asphalt lifts.

All other tolerances as specified in Section 321 are applicable, except for bases, when tested longitudinally, the maximum deviation when measured at the 12½-foot midpoint shall be ±3/8 inches.

Acceptance and payment of asphalt will be determined on a lot to lot basis by cores taken from the completed pavement as outlined in Subsection 907-403.03.3.

Approved contacting type profile averaging devices are those devices capable of working in conjunction with a taut string or wire set to grade, or ski-type device with extreme contact points with the surface at least 30 feet apart. Approved non-contacting type profile averaging devices are laser type ski devices with at least four referencing mobile stations at a minimum length of 24 feet, or an approved equal.

When approved by the Engineer, a short ski or shoe may be substituted for a long ski on the

second paving operation working in tandem.

During the finishing and compacting of pavement lifts, it shall be the responsibility of the Contractor to check the surface and joints for progress toward conformance to surface requirements set forth herein. Variations from surface requirements exceeding the allowable tolerances shall be corrected at the Contractor's expense.

When a portland cement concrete pavement is to be placed on an asphalt lift, the finished top of the asphalt lift shall meet the requirements of Sections 32l and 50l.

Sections(s) or portions thereof representing areas excluded from a smoothness test with the High Speed Inertial Profiling System (IPS) shall also be excluded from consideration for a contract price adjustment for rideability.

Any contract price adjustment for rideability will be applied on a continuous basis to the pay tonnage, determined in accordance with Subsections 907-401.02.6.8 and 907-403.04, for the section(s) or portions thereof for which an adjustment is warranted.

Contract price adjustments for rideability shall only be applicable to the surface lift and furthermore to only the long continuous section(s) or portions of the long continuous section(s) of the surface lift that require smoothness be determined by using a profiling device.

907-403.03.2.1--Smoothness Tolerances for Mean Roughness Index (MRI). Smoothness tolerances shall be applied to asphalt pavements based on the following pavement categories.

Category A applies to the following pavement constructions:

- New construction
- Construction with three (3) or more lifts
- Mill and two (2) or more lifts

Category B applies to the following pavement constructions:

- Mill and one (1) lift
- Two (2) lift overlays without milling

Category C applies to the following pavement constructions:

- Single lift overlay without milling
- All 57,650-pound routes regardless of the pavement construction

Additional projects may qualify for Category C construction at the department's discretion. Spot Leveling does not count as a lift. Full width / continuous leveling courses that have a minimum thickness of ¾" across the entire lane width will be considered a lift.

Category A projects shall have a long continuous interval (528-foot) surface MRI of not more than 60 inches per mile.

Category B projects shall have a long continuous interval (528-foot) surface MRI of not more than 70 inches per mile.

Category C projects shall have the existing surface profiled at no additional cost to the State. These projects shall be measured by a long fixed interval (528-foot) surface MRI and meet the higher value of the following requirements:

A 50% improvement in MRI from the existing surface
OR
80 inches per mile

In the case that 50% of the existing surface MRI is greater than 80 inches per mile, the short continuous threshold shall be increased from 160 inches per mile by the difference between 50% of the existing surface MRI and 80 inches per mile.

For all projects, areas of the surface lift with localized roughness greater than 160 inches per mile as determined by the continuous short interval (25') report will be identified for correction by the Project Engineer.

When a project has multiple lifts, the lift underlying the surface lift shall have a MRI of no more than 10 inches/mile more than the surface lift threshold for both long and short continuous intervals. Category B projects containing multiple lifts must meet the Category C percent improvement requirement for the underlying lift. Corrective action must be taken on those segments that do not meet this requirement. No unit price adjustment will be applied on any underlying lift.

For Category A and B projects, a unit price increase will be added when the MRI for the final surface lift, prior to any required localized roughness (short interval) corrective action, is less than or equal to fifty inches per mile (50.0 inches / mile) on the long interval report. These Projects will be considered for incentive pay based on the following guidelines for the long interval surface lift MRI.

Mean Roughness Index inches / mile	Contract Price Adjustment Percent of Asphalt Unit Bid Price
Less than 35.0	108
35.1 to 40.0	106
40.1 to 45.0	104
45.1 to 50.0	102
50.1 to Required Surface MRI	100

In addition to the above pay incentive factors, a project may be subject to a disincentive when the Long Continuous Interval MRI for the surface exceeds the allowable tolerance.

Mean Roughness Index (inches / mile)	Contract Price Adjustment Percent of Asphalt Unit Bid Price
Above 20.0 Over	REMOVE AND REPLACE
15.1 to 20.0 Over	80
10.1 to 15.0 Over	85
5.1 to 10.0 Over	90
0.1 to 5.0 Over	95
Required Surface MRI	100

For Category C projects, segments may be subject to a disincentive when the Fixed Interval MRI for the surface does not meet the minimum requirements.

Percent Improvement MRI (inches/mile)	Contract Price Adjustment Percent of Asphalt Unit Bid Price
Below 30 Percent	REMOVE AND REPLACE
30.1 to 35.0 Percent	80
35.1 to 40.0 Percent	85
40.1 to 45.0 Percent	90
45.1 to 50.0 Percent	95
Above 50%	100

Segment(s) or portions thereof representing areas excluded from a smoothness test shall also be excluded from consideration for a contract price adjustment for rideability. Where a segment less than 528 feet occurs at the end of a section, it will be combined with the preceding 528-foot segment for calculation of MRI. Corrective action must be taken on those sections that exceed the 'Remove and Replace' threshold as directed by the Project Engineer. The minimum remove and replace length will be 528 feet (0.1 mile). Additional smoothness testing shall be required on sections following replacement and will be required to meet *at least* the maximum surface MRI short of 'Remove and Replace' tolerance.

The above pay factors will be applied in conjunction with the Long Continuous Histogram Chart from ProVAL's Smoothness Assurance Module. The price adjustments for rideability will be tabulated in MDOT's Pay Incentive spreadsheet on the basis of a theoretical tonnage of 110 lbs/yd^2 * inch thickness (pounds per square yard * inch thickness) determined in accordance with Subsections 907-401.02.6.5 and 907-403.04, for the segment(s) or portions thereof for which an adjustment is warranted.

907-403.03.3--Thickness Requirements. Asphalt overlay lifts shall be constructed as nearly in accordance with the thickness shown on the plans as the underlying pavement and foundation will permit. Periodic and cumulative yield tests will be made to determine practicable conformity to the thickness of each lift. The Engineer may order modifications in placement thicknesses to prevent unwarranted variations in plan quantities.

When the paver is operating off an established grade line, no thickness determination will be

required for the various lifts of pavement. It is understood that the tolerances from design grade will control the thickness requirements.

When grade stakes are eliminated by Notice to Bidders or as outlined in Subsection 907-403.03.2(d) and where resulting in the placement of two (2) or more lifts, acceptance and payment will be determined on a lot to lot basis by cores taken from the completed pavement. Lots will be coincidental with acceptance lots for the surface lift as provided in Subsection 907-401.02.6.4, except that only lots resulting from the placement of mainline surface lift will be used for thickness assessment. One core will be obtained at random from each lot. Irregular areas will not be cored.

When the average thickness of all the cores from the lots representing a day's production, excluding any discarded by the Engineer for justifiable reason, is within three-eighths of an inch (3/8") of the total pavement thickness shown on the plans, excluding lift(s) placed using an established grade line, corrective action will not be required and a price adjustment will not be made for non-conformity to specified thickness.

When the average thickness of all the cores from the lots representing a day's production is deficient in thickness by more than three eights of an inch (3/8") of the total pavement thickness shown on the plans, excluding lift(s) placed using an established grade line, the deficiency shall be corrected by overlaying the entire length of the day's production. The thickness of the overlay shall be equal to the thickness deficiency but no less than the minimum single lift laying thickness for the specified mixture.

When the thickness of all the cores from the lots representing a day's production is more than three eights of an inch (3/8") thicker than the total thickness shown on the plans, excluding lift(s) placed using an established grade line, a price adjustment will be made in accordance with Subsection 907-403.05.1.

The cores shall be cut and removed by the Contractor in the presence of the Engineer's representative and turned over to the Engineer's representative for further handling. The Contractor shall fill each core hole with surface lift mixture and compact to the satisfaction of the Engineer within 24 hours after coring.

907-403.03.4--Lift Corrections. Pavement exceeding the allowable surface tolerances shall be corrected at the Contractor's expense by the following methods:

Lower, Leveling and Lower Intermediate Lifts:

(a) Removal or addition of mixture by skin patching, feather edging, wedge lift construction or full depth patching where appropriate and can be completed in a satisfactory manner.

(b) Superimposing an additional layer which shall be an approved grade raise for the full roadway width and length of the area to be corrected.

Top Intermediate Lift:

(a) Removal and the addition of sufficient mixture to provide the specified thickness. Corrections by this method shall be square or rectangular in shape and shall completely cover the area to be corrected.

(b) Superimposing an additional layer of minimum lift thickness for mixture being used which shall be an approved grade raise for full roadway width of the area to be corrected. Transverse joints shall be perpendicular to the centerline of the pavement.

Surface Lift:

(a) Removal and the addition of sufficient mixture to provide new material of at least minimum single lift laying thickness for full lane width of the area to be corrected. Transverse joints shall be perpendicular to the centerline of the lane.

(b) Superimposing an additional layer (minimum lift thickness for mixture being used) which shall be an approved grade raise for full roadway width of the area to be corrected. Transverse joints shall be perpendicular to the centerline of the pavement.

All mixtures used in the correction of unacceptable pavement shall be approved by the Engineer prior to use.

907-403.03.5--Overlays or Widening and Overlays. In addition to the requirements of Subsections 907-403.03.1 through 907-403.03.4, the following requirements will be applicable when an existing pavement is to be overlaid or widened and overlaid.

907-403.03.5.1--Blank.

907-403.03.5.2--Sequence of Operations. In order to expedite the safe movement of traffic and to protect each phase of the work as it is performed, a firm sequence of operations is essential. Unless otherwise provided in the traffic control plan and/or the contract, the following appropriate items of work shall be begun and continually prosecuted in the order listed:

(a) In sections designated by the Engineer, trim the shoulders along the pavement edges to provide drainage from the pavement.

(b) Perform pre-rolling to locate areas of pavement with excessive movement per Section 511.

(c) Perform selective undercutting and patching as directed per Subsection 907-403.03.5.4.

(d) Perform pressure grouting as specified in Section 512.

(e) Clean and seal joints per Section 413.

(f) Complete preparation on one side of roadway to be widened and place widening

materials.

(g) Reconstruct shoulders to elevation necessary to assure traffic safety.

(h) Open the widened section to traffic.

(i) Complete above work for other side of roadway.

(j) Perform preliminary leveling as directed.

(k) Apply interlayer as specified.

(l) Place the first overall leveling lift.

(m) After the first overall leveling lift, reconstruct shoulders as necessary to eliminate vertical differentials which may be hazardous to traffic.

(n) Place first intermediate lift.

(o) Construct shoulders to the contiguous elevation of the first intermediate lift.

(p) Place remaining intermediate lift, if required.

(q) Place surface lift.

(r) Complete construction of shoulders.

(s) Apply permanent traffic marking.

(t) Final cleanup.

The above operations shall be performed in such a manner that traffic will be maintained on a paved surface at all times. Two-lane, two-way highways should not be restricted to a single lane in excess of a 3,000-foot section.

907-403.03.5.3--Widening of Pavement. The foundation for widening shall be formed by trenching or excavating to the required depth and constructing a smooth, firm and compacted foundation. It shall have sufficient density and stability to withstand the placement and compaction of subsequent lifts. Soft, yielding and other unsuitable material which the Engineer determines will not compact readily shall be removed and backfilled with granular material or asphalt as directed.

Except as provided herein, excavation for widening, undercutting or other required excavation shall be spread along the edge of the shoulders, foreslopes or other adjacent areas as directed and will be an absorbed item. When the quantity is in excess of what may be used satisfactorily on adjacent areas, the Engineer may direct that the material be loaded, hauled and spread uniformly

on other designated areas. In this case, compensation for handling surplus material will be in accordance with the appropriate pay items as provided in the contract or as extra work.

If the plans require widening of the shoulders or embankment with Contractor furnished material, all suitable material obtained from widening excavation may be used and will be measured and paid for as Contractor furnished materials. No measurement for payment of haul will be made.

Removal and disposal of old stakes, forms and other debris encountered in excavating shall be in accordance with Section 201 and shall be considered as incidental to and included in the unit prices bid for other items. No separate measurement will be made therefor. Pavement edges and surfaces shall be cleaned prior to final shaping and compaction of adjacent trenching or undercut areas.

Granular material for widening shall be placed on a previously prepared, smooth, firm and unyielding foundation in accordance with the typical section. Density of the granular material shall be as specified.

Asphalt for widening, including trench widening, shall meet the applicable requirements of Section 907-401, Section 907-403, and shall be placed in one or more layers as shown on the plans or directed. The surface of the mixture shall be finished as a continuation of the adjacent pavement slope.

Trench rollers or other compaction equipment shall be used to compact the foundation, granular material and bituminous mixtures for widening when standard width rolling equipment cannot be used.

907-403.03.5.4--Patching. Existing pavement which has failed or unsatisfactorily stabilized shall be removed as directed. Removal of pavement will be measured and paid for under the appropriate pay items as provided in the contract.

Backfill shall consist of asphalt or a combination of compacted layers of aggregate material and asphalt. Unless otherwise specified, the Engineer will make this determination based on depth and field conditions.

Asphalt used for backfilling will be measured and paid for at the contract unit price for the mixture designated on the plans as the lowest lift. Aggregate will be measured and paid for under the appropriate pay item as provided in the contract or as extra work.

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.

907-403.03.5.6--Placement of Lifts. The leveling lift shall be placed in a layer, or layers, not exceeding approximately two and one-half inches compacted thickness.

When single lane construction is required, placement of a lift on the adjacent lane may be performed by an approved profile averaging device provided the lane previously placed is within the allowable tolerances for all surface requirements. When any of the tolerances are exceeded, the Contractor shall reestablish the control stringline for laying the adjacent lane should the Contractor elect to perform this work prior to correcting the deficiencies of the lane previously placed. In no case shall a "matching shoe" be used to control the grade of an adjacent lane.

In instances where there are only minor deviations from the allowable tolerances in the first overall lift, the Engineer may permit the Contractor to place the next higher lift by graded stringline in lieu of making the corrections.

Single lane placement of leveling, intermediate and surface lifts shall be limited to the distance covered in one and one-half days in advance of that placed in the adjacent lane.

907-403.03.5.7--Protection of Pavement. The pavement shall be protected and properly maintained until it has been compacted and cooled sufficiently for use by traffic.

907-403.04--Method of Measurement. Asphalt pavement, of the type specified, will be measured by the ton. The weight of the composite mixture shall be determined in accordance with the provisions of Subsection 907-401.03.2.1.11.

The pay quantities for each individual job mix formula (JMF) will be calculated using the approved JMF maximum specific gravity (Gmm) and the following formulas.

When the composite mixture has a maximum specific gravity of 2.540 or less,

$$Tp = Tw$$

When the composite mixture has a maximum specific gravity greater than 2.540,

$$Tp = Tw((100-(((Gmm*A*B)-C)/(Gmm*A*B))*100))/100$$

Where:

Tp = Total tonnage for payment
Tw = Total tonnage weighed, used and accepted
Gmm = Maximum Specific Gravity of the approved composite asphalt mixture
A = 46.725 lbs/yd^2/in
B = 0.93 = 93% density
C = 110.374 lbs/yd^2/in = Theoretical density at 2.540 Gmm

Unless shown as a separate pay item, the furnishing and application of the tack coat will not be measured for payment. When payment is provided, tack coat will be measured as set out in Section 407.

Joint sealant will be measured by the linear foot for each joint sealed.

The quantity of bituminous mixture required to correct the work, when made at the expense of the Contractor, will not be measured for payment.

Any trenching required for widening will not be measured for payment, such cost thereof shall be included in other items of work.

Undercut required by the Engineer will be measured for payment under the appropriate excavation item as provided in the contract or as extra work. Pavement removal and any required trenching will not be included in the measurement for undercut.

Class "B" structural concrete base substituted for asphalt under portland cement concrete bridge end pavement, as per Subsection 502.03.1, will be paid for as asphalt calculated as follows:

Square yards of portland cement concrete bridge end pavement x concrete base thickness in inches x 0.055 = tons of asphalt.

907-403.05--Basis of Payment. Subject to the adjustments set out in Subsections 907-401.02.6.3, 907-401.02.6.4, 907-401.02.6.5 & 907-403.03.2, asphalt pavement, measured as prescribed above, will be paid for at the contract unit price per ton for each lift of pavement specified in the bid schedule and shall be full compensation for completing the work.

Joint sealant will be paid for at the contract unit price per linear foot for each joint which shall be full compensation for furnishing the joint sealant material, cleaning the joint, applying the sealant, and for all equipment, tools, labor, and incidentals necessary to complete the work.

907-403.05.1--Price Adjustment for Thickness Requirement. When grade stakes are eliminated as provided in Subsection 907-403.03.3 and the average thickness of all cores from lots representing a day's production is more than three eights of an inch (3/8") thicker than the total specified thickness of the pavement, excluding lift(s) placed using an established grade line, a lump sum reduction in payment for the surface lift of lots representing a day's production will be made as follows:

$$\text{Individual Day's L.S. Reduction} = (\text{Monetary Value of the Day's Surface Lift Production}) \times \frac{(D - 3/8)}{ST}$$

Where:

D = The day's average deviation from total pavement thickness shown on the plans, excluding lift(s) placed using an established grade line.

ST = Specified thickness for surface lift.

The total L.S. reduction for the project is the summation of the individual day's reductions in payment.

907-403.05.2--Pay Items.

Payment will be made under:

907-403-A: (1) , (4) , Asphalt Pavement - per ton

907-403-B: (2) , (4) , Asphalt Pavement, Leveling - per ton

907-403-C: (3) , (4) , Asphalt Pavement, Trench Widening - per ton

907-403-D: (2) , HT, Asphalt Pavement, Polymer Modified - per ton

907-403-E: (2) , HT, Asphalt Pavement, Polymer Modified, Leveling - per ton

907-403-S: Joint Sealant - per linear foot or mile

(1) 4.75-mm mixture, 9.5-mm mixture, 12.5-mm mixture, 19-mm mixture, or 25-mm mixture
(2) 4.75-mm mixture, 9.5-mm mixture, 12.5-mm mixture, or 19-mm mixture
(3) 19-mm mixture or 25-mm mixture
(4) ST, MT or HT

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-407-2 **CODE: (SP)**

DATE: 07/22/2014

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, 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. 907-601-1 **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. 907-618-13 **CODE: (SP)**

DATE: 06/03/2014

SUBJECT: Temporary Construction Signs

Section 618, Maintenance of Traffic and Traffic Control Plan, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-618.03--Construction Requirements.

907-618.03.2--Barricades, Signs, and Flaggers. Delete the second paragraph of Subsection 618.03.2 on page 414, and substitute the following.

Flaggers shall be stationed at such points as may be deemed necessary.

Temporary construction signs shall be removed as their use becomes inapplicable. However, placing temporary signs and their supports flat on the ground outside the shoulder break line will be allowed.

907-618.05--Basis of Payment. Delete the first two pay items listed on page 418, and substitute the following.

907-618-A: Maintenance of Traffic - lump sum

907-618-B: Additional Construction Signs - per square foot

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-626-24 **CODE: (SP)**

DATE: 11/08/2011

SUBJECT: Thermoplastic Blue ADA Markings

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 thermoplastic marking material shall meet the requirements of Subsection 720.02 with the exception that the color shall be blue-ADA. In lieu of the above material requirements, the Contractor may use hot applied thermoplastic materials meeting the satisfaction of the Engineer.

907-626.04--Method of Measurement. After the last paragraph of Subsection 626.04 on page 446, add the following:

For pay items indicated to be 4-inch equivalents, the detail traffic stripe will be measured by the linear foot from end-to-end of individual stripes. Measurements will be made along the surface of each stripe and will exclude skip intervals where skips are specified. Stripes more than four inches in width will be converted to equivalent lengths of four-inch stripe. Legend, which is to include railroad markings, pedestrian crosswalks and stop lines, will be measured by the square foot or linear foot. Pay areas of individual letters and symbols will usually be shown on the plans and measured by the square foot. Transverse railroad bands, pedestrian crosswalks and stop lines will generally be measured by the linear foot, in which case, stripes more than four inches in width will be converted to equivalent lengths of four-inch widths. Cold Plastic Legend, Handicap Symbol of the color specified will be measured per each as determined by actual count in place.

907-626.05--Basis of Payment. Delete the first sentence under Subsection 626.05 on page 446 and substitute the following:

Thermoplastic traffic markings will be paid for at the contract unit price per mile, linear foot, square foot or each, as applicable, which shall be full compensation for completing the work.

Add the following pay items after pay item 626-G on page 446.

907-626-G: Thermoplastic Detail Stripe, Blue-ADA - per linear foot

907-626-H: Thermoplastic Legend, Blue-ADA - per square foot

907-626-H: Thermoplastic Legend, Handicap Symbol, Color - per each

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-626-25 **CODE: (IS)**

DATE: 11/13/2012

SUBJECT: Thermoplastic Traffic Markings

Section 626, Thermoplastic Traffic Markings, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-626.01--Description. After the last sentence of the first paragraph of Subsection 626.01 on page 443, add the following.

All pavement marking material, excluding edge lines over rumble strips, shall be applied using the extrusion/ribbon method. Edge lines placed over rumble strips shall be applied using the atomization/spray method.

907-626.03.1.1--Equipment. After the second paragraph of Subsection 626.03.1.1 on page 444, add the following.

When edge lines are placed over rumble strips, the equipment must be able to apply the marking material using the atomization/spray method instead of extrusion/ribbon method.

907-626.03.1.2--Construction Details. Delete the second sentence of the first full paragraph of Subsection 626.03.1.2 on page 445, and substitute the following.

Unless otherwise specified in the plans or contract documents, the thickness shall be 90 mils for edge lines, center lines, lane lines, barrier lines and detail stripe including gore markings, and 120 mils for crosswalks, stop lines, and railroad, word and symbol markings.

After the last sentence of the third full paragraph of Subsection 626.03.1.2 on page 445, add the following.

When double drop thermoplastic stripe is called for in the contract, additional beads by the drop-on method shall be applied as follows.

Class A glass beads at a rate of not less than three pounds of beads per 100 feet of six-inch stripe.
Class B glass beads at a rate of not less than three pounds of beads per 100 feet of six-inch stripe.

The Class B glass beads shall be applied to the newly placed stripe first, followed by the application of the Class A glass beads.

907-626.05--Basis of Payment. Delete the pay items listed on page 446 and substitute the following.

907-626-A: 6" Thermoplastic* Traffic Stripe, Skip White - per linear foot or mile

907-626-B: 6" Thermoplastic* Traffic Stripe, Continuous White - per linear foot or mile

907-626-C: 6" Thermoplastic* Edge Stripe, Continuous White - per linear foot or mile

907-626-D: 6" Thermoplastic* Traffic Stripe, Skip Yellow - per linear foot or mile

907-626-E: 6" Thermoplastic* Traffic Stripe, Continuous Yellow - per linear foot or mile

907-626-F: 6" Thermoplastic* Edge Stripe, Continuous Yellow - per linear foot or mile

907-626-G: Thermoplastic* Detail Stripe, Color - per linear foot

907-626-H: Thermoplastic* Legend, White - per linear foot or square foot

* Indicate Double Drop if applicable

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-699-5 **CODE: (SP)**

DATE: 12/17/2013

SUBJECT: Construction Stakes

Section 699, Construction Stakes, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby deleted and replaced as follows.

SECTION 907-699 - CONSTRUCTION STAKES

907-699.01--Description. This work consists of performing all calculations and other work necessary to establish and/or verify all horizontal and vertical control data; and furnishing, placing and maintaining roadway construction stakes or bridge construction stakes, or both, necessary for the proper prosecution of all features and items of the work under contract. This shall include, but not be limited to, grades and drainage structure locations, lengths, elevations and skews. When the contract includes a pay item for roadway construction stakes as provided herein, any references in other sections of the Standard Specifications to establishment of control points or construction staking "by the Department" shall be construed to mean "by the Contractor".

This work may be performed utilizing Automated Machine Guidance technologies and systems in accordance with the standard specifications and contract documents. Automated Machine Guidance (AMG) is defined as the utilization of positioning technologies such as Global Positioning Systems (GPS), Robotic Total Stations, lasers, and sonic systems to automatically guide and adjust construction equipment according to the intended design requirements. Global Positioning Systems (GPS) shall NOT be used for determining any points above the subgrade line. The Contractor may use any type of AMG system(s) that result in compliance with the contract documents and applicable Standard Specifications.

