

**DESIGN-BUILD  
RFP CONTRACT BOOK 1  
INSTRUCTIONS TO  
DESIGN-BUILDERS (ITDB)  
TENNESSEE DEPARTMENT OF TRANSPORTATION**

**INTERSTATE 65 INTERCHANGE AT BUCKNER ROAD IN  
SPRING HILL, TN**

**WILLIAMSON COUNTY- TENNESSEE**

**CONTRACT NUMBER: DB2001**



**July 17, 2020**

Addendum #1 August 21, 2020  
Addendum #2 September 11, 2020  
Addendum #3 September 29, 2020  
Addendum #4 October 12, 2020  
Addendum #5 November 9, 2020  
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## **STANDARD INSTRUCTIONS TO DESIGN-BUILDERS**

### **A. SCOPE OF SOLICITATION / PROJECT DESCRIPTION**

#### ***1. INTRODUCTION***

This **Contract Book 1 (ITDB - Instructions to Design-Builders)** is issued by the Tennessee Department of Transportation (the Department) to all firms and teams of firms (“Design-Builders”) that the Department has shortlisted for the Department’s Request for Proposals (RFP) to solicit competitive Proposals for **Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee.**

Design-Build Project (the “Project”). The Department hereby invites such Design-Builders to submit competitive sealed proposals (“Proposals”) for design and construction of the Project as more specifically described in the Contract Documents. Design-Builders should not rely on only the limited information contained in this **Contract Book 1 (ITDB - Instructions to Design-Builders)**, but should review and understand the specific information and requirements in the RFP.

This solicitation is a request for competitive proposals. Proposals are only invited from and will only be considered from those entities (“Design-Builders”) on the short-list as determined through the evaluation of Statements of Qualifications (“SOQ”) submitted in response to the Request for Qualifications (“RFQ”).

The Design-Builder is advised to familiarize itself with the provisions of Tennessee Code Annotated, Section 67-6-209, entitled "Use of Property Produced or Severed from the Earth-Exemptions", which relates to the payment of taxes on the use of tangible personal property severed from the earth. This tax is in addition to those levied for other tangible personal property.

The Design-Builder must have at their disposal the necessary equipment to put on the Project when instructions are issued to begin work, and to do the work within the time specified. In the event the Design-Builder has been awarded contracts for highway work in the past, they shall have financed the work in such a manner that just and proper claims in the discretion of the Department, representing labor and materials entering therein, have not been filed with the Department.

This **Contract Book 1 (ITDB - Instructions to Design-Builders)** contains Technical Proposal, Price Proposal, and other submittal requirements, a description of the procurement process to be used, Technical Proposal evaluation criteria, and other instructions to Design-Builders. This **Contract Book 1 (ITDB - Instructions to Design-Builders)** shall be used by Design-Builders in conjunction with the other Contract Documents for the generation and submission of responsive Technical Proposals, sealed Price Proposals, and other required pre-award submittals.

Submittal of a Price Proposal and the execution by Design-Builders of the signature sheets contained in the RFP, shall constitute the Design-Builder’s acknowledgement and understanding of the procurement process, submittal requirements, and evaluation criteria contained herein.

The Contract will include **Contract Book 1 (ITDB - Instructions to Design-Builders)**, **Contract Book 2 (Design-Build Contract)**, and **Contract Book 3 (Project Specific Information)**, **Design-Builder Standard Guidance** and all referenced documents, including, but not limited to, the listing in the **Contract Book 2 (Design-Build Contract)** are to set forth the rights and obligations of the Parties and the terms and conditions governing completion of the work.

The proposed project shall include the design and construction of a new diverging diamond interchange on Interstate 65 at L.M. 2.62 in Spring Hill, Williamson County, TN and roadway (Buckner Road) extensions to near the existing intersection with Buckner Road at Buckner Lane to the west and Lewisburg Pike (US-431/SR-106) to the east. The project shall include:

- Construction of Buckner Road Extensions to existing Buckner Road and Lewisburg Pike (US-431/SR-106) from Interstate 65;
- Construction of a new diverging diamond interchange and associated on- and off-ramps to Interstate 65 including a new bridge over Interstate 65;
- Mill and overlay of Interstate 65 as described in **Contract Book 3 (Project Specific Information)** Section 3.2 and Appendix A;
- Construct grass strips to accommodate future sidewalk and shared-use path along Buckner Road;
- Replacing all substandard guardrail and terminals within the project limits;
- Construction of all required drainage structures, bridges, box bridges, and/or channel relocations;
- New signals at Lewisburg Pike and at the diverging diamond interchange ramp terminals;
- Construct new access control fencing as described in **Contract Book 3 (Project Specific Information)** Section 3.2;
- Right-of-way (ROW) acquisition;
- Preparing all documents necessary to obtain all permits required;
- All erosion prevention and sediment control designs and implementation;
- Traffic maintenance and management during all phases of construction;
- Pavement markings and signage;
- Maintenance as described in **Contract Book 3 (Project Specific Information)** Section 12 and in the DB Standard Guidance;
- Complete interchange lighting;
- Other structures (retaining walls, overhead sign structures, etc.) as needed to complete the project; and
- Project and Quality Management.

The Design-Builder's obligations shall include without limitation the following:

- Furnishing all design services, Quality Management, materials, equipment, labor, transportation, and incidentals required to complete the Project according to the approved Plans, the Department's Standard Specifications, as amended, and terms of the Contract;
- Performing the construction work according to the lines, grades, typical sections, dimensions, and other details shown on the accepted Plans, as modified by Change Order or other written directive issued by the Department;
- Performing all work determined by the Department to be necessary to complete the Contract as proposed by Design-Builder; and
- Contacting the Department Alternative Contracting Office for any necessary clarification or interpretation of the Contract prior to proceeding with the affected work.
- All Project components identified in the Contract and performance of all work described in accordance with all Contract requirements. The Design-Builder shall determine the full Project requirements through comprehensive examination of the Contract and the Project Site.
- Designing, furnishing, constructing, and installing all components of the Project, except for those components, if any, as may be stipulated within the **Contract Book 3 (Project Specific Information)** to be furnished and/or installed by the Department or others.

The Design-Builder shall be fully and totally responsible for the accuracy and completeness of all work performed under the Contract, and shall indemnify and hold the Department harmless for any additional costs and all claims against the Department which may arise due to errors or omissions of the Department in the Provided Materials, and of the Design-Builder in performing the work.

## **2. PROJECT OVERVIEW**

### **Project Description: Interstate 65 Interchange at Buckner Road**

This project will consist of the design and construction of a new diverging diamond interchange on Interstate 65 at L.M. 2.62 in Spring Hill, Williamson County, TN and roadway (Buckner Road) extensions to near the existing intersection with Buckner Road at Buckner Lane to the west and Lewisburg Pike (US-431/SR-106) to the east. The project will include construction of the new roadway and bridge, traffic signals and lighting, right-of-way (ROW) acquisition, and environmental permitting.

Additionally the Design-Builder shall be responsible for:

- Easements required for the construction of the Project. Any easement required to construct the Project shall be in the name of Tennessee Department of Transportation.
- Coordinating the construction/ relocation of private utilities with the appropriate owners.
- Development and installation of the Traffic Control and Pavement Marking Plans.
- All erosion prevention and sediment control designs and implementation.
- Preparing all documents necessary for to obtain the environmental permits. Should the Design-Builder's activities be in violation of the environmental permits, law and/or regulations and therefore cause fines and/or penalties to be assessed against



the Department, said fines and/or penalties will be deducted from monies due the Design-Builder.

- Following all reference guidance as stated in **Design-Build Standard Guidance**.
- Specific Technical requirements as stated in **Contract Book 3 (Project Specific Information)**.
- Coordination and communication with all stakeholders, including but not limited to:
  - Tennessee Department of Transportation (Headquarters Construction, Region 3, and Structures Division)
  - Williamson County
  - City of Spring Hill
  - Tennessee Wildlife Resources Agency (TWRA)
  - Tennessee Department of Environment and Conservation (TDEC)
  - Local Property Owners
  - Local Businesses
  - FHWA
  - Utility Companies

### **3. RFP COMMUNICATION**

The Department Alternative Contracting Assistant Director is the single point of contact for the Department for the duration of the procurement process, together with address, phone number, fax number, and e-mail address, as set out in the Contract.

#### **a. CORRESPONDENCE**

All correspondence and submittals must be submitted electronically, addressed to the Department Alternative Contracting Assistant Director and labeled as set out in Section C.2 of **Contract Book 2 (Design-Build Contract)**.

**Return Address** – The Design-Builder’s must also include Design-Builder’s name and return address in the package.

Any Department designated contact person specified in the **Design-Build Standard Guidance** for a specific technical area will be disclosed to the contracted Design-Builder within the Initial Notice to Proceed (NTP).

#### **b. OTHER MEANS OF COMMUNICATION**

The Design-Builders may also communicate with the Department Alternative Contracting Assistant director by fax, phone, or e-mail (or if the Program Manager is unavailable, as a secondary contact, the Department Director of Construction by telephone at 615-741-2414. Official communications will only be disseminated in writing by the Department.

**c. COMMUNICATIONS WITH DESIGN-BUILDER;  
DESIGN-BUILDER’S SINGLE POINT OF CONTACT AND  
ADDRESS**

The Department Alternative Contracting Assistant Director shall be the Design-Builder’s single point of contact for all communications during the procurement process prior to the Proposal Due Date. The Design-Builder’s single point of contact for communications during the procurement process shall be the only contact person to request information.

**4. THE DEPARTMENT’S DISSEMINATION OF INFORMATION**

**a. INFORMAL COMMUNICATIONS**

The Department may post informal advance notices of Addenda and information on the Project website, and may also utilize e-mail alerts ([lia.obaid@tn.gov](mailto:lia.obaid@tn.gov)). However, the Design-Builders may not rely on oral communications, or on any other information or contact that occurs outside the official communication process specified herein. Official communications will only be disseminated in writing, by e-mail, or via the website by the Department.

In the event the Department determines that a change of RFP or Contract terms or specifications are warranted, the Department will issue formal written clarifications or Addenda.

**b. RESPONSES TO FORMAL REQUESTS**

Questions on or modification of provisions of the RFP or any Addenda can be pursued through submittal of Form QR. The Department will provide responses to all:

- Requests for QPL product determination;
- Requests for answers; and
- Requests for change of Contract terms or specifications.

Information that the Department issues to the Design-Builders in writing responding to the questions submitted on Form QR will be posted to the website for all Design-Builders to view.

**c. ADDENDA**

If the Department determines that a formal request or protest raises an issue that should be resolved by amending a RFP provision, specification or Contract term, the Department will do so by issuing a formal Addendum clearly identifying the change as amending, revising, or modifying the RFP provision, specification or Contract term in question.

The Department may issue Addenda up to five (5) Calendar Days prior to the Proposal Due Date, unless the Department extends the Proposal Due Date concurrent with issuance of the Addendum.

**d. REQUESTS FOR QPL PRODUCT DETERMINATION**

The Design-Builder may request a product in lieu of a QPL product by identifying the product category included on the QPL. The shall provide sufficient manufacturer product information, together with supporting documentation such as industry studies and test results, and product demonstration, if relevant, as may be reasonably necessary to enable the Department to make a determination as to the inclusion of said product on the Department's QPL. The Design-Builder shall not submit any proprietary items, unless specified in accordance with 23 CFR 635.411 and approved by the Department prior to the request.

The Department may reject any request without recourse by the Design-Builder. The Department has no obligation but to review the product and shall not be liable for failure to accept or act upon any request. The Department shall be the sole judge of the acceptance or rejection of a product. If an agreement has not been reached by five (5) Calendar Days prior to the Proposal Due Date, the product shall be deemed rejected.

**e. QUESTIONS**

The Design-Builders may provide questions on RFP provisions, Contract provisions, and specifications that the Design-Builder considers unclear or incomplete. To be considered, the questions must identify the unclear language or omission, or the specific discrepancies between identified provisions that result in ambiguity. All requests shall be submitted to the Department Alternative Contracting Assistant Director and will only be accepted in the format of Form QR in electronic format by e-mail ([lia.obaid@tn.gov](mailto:lia.obaid@tn.gov)) or fax. Any questions to addenda issued after the question deadline will be considered and answers issued if time allows.

**f. REQUESTS FOR CHANGE OF CONTRACT TERMS OR SPECIFICATIONS**

The Design-Builders may submit a request for change of Contract terms or specifications setting out the language for which change is sought and indicating the document title, page, and subsection where the language is located. To be considered, the request must include the reason for the requested change, supported by factual documentation, and the proposed change. All requests shall be submitted to the Department Alternative Contracting Assistant Director and will only be accepted in the format of Form QR in electronic format using MS Word by e-mail ([lia.obaid@tn.gov](mailto:lia.obaid@tn.gov)) or fax.

**g. PROHIBITED DESIGN-BUILDER COMMUNICATIONS**

No member of Design-Builder's organization (employees, agents, Principal Participants, the Designer, Key Personnel or the Technical Manager) may communicate with members of another Design-Builder's organization to give, receive, or exchange information, or to communicate inducements, that constitute anti-competitive conduct in connection with this procurement.

The Design-Builders shall not contact stakeholder staff regarding the RFP content or the requirements for the Project. Stakeholder staff includes employees of the Department, city(ies) and county(ies) in which the Project or any part of it are located.

Prohibited communications do not include contact with regulatory/county/city/utility officials for the limited purpose of obtaining information regarding available detour routes and conditions associated with such use or regulatory/county/city guidelines.

## **5. PROCUREMENT SCHEDULE/SUBMITTAL DEADLINES**

The Procurement Schedule and submittal deadlines are set out below. The Department will not consider requests on any submittal received by the Department after the deadline for its submittal date stated below. The Department will not consider requests on any submittals pertaining to an Addendum after the deadline established in the Addendum.

Confidential (One on One) Meetings with Each Proposer	<i>Week of August 3, 2020</i>
Deadline for Submittal of Alternate Technical Concepts	<i>On or before September 18, 2020 4:00 p.m., CT.</i>
Deadline for Response to Alternate Technical Concepts	<i>September 28, 2020 4:00 p.m., CT.</i>
Deadline for Submittal of Initial Lighting Design (Exhibit)	<i>October 23, 2020</i>
Deadline for Response Initial Lighting Design (Exhibit)	<i>October 30, 2020</i>
Deadline for Submittal Right-Of-Way Acquisition (Exhibit)	<i>October 30, 2020</i>
Deadline for Response Right-Of-Way Acquisition (Exhibit)	<i>November 6, 2020</i>
Deadline for Submittal of Question Requests, and Requests for QPL Determination	<i>November 9, 2020 4:00 p.m., CT.</i>
Technical Proposal and Price Proposal Due Date and Time	<i>December 4, 2020 4:00 p.m., CT.</i>
Price Proposal Opening	<i>December 18, 2020 9:00a.m., CT.</i>
Anticipated Award of Design-Build contract, or rejection of all proposal	<i>On or before January 8, 2021</i>
Anticipated Issuance of Initial Notice to Proceed	<i>January 22, 2021</i>

The Department will not consider any late Proposals. Proposals received after the Proposal Due Date will be returned to the unopened. The Department will not consider any Proposal modifications submitted after the Proposal Due Date. Nor will the Department acknowledge Proposal withdrawals submitted after the Proposal Due Date. Any such attempted withdrawal will be ineffective.

If the Design-Builder does not submit a Proposal by the Due Date and the Department chooses to issue a new, revised, or modified RFP, the Proposal will be considered non-

responsive to the requirements set forth herein. As a result, the Design-Builder will not be eligible to respond to any additional RFP requests from the Department on this project.