Automated Machine Guidance (AMG) is not a mandatory requirement. Automated Machine Guidance (AMG), conventional staking, or a combination of both may be used at the Contractor's option for staking on this project.

907-699.02--Materials. The Contractor shall furnish all personnel, materials, equipment and devices necessary for determining, establishing, setting, checking and maintaining points, lines, grades and layout of the work. All surveying equipment shall be properly adjusted and suited for performing the work required. Traffic control necessary for the proper execution of the work shall be furnished by the Contractor without separate measurement for payment. Stakes shall be of sufficient length, thickness and quality to serve the purpose for which they are being used.

All equipment required to accomplish automated machine guidance shall be provided by the Contractor. The Contractor may use any type of AMG equipment that achieves compliance with the contract documents and applicable Standard Specifications.

The Contractor shall provide the Department with an acceptable portable grade-verification device (Rover) to be used by the Department during the duration of the contract. On large projects with high production rates, the Contractor may have to provide more than one device. At the end of the contract, the device will be returned to the Contractor. This device shall have the same capabilities as the unit used by the Contractor.

907-699.03--Construction Requirements.

907-699.03.1--General. The Department will establish, one time only, secondary control points with elevations at distances not to exceed 1500 feet or that minimum distance necessary to maintain inter-visibility. For bridge work, the Engineer's field control will consist of a stationed baseline reference point near each end of the bridge(s) and one accessible bench mark near each bridge site. For the purpose of determining responsibility for construction stakes, lines and grades, a box bridge will not be considered as a bridge. The Contractor shall verify the accuracy of the control points before proceeding with the layout for construction.

When errors are discovered and control points do not agree with the plans, the Contractor shall promptly notify the Engineer in writing, and explain the problem in detail. The Engineer will advise the Contractor within five (5) working days of any corrective actions which may be deemed necessary.

The Contractor will be responsible for verifying and modifying, as necessary to best fit existing field conditions, lengths, locations, elevations and skew angles of all drainage structures shown on the construction plans. All junction box and inlet locations and heights shall also be verified and modified as necessary to fit existing field conditions. Modifications to the plans shall not be made without the consent of the Project Engineer. The Contractor will not be responsible for determining the size of drainage structures, but should immediately report any suspected error to the Engineer. Heights of fill over drainage structures shall be checked to verify class of pipe, bedding and the appropriate standard and/or modified standard drawing(s) required in the construction with any differences from the plans being reported to the Engineer.

The Contractor shall perform work necessary to verify alignment and plan grades on all roadway intersections and tie-ins. Any discrepancies in grades, alignment, location and or dimension detected by the Contractor shall immediately be brought to the attention of the Project Engineer.

The Contractor shall employ sufficient qualified personnel experienced in highway surveying and layout to complete the work accurately. The Contractor shall also determine and provide all additional grade controls and staking operations necessary to secure a correct layout and construction of the work. All minor variations in layout and grades required to meet field conditions shall be resolved with the Engineer and shall not be considered justification for adjusting contract price or time.

Examples of minor variations in layout and grades are:

(a) Adjustment of drainage or other structure length, alignment, and flow line elevation.

(b) The adjustment of grades and alignment at roadway intersections, cross-overs, railroad crossings, interchanges, existing bridges and roadways.

(c) Adjustment of curve data.

The Contractor will be responsible for calculating and laying out all additional lines, grades, elevations and dimensions necessary to construct the work required in the plans. All grades and other layout data computed by the Contractor shall be recorded and a copy of this data shall be furnished, with sufficient time for checking, to the Engineer before field work is started. The originals of all data shall be furnished to the Engineer on or before final inspection for the Department's permanent file. The Contractor shall also furnish personnel to assist the Engineer in taking tolerance verification checks or other notes to determine whether specified tolerances are met. Any inspection or checking of the Contractor's layout by the Engineer and the approval of all or any part of it will not relieve the Contractor of the responsibility to secure proper dimensions, grades, and elevations of the several parts of the work.

Prior to beginning construction on any structure which is referenced to an existing structure or topographical feature, the Contractor shall check the pertinent location and grades of the existing structures or topographical features to determine whether the location and grade shown on the plans are correct.

The Contractor shall stake centerline control at each station, BOP, EOP, PC, PT, SC, CS, TS, ST, and equations just before field cross sectioning by the Department for both original and final cross sections.

The Contractor shall furnish "as built" finish centerline elevations to the Project Engineer prior to final inspection of the project.

The Contractor shall set stakes and/or flags on the right-of-way line at each station and right-of-way break or as directed by the Engineer before clearing operations are started on any section of roadway.

Regardless of the method used, the Contractor shall meet the surface tolerances addressed in Section 321.

The Contractor shall exercise care in the preservation of stakes and bench marks and shall reset them when they are damaged, lost, displaced or removed. The Contractor shall use competent personnel and suitable equipment for the layout work required and shall provide that it be performed under the supervision of, or directed by, a Registered Professional Engineer or Registered Land Surveyor who is duly registered and entitled to practice as a Professional Engineer or Professional Land Surveyor in the State of Mississippi. The duties performed by said Registrant shall conform to the definitions under the "practice of engineering" and practice of "land surveying" in Mississippi Law and the latest edition of the MDOT Survey Manual. The MDOT Survey Manual can be obtained online at the following address.

http://sp.mdot.ms.gov/RoadwayDesign/Pages/MDOT-Survey-Manual.aspx

The Contractor shall not engage the services of any person in the employ of the Department for the performance of any of the work covered by this Section or any person who has been employed by the Department within the past six months except those who have legitimately retired from service with the Department during this period.

All cross sections, measurements, and tickets required for determining pay quantities will be the responsibility of the Department.

The Department reserves the right to check for accuracy any or all of the Contractor's layout work and shall be assisted by the Contractor's personnel in such checking. When errors or discrepancies are found, the Contractor will take measures necessary to correct, at no expense to the State, any construction that has been performed using the improper layout. Any inspection, checking and approval thereof by the Engineer of work for which the Contractor is responsible will not relieve the Contractor of responsibility to secure correct dimensions, grades, elevations, alignments and locations of the work for satisfactory completion of the project and as a condition for final acceptance by the Department.

907-699.03.2--Conventional Staking. In addition to the requirements set forth in Subsection 907-699.03.1, the following shall be required when using the conventional staking method.

On grading projects, the Contractor shall set slope stakes at each station and at the beginning and end of spirals and curves. Closer intervals will be required for sharp changes in grades or alignment, widening and certain other geometric details.

The Contractor shall set subgrade blue tops on centerline, break points and at the left and right subgrade shoulder lines at intervals of not more than 100 feet on tangents and intervals of not more than 50 feet in curves. Closer intervals will be required for sharp changes in grades or alignment, widening, or super elevation.

The Contractor shall furnish personnel to assist the Engineer in taking stringline and other notes to determine whether specified tolerances are met.

On paving contracts, the Contractor shall set subgrade, base and paving blue tops. The base and pavement grade stakes shall be set on intervals in accordance with the applicable requirements of Sections 321, 403 and 501.

907-699.03.3--Automated Machine Guidance. In addition to the requirements set forth in Subsection 907-699.03.1, the following shall be required when using the automated machine grading method.

907-699.03.3.1--Automated Machine Guidance Work Plan. The Contractor shall submit a comprehensive written Automated Machine Guidance Work Plan to the Engineer for review at least 30 days prior to use. The Project Engineer will have to concur with the Plan prior to the Contractor performing any AMG work. The submittal of an AMG Work Plan shall be an indication of the Contractor's intention to utilize AMG instead of conventional methods on the

project areas and elements stated in the Work Plan. The Engineer shall review the Automated Machine Guidance Work Plan to ensure that the requirements of this special provision are addressed. The Contractor shall assume total responsibility for the performance of the system utilized in the Work Plan. Any update or alteration of the Automated Machine Guidance Work Plan in the course of the work shall be approved and submitted to MDOT for determination of conformance with requirements of this special provision.

The Automated Machine Guidance Work Plan shall describe how the automated machine guidance technology will be integrated into other technologies employed on the project. This shall include, but not limited to, the following:

1. A description of the manufacturer, model, and software version of the AMG equipment.
2. Information on the Contractor's experience in the use of Automated Machine Guidance system (or Related Technologies) to be used on the project, including formal training and field experience of project staff.
3. A single onsite staff person as the primary contact, and up to one alternate contact person for Automated Machine Guidance technology issues.
4. A definition of the project boundaries and scope of work to be accomplished with the AMG system.
5. A description of how the project proposed secondary control(s) is to be established. It shall also include a list and map detailing control points enveloping the site.
6. A description of site calibration procedures including, but not limited to, equipment calibration and the frequency of calibration as well as how the equipment calibration and information will be documented to MDOT and the Project Engineer. The documentation shall contain a complete record of when and where the tests were performed and the status of each equipment item tested within or out of the ranges of required tolerances.
7. A description of the Contractor's quality control procedures for checking mechanical calibration and maintenance of equipment. It shall also include the frequency and type of checks to be performed.
8. A description of the method and frequency of field verification checks and the submission schedule of results to the Project Engineer.
9. A description of the Contractor's contingency plan in the event of failure/outage of the AMG system.
10. A schedule of Digital Terrain Models (DTM) intended for use on the project. This shall be submitted to the Engineer for review, feedback, and communication.

907-699.03.3.2--State's Responsibilities. The District Surveyor will set the primary horizontal and vertical control points in the field for the project as per latest edition of the MDOT Survey Manual. The control points shall be in Mississippi State Plane coordinate system.

MDOT will provide an electronic alignment file and primary control file for the project. This file will be based on the appropriate Mississippi State Plane Coordinate Zone either West or East. These files will be created with the computer software applications MicroStation (CADD software) and GEOPAK (civil engineering software). The data files will be provided in the native formats. The Contractor shall perform necessary conversion of the files for their selected grade control equipment, field verify the data for accuracy, and immediately report any errors to

MDOT.

MDOT will provide design data, if available, in an electronic format to the Contractor. These files will be created with the computer software applications MicroStation (CADD software) and GEOPAK (civil engineering software). The data files will be provided in the native formats as specified in the Data Format section of this specification. No guarantee is made to the data accuracy or completeness, or that the data systems used by MDOT will be directly compatible with the systems used by the Contractor. Information shown on the paper plans marked with the seal (official plans as advertised) shall govern.

The Engineer will perform spot checks as necessary of the Contractor's machine control grading results, surveying calculations, records, field procedures, and actual staking. If the Engineer determines that the work is not being performed in accordance with the Specifications, the Engineer shall order the Contractor to re-construct the work to the requirements of the contract documents at no additional cost to the Department.

907-699.03.3.3--Contractor's Responsibilities. The Contractor shall provide formal training, as requested, on the use of the Automated Machine Guidance Equipment, including Rover, and the Contractor's systems to MDOT project personnel prior to the start of construction activities utilizing AMG. This training is for providing MDOT project personnel with an understanding of the equipment, software, and electronic data being used by the Contractor.

The Contractor shall use the alignment and control data provided by MDOT.

The Contractor shall bear all costs, including but not limited to the cost of actual reconstruction work that may be incurred due to errors in application of Automated Machine Guidance techniques or manipulation of MDOT design data in Digital Terrain Models (DTM). The Contractor shall also bear all costs associated with any graphical grading outside the model / typical section, such as tying to existing grades at the beginning or end of a project.

The Contractor shall be responsible for converting the information on the plans and/or electronic data file provided by MDOT into a format compatible with the Contractor's AMG system.

The Contractor shall establish secondary control points at locations along the length of the project and outside the project limits and/or where work is performed beyond the project limits as required by the Automated Machine Guidance system utilized. The Contractor shall establish this secondary control using survey procedures as outlined in the latest edition of the MDOT Survey Manual. A copy of all new control point information shall be provided to the Engineer prior to construction activities. The Contractor shall be responsible for all errors resulting from their efforts and shall correct deficiencies to the satisfaction of the Engineer and at no additional cost to the State.

The Contractor shall preserve all reference points and monuments that are established by the District Surveyor outside the construction limits. If the Contractor fails to preserve these items, they shall be re-established by the Contractor to their original quality at no additional cost to the State.

The Contractor shall set grade stakes at the top of the finished sub-grade and base course at all hinge points on the typical sections at 1000-foot maximum intervals on mainline, critical points such as, but not limited to, PC's, PT's, beginning and ending super elevation transition sections, middle of the curve, and at least two locations on each of the side roads and ramps, and at the beginning and end of each cross slope transition where Automated Machine Guidance is used. These grade stakes shall be established using conventional survey methods for use by the Engineer to check the accuracy of the construction.

On grading projects, the Contractor shall set slope stakes and centerline stationing every 500 feet and at the beginning and end of spirals and curves. Closer intervals will be required for sharp changes in grades or alignment, widening and certain other geometric details.

The staking requirements for pavement grade stakes addressed in Sections 403 and 501will not apply. The Contractor shall furnish an acceptable portable grade-verification device(s) (Rover) to verify grade tolerances.

The Contractor will be required to set 20 grade points (hubs) per mile at locations determined by the Engineer for field verification. If tolerances are not met, additional grade points may be required by the Engineer.

The Contractor shall furnish personnel to assist the Engineer in taking tolerance verification checks as necessary to determine whether specified tolerances are met.

The Contractor shall meet the same accuracy requirements as detailed in the Mississippi Standard Specifications for Road and Bridge Construction.

The Contractor shall be responsible for implementing the AMG system using the Mississippi State Plane Coordinate System. No localization methods will be accepted.

907-699.03.3.4--Data Format. It is the Contractor's responsibility to produce the Digital Terrain Model(s) and/or 3D line work needed for Automated Machine Guidance. MDOT does not produce this data in its design process. MDOT does provide CADD files created in the design process to the Contractor. The CADD files provided by MDOT are provided in the native software application formats in which they are created with no conversions, and their use in developing 3D data for machine guidance is at the discretion of the Contractor. The CADD files that may be available are listed below. Cross-Sections are one of the items provided but are not necessarily created at critical design locations. Therefore their use in Digital Terrain Models (DTM) for AMG is limited.

1. Project Control - Microstation DGN file and ASCII file
2. Existing Topographic Data - Microstation DGN file(s)
3. Preliminary Surveyed Ground Surface - GeoPak TIN, if available
4. Horizontal and Vertical alignment information - GeoPak GPK file and/or Microstation DGN file(s)
5. 2D Design line work (edge of pavement, shoulder, etc.) - Microstation DGN file(s)

6. Cross sections - Microstation DGN file(s), GeoPak format
7. Superelevation - Microstation DGN file(s), GeoPak format
8. Form Grades - Microstation DGN file(s)
9. Design Drainage - Microstation DGN file(s)

It is expressly understood and agreed that MDOT assumes no responsibility in respect to the sufficiency or accuracy of these CADD files. These files are provided for convenience only and the contract plans are the legal document for constructing the project.

907-699.04--Method of Measurement. Construction stakes will be measured as a lump sum quantity. When Pay Item No. 907-699-A, Roadway Construction Stakes, is provided in the contract, measurement shall include the staking of all bridges, including detour bridges, which are a part of the contract.

907-699.04.1--Roadway Construction Stakes. Roadway Construction Stakes will be measured for payment in accordance with the following schedule:

(a) When one percent of the original contract amount is earned from all direct pay items, 10 percent of the amount bid for Roadway Construction Stakes will be paid.
(b) When five percent of the original contract amount is earned from all direct pay items, 25 percent of the amount bid for Roadway Construction Stakes will be paid.
(c) When 20 percent of the original contract amount is earned from all direct pay items, 50 percent of the amount bid for Roadway Construction Stakes will be paid.
(d) After the Contractor has earned 50 percent of the original value of all direct pay items, the amount paid will be based on the contract percent complete.

907-699.04.2--Bridge Construction Stakes. Bridge Construction Stakes will be measured for payment in accordance with the following schedule:

(a) When one percent of the original contract value of all bridge items is earned, 10 percent of the amount bid for Bridge Construction Stakes will be paid.
(b) When five percent of the original contract value of all bridge items is earned, 25 percent of the amount bid for Bridge Construction Stakes will be paid.
(c) When 20 percent of the original contract value of all bridge items is earned, 50 percent of the amount bid for Bridge Construction Stakes will be paid.
(d) After the Contractor has earned 50 percent of original contract value of all bridge items, the amount paid will be based on the percentage of work completed on all bridge items.

907-699.05--Basis of Payment. Construction stakes, measured as prescribed above, will be paid for at the contract lump sum price, which shall be full compensation for completing the work.

Payment will be made under:

907-699-A: Roadway Construction Stakes - lump sum

907-699-B: Bridge Construction Stakes - lump sum

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-701-5

DATE: 09/17/2014

SUBJECT: Hydraulic Cement

In the last paragraph of Subsection 907-701.04.1.1 on page 3, change “AASHTO Designation: M 240, Table 3” to “AASHTO Designation: M 240, Table 4”.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-701-5 **CODE: (SP)**

DATE: 08/20/2014

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. 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 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.

**** 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. 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 IS – Portland blast-furnace slag cement
Type IP – Portland-pozzolan cement
Type IL – Portland-limestone cement

Blended cement Types IS and IP 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 3 and the "(MS)" suffix shall be added to the type designation.

907-701.04.1.2--Alkali Content. All blended cement shall be made with clinker that would result in cement meeting the requirements of Subsection 907-701.02.1.2 when used in the production of AASHTO Designation: M 85, Type I or Type II cement.

907-701.04.2--Replacement by Other Cementitious Materials. The maximum replacement of blended cement Type IL by weight is 35% for fly ash or 50% for GGBFS. Replacement contents below 20% fly ash or 45% 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 blended cement by fly ash or GGBFS. 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 Types IS and IP.

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 3.

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. 907-702-5 **CODE: (SP)**

DATE: **08/12/2014**

SUBJECT: **Specifications for Bituminous Materials**

Section 702, Bituminous Materials, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-702.05--Petroleum Asphalt Cement. Delete the third paragraph of Subsection 702.05 on page 598, and substitute the following.

The bituminous material used in all types of asphalt mixtures shall conform to AASHTO Designation: M 320, Performance Grade PG 67-22, as modified in the table below, except that Polyphosphoric Acid (PPA) may be used at low dosage rates as a modifier to enhance the physical properties of a base binder to meet the requirements for Performance Grade PG 67-22. In addition, PPA may be used as a catalyst or mixing agent at low dosage rates in the production of Polymer Modified, Performance Grade PG 76-22.

When PPA is used as a modifier, in no case shall the PPA modifier be used to adjust the physical properties of the binder a full binder grade. For example: the base binder (unmodified) is graded as a PG 64-22 and should only be modified by the addition of PPA to a modified binder grade of PG 67-22.

When petroleum asphalt cement is modified by PPA, the following dosage limits shall be applied.

Grade	Dosage Limit
PG 67-22	0.75% by weight of binder
PG 76-22	0.50% by weight of binder

907-702.07--Emulsified Asphalt.

907-702.07.2--Anionic and Cationic. After the last paragraph of Subsection 702.07.2 on page 600, add the following.

LockDown (LD-7) and CQS-1h shall conform to the requirements of Table V.

907-702.07.3--Polymer Modified Cationic Emulsified Asphalt (CRS-2P). Delete the paragraph in Subsection 702.07.3 on page 600, and substitute the following.

Polymer Modified Cationic Emulsified Asphalt shall conform to the requirements of AASHTO Designation: M 316, with the following exception:

In Table 1, the Ductility, 25˚C, 5 cm/min, shall be a minimum of 100 cm.

907-702.12--Tables. After the last Table of Subsection 702.12 on page 606, add the following.

TABLE V
SPECIFICATION FOR FOG SEAL

	LD-7		CQS-1h		
Test Requirements	**Min.**	**Max.**	**Min.**	**Max.**	**Test Method**
Viscosity, Saybolt Furol, @ 25°C, Sec.	15	100	20	150	AASHTO T 72
Storage Stability Test, 24 hr, %	-	1	-	1	AASHTO T 59
Settlement, 5 day, %	-	5	-	-	AASHTO T 59
Particle Charge	-	-	Positive		AASHTO T 59
Oil Distillate, %	-	1	-	-	AASHTO T 59
Sieve Test, % *	-	0.3	-	0.1	AASHTO T 59
Residue by Distillation, %	40	-	60	-	AASHTO T 59
Test on Residue from Distilation					
Penetration @ 25°C	-	20	-	-	AASHTO T 49
Penetration @ 25°C, 100g, 5s	-	-	60	110	AASHTO T 49
Softening Point, °C	65	-	-	-	ASTM 36
Solubility in trichloroethylene, %	97.5	-	97.5	-	AASHTO T 44
Ductility @ 25°C, cm	-	-	40	-	AASHTO T 51
Original DSR @ 82° (G*/Sinδ, 10 rad/sec)	1	-	-	-	AASHTO T 111

* The Sieve result is tested for reporting purpose only, and it may be waived if no application problems are present in the field.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-703-12

DATE: 01/29/2015

SUBJECT: Aggregates

In the title of Subsection 907-703.06 on page 2, delete “Hot Mix”.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-703-12 **CODE: (IS)**

DATE: 10/28/2014

SUBJECT: Aggregates

Section 703, Aggregates, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-703.03.2.4--Gradation. Delete the table in Subsection 703.03.2.4 on page 611 and substitute the following.

Table of Sizes and Gradation of Coarse Aggregate for Portland Cement Concrete

Square Mesh Sieves	Percent Passing by Weight						
	Size No. 467	Size No. 57	Size No. 67	Size No. 7	Size No. 78	Size No. 8	Size No. 89
2 inch	100						
l½ inch	95-100	100					
1 inch		80-100	100				
3/4 inch	35-70		80-100	100	100	100	
1/2 inch		25-60		90-100	90-100	95 100	100
3/8 inch	10-30		20-55	40-70	40-75	75-100	85 100
No. 4	0-5	0-10	0-10	0-15	5-25	5-30	20-40
No. 8		0-5	0-5	0-5	0-10	0-10	0-10
No. 16					0-5	0-5	0-5

Delete the last sentence of the last paragraph of Subsection 703.03.2.4 on page 611.

907-703.04--Aggregate for Crushed Stone Courses.

907-703.04.1--Coarse Aggregate. Delete the first paragraph of Subsection 703.04.1 on page 611, and substitute the following.

Coarse aggregate, defined as material retained on No. 8 sieve, shall be either crushed limestone, steel slag, granite, concrete, or combination thereof. Crushed concrete is defined as recycled concrete pavement, structural concrete, or other concrete sources that can be crushed to meet the gradation requirements for Size No. 825B as modified below. In no case shall waste from concrete production (wash-out) be used as a crushed stone base.

907-703.04.2--Fine Aggregate. Delete the first sentence of the first paragraph of Subsection 703.04.2 on page 612, and substitute the following.

Fine aggregate, defined as material passing the No. 8 sieve, shall be material resulting from the crushing of limestone, steel slag, granite, concrete, or combination thereof.

Delete the third paragraph of Subsection 703.04.2 on page 612.

907-703.04.3--Gradation. In the table of Subsection 703.04.3 on page 613, change the requirement for the 1-inch sieve under Size No. 825 B from "75 - 98" to "75 - 100".

After the table in Subsection 703.04.3 on page 613, add the following.

If crushed concrete is used, the crushed material shall meet the gradation requirements of Size No. 825 B with the exception that the percent passing by weight of the No. 200 sieve shall be 2 – 18.

907-703.06--Aggregates for Hot Mix Asphalt.

907-703.06.1--Coarse Aggregates. Delete the third paragraph of Subsection 703.06.1 on page 613, and substitute the following.

When tested in accordance with AASHTO Designation: T 19, the dry rodded unit weight of all aggregates except expanded clay and shale shall not be less than 70 pounds per cubic foot.

907-703.06.1.2--Fine Aggregates. Delete the last sentence of Subsection 703.06.1.2 on page 614.

907-703.14--Aggregates for Bituminous Surface Treatments.

907-703.14.2--Detail Requirements.

907-703.14.2.1--Gradation. In the table entitled "Gradation Requirements For Cover Aggregate" in Subsection 703.14.2.1 on page 622, delete the requirement for the No. 16 sieve for Size No. 7 under the column "Slag or Expanded Clay".

Delete Subsection 703.19 on page 624, and substitute the following.

907-703.19--Lightweight Aggregate for Concrete.

907-703.19.1--Lightweight Aggregate for Structural Concrete. Lightweight aggregate for structural concrete shall meet the requirements of AASHTO Designation: M 195.

907-703.19.2--Lightweight Aggregate for Internal Curing of Concrete. Lightweight aggregate for internal curing of concrete shall meet the requirements of ASTM Designation: C 1761. The lightweight aggregate shall meet the gradation requirements listed in Table 1 for either "9.5 mm to 2.36 mm (3/8 in. to No. 8)" Coarse aggregate, "9.5 mm to 0 (3/8 in. to 0)" Combined fine and coarse aggregate, or "4.75 mm to 0 (No. 4 to 0)" Fine aggregate. The fineness modulus of the lightweight aggregate shall not be less than 2.70.