## **6. CONTRACT DOCUMENTS**

- Contract Book 1 (ITDB - Instructions to Design-Builders);
- Contract Book 2 (Design-Build Contract);
- Contract Book 3 (Project Specific Information);
- Design-Build Standard Guidance and Addendum;
- The Department Standard Specifications;
- The Department Supplemental Specifications;
- The Department Design Guidelines, and Addendum;
- The Department Construction Circular Letters;
- The Department Standard Drawings;
- Design Procedures for Hydraulic Structures;
- Drainage Manual;
- FHWA scour publication HEC-18, FHWA publication HEC-21 or HEC-22;
- Exhibit A (Technical Proposal), including any ATCs;
- Change Orders;
- Force Account Work Orders;
- Written Orders and Authorizations Issued by the Department;
- All Other Programmatic Plans or any Other Documents;
- All Material Included by Reference in any of the above Documents.
- The Department Material and Test Standard Operating Procedures.

## **7. COMPLETION DATES**

- Contract Completion Time – The Design-Builder shall specify the number of Calendar Days after receipt of the Initial Notice to Proceed required for completion of the project within their Price Proposal. Completion of the project is completion of all work to be done under the Contract, except for plant/vegetation establishment, and the Department has provided final acceptance as stated in the Department’s Standard Specifications. The number of Calendar Days specified by the Design-Builder in their Price Proposal will be placed in the Contract prior to execution of this Design-Build Contract.
- Interim Completion Dates – To be determined by the Critical Path Method (CPM) Schedule.

## **8. CRITICAL PATH METHOD (CPM)**

The Technical Proposal CPM Schedule shall follow the applicable categories within the Schedule of Items and other cost control systems, including the Payment Progress Process.

The Project CPM Schedule shall include all major activities of work required under the Contract for each segment of the project defined in Section 3.1 of the **Contract Book 3 (Project Specific Information)**, in sufficient detail to evaluate design and construction

process. The Design-Builder shall provide adequate time in the schedule for all parties involved with the Project to complete their work, including inspections, procurement activities, and testing. The Design-Builder's plan, as presented in the CPM, shall adhere to all Contract requirements. The Design-Builder shall include in the CPM schedule the work of subcontractors, vendors, suppliers, utilities, railroads, permitting agencies, the Department, and all other parties associated with the Project. Failure by the Design-Builder to include any element of its work or the work of others required for completion of the Project will not excuse the Design-Builder from completing the Project by the Contract Completion Date(s).

The scheduling compatible software employed by the Design-Builder shall be with the current and any future scheduling software employed by the Department. The Department's current software in use is Primavera Project Manager (P6). The software shall be compatible provided in an electronic file version of the Project Schedule that can be loaded or imported by the Department using the Department's scheduling software with no modifications, preparation or adjustments.

The CPM Schedule shall show the order in which the Design-Builder proposes to carry on the work, the time frame which it will start the major items of work and the critical features of such work (including procurement of materials, plant, and equipment), and the contemplated time frames for completing the same. For the purposes of developing the CPM Schedule, the Design-Builder shall use ten (10) business days for the Review and Acceptance performed by the Department. The CPM Schedule shall include, at a minimum, the following items:

- Controlling items of work, major work and activities to be performed;
- Seasonal weather limitations;
- Land disturbance restrictions;
- Phase duration or milestone events, based on selected option as applicable;
- Specified contract completion time (defined above) from Price Proposal.

The purpose of this scheduling requirement is to ensure adequate planning and execution of the work and to evaluate the progress of the work. The CPM Schedule proposed shall meet or exceed minimum Contract requirements, as determined by the Department in its sole discretion, where all Design-Builder risks are mitigated with schedule logic. The Design-Builder is and shall remain solely responsible for the scheduling, planning, and execution of the work in order to meet the Project Milestones, the Intermediate Contract Times, and the Contract Completion Date(s).

Within ten (10) business days after Contract effective date, the Design-Builder shall assign a percentage of the Pay Item Cost to each activity in the proposed CPM that reflects an accurate percentage value to each activity based on estimated costs plus associated profit and overhead. The profit and overhead assigned by the to the individual activities starting shall be equal to or less than the mark-up applied to the work when establishing the Contract Lump Sum Price. The schedule shall be in a suitable scale to indicate graphically the total percentage of work scheduled to be completed at any time.

Review and Comment by the Department shall not be construed to imply approval of any particular method or sequence of construction or to relieve the Design-Builder of

providing sufficient materials, equipment, and labor to guarantee completion of the Project in accordance with all Contract requirements. The Department Review and Comment shall not be construed to modify or amend the Contract, Interim Completion Dates, or the Contract Completion Date. The updated CPM Schedule may be utilized to facilitate the Department's Quality Assurance (QA) activities.

If at any time the design of the project potentially affects the approved FHWA NEPA document, the Design-Builder shall cease work and contact the Department Alternative Contracting Office.

The Department acceptance of any schedule does not relieve the Design-Builder of responsibility for the accuracy or feasibility of the schedule, does not modify the Contract, will not be construed as an endorsement or validation of the Design-Builder's plan, and does not guarantee that the Project can be performed or completed as scheduled. The Department's acceptance of the Design-Builder's schedules in no way attests to the validity of the assumptions, logic constraints, dependency, relationships, resource allocations, resource availability, manpower and equipment, or any other aspect of the means and methods of performing the work.

The Design-Builder shall produce a schedule that does not contain open-ended activities, except for the first and last activity in the schedule.

## **9. SUBMITTALS**

Design-Build submittals will be based on the approved CPM Schedule. All submittals must be received by the Department designated contact office before 12:00 p.m. CST to start the review period that day. If submittals are received after 12:00 p.m. CST, the review period will begin on the following business day. The review period includes only the Department workdays.

Submittals shall be transmitted in a logical order and in accordance with the submittal schedule. All submittals shall be stamped by a Professional Engineer licensed in Tennessee.

## **B. PREPARATION OF PROPOSAL**

### **1. METHOD OF PROCUREMENT**

The Contract will be for Design-Build services to be paid on a lump sum basis for each Pay Item Number. The Department will award the Contract to the Design-Builder that submits a responsive Proposal that is determined by the Department to offer the lowest Adjusted Price considering the evaluation factors set forth in this ITDB.

The procurement process includes two steps:

**Step One:** RFQ (determination of Short list); and,

**Step Two:** RFP (selection of Apparent Low Bidder from submitting responsive Proposals).

Evaluation of Proposals will be based on information submitted in the Proposals or otherwise available to the Department, and will involve both pass/fail factors and price, as further detailed below

The Design-Builder shall comply with the Proposal preparation instructions set out in this **Contract Book 1 (ITDB - Instruction to Design-Builders)**, the **Contract Book 2 (Design-Build Contract)**, the **Contract Book 3 (Project Specific Information)**, the **Design-Build Standard Guidance** and any other Contract Documents released for this procurement.

## **2. ALTERNATIVE TECHNICAL CONCEPTS – SUBMITTAL REQUIREMENTS AND AUTHORIZATION TO USE**

### **a. INFORMATION**

To accommodate innovation that may or may not be specifically allowed by the RFP Documents, the Design-Builder has the option of submitting Alternative Technical Concepts.

An Alternative Technical Concept (ATC) is a private query to the Department that requests a variance to the requirements of the RFP or other Contract Documents that is equal or better in quality or effect as determined by the Department in its sole discretion and that have been used elsewhere under comparable circumstances.

The Design-Builder may include an ATC in the Proposal only if the ATC has been received by the Department by the deadline identified in this **Contract Book 1 (ITDB - Instruction to Design-Builders)** and it has been approved by the Department).

The submittal original deadline applies only to initial ATC submittals. Resubmittal of an ATC that has been revised in response to the Department's requests for further information concerning a prior submittal shall be subsequently received as directed by the Department.

An ATC shall in no way take advantage of an error or omission in the RFP. If, at the sole discretion of the Department, an ATC is deemed to take advantage of an error or omission in the RFP, the RFP will be revised without regard to confidentiality.

By approving an ATC, the Department acknowledges that the ATC may be included in the design and RFC (Readiness-for-Construction) plans; however, approval of any ATC in no way relieves the Design-Builder of its obligation to satisfy (1) other Contract requirements not specifically identified in the ATC submittal; (2) any obligation that may arise under applicable laws and regulations; and (3) any obligation mandated by the regulatory agencies as a permit condition.

A proposed ATC is not acceptable if it merely seeks to reduce quantities, performance, or reliability, or seeks a relaxation of the contract requirements. ATCs shall be submitted by the Design-Builder and pre-approved in writing by the Department. All Technical Proposals must include the Department's pre-approval letters for consideration of the ATCs.



**b. SUBMITTAL REQUIREMENTS**

Each ATC submittal shall include one (1) electronic copy in Adobe (.pdf) format by email ([lia.obaid@tn.gov](mailto:lia.obaid@tn.gov)) and shall use Form ATC located in **Appendix A - Contract Book 1 (ITDB - Instruction to Design-Builders)**. Each ATC shall include the following information:

- 1) Description. A detailed description and schematic drawings of the configuration of the ATC or other appropriate descriptive information (including, if appropriate, product details [i.e., specifications, construction tolerances, and special provisions] and a traffic operational analysis, if appropriate).
- 2) Usage. Where and how the ATC would be used on the Project.
- 3) Deviations. References to all requirements of the RFP that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such variance(s).
- 4) Analysis. An analysis justifying use of the ATC and why the variance to the requirements of the RFP should be allowed.
- 5) Impacts. Discussion of potential impacts on vehicular traffic, environmental impacts identified, community impact, safety and life-cycle Project impacts, and infrastructure costs (including impacts on the cost of repair and maintenance).
- 6) History. A detailed description of other projects where the ATC has been used, the success of such usage, and names and telephone numbers of project owners that can confirm such statements.
- 7) Risks. A description of added risks to the Department and other entities associated with implementing the ATC; and
- 8) Costs. A description of the ATC implementation costs to the Department, the Design-Builder, and other entities (right-of-way, utilities, mitigation, long term maintenance, etc.).

The ATC, if approved, shall be included in the Price Proposal if the Design-Builder elects to include it in their Technical Proposal. The Design-Builder shall not request more than eight ATCs.

**c. REVIEW OF ATCs.**

A panel will be selected to review each ATC, which may or may not include members of the Design-Build Review Committee. The Design-Builder shall make no direct contact with any member of the review panel, except as may be permitted by the Department Alternative Contracting Assistant Director. Unapproved contact with any member of the review panel will result in a disqualification of that ATC.

The Department may request additional information regarding a proposed ATC at any time. The Department will return responses to, or request additional information from, the Design-Builder within ten (10) business days of the original submittal. If additional information is requested, the Department will provide a response within ten (10) business days of receipt of all requested information.

Under no circumstances will the Department be responsible or liable to the Design-Builder or any other party as a result of disclosing any ATC materials, whether the disclosure is deemed required by law, by an order of court, or occurs through inadvertence, mistake or negligence on the part of the Department or their respective officers, employees, contractors, or consultants.

**d. THE DEPARTMENT RESPONSE**

The Department will review each ATC and will respond to the Design-Builder on Form ATC as shown in **Contract Book 3 (Project Specific Information)** with one of the following determinations:

- 1) The ATC is approved.
- 2) The ATC is not approved.
- 3) The ATC is not approved in its present form, but may be approved upon satisfaction, in the Department's sole discretion, of certain identified conditions that shall be met or certain clarifications or modifications that shall be made (conditionally approved).
- 4) The submittal does not qualify as an ATC but may be included in the Proposal without an ATC (i.e., the concept complies with the baseline requirements of the RFP Documents).
- 5) The submittal does not qualify as an ATC & may not be included in the Proposal; or
- 6) The ATC is deemed to take advantage of an error or omission in the RFP, in which case the ATC will not be considered, and the RFP will be revised to correct the error or omission.

**e. ATC INCLUSION IN TECHNICAL PROPOSAL**

The Design-Builder may incorporate one or more approved ATCs as part of its Technical and Price Proposals. If the Department responded to an ATC by stating that it would be approved if certain conditions were met, those conditions must be stipulated and met in the Technical Proposal. If the ATC is used in the submittal, the approved Form ATC shall be included in the Technical Proposal.

In addition to outlining each implemented ATC, and providing assurances to meet all attached conditions, the Technical Proposal shall also include a copy of the ATC approval letter with approved form from the Department in the Technical Proposal within the Appendix and these will not count towards the page limit maximum; however the ATC must be discussed within the Technical Proposal Response Category for scoring.

Approval of an ATC in no way implies that the ATC will receive a favorable review from the Design-Build Review Committee. The Technical Proposals will be evaluated in regards to the evaluation criteria found in this **Contract Book 1 (ITDB - Instructions to Design-Builders)**, regardless of whether or not ATCs are included.

The Price Proposal shall reflect all incorporated ATCs. Except for incorporating approved ATCs, the Technical Proposal may not otherwise contain exceptions to, or deviations from, the requirements of the RFP.

### **3. SELECTION PROCEDURE**

The Department will utilize a *Meets Technical Criteria (A+B)* selection process in this procurement to award a Contract to the responsible Design-Builder that demonstrates it meets the technical criteria and can deliver the best combination of price and time (A+B) in the design and construction of the Project.

Price Proposals will be calculated in accordance with the following method:

Total Contract (A+B) = A+ (B x TIME VALUE)

Where, A = Contract Amount

B = the number of Calendar Days (from the Initial Notice to Proceed) indicated by the time needed to complete the Project in their Price Proposal and will become the contract completion time to be shown in the contract book. See **Contract Book 3 (Project Specific Information)** for minimum Calendar Days to be used.

TIME VALUE = Value associated with time of completion on this Project. The amount of one Calendar Day is **\$15,000** as stated in Special Provision 108B.

It is intended that all construction be completed by the earliest feasible date to minimize public inconvenience and enhance public safety. Should the total number of calendar days that the Design-Builder placed in the Proposal under the “B” portion of the Proposal to be deemed excessive, then the Proposal will be rejected. To this end the Design-Builder shall pursue the work rigorously utilizing the necessary work week, work hours and/or work shift schedules to expedite the work. The total Contract (A+B) cost will be used by the Department to determine the Apparent Design-Builder, but reimbursement to the Design-Builder shall be based solely on the Proposal Price total “A” and any incentive or disincentive payment made in accordance with the Contract.

**IMPORTANT:** The number of Calendar Days “B” is to be placed in the Price Proposal. Failure to enter a value for “B” will make the Proposal irregular and be cause for rejection.

Calendar days will be charged in accordance with the Contract and time charges will begin on the date shown on the initial NTP letter. Time charges will continue until work is complete, excluding punchlist items and vegetation establishment, on the Project in accordance with the Contract.

Notwithstanding any other provision of this Contract to the contrary, no time adjustments will be allowed for:

- Adverse weather conditions;
- The time required to Review and Approve Shop Drawings;
- The time required to review VECs;
- The time to process Change Orders or plan revisions requiring additional Review and Approval;
- The time to complete work not on the CPM Schedule;
- Any delays typically encountered during a Project regardless of the source.

Time adjustments may be considered for:

- The time for plan revisions requiring additional Review and Approval if the Design-Builder was unable to work on the controlling item of work without revised plans or shop drawings;
- The time for ordering and delivery of materials for Extra Work directed by the Department that affects the CPM Schedule;
- Delays encountered due to a catastrophic event, beyond the control of the Design-Builder, that the Department determines adversely affected the progress of work.

The Department reserves the right to reject any or all Proposals, to waive technicalities, or to advertise for new Proposals, if, in the judgment of the Department, the best interests of the public will be promoted thereby. In putting together their Proposals, the Design-Builder should keep in mind and address the Project goals stated herein.

### **C. RELATIVE WEIGHTS ALLOCATED TO TECHNICAL AND PRICE PROPOSALS**

The selection method to be utilized for this Project is “Meets Technical Criteria (A+B)”. The Technical Proposal will be evaluated on the pass/fail and technical evaluation factors identified herein. A Proposal must achieve a **Pass** rating for RC I, II, III, and IV. The Department shall first determine whether the Proposals are responsive to the requirements of the RFP. Prior to making such determination, the Department may offer a Design-Builder the opportunity to provide supplemental information or clarify its Proposal. Each responsive Technical Proposal shall be evaluated based on the criteria provided herein. After evaluation of the Technical Proposal, the Department, as required by Department Rule 1680-5-4, Procedures for the Selection and Award of Design-Build Contract, will publically open and read the Total Contract Amount (A+B). Although the selection will be made on the bid proposal that qualifies as the lowest and best adjusted bid, the cost of the Contract will be the amount received as the Proposal Price “A” and will be placed in **Contract Book 2 (Design-Build Contract)** upon award.

### **D. TECHNICAL RESPONSE CATEGORIES AND SCORING**

Proposal responses for Response Categories I through IV will be evaluated using the rating guidelines set out in this **Contract Book 1 (ITDB - Instruction to Design-Builders)**.

<b>EVALUATION FACTORS</b>	<b>POINTS</b>
<b>RESPONSE CATEGORY I</b>	<b>PASS/FAIL</b>
<b>RESPONSE CATEGORY II</b>	<b>PASS/FAIL</b>
<b>RESPONSE CATEGORY III</b>	<b>PASS/FAIL</b>
<b>RESPONSE CATEGORY IV</b>	<b>PASS/FAIL</b>
<b>TOTAL</b>	

During the evaluation period, each Technical Proposal will be reviewed by the Department Design-Build Review Committee (DBRC) individually.

## **1. RESPONSE CATEGORY I**

The submittals required under Response Category I as stated in this **Contract Book 1 (ITBD - Instruction to Design-Builders)** will be evaluated as a matter of responsibility on a pass/fail basis.

### **a. FORMS**

- 1) All required contract forms filled out. All Response Category forms and any forms specified within a Response Category shall be placed within the appropriate response category below.
- 2) All other forms are to be placed within this Response Category.

### **b. OTHER**

- 1) City and state where assigned staff will be located, particularly the location(s) of design staff.
- 2) List of DBEs Contacted and most likely to be utilized (Include identification of the type of work considered).

## **2. RESPONSE CATEGORY II: DESIGN-BUILDER'S ORGANIZATION AND EXPERTISE**

Submit as much of the following for Evaluation on the Response Category II form in **Appendix A**, will be evaluated as a matter of responsibility on a pass/fail basis (be as specific as possible):

### **a. ORGANIZATION**

- 1) Project-Wide Organizational Chart, including Design and Construction Functions; Key Personnel and Design Professionals including:
  - Responsibilities and reporting relationships or chain of command,
  - Clearly identified Project Manager, and
  - Personnel who will be assigned to the various tasks identified in this RFP.
- 2) Description of those categories of work which the Design-Builder anticipates will be performed by the Design-Builder's own forces and those categories which will be performed by Subcontractors.
- 3) Plans and procedures for management of Subcontractors.

### **b. PROJECT EXPERTISE**

- 1) The Design-Builder shall identify all major subcontractors, as defined in the Design-Build Standard Guidance, in the Technical Proposal.
- 2) Describe the overall strengths of the Design Team and their ability to fulfill the design requirements of this Project.

## **3. RESPONSE CATEGORY III: PROJECT CONTROLS AND MANAGEMENT**

Submit as much of the following for evaluation on the Response Category III form in Appendix A will be evaluated as a matter of responsibility on a pass/fail basis (be as specific as possible):

**a. PROJECT UNDERSTANDING**

- 1) Describe or outline the objectives, goals, and tasks to show or demonstrate the Design-Builder's view and understanding of the nature of the contract. Consider if the Scope of Services attached to this RFP is sufficient to attain the Department's goals and objectives.
- 2) Identify any potential right-of-way and utility conflicts.
- 3) Identify innovative approaches to minimize any impacts to the right-of-way. Describe any temporary impacts and associated minimization approaches.

**b. SCHEDULE MANAGEMENT**

- 1) CPM Time Schedule (to be submitted in color) meeting the requirements established in the Contract, and consistent with the segments defined in **Contract Book 3 (Project Specific Information)**, the Department's Design Build Standard Guidance, and Pay Items identified. See Section A.7 and A.8 of this **Contract Book 1 (ITDB - Instruction to Design-Builders)**.
- 2) Describe or outline the assumptions upon which the CPM Schedule was based, risks, constraints, contingencies, sequence of work, the controlling operation or operations, intermediate completion dates, milestones, project phasing, anticipated work schedule and estimated resources that impacted the schedule.
  - a) The CPM Schedule shall indicate how the Design-Builder intends to:
    - Divide the Project into work segments to enable optimum construction performance and explain the planned sequence of work, the critical path, proposed phasing of the Project, and any other scheduling assumptions made by the Design-Builder.
    - Plans and procedures to ensure timely deliveries of materials to achieve the Project schedule.
    - Categories of work that are anticipated to be performed by Design-Builder's own direct labor force, those categories that will be performed by Subcontractors, those categories that will be performed by project specific teams, and those categories that will be performed by existing teaming arrangements.
    - An explanation of Design-Builder's methodology for updating the CPM Schedule.
  - b) The Design-Builder may adjust the list to more accurately reflect planned sequences and methods, although the level of detail shall be similar to that reflected in the list of required Pay Items in the Schedule of Items.
- 3) Submit a description of Pay Item Breakdowns, including the physical features and activities included in the Pay Item, and all work included in the Pay Item Totals as reflected on the Schedule of Items for the project. Pay-items to be included are listed below. Additional work included under any pay-items should be identified in the technical proposal.

105-01.20 Design-Build Construction Stakes, Lines & Grades

- Field Survey
- Construction Staking

105-01.55 Design-Build Design Services

(All Design Activities shall be included in this item.)

- Definitive Design and Reviews
- Readiness-for-Construction Plans and Reviews, Specification and quantity estimates
- Working Drawings
- As-Built Plans and Reviews

105-08.20 Design-Build Contract Management

- Project Administration
- Project progress (scheduling)
- Contract progress submittals for payment

109-04.50 Design-Build ROW Services

- Appraisal
- Acquiring
- Public meetings, if required

109-10.01 Trainee

Trainee at the unit price \$0.80 per hour for each hour approved training provided, as indicated in SP1240

203-01.95 Design-Build Grading & Roadways

- Road and Drainage excavation
- Borrow excavation (rock)
- Borrow excavation (other than solid rock)
- Undercutting
- Guardrail and Median Barrier

203-50 Construction of Haul Road

203-50.50 Construction of Access Road

- Access Road

Note, Item No. 203-50.50 shall include all costs associated with providing access to Tracts 17 and 32 per Contract Book 3 Section 3.11. If it is determined during ROW acquisition that this item is not needed, the Department will reduce the lump sum contract amount by the amount bid for Item No. 203-50.50.

204-05.50 Design-Build Geotechnical

- Borings
- Geotechnical Investigations
- Any Sinkholes

209-01.50 Design-Build Environmental Management

- EPSC measures, EPSC installation
- EPSC inspections
- Permit Acquisitions
- Mitigation of Streams and Wetlands

301-50.50 Design-Build Pavement

- Any aggregate base
- Any Bituminous Plant Mix Base (HM) (A, BM-2, Etc.)
- Any Bituminous Concrete Surface (HM) (D, E)
- Treated Permeable Base Or Lean Concrete Base
- Any Portland Cement Concrete Pavement ( $\leq$  10 in. Thickness)
- Any Portland Cement Concrete Pavement ( $>$  10 in. Thickness)
- Tack, Prime coat

604-10.82 Design-Build Bridge Aesthetics

- Bridge

604-10.95 Design-Build Bridges

- Components (steel, deck drains, etc.)
- Bridge (including ABC elements)
- Bridge Repairs and Shoring
- Inspections
- Removal of existing structures

604-50.50 Design-Build Minor Structures (Other)

- Removal of Existing Buildings and Improvements
- Box Culvert
- Retaining Walls
- Endwalls
- Wingwalls
- Temporary structures

610-10.50 Design-Build Drainage

- Catch Basins
- Storm Drainage System
- Side drain
- Under drain

712-01.75 Design-Build Maintenance of Traffic

- Work Zone Safety Plan
- Barrier Rail
- Changeable Message Sign
- Traffic Control

713-15.25 Design-Build Signing

- Footings
- Installation
- Removal and Disposal

714-40.75 Design-Build Utilities

- Interchange Lighting

716-99.50 Design-Build Striping/Pavement Markings

- Material
- Raised Pavement Markers



- Snowplowable Raised Pavement Markers

Note, Item No. 716-99.50 lump sum bid amount shall include cost of permanent pavement markings for LIC No. 1, Interchange, and LIC No. 2 segments as depicted in the Functional Plans from the western end of the proposed raised median to the end of the project. The Design-Builder shall obtain approval from the Alternative Contracting Office prior to performing the design and construction under this item in segment LIC No. 1.

716-99.51 Design-Build Striping/Pavement Markings

- Material
- Raised Pavement Markers
- Snowplowable Raised Pavement Markers

Item No. 716-99.51 of the Design-Builder's lump sum bid shall include the cost of permanent pavement markings in segment LIC No. 1 (see **Contract Book 3 (Project Specific Information)** Section 3.1) from the beginning of the project to the start of the raised median section as necessary for constructing the future pavement markings as shown in the Functional Plans. Under this pay-item, pavement markings shall be provided for two (2) through lanes, two (2) left turn lanes, and one (1) right turn lane. This work will be required if Project No. 1 and Project No. 2, as described in **Contract Book 3 (Project Specific Information)** Section 3.1, have been completed. The Design-Builder shall obtain approval from the Alternative Contracting Office prior to performing the design and construction under this item. In the event the Department determines the work is not needed, the Department will notify the Design-Builder and reduce the lump sum contract amount by the amount bid for Item No. 716-99.51.

716-99.52 Design-Build Striping/Pavement Markings

- Material
- Raised Pavement Markers

Note, Item No. 716-99.52 lump sum bid amount shall include cost of permanent pavement markings for LIC No. 1 segments as depicted in the Functional Signing/Striping Exhibit provided on the project web site. It is based on an interim design for segment LIC No. 1 from the beginning of the project to the start of the raised median as shown in the Functional Plans. Under this pay-item, pavement markings shall be provided for one (1) through lane, one (1) left turn lane, and one (1) right turn lane. This work will be required if Project No. 1 and Project No. 2, as described in **Contract Book 3 (Project Specific Information)** Section 3.1, have not been completed at the proposed intersection to accommodate all traffic movements. The Design-Builder shall obtain approval from the Alternative Contracting Office prior to performing the design and construction under this item. In the event the Department determines the work is not needed, the Department will notify the Design-Builder and reduce the lump sum contract amount by the amount bid

for Item No. 716-99.52. Note, Snowplowable Pavement Markings to be excluded thru interim design segment of LIC No. 1 under this pay item.

717-99.95 Design-Build Mobilization

730-01.95 Design-Build Traffic Signals

Note, after award of the Contract the schedule of items must be separated into each of the three segments of work defined in **Contract Book 3 (Project Specific Information)** Project Specific Information.

4) Issues Resolution Plan

**c. PROJECT MANAGEMENT**

- 1) Describe the administrative and operational structure that would be used to perform the proposed work, including:
  - Management plan to attain the necessary staff required.
  - Describe how design personnel will interface with the construction personnel.
  - Communicating and coordinating between the Department and the Design-Builder. Include the approach for change management during construction for design initiated, field initiated, and the Department-initiated changes.
  - Describe existing design and/or construction quality management plan(s) that the Design-Builder may have already developed, and how it (they) will be implemented into work performed. Describe coordination of design and construction activities to ensure consistency in quality. Explanation of how independence of quality staff and function will be maintained.
  - Approach to managing costs under this Contract while fulfilling required tasks and assuring quality of work.
  - Describe or outline the process for constructability, durability, maintainability, safety, aesthetics and environmental mitigation in the design and construction processes.
  - Describe or outline the process for coordinating design and construction functions, including both design and construction components and all Subcontractor activities. Include a brief description (Construction Management Plan) of the Design-Builder proposes to deal with unexpected disruptions (e.g., weather- or accident-related).
  - Describe or outline the process (Design Review Plan) on how the Design-Builder will facilitate and implement Design Reviews as required under the Contract. Describe how the Designer and the design staff will be involved during construction. Also include the Design-Builder's Construction Staging and Phasing Plan, indicating timing and sequencing of major activities for the Project.
  - Describe or outline the process (Diversity Plan) of the plan to ensure projected subcontracting plan is applied at all tiers. Describe how the Design-Builder will achieve the goal set forth on this project. Participation shall be accomplished by including certified DBEs in any part of the Contract work

that is necessary to complete the Contract obligation. A certified DBE may participate as a Design-Builder, subcontractor, joint venture member, material supplier, material manufacturer, or professional service provider.

- Identify DBE and EEO representatives and their roles and responsibilities and identification of specific strategies and approaches that will be taken by the Design-Builder to meet the requirements of the Affirmative Action and Equal Employment Opportunity provisions described in **Design-Build Standard Guidance**.
- The Design-Builder will also be responsible for fulfilling FHWA 1273 “Contract Provisions”

**d. ENVIRONMENTAL COMPLIANCE**

- 1) Identify any potential environmental impacts.
- 2) Describe or outline the process for environmental compliance.
- 3) Describe or outline the approach to Erosion Prevention and Sediment Control for the Project.
- 4) Describe or outline the understanding of the overall approach to permitting and the comfort level with obtaining the required permit application/ modification within the allowed timeframe.
- 5) Identify innovative approaches to minimize any impacts in environmentally sensitive areas.

**e. INNOVATION**

- 1) Identify any design or construction solutions that the Design-Builder considers innovative and how those solutions will better serve the Project. Include a description of ideas that were considered, whether implemented or not. If this is an alternate technical concept, include only approved ATCs.
- 2) Identify any potential innovative traffic control and how those solutions will better serve the Project. Describe any temporary impacts associated with innovations.
- 3) Will these innovations add to, subtract from, or have no effect on the costs?

**4. RESPONSE CATEGORY IV: TECHNICAL SOLUTIONS**

Submit as much of the following for Evaluation on form Response Category IV form in **Appendix A** (be as specific as possible):

- a. It is not the intent of the Department for the Design-Builder to submit design plans. The details submitted shall be of sufficient detail to illustrate color, texture, pattern, emblems, proportion, corridor consistency, complementing details, or other such visual effects. For those details used in multiple locations, typical details will suffice with the locations for their use noted in narrative or graphic form.
- b. Conceptual plans, drawings, etc. within the Technical Proposal (these plans are in addition to and are separate from the ROW Acquisition sheets required in **Contract Book 3 (Project Specific Information)**) shall include at a minimum the following:
  - 1) Show plan view of design concepts with key elements noted. Define all proposed lanes, turning movements, gore locations, intersection locations, bridge limits, access roads, and dimensions.