907-703.20--Aggregate for Stabilizer.

907-703.20.3--Gradation. Delete the table and notes in Subsection 703.20.3 at the top of page 626, and substitute the following.

PERCENT PASSING BY WEIGHT

Square Mesh Sieves	Shell	Coarse			Medium	Fine
		Size I	Size II Note (1)	Size III Note (3)		
3 inch				100		
2 1/2 inch	90-100			90-100		
2 inch		100				
1 1/2 inch		90-100	100	25-60		
1 inch		80-100	97-100			
3/4 inch		55-100	55-100	0-10		
1/2 inch		35-85	35-85	0-5	100	
3/8 inch		12-65	12-65		97-100	
No. 4, Note (2)		0-30	0-30		92-100	
No. 10		0-8	0-8		80-100	100
No. 40					10-40	80-100
No. 60					0-20	30-100
No. 100						15-80
No. 200	0-5	0-4	0-4		0-5	0-30
PI Material Passing No. 40					6 or less	0

Note (1): Size II is intended for use in bases in which portland cement is used.
Note (2): Ground shell shall contain at least 97% passing the No. 4 sieve.
Note (3): Size III is intended for use in stabilized construction entrances.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-708-6 **CODE: (IS)**

DATE: 05/01/2013

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%".

907-708.02.1.4--Coarse Aggregate. Delete the last sentence of Subsection 708.02.1.4 on page 639.

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 ($\leq$ 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. 907-713-6 **CODE: (SP)**

DATE: 03/17/2016

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 responsibility of the Contractor 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. Admixtures providing a specific performance characteristic(s) other than those of water reduction or set retardation shall meet the minimum requirements for Type S. For admixtures meeting the requirements for Type S, the manufacturer shall provide data to substantiate the specific performance characteristic(s) to the satisfaction of the State Materials Engineer.

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 approved and 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.

907-713.02.4--Waterproofing Admixture. This product is used as a waterproofing admixture for cast in place concrete bridge decks and bridge deck topping.

The Contractor shall submit manufacturer's product data and installation methods for each type of the products required to demonstrate the product complies with specifications.

The materials shall be installed in accordance with manufacturer's instructions.

The waterproofing admixture shall be one of the following, or an approved equal.

- Xypex Admix
- Everdure Caltite
- Hycrete W1000

The dosage rate for the above admixtures shall be as follows:

- Xypex Admix shall be 15 pounds per cubic yard.
- Everdure Caltite shall be a minimum of 1.5% by weight of cement.
- Hycrete W1000 shall be a minimum one (1) gallon per cubic yard.

Any retardation of set that occurs will depend upon the concrete mix design and the dosage rate of the admixture.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-714-8 **CODE: (IS)**

DATE: 05/01/2013

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 8.0%.

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. 907-715-4 **CODE: (IS)**

DATE: 05/01/2013

SUBJECT: Roadside Development Materials

Section 715, Roadside Development Materials, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-715-02.2.1--Agricultural Limestone. Delete the first sentence of Subsection 715-02.2.1 on page 704 and substitute the following.

Agricultural limestone shall be either a hard-rock limestone material or a marl or chalk agricultural liming material as addressed in the latest amendment to the Mississippi Agricultural Liming Material Act of 1993, published by the Mississippi Department of Agriculture and Commerce.

907-715.02.2.1.1--Screening Requirements. Delete the first sentence of Subsection 715.02.2.1.1 on page 704.

Delete Subsection 715.02.2.1.2 on page 704 and substitute the following.

907-715-02.2.1.2--Calcium Carbonate Equivalent. Marl or chalk liming material shall not have less than 70% calcium and magnesium carbonate calculated as calcium carbonate equivalent when expressed on a dry weight basis.

907-715-02.2.1.3--Neutralizing Values. Hard-rock limestone material shall have a minimum Relative Neutralizing Value (RNV) of 63.0%, which is determined as follows.

% RNV = CCE x (% passing #10 mesh + % passing #50 mesh)/2

Where: CCE = Calcium Carbonate Equivalent

907-715.03--Seed.

907-715.03.2--Germination and Purity Requirements. Add the following to Table B on page 705.

Name (Kind)	Name (Variety)	Percent Germination	Percent Purity
GRASSES			
Rye Grass	Annual	80	98
Wheat	-	80	98

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-720-2 **CODE: (IS)**

DATE: 05/01/2013

SUBJECT: Pavement Marking Materials

Section 720, Pavement Marking Materials, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-720.01--Glass Beads. After the first sentence of Subsection 720.01 on page 729, add the following.

The glass beads shall contain no more than 200 ppm (mg/kg) total concentration for lead, arsenic, or antimony. The manufacture shall furnish the Engineer with a certified test report indicating that the glass beads meet the above requirement.

907-720.02--Thermoplastic Pavement Markings. Delete the first paragraph of Subsection 720.02 on page 730 and substitute the following.

The thermoplastic material shall be lead free and conform to AASHTO Designation: M 249 except the glass beads shall be moisture resistant coated.

After the first sentence of the second paragraph of Subsection 720.02 on page 730, add the following.

In addition, the certification for the thermoplastic material shall state that the material is lead free.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-804-19

DATE: 03/22/2016

SUBJECT: Concrete Bridges and Structures

Delete the second and third paragraphs of Subsection 907.804.03.16.2 on page 37, and substitute the following.

For bridge decks when the ambient temperature is above 90°F, the forms, reinforcing steel, steel beam flanges, and other surfaces which will come in contact with the concrete shall be cooled to below 90°F by means of a water spray or other approved methods. Additionally, when the atmospheric temperature is predicted to be 90°F or above based on the latest information available from the National Weather Service any time during the day of placement or day after placement, the time of placement shall not begin until 5:00 p.m. on the day of placement and shall be completed by 6:00 a.m. the following day.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-804-19 **CODE: (SP)**

DATE: 11/10/2015

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 deleted and replaced as follows.

SECTION 907-804--CONCRETE BRIDGES AND STRUCTURES

907-804.01--Description. This work consists of constructing concrete bridges and structures in accordance with these specifications and in reasonably close conformity with the dimensions, designs, lines, and grades indicated on the plans or established.

Construction of box bridges shall be in accordance with Sections 601 and 602.

907-804.02--Materials.

907-804.02.1--General. Concrete produced and controlled from this specification shall be accepted upon proper certification of concrete production through an approved quality control program and verification by job site acceptance criteria. The Contractor shall develop and implement a quality control program which shall be used to maintain the required properties of concrete. 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. For projects less than or equal to 200 cubic yards, refer to the requirements of TMD-20-05-00-000 "Sampling and Testing of Small Quantities of Miscellaneous Materials" for mixture design and testing requirements.

The materials for concrete bridges and structures, when sampled and tested in accordance with Subsection 700.03, shall meet the requirements of the following Subsections:

Portland Cement	701.01 and 701.02
Blended Cement	907-701.01 and 907-701.04
Admixtures	713.02
Fly Ash	714.05
Ground Granulated Blast Furnace Slag (GGBFS)	907-714.06
Silica Fume	907-714.07.2
Water	714.01.1 and 714.01.2
Fine Aggregate	703.02
Coarse Aggregate	703.03
Lightweight Aggregate	907-703.19
Curing Materials	713.01

Joint Materials	707.01, 707.02, and 707.07
Structural Steel Joints and Bearing Devices	717.01
Bearing Pads	714.10
Wire Rope or Wire Cable for Prestressed Concrete	700.01 and 711.03
Sprayed Finish for Concrete Surface	714.12
Reinforcing Steel	711.02

907-804.02.2--Use, Care, and Handling. The use, care, and handling of materials shall conform to the applicable requirements of Subsection 501.03.10 and the specific requirements of Subsections 907-804.02.4 and 907-804.02.5. Unless otherwise authorized, only fine aggregate or coarse aggregate of one type and from the same source shall be used in the construction of any one unit of a structure. Should the Contractor, with written permission of the Engineer, elect to substitute high early strength cement for cement of the type specified, the Contractor will not receive additional compensation for the substitution.

907-804.02.3--Blank.

907-804.02.4--Care and Storage of Concrete Aggregates. The handling and storage of aggregates shall be such as to prevent segregation or contamination with foreign materials. The Engineer may require that aggregates be stored on separate platforms at satisfactory locations.

When specified, coarse aggregates shall be separated into two or more sizes in order to secure greater uniformity of the concrete mixture. Different sizes of aggregate shall be stored in separate stock piles sufficiently removed from each other to prevent the material at the edges of the piles from becoming intermixed.

907-804.02.5--Storage of Cementitious Materials. All cementitious materials shall be stored in suitable weather-proof buildings or bins. These buildings or bins shall be placed in locations approved by the Engineer. Provision for storage shall be ample, and the shipments of cementitious materials as received shall be stored separately or other provisions made to the satisfaction of the Engineer for easy access for the identification, inspection, and sampling of each shipment as deemed desirable. Stored cementitious materials shall meet the test requirements at any time after storage when a retest is ordered by the Engineer.

On small jobs, open storage consisting of a raised platform and ample waterproof covering may be permitted by written authorization from the Engineer.

When specified, the Contractor shall keep accurate records of deliveries of cementitious materials and of their use in the work. Copies of these records shall be supplied in the form required by the Engineer.

907-804.02.6--Classification and Uses of Concrete. When a specific class of concrete is not specified on the plans or in the contract documents, the structure or parts thereof shall be constructed with the class of concrete as directed by the Engineer.

The classes and their uses are as follows:

(1) Class AA - Concrete for bridge construction and concrete exposed to seawater.
(2) Class A - Concrete shown as Class A shall herein be classified as and required to meet the performance criteria of Class AA.
(3) Class B - General use, heavily reinforced sections, cast-in-place concrete piles, and conventional concrete piles.
(4) Class C - Massive sections or lightly reinforced sections.
(5) Class D - Massive unreinforced sections and riprap.
(6) Class F - Concrete for prestressed members.
(7) Class FX - Extra strength concrete for prestressed members, as shown on plans.
(8) Class S - For all seal concrete deposited under water.
(9) Class DS - Drilled Shaft

907-804.02.7--Blank.

907-804.02.8--Laboratory Accreditation. The Contractor shall be responsible for furnishing the laboratory used to perform concrete quality control tests. The laboratory may be the Contractor's facility, the concrete producer's facility, or a certified independent testing laboratory.

Only laboratories certified by the Mississippi Department of Transportation are qualified to perform material testing. Certification by AASHTO Accreditation Program (AAP) will be acceptable if the laboratory is listed in the latest AAP publication and maintains accreditation to completion of concrete work.

The Contractor's laboratory designated for quality control testing shall have equipment necessary to test aggregates and concrete for the test methods listed in Table 1.

Table 1

AASHTO: R 39	Making and Curing Concrete Test Specimens in the Laboratory
AASHTO: R 60	Sampling Freshly Mixed Concrete
AASHTO: T 2	Sampling Aggregates
AASHTO: T 19	Bulk Density ("Unit Weight") and Voids in Aggregates
AASHTO: T 22	Compressive Strength of Cylindrical Concrete Specimens
AASHTO: T 23	Making and Curing Concrete Test Specimens in the Field
AASHTO: T 27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO: T 84	Specific Gravity and Absorption of Fine Aggregate
AASHTO: T 85	Specific Gravity and Absorption of Coarse Aggregate
AASHTO: T 119	Slump of Hydraulic Cement Concrete
AASHTO: T 121	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
AASHTO: T 152	Air Content of Freshly Mixed Concrete by Pressure Method *
AASHTO: T 196	Air Content of Freshly Mixed Concrete by the Volumetric Method *
AASHTO: T 231	Capping Cylindrical Concrete Specimens
AASHTO: T 248	Reducing Field Samples of Aggregate to Testing Size
AASHTO: T 255	Total Evaporable Moisture Content of Aggregate by Drying

AASHTO: T 325	Standard Method of Test for Estimating the Strength of Concrete in Transportation Construction by Maturity Tests **
ASTM: C 1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic Cement Concrete
ASTM: C 1074	Standard Practice for Estimating Concrete Strength by the Maturity Method **

* Equipment necessary for either pressure or volumetric air content.
** Equipment necessary for estimating concrete strength following the maturity method.

Testing equipment shall have been inspected by the Department or through the AASHTO Accreditation Program. Testing equipment calibration files shall be made available upon request by the Department.

907-804.02.9--Testing Personnel. Technicians testing portland cement concrete, for either acceptance or production control purposes, shall be certified by an accepted certification program. Recertification is required for each Class after five years. Certification requirements are listed in Table 2.

Table 2

Concrete Technician's Tasks	Test Method Required	Certification Required**
Sampling or Testing of Plastic Concrete	AASHTO Designation: R 60, T 23, T 119, T 121, 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 a 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 certification
Interpretation and Application of Maturity Meter Readings	AASHTO Designation: T 325 and ASTM Designation: C 1074	MDOT Class III certification or Two hours maturity method training

* Technicians making concrete test specimens for meeting the requirements of Subsection 907-804.02.10.1.2 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.

Specific requirements for each level of certification are in the latest edition of the Department's *Concrete Field Manual*. Current MDOT Class I, MDOT Class II, and/or MDOT Class III certifications shall be acceptable until those certifications expire. Upon expiration of a current certification, recertification with the certifications listed in Table 2 shall be required. Technicians 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 Mixture Design. At least 10 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*. Materials shall be from approved sources meeting the requirements of the Standard Specifications. Proportions for the mixture designs shall be for the class concrete required by the contract plans and shall meet the requirements of the "Master Proportion Table for Structural Concrete Design" listed in Table 3. The concrete producer shall assign a permanent unique mixture number to each mixture design. Each mixture design shall be field verified as required in Subsection 907-804.02.10.3. Acceptable field verification data shall be required for final approval of a mixture design.

All concrete mixture designs will be reviewed by the Materials Division prior to use. Concrete mixture designs disapproved will be returned to the Contractor with a statement explaining the disapproval.

If the Contractor chooses to cure the concrete in accordance with the requirements listed under **Length of Time Defined by Development of Compressive Strength** in Subsection 907-804.03.17, the compressive strength/maturity relationship shall be developed for the mixture design for a minimum of 28 days following the requirements of Subsection 907-804.03.15. The compressive strength/maturity relationship information shall be submitted with the mixture design information.

Table 3
MASTER PROPORTION TABLE FOR STRUCTURAL CONCRETE DESIGN

Class	Coarse Aggregate Size No.*	Maximum Water/ Cementitious** Ratio	Specified Compressive Strength (f'_c) psi	Maximum Permitted Slump*** inches	Nominal Total Air Content**** %
AA*****	57 or 67	0.45**	4000	3***	4.5****
B	57 or 67	0.50	3500	4	4.5
C	57 or 67	0.55	3000	4	4.5
D	57 or 67	0.70	2000	4	4.5
F	67	0.40	5000	3	******
FX	67	(As per mixture design)	(As shown on plans)	3	******
S	57 or 67	0.45	3000	8	4.5
DS	67	0.45	4000	***	******

* Maximum size aggregate shall conform to the concrete mixture design for the specified aggregate. Other smaller coarse aggregate sizes meeting the requirements of Subsection 907-703.03.2.4 may also be used in conjunction with the coarse aggregate sizes listed. Lightweight aggregate (LWA) meeting the requirements of Subsection 907-703.19.2 may also be used as a partial replacement for fine aggregate.

** The replacement limits of portland cement by weight by other cementitious materials (such as fly ash, GGBFS, 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.

For Class AA concrete for concrete bridge decks, the water / cementitious ratio range shall be 0.43 – 0.45 and the maximum cementitious material content shall be 550 pounds per cubic yard. The "maximum cementitious material content" refers to the total weight of Portland cement, blended hydraulic cement, GGBFS, silica fume, and fly ash.

*** Unless otherwise specified, minus slump requirements shall meet those set forth in Table 3 of AASHTO Designation: M157.

For Class AA concrete for concrete bridge decks the maximum permitted slump may be increased to five (5) inches. Also, for each additional pound of fibers per cubic yard added in excess of the requirement in Note *****, an additional inch of slump will be allowed up to a maximum permitted slump of eight (8) inches.

For Class AA not used in bridge decks and all other Classes of concrete, the maximum permitted slump may be increased to eight (8) inches.

For Class DS concrete for drilled shafts the slump range shall be 8 inches ±1 inch.

**** The tolerance on total air content shall be ±1.5%. For Class AA concrete for concrete bridge decks, the nominal total air content may be increased to 6.5%.

***** For Class AA concrete for concrete bridge decks, an approved synthetic structural fiber meeting the requirements of Special Provision 907-711, Synthetic Structural Fiber Reinforcement, shall be incorporated into the mixture at 1.25 times the approved dosage rate.

****** Entrained air is not required except for concrete exposed to seawater. For concrete not exposed to seawater, the total air content shall not exceed 6.0%. For concrete exposed to seawater, the nominal total air content shall be 4.5%.

At least one water-reducing admixture or water-reducing/set-retarding admixture shall be used in all classes of concrete in accordance with the manufacturer's recommended dosage range. Admixtures providing a specific performance characteristic other than those of water reduction or set retardation may be used in accordance with the manufacturer's recommended dosage range. Mixture designs containing accelerating admixtures will not be approved. Any combinations of admixtures shall be approved by the Engineer before their use.

907-804.02.10.1--Proportioning of Portland Cement Concrete Mixture Design. Proportioning of portland cement concrete shall be based on an existing mixture of which the producer has field experience and documentation or based on a recently batched laboratory mixture tested according to the required specifications.

907-804.02.10.1.1--Proportioning on the Basis of Previous Field Experience of Trial Mixtures. 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. The record of tests from which the standard deviation is calculated shall:

a) Represent similar materials and conditions to those expected. Changes in materials and proportions within the test record shall not have been more closely restricted than those for the proposed work.

b) Represent concrete produced to meet a specified strength.

c) Consist of 10 consecutive tests, average of two cylinders per test, tested at 28 days.

The standard deviation, s , shall be calculated as:

$$s = \left[\sum \left(X_i - \overline{X}\right)^2 \div \left(N - 1\right)\right]^{1/2}$$

where:

X_i = the strength result of an individual test
$\overline{X}$ = the average of individual tests in the series
N = number of tests in the series

When the concrete production facility does not have a record of tests for calculation of standard deviation, as required in the above formula, the requirements of Subsection 907-804.02.10.1.2 shall govern.

The required average compressive strength (f'_{cr}) used as the basis for selection of concrete proportions shall conform to the inequality listed below, while using a standard deviation, *s*, calculated as shown above.

$$\overline{X} \geq f'_{cr}$$

where:

$$f'_{cr} = f'_c + 1.43s$$

where:

f'_c = specified compressive strength of concrete, psi
f'_{cr} = required average compressive strength of concrete, psi
s = standard deviation, psi

1.43 represents the Lower Quality Index necessary to assure that 93% of compressive strength tests are above f'_c.

907-804.02.10.1.2--Proportioning on the Basis of Laboratory Trial Mixtures. When an acceptable record of field test results is not available, concrete proportions shall be established based on laboratory trial mixtures meeting the following restrictions:

a) The combination of materials shall be those intended for use in the proposed work.

b) Trial mixtures having proportions and consistencies suitable for the proposed work shall be made using the ACI 211.1 as a guide to proportion the mixture design.

c) Trial mixtures shall be designed to produce a slump within ±3/4 inch of the maximum permitted, and for air-entrained concrete, ±0.5 percent of the maximum total air content. The temperature of freshly mixed concrete in trial mixtures shall be reported.

d) For each proposed mixture, at least three compressive test cylinders shall be made and cured in accordance with AASHTO Designation: R 39. Each change of water-cement ratio shall be considered a new mixture. The cylinders shall be tested for strength in accordance with AASHTO Designation: T 22 and shall be tested at 28 days.

e) The required average strength of laboratory trial mixes shall exceed f'_c by 1200 psi for concrete mixture designs less than 5000 psi and by 1400 psi for concrete mixture designs of 5000 psi or more.

f) The laboratory trial batch mixtures shall have been made within the previous 12 months before being submitted for approval and shall not have been previously used on Department projects.

907-804.02.10.2--Documentation of Average Strength. Documentation that the proposed concrete proportions will produce an average strength equal to or greater than the required average shall consist of the strength test records from field tests or results from laboratory trial mixtures.

907-804.02.10.3--Field Verification of Concrete Mixture Design. Concrete mixture designs will only be tentatively approved pending field verification. The requirements for yield, slump, or total air content shall be successfully met within the first three (3) production days. Mixture designs may be transferred to other projects without additional field verification testing, once the mixture design has passed the field verification process.

The Contractor's Certified Quality Control Technicians shall test each concrete mixture design upon the first placement of the mix. Aggregates and concrete tests during the first placement shall be as follows.

Aggregates	Concrete
Bulk Specific Gravity	Water Content
Moisture	Slump
Gradation	Air Content
	Unit Weight
	Yield

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.

The mixture shall be adjusted and retested, if necessary, on subsequent placements until the above mentioned properties are met.

If the requirements for yield, slump, or total air content are not met within the first three (3) production days, subsequent field verification testing shall not be permitted on Department projects, and the mixture design shall not be used until the requirements listed above are met. Any mixture design adjustments, changes in the mixture proportions, are to be made by a Class III Certified Technician representing the Contractor. After the mixture design has been verified and adjustments made, verification test results will be reviewed by the Engineer.

907-804.02.10.3.1--Slump Retention of Class DS Concrete Mixture Designs. Prior to concrete placement, the Contractor shall provide test results of a slump loss test using approved methods to demonstrate that the mixture meets the four hour requirement in Subsection 907-803.02.7.1. These tests shall be conducted successfully by an approved testing laboratory within 30 days prior to installation of the trial shaft, with personnel from the Materials Division present. The slump loss test shall be conducted at temperatures and conditions similar to those expected at the job site at the time of the installation of the trial shaft. The sample for the slump loss test shall be from a minimum batch size of four (4) cubic yards of concrete. If the time between the previous successful slump loss test and the installation of the trial shaft exceeds 30 days, another successful slump loss test shall be performed on the first truckload of concrete as part of the installation of the trial shaft. This requirement limiting the time between the previous slump loss test and an installation of the trial shaft also applies to Class DS concrete mixture designs being transferred from another project. During any shaft installation a slump loss test shall be conducted by the Contractor at the direction of the Engineer from the concrete at the site for verification of slump loss requirements using a sample from a minimum batch size of four cubic yards of concrete.

907-804.02.10.4--Adjustments of Mixtures. The mixture design 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 907-804.02.10.3 and approval by the Engineer.

907-804.02.11--Concrete Batch Plants. 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. The Contractor shall provide and maintain a quality control program that will provide reasonable assurance that all materials and products submitted to the Department for acceptance will conform to the contract requirements, whether manufactured or processed by the Contractor or procured from suppliers, subcontractors, or vendors.

The Contractor's Quality Control program shall implement the minimum quality control requirements shown in Table 4, "CONTRACTOR'S MINIMUM REQUIREMENTS FOR QUALITY CONTROL". The quality control activities shown in the table are considered to be normal activities necessary to control the production and placing of a given product or material at an acceptable quality level. To facilitate the Department's activities, all completed gradation samples shall be retained for a maximum of sixty (60) days by the Contractor until further disposition is designated by the Department.

The Contractor shall perform, or have performed, the tests required to substantiate product conformance to contract document requirements and shall also perform, or have performed, all tests otherwise required.

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 shall be allowed to be added. Water shall not be added at a later time. Job site adjustment of a batch using chemical admixtures or the mechanical adjustment of a batch may be performed by the Contractor if the requirements of Subsection 907-804.02.12.1.1 have been satisfactorily addressed in the Quality Control Plan. If either the maximum permitted slump is exceeded or the total air content is not within the required range after all adjustments are made at the job site, the concrete shall be rejected.

The Contractor's quality control tests shall be documented and shall be available for review by the Engineer throughout the life of the contract.

As set out in these specifications, quality control sampling and testing performed by the Contractor will be used by the Department for determination of acceptability of the concrete.

The Contractor shall maintain standard equipment and qualified personnel as required to assure conformance to contract requirements.

907-804.02.12.1--Quality Control Plan. The Contractor shall prepare a Quality Control Plan which shall identify the personnel responsible for the Contractor's quality control including the company official who will act as liaison with Department personnel. The Quality Control Plan shall be submitted in writing to the Engineer for approval 30 days prior to the production of concrete.

The class(es) of concrete involved will be listed separately. If an existing mixture design(s) is to be used, the mixture design number(s) as previously approved shall be listed.