- 2) Provide preliminary interchange lighting design. Information shall include electronic design files using AGi32 software, layout sheets which illustrate the photometrics, and high mast foundation. See **Contract Book 3 (Project Specific Information)** Section 5.2 for more information.
  - 3) Show preliminary drawing of bridge elements.
  - 4) Identify preliminary horizontal and vertical alignments of all roadway elements.
  - 5) Show typical sections for the mainline of the Project.
  - 6) Identify drainage modifications and designs to be implemented.
  - 7) Identify the appropriate design criteria for each feature, if not provided.
  - 8) Identify all bridge types to be constructed, including any special design features or construction techniques needed.
  - 9) Identify any deviations or proposed design exceptions, from the established design criteria that will be utilized. Explain why the deviation is necessary.
  - 10) Describe any geotechnical investigations to be performed by the Design-Builder.
  - 11) Describe how any utility conflicts will be addressed and any special utility design considerations. Describe how the design and construction methods minimize the Department's utility relocation costs.
  - 12) Describe how the design will affect the right-of-way costs.
  - 13) Identify types of any retaining walls and/or noise walls, if applicable.
- c. The Technical Proposal shall include half-size plan sheets depicting those elements required by the RFP.
  - d. Describe any traffic control measures that will be used for each construction phase.
  - e. Describe how traffic will be maintained as appropriate and describe understanding of any time restrictions noted in the RFP.
  - f. Describe the safety considerations specific to the Project.
  - g. Discuss overall approach to safety.
  - h. Describe any proposed improvements that will be made prior to or during construction that will enhance the safety of the work force and/or traveling public both during and after the construction of the Project.

## **5. INITIAL LIGHTING DESIGN AND RIGHT-OF-WAY ACQUISITION EXHIBIT SUBMITTAL**

An Initial Lighting Design and Right-of-Way Acquisition Exhibit submittal containing Item 4.b.2) above and the Right-of-Way Acquisition Sheets is required and is to be submitted in accordance with the Procurement Schedule in Adobe PDF electronic format. Right-of-Way (ROW) Acquisition Sheets comprise the ROW Acquisition Table including all proposed areas of right-of-way and easements for each segment (LIC No. 1, Interchange, and LIC No. 2) and in the format depicted in the Functional Plans along with Property Maps or Present Layouts as needed to clearly depict the proposed acquisitions. The Design-Builder's Initial Right-of-Way Acquisition Exhibit shall also include its proposed design of the access road described in Contract Book 3 (Project Specific Information) Section 3.11. The Department will respond with comments in accordance with the Procurement Schedule. The technical proposal shall include Item 4.b.2) above along with the ROW Acquisition Sheets with any comments received from the initial design exhibit review addressed.

## **E. PROPOSALS**

### **1. MINIMUM CONTRACT REQUIREMENTS**

The RFP Contract Documents constitute the minimum Contract requirements established by the Department. Please refer to the **Contract Book 2 (Design-Build Contract)** for the order of precedence established in the Contract. Therefore, those portions of the Proposal that meet or exceed minimum Contract requirements established by the Department, as determined by the Department in its sole discretion, will themselves become minimum Contract requirements upon Contract execution.

The award of the Contract does not in any way imply that the Department will modify, relax, or relieve the Contract Documents in favor of the details of the Technical Proposal submitted by the Design-Builder.

#### **a. TOTAL PROPOSAL SUBMITTAL**

The Proposal consists of the Technical Proposal, the Price Proposal, and all required Contract Documents. The Technical Proposal shall be delivered in a sealed container within the mailing package clearly identified, labeled, and addressed as follows:

- 1. Recipient (the Department) set out in the Contract and “Proposal - Procurement Sensitive”**
- 2. Return address: Design-Builder’s name, contact person’s name, mailing address;**
- 3. Date of submittal;**
- 4. Contents labeled as “Interstate 65 Interchange at Buckner Road, Williamson County”; and “Design-Build Project (DB2001)” and “Design-Build Technical Proposal”.**

The Technical Proposal may be sent by United States Mail or private carrier (i.e., Federal Express, United Postal Service, etc.), or be hand-delivered to the address shown in Section C.2 of **Contract Book 2 (Design-Build Contract)**. The container shall include the packaged sealed manila envelope as follows:

- Technical Proposal Package labeled as such (including required forms) and all other required Contract Documents.

Text for all documents can be single spaced, Times New Roman, 12-point font shown in English units. Font size on tables and figures may be of any size so long as it is easily readable. Pricing shall be in US currency, in current dollars and cents. In each case in which a form is required to be submitted, it will be found in the **Contract Book 2 (Design-Build Contract)** or in **Contract Book 3 (Project Specific Information)** and its use is mandatory. Technical Proposals shall be organized and formatted as specified herein. Each Technical Proposal Response Category shall be preceded by a simple tab divider identifying the Response Category (e.g., “Response Category I,” “Response Category II Design-Builder’s Organization and Expertise,” etc.) with each appropriate Response Category Form.

Technical Proposal pages shall be 8-½ inch x 11-inch white paper. Drawings or sketches shall be submitted on 11-inch x 17-inch and/or 8 ½-inch x 11-inch white

paper. Schedule plots shall be on 8-1/2-inch x 11-inch or 11-inch x 17-inch paper. Double-sided pages shall be used except for pre-printed information, such as corporate brochures, and the original copy of all signed forms, which shall be single-sided.

The Technical Proposal should present information clearly and concisely. Text or other information that is difficult to read may be disregarded, potentially resulting in rejection of the Proposal as non-responsive.

All Technical Proposal responses shall be easily reproducible by normal black and white photocopying machines. Color photographs, renderings and brochures shall be adequately bound and suitably protected for handling and circulation during review.

Technical Proposals and the ROW Acquisition sheets required in **Contract Book 3 (Project Specific Information)** shall be organized and numbered consistent with the requirements of **Contract Book 1 (ITDB - Instructions to Bidders)** and submitted by the date and time defined in Section 5, page 7. One (1) electronically signed original (Adobe PDF) on electronic media (flash drive) shall be provided.

Price Proposals shall be submitted using Internet bidding with electronic bid bond. The Design-Builder shall not submit a hardcopy Price Proposal to the Department. The Internet bid and electronic bid bond executed by the Design-Builder and their Surety will be considered as a complete Price Proposal and will be printed at the time of the public opening. Letters recognizing the addenda to the RFP and amendments to the electronic bidding file will be posted on the Bid Express website. Design-Builder must acknowledge addenda by completing the Technical Proposal Signature Page (Form TPSP) found in RFP **Contract Book 2 (Design-Build Contract)** and placed within your Technical Proposal. Also, by submitting the EBS bid file within your Price Proposal you are also acknowledging all addenda associated with the Price Proposal. It is the bidder's responsibility to notify all affected manufacturers, suppliers and subcontractors of any change. Failure to acknowledge receipt of Addenda or to apply any applicable amendments to the electronic bidding file is grounds for rejection. The electronic bid "A" shall be the Total Bid Amount using the ATC.

## 1) TECHNICAL PROPOSAL

Place the required Technical Proposal forms, except the Response Category Forms, in Technical Proposal Response Category I after a tab labeled "Forms."

**Technical Proposal Response Category I** – There is *no page limit* on the information required to be submitted under Response Category I.

**Technical Proposal Response Categories II through IV** – Proposal responses to Response Categories II through IV shall be limited to the combined maximum total of 75 page count (not pages), not including section dividers and tabs (Response Category Forms will be counted toward the total page count). The forms provided for response shall be used for the information requested. All

information submitted in Response Categories II through IV will be counted in calculating page count, regardless of format or medium.

## **2) PROPOSAL PRICE**

Design-Builders are cautioned that the total of price proposed in the Price Proposal “Schedule of Items” (the “A”) shall become the Contract Amount upon Contract execution, and shall constitute total compensation to the selected Design-Builder for performing the Contract, including but not limited to all minimum Contract requirements. Therefore, the fact that a selected Design-Builder’s Technical Proposal may contain elements that do not meet or exceed all minimum Contract requirements, as determined by the Department in its sole discretion, shall not entitle the selected to receive compensation in excess of the amount of the Proposal Price as a condition of performing the minimum Contract requirements or any other Contract obligation. Nor shall such fact entitle the selected Design-Builder to perform below minimum Contract requirements or fail to perform any other Contract obligation.

## **2. PROPOSAL OPENING**

### **a. TECHNICAL PROPOSALS**

The Department Alternative Contracting Assistant Director and the Design-Build Review Committee will open the Technical Proposal Package from each Design-Builder. They will determine responsiveness and the Pass/Fail rating for RC I to RC IV. Responsive and Passing Technical Proposals that meet all minimum criteria will be opened at the Proposal Due Date and time set out in this **Contract Book 1 (ITBD - Instruction to Design-Builders)** Section A.5, page 7. All technical proposals deemed non-responsive or failing to meet the minimum criteria will be notified prior to the public opening of the price proposals.

### **b. PRICE PROPOSALS; PUBLIC OPENING**

Upon concluding its evaluation and scoring of the Technical Proposals, the Department will conduct a public opening of the Price Proposals for each responsive bid at the following location:

**505 Deadrick Street, J.K. Polk Bldg.**

**Suite 700, Nashville, TN 37243, 7<sup>th</sup> floor Large Conference Room.**

on the date and time set out in above in Section A.5, page 7.

Totals read at the opening of the Price Proposals are not guaranteed to be correct and no final award of the Contract will be made until Proposals have been checked and re-checked.

On all projects which are financed in whole or in part by funds received through Federal agencies and other third parties, the awarding of Contracts by the Department will be subject to approval or concurrence by the party or parties through which funds are received. The Department reserves the right to reject any Proposal which is not acceptable to any such third party set out above, although such bid proposal would

otherwise qualify as the best Proposal in accordance with the Contract. It shall be the responsibility of the Department to determine which projects are so financed in part by third parties, such information being available upon request from the Department.

### **3. PROPOSAL STIPEND**

A stipulated fee of **\$100,000** will be awarded to each eligible Design-Builder on the short-list that provides a responsive bid, but unsuccessful, Proposal. If a contract award is not made, all Design-Builders on the short-list that submit a responsive Proposal shall receive the stipulated fee. If the Department chooses to continue the process by revising, modifying, or issuing a new RFP, or issuing a Best and Final Offer, the stipend will only be paid to each eligible Design-Builder responding to the additional request and/or requirement. The Department Alternative Contracting Assistant Director will be notified of the opportunity to request to invoice for the stipulated fee from each eligible Design-Builder within thirty (30) days after the award of the Contract or the decision not to award. If the Design-Builder requests and accepts the stipulated fee, the Department reserves the right to use any ideas or information contained in the Proposals in connection with any contract awarded for the Project, or in connection with any subsequent procurement, with no obligation to pay additional compensation to the unsuccessful Proposers. Unsuccessful Design-Builders may elect not to invoice and thus refuse payment of the stipulated fee to retain any rights to its Proposal and the ideas and information contained therein.

The decision to issue a new RFP, a modified/revised RFP, or a “Best and Final Offer” indicates the Departments decision to continue with the award on or not to cancel the project; therefore the stipend will only be paid once after the conclusion of the entire procurement process.

## **F. PRICE PROPOSAL EVALUATION**

### **1. PRICE PROPOSAL EVALUATION METHODOLOGY**

#### **a. PRELIMINARY EVALUATION**

##### **1) PRICE REALISM AND REASONABLENESS**

The Department will make a preliminary evaluation of the Price Proposal to determine if the prices set forth reflect Price Realism and Price Reasonableness in comparison with the Departments cost estimate. In making this evaluation, the Department may require review of Price Documents. In such case, the Design-Builder shall make itself available upon the Department’s request to conduct a joint review of the Price Documents. If the Department concludes that the Price Proposal does not reflect Price Realism or Price Reasonableness, the Department will consider the Price Proposal non-responsive.

##### **2) UNBALANCED PRICING**

The Department will prepare a cost estimate prior to accepting Price Proposals. This will be used as a basis for a preliminary evaluation of the Price Proposal to determine if any of the prices are significantly unbalanced to the potential



detriment of the Department. An unbalanced Proposal is considered to be one containing lump sum which does not reflect reasonable actual costs plus a reasonable proportionate share of the Design-Builder's anticipated profit, overhead costs, and other indirect costs which are anticipated for the performance of the items in question in comparison with the Departments cost estimate.

## **G. TECHNICAL PROPOSAL RESPONSE CATEGORIES AND REQUIRED TECHNICAL PROPOSAL CONTENT**

Additional information or requirements for each Response Category, or modifications to the Response Category instructions and requirements set out below, will be identified in the **Contract Book 3 (Project Specific Information)**. **Design-Builders are therefore advised to download this Contract Book 1 (ITDB - Instruction to Design-Builders) and the Contract Book 3 (Project Specific Information) and read them together.**

Regardless of the score assigned to any Technical Proposal evaluation factor or Response Category, and notwithstanding the fact that a Proposal is selected for award, only those portions of Sections II through IV of the Technical Proposal that meet or exceed the Department's minimum Contract requirements, as determined by the Department in its sole discretion, shall be incorporated into the resulting Contract. Those portions that do not meet or exceed the stipulated criteria, as determined by the Department in its sole discretion, shall not be incorporated into the resulting Contract or modify any of the terms and conditions of the Contract.

### ***1. RESPONSE CATEGORY I through IV***

The submittals required under Response Category I through IV will be evaluated as a matter of responsibility on a pass/fail basis. Submit responses for each element of Category I through IV using the required forms as instructed acknowledging receipt of RFP, all Addenda and responses to questions, if any, issued by the Department.

#### **a. COVER LETTER**

The Design-Builder shall provide with its Technical Proposal a cover letter (maximum two pages) indicating its desire to be considered for the Project and stating the official names and roles of all Principal Participants, the Designer, and Project Manager. The Design-Builder shall identify a single point of contact and the address and telephone and fax numbers and e-mail address to which communications should be directed. An authorized representative of the Design-Builder's organization shall sign the letter. If the Design-Builder is not yet a legal Entity or is a joint venture or general partnership, authorized representatives of all Principal Participants shall sign the letter. Additionally, if the Design-Builder wishes to add, delete, or substitute a Principal Participant, or wishes to substitute its Designer or any Key Personnel that it identified in its SOQ, the Design-Builder must make such request in this cover letter. In addition to including such a substitution or change request in its cover letter, the Design-Builder must follow the procedures and submit the information required under this RFP.

The Design-Builder shall attach to the cover letter the Acknowledgment of Receipt acknowledging receipt of RFP, all Addenda and responses to questions, if any, issued by the Department.

**b. FORMS**

Form Question Request (QR), Form Alternate Technical Concepts (ATC), and Response Category Forms are located in **Appendix A**. All other contract forms are located within **Contract Book 2 (Design-Build Contract) Appendix C**.

**c. EVIDENCE OF CORPORATE EXISTENCE; CERTIFICATE OF AUTHORITY**

Submit the following, as applicable:

- A Certificate of Good Standing issued by the Design-Builder’s state of residence; or
- For Entities not residents of the State of Tennessee, a Certificate of Authority to transact business in Tennessee.

**d. EVIDENCE OF AUTHORITY TO ENTER INTO JOINT VENTURE; EXECUTE JOINT-VENTURE AGREEMENT**

If the Design-Builder is a joint venture; submit a copy of the joint venture agreement. Also, for each joint venturer submit the partnership agreement or corporate resolution authorizing it to enter into the joint venture and authorizing named individuals to execute the joint venture agreement on the joint venturer’s behalf.

**e. EVIDENCE OF PROPOSAL SIGNATORY AUTHORITY**

Submit bylaws, or the corporate resolution, partnership agreement, or joint venture agreement evidencing authority of each signatory to the Technical Proposal Signature Page and Proposal Firm Offer to execute it on behalf of the Design-Builder. **NOTE:** If the Design-Builder is a joint venture or partnership, each joint venture or partner must sign the Technical Proposal Signature Page (Form TPSP).

**H. PRICE PROPOSAL RESPONSE CATEGORIES AND REQUIRED PRICE PROPOSAL CONTENT**

Submit responses for each element below, using the required forms where instructed. All prices quoted shall be in U.S. currency.

**1. PRICE PROPOSAL CONTENTS**

Design-Builders shall include each of the following in the Price Proposal:

- Electronic Price Proposal (including specified Contract Completion Time); and
- Electronic Proposal Security in the amount of five (5%) percent of the Proposal Price. Proposal Security may be submitted in the form of a Proposal Bond or Proposal Guarantee issued by an insured institution or certified check payable to the Department of Transportation.

## **2. INSTRUCTIONS REGARDING PREPARATION OF SCHEDULE OF ITEMS**

Design-Builders shall complete and submit in compliance with the following instructions:

- a. Provide a lump-sum price for each Pay Item Total in each Pay Item. The lump-sum price shall represent the total price to complete and integrate all work represented by that Pay Item into the Project, inclusive of associated overhead, labor, materials, equipment, tools, transportation and Project administration. These are not bid items and will be used as a basis in developing the cost-loaded CPM after award.
- b. Utilize the same titles, contents, and limits as are shown on Schedule of Items.
- c. Price Proposal supporting documentation may be requested by the Department.

## **I. FORMS**

The following forms are required to be used in preparation of the Proposal. They are located within **Contract Book 2 (Design-Build Contract) Appendix C** and this **Contract Book 1 (ITDB - Instruction to Design-Builders) Appendix A**. The Design-Builders shall download the forms and complete them in accordance with the instructions contained in the forms and the text of this **Contract Book 1 (ITDB - Instruction to Design-Builders)** or the **Contract Book 2 (Design-Build Contract)** in which the forms are referenced.

### **1. DESIGN-BUILDER QUESTIONS**

- FORM QR, Question Request Form.

### **2. TECHNICAL PROPOSAL FORMS**

- RESPONSE CATEGORY FORMS II THRU IV;
- ATC FORM;
- FORM AT, ATTESTATION RE PERSONNEL USED IN CONTRACT
- FORM COI, CONFLICT OF INTEREST DISCLOSURES;
- FORM TPSP, TECHNICAL PROPOSAL SIGNATURE PAGE FORM;

### **3. BONDS AND FORMS TO BE SUBMITTED BY THE APPARENT DESIGN-BUILDER**

- FORM CP&PB, CONTRACT PAYMENT AND PERFORMANCE BOND (submitted after award of the Contract).
- FORM LC, LOBBYING CERTIFICATE

## **J. PROPOSAL MEETINGS**

The Department may elect to hold meetings with all Design-Builders. The Design-Builders are strongly encouraged to attend, and will be expected to bring (a) appropriate members of its anticipated Key Personnel, and if required by the Department, (b) senior representatives of the proposed Designer and proposed Technical Manager. The Department shall provide sufficient time to the Design-Builder's for travel and preparation for the meetings.

The information received by the Department will be part of the procurement process and will not be disclosed by the Department until award of the Contract, at which time the information will be subject to disclosure except as to information that is subject to exemption from disclosure under the Tennessee Open Records Law.

### **1. MANDATORY PRE-PROPOSAL MEETINGS**

The Department does not expect to hold a pre-proposal meeting on this project; however, the Department may hold one or more mandatory pre-proposal meetings with all Design-Builder's prior to the Proposal Due Date, to provide additional opportunity for questions and comments. Failure of a Design-Builder to attend any such meetings will result in elimination of that Design-Builder from the short-List, and any Proposal submitted by that Design-Builder will be rejected. The decision to hold pre-proposal meetings will be disclosed by the Department no later than the date shown in Section A.5 for the anticipated deadline for issuance of the last addendum

The Department will respond, orally or in writing, to Design-Builders' questions, if any, raised at the meetings. In the event the Department determines that formal answers or change of the RFP, specifications or Contract terms is warranted, the Department will issue formal written clarifications or Addenda in accordance with the terms of **Contract Book 2 (Design-Build Contract)**.

### **2. ORAL PRESENTATIONS AFTER SUBMISSION OF PROPOSALS**

The Department may elect, in its sole discretion, to require each to make a one-on-one oral presentation regarding the Technical Proposal. The oral presentations will be mandatory, and failure of a Design-Builder to appear and make the presentation will result in elimination of that Design-Builder from the Short-List. The Department will give no further consideration to that Design-Builder's Proposal, and that will be ineligible for a stipend. If the Department elects to require oral presentations, the Department will notify the Design-Builders in writing or by e-mail of the dates, times and locations, rules, requirements and protocols for the oral presentation.

The oral presentation will be an opportunity for the Design-Builders to either explain or present their Technical Proposals and respond to the Department requests for clarification, but such presentations will not be a substitute for, nor be a means to modify or augment, any part of the Technical Proposal. The oral presentations will be used by the Department to assist in the evaluation of the Technical Proposals, and the information from the oral presentations may be used by the Department to evaluate the Technical Proposal Score.

## **K. CHANGES IN DESIGN-BUILDER'S ORGANIZATION AFTER SUBMITTAL OF SOQ**

Key Personnel identified in the SOQ shall not be modified in the Technical Proposal without written approval of the Department. Any request for modification shall be sent to the Department Alternative Contracting Assistant Director. The written approval to modify the Key Personnel shall be included in Technical Proposal Response Category I. Failure to

comply with this requirement may be justification for removing the Design-Builder from further consideration for this Project.

The Design-Builder must submit with any request the same information about the proposed Principal Participant or team member that was originally required to be submitted in the SOQ, including legal and financial information (pass/fail) and Technical evaluation information. If a Major Participant is being added, deleted, or substituted, the Design-Builder must submit such additional information as may be required by the Department to demonstrate that the changed organization still meets the RFQ criteria upon which short-list selection was based.

## **L. MODIFYING A PROPOSAL PRIOR TO PROPOSAL DUE DATE**

### ***1. ERASURES, INTERLINEATIONS, STRIKEOUTS***

If the initial Proposal has been modified by hand-written interlineations, strikeouts, or erasures, **EACH** such alteration must be initialed in blue ink by the signatory to the Technical Proposal and submitted to the Department Alternative Contracting Assistant Director.

### ***2. SUBSEQUENT TO THE INITIAL SUBMITTAL***

Subsequent to Proposal submittal, a Design-Builder may submit written modifications identified either by redlined text or on Design-Builder's letterhead indicating the revisions with reference to the Proposal or form section, subsection, paragraph (if applicable) and page number. The Design-Builder must submit with its Proposal modifications an affirmation signed by each of the original signatories that the modifications amend the terms of the Proposal previously submitted and submitted to the Department Alternative Contracting Assistant Director.

## **M. WITHDRAWING A PROPOSAL**

### ***1. BY WRITTEN NOTICE***

A Design-Builder may withdraw its Proposal prior to the Proposal due date by submitting written notice to the Department Alternative Contracting Assistant Director on the Design-Builder's letterhead signed by an authorized representative. The notice must include the name and telephone number of the Design-Builder's representative that will be contacted to arrange for the Design-Builder to retrieve the withdrawn Proposal.

### ***2. IN PERSON***

A Design-Builder may withdraw its Proposal in person prior to the Proposal Due Date upon presentation of identification and evidence of authorization to act for the Design-Builder. If possible, the Department will return all Proposal materials at the time an in-person withdrawal is presented. However, Proposals are in the possession of one individual and are available only when that person is present.

### **3. *SUBSEQUENT PROPOSAL SUBMITTAL NOT PRECLUDED***

Withdrawal of a Proposal will not preclude a Design-Builder from subsequently submitting a new Proposal, so long as that new Proposal is properly submitted and received by the Department's Alternative Contracting Assistant Director prior to the Proposal Due Date.

If the Design-Builder withdraws their Proposal and the Department chooses to issue a new, revised, or modified RFP after the Proposal Due Date (as stated in Section T), the Design-Builder must state within their withdraw written notice their request to be considered eligible to submit a Proposal in this instance. If the withdrawal is in person or the written notice does not state this request, the Design-Builder will no longer be considered eligible for the Project.

## **N. CONFLICT-OF-INTEREST DISCLOSURE REQUIREMENTS**

If the Design-Builder finds that a Principal Participant, Design Professionals, or any Key Personnel listed in its SOQ is no longer eligible to be part of its organization or team for this procurement due to a conflict of interest (as defined in 23 CFR 636), if the Design-Builder's organization has changed since submittal of the Design-Builder's SOQ, or if additional potential conflicts of interest have developed since the Design-Builder's submittal of its SOQ, the Design-Builder shall comply with the following disclosure requirements.

### **1. *THE DESIGN-BUILDER ORGANIZATION CHANGE OR ADDITIONAL POTENTIAL CONFLICTS OF INTEREST***

If the Design-Builder's organization has changed and the change has been approved by the Department per Section G., or additional potential conflicts of interest have developed since the Design-Builder's RFQ submittal, the Design-Builder shall submit with its Proposal a new RFQ submittal for that SOQ Section and making a full disclosure of all potential 23 CFR 636 organizational conflicts of interest other than those already disclosed in the SOQ. If the Design-Builder's organization has not changed and no additional potential conflicts of interest have developed since initial submittal of the Design-Builder's SOQ, the Design-Builder shall submit a signed statement that no potential 23 CFR 636 organizational conflicts currently exist other than those already disclosed within the Design-Builder's SOQ. Also see **Design-Build Standard Guidance**, and the COI Guidelines provided with Form COI regarding State conflict of interest standards and disclosure regarding former the Department employees.

### **2. *SUBCONTRACTORS***

The Design-Builder shall include in its subcontracts a completed Conflict of Interest statement from each Subcontractor for whom the Design-Builder will utilize on the Project. The Design-Builder shall provide each Subcontractor with the Department's "Conflict of Interest Guidelines, and Disclosure Process" attached hereto.

## **O. PROPOSALS RESPONSIVENESS, RESPONSIBILITY AND REJECTION**

### **1. SUBSTANTIAL COMPLIANCE REQUIRED**

The Department may in its discretion reject any Proposal that does not substantially comply with the requirements set forth in the RFP, including this **Contract Book 1 (ITDB – Instruction to Design-Builders)**, and applicable public procurement procedures.

### **2. RESPONSIVENESS**

The Department has determined that failure to properly submit the following items (all contract forms are located in **Contract Book 2 (Design-Build Contract)**) and in **Contract Book 3 (Project Specific Information)** will render the Proposal non-responsive:

- Technical Proposal;
- Technical Proposal Response Category Forms;
- Technical Proposal approved ATC Form, if utilizing ATC (In Appendix);
- Electronic Bid Price Proposal Schedule of Items;
- Electronic Proposal Bond or Electronic Proposal Guarantee; and
- USB drive with the Technical Proposal and the ROW Acquisition sheets.

### **3. COMPLETENESS**

The following items must be properly submitted for a complete Proposal:

- Technical Proposal Forms (In RC Category I)
  - Form QR (This is the most current FORM QR with all Department answers);
  - Form AT;
  - Form COI;
  - Form TPSP;
  - Form LC (Submit Blank if not applicable);

### **4. UNINTENTIONALLY INCOMPLETE OR OMITTED PROPOSAL RESPONSES**

Unless the Department, in its discretion, determines that a submitted Proposal is not in substantial compliance with RFP requirements, unintentionally incomplete, qualified, or omitted responses to the Technical Proposal, unlike the omission of any required submittals above, will be dealt with as a matter of Proposal scoring/review as opposed to responsiveness.

### **5. THE DEPARTMENT'S RIGHT TO SEEK CLARIFICATION; WAIVER**

As permitted by Law, the Department Points of Contact may seek clarification of or discuss any response with the Design-Builder, in the Department's sole discretion, and the Department may waive minor informalities and irregularities it deems necessary or

advisable that the best interest of the Department and/or the public will be promoted thereby.

As permitted by Law, the Department may hold meetings and conduct discussions and correspondence with one or more of the Design-Builders responding to this RFP to seek an improved understanding and evaluation of the responses to this RFP.

## **6. RESPONSIBILITY AND REJECTION OF PROPOSALS**

The Department will reject any Proposal submitted by a Design-Builder that does not meet the applicable standards of responsibility.

## **7. REJECTION IN THE PUBLIC INTEREST**

The Department reserves the right to reject any Proposal at its discretion. The Department may reject all Proposals for good cause upon a finding that to do so is in the public interest.

## **P. CONFIDENTIALITY**

Documents submitted pursuant to this RFP will be subject to the Tennessee Open Records Law, TCA §§ 10-7-503 to 10-7-506, et. seq. Information submitted will be kept confidential until award by the Department, unless otherwise provided by law. The State shall not be liable for disclosure or release of information when authorized or required by Law to do so. The State shall also be immune from liability for disclosure or release of information.

## **Q. PROPOSAL BOND**

### **1. REQUIREMENTS**

- Each Proposal must be accompanied by a Design-Builder's bidder's bond, in an amount of equaling not less than five (5%) percent of the Proposal Price electronically through Bid Express.
- If the Design-Builder's bidder's bond is offered as guaranty, the bond must be made by a surety company, qualified and authorized to transact business in the State of Tennessee and must be acceptable to the Department.

## **R. APPARENT DESIGN-BUILDER REQUIRED SUBMITTALS**

Within ten (10) Calendar Days of the date of the delivery of the Contract by the Department, the apparent Design-Builder shall provide the Department, in writing the following:

### **1. PAYMENT AND PERFORMANCE BOND**

A Contract Payment and Performance Bond, in the amount of 100 percent of the Contract Amount on the form furnished by the Department (Form CP&PB).

### **2. INSURANCE CERTIFICATES**

Insurance certificates evidencing the required insurance coverage. (Refer to the **Design-Build Standard Guidance**).



### **3. EVIDENCE OF AUTHORITY**

- The names of all signatories to the anticipated Contract, their capacities and the names of their respective principals if not already provided.
- Corporate Resolutions or Bylaws evidencing the authority of each named signatory to act for its principal in executing the Contract and bind the principal to the terms of the Contract, if not already provided.

### **4. LICENSES**

Evidence that the Apparent Design-Builder and its personnel are properly licensed to perform the work, unless previously provided.

### **5. ATC BREAKDOWN COST SAVINGS**

Price Proposal ATC Breakdown, only if an approved ATC was submitted (format will be a one page summary of the Contract Amount including the original cost for Base Technical Concept cost minus ATC cost savings).

## **S. MODIFICATION OF CONTRACT**

The Department may make modifications to the Contract as it may determine, in the exercise of its sole discretion, to be necessary to fully incorporate the terms of the Apparent Design-Builder's Proposal, to correct any inconsistencies, ambiguities, or errors that may exist in the Contract, and to clarify Contract terms, including technical requirements and specifications, if any. If, in the Department's sole discretion, it determines that the parties will be unable to reach a mutually-acceptable Contract, the Department may terminate discussions with the Apparent Design-Builder. The Department will then continue the process of discussion with the next highest-ranked Design-Builder until the Department either successfully executes a Contract or cancels the procurement.