It is intended that sampling and testing be in accordance with standard methods and procedures, and that measuring and testing equipment be standard and properly calibrated. If alternative sampling methods and procedures, and inspection equipment are to be used, they shall be detailed in the Quality Control Plan.

907-804.02.12.1.1--Elements of Plan. The Plan shall address all elements that affect the quality of the structural concrete including, but not limited to, the following items:

1) Stockpile Management
2) Procedures for Corrective Actions for Non Compliance of Specifications
3) Procedure for Controlling Concrete Temperatures
4) Job Site Batch Adjustments by Addition of Chemical Admixtures:

   The Plan shall address if the Contractor intends to adjust either the slump and/or total air content of a batch on the job site by adding chemical admixture(s) to a batch. The Contractor shall include the names of the personnel designated to perform this batch adjustment, the equipment used to add the chemical admixture(s), and the procedure by which the batch adjustment will be accomplished. Only the Contractor's designated personnel shall adjust a batch. Only calibrated dispensing equipment shall be used to add chemical admixture(s) to a batch. Only the procedure described in this section of the Plan shall be utilized.

   If either the maximum permitted slump is exceeded or the total air content is not within the required range after all adjustments are made at the job site, the concrete shall be rejected.

   If the Contractor elects to utilize Job Site Batch Adjustments by Addition of Chemical Admixture within Item 2, Procedures for Corrective Actions for Non Compliance of Specifications, to adjust batches which do not meet the minimum specification requirements for slump and/or total air content, no more than three batches on any one project shall be allowed to be adjusted regardless of the number of mixtures associated with the project.

5) Construction of Concrete Bridge Decks, including the following:

- the description of the equipment used for placing concrete on the bridge deck in accordance with Subsection 907-804.03.6 and, as applicable, Subsections 907-804.03.7 and 907-804.03.8 including any accessories added to the pump to ensure the entrained air in the concrete mixture remains entrained during pumping and depositing of the concrete mixture,
- the description of and the number of pieces of equipment used to consolidate the concrete in accordance with Subsection 907-804.03.6.2,
- the description of the equipment used to finish the bridge deck in accordance with Subsection 907-804.03.19.7,
- the plan for ensuring a continuous rate of finishing the bridge deck without delaying the application of curing materials within the time specified in Subsection 907-804.03.17, including ensuring a continuous supply of concrete throughout the placement with an adequate quantity of concrete to complete the deck and filling diaphragms and end walls in advance of deck placement,
- the plan for applying the curing materials within the time specified in Subsection 907-804.03.17,
- the description of the powered fogging equipment in accordance with Subsection 907-804.03.17,
- a sample of the documentation used as the daily inspection report for ensuring maintenance of the continuous wet curing in accordance with Subsection 907-804.03.17, as required,
- the description of the equipment used to apply the liquid membrane, including but not limited to, the nozzles, pumping/pressurization equipment, and liquid membrane tanks, in accordance with Subsection 907-804.03.17,
- the method for determining the rate of applied liquid membrane meets the application rate requirements in accordance with Subsection 907-804.03.17,
- a sample of the documentation used for the application rate verification of the liquid membrane in accordance with Subsection 907-804.03.17.

6) Mechanical Adjustment of Trucks

907-804.02.12.2--Personnel Requirements. The Contractor's Designated Certified Technician shall perform and use quality control tests and other quality control practices to assure that delivered materials and proportioning meet the requirements of the mixture design including temperature, slump, air content, and strength and shall periodically inspect all equipment used in transporting, proportioning, and mixing.

The Contractor's Designated Technician shall periodically inspect all equipment used placing, consolidating, finishing, and curing to assure it is operating properly and that placement, consolidation, finishing, and curing conform to the mixture design and other contract requirements.

907-804.02.12.3--Documentation. The Contractor shall maintain adequate records of all inspections and tests. The records shall indicate the nature and number of observations made, the number and type of deficiencies found, date and time of samples taken, the quantities approved and rejected, and the nature of corrective action taken as appropriate. The Contractor's

documentation procedures will be subject to approval of the Department prior to the start of the work and to compliance checks during the progress of the work.

All conforming and non-conforming results shall be kept complete and shall be available at all times to the Department during the performance of the work. Forms shall be on a computer-acceptable medium. 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. All material added to a batch by both the batch plant or added manually shall be documented on the ticket. Batch tickets shall also contain the concrete producer's permanent unique mixture number assigned to the concrete mixture design. Copies shall be submitted to the Department as the work progresses.

Test data for portland cement concrete, including gradation, shall be charted in accordance with the applicable requirements.

The Contractor may use additional control charts as deemed appropriate. It is normally expected that testing and charting will be completed within 24 hours after sampling.

All records documenting the Contractor's quality control tests shall become the property of the Department upon completion of the work.

907-804.02.12.4--Corrective Action. The Contractor shall take prompt action to correct conditions that have resulted, or could result, in the submission to the Department of materials and products that do not conform to the requirements of the contract documents. All corrective actions shall be documented.

907-804.02.12.5--Non-Conforming Materials. The Contractor shall establish and maintain an effective and positive system for controlling non-conforming material, including procedures for its identification, isolation and disposition. Reclaiming or reworking of non-conforming materials shall be in accordance with procedures acceptable to the Department.

All non-conforming materials and products shall be positively identified to prevent use, shipment, and intermingling with conforming materials and products. Holding areas, mutually agreeable to the Department and the Contractor, shall be provided by the Contractor.

TABLE 4
CONTRACTOR'S MINIMUM REQUIREMENTS FOR QUALITY CONTROL

Portland Cement Concrete		
Control Requirement	**Frequency**	**AASHTO/ASTM Designation**
A. PLANT AND TRUCKS		
1. Mixer Blades	Monthly	
2. Scales		
a. Tared	Daily	
b. Calibrate	Every 6 months	
c. Check Calibration	Weekly	
3. Gauges & Meters - Plant & Truck		
a. Calibrate	Every 6 months	
b. Check Calibration	Weekly	
4. Admixture Dispenser		
a. Calibrate	Every 6 months	
b. Check Operation & Calibration	Daily	
B. AGGREGATES		
1. Sampling		T 2
2. Fine Aggregate		
a. Gradation / FM	250 yd^3 concrete	T 27
b. Moisture	Check meter against test results weekly	T 255
c. Specific Gravity / Absorption	2500 yd^3 concrete	T 84
3. Coarse Aggregates		
a. Gradation	250 yd^3 concrete	T 27
b. Moisture	Minimum of once daily or more as needed to control production. Check meter against test results weekly.	T 255
c. Specific Gravity / Absorption	2500 yd^3 Concrete	T 85
C. PLASTIC CONCRETE		
1. Sampling		T 141
2. Air Content	First load then one per 50 yd^3	T 152 or T 196
3. Slump	First load then one per 50 yd^3	T 119
4. Compressive Strength	A minimum of one set (three cylinders) for each 100 yd^3 inclusive and one set for each additional 100 yd^3 or fraction thereof for each class concrete delivered and placed on a calendar day from a single supplier. A test shall be the average of three cylinders.	T 22, T 23, T 231
5. Yield	Each 400 yd^3	T 121
6. Temperature	With each sample	C 1064

907-804.02.13--Quality Assurance Sampling and Testing. Quality Assurance (QA) inspection and testing will be provided by the Department to assure that the Contractor's Quality Control (QC) testing meets the requirements of these specifications.

Acceptance of the material is based on the inspection of the construction, monitoring of the Contractor's QC program, QC and QA test results per Subsection 907-804.02.13.1, and the comparison of the QA test results with the QC test results. The Department may use the results of the Contractor's QC tests as a part of the acceptance procedures instead of the results of QA tests, provided:

a) The Department's inspection and monitoring activities indicate that the Contractor is following the approved QC program and, respectively,
b) For aggregates, the results from the Contractor's QC and the Department's QA testing of aggregate gradations compare by both meeting the aggregate type's gradation requirements;
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.

The minimum frequency for QA testing of aggregate and plastic concrete by the Department will follow the frequencies listed in Table 5, **"**DEPARTMENT'S MINIMUM REQUIREMENTS FOR QUALITY ASSURANCE".

TABLE 5
DEPARTMENT'S MINIMUM REQUIREMENTS FOR QUALITY ASSURANCE

Quality Assurance Tests	Frequency	AASHTO/ASTM Designation
A. AGGREGATES		
1. Sampling		T 2
2. Fine Aggregate Gradation and FM	250 yd^3 concrete	T 27
3. Coarse Aggregates Gradation	250 yd^3 concrete	T 27
B. PLASTIC CONCRETE		
1. Sampling		T 141
2. Air Content	Every 100 yd^3	T 152 or T 196
3. Slump	Every 100 yd^3	T 119
4. Compressive Strength	One set (three cylinders) for every 100 yd^3 inclusive. A test shall be the average of three cylinders.	T 22, T 23, T 231
5. Temperature	With each sample	C 1064

Periodic inspection by the Department of the Contractor's QC testing and production will continue through the duration of the project. Weekly reviews will be made of the Contractor's QC records and charts.

For aggregates, comparison of data of the Contractor's QC aggregate gradation test results to those of the Department's QA aggregate gradation test results will be made monthly during concrete

production periods according to Department Standard Operating Procedures. When it is determined that the Contractor's QC test results of aggregate gradations are comparative to that of the Department's QA test results, then the Department will use the Contractor's QC results as a basis for acceptance of the aggregates and the Department's QA testing frequency of aggregates may be reduced to a frequency of no less than three QA tests to every 10 QC tests. If the Contractor's QC aggregate gradation test results fail to compare to those of the Department's QA aggregate gradation test results, Department testing for aggregate gradations will revert to the frequency shown in Table 5 for aggregates until the Contractor's and Department's aggregate gradation test data compare.

For concrete compressive strength, comparison of data of the Contractor's QC compressive strength test results to those of the Department's QA compressive strength test results will be made monthly during concrete production periods according to Department's *Concrete Field Manual*. When it is determined that the Contractor's QC test results of concrete compressive strengths are comparative to that of the Department's QA test results, then the Department will use the Contractor's QC results as a basis for acceptance of the concrete and the Department's QA testing frequency of concrete compressive strengths may be reduced to a frequency of no less than three QA tests to every 10 QC tests. If the Contractor's QC compressive strength test results fail to compare to those of the Department's QA compressive strength test results, Department testing will revert to the frequency shown in Table 5 for plastic concrete until the Contractor's and Department's compressive strength test data compare.

907-804.02.13.1--Job Control Testing.

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 three percent (±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 mixture design varies outside the batching tolerance range of the originally approved proportions by more than the tolerances allowed in Subsection 907-804.02.12, the new proportions shall be field verified per Subsection 907-804.02.10.3.

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

907-804.03.16.2. Concrete with a temperature more than the maximum allowable temperature shall be rejected and not used in Department work.

The maximum acceptance temperature for Class DS concrete mixtures is 95°F.

The maximum acceptance temperature of Class C concrete mixtures is 100°F for mixtures meeting the cement replacement requirements of Subsection 907-701.02.2. For Class C concrete mixtures that do not meet the cement replacement requirements of Subsection 907-701.02.2, the maximum acceptance temperature is 95°F.

The maximum acceptance temperature for all other concrete mixtures meeting the cement replacement requirements of Subsection 907-701.02.2 is 95°F. The maximum acceptance temperature for all other concrete mixtures which do not meet the cement replacement requirements of Subsection 907-701.02.2 is 90°F.

907-804.02.13.1.6--Compressive Strength. Standard 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)

$$\% \text{ Reduction} = \frac{(f'_c - X)}{f'_c - (f_c + s)} \times 100 \text{ x M}$$

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
M = pay reduction multiplier, per the *Concrete Field Manual*, paragraph 7.3

* 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)

$$\% \text{ Reduction} = \frac{(f'_c - X)}{f'_c} \times 100 \text{ x M}$$

where:

f'c = Specified 28-day compressive strength, psi
X = Individual compressive strength below f'c, psi
M = pay reduction multiplier, per the *Concrete Field Manual*, paragraph 7.3

907-804.02.14--Dispute Resolution. Disputes over variations between Contractor's QC test results and the Department's QA test results shall be resolved at the lowest possible level using the latest edition of the Department's *Concrete Field Manual*. When there are significant discrepancies between the QC test results and the QA test results, the Contractor's QC Manager, the Project Engineer, and/or the District Materials Engineer shall look for differences in the procedures, and correct the inappropriate procedure before requesting a third party resolution.

If the dispute cannot be resolved at the project or District level, the Department's Materials Division will serve as a third party to resolve the dispute. The Materials Division's decision shall be binding.

The Contractor shall be responsible for the cost associated with the third party resolution if the final decision is such that the Department's QA test results were correct. Likewise, the Department will be responsible for the cost when the final decision is such that the Contractor's QC test results were correct.

907-804.03--Construction Requirements.

907-804.03.1--Measurement of Materials.

907-804.03.1.1--General. The accuracy for measuring materials shall be in accordance with AASHTO Designation: M 157.

907-804.03.1.2--Measurement by Weighing. Except when otherwise specified or authorized, the materials shall be measured by weighing. The apparatus provided for weighing materials shall be

suitably designed and constructed for this purpose. Cementitious materials and aggregates shall be weighed separately. Cement in standard bags need not be weighed, but bulk cement and other cementitious materials shall be weighed. The mixing water shall be measured by volume or by weight. All measuring devices shall be subject to approval.

907-804.03.2--Blank.

907-804.03.3--Blank.

907-804.03.4--Hand Mixing. Hand mixing of concrete will not be allowed.

907-804.03.5--Delivery. The plant supplying concrete shall have sufficient capacity and transporting apparatus to ensure continuous delivery at the rate required. The rate of delivery shall be such as to provide for the proper continuity in handling, placing, and furnishing of the concrete. The rate shall be such that the interval between batches shall not exceed 20 minutes. The methods of delivering and handling the concrete shall be that which will facilitate placing with minimum re-handling and without damage to the structure or the concrete.

907-804.03.6--Handling and Placing Concrete.

907-804.03.6.1--General. Prior to placing concrete, all reinforcement shall have been accurately placed in the position shown on the plans and fastened as set out in Section 805. All sawdust, chips, and other construction debris and extraneous matter shall have been removed from the interior of the forms. Temporary struts, braces, and stays holding the forms in correct shape and alignment shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms and shall not be buried in the concrete.

No concrete shall be placed until the forms and reinforcement have been inspected.

Except as provided for truck mixers and truck agitators, concrete shall be placed in the forms within 30 minutes after the time that the cement is first added to the mixture.

Concrete shall be placed so as to avoid segregation of materials and displacement of reinforcement. The use of troughs, chutes, and pipes over 25 feet in length for gravity conveyance of concrete to the forms, will not be permitted except when authorized by the Engineer and subject to the production of quality concrete.

Only approved mechanical conveyors will be permitted.

Open troughs and chutes shall be metal or metal lined. The use of aluminum pipes, chutes, or other devices made of aluminum that come into direct contact with the concrete shall not be used. Where steep slopes are required, the chutes shall be equipped with baffles or be in short sections that change the direction of movement.

All chutes, troughs, and pipes shall be kept clean and free from coatings of hardened concrete by thoroughly flushing with water after each run. Water used for flushing shall be discharged clear of the structure.

When placing operations involve dropping the concrete more than five feet, it shall be deposited through sheet metal or other approved pipes to prevent segregation and unnecessary splashing. The pipes shall be made in sections to permit discharging and raising as the placement progresses. A non-jointed pipe may be used if sufficient openings of the proper size are provided to allow for the flow of the concrete into the shaft. As far as practicable, the pipes shall be kept full of concrete during placing, and their ends shall be kept buried in the newly placed concrete.

Except as herein provided, concrete shall be placed in horizontal layers not more than 12 inches thick. When, with the Engineer's approval, less than the complete length of a layer is placed in one operation, it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding layer has taken its initial set and shall be compacted so as to avoid the formation of a construction joint with the preceding layer.

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.

907-804.03.6.2--Consolidation. Immediately after depositing the concrete mixture, the concrete mixture shall be thoroughly consolidated by the use of approved mechanical vibrators and suitable spading tools. Only concrete mixture which has not achieved initial set shall be consolidated. Hand spading alone will be permitted on small structural members such as railing, small culvert headwalls, and as necessary to ensure smooth surfaces and dense concrete along form surfaces, in corners, and in locations impossible to reach with vibrators. When hand spading is used for consolidation, a sufficient number of workmen with spading tools shall be provided. For hand spading, flush a thin layer of mortar to all the surfaces and thoroughly and satisfactorily consolidate the concrete.

The Contractor shall conduct operations of depositing and consolidating the concrete mixture such that the operation produces concrete which is uniformly smooth and dense, having no honeycombing or pockets of segregated aggregate.

Movement of personnel through the consolidated concrete shall not be permitted. If it is determined it is necessary to step into previously consolidated concrete, the concrete in the stepped into area shall be consolidated again.

907-804.03.6.2.1--Requirements for Vibrators. Mechanical vibrators shall be subject to the following:

1. To verify compliance with these requirements, the Contractor shall provide the Engineer with a copy of the manufacturer's specifications for each type and brand of vibrator used on the project.

2. The Contractor shall provide a sufficient number of personnel with vibrators to properly consolidate each batch immediately after the concrete is placed in the forms. The Contractor shall provide at least one stand-by vibrator and required power source.
3. Concrete having been consolidated shall not be walked in or through. If it is determined it is necessary to step into previously consolidated concrete, the concrete in the stepped into area shall be consolidated again.
4. Internal vibrators shall be of the spud or tube type, meeting the following characteristics and performance:
    a. The diameter of the head of the vibrator shall be 1¼ to 2½ inches.
    b. The frequency of vibration shall be 8000 to 12000 vibrations per minute (Hz) while operating in the concrete.
    c. The average amplitude shall be 0.025 to 0.05 inch while operating in air.
    d. The minimum radius of influence shall be seven (7) inches.
    e. The length of the vibrator head shall be nearly equal to the depth of the layer of concrete placed.
5. When the reinforcing steel is coated with epoxy, internal vibrators with heads of rubber or other resilient material shall be used. Rubber covers securely fastened over steel heads shall be acceptable.
6. For consolidation of concrete used in concrete bridge decks, the following additional requirements shall apply:
    a. Only internal vibration shall be used.
    b. Internal vibrators shall all be of the same type and size.
    c. The configuration of the internal vibrators shall meet the requirements of Subsection 907-804.03.6.2.3.

907-804.03.6.2.2--Operation of Internal Vibration. Mechanical vibrators used for internal vibration shall be operated as follows:

1. Vibrators shall not be dragged or moved laterally through the concrete to transport concrete. Vibrators shall not be used in such a manner that the concrete segregates or forms pockets of grout. Vibrators shall not be applied directly or through the reinforcement to sections or layers of concrete which have taken initial set.
2. Vibrators shall only be inserted into the concrete while operating and at the point of placement to consolidate the concrete for such a length of time that there is a general cessation in the escape of large entrapped air bubbles at the surface.
3. Vibrators shall be inserted slowly into the concrete and allowed to penetrate into the concrete under their own weight.
4. Vibrators shall be inserted into the concrete while they are in a vertical position with enough flexibility to work themselves around the reinforcing steel.
5. The head of the vibrator shall be completely submerged in the concrete for a time of consolidation between 3 and 15 seconds prior to removal, unless otherwise defined by the Engineer.
6. For consolidation of two or more layers of concrete, the vibrator shall be inserted into the bottom most layer at least six (6) inches. The vibrator shall be manipulated in a series of up-and-down motions to knit the layers together.

7. Vibrators shall be removed slowly from the concrete after the consolidation has been accomplished. However, once the head of the vibrator has become only partially immersed in the concrete, vibrators shall be removed rapidly.
8. The insertions of the vibrators shall be systematically spaced such that the entire surface of the concrete comes under the influence of the vibrator during consolidation. This includes areas around the reinforcing steel, imbedded fixtures, the corners and angles of forms, and any irregular areas. The distance between insertions shall not exceed 1.5 times the radius of influence such that the area visibly affected by the vibrator overlaps the adjacent, just-vibrated area.
9. For additional information, refer to ACI 309-07, Chapter 7, Sections 7.1 through 7.3

907-804.03.6.2.3--Method of Consolidation. It is anticipated the Contractor will accomplish consolidation by internal vibration using one of the following two methods: vibrators mounted on a mechanical device or an orchestrated effort utilizing personnel. Regardless of the chosen method, the method shall be included in the QCP in accordance with Subsection 907-804.02.12.1.1.5 and shall only receive tentative approval until the method is demonstrated as effectively meeting the requirements of Subsection 907-804.03.6.2.

907-804.03.6.3--Discontinuance of Placing. When placing is temporarily discontinued, the concrete, after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete. To avoid visible joints insofar as possible upon exposed faces, the top surface of the concrete adjacent to the forms shall be smoothed with a trowel. Where a "feather edge" might be produced at a construction joint, such as in the sloped top surface of a wing wall, an inset form work shall be used in the preceding layer to produce a blocked out portion that will provide an edge thickness of at least six inches (6") in the succeeding layer. Work shall not be discontinued within 18 inches of the top of any face unless provision has been made for a coping less than 18 inches thick. In this case and if permitted by the Engineer, the construction joint may be made at the underside of the coping.

Immediately following the discontinuance of placing concrete, all accumulations of mortar splashed on the reinforcement and the surface of forms shall be removed. Dried mortar chips and dust shall not be puddled into the unset concrete. If the accumulations are not removed prior to the concrete becoming set, care shall be exercised not to break or injure the concrete-steel bond at and near the surface of the concrete while cleaning the reinforcement. After initial set the forms shall not be jarred, and no strain shall be placed on the ends of projecting reinforcement until the concrete has sufficiently set to ensure against any damage by such jarring or strain.

907-804.03.6.4--Placing Bridge Concrete. The method and sequence of placing concrete shall conform to the provisions and requirements set forth for the particular type of construction.

907-804.03.6.4.1--Foundations and Substructures. Concrete seals shall be placed in accordance with Subsection 907-804.03.9. All other concrete for foundations shall be poured in the dry unless otherwise stipulated or authorization is given in writing by the Engineer to do otherwise. Concrete shall not be placed in foundations until the foundation area has been inspected and approved.

Unless otherwise specified, the placement of concrete in the substructure shall be in accordance with the general requirements of Subsection 907-804.03.6.

Unless otherwise directed, concrete in columns shall be placed in one continuous operation, and shall be allowed to set at least 12 hours before the caps are placed.

907-804.03.6.4.2--Superstructure. For simple spans, concrete shall preferably be deposited by beginning at the center of the span and working toward the ends. For continuous spans, concrete shall be deposited as shown on the plans. Concrete in girders shall be uniformly deposited for the full length of the girder and brought up evenly in horizontal layers. Concrete in areas below the bridge deck but being deposited at the same time as concrete for the bridge deck, like a diaphragm, shall be placed and consolidated sufficiently ahead of placing the concrete for the bridge deck such that the placing, consolidating, finishing, and curing of concrete for the bridge deck shall not be impeded or slowed.

Unless otherwise permitted by the Engineer, concrete shall not be placed in the superstructure until the column forms have been stripped sufficiently to determine the character of the concrete in the columns. Unless otherwise permitted by the Engineer, the load of the superstructure shall not be placed on pile bents until the caps have been in place at least seven (7) days and shall not be placed on other types of bents until the bents have been in place at least 14 days.

In placing concrete around steel shapes, it shall be placed on one side of the shape until it flushes up over the bottom flange of the shape on the opposite side, after which it shall be placed on both sides to completion.

Concrete in girder haunches less than three feet (3') in height shall be placed at the same time as that in the girder stem. Whenever a haunch or fillet has a height of three feet (3') or more at the abutment or columns, the haunch and the girder shall be poured in three successive stages: first, up to the lower side of the haunch; second, to the lower side of the girder; and third, to completion.

Except when intermediate construction joints are specified, concrete in slab, T-beam, or deck-girder spans shall be placed in one continuous operation for each span.

The floors and girders of through-girder superstructures shall be placed in one continuous operation unless otherwise specified, in which case special shear anchorage shall be provided to ensure monolithic action between girder and floor.

Concrete in box girders shall be placed as shown on the plans.

Concrete shall not be chuted directly into the forms of the span and shall be placed continuously with sufficient speed to be monolithic and to allow for finishing before initial set.

907-804.03.6.4.3--Bridge Deck. When using the Transverse Method in accordance with Subsection 907-804.03.19.7.3, the period of time between concrete placement and completion of the final curing shall be kept to a minimum, as directed by the Engineer.

907-804.03.7--Pneumatic Placing. Pneumatic placing of concrete will be permitted only if specified in the contract or if authorized by the Engineer. The equipment shall be so arranged that no vibrations result which might damage freshly placed concrete.

Where concrete is conveyed and placed by pneumatic means the equipment shall be suitable in kind and adequate in capacity for the work. The machine shall be located as close as practicable to the place of deposit. The position of the discharge end of the line shall not be more than 10 feet from the point of deposit. The discharge lines shall be horizontal or inclined upwards from the machine. At the conclusion of placement the entire equipment shall be thoroughly cleaned.

907-804.03.8--Pumping Concrete. Placement of concrete by pumping will be permitted only if specified in the contract or if authorized in writing by the Engineer. If used, the equipment shall be arranged so that no vibrations result which might damage freshly placed concrete.

Where concrete mixture is conveyed and placed by mechanically applied pressure (pumping), the equipment shall be suitable in kind and adequate in capacity for the work. The Contractor shall select concrete mixture proportions such that the concrete mixture is pumpable and placeable with the selected equipment.

The pumping equipment shall be thoroughly cleaned prior to concrete placement. Excess form release agent shall be removed from the concrete pump hopper. The Contractor shall prime the pump at no additional cost to the Department by pumping and discarding enough concrete mixture to produce a uniform mixture exiting the pump. At least 0.25 cubic yard of concrete mixture shall be pumped and discarded to prime the pump. Only concrete mixture shall be added directly into the concrete pump hopper after placement has commenced. If anything other than concrete mixture is added to the concrete pump hopper, all concrete mixture in the concrete pump hopper and pump line shall be discarded and the pump re-primed at no additional cost to the Department.

The discharge end of the pump shall be of such a configuration that the concrete does not move in the pump line under its own weight. The intent of this requirement is to ensure that entrained air in the concrete mixture remains entrained during pumping and depositing the concrete mixture. This shall be accomplished with one or both of the following:

- a minimum 10-foot flexible hose attached to the discharge end of a steel reducer having a minimum length of three (3) feet and a minimum reduction in area of 20% which is attached to the discharge end of the pump line, or
- a flexible reducing hose to the discharge end of the pumpline with a minimum reduction in area of 20% over a minimum 10-foot hose length.

Regardless of the configuration chosen, the Contractor shall ensure that the concrete is pumped and does not free-fall more than five (5) feet within the entire length of pump line and after discharge from the end of pump line.

The Contractor shall not have any type of metal elbow, metal pipe, or other metal fitting within five (5) feet of any person during discharge of concrete mixture.

Boom pumps shall have a current Concrete Pump Manufacturers Association's ASME/ANSI B30.27 certification. Equipment added to the boom and pump line shall meet the pump manufacturer's specifications and shall not exceed the manufacturer's maximum recommended weight limit for equipment added to the boom and pump line.

The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, the concrete remaining in the pipe line, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned.

The use of aluminum pipe as a conveyance for the concrete will not be permitted.

907-804.03.9--Depositing Concrete Under Water. Concrete shall not be deposited in water except with the approval of the Engineer.

Concrete deposited under water shall be Class S.

Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie, a bottom dump bucket, or other approved method and shall not be disturbed after being deposited. Special care shall be exercised to maintain still water at the point of deposit. No concrete shall be placed in running water and all form work designed to retain concrete under water shall be water-tight. The consistency of the concrete shall be carefully regulated, and special care shall be exercised to prevent segregation of materials.

Concrete seals shall be placed continuously from start to finish, and the surface of the concrete shall be kept as nearly horizontal as practicable at all times. To ensure thorough bonding, each succeeding layer of a seal shall be placed before the preceding layer has taken initial set.

When a tremie is used, it shall consist of a tube having a diameter of at least 10 inches and constructed in sections having flanged couplings fitted with gaskets. The means of supporting the tremie shall be such as to permit the free movement of the discharge over the entire top surface of the work and to permit it to be lowered rapidly when necessary to choke off or retard the flow of concrete. The discharge end shall be closed at the start of the work so as to prevent water entering the tube and shall be entirely sealed. The tremie tube shall be kept full to the bottom of the hopper. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly raising the discharge end, always keeping it in the deposited concrete. The flow is then stopped by lowering the tremie. The flow shall be continuous until the work is completed.

Depositing of concrete by the drop bottom bucket method shall conform to the following: The top of the bucket shall be open. The bottom doors shall open freely downward and outward when tripped. The bucket shall be completely filled and slowly lowered to avoid backwash. It shall not be dumped until it rests on the surface upon which the concrete is to be deposited and when discharged shall be withdrawn slowly until well above the concrete.

Dewatering may proceed when the concrete seal is sufficiently hard and strong. As a general rule, this time will be 48 hours for concrete made with high-early-strength cement and three days for concrete made with other types of cement. All laitance and other unsatisfactory material shall be removed from the exposed surface by scraping, chipping, or other means which will not injure the surface of the concrete.

907-804.03.10--Construction Joints.

907-804.03.10.1--General. Unless otherwise approved by the Engineer, construction joints shall be made only where located on the plans or shown in the pouring schedule. If not detailed on the plans, or in the case of emergency, construction joints shall be placed as directed by the Engineer. Shear keys or inclined reinforcement shall be used where necessary to transmit shear or to bond the two sections together.

For continuous spans, bridge deck concrete shall be deposited as shown on the plans. Deviation from the pouring schedule shown in the plans is not permitted.

907-804.03.10.2--Bonding. Before depositing new concrete on or against concrete which has hardened, the forms shall be retightened. The surface of the hardened concrete shall be roughened as required by the Engineer and in a manner that will not leave loosened particles of aggregate or damaged concrete at the surface. It shall be thoroughly cleaned of foreign matter and laitance and saturated with water. When directed by the Engineer, the cleaned and saturated surfaces, including vertical and inclined surfaces, shall first be thoroughly covered with a coating of mortar or neat cement grout against which the new concrete shall be placed before the grout has attained its initial set.

The placing of concrete shall be carried continuously from joint to joint. The face edges of all joints which are exposed to view shall be carefully finished, true to line and elevation.

In order to bond successive courses suitable depressed or raised keys of the designated size shall be constructed. Raised keys shall be monolithic with the concrete of the lower course.

907-804.03.11--Concrete Exposed to Seawater. Unless otherwise specifically provided, concrete for structures exposed to seawater shall be Class AA concrete as referenced in Subsection 907-804.02.10. The clear distance from the face of the concrete to the nearest face of reinforcing steel shall be at least four inches. The mixing time and the water content shall be carefully controlled and regulated so as to produce concrete of maximum impermeability. The concrete shall be thoroughly compacted, and stone pockets shall be avoided. No construction joints shall be formed between the levels of extreme low water and extreme high water as determined by the Engineer. Between these levels, seawater shall not come in direct contact with the new concrete until at least 30 days have elapsed. The surface concrete as left by the forms shall be left undisturbed.

907-804.03.12--Blank.

907-804.03.13--Falsework. The Contractor shall submit to the Engineer four copies of structural design analysis and detail drawings, which show the method of falsework or centering. These designs and detail plans shall be prepared and bear the seal of a Registered Professional Engineer with experience in falsework design.

Falsework plans shall include falsework elevations together with all other dimensions and details which is considered necessary for the construction. Other pertinent data needed is size and spacing of all falsework members and minimum bearing requirements for false piles.

Upon completion of falsework erection, the Registered Professional Engineer shall certify that the erected falsework is capable of supporting the load for construction.

Falsework piling shall be spaced and driven so that the bearing value of each pile is sufficient to support the load that will be imposed upon it. The bearing value of the piles should be calculated according to the appropriate formula given in Section 803.

For designing falsework and centering, a weight of 150 pounds per cubic foot shall be assumed for green concrete. All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads without appreciable settlement or deformation. The Contractor may be required to employ screw jacks or hardwood wedges to take up slight settlement in the falsework either before or during the placing of concrete. An allowance shall be made for anticipated compressibility of falsework and for the placement of shims, wedges, or jacks to produce the permanent structural camber shown on the plans. If during construction, any weakness develops and the falsework shows any undue settlement or distortion, the work shall be stopped, the part of the structure affected removed, and the falsework strengthened before work is resumed. Falsework which cannot be founded on a satisfactory footing shall be supported on piling, which shall be spaced, driven, and removed, as referenced in Subsection 907-804.03.15, in a manner approved by the Engineer.

All structures built across a public street or highway on which maintenance of traffic is required, shall have falsework so arranged that a vertical clearance of at least 12' 6" is provided. Unless otherwise specified, a horizontal clearance of at least the width of the traveled way shall be provided at all times. If the vertical clearance is less than 13' 6" or the horizontal clearance is less than the full crown width of the roadway, the Contractor shall install and maintain appropriate safety devices, clearance signs and warning lights, and shall notify the Engineer sufficiently in advance of restricting the clearance for the Engineer to advise both the Traffic Engineering and the Maintenance Divisions. All traffic control and safety devices shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

907-804.03.14--Forms.

907-804.03.14.1--General. Forms shall be wood, metal, or other material approved by the Engineer. All forms shall be built mortar-tight and sufficiently rigid to prevent distortion due to pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the opening of joints due to shrinkage. The forms shall be substantial and unyielding and shall be so designed that the finished concrete

will conform to the proper dimensions and contours. The design of the forms shall take into account the effect of vibration of concrete as it is placed.

Minimum requirements for slab overhang forms shall be 3/4-inch plywood supported on 2-inch x 6-inch S4S wood timbers placed flatwise on 16-inch centers.

Adjustable brackets for support of slab overhang forms shall be spaced at a maximum distance of 3' 0" center to center unless specifically approved otherwise. Grade points for forms shall coincide with the location of the adjustable form brackets.

Forms for surfaces exposed to view shall be of uniform thickness with a smooth inside surface of an approved type. Joints in forms for exposed surfaces shall be closely fitted to eliminate fins, stone pockets, or other variations in the surface of the concrete which would mar a smooth and uniform texture.

Forms shall be filleted at all sharp corners and shall be given a bevel or draft in the case of all projections, such as girders and copings, to ensure easy removal.

Metal ties or anchorages within the forms shall be so constructed as to permit their removal, without injury to the concrete, to a depth of at least the reinforcing steel clearance shown on the plans. In case ordinary wire ties are permitted, all wires, upon removal of the forms, shall be cut back at least 1/4 inch from the face of the concrete with chisels or nippers. Nippers shall be used for green concrete. All fittings for metal ties shall be designed so that upon their removal the cavities which are left will be the smallest practicable size. The cavities shall be filled with cement mortar and the surface left sound, smooth, even, and uniform in color.

Forms shall be set and maintained to the lines designated until the concrete is sufficiently cured for form removal. Forms shall remain in place for periods which shall be determined as hereinafter specified. If forms are deemed to be unsatisfactory in any way, either before or during the placing of concrete, the Engineer will order the work stopped until the defects have been corrected.

The shape, strength, rigidity, water-tightness, and surface smoothness of reused forms shall be maintained at all times. Warped or bulged lumber shall be resized before being reused. Forms which are unsatisfactory in any respect shall not be reused.

Access to the lower portions of forms for narrow walls and columns shall be provided for cleaning out extraneous material immediately before placing the concrete.

All forms shall be treated with an approved oil or saturated with water immediately before placing the concrete. For rail members or other members with exposed faces, the forms shall be treated only with an approved oil to prevent the adherence of concrete. Any material which will adhere to or discolor the concrete shall not be used.

When metal forms are used they shall be kept free from rust, grease, or other foreign matter which will discolor the concrete. They shall be of sufficient thickness and so connected that they will remain true to shape and line, and shall conform in all respects as herein prescribed for mortar

tightness, filleted corners, beveled projections, etc. They shall be constructed so as to ensure easy removal without injury to concrete. All inside bolt and rivet heads shall be countersunk.

All chamfer strips shall be dressed, straight, and of uniform width and shall be maintained as such at all times.

907-804.03.14.2--Stay-In-Place Metal Forms. Stay-in-place (SIP) metal forms are corrugated metal sheets permanently installed between the supporting superstructure members. After the concrete has cured, these forms shall remain in place as permanent, non-structural members of the bridge.

Pay quantities for deck concrete will be computed from the dimensions shown in the Contract Plans with no allowance for changes in deflection and /or changes in dimensions necessary to accommodate the SIP metal forms.

There will be no direct payment for the cost of the forms and form supports, or any material, tools, equipment, or labor incidental thereto, but the cost shall be considered absorbed in the contract unit price for concrete.

Before fabricating any material, three (3) complete sets of SIP metal form shop drawings and design calculations, bearing the Design Engineer's Seal, shall be submitted to the Director of Structures, State Bridge Engineer, through the Engineer, for review. The Contractor's SIP metal form Design Engineer shall be a MS Registered Professional Engineer who is knowledgeable in the field of structural design.

In no case shall additional dead load produced by the use of SIP metal forms overstress any bridge component. Design calculations shall indicate any additional dead load from SIP metal form self-weight, form support hangers, concrete in flutes, concrete due to form deflection, etc. not included in the Contract Plans. The additional dead loads shall be clearly labeled and tabulated on the shop drawings. Bridge Division will evaluate the additional load for overstress of the bridge components. In the event that the additional dead load produces an overstress in any bridge component, Bridge Division will reject the Contractor's design. Deflection and loads produced by deflection of the SIP metal forms shall be considered and indicated in the design calculations.

The cambers and deflections provided in the Contract Plans do not consider the effects of SIP metal forms. The Contractor's Engineer shall take into account the weight of the forms and any additional dead load when developing the "Bridge Superstructure Construction Plan".

For the purpose of reducing any additional dead load produced by the SIP metal forms, the flutes of SIP metal forms may be filled with polystyrene foam. When polystyrene foam is used to fill the forms, the form flutes shall be filled completely; no portion of the polystyrene foam shall extend beyond the limits of the flutes. The Contractor shall ensure that the polystyrene foam remains in its required position within flutes during the entire concrete placement process. The Contractor shall not use reinforcing steel supports or other accessories in such a manner as to cause damage to the polystyrene foam. All damaged polystyrene foam shall be replaced to the

satisfaction of the Engineer. All welding of formwork shall be completed prior to placement of polystyrene foam.

For bridges not located in horizontal curves, the Contractor may reduce the additional dead load by matching the flute spacing with the transverse steel spacing of the bottom layer. The bottom longitudinal layer of steel shall have one (1) inch of minimum concrete cover measured from the bottom of the reinforcing to the top of the flute. The Contractor will not be allowed to vary the reinforcing steel spacing or size from the Contract Plans for the purpose of matching flute spacing.

907-804.03.14.2.1--Materials. SIP metal forms and supports shall meet the requirements of ASTM Designation: A653 having a coating designation G165. Form materials that are less than 0.03-inch uncoated thickness shall not be allowed.

907-804.03.14.2.2--Certification. The Contractor shall provide written certification from the manufacturer stating the product meets the requirements of this specification to the Engineer along with the delivery of the coated forms to the job site.

907-804.03.14.2.3--Polystyrene Foam. The polystyrene foam shall be comprised of expanded polystyrene manufactured from virgin resin of sufficient density to support the weight of concrete without deformation. The polystyrene foam shall be extruded to match the geometry of the flutes and provide a snug fit. The polystyrene foam shall have a density of not less than 0.8 pounds per cubic foot. The polystyrene foam shall have water absorption of less than 2.6% when tested according to ASTM Designation: C272. The Contractor shall provide written certification from the manufacturer stating the polystyrene foam product meets the requirements of this specification to the Engineer along with the delivery of the coated forms to the job site.

907-804.03.14.2.4--Design. The design of the SIP metal forms shall meet the following criteria.

1. The maximum self-weight of the stay in place metal forms, plus the weight of the concrete or expanded polystyrene required to fill the form flutes (where used), shall not exceed 20 psf.

2. The forms shall be designed on the basis of dead load of form, reinforcement, and plastic concrete plus 50 pounds per square foot for construction loads. The design shall use a unit working stress in the steel sheet of not more than 0.725 of the specified minimum yield strength of the material furnished, but not to exceed 36,000 psi.

3. Deflection under the weight of the forms, reinforcement, and plastic concrete shall not exceed 1/180 of the form span or 1/2 inch, whichever is less, for form spans of 10 feet or less, or 1/240 of the form span or 3/4 inch, whichever is less, for form spans greater than 10 feet.

4. The design span of the form shall equal the clear span of the form plus two (2) inches. The span shall be measure parallel to the form flutes.

5. Physical design properties shall be computed in accordance with requirements of the AISI Specifications for the Design of Cold Formed Steel Structural Members, latest published edition.

6. The design concrete cover required by the plans shall be maintained for all reinforcement.

7. The plan dimensions of both layers of primary deck reinforcement from the top surface of the concrete deck shall be maintained.

8. The SIP metal form shall not be considered as lateral bracing for compression flanges of supporting structural members.

9. SIP metal forms shall not be used under closure pours or in bays where longitudinal slab construction joints are located. SIP metal forms shall not be used under cantilevered slabs such as the overhang outside of fascia members.

10. Forms shall be secured to the supporting members by means other than welding directly to the member. Welding to the top flanges of steel stringers and/or girders shall not be allowed. Alternate installation procedures shall be submitted addressing this condition.

907-804.03.14.2.5--Construction. SIP metal form sheets shall not rest directly on the top of the stringer of floor beam flanges. Sheets shall be fastened securely to form supports, and maintain a minimum bearing length of one (1) inch at each end for metal forms. Form supports shall be placed in direct contact with the flange of the stringer or floor beam. All attachments for coated metal forms shall be made by bolts, clips, screws, or other approved means.

907-804.03.14.2.6--Form Galvanizing Repairs. Where forms or their installation are unsatisfactory in the opinion of the Engineer, either before or during placement of the concrete, the Contractor shall correct the defects before proceeding with the construction work. The cost of such corrective work shall be at the sole expense of the Contractor. Minor heat discoloration in areas of welds shall not be touched up.

907-804.03.14.2.7--Concrete. The Contractor shall ensure concrete placement does not damage the SIP metal forms. Approved pouring sequences shall be used. The completed SIP metal form system shall be sufficiently tight to prevent leakage of mortar or concrete. The concrete shall be consolidated to avoid honeycomb and voids, especially at construction joints, expansion joints, valleys, and ends of form sheets. Calcium chloride or any other admixture containing chloride salts shall not be used in the concrete.

907-804.03.14.2.8--Inspection. The Engineer will observe the Contractor's method of construction during all phases of the construction of the bridge deck slab, including the installation of the SIP metal form system; location and fastening of the reinforcement; composition of concrete items; mixing procedures, concrete placement, and vibration; and finishing of the bridge deck. Should the Engineer determine that the procedures used during the placement of the concrete warrant inspection of the underside of the deck, at least one section of the metal forms shall be removed in each span for this purpose. This shall be done as soon after placing the concrete as

practical in order to provide visual evidence that the concrete mix and the procedures are obtaining the desired results. An additional section shall be removed in any span if the Engineer determines that there has been any change in the concrete mix or in the procedures warranting additional inspection.

If, in the Engineer's judgment, inspection is needed to check for defects in the bottom of the deck or to verify soundness, the SIP metal forms shall be sounded with a hammer after the deck concrete has been in place a minimum of two days. If sounding discloses areas of doubtful soundness to the Engineer, the SIP metal forms shall be removed from such areas for visual inspection after the concrete has attained adequate strength. The SIP metal bridge deck forms shall be removed at no expense to the State.

At locations where sections of the metal forms have been removed, the Engineer will not require the Contractor to replace the metal forms. The adjacent metal forms and supports shall be repaired to present a neat appearance and to ensure their satisfactory retention. As soon as the form is removed, the Engineer will examine the concrete surfaces for cavities, honeycombing, and other defects. If irregularities are found and the Engineer determines that these irregularities do not justify rejection of the work, the concrete shall be repaired as directed by the Engineer. If the Engineer determines that the concrete where the form is removed is unsatisfactory, additional metal forms as necessary shall be removed to inspect and repair the slab, and the Contractor's method of construction shall be modified as required to obtain satisfactory concrete in the slab. All unsatisfactory concrete shall be removed and replaced as directed at no expense to the State.

If the method of construction and the results of the inspections as outlined above indicate that sound concrete has been obtained throughout the slabs, the amount of sounding and form removal may be reduced when approved by the Engineer.

The Contractor shall provide a safe and convenient means of conducting of the inspection.

907-804.03.15--Removal of Falsework, Forms, and Housing. In the determination of the time for the removal of falsework, forms, and housing and the discontinuance of heating, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the setting of the concrete, and the materials used in the mix. No forms or supports shall be removed prior to approval by the Engineer. During cold weather, removal of housing and the discontinuance of heating shall be in accordance with Subsection 907-804.03.16.1.

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. It is important that falsework be removed as evenly as possible to prevent excessive deflection stresses in the spans.

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. The facilities shall include an approved concrete testing machine of sufficient capacity and calibrated by an acceptable commercial laboratory. Tests shall be conducted in the presence of a Department representative

to witness and record strengths obtained on each break or performed by a Department certified technician in an approved testing laboratory.

[a1]The cylinders shall be cured under conditions which are not more favorable than those existing for the portions of the structure which they represent.

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

For bridges, non-SIP metal forms for bridge deck slabs overhead and bridge deck slabs between beams shall be removed with the approval of the Engineer, between two weeks and four weeks after the removal of the wet burlap applied in accordance with Subsection 907-804.03.17.1, or application of liquid membrane applied in accordance with Subsection 907-804.03.17.2.

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

Methods of form removal likely to cause overstressing of the concrete shall not be used. Forms and supports shall be removed in a manner that will permit the concrete to uniformly and gradually take the stresses due to its own weight. Centers shall be gradually and uniformly lowered in a manner that will avoid injurious stresses in any part of the structure.

As soon as concrete for railings, ornamental work, parapets and vertical faces which require a rubbed finish has attained a safe strength, the forms shall be carefully removed without marring the surfaces and corners, the required finishing performed, and the required curing continued.

Prior to final inspection of the work, the Contractor shall remove all falsework, forms, excavated material or other material placed in the stream channel during construction. Falsework piles may be cut or broken off at least one foot below the mudline or ground line unless the plans specifically indicate that they are to be pulled and completely removed from the channel.

907-804.03.16--Cold or Hot Weather Concreting.

907-804.03.16.1--Cold Weather Concreting. In cold weather, the temperature of the concrete when delivered to the job site shall conform to the temperature limitations of "Temperature Limitations on Concrete when Delivered to Job Site" listed in Table 8 below. Cold weather is defined as three consecutive days when there is a probability that the daily average of the highest and lowest ambient temperatures is expected to be less than 40°F. This three-day forecast shall be based on the latest information available from the National Weather Service.

When the Contractor proposes to place concrete during seasons when there is a probability of ambient temperatures lower than 40°F, the Contractor shall have available on the project the approved facilities necessary to enclose uncured concrete and to keep the temperature of the air inside the enclosure within the ranges and for the minimum periods specified herein.

When there are indications of temperatures of less than 40°F during the first four days after placement of the concrete, the concrete shall be protected from cold temperatures by maintaining a temperature between 50°F and 100°F for at least four days after placement and between 40°F and 100°F for at least three additional days. The Contractor shall use such heating equipment such as stoves, salamanders, or steam equipment as deemed necessary to protect the concrete. When dry heat is used, means of maintaining atmospheric moisture shall be provided.

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.

One or more of the aggregates and/or mixing water may be heated. The aggregates may be heated by steam, dry heat, or by placing in the mixing water which has been heated. Frozen aggregates shall not be used. When either aggregates or water are heated above 100°F, the aggregates and water shall be combined first in the mixer before the cement is added to avoid flash set. Cement shall not be mixed with water or with a mixture of water and aggregate having a temperature greater than 100°F.

The use of salt or other chemical admixtures in lieu of heating will not be permitted.

Before placing concrete, all ice or frost shall be removed from the forms and reinforcement.

In the case of concrete placed directly on or in the ground, such as for footings or bottom slabs, protection and curing during cold weather may be provided as set for concrete pavement under Subsection 501.03.20.3.

The Contractor shall assume all risk and added cost connected with the placing and protecting of concrete during cold weather. Permission given by the Engineer to place concrete during such time will in no way relieve the Contractor of responsibility for satisfactory results. Should it be determined at any time that the concrete placed under such conditions is unsatisfactory, it shall be removed and replaced with satisfactory concrete by the Contractor without extra compensation.

TABLE 8
COLD WEATHER TEMPERATURE LIMITATIONS ON CONCRETE WHEN DELIVERED TO JOB SITE

Section thickness in the least dimension inches	Jobsite Acceptance Temperature Range °F
Less than 12	55 to 75
12 to 36	50 to 70
36 to 72	45 to 65
Greater than 72	40 to 60

907-804.03.16.2--Hot Weather Concreting. The manufacture, placement, and protection of concrete during hot weather requires special attention to ensure that uniform slump ranges and satisfactory placement qualities are maintained, that surface cracking is held to a minimum, and that design strengths are produced.

When the ambient temperature is above 90°F, the forms, reinforcing steel, steel beam flanges, and other surfaces which will come in contact with the concrete shall be cooled to below 90°F by means of a water spray or other approved methods.