The Department may investigate the qualifications of any Design-Builder under consideration, may require confirmation of information furnished by a Design-Builder, and may require additional evidence of qualifications to perform the Work described in this RFP.

## **T. MODIFIED OR NEW RFP ISSUANCE**

The Department reserves the right, in its sole and absolute discretion, to:

- Reject any or all Proposals.
- Issue new RFP.
- Cancel, modify, or withdraw the RFP in their entirety.
- Solicit subsequent "Best and final offer" (BAFO) from Design-Builders.
- Modify the RFP process (with appropriate notice to Design-Builders).

A BAFO is a change to a design-builder's technical and/or price proposal made at the request of, or as allowed by, the Department within a best and final offer RFP after the solicitation closing date when all price proposals exceed an acceptable range of the Department's estimate. In the event initial price proposals exceed an acceptable range of the Department's

Estimate may choose to make amendments to the details of the RFP and request a Best and Final Offer within a new RFP called a “Best and Final Offer” RFP.

Alternately, the Department reserves the right to redistribute a new or modified RFP for the project, outside the issuance of a BAFO RFP, to the eligible shortlisted firms if in the judgment of the Department that the best interest of the Department or the public will be promoted.

This may occur at any time prior to the execution by the Department of the Design-Build Contract, without incurring any obligations or liabilities.

## **U. CONTRACT EXECUTION; DELIVERY OF REQUIRED DOCUMENTS**

### ***1. BY APPARENT DESIGN-BUILDER***

The Apparent Design-Builder must execute three (3) originals of the Contract and return the executed originals, together with (a) the rest of the Contract (Technical (*Exhibit A*) and Price Proposals) and (b) the Apparent Design-Builder required submittals set out above in this **Contract Book 1 (ITDB - Instruction to Design-Builders)**, to the Department within ten (10) Calendar Days of the date of the delivery of the Contract by the Department, or within such longer period as the Department may set in writing prior to or during the response period established herein. The Apparent Design-Builder’s failure to execute and deliver the duly-executed Contract, Contract, and required submittals to the Department within the response period, will result in (a) forfeiture of the Proposal Security as Liquidated Damages payable to the Department, and (b) the Department’s commencement of discussions with the second highest-ranking Design-Builder. If the Apparent Design-Builder is a joint venture or partnership, each joint venture member or partner must sign the Contract on behalf of both itself and Design-Builder.

### ***2. BY THE DEPARTMENT***

If the Department fails to execute the Contract and deliver to the Apparent Design-Builder an original of the Contract within forty-five (45) Calendar Days following receipt of the Apparent Design-Builder’s duly-executed Contract, and other required submittals, the Design-Builder shall have the right to withdraw the Proposal without penalty.

The following information applies to Federal-Aid construction projects:

**To report bid rigging activities call: 1-800-424-9071**

The U.S. Department of Transportation (DOT) operates the above toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m. eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

Nothing in this **Contract Book 1 (ITDB - Instruction to Design-Builders)** shall be construed to obligate the Department to enter into a Contract with any Design-Builder.

**APPENDIX A**

CONTRACT BOOK 1 (ITDB - INSTRUCTIONS TO DESIGN-BUILDERS) FORMS

<b>FORM NAME</b>	<b>FORM DESIGNATION</b>
ALTERNATE TECHNICAL CONCEPTS (ATC) SUBMITTAL	FORM ATC
RFP QUESTION REQUEST	FORM QR
RESPONSE CATEGORY II	FORM RC II
RESPONSE CATEGORY III	FORM RC III
RESPONSE CATEGORY IV	FORM RC IV
Receipt of Addenda/Clarifications	FORM C

For TDOT use only					
The ATC:					
<input type="checkbox"/>	Is Approved	<input type="checkbox"/>	Does not qualify as an ATC, but may be included in the Proposal without an ATC.	<input type="checkbox"/>	Is Conditionally approved with identified conditions attached.
<input type="checkbox"/>	Is Not approved	<input type="checkbox"/>	Does not qualify as an ATC and may not be included in the Proposal.	<input type="checkbox"/>	Is Deemed to take advantage of an error or omission in the RFP and will not be considered. The RFP will be revised to correct this.

1. Design-Builder Name:
  
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
  
3. Description. A detailed description (attach schematic drawings) of the configuration of the ATC or other appropriate descriptive information (including, if appropriate, product details [i.e., specifications, construction tolerances, special provisions] and a traffic operational analysis, if appropriate).
  
4. Usage. Where and how the ATC would be used on the Project.
  
5. Deviations. References to all requirements of the RFP those are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such variance(s).
  
6. Analysis. An analysis justifying use of the ATC and why the variance to the requirements of the RFP should be allowed.
  
7. Impacts. Discussion of potential impacts on vehicular traffic, environmental impacts identified, community impact, safety and life-cycle Project impacts, and infrastructure costs (including impacts on the cost of repair and maintenance).
  
8. History. A detailed description of other projects where the ATC has been used, the success of such usage, and names and telephone numbers of project owners that can confirm such statements.

9. Risks. A description of added risks to TDOT and other entities associated with implementing the ATC.
  
10. Costs. A description of the ATC implementation costs to TDOT, the Design Builder, and other entities (right-of-way, utilities, mitigation, long term maintenance, etc.).

**RFP QUESTION REQUEST  
FORM QR**

PROJECT: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee

DB CONTRACT No.: DB2001

DATE:

QR#	RFP Book No. and Section ID	Question	Reserved for Agency Response

**RFP QUESTION REQUEST  
FORM QR**

<b>QR#</b>	<b>RFP Book No. and Section ID</b>	<b>Question</b>	<b>Reserved for Agency Response</b>



## **RESPONSE CATEGORY II: ORGANIZATION**

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. Describe responsibilities and reporting relationships or chain of command clearly identifying assignments of various tasks for Design and Construction Functions, Key Personnel and Design Professionals.  Organizational Chart included.
4. Description of those categories of work which the Design-Builder anticipates will be performed by the Design-Builder's own forces and those categories which will be performed by Subcontractors.
5. Plans and procedures for management of Subcontractors

## **RESPONSE CATEGORY II: PROJECT EXPERTISE**

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. The Design-Builder is encouraged to identify all major subcontractors (including lead design firm) in the Technical Proposal as omission of this information may affect the evaluation under this evaluation criterion.
4. Describe the overall strengths of the Design Team and their ability to fulfill the design requirement of this Project.

## **RESPONSE CATEGORY III: PROJECT UNDERSTANDING**

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. Describe or outline the objectives, goals, and tasks to show or demonstrate the Design-Builder's view and understanding of the nature of the contract. Consider if the Scope of Services in this RFP is sufficient to attain the Department's goals and objectives.
4. Identify any potential Right-of-Way and Utility impacts or state no potential impacts. If impacts, identify innovative approaches to minimize any impacts to the Right-of-Way and/or to the Utility.

## **RESPONSE CATEGORY III: SCHEDULE MANAGEMENT**

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. Describe or outline the assumptions upon which the CPM Schedule was based, risks, constraints, contingencies, sequence of work, the controlling operation or operations, intermediate completion dates, Milestones, project phasing, anticipated work schedule and estimated resources that impacted the schedule.  
 CPM Schedule included in the Proposal.  
The CPM Schedule shall indicate how the Design-Builder intends to:
  - Divide the Project into work segments to enable optimum construction performance and explain the planned sequence of work, the critical path, proposed phasing of the Project, and any other scheduling assumptions made by the Design-Builder.
  - Plans and procedures to insure timely deliveries of materials to achieve the Project schedule.
  - Categories of work that Design-Builder anticipates will be performed by Design-Builder's own direct labor force, those categories that will be performed by Subcontractors, those categories that will be performed by project specific teams, and those categories that will be performed by existing teaming arrangements.
  - Provide an explanation of Design-Builder's methodology for updating the CPM.
4. Describe Pay Item Breakdowns, including the physical features and activities included in the Pay Item, and all work included in the Pay Item Totals as reflected on the Schedule of Items.
5. Describe the Design-Builder Issue Resolution Plan

## RESPONSE CATEGORY III: PROJECT MANAGEMENT

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. Describe how the Design-Builder would bring experience, expertise, innovation, and “not business as usual” skills in leadership and technical ability.
4. Describe the administrative and operational structure that would be used to perform the proposed work, including:
  - Management plan to attain the necessary staff required.
  - Describe how design personnel will interface with the construction personnel.
  - Communicating and coordinating between TDOT and the Design-Builder. Include the approach for change management during construction for design initiated, field initiated, and TDOT-initiated changes.
  - Describe existing design and/or construction quality management plan(s) that the Design-Builder may have already developed, and how it (they) will be implemented into work performed. Describe coordination of design and construction activities to ensure consistency in quality. Explanation of how independence of quality staff and function will be maintained. Indicate the minimum number of inspectors that will be supplied at different stages during the Project duration.
  - Approach to managing costs under this Contract while fulfilling required tasks and assuring quality of work.
  - Describe or outline the process for constructability, durability, maintainability, safety, aesthetics and environmental mitigation in the design and construction processes.
  - Describe or outline the process for coordinating design and construction functions, including both design and construction components and all Subcontractor activities. Include a brief description (Construction Management Plan) of the Design-Builder proposes to deal with unexpected disruptions (e.g., weather- or accident-related).

## **RESPONSE CATEGORY III: PROJECT MANAGEMENT**

- Describe or outline the process (Design Review Plan) on how the Design-Builder will facilitate and implement Design Reviews as required under the Contract. Describe how the Designer and the design staff will be involved during construction. Also include the Design-Builder's Construction Staging and Phasing Plan, indicating timing and sequencing of major activities for the Project.
  
- Describe or outline the process (Diversity Plan) of the plan to ensure projected subcontracting plan is applied at all tiers. Describe how the Design-Builder will achieve the goal set forth on this project.
  
- Identify DBE and EEO representatives and their roles and responsibilities and identification of specific strategies and approaches that will be taken by the Design-Builder to meet the requirements of the Affirmative Action and Equal Employment Opportunity provisions described in **Design-Build Standard Guidance**.

## **RESPONSE CATEGORY III: ENVIRONMENTAL COMPLIANCE**

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. Identify any potential environmental impacts.
4. Describe or outline the process for environmental compliance.
5. Describe or outline the approach to Erosion Prevention and Sediment Control for the Project.
6. Describe or outline the understanding of the overall approach to permitting and the comfort level with obtaining the required permit application/ modification within the allowed timeframe.
7. Identify innovative approaches to minimize any impacts in environmentally sensitive areas.
8. A description of instances on projects within the last three years where there has been success in meeting and/or exceeding environmental performance standards and permit conditions. If none, state none.
9. A description of instances on projects within the last three years where the Design-Builder, including Major Participants and Subcontractors have not met environmental performance standards and permit conditions. For each of these instances, describe the non-compliance act, the reason(s) the non-compliance act occurred, plans implemented to correct the non-compliance act and lessons learned from these instances, and internal procedures developed to ensure similar issues do not occur on future projects. If none, state none.

## **RESPONSE CATEGORY III: INNOVATION**

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. Identify any innovative design or construction solutions that the Design-Builder considers innovative and how those solutions will better serve the Project. Include a description of ideas that were considered, whether implemented or not.
4. Identify any potential innovation in traffic control and how those solutions will better serve the Project. Describe any temporary impacts and associated with innovations.
5. Will these innovations add to, subtract from, or have no effect on the costs?



## RESPONSE CATEGORY IV: TECHNICAL SOLUTION

1. Design-Builder Name:
2. Name of Project: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (DB2001)
3. Conceptual Plans, Drawings:
  - Plan View of design concepts with key elements noted included.
  - Preliminary horizontal and vertical alignments of all roadway elements included.
  - Typical Sections included.
4. Identify drainage modifications and designs to be implemented.
5. Identify the appropriate design criteria for each feature if not provided.
6. Identify all bridge types to be constructed, including any special design features or construction techniques needed.
7. Identify any deviations or proposed design exceptions, from the established design criteria that will be utilized. Explain why the deviation is necessary. Describe any geotechnical investigations to be performed by the Design-Builder.
8. Describe any geotechnical investigations to be performed by the Design-Builder.
9. Describe how any utility conflicts will be addressed and any special utility design considerations. Describe how the design and construction methods minimize TDOT's utility relocation costs. If none, state none.
10. Describe how the design will affect TDOT Right-of-Way costs. If none, state none.
11. Identify types of any retaining walls and /or noise walls if applicable. If none, state none.
12. Identify any aspects of the design or construction elements that are considered innovative. Include a description of alternatives that were considered, whether implemented or not. Attach a copy of any approved ATCs used in this Technical Proposal. If none, state none.

## **RESPONSE CATEGORY IV: TECHNICAL SOLUTION**

13. Describe any traffic control requirements that will be used for each construction phase. Describe how traffic will be maintained as appropriate and describe understanding of any time restrictions noted in the RFP. Specifically describe how business and residential access will be maintained, if applicable. Describe any required road closures and duration thereof.
  
14. Describe the safety considerations specific to the Project. Discuss overall approach to safety. Describe any proposed improvements that will be made prior to or during construction that will enhance the safety of the work force and/or traveling public both during and after the construction of the Project.

**Form C**  
**Receipt of Addenda/Clarifications**

Design-Build Project: Interstate 65 Interchange at Buckner Road, Williamson County,  
Tennessee (DB2001)

Design-Builder's Name: \_\_\_\_\_

The undersigned acknowledges receipt of the addenda to the RFP as indicated below.

**ADDENDA**

Addendum/Clarification No.	_____	Dated	_____
Addendum/Clarification No.	_____	Dated	_____
Addendum/Clarification No.	_____	Dated	_____
Addendum/Clarification No.	_____	Dated	_____
Addendum/Clarification No.	_____	Dated	_____

Failure to acknowledge receipt of all addenda may cause the Proposal package to be considered non-responsive to the solicitation. Acknowledged receipt of each addendum must be clearly established and included with response to this RFP.

By: \_\_\_\_\_ Print Name: \_\_\_\_\_

Title: \_\_\_\_\_ Date: \_\_\_\_\_

**DESIGN-BUILD  
RFP CONTRACT BOOK 2  
DESIGN-BUILD CONTRACT**

**TENNESSEE DEPARTMENT OF TRANSPORTATION**

**INTERSTATE 65 INTERCHANGE AT BUCKNER ROAD IN  
SPRING HILL, TN  
WILLIAMSON COUNTY- TENNESSEE**

**CONTRACT NUMBER: DB2001**



**July 17, 2020**

Addendum #1 August 21, 2020

Addendum #2 September 11, 2020

Addendum #3 September 29, 2020

Addendum #6 November 19, 2020

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## **DESIGN-BUILD CONTRACT**

**THIS Design-Build Contract** is entered into by and between the State of Tennessee, acting by and through the Department of Transportation (the “Department”) and----- (the “Design-Builder”), (collectively, the “Parties”) as of the Effective Date of the Contract.