When the atmospheric temperature is predicted to be 90°F or above based on the latest information available from the National Weather Service any time during the day of placement or day after placement, the time of placement shall not begin until 5:00 p.m. on the day of placement and shall be completed by 6:00 a.m. the following day.

907-804.03.17--Curing Concrete. Curing is defined as all actions taken to ensure the moisture and temperature conditions of freshly placed concrete exist so the concrete may develop its potential properties. Curing shall take place from the time of placement until its potential properties have developed. The Contractor shall use the guidance in ACI 308R-01 to:

a) cure the concrete in such a manner as to prevent premature moisture loss from the concrete,
b) supply additional moisture to the concrete as required in order to ensure sufficient moisture within the concrete, and
c) maintain a concrete temperature beneficial to the concrete.

Curing in accordance with the requirements in either Subsection 907-804.03.17.1 or Subsection 907-804.03.17.2 shall be completely established within 20 minutes after finishing, except as noted for bridge decks. Finishing is complete when the pan drag, burlap drag, or other finishing method is complete.

When stay-in-place (SIP) metal forms are used in accordance with Subsection 907-804.03.14.2 in conjunction with the Transverse Method in accordance with Subsection 804.03.19.7.3, if the concrete mixture contains lightweight aggregate (LWA) meeting the requirements of Subsection 907-703.19.2 and an internal curing water content of 8.0 pounds or greater per 100 pounds of total cementitious materials, curing shall be accomplished in accordance with either Subsection 907-804.03.17.1 or Subsection 907-804.03.17.2. The minimum amount of LWA shall be established following the information in the Department's *Concrete Field Manual*, Paragraph 5.5.5. If the concrete mixture does not meet or exceed this internal curing water content, curing shall be accomplished in accordance with Subsection 907-804.03.17.1.

When SIP metal forms are not used or used in conjunction with the Longitudinal Method in accordance with Subsection 804.03.19.7.2, curing shall be accomplished in accordance with either Subsection 907-804.03.17.1 or Subsection 907-804.03.17.2.

The length of time for curing shall be maintained in accordance with either of the following:

1. Prescribed Length of Time:

a) Curing following the requirements of Subsection 907-804.03.17.1 shall continue uninterrupted for at least 14 days.
b) Curing following the requirements of Subsection 907-804.03.17.2 shall continue uninterrupted for at least 10 days.

OR

2. Length of Time Defined by Development of Compressive Strength:
Curing following the application requirements of Subsection 907-804.03.17.1 or Subsection 907-804.03.17.2 shall continue uninterrupted for each day's production until the compressive strength of the concrete exceeds 75% of the 28-day compressive strength submitted as the Basis of Proportioning per Subsection 907-804.02.10.1. Therefore, if an area is being cured in accordance with Subsection 907-804.03.17.1, the curing by wet burlap shall continue until the concrete in that area has attained a minimum of 75% of the 28-day compressive strength submitted as the Basis of Proportioning per Subsection 907-804.02.10.1. Likewise, if an area is being cured in accordance with Subsection 907-804.03.17.2, the curing by liquid membrane shall continue until the concrete in that area has attained a minimum of 75% of the 28-day compressive strength submitted as the Basis of Proportioning per Subsection 907-804.02.10.1.

The compressive strength of the concrete may be determined by the use of maturity meter in accordance with Subsection 907-804.03.15.

907-804.03.17.1--Water With Waterproof Cover. All burlap shall be completely saturated and wet prior to placing it on the concrete. The burlap shall have been fully soaked in water for a minimum of 12 hours prior to placement on the concrete.

For bridge decks, the Contractor shall apply one (1) layer of saturated burlap within 20 minutes of the initial strike-off for bridges without a skew and 25 minutes of the initial strike-off for bridges with a skew. For all other concrete, the Contractor shall apply one (1) layer of saturated burlap within 20 minutes of completing finishing.

For bridge decks, following the first layer of burlap, the Contractor shall apply a second layer of saturated burlap within five (5) minutes of applying the first layer.

The applied burlap shall completely cover all exposed concrete surfaces. In areas where the burlap may not be directly applied due to the concrete surface, for example, in areas where reinforcing steel protrudes thru the concrete surface, like in the areas of a bridge deck where the bridge railing will be constructed at a later time, the saturated burlap shall be draped over the steel. The concrete surface shall not be allowed to dry after strike-off or at any time during the curing period.

The Contractor shall maintain the burlap in a fully wet condition using powered fogging equipment capable of producing a fog spray of atomized droplets of water until the concrete has gained sufficient strength to allow foot traffic without the foot traffic marring the surface of the concrete. Burlap shall not be maintained in the fully wet condition using equipment which does not produce a fog spray of atomized droplets of water or by use of manually pressurized sprayers.

For bridge decks, once the concrete has gained sufficient strength to allow foot traffic which does not mar the surface of the concrete, soaker hoses shall be placed on the burlap. The soaker hoses shall then be supplied with running water continuously to maintain continuous saturation of all burlap and the entire concrete surface.

If there is a delay in the placement of the first layer of saturated burlap outside the time limit, the struck-off and finished concrete shall be kept wet by use of the powered fogging equipment used to keep the burlap wet.

White polyethylene sheets shall be placed on top of the wet burlap and, as applicable, soaker hoses, covering the entire concrete surface as soon as practical and not more than 12 hours after the placement of the concrete. White polyethylene sheets of the widest practical width shall be used, overlapping adjacent sheets a minimum of six inches (6") and tightly sealed with an adhesive like pressure sensitive tape, mastic, glue, or other approved methods to form a complete waterproof cover of the entire concrete surface. White polyethylene sheets which overlap a minimum of two feet (2') may be held in place using means other than an adhesive. The white polyethylene sheets shall be secured so that wind will not displace them. The Contractor shall immediately repair the broken or damaged portions or replace sections that have lost their waterproof qualities.

If burlap and/or white polyethylene sheets are temporarily removed for any reason during the curing period, the Contractor shall keep the entire exposed area continuously wet. The saturated burlap and white polyethylene sheets shall be replaced, resuming the specified curing conditions, as soon as possible.

The Contractor shall inspect the bridge deck surface once every eight (8) hours for the entirety of the curing period, so that all areas remain wet for the entire curing period and all curing requirements are satisfied and document the inspection in accordance with Subsection 907-804.03.17.1.1.

At the end of the curing period, one coating of liquid membrane shall be applied following the requirements of Subsection 907-804.03.17.1.2. The purpose of the coating of liquid membrane is to allow for slow drying of the concrete. The application of liquid membrane to any area shall be complete within 30 minutes of the beginning of removal of the white polyethylene sheets, soaker hoses, and burlap from this area.

907-804.03.17.1.1--Documentation for Bridge Decks. The Contractor shall provide the Engineer with a daily inspection report that includes:

- documentation that identifies any deficiencies found (including location of deficiency);
- documentation of corrective measures taken;
- a statement of certification that all areas are wet and all curing material is in place on the entire bridge deck;
- documentation showing the time and date of all inspections and the inspector's signature;
- documentation of any temporary removal of curing materials including location, date and time, length of time curing was removed, and means taken to ensure exposed area was kept continuously wet.

907-804.03.17.1.2--Liquid Membrane. At the end of the 14-day wet curing period the wet burlap and polyethylene sheets shall be removed and within 30 minutes, the Contractor shall apply white liquid membrane to the deck. The liquid membrane shall be thoroughly mixed within the time recommended by the liquid membrane producer but no more than an hour before use. If the use of liquid membrane results in a streaked or blotched appearance, the method shall be stopped and water curing applied until the cause of defective appearance is corrected.

The liquid membrane shall be applied when no free water remains on the surface but while the surface is still wet. The liquid membrane shall be applied according to the manufacturer's instructions with a minimum spreading rate per coat of one (1) gallon per 200 square feet of concrete surface. If the concrete is dry or becomes dry, the Contractor shall thoroughly wet it with water applied as a fog spray by means of approved equipment.

The application of liquid membrane shall be accomplished by the use of power applied spray equipment using nozzles and other equipment recommended by the liquid membrane producer. Manually pressurized or manual pump-up type sprayers shall not be used to apply the first application of liquid membrane.

As a visual guide, the color of concrete covered with the required amount of liquid membrane should be indistinguishable from a sheet of commercially available standard "letter" size white copier paper placed on top of it when viewed from a distance of about five feet (5') away horizontally if standing on the same grade as the concrete. The appearance of the concrete does not supersede applying the minimum spreading rate.

The coating shall be protected against marring for at least seven (7) days after the application of the curing compound. The coating on bridge decks shall receive extra attention and may require additional protection as required by the Engineer. All membrane marred or otherwise disturbed shall be given an additional coating. Manually pressurized or manual pump-up type sprayers may be used for giving marred areas the required additional application of liquid membrane. Should the surface coating be subjected repeatedly to injury, the Engineer may require that the water curing method be applied at once.

The 7-day period during which the liquid membrane is applied and protected shall not be reduced even if the period of wet curing is extended past the required 14 days.

907-804.03.17.1.2.1--Liquid Membrane Documentation. The Contractor shall make available to the Engineer an application rate verification method and any information necessary during application of the liquid membrane to verify that the rate of application meets the prescribed rate for the various surfaces of the concrete, including, but not limited to, the top surface of the bridge deck and exposed sides of the bridge deck after any forms are removed. The Contractor shall submit this application verification method to the Engineer in accordance with Subsection 907-804.02.12.1.1.

One method of verifying the rate of application is as follows:

1. Determine the volume of liquid membrane in the container. For a container with a uniform cross-sectional area, for example a 55-gallon drum, determine the area of the cross-section. Determine the height of the surface of the liquid membrane from the bottom of the container. This may be accomplished by inserting a sufficiently long, clean dip-stick parallel with the axis of the container into the liquid membrane until the inserted end of the dip-stick contacts the bottom of the container. On removing the dip-stick, measure the length from the end which was inserted to the point on the dip-stick where the liquid membrane ceases to coat the dip-stick. Multiply the area of the cross-section by the height of the level of liquid membrane, maintaining consistent units, to determine the volume.
2. Perform step 1 prior to beginning applying the liquid membrane to establish the initial volume.
3. During the period of application, perform step 1 each 100 square feet of bridge deck.
4. In order to meet the required application rate of one (1) gallon per 200 square feet, the amount in the container shall be at least 0.5 gallon less than the previous volume in the previous 100 square feet. Other changes in volume may apply depending on the manufacturer's recommended application rate.
5. Additional applications to an area shall be applied until the required rate is satisfied. Areas which are not visually satisfactory to the Engineer shall have additional liquid membrane applied as directed by the Engineer.

The amount of liquid membrane applied shall be determined each day using the application verification method. This information shall be submitted to the Engineer within 24 hours of applying the liquid membrane.

907-804.03.17.2--Liquid Membrane Method. All surfaces on which curing is to be by liquid membrane shall be given the required surface finish prior to the application of liquid membrane. Concrete surfaces cured by liquid membrane shall receive two applications of white liquid membrane. Neither application shall be made from a position supported by or in contact with the freshly placed concrete. Both applications shall be applied perpendicularly to the surface of the concrete.

When using liquid membrane, the liquid membrane shall be thoroughly mixed within the time recommended by the liquid membrane producer but no more than an hour before use. If the use of liquid membrane results in a streaked or blotched appearance, the method shall be stopped and water curing applied until the cause of defective appearance is corrected.

The application of liquid membrane shall accomplished by the use of power applied spray equipment using nozzles and other equipment recommended by the liquid membrane producer. Manually pressurized or manual pump-up type sprayers shall not be used to apply the first two applications of liquid membrane.

The liquid membrane shall be applied when no free water remains on the surface but while the surface is still wet. The liquid membrane shall be applied according to the manufacturer's instructions with a minimum spreading rate per coat of one (1) gallon per 200 square feet of concrete surface. If the concrete is dry or becomes dry, the Contractor shall thoroughly wet it with water applied as a fog spray by means of approved equipment.

The first application of the liquid membrane shall be made as the work progresses. For bridge decks, the first application shall be completed in each area of the deck, including the area in which the bridge railing will be later constructed, within 20 minutes of initial strike-off for bridges with no skew and within 25 minutes of initial strike-off for bridges with skew. For all other concrete, the first application of the liquid membrane shall be completed within 20 minutes of finishing.

The second application shall be applied within 30 minutes after the first application. The liquid membrane shall be uniformly applied to all exposed concrete surfaces.

As a visual guide, the color of concrete covered with the required amount of liquid membrane should be indistinguishable from a sheet of commercially available standard "letter" size white copier paper placed on top of it when viewed from a distance of about five feet (5') away horizontally if standing on the same grade as the concrete. The appearance of the concrete does not supersede applying the minimum spreading rate.

The Contractor shall make available to the Engineer an application rate verification in accordance with Subsection 907-804.03.17.1.2.1.

The coating shall be protected against marring for at least 10 days after the application of the curing compound. The coating on bridge decks shall receive extra attention and may require additional protection as required by the Engineer. All membrane marred or otherwise disturbed shall be given an additional coating. Manually pressurized or manual pump-up type sprayers may be used for giving marred areas the required additional application of liquid membrane. Should the surface coating be subjected repeatedly to injury, the Engineer may require that the water curing method be applied at once.

After the specified time for curing, but prior to constructing the bridge railing, all liquid membrane shall be removed from both the exposed surfaces of the reinforcing steel and the concrete surfaces on which bridge rail will be constructed. This removal of liquid membrane may be accomplish by high pressure washing or other methods approved by the Engineer.

907-804.03.18--Expansion and Fixed Joints, Bearings, Anchor Bolts, Plates, Castings, Pipes, Drains, Conduits, Etc. All joints shall be constructed according to details shown on the plans. The edges of the concrete at open or filled joints shall be chamfered or edged as indicated on the plans.

907-804.03.18.1--Open Joints. Open joints shall be placed in the locations shown on the plans and shall be constructed by the insertion and subsequent removal of a wood strip, metal plate, or other approved material. The insertion and removal of the template shall be accomplished without chipping or breaking the corners of the concrete. Reinforcement shall not extend across an open joint unless so specified on the plans.

907-804.03.18.2--Filled Joints. Poured expansion joints and joints to be sealed with premolded materials shall be constructed similar to open joints. When premolded types are specified, the filler shall be placed in correct position as the concrete on one side of the joint is placed. When

the form is removed, the concrete on the other side shall be placed. Adequate water stops of metal, rubber, or plastic shall be carefully placed as shown on the plans.

907-804.03.18.3--Premolded and Preformed Joint Seals. When preformed elastomeric compressive joint seals are specified, the previously formed and cured open joint shall be thoroughly cleaned of all foreign matter, the required adhesive uniformly applied, and the seal installed in accordance with the recommendations of the manufacturer of the seal.

When premolded filler is used for the joints in the roadway slab, the tops shall be adequately sealed with poured joint filler in accordance with details on the plans. Premolded filler shall be permanently fastened to an adjacent concrete surface by appropriate use of copper wire, copper nails, or galvanized nails.

907-804.03.18.4--Steel Joints. The plates, angles, or other structural shapes shall be accurately shaped at the shop to conform to the section of the concrete floor. Fabrication and painting shall conform to the specifications covering those items. When called for on the plans or in the special provisions, the material shall be galvanized in lieu of painting. Care shall be taken to ensure that the surface in the finished plane is true and free of warping. Positive methods shall be employed in placing the joints to keep them in correct position during the placing of the concrete. The opening at expansion joints shall be that designated on the plans at normal temperature, and care shall be taken to avoid impairment of the clearance in any manner.

907-804.03.18.5--Water Stops. Adequate water stops of metal, rubber, or plastic shall be placed as shown on the plans. Where movement at the joint is provided for, the water stops shall be of a type permitting movement without injury. They shall be spliced, welded, or soldered to form continuous watertight joints.

907-804.03.18.6--Bearing Devices. Bearing plates, rockers, and other bearing devices shall be constructed according to details shown on the plans. Unless otherwise specified or set in plastic concrete, they shall be set in grout to insure uniform bearing. Structural steel and painting shall conform to the requirements of Sections 810 and 814. When specified, the material shall be galvanized in lieu of painting. The rockers or other expansion bearing devices shall be set, considering the temperature at the time of erection, so that the required position of the device is provided.

At all points of bearing contact, concrete members shall be separated from underlying members by dimensioned bearing pads or by methods and/or materials specified on the plans.

When not otherwise specifically provided, contact areas between concrete super-structures and substructures shall be separated by three layers of No. 15, Type I, roofing felt.

907-804.03.18.7--Friction Joints. Metal friction joints shall consist of plates as indicated on the plans and shall be securely anchored in correct position. All sliding surfaces shall be thoroughly coated with an approved graphite grease. Movement shall not be impeded by the concrete in which the plates are embedded.

907-804.03.18.8--Placing Anchor Bolts, Plates, Castings, Grillage, Conduits, Etc. All anchor bolts, plates, castings, grillage, conduits, etc. indicated on the plans to be placed in or on the concrete shall be placed, set, or embedded as indicated or as directed. These items of the construction shall be set in portland cement mortar as referenced in Subsection 714.11.5, except that anchor bolts may, as permitted by the Engineer, be built into the masonry, set in drilled holes, or placed as the concrete is being constructed by inserting encasing pipe or oiled wooden forms of sufficient size to allow for adjustment of the bolts. After removal of the pipe or forms, the space around the bolts shall be filled with portland cement mortar completely filling the holes. The bolt shall be set accurately and perpendicular to the plane of the seat.

Anchor bolts which are to be set in the masonry prior to the erection of the superstructure shall be carefully set to proper location and elevation with a template or by other suitable means.

When bed plates are set in mortar, no superstructure or other load shall be placed thereon until this mortar has been allowed to set for a period of at least 96 hours, subject to the restrictions for cold weather concreting in Subsection 907-804.03.16.1. The mortar shall be kept well moistened during this period.

Weep hole drains shall be installed in abutments and retaining walls, and roadway drains or scuppers shall be installed in the roadway slabs in accordance with the details shown on the plans.

Where backfill is to be made at weep holes or openings in the structure, sand or stone chimneys or French drains shall be constructed as specified and shall extend through the portion of the backfill to be drained. Except as otherwise provided, the sand, stone, or slag used in this construction shall meet the requirements of Subsection 704.04.

907-804.03.19--Finishing Concrete Surfaces.

804.03.19.1--Classes of Finishes. Surface finishes of exposed concrete surfaces shall be classified as follows:

Class 1 - Ordinary Surface Finish
Class 2 - Rubbed or spray Finish
Class 3 - Tooled Finish
Class 4 - Sand-Blast Finish
Class 5 - Wirebrush or Scrubbed Finish
Class 6 - Floated Surface Finish

907-804.03.19.2--Class 1, Ordinary Surface Finish. Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed or not to be waterproofed. On all surfaces, the cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges, and other defects shall be thoroughly cleaned, and after having been kept saturated with water for at least three hours shall be carefully pointed and trued with a mortar of cement and fine aggregate mixed in the proportions used in the class of the concrete being finished. Mortar used in pointing shall be not more than one hour old. The mortar patches shall be cured as specified under Subsection 907-804.03.17. All

construction and expansion joints shall be left carefully tooled and free of mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

The resulting surfaces shall be true and uniform. All surfaces which cannot be repaired to the satisfaction of the Engineer shall be given a Class 2 rubbed finish.

907-804.03.19.3--Class 2, Rubbed or Spray Finish.

907-804.03.19.3.1--Rubbed Finish. After removal of forms, the Class 1 finish shall be completed and the rubbing of concrete shall be started as soon as its condition will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water for at least three hours. Surfaces shall be rubbed with a medium course Carborundum stone using a small amount of mortar on its face. The mortar shall be composed of cement and sand mixed in the proportions used in the concrete being finished. Rubbing shall be continued until all form marks, projections, and irregularities have been removed, all voids are filled, and a uniform surface has been obtained. The paste produced by this rubbing shall be left in place at this time.

After all concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine Carborundum stone and water. This rubbing shall continue until the entire surface is of a smooth texture and uniform color.

After the final rubbing is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and objectionable marks.

907-804.03.19.3.2--Spray Finish. Prior to the spray finish, the concrete shall be given a Class 1 finish in accordance with Subsection 907-804.03.19.2, supplemented if necessary with a grout meeting the requirements of Subsection 714.11 with fine aggregate modified to require 100 percent passing the No. 16 Sieve.

Grout shall be applied with burlap pads or float sponges, and as soon as the grout has dried the surface shall be brushed to remove all loose grout and the surface left smooth and free of air holes. Surfaces to be sprayed shall be free of efflorescence, flaking coatings, dirt, oil, and other foreign substances. Prior to application of the spray finish, the surfaces shall be free of moisture, as determined by sight and touch, and in a condition consistent with the manufacturer's published recommendations.

The spray finish material shall meet the requirements of Subsection 714.12 and shall be listed on of Approved Sources of Materials. The spray finish shall be applied with heavy duty spray equipment capable of maintaining a constant pressure as necessary for proper application. The material shall be applied as recommended by the manufacturer except the rate of application shall not be less than one gallon per 50 square feet of surface area without prior written approval of the Engineer.

The completed finish shall be tightly bonded to the structure and present a uniform appearance and texture equal to or better than a rubbed finish. If necessary, additional coats shall be sprayed to produce the desired surface texture and uniformity. Upon failure to adhere positively to the

structure without chipping or cracking or to attain the desired surface appearance, the coatings shall be completely removed and the surface given a rubbed finish in accordance with 907-804.03.19.3.1, or other approved methods shall be used to obtain the desired surface finish to the satisfaction of the Engineer without additional cost to the State.

907-804.03.19.4--Classes 3, 4, and 5 Finishes. If required, specifications for these finishes will be contained in the special provisions.

907-804.03.19.5--Class 6, Floated Surface Finish. After the concrete has been deposited in place, it shall be consolidated and the surface shall be struck off by means of a strike board and floated with a wooden or cork float. An edging tool shall be used on edges and expansion joints. The surface shall not vary more than 1/8 inch under a 10-foot straightedge. The surface shall have a granular or matte texture which will not be slick when wet.

907-804.03.19.6--Required Finishes for Various Surfaces.

907-804.03.19.6.1--General. Unless otherwise specified, the top surface of sidewalks, the top horizontal surfaces of footings, and top slabs of box bridges, box culverts, or other structures shall be given a Class 6 finish. All formed concrete surfaces shall be given a Class 1 finish, except on surfaces which are completely enclosed, such as the inside surfaces of cells of box girders, the removal of fins and form marks and the rubbing of mortared surfaces to a uniform color will not be required.

In reference to finishing, exposed surfaces are surfaces or faces which may be seen after all backfill has been placed. Exposed surfaces requiring a Class 2 finish shall be finished at least one foot below the ground line or the low water elevation, whichever is higher.

The Class 2 finish shall be made upon a Class 1 finish. After the removal of forms the Class 1 finish shall be completed and the rubbing of concrete shall be started as soon as the condition of the concrete will permit.

Bridge floors shall be finished in accordance with Subsection 907-804.03.19.7.

907-804.03.19.6.2--Finishing Formed Concrete Surfaces of Box Bridges, Box Culverts, Pipe Headwalls, and Minor Structures. The exposed surfaces of wing walls and parapets of box bridges and box culverts to be used as vehicular or pedestrian underpasses shall be given a Class 2 finish. Exposed surfaces of other box culverts or box bridges, pipe culvert headwalls, and other minor structures shall be given a Class 1 finish unless otherwise indicated on the plans.

The exposed surfaces of retaining walls including copings and parapets shall receive a Class 2 finish.

907-804.03.19.6.3--Finishing Formed Concrete Surface of Bridges. All formed concrete bridge surfaces which are exposed shall have a Class 1 or 2 finish as set forth herein unless designated otherwise on the plans.

Bridges with designated surfaces for Class 2 finish are classified as follows:

Group A - Bridges over highways, roads and streets.
Group B - Bridges over waterways and railroads.
Group BB - Twin or adjacent bridges of Group B category.

When a Group B or BB bridge also spans a highway, road or street, exposed concrete surfaces shall be finished in accordance with Group A requirements.

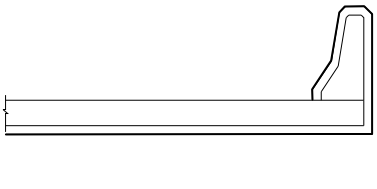
(A) Superstructures. Concrete surfaces to be given a Class 2 finish shall be the exposed surfaces of wings and rails and other exposed surfaces indicated by a double line in Figures 804-1, 804-2, and 804-3.

When a Group B or BB also spans a highway, road or street, the superstructure of spans over and extending one span in each direction beyond the lower level highway, road or street shall be given a Class 2 finish as shown for Group A.