### **RECITALS**

**WHEREAS**, the Department requires the improvements for the project known as the **Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee Design-Build Project** (the “Project”) more particularly described in **Contract Book 1 (ITDB - Instructions to Design-Builders)** and **Contract Book 3 (Project Specific Information)**. The Project will be funded with state and federal dollars, thereby requiring that the Design-Builders adhere to all pertinent state, federal, and local requirements.

and

**WHEREAS**, the parties intend for the Contract to be a lump-sum Design-Build contract obligating the Design-Builder to perform all work necessary to complete the Project by the deadlines specified herein, for the Contract Amount, subject only to certain specified limited exceptions. To allow the Department to budget for the Project and to reduce the risk of cost overruns, the Contract includes restrictions affecting Contractor’s ability to make claims for an increase to the Contract Amount or an extension of the Completion Deadlines. The Department may require additional related work within the general vicinity of the Project which, if required, shall be included in the Project and added to the Contract by Change Order; and

**WHEREAS**, the Department requires a Design-Builder competent to perform all work necessary to complete the Project in accordance with the terms and conditions of the Contract, and able to do so within the Contract Time allocated herein. If the Design-Builder fails to complete the Project within the time limitations set forth in the Contract, then the Department will suffer substantial losses and damages. The Contract therefore provides that a deduction shall be made from monies due the Design-Builder, not as a penalty, but as Liquidated Damages, as stated in **Contract Book 3 (Project Specific Information)**, if such completion is delayed;

and

**WHEREAS**, Design-Builder asserts that it is competent and prepared to perform all work necessary to complete the Project in accordance with the terms and conditions of the Contract, and that it is able to do so within the Contract Time allotted herein;

**WHEREAS**, the Department is authorized under Section 54-1-119 of the Tennessee Code Annotated to enter into this Contract;

**NOW, THEREFORE**, in consideration of the mutual promises contained herein, and for other good and valuable consideration, the Department and the Design-Builder agree as follows:

## **AGREEMENT**

### **A. GENERAL CONTRACT PROVISIONS, DEFINED TERMS AND GENERAL SCOPE OF WORK**

#### **1. *INCORPORATION OF RECITALS***

The foregoing Recitals incorporated herein and made a part hereof for all purposes as if fully set forth constitute additional promises or representations and warranties of the Parties.

#### **2. *CONTRACT DOCUMENTS***

The Contract Documents, made a part hereof for all purposes as if fully set forth, are intended to reflect the complete understanding of the Parties concerning their respective rights and responsibilities under the Contract.

#### **3. *EFFECTIVE DATE***

The Contract shall become effective on the date on which each Party has signed this Contract and all approvals have been obtained (the “Effective Date”).

#### **4. *THE CONTRACT***

The Contract, which includes this **Contract Book 2 (Design-Build Contract)** and all other Contract Documents, forms the entire agreement between the Parties.

#### **5. *DEFINED TERMS AND ACRONYMS***

Defined terms and acronyms utilized in **Contract Book 1 (ITDB - Instructions to Design-Builders)**, this **Contract Book 2 (Design-Build Contract)**, **Contract Book 3 (Project Specific Information)** and in the other Contract Documents are either set forth in **Design-Build Standard Guidance**, or defined in the text accompanying the term.

#### **6. *APPLICABLE VERSION OF LAW OR STANDARD***

All work shall be performed pursuant to the applicable law and in accordance with the standards in effect at the time of the RFP issuance, including addenda, unless otherwise specified in the Contract or by amendment.

#### **7. *MINIMUM CONTRACT REQUIREMENTS***

##### **a. *DEPARTMENT SUPPLIED***

Among the Contract, the Department has mandated certain Contract requirements from which the Design-Builder may not deviate in the scope of the work, except as instructed by the Department. The Department has also established certain minimum Contract requirements that set a minimum standard of performance or quality that the Design-Builder must meet or exceed in performance of the Contract.

**b. DESIGN-BUILDER SUPPLIED**

Design-Builder has established certain minimum Contract requirements located in *Exhibit A* (Design-Builder's Technical Proposal), consisting of those provisions of its Proposal that meet or exceed minimum Contract requirements established by the Department and upon which the Department has relied in awarding the Contract to the Design-Builder.

Any non-standard Department specification or provision shall be considered the Design-Builder-supplied Contract provisions and requires Department Review and Approval which will obligate the Design-Builder within this the Contract.

**c. MANAGEMENT PLANS**

A Transportation Management Plan is required, pursuant to the **Design-Build Standard Guidance**. A Quality Plan, Safety Plan and Health, Environmental Compliance Plan or other management plans (e.g. a Project Management Plan), pursuant to the **Design-Build Standard Guidance**, have to be submitted under this Contract.

**8. RIGHT- OF-WAY/UTILITY COORDINATION SERVICES**

Right-of-Way (ROW) acquisition services and construction related Utility Coordination are included under this Contract. See **Contract Book 3 (Project Specific Information)** for information on ROW services, ROW acquisition and ROW acquisition cost and/or Utility Coordination services required for the Design-Builder's Technical Proposal.

**9. DESIGN SERVICES**

The design services required under the Contract shall include, at a minimum, each of the following:

- Performance of all design services, including but not limited to roadway design, pavement design, geotechnical design, environmental design, drainage design, structural design, hydraulic/hydrologic design, traffic control and survey;
- Performance of all other engineering design services required under the Contract and/or otherwise necessary to complete the work in accordance with all Contract requirements; and
- All Design Documents and Design Reviews shall be provided by the Design-Builder and performed in accordance with the Design Review schedule established in the Critical Path Method (CPM) Schedule, and in accordance with all Contract requirements.

All design services to be performed under the Contract are appurtenant to construction services being provided by the Design-Builder.

**a. LICENSE REQUIREMENTS; STANDARD OF CARE**

Whether the Design-Builder is a design professional, has a design professional as a member or on staff, or will otherwise provide an outside source to perform the services of a design professional, all design services (whether constituting the practice of architecture, the practice of engineering, the practice of surveying, or

the practice of other design services) referred to in this Contract shall be provided by duly-licensed and competent design professionals employed or otherwise retained by the Design-Builder. The design professionals currently designated to provide such design services are listed in Subsection 3.4. All design services shall be performed by a design professional of the appropriate professional discipline in accordance with the degree of skill and care ordinarily used by competent practitioners of the same professional discipline under similar circumstances, taking into consideration the contemporary state of the practice and the project conditions.

**b. DESIGN DOCUMENTS**

The Design-Builder shall generate and provide to the Department all Design Documents. The Design-Builder shall make a comprehensive design check and Design Review at the following five (5) stages of design development, stated in more detail within **Design-Build Standard Guidance**:

- Definitive Design;
- Interim designs;
- Readiness-for-Construction Plans, Specification and quantity estimates;
- Working Plans;
- As Built Plans.

**1) READINESS-FOR-CONSTRUCTION PLANS AND SPECIFICATIONS**

Upon completion of the Definitive Design Reviews, Working Plan Design Reviews, Interim Design Reviews (if any), and Readiness-for-Construction Design Reviews, as specified in the **Design-Build Standard Guidance**, the Design-Builder shall finalize the Readiness-for-Construction Plans and Specifications. In performing these services, the Design-Builder shall meet the following requirements:

- Readiness-for-Construction Plans and Specifications shall comply with all applicable Laws and all Contract requirements.
- Readiness-for-Construction Plans and Specifications shall be a complete, fully coordinated, integrated package, without any significant modifications or further clarifications required.
- The Design-Builder shall file all documents required for the approval of Authorities having jurisdiction over the Project, shall obtain all necessary permits not obtained by the Department, and shall pay for all associated fees, including application, filing, plan review, and appeal fees.
- The Design-Builder shall provide the Department with written certification and all Design Documents required for the Readiness-for-Construction certification, in accordance with **Design-Build Standard Guidance**.
- The Design-Builder shall submit to the Department all documentation and Design Quality Records required under **Design-Build Standard Guidance**.

- The Design-Builder shall submit to the Department As-Built Plans and the Design-Builder Specifications, compiled and organized in accordance with all Contract requirements that incorporate all changes in the design and construction of the Project.
- The Design-Builder shall prepare and deliver to the Department all As-Built Plans, the Design-Builder Specifications, and other Design Documents, information, and data required under the Contract to be provided to the Department.

## 2) VALUE ENGINEERING COST PROPOSALS

During development of the Design Documents, the Design-Builder and the Department may collaborate on identifying, evaluating and implementing value engineering cost proposal (VECP) options in accordance with **Design-Build Standard Guidance**. The Design-Builder's development of the Design Documents and completion of the Readiness-for-Construction Plans and Specifications shall not preclude further identification and implementation by the Design-Builder and the Department of additional cost-reduction options during construction. VECPs adopted by the Department will be implemented through Change Orders pursuant to **Design-Build Standard Guidance**.

## 10. CONSTRUCTION SERVICES

The construction services required under the Contract shall include, at a minimum, each of the following:

- Performance of all construction services, including but not limited to construction and removal, if required, of temporary and/or permanent roadway, structures, and erosion prevention and sediment control, materials testing, signing, traffic control, paving and pavement markings;
- Protection of environmental resources, including plant and animal life and associated habitats; and
- Performance of all other construction services required under the Contract and/or otherwise necessary to complete the work in accordance with all Contract requirements

The Design-Builder shall provide all necessary work to furnish to the Department complete, fully-functional road improvements specified in **Design-Build Standard Guidance**, capable of being fully utilized for the purposes described in the Contract, and constructed in compliance with all Contract requirements. The Design-Builder shall perform the construction services as follows:

- The Design-Builder shall supervise and administer all construction activities in accordance with Contract requirements.
- In the event of the existence of any dispute between the Parties under the Contract, the Design-Builder shall continue to perform in accordance with the Contract terms and seek resolution in accordance with **Design-Build Standard Guidance**.
- The construction work shall be of good quality, free from faults and defects, and in conformance with all Contract requirements. At its own expense, the Design-

Builder shall correct construction work that does not conform to these requirements.

- The Design-Builder shall utilize new materials and equipment in the work, unless otherwise specified in the Contract.
- The Design-Builder shall pay all taxes, fees, and costs associated with the acquisition of tools, equipment, materials, and the performance of the work, in accordance with **Design-Build Standard Guidance**.
- The Design-Builder shall comply with all applicable laws.
- The Design-Builder shall keep the work location and its vicinity free from accumulation of waste materials and rubbish caused by the Design-Builder's operations.
- The Design-Builder shall notify the Department when the work or an agreed upon portion thereof has been completed, in accordance with **Design-Build Standard Guidance**.
- The Design-Builder shall maintain, on the work location, a copy of all approved Management Plans, environmental permits, approved design documents, project records and the entire Contract and any other document required in accordance with **Design-Build Standard Guidance**.
- As the Project constitutes "Highway construction" utilizing Federal funds, the Design-Builder shall comply with any Federal requirements and appropriate Department Special Provisions as provided by **Design-Build Standard Guidance** and **Contract Book 3 (Project Specific Information)**, respectively. Consistent with **Design-Build Standard Guidance**, the Design-Builder shall be fully responsible for initiating, maintaining, and supervising safety precautions and programs in connection with the work, including but not limited to, taking reasonable precautions to ensure the safety of, and prevention of damage, injury, or loss to:
  - Employees of the Department present on or in the vicinity of a work location, employees of the Design-Builder and other persons performing work on or in the vicinity of a work location, and other persons, including the traveling public, who may be affected;
  - Materials and equipment to be incorporated into the Project;
  - Portions of the Project under construction or completed; and
  - Other property within or adjacent to a work location.
- The Design-Builder shall be liable for damage to or loss of property at work locations and on private property affected by the Design-Builder's activities, pursuant to **Design-Build Standard Guidance**. This subparagraph shall in no way affect the applicability or coverage of the bonds and insurance required under Section 7.0 of this Contract.
- The Design-Builder shall deliver to the Department all notices regarding completion of the work pursuant to **Design-Build Standard Guidance**.
- The Design-Builder shall perform all other construction work required to complete the Project in conformance with all Contract requirements, including Legal Requirements.

## **11. QUALITY MANAGEMENT SERVICES**

Quality Management services will include performance, at a minimum, of all activities and obligations, including preparation of all documentation, described in **Design-Build Standard Guidance**, and as otherwise necessary to ensure that the work is performed in accordance with all Contract requirements.

## **12. PROJECT MANAGEMENT SERVICES**

Project management services shall be integrated with the design services and construction services described herein and in the Contract, and shall include, at a minimum, the following:

- Project Controls (including Risk Management, Scheduling, Reporting and Document Management).
- Construction management;
- Contract management;
- Safety management; and
- Traffic management.

## **B. GENERAL STANDARDS FOR PERFORMANCE OF THE WORK**

### **1. GOOD FAITH**

The Design-Builder shall provide and perform all design services, quality management, project management, and construction services in good faith and as expeditiously as is consistent with the applicable standards of skill and care ordinarily exercised by members of the profession under similar conditions and circumstances, and the orderly prosecution of the work.

### **2. PERFORMANCE STANDARDS**

Where specific performance standards for any aspect of the work have been established in the Department Special Provisions as stated in Appendix B, pursuant to **Contract Book 3 (Project Specific Information)**, the work shall be performed so as to meet or exceed such standards.

### **3. CRITICAL PATH METHOD (CPM) SCHEDULE**

The CPM Schedule establishes the schedule and deadlines for Contract performance, with which the Design-Builder must comply. The CPM Schedule, as it may be modified during the course of the Project pursuant to the **Design-Build Standard Guidance**, shall anticipate and accommodate such periods of time shown in **Contract Book 1 (ITDB - Instructions to Design-Builders)** as may be required for the Department's review of Design Documents, and for approval by Authorities having jurisdiction over the Project of any required submissions, including but not limited to, applications for permits and environmental impact evaluations. Since time is of the essence in the Design-Builder's successful completion of its assignment, the Design-Builder agrees to begin work on each work location immediately after receiving authorization from the Department to proceed with its work efforts.

**4. REVIEW AND COMMENT, OR ACCEPTANCE**

The Department's consideration, Review and Comment, or Acceptance of any matters, or the Department's authorization of any action, will not be deemed or construed as relieving the Design-Builder of its sole responsibility for, and its complete and exclusive control over the means, methods, sequences and techniques for, performance of the work in accordance with the terms of the Contract.

**5. EXTRA WORK TO BE PROVIDED BY THE DESIGN-BUILDER**

The Design-Builder shall perform Extra Work in accordance with **Design-Build Standard Guidance**.

**C. RELATIONSHIP AND ROLES OF THE PARTIES**

**1. INDEPENDENT ENTITY**

The Design-Builder is an independent entity and not an officer, employee, or agent of the Department.

**2. DEPARTMENT REPRESENTATIVE AND CONTACT INFORMATION**

The Department's representative for this Project is

	<u>Ms. Lia Obaid, P.E.</u>
	CONSTRUCTION DIVISION REPRESENTATIVE
Address:	<u>TENNESSEE DEPARTMENT OF TRANSPORTATION</u>
	<u>505 DEADERICK STREET, SUITE 700</u>
	<u>NASHVILLE, TN 37243</u>
E-mail:	<u><a href="mailto:lia.obaid@tn.gov">lia.obaid@tn.gov</a></u>
Telephone Number:	<u>615-532-7522</u> Fax Number: <u>615-741-0782</u>



**4. DESIGN-BUILDER REPRESENTATIVE**

The Design-Builder’s representative for this Project is

\_\_\_\_\_   
Design-Builder’s Project Manager

**Address:**

\_\_\_\_\_  
\_\_\_\_\_

**E-mail:**

\_\_\_\_\_

**Telephone Number:**

\_\_\_\_\_

**Fax Number:**

\_\_\_\_\_

**5. KEY PERSONNEL AND DESIGN PROFESSIONALS**

The Design-Builder’s Key Personnel, Design Professionals, shall perform the functions established under the Contract for the duration of the Contract and are listed below.

**a. KEY PERSONNEL**

Design-Builder’s Project Management Personnel (Level “1” Personnel) shall consist of the following:

- Project Manager: \_\_\_\_\_
- Design Manager: \_\_\_\_\_
- Construction Manager/Superintendent: \_\_\_\_\_
- Traffic Control Supervisor: \_\_\_\_\_
- Environmental Compliance Manager: \_\_\_\_\_
- Safety Manager: \_\_\_\_\_

Safety Manager to meet requirements of amendment to Section 2.5.5. Safety and Health Plan of the TDOT Design-Build Standard Guidance (see **Contract Book 3 (Project Specific Information)**, Section 1.3 Department Provided Materials).

**b. DESIGN PROFESSIONALS**

The Design-Builder’s design professionals (Level “2” Personnel) shall consist of the following:

- Prequalified R.O.W. Acquisition/Appraisals: \_\_\_\_\_
- Design Lead Engineer - Structures: \_\_\_\_\_
- Design Lead Engineer - Roadway: \_\_\_\_\_
- Design Lead Engineer – Geotechnical: \_\_\_\_\_
- Design Lead Engineer – Traffic: \_\_\_\_\_

- Erosion Prevention/Sediment Control Inspector: \_\_\_\_\_

**6. *SUBSTITUTION OF KEY PERSONNEL AND/OR DESIGN PROFESSIONALS***

The Parties agree that each Key Personnel, Design Professional and Subcontractor is unique, and that the Department has relied upon their qualifications in selecting the Design-Builder to perform the Contract. Therefore, the Design-Builder shall not replace any Key Personnel or Design Professional during the term of the Contract. Notwithstanding the foregoing, in those limited circumstances in which the Department elects to consider substitutions, the process shall be governed by the provisions of **Design-Build Standard Guidance**. In the event the Department approves a substitution request, the Department retains the right to strictly enforce this Section C.5 in the event of future requests for substitution. No individual substitution approval or pattern of substitution approvals shall constitute a waiver of this requirement. Should the Department, in its sole discretion, elect to authorize a substitution, such authorization shall not relieve the Design-Builder of its sole responsibility under the Contract to complete all work and deliver the Project in accordance with all Contract requirements.

**D. *DATE OF COMMENCEMENT AND COMPLETION OF SERVICES***

**1. *TIME FOR PERFORMANCE***

The Contract shall take effect on the Effective Date and shall be performed by the Parties according to its terms, unless earlier terminated, until Final Acceptance by the Department in accordance with **Design-Build Standard Guidance**.

**2. *COMMENCEMENT OF SERVICES***

The Design-Builder is authorized to commence the work within the Contract for post award submittals pursuant to **Design-Build Standard Guidance**. The Design-Builder shall not perform any services beyond post award submittal until the issuance of first Notice to Proceed (NTP) and for each subsequent phase requiring a Review and Approval NTP.

**3. *COMPLETION DATES***

The Design-Builder shall complete all work to be done under the Contract, except for plant/vegetation establishment, by   /  /   and not later than September 30, 2023.

The Design-Builder shall specify the number of calendar days for completion of the project within their price proposal. The number of calendar days specified by the Design-Builder in their price proposal will be placed in the Contract above prior to execution of this Design-Build contract.

## **E. COMPENSATION**

### **1. CONTRACT AMOUNT**

The Department agrees to compensate the Design-Builder for all work performed under the Contract for a fixed price of \$\_\_\_\_\_the “Contract Amount”). The Contract Amount includes the entire cost of completing the Project in accordance with all Contract requirements as contemplated by the Parties under the Contract, and further includes all contingencies and the Design-Builder’s overhead and profit. The Contract Amount shall be payable in accordance with **Design-Build Standard Guidance**.

### **2. PROGRESS PAYMENTS**

The Department shall make progress payments to the Design-Builder in accordance with **Design-Build Standard Guidance**. Progress payments shall be based upon the Design-Builder’s Schedule of Items submitted with the Price Proposal, which shall include the cost of all work, and separately for each of the three segments of work defined in Contract Book 3 Project Specific Information. The Department’s payment of progress payments shall not be deemed by either Party to constitute Acceptance or Approval of any Pay Item covered by such payment, or a waiver of a claim or demand for repair of any defects therein.

### **3. ADJUSTMENTS TO THE CONTRACT AMOUNT**

The Contract Amount shall only be adjusted through issuance of properly-authorized Change Orders.

### **4. PAYMENTS FOR EXTRA WORK**

The Department will make payments for Extra Work in accordance with the provisions of **Design-Build Standard Guidance**.

### **5. DEDUCTIONS FROM MONIES DUE**

The Department may deduct from monies due or to become due the Design-Builder, as follows:

- Amounts representing price adjustments authorized under the provisions **Design-Build as specified in Contract Book 3 (Project Specific Information)**;
- Amounts representing recoupment of damages, including but not limited to Liquidated Damages as stated in **Contract Book 3 (Project Specific Information)**;
- Amounts assessed by Authorities (e.g., fines and penalties) for which the Design-Builder is responsible under the terms or the Contract or by law;
- Amounts the Department is compelled by court order or other legal mandate to withhold and/or tender to Authorities or third parties; and
- Any other amounts authorized under the Contract or by law to be deducted.

## **F. CHANGES IN THE WORK**

Changed work and Extra Work shall be authorized by the Department only under the circumstances set forth in, and pursuant to the terms of, **Design-Build Standard Guidance**. The Design-Builder shall not begin performance of any Changed work or Extra Work until the Department has issued a properly-authorized Change Order, and the Design-Builder shall perform all such work strictly in accordance with the terms of the Change Order.

## **G. INSURANCE AND BONDING REQUIREMENTS**

### **1. INSURANCE REQUIREMENTS**

During the term of the Contract, the Design-Builder shall maintain in full force, at its own expense, from insurers holding a current certificate of authority to transact the business of insurance in the State of Tennessee, all of the insurance coverage's required under **Design-Build Standard Guidance**.

The Design-Builder, being an independent contractor, agrees to maintain errors and omissions insurance in such an amount (**\$ 1,000,000.00 minimum**) and form as are agreeable to the Department.

### **2. BONDING REQUIREMENTS**

During the term of the Contract, the Design-Builder shall maintain in full force, at its own expense and from Sureties licensed to do business in Tennessee, Performance and Payment Bond in the full Contract Amount. The Parties understand and agree that the obligation of the Design-Builder's Surety for the faithful performance of the Contract shall include not only all construction, but also the performance of all design services under the Contract.

### **3. INDEMNIFICATION**

The Design-Builder shall, at all times, observe and comply with all applicable federal, state and local laws, ordinances and regulations and shall indemnify and hold harmless the State of Tennessee and all of its officers, agents and servants against any claim of liability or assessment of fines or penalties arising from or based upon the Design-Builder's and/or its employees' or agents' violations of any such law ordinance or regulation.

The Design-Builder shall hold harmless and indemnify the Department for all claims and damages which result from the failure of the Design-Builder to perform its engineering and design duties in conformance with the reasonable standard of care within the State of Tennessee. Said indemnification shall include, but not be limited to, costs for the redesign of plans and the preparations of new specifications as well as the costs for repairs to the construction work itself.

The Design-Builder shall be responsible for any and all injury or damage to persons or to property arising from the prosecution of the work and due to any act, omission, neglect or misconduct in its manner or method of prosecuting the work or due to its non-execution of the work or due to defective work or materials. The Design-Builder shall indemnify and hold harmless the State, the Department, and all of its officers,

agents, and employees from all suits, actions or claims of any character arising from the Design Builder's negligent or other tortious acts or omissions in the prosecution of the work, use of unacceptable materials in constructing the work, infringement of patent, trade mark or copyright, or claims for Workers' Compensation.

If any such suit, action or claim is filed, the Department may retain from the monies due to the Design-Builder under this Contract a sum deemed sufficient by the Department to protect the Department from loss therefrom. Upon resolution of the suit, action or claim, any remaining retained funds will be released.

These requirements of indemnification shall be a continuing obligation of the Design-Builder and shall survive the termination of the Contract regardless of cause.

## **H. OWNERSHIP AND USE OF WORK PRODUCT OF THE DESIGN-BUILDER**

All work product of the Design-Builder arising from performance of the Contract shall be the exclusive property of the Department, as more particularly provided for under **Design-Build Standard Guidance**.

Plans, specifications and any maps prepared or obtained under the terms of this Contract shall be delivered to and become the property of the Department pursuant to **Design-Build Standard Guidance**. Basic design notes and sketches, charts, computations, all original drawings, and other data prepared or obtained under this Contract shall be made available, upon request, to the Department without restriction or limitation of their use.

## **I. PROJECT RECORDS**

### **1. FINANCIAL AND OTHER PROJECT RECORDS**

The Design-Builder shall maintain complete Project Records as described in **Design-Build Standard Guidance**, in the manner required under the terms of the Contract. The Design-Builder shall keep full and detailed accounts and exercise such controls as may be necessary for proper financial management of the Project. The accounting and control systems shall be satisfactory to the Department.

### **2. RECORD RETENTION PERIOD**

The Design-Builder shall retain and preserve all Project Records for a period as stated in **Design-Build Standard Guidance**, after final payment or for such longer period as may be required by law (the "Record Retention Period").

### **3. ACCESS TO RECORDS**

The Department, the Department's representatives, and FHWA shall be afforded reasonable and regular access to the Project Records for the duration of the Contract and the Record Retention Period. This requirement to make Project Records available to the Department shall be a continuing obligation of the Design-Builder and shall survive the termination of the Contract regardless of cause.

#### **4. SUBCONTRACT RECORD RETENTION REQUIREMENTS**

The Design-Builder shall require each Subcontractor to retain its Project Records for the Record Retention Period, and to provide equivalent access to Project Records to the Department, the Department's representatives and FHWA. The Design-Builder shall require each Subcontractor to include in lower-tier subcontracts the same Project Record retention and access requirements.

#### **5. LOCATION**

The Design-Builder shall maintain all Project Records at the locations required under the terms of the Contract for the duration of the Contract. Subsequent to Contract completion, the Project Records shall be maintained for the Record Retention Period with suitable security, protection against damage and casualty loss, and access to the Department.

### **J. TERMINATION OR SUSPENSION**

#### **1. TERMINATION FOR CONVENIENCE AND NO FAULT; PAYMENT**

The Contract may be terminated for convenience by the Department in accordance with Department Standard Specifications, as amended. In such case, the Department will make payment in accordance with **Design-Build Standard Guidance**. However, the amount to be paid to the Design-Builder shall in no event exceed the Contract Amount.

#### **2. TERMINATION FOR CAUSE; AMOUNTS PAYABLE**

The Contract may be terminated by the Department for default in accordance with Department Standard Specifications, as amended, and **Design-Build Standard Guidance**. In addition to the acts listed in the above documents, the following shall also be considered defaults for which the Contract may be terminated:

- The Design-Builder or its Design Professionals no longer hold the licenses or certificates required to perform the work or any portion thereof;
- The Design-Builder so fails to perform any agreed-upon portion of the work or Contract item or applicable standard of care as to materially affect the Design-Builder's performance under the Contract in accordance with its terms, and such breach, default or failure is not cured within the requirements of **Design-Build Standard Guidance**; or
- The Design-Builder made knowing or reckless misrepresentations, concealed facts, or failed to disclose information in Design-Builder's Proposal. Such shall constitute fraudulent inducements, and shall entitle the Department to recover reliance damages, in addition to any other available remedies to which it may show itself entitled.

In case of termination for cause, the Department will make payment consistent with the payment provisions included in **Design-Build Standard Guidance** and at the Department's option, including payment for materials left on hand, in accordance with Department Standard Specifications, as amended.

**3. CONTRACT NOTICE OF CONTRACT TERMINATION**

The Department may terminate the Contract, in whole or in part, immediately upon notice to the Design-Builder, or at such later date as the Department may establish in such notice, in accordance with Department Standard Specifications, as amended.

**4. QUALITY OF THE WORK**

In the event of the Department's termination of the Contract, regardless of reason, the Design-Builder shall remain responsible for the quality of the work performed through the date of termination.

**5. LITIGATION**

In the event of litigation instigated by the Design-Builder in accordance with the Contract or by the Department for breach of contract or fraudulent inducement, the Department may pursue both recoupment and set-off in addition to its other available remedies.

**K. ENUMERATION OF CONTRACT**

The Contract includes the following:

- 1. CONTRACT BOOK 1 (INSTRUCTIONS TO DESIGN-BUILDERS - ITDB);**
- 2. CONTRACT BOOK 2 (DESIGN-BUILD CONTRACT);**
- 3. CONTRACT BOOK 3 (PROJECT SPECIFIC INFORMATION);**
- 4. DESIGN-BUILD STANDARD GUIDANCE AND ADDENDUM;**
- 5. THE DEPARTMENT STANDARD SPECIFICATIONS;**
- 6. THE DEPARTMENT SUPPLEMENTAL SPECIFICATIONS;**
- 7. THE DEPARTMENT DESIGN GUIDELINES, AND ADDENDUM;**
- 8. THE DEPARTMENT CONSTRUCTION CIRCULAR LETTERS;**
- 9. THE DEPARTMENT STANDARD DRAWINGS;**
- 10. THE DEPARTMENT MATERIAL AND TEST STANDARD OPERATING PROCEDURES;**
- 11. EXHIBIT A (TECHNICAL PROPOSAL);**
- 12. CHANGE ORDERS;**
- 13. FORCE ACCOUNT WORK ORDERS;**
- 14. WRITTEN ORDERS AND AUTHORIZATIONS ISSUED BY THE DEPARTMENT;**
- 15. ALL OTHER PROGRAMMATIC PLANS OR ANY OTHER DOCUMENTS; IN ANY FORM, REQUIRED TO BE SUBMITTED TO THE DEPARTMENT PURSUANT TO THE TERMS OF APPLICABLE CONTRACT.**
- 16. ALL MATERIAL INCLUDED BY REFERENCE IN ANY OF THE ABOVE DOCUMENTS.**

**L. ORDER OF PRECEDENCE**

All Contract Documents are intended to be complementary. Conflicts, if any, will be resolved utilizing the following descending order of precedence.

1. ***CONTRACT BOOK 3 (PROJECT SPECIFIC INFORMATION) AND ADDENDA;***
2. ***CONTRACT BOOK 2 (DESIGN-BUILD CONTRACT);***
3. ***CONTRACT BOOK 1 (INSTRUCTIONS TO DESIGN-BUILDERS - ITDB);***
4. ***THE DEPARTMENT SUPPLEMENTAL SPECIFICATIONS;***
5. ***THE DEPARTMENT CONSTRUCTION CIRCULAR LETTERS;***
6. ***THE DEPARTMENT STANDARD SPECIFICATIONS;***
7. ***THE DEPARTMENT DESIGN GUIDELINES AND ADDENDUM;***
8. ***THE DEPARTMENT STANDARD DRAWINGS;***
9. ***DESIGN-BUILD STANDARD GUIDANCE;***
10. ***ALL OTHER PROGRAMMATIC PLANS OR ANY OTHER CONTRACT DOCUMENTS;***
11. ***ALL MATERIAL INCLUDED BY REFERENCE IN ANY OF THE ABOVE DOCUMENTS.***

## **M. DESIGN-BUILDER CERTIFICATIONS AND DISCLOSURES**

### **1. NONDISCRIMINATION**

The Design-Builder shall follow the nondiscrimination provisions as provided in this **Contract Book 2 (Design-Build Contract)**.

### **2. DBE COMPLIANCE**

The Design-Builder shall follow the DBE provisions as provided in the Special Provisions provided in this **Contract Book 2 (Design-Build Contract)**. The Design-Builder shall comply with the Department DBE requirements in the **Design-Build