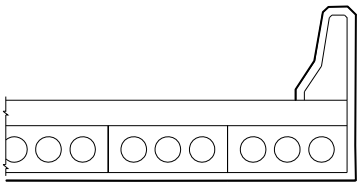
(B) Substructures. Concrete surfaces to be given a Class 2 finish are as follows:

Group A. Exposed surfaces of abutments, end bents, end bent posts, wing walls, railing, retaining walls, parapets, copings, piers, columns, piles, caps, struts or walls between columns or piles, encasement of steel piles, arch rings and spandrel walls.

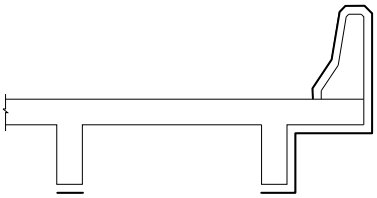
Group B and BB. Exposed surfaces of abutments, wing walls, end bent posts, railing, retaining walls, parapets and copings.



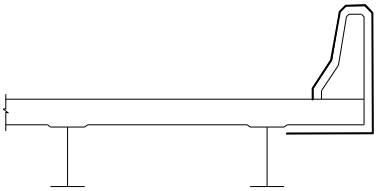
CONCRETE SLAB SPAN & HOLLOW SLAB SPAN



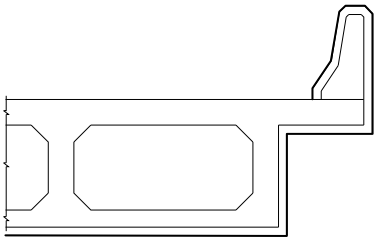
PRECAST HOLLOW SLAB SPAN



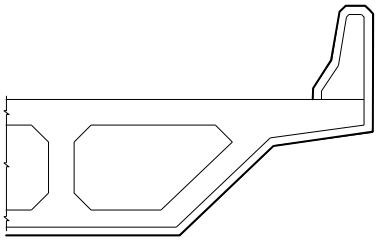
CONCRETE GIRDER SPAN



STEEL BEAM SPAN

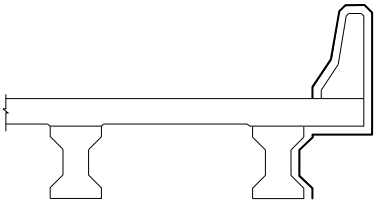


Vertical Face

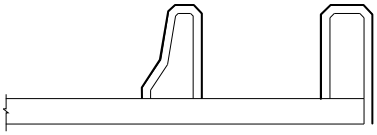


Slope Face

CONCRETE BOX GIRDER SPAN



PRESTRESSED CONCRETE BEAM SPANS



For Finishing On The Remainder Of Superstructure, See The Appropriate Section On This Page.

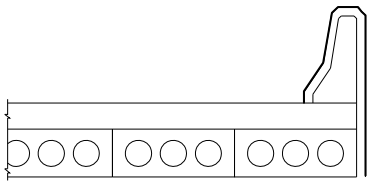
TYPICAL SIDEWALK SECTION

GROUP "A"

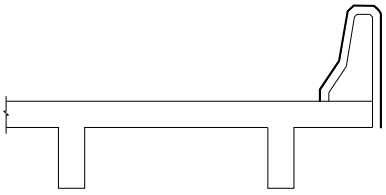
BRIDGES OVER HIGHWAYS, ROADS & STREETS

CLASS 2 FINISH - BRIDGE SUPERSTRUCTURES - FIG. 804-1

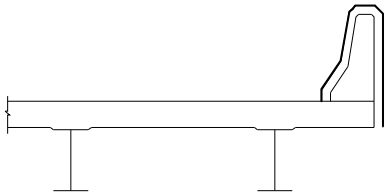
CONCRETE SLAB SPAN & HOLLOW SLAB SPAN



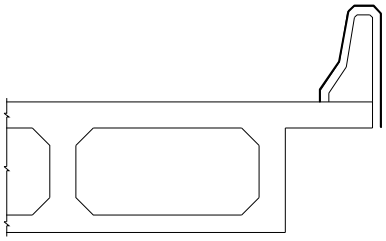
PRECAST HOLLOW SLAB SPAN



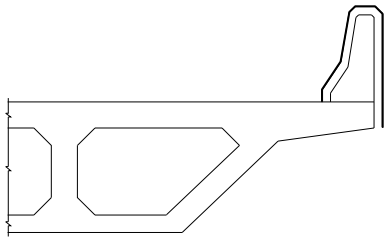
CONCRETE GIRDER SPAN



STEEL BEAM SPAN

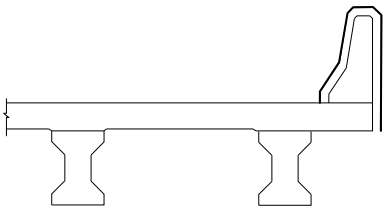


Vertical Face

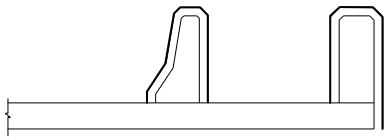


Slope Face

CONCRETE BOX GIRDER SPAN



PRESTRESSED CONCRETE BEAM SPANS



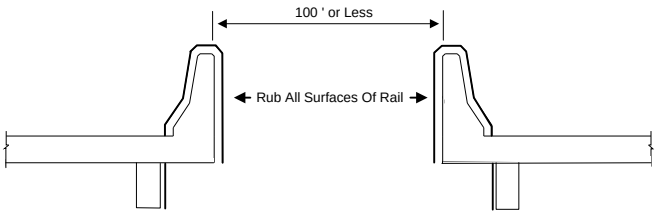
For Finishing On The Remainder Of Superstructure, See The Appropriate Section On This Page.

TYPICAL SIDEWALK SECTION

GROUP "B"

BRIDGES OVER WATERWAYS AND BRIDGES OVER RAILROAD TRACKS

CLASS 2 FINISH - BRIDGE SUPERSTRUCTURES - FIG. 804-2



GROUP "B B" - ADJACENT BRIDGES

GROUP "B B"

TWIN or DUAL BRIDGES

CLASS 2 FINISH - BRIDGE SUPERSTRUCTURES - FIG. 804-3

907-804.03.19.7--Finishing Bridge Decks.

907-804.03.19.7.1--General. Concrete bridge decks shall be struck off and finished by the method(s) designated on the plans.

In the event a method is not designated, the Contractor may use either the longitudinal or transverse method subject to the requirements contained in these specifications.

Except when indicated otherwise on the plans, the finish of the bridge deck shall be either a belt finish, a broom finish, or one of the following drag methods: pan, double pan, burlap, or pan and burlap. Manual finishing of the bridge deck shall be performed only in areas inaccessible by the finishing equipment mounted to the strike-off screed, but shall not hinder the requirements for curing in accordance with Subsection 907-804.03.17.1. The surface texture specified and surface requirements shall be in accordance with the applicable requirements of Subsections 501.03.17 and 501.03.18 modified only as the Engineer deems necessary for bridge deck construction operations.

At no time shall water on the surface of the concrete from bleeding, fogging, curing, or other sources be worked into the concrete or used as an aid for finishing.

Regardless of the method of finishing selected, requirements for curing per Subsection 907-804.03.17 shall be completed within the specified time limits. If the requirements in Subsection 907-804.03.17 are not completed within the specific time limits, the Contractor shall cease operations, revise his operations up to and including acquiring new or additional equipment or additional personnel in order to satisfy the requirements in Subsection 907-804.03.17, and, on approval from the Engineer, resume operations

907-804.03.19.7.2--Longitudinal Method. The longitudinal method may be used for repairs to bridge decks or bridge widening projects. For bridge widening projects, curing in accordance with Subsections 907-804.03.17 shall be completed within 30 minutes of initial strike-off for bridges without skew and within 35 minutes of initial strike-off for bridges with skew.

The longitudinal method requires that the strike-off screed be supported on accurately graded and supported bulkheads or templates placed across the full width at the end(s) of the pour. Before the concrete is placed, approved fixed templates or wooden bulkheads of not less than 1¼-inch lumber shall be placed perpendicular to the centerline of the roadway, or in the case of skew bridges at the angle of skew. At least one dry run shall be made the length of each pour with a "tell-tale" device attached to the screed to assure the specified clearance to the reinforcing steel. The upper surface of the template or bulkheads shall be accurately set to conform to the required grade and crown.

Special attention shall be given to the gutter lines where the strike-off screed cannot reach. The gutters shall be finished by hand and tested with the straight edge. Floor drains shall be set lower than the finished gutter line and finished over. After initial set, the concrete shall be dished out and finished around the drains to form an outlet.

After the concrete has been deposited and rough graded, it shall be struck off by means of a strike-off screed resting on the bulkheads or fixed templates. The strike-off screed shall be of a type satisfactory to the Engineer and shall have sufficient strength to retain its shape under all working conditions. The final surface shall comply with the applicable requirements of Subsections 501.03.17.6 and 501.03.18, and unless otherwise specified in the contract, the final finish under this method shall be the belt finish.

In general, the overall strike-off screed should be trussed, with bracing heavy enough to support the weight of a man without deflecting, and should be adjustable for camber and correction of sag.

The strike-off screed will ride on the bulkheads or fixed templates at the ends of the section being finished. Care shall be taken to see that the bulkhead or fixed template elevations are accurately set since the entire span surface will be controlled by them. The manipulation of the screed shall be such that neither end is raised from the bulkheads or templates during the process.

The concrete shall be struck off by beginning at one curb and proceeding entirely across the span. A slight excess of concrete shall be kept in front of the cutting edge at all times. This operation shall be repeated at least three times. In each case, the strike-off screed shall be picked up and carried back to the point of beginning. No backward strokes will be allowed. The strike-off screed shall be moved along the bulkheads or fixed templates with a combined longitudinal and transverse motion. This operation may be manual or mechanical. Standing or walking in the fresh concrete ahead of the strike-off screed will not be permitted.

907-804.03.19.7.3--Transverse Method. The transverse method requires that the screeding equipment be supported on accurately graded and supported rails placed beyond the gutter lines and parallel with the centerline of the bridge.

The machine shall be so constructed and operated as to produce a bridge deck of uniform density with minimum manipulation of the fresh concrete and achieved in the shortest possible time. Manual transverse methods of screeding will not be permitted.

The finishing machine shall be supported on vertically adjustable rails set a sufficient distance from the gutter line to allow free movement of the screed from gutter line to gutter line. Satisfactory means of load distribution with minimum rail deflection shall be provided. The screed rails for a deck pour shall be completely in place for the full length of the pour and shall be firmly secured prior to placing concrete. The screed rails shall be adjusted as necessary to compensate for settlement and deflection occurring during the screeding operations. Supports for the screed rail shall be located directly over slab overhang support brackets as referenced in Subsection 907-804.03.14.1.

At least one dry run shall be made the length of each pour with a "tell-tale" device attached to the screed carriage to assure the specified clearance to the reinforcing steel.

The screed shall be equipped with a metal cutting edge or other approved mechanical means for accurately fine grading the plastic concrete to the required grade and surface smoothness and shall be supported by a bridging structure sufficiently rigid and heavy to perform operations

satisfactorily on concrete of minimum slump without vibration, distortion, and wrecking of forms. The screed shall be mechanically actuated to deliver the screeding action and for travel in a longitudinal direction at a uniform rate along the bridge deck.

The screed shall complete sufficient passes to strike off all of the excess concrete with ample mortar along the entire leading edge to assure filling of low spots. Care shall be taken to remove all objectionable material from the gutters where final hand finishing will be required.

The selection of the transverse method may require the Contractor to furnish bridge deck concrete which contains an approved water-reducing set-retarding admixture in the quantities approved by the Engineer at no additional cost to the State. See Subsection 713.02 for more information.

Other finishing requirements shall be in accordance with the general requirements in Subsection 907-804.03.19.7.1 and as specified on the plans.

907-804.03.19.7.4--Acceptance Procedure for Bridge Deck Smoothness. After the bridge decks and bridge end slabs are completed and preferably before the construction of the bridge railing, they shall be tested for ride quality using a Contractor furnished profilograph. Profile Index Values shall be determined in accordance with Department SOPs and these specifications. The profilograph shall meet the requirements of Subsection 907-804.03.19.7.5. Profiles will be obtained in the wheel paths of the main thru lanes and, where conditions allow, in the wheel paths of any auxiliary lanes or tapers. Profile Index Values for bridge decks and bridge end slabs shall be obtained for all state roads with four lanes or more, on state roads three lanes or less where the current traffic count is 2000 ADT or higher, or as designated on the plans. Ride quality tests will begin at a point where the rearmost wheel of the profilograph is as close to the beginning of the bridge end slab as possible and shall proceed forward across the remainder of the bridge end slab, across the bridge deck and continue across the next bridge end slab to a point where the front-most wheel of the profilograph reaches the far-most edge of the bridge end slab. Bridges and bridge end slabs not requiring a ride quality test must meet a 1/8 inch in 10-foot straightedge requirement in longitudinal and transverse directions. Bridges in horizontal curves having a radius of less than 1000 feet at the centerline and bridges within the superelevation transition of such curves are excluded from a test with the profilograph.

The Profile Index Value for bridge decks including the bridge end slabs shall be averaged for the left and right wheel path for each lane and where applicable, each auxiliary lane and taper, and shall not exceed 65 inches per mile for each lane. 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. In addition, individual bumps or depressions exceeding 0.3 of an inch, when measured from a chord length of 25 feet, shall be corrected and the surface shall meet a 1/8 inch in 10-foot straightedge check made transversely across the deck or slab.

Bridge decks and bridge end slabs not meeting the preceding requirements shall be corrected. Corrective work shall be done at no additional cost to the Department. Corrective work shall consist of grinding the bridge deck in accordance with this specification. All corrective work shall precede final surface texturing. After completion of final surface texturing, all surface areas

corrected by grinding shall be sealed with a nonstaining 40% minimum alkylalkoxysilane penetrating sealant applied per the manufacturer's directions.

In case the bridge end slabs are to be constructed on a future project, the bridge deck(s) alone shall be tested for ride quality using the acceptance procedure outlined above, except that the ride quality test will begin at a point where the rearmost wheel of the profilograph is as close to the beginning of the bridge as possible and shall proceed forward across the bridge deck to a point where the front-most wheel of the profilograph reaches the far-most edge of the bridge.

Expansion joint installation shall be delayed and the joint temporarily bridged to facilitate operation of the profilograph and grinding equipment across the joint wherever feasible.

It shall be the Contractor's responsibility to schedule profilograph testing. The Contractor shall notify the Department at least five (5) days in advance of profilograph testing. The Contractor shall ensure that the area to be tested has been cleaned and cleared of all obstructions. Profilograph testing of bridge decks and bridge end slabs shall be performed by the Contractor under supervision of the Engineer. All profilograph testing shall be performed at no additional cost to the Department. The Contractor will be responsible for traffic control associated with this testing operation.

907-804.03.19.7.4.1--Grinding Bridge Decks.

907-804.03.19.7.4.1.1--Equipment. The grinding equipment shall be a power driven, self-propelled machine that is specifically designed to smooth and texture portland cement concrete pavement with diamond blades. The effective wheel base of the machine shall not be less than 12.0 feet. It shall have a set of pivoting tandem bogey wheels at the front of the machine and the rear wheels shall be arranged to travel in the track of the fresh cut pavement. The center of the grinding head shall be no further than 3.0 feet forward from the center of the back wheels.

The equipment shall be of a size that will cut or plane at least 3.0 feet wide. It shall also be of a shape and dimension that does not encroach on traffic movement outside of the work area. The equipment shall be capable of grinding the surface without causing spalls at cracks, joints, or other locations.

907-804.03.19.7.4.1.2--Grinding. The grinding areas will be determined by the Contractor and approved by the Engineer. The Contractor shall develop and submit to the Engineer for approval a Grinding Plan. The Contractor shall allow up to 45 days for the Department to review the Plan prior to starting any grinding operations. This plan shall include as a minimum:

1) Name of the project superintendent in responsible charge of the grinding operation.
2) List and description of all equipment to be used.
3) Maximum depth of each pass allowed by the grinding equipment.
4) Maximum width of each pass allowed by the grinding equipment.
5) Details of a sequence of the grinding operation.
6) Complete data from Profilograph runs, based on a 0.3 inch bump height, for each wheel path over the entire bridge including bridge end slabs, which shall include profile index,

bump locations (in stations), bump heights and proposed final cross-slopes. When a computerized profilograph is used, a complete printout of the profile including the header information for each wheel path will be required.

7) Data showing reinforcing steel clearance in all areas to be ground.
8) A detailed drawing of the deck showing areas to be ground with station numbers and grinding depths clearly indicated.
9) A description of grinding in areas where drains are in conflict with grind areas.
10) Details of any changes in deck drainage, anticipated ponding, etc.

The Engineer will evaluate the grinding plan for conformance with the plans and specifications, after which the Engineer will notify the Contractor of any additional information required and/or changes that may be needed. Any part of the plan that is unacceptable will be rejected and the Contractor shall submit changes for reevaluation. All approvals given by the Engineer shall be subject to trial and satisfactory performance in the field, and shall not relieve the Contractor of the responsibility to satisfactorily complete the work.

The construction operation shall be scheduled and proceed in a manner that produces a uniform finished surface. Grinding will be accomplished in a manner that eliminates joint or crack faults while providing positive lateral drainage by maintaining a constant cross-slope between grinding extremities in each lane. Auxiliary or ramp lane grinding shall transition as required from the mainline edge to provide positive drainage and acceptable riding surface.

The operation shall result in a finished surface that conforms as close as possible to the typical cross-section and the requirements specified in Subsection 907-804.03.19.7.4.1.3.

The Contractor shall establish positive means for removal of grinding residue. Residue shall not be permitted to flow across lanes used by public traffic or into gutters or drainage facilities.

907-804.03.19.7.4.1.3--Final Surface Texture. The grinding process shall produce a finish surface that is as close as possible to grade and uniform in appearance with a longitudinal line type texture. The line type texture shall contain parallel longitudinal corrugations that present a narrow ridge corduroy type appearance. The peaks of the ridges shall be approximately 1/16 inch higher than the bottoms of the grooves with approximately 53 to 57 evenly spaced grooves per foot. Grinding chip thickness shall be a minimum of 0.080 inches thick.

The finished bridge decks and bridge end slabs shall be retested for riding quality using a Contractor furnished profilograph meeting the requirements of Subsection 907-804.03.19.7.5. The finished results shall meet the following conditions:

(a) Individual bumps or depressions shall not exceed 0.3 inches when measured from a chord length of 25 feet.
(b) The final index value for the bridge deck and bridge end slabs shall be an average of both the right and left wheel paths of each lane and shall not exceed 65 inches per mile.

The final profilogram will be furnished to the Engineer for informational purposes.

907-804.03.19.7.5--Profilograph Requirements. The smoothness of the bridge deck will be determined by using a California Profilograph to produce a profilogram (profile trace) at each designated location. The surface shall be tested and corrected to a smoothness index as described herein with the exception of those locations or specific projects that are excluded from a smoothness test with the profilograph.

The profilograph, furnished and operated by the Contractor under supervision of the Engineer, shall consist of a frame at least 25 feet in length supported upon multiple wheels having no common axle. The wheels shall be arranged in a staggered pattern so that no two wheels will simultaneously cross the same bump. A profile is to be recorded from the vertical movement of a sensing mechanism. This profile is in reference to the mean elevation of the contact points established by the support wheels. The sensing mechanism, located at the mid-frame, may consist of a single bicycle-type wheel or a dual-wheel assembly consisting of either a bicycle-type (pneumatic tire) or solid rubber tire vertical sensing wheel and a separate bicycle-type (pneumatic tire) longitudinal sensing wheel. The wheel(s) shall be of such circumference(s) to produce a profilogram recorded on a scale of one (1) inch equal to 25 feet longitudinally and one (1) inch equal to one (1) inch (full scale) vertically. Motive power may be provided manually or by the use of a propulsion unit attached to the center assembly. In operation, the profilograph shall be moved longitudinally along the pavement at a speed no greater than 3 MPH so as to reduce bounce as much as possible. The testing equipment and procedure shall comply with the requirements of Department SOP.

The Contractor may elect to use a computerized version of the profilograph in lieu of the standard profilograph. If the computerized version of the profilograph is used, it shall meet the requirements of Subsection 907-804.03.19.7.5.1.

907-804.03.19.7.5.1--Computerized Profilograph.

907-804.03.19.7.5.1.1--General The computerized profilograph, furnished and operated by the Contractor under the supervision of the Engineer, shall be equipped with an on-board computer capable of meeting the following conditions.

Vertical displacement shall be sampled every three (3) inches or less along the bridge deck. The profile data shall be bandpass filtered in the computer to remove all spatial wavelengths shorter than two (2) feet. This shall be accomplished by a third order, low pass Butterworth filter. The resulting band limited profile will then be computer analyzed according to the California Profilograph reduction process to produce the required inches per mile index. This shall be accomplished by fitting a linear regression line to the length of bridge. This corresponds to the perfect placement of the blanking band bar by a human trace reducer. Scallops above and below the blanking band are then detected and totaled according to the California protocol. Bump/Dip analysis shall take place according to the California Profilograph reduction process.

The computerized profilograph shall be capable of producing a plot of the profile and a printout which will give the following data: Stations every twenty five (25) feet, bump/dip height and bump/dip length of specification (3/10 of an inch and 25 feet respectively), the blanking band width, date of measurement, total profile index in inches per mile for the measurement, total length

of the measurement, and the raw inches for each segment.

907-804.03.19.7.5.1.2--Mechanical Requirements. The profilograph shall consist of a frame twenty five (25) feet long supported at each end by multiple wheels. The frame shall be constructed to be easily dismantled for transporting. The profilograph shall be constructed from aluminum, stainless steel and chromed parts. The end support wheels shall be arranged in a staggered pattern such that no two wheels cross a transverse joint at the same time. The relative smoothness shall be measured by the vertical movement of an eight (8) inch or larger diameter sensing wheel at the midpoint of the 25-foot frame. The horizontal distance shall be measured by a twenty (20) inch or larger diameter pneumatic wheel. This profile shall be the mean elevation referenced to the twelve points of contact with the pavement established by the support wheels. Recorded graphical trace of the profile shall be on a scale of one inch equals one inch (full scale) vertical motion of the sensing wheel and one inch equals 25 feet horizontal motion of the profilograph.

907-804.03.19.7.5.1.3--Computer Requirements. The computer shall have the ability to produce output on sight for verification. The computerized output shall indicate the profile index for each specified section of bridge deck. Variable low and high pass third-order Butterworth filtering options shall be available. The printout shall be capable of showing station marks automatically on the output. Blanking band positioning for each specified section of the bridge deck shall be placed according to the least squares fit line of the collected data. Variable bump and dip tests shall be available to show "must correct" locations on the printout. The computer must have the ability to display on screen "must correct" conditions and alert the user with an audible warning when a "must correct" location has been located. The computer must have the ability to store profile data for later reanalysis. The measurement program must be menu driven and PC compatible. User selected options, identification, calibration factors, and time and date stamps shall be printed at the top of each printed report for verification. The control software must be upgradeable. A power source shall be included for each profilograph and be capable of supplying all power needs for a full days testing.

907-804.03.19.8--Finishing Horizontal Surfaces of Footings or Top Slabs of Box Bridges, Culverts, or Other Structures. The finishing of horizontal surfaces of footing or top slabs of box bridges, culverts, or other structures shall be achieved by placing an excess of material in the form and removing or striking off the excess with a template, forcing the coarse aggregate below the mortar surface. After the concrete has been struck off the surface shall be given a Class 6 finish.

907-804.03.19.9--Finishing Exposed Surfaces of Sidewalks. After the concrete has been deposited in place it shall be consolidated and the exposed surface shall be given a Class 6 finish. An edging tool of the required radius shall be used on all edges and at all expansion joints. The surface shall have a granular texture which will not be slick when wet.

Sidewalk surfaces shall be laid out in blocks with an approved grooving tool as shown on the plans or as directed.

907-804.03.20--Opening Bridges.

907-804.03.20.1--Public Traffic. Unless otherwise specified, concrete bridge decks shall be closed to public highway traffic for a period of at least 21 days after placing concrete.

907-804.03.20.2--Construction Traffic. Unless otherwise specified, concrete bridge decks shall be closed to construction traffic for the time required for curing in Subsection 907-804.03.17 and the minimum required compressive strength for the concrete placed is obtained.

907-804.03.21--Final Cleanup. Upon completion of the work all equipment, surplus materials, forms, and waste material shall be removed, the bridge cleaned, and the site of the work given a final cleanup.

907-804.03.22--Precast-Prestressed Concrete Bridge Members.

907-804.03.22.1--General. All installations and plants for the manufacture of precast-prestressed bridge members shall be PCI (Precast / Prestressed Concrete Institute) Certified. Bridge members manufactured in plants or installations not so approved will not be accepted for use in the work. The Contractor or other manufacturer shall employ a technician skilled in the adopted system of prestressing to supervise the manufacturing operations. This technician shall be certified according to the guidelines of this specification. The Contractor shall develop and implement a Quality Control Program as per Division I of PCI Quality Control Manual, 4th Edition. The Quality Control Program shall be submitted to the District Materials Engineer for approval.

907-804.03.22.2--Stressing Requirements. The jacks for stressing shall be equipped with accurate calibrated gauges for registering the jacking pressure. Means shall be provided for measuring elongation of strands to at least the nearest 1/16 inch.

Prior to beginning work, the Contractor or manufacturer shall have all jacks to be used, together with their gauges, calibrated by an approved laboratory. All jacks and gauges shall have an accuracy of reading within two percent. The testing agency shall furnish the Engineer a statement certifying that the jacks and gauges meet this requirement. During the progress of the work, if a gauge appears to be giving erratic results or if the gauge pressure and elongations indicate materially differing stresses, recalibration will be required.

Calibration of jacks and gauges shall be repeated at intervals deemed necessary by the Engineer. These intervals for calibration shall not exceed one year.

Shop drawings of prestressed beams, including an erection plan, shall be submitted in duplicate to the Bridge Engineer for approval prior to manufacture of members.

907-804.03.22.2.1--Methods. Plans for the particular bridge members will show prestressing by one of the following methods:

(A) Pretensioning. The prestressing strands are stressed initially. After the concrete is placed, cured, and has attained the compressive strength shown on the plans, the stress is transferred to the member. The method used for pretensions shall be in accordance to Division V of PCI Quality Control Manual, 4th Edition.

(B) Posttensioning. The posttensioning tendons are installed in voids or ducts and are stressed and anchored after development of the compressive strength specified on the plans. The voids or ducts are then pressure grouted.

(C) Combined Method. Part of the reinforcing is pretensioned and part posttensioned. Under this method all applicable requirements for the two methods specified shall apply to the respective stressing elements being used.

907-804.03.22.2.2--Alternate Details for Prestressed Members. In the event that the Contractor / Manufacturer desires to use materials or methods that differ in any respect from those shown on the plans or described in these specifications, the Contractor shall submit for approval full plan details on acceptable tracings suitable for reproduction and specifications which shall become the property of the Department. In order for alternate materials and/or methods to be considered, they will be required to comply fully with the following:

A. Provisions equal to those stipulated in these specifications.
B. Current AASHTO Specifications.
C. Recommendations of materials manufacturer.
D. Camber tolerance of beams and spans shown on plans.

Note: Alternate materials and methods will not be authorized on Federal-Aid Projects.

The Engineer shall be the sole judge as to the adequacy and propriety of any variation of materials or methods.

907-804.03.22.2.3--Stressing Procedure.

(A) General. Stressing shall be performed by suitable jacks working against unyielding anchorages and capable of maintaining the required stress for an indefinite period without movement or yielding. Strands may be stressed singularly or in a group.

The tension to be applied to each strand shall be as shown on the plans. The tension shall be measured by both jacking gauges and elongations in the strands and the result shall check within close limits.

It is anticipated that there will possibly be a difference in indicated tension between jack pressure and elongation of about five (5) percent. In this event, the discrepancy shall be placed on the side of slight overstress rather than understress.

In the event of an apparent discrepancy between gauge pressure and elongation of as much as five (5) percent, the entire operation shall be carefully checked, and the source of error determined before proceeding further.

Elongation is to be measured after the strands have been suitably anchored, and all possible slippage at the anchorages has been eliminated.

In all stressing operations, the stressing force shall be kept as nearly symmetrical about the vertical axis of the member as practicable.

(B) Pretensioning. All strands to be prestressed shall be brought to a uniform initial tension prior to being given their full pretensioning. This uniform initial tension of approximately 1000 to 2000 pounds shall be measured by suitable means such as a dynamometer so that its value can be used as a check against elongation computed and measured.

After the initial tensioning, the strand or group shall be stressed until the required elongation and jacking pressure is within the limits specified.

When the strands are stressed in accordance with the plan requirements and these specifications and all other reinforcing is in place, the concrete shall be placed in the prepared forms.

Strand stress shall be maintained until the concrete between anchorages has attained the required compressive strength as determined by cylinder tests, after which the strands shall be cut off flush with the ends of column members, and cut as shown on the plans for beams, girders, etc. Strands shall be cut or released in such a manner that eccentricity of prestress will be kept to a minimum and no damage to the member will result. The strand cutting pattern shall be as shown on the plans or as approved by the Bridge Engineer.

(C) Posttensioning. For all posttensioning tendons/bars the anchor plates shall set exactly normal in all directions to the axis of the tendon/bar. Parallel wire anchorage cones shall be recessed within the beams. Tensioning shall not take place until the concrete has reached the compressive strength shown on the plans.

Elongation and jacking pressures shall make appropriate allowance for all possible slippage or relaxation of the anchorage. Posttensioning tendons/bars shall be stressed in the order and manner shown on the plans.

The units shall be tensioned until the required elongations and jacking pressures are attained and reconciled within the limits specified in Subsection 907-804.03.22.2.3(A) with such overstresses as approved by the Engineer for anchorage relaxation.

Independent references shall be established adjacent to each anchorage to indicate any yielding or slippage that may occur between the time of initial stressing and final release of the strands.

Straight tendons/bars may be tensioned from one end. Unless otherwise specified, curved tendons shall be stressed by jacking from both ends of the tendons.

(D) Combined Method. In the event that girders are manufactured with part of the reinforcement pretensioned and part posttensioned, the applicable portions of the requirements listed herein shall apply to each type.

907-804.03.22.3--Manufacture.

907-804.03.22.3.1--Forms. The forms used for precast-prestressed bridge members shall meet the requirements of Division II of the PCI Quality Control Manual, 4th Edition.

907-804.03.22.3.2--Placing and Fastening Steel. Placing and fastening of all steel used for precast-prestressed bridge members shall meet the requirements of Division V of the PCI Quality Control Manual, 4th Edition.

907-804.03.22.3.3--Holes for Prestressing Tendons/Bars. Holes provided in girders for prestressing tendons/bars shall be formed by means of inflatable rubber tubing, flexible metal conduit, metal tubing, or other approved means.

907-804.03.22.4--Placing and Curing Concrete.

907-804.03.22.4.1--Placing. The placing of concrete shall meet the applicable requirements of Division III of PCI Quality Control Manual, 4th Edition.

907-804.03.22.4.2--Curing. Initial and accelerated curing of all members shall meet the applicable requirements of Division IV of PCI Quality Control Manual, 4th Edition except for the following listed requirements.

The source of heat for accelerated cure shall be steam. Calibrated thermocouples shall be implanted into the concrete members to monitor areas expected to have maximum and minimum heat. Curing methods and procedures listed in the prestress producer's PCI Quality System Manual shall be approved by the Department before their implementation.

907-804.03.22.4.3--Removal of Side Forms. Side forms may be removed after the concrete has attained sufficient strength to maintain a true section. In order to obtain "sufficient strength", it may be necessary to cure members for 12 hours or more as prescribed in Subsection 907-804.03.22.4.2, or to attain a minimum compressive strength of 1000 psi.

If high-early-strength concrete is obtained by use of low slump (0 to 1.5-inch) concrete, vacuum process, or other approved methods, side forms may be removed earlier; however, approval of the methods and revision from normal schedules will be made only after inspections by the District Materials Engineer and Materials Division have determined that satisfactory results will be attained by the methods and schedules proposed.

907-804.03.22.4.4--Grouting. The holes through posttensioned members in which the tendons are installed shall be equipped with approved grouting vents. All prestressing tendons to be bonded shall be free of dirt, loose rust, grease, or other deleterious substances. Before grouting, the ducts shall be free of water, dirt, and other foreign substances. The ducts shall be blown out with compressed air until no water comes through the ducts. For long members with draped tendons an open tap at low points may be necessary. After completion of stressing, the annular space between sides of tendon and sides of hole shall be grouted as set in the following paragraphs.

With the grouting vent open at one end of the core hole, grout shall be applied continuously under moderate pressure at the other end until all entrapped air is forced out through the open grout vent, as evidenced by a steady stream of grout at the vent. Whereupon, the open vent shall be closed under pressure. The grouting pressure shall be gradually increased to a refusal of at least 75 psi and held at this pressure for approximately 10 seconds, and the vent shall then be closed under this pressure.

Portland cement grout shall consist of a mixture of:

1	part Type 1 portland cement
1/4	part fly ash
3/4	part washed sand *
4 to 6	gallons of water per bag of cement.

* all passing No. 16 sieve and not more than 5% retained on No. 30

Water-reducing admixtures, subject to approval by the Engineer, shall be used in accordance with the manufacturer's recommendations.

The grout shall be mixed in a mechanical mixer, shall have the consistency of heavy paint, and shall be kept agitated until placed.

Members shall not be moved before the grout has set, ordinarily at least 24 hours at 80°F or higher.

907-804.03.22.5--Finishing and Marking. Units shall be given a Class 1 finish at the plant and shall be given a Class 2 finish after erection when required.

Recesses in girders at end of diaphragm bars, holes left by form ties, and other surface irregularities shall be carefully cleaned and patched with an approved non-shrink commercial grout or a non-shrinkage mortar of the following composition:

1 part Type 1 portland cement
1 1/2 to 2 parts fine sand
1/2 to 3/4 ounces aluminum powder per bag of cement
Approved admixture per Subsection 713.02.
Sufficient water to produce a workable but rather stiff mix.

The units shall be clearly marked in accordance with Department's *Materials Division Inspection, Certification and Testing Manual*.

907-804.03.22.6--Handling, Storage, and Installation. Posttensioned members may be handled immediately after completion of stressing and grout has set. Pretensioned members may be handled immediately after release of tensioning. In either case, the members shall have developed a minimum compressive strength of 4000 psi prior to handling. In the event stressing is not done in a continuous operation, members shall not be handled before they are sufficiently stressed, as determined by the Engineer, to sustain all forces and bending moments due to handling. In the

handling, storage, and transporting of beams or girders, they shall be maintained in an upright position (position as cast) at all times and shall be picked up from points within distance from beam ends equal to beam depth or at pick-up points designated on the plans. Disregard of this requirement and dropping of units may be cause for rejection, whether or not injury to the unit is apparent. Piles shall be picked up and loaded for shipment at points shown by the suspension diagram on the plans. Extreme care shall be used in handling and storing piles to prevent damage. The dropping of a pile may be cause for rejection of same, whether or not there is apparent injury to the member.

Care shall be exercised during the storage, hoisting, and handling of precast units to prevent damage. Damaged units shall be replaced by the Contractor at no additional costs to the State.

When members are stacked for storage, each layer shall be supported at or near the pick-up points. Supports shall be carefully placed in a vertical line in order that the weight of any member will not stress an underlying member. To prevent damage in moving members it is suggested that rigid supports be covered with a cushion of wood or other resilient material.

Members shall not be transported until at least one day after the concrete has reached a compressive strength of 5000 psi or greater strength when shown on the plans.

Piles used in salt water shall not be driven until concrete is seven days old, and air-entrained concrete shall be used in such piles.

After prestressed concrete voided slab units are set, doweled and bolted in their final position the keyways and dowel holes shall be filled with an approved non-shrink grout. Traffic shall not be permitted on the spans for 24 hours after grouting, and heavy construction equipment exceeding 15 tons will not be permitted on the spans for a period of 72 hours after grouting.

Adjacent slab units that mismatch more than one-fourth inch shall be adjusted prior to grouting of the shear keys. The maximum deviation from cross-section and grade (exclusive of camber) at any point shall not exceed one-fourth inch; and when the surface is checked with a ten-foot straightedge applied both parallel and perpendicular to the centerline, the variance shall not exceed one-fourth inch.

In addition to the requirements set out in this section, the applicable requirements of Section 803 shall apply.

907-804.03.22.7--Tolerances for Accepting Precast Prestressed Concrete. Member shall meet the dimension tolerances set by Division VII of PCI Quality Control Manual, 4th Edition.

907-804.03.22.8--Testing of Materials. Concrete and aggregate testing shall meet the requirements of Division VI of PCI Quality Control Manual, 4th Edition, except that the concrete mixture design shall meet the requirements of Subsection 907-804.02.10. Also, in addition to concrete compressive tests samples made for detensioning and 28-day strength, test samples shall be made and tested in order to prove compliance to the requirements of Subsection 907-804.03.22.6 for handling and shipping prestressed members. Compressive strength test cylinders

for detensioning, handling and shipping shall receive the same type curing as the prestressed members for which they represent. Compressive strength samples shall be made each day for each prestress casting bed.

907-804.03.22.9--Testing Personnel. Technicians testing portland cement concrete used in the production of precast-prestressed members shall be PCI Quality Control Technician/Inspector Certified. Each producer of precast-prestressed members shall have at least one PCI Level II certified technician on site during production for Department projects.

907-804.03.22.10--Documentation. The Precast-Prestressed Producer for each precast-prestressed concrete bridge member shall maintain documentation as set forth in the Department's *Materials Division Inspection, Certification and Testing Manual*. Testing and inspection record forms shall be approved by the Central Laboratory and as a minimum contain information listed in Division VI of PCI Quality Control Manual, 4th Edition.

907-804.03.22.11--Use in the Work. Before any precast-prestressed member is incorporated into the work, documentation as described in Subsection 907-804.03.22.10 is required along with visual inspection of the member at the bridge construction site. Project Office personnel as per the Department's *Materials Division Inspection, Certification and Testing Manual* will make visual inspection of the precast-prestressed member at the bridge construction site.

907-804.04--Method of Measurement. Concrete, complete and accepted, will be measured in cubic yards. The concrete volume will be computed from the neat dimensions shown on the plans, except for such variations as may be ordered in writing by the Engineer. The quantity of concrete involved in fillets, scorings, and chamfers one square inch or less in cross-sectional area will be neglected. Deductions shall be made for the following:

(1) The volume of structural steel, including steel piling encased in concrete.
(2) The volume of timber piles encased in concrete, assuming the volume to be 0.80 cubic foot per linear foot of pile.
(3) The volume of concrete piles encased in concrete.

No deduction will be made for the volume of concrete displaced by steel reinforcement, floor drains, or expansion joint material that is one inch or less in width normal to the centerline of the joint. Where railing is bid as a separate item, that portion of the railing above the top of the curb, above the surface of the sidewalk, or above the bridge roadway, as the case may be, will not be included in the measurement of concrete, but will be measured as railing. Massive pylons or posts which are to be excepted from payment for railing and are intended to be measured for as concrete will be so noted on the plans.

When shown on the plans or directed by the Engineer, concrete placed as a seal for cofferdams will be measured by the cubic yard actually in place, except that no measurement will be made of seal concrete placed outside of an area bounded by vertical planes 18 inches outside the neat lines of the footing as shown on the plans or as directed and parallel thereto.

Reinforcing steel will be measured and paid for in pounds as set out in Section 805.

Unless otherwise specified, structural steel will be measured and paid for as set out in Section 810.

Excavation for bridges will be measured and paid for as in Section 801.

Piling will be measured and paid for as set out in Sections 802 and 803.

Railing will be measured and paid for as set out in Section 813.

Prestressed concrete beams and plank will be measured by the linear foot.

Prestressed concrete voided slab units, interior and exterior with railing, and precast concrete caps, intermediate and end cap with winged abutment wall, of the size and type specified will be measured by the unit complete in place and accepted. Railing, winged abutment walls, grout, tie rods, nuts, washers, bearing pads and other appurtenances will not be measured for separate payment.

907-804.05--Basis of Payment. Concrete will be paid for at the contract unit price per cubic yard for the class or classes specified, complete in place. Prestressed concrete beams and plank will be paid for at the contract unit per linear foot of specified size and type.

Prestressed concrete voided slab units and precast caps will be paid for at the contract unit price per each for the specified types and sizes, complete in place and accepted; which price shall be full compensation for furnishing, hauling and erecting the members; including all prestressing reinforcement and other reinforcement in the members. Payment at the contract unit prices bid shall be full compensation for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work.

Payment will be made under:

907-804-A:	Bridge Concrete, Class ____	- per cubic yard
907-804-B:	Box Bridge Concrete, Class ___	- per cubic yard
907-804-C:	Length Prestressed Concrete Beam, Type ___	- per linear foot
907-804-D:	Length Prestressed Concrete Plank	- per linear foot
907-804-E:	Length Prestressed Concrete Voided Slab, Size Interior	- per each
907-804-F:	Length Prestressed Concrete Voided Slab, Size Exterior	- per each
907-804-G:	Length Precast Concrete Caps, End Unit with Wall	- per each
907-804-H:	Length Precast Concrete Caps, Intermediate Unit	- per each

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.

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.

SECTION 905 -- PROPOSAL (CONTINUED)

I (We) hereby certify by execution of the Section 905 proposal below, that all certifications, disclosures and affidavits incorporated herein are deemed to be duly executed in the aggregate, fully enforceable and binding upon delivery of the bid proposal. I (We) further acknowledge that this certification shall not extend to the bid bond or alternate security which must be separately executed for the benefit of the Commission. This signature does not cure deficiencies in any required certifications, disclosures and/or affidavits. I (We) also acknowledge the right of the Commission to require full and final execution on any certification, disclosure or affidavit contained in the proposal at the Commission's election upon award. Failure to so execute at the Commission's request within the time allowed in the Standard Specifications for execution of all contract documents will result in forfeiture of the bid bond or alternate security.

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.

Revised 11/24/2008

Construction of Project Office, Storage Building, and Lot Work, known as State Project Nos. BWO-2209-49(001), BWO-2208-49(001), LWO-2093-49(002) / 502399301, 302, & 303 in Montgomery 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 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
					Building Items				
0010	907-242-A006		1	Lump Sum	Construction of Project Office	XXXXXXX	XXX		
0020	907-242-A006		1	Lump Sum	Construction of Storage Building	XXXXXXX	XXX		
					Lot Work Items				
0030	201-A001		1	Lump Sum	Clearing and Grubbing	XXXXXXX	XXX		
0040	202-B041		430	Linear Feet	Removal of Fence, All Types				
0050	202-B064		30	Linear Feet	Removal of Pipe, 8" And Above				
0060	203-A003	E	1,000	Cubic Yard	Unclassified Excavation, FM, AH				
0070	203-EX018	E	500	Cubic Yard	Borrow Excavation, AH, LVM, Class B9				
0080	209-A004		6,406	Square Yard	Geotextile Stabilization, Type V, Non-Woven				
0090	213-C001		1	Ton	Superphosphate				
0100	220-A001		2	Acre	Insect Pest Control	30.	00	60.	00
0110	223-A001		2	Acre	Mowing	50.	00	100.	00
0120	224-A001		2,700	Square Yard	Soil Reinforcing Mat				
0130	234-A001		1,600	Linear Feet	Temporary Silt Fence				
0140	602-A001	S	630	Pounds	Reinforcing Steel				

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0150	603-CA002	S	116	Linear Feet	18" Reinforced Concrete Pipe, Class III				
0160	603-CA003	S	44	Linear Feet	24" Reinforced Concrete Pipe, Class III				
0170	603-CB001	S	3	Each	18" Reinforced Concrete End Section				
0180	603-CB002	S	2	Each	24" Reinforced Concrete End Section				
0190	603-CE001	S	264	Linear Feet	22" x 13" Concrete Arch Pipe, Class A III				
0200	603-CF001	S	3	Each	22" x 13" Concrete Arch Pipe End Section				
0210	604-A001		1,952	Pounds	Castings				
0220	604-B001		1,600	Pounds	Gratings				
0230	607-B041		1,400	Linear Feet	72" Type I Chain Link Fence, Class I , With Top Guard				
0240	607-D002		1,400	Linear Feet	Barbed Wire Fence, 3 Strands, Galvanized Steel				
0250	607-G039		1	Each	Gate, 6' x 6' Chain Link				
0260	607-G112		2	Each	Gate, 13' x 6' Chain Link, With Top Guard				
0270	607-P1009		90	Each	Line Post, 9' x 2" Galvanized Steel				
0280	607-P2021		46	Each	Brace Post, 9' 6" x 2 1/2" Galvanized Steel				
0290	607-P3008		4	Each	Gate Post, 9' x 3 1/2" Galvanized Steel				
0300	608-B001	S	206	Square Yard	Concrete Sidewalk, With Reinforcement				
0310	609-B001	S	270	Linear Feet	Concrete Curb, Header				
0320	620-A001		1	Lump Sum	Mobilization	XXXXXXX	XXX		
0330	815-A006	S	90	Ton	Loose Riprap, Size 100				
0340	815-E001	S	160	Square Yard	Geotextile under Riprap				
0350	907-216-A001		2,717	Square Yard	Solid Sodding				

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0360	907-225-A001		2	Acre	Grassing				
0370	907-225-B001		1	Ton	Agricultural Limestone				
0380	907-225-C001		4	Ton	Mulch, Vegetative Mulch				
0390	907-226-A001		2	Acre	Temporary Grassing				
0400	907-234-D001		2	Each	Inlet Siltation Guard				
0410	907-234-E001		1	Each	Reset Inlet Siltation Guard				
0420	907-237-A003		500	Linear Feet	Wattles, 20"				
0430	907-246-B002		50	Each	Rockbags				
0440	907-403-A017	BA1	272	Ton	9.5-mm, ST, Asphalt Pavement				
0450	907-403-A019	BA1	544	Ton	19-mm, ST, Asphalt Pavement				
0460	907-407-A001	A2	165	Gallon	Asphalt for Tack Coat				
0470	907-601-B003	S	10	Cubic Yard	Class "B" Structural Concrete, Minor Structures				
0480	907-626-H001		117	Square Feet	Thermoplastic Legend, Blue-ADA				
0490	907-626-H002		2	Each	Thermoplastic Legend, Blue-ADA Handicap Symbol				
0500	907-626-Y002		1,565	Linear Feet	Thermoplastic Detail Traffic Stripe, White, 6" Equivalent Length, 40-mil. min.				
0510	907-626-Z003		126	Linear Feet	Thermoplastic Legend, White, 6" Equivalent Length, 40-mil. min.				
0520	907-630-PP001		2	Each	Handicap Parking Sign with Post				
0530	907-699-A002		1	Lump Sum	Roadway Construction Stakes	XXXXXXX	XXX		
ALTERNATE GROUP AA NUMBER 1									
0540	907-304-F002	GT	2,100	Ton	Size 610 Crushed Stone Base				
ALTERNATE GROUP AA NUMBER 2									

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0550	907-304-F003	GT	2,100	Ton	3/4" and Down Crushed Stone Base				
					ALTERNATE GROUP AA NUMBER 3				
0560	907-304-F004	GT	2,100	Ton	Size 825B Crushed Stone Base				

*** BID CERTIFICATION ***

TOTAL BID.....$_____

*** BID 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 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.

* *

COMBINATION BID PROPOSAL

I. This proposal is tendered as one part of a Combination Bid Proposal utilizing option ___* of Subsection 102.11 on the following contracts:

* Option to be shown as either (a), (b), or (c).

	Project No.	County		Project No.	County
1.	____________	____________	6.	____________	____________
2.	____________	____________	7.	____________	____________
3.	____________	____________	8.	____________	____________
4.	____________	____________	9.	____________	____________
5.	____________	____________	10.	____________	____________

A. If option (a) has been selected, then go to II, and sign Combination Bid Proposal.

B. If option (b) has been selected, then complete the following, go to II, and sign Combination Bid Proposal.

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.

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 September 8, 2011.

I (we) agree that this notification of intent DOES NOT constitute APPROVAL of the subcontracts.

(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 September 8, 2011.

Contractor _____

REV. 1/2016

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

CERTIFICATION

I,_____,
(Name of person signing bid)

individually, and in my capacity as _____ of
(Title of person signing bid)

_____
(Name of Firm, Partnership, or Corporation)

do hereby certify under 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-2208-49(001)/502399302, BWO-2209-49(001)/502399301 & LWO-2093-49(002)/502399303**,

in **Montgomery** 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.

S E C T I O N 9 0 2

CONTRACT FOR **BWO-2208-49(001)/502399302, BWO-2209-49(001)/502399301 & LWO-2093-49(002)/502399303**

LOCATED IN THE COUNTY(IES) OF **Montgomery**

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-2208-49(001)/502399302, BWO-2209-49(001)/502399301 & LWO-2093-49(002)/502399303**

LOCATED IN THE COUNTY(IES) OF: **Montgomery**

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, effective as of the contract date shown below, 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.

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.

_____	_____
(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

Revised 9/02/2014

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 Project Office, Storage Building, and Lot Work, known as State Project Nos. BWO-2209-49(001), BWO-2208-49(001), LWO-2093-49(002) / 502399301, 302, & 303 in Montgomery 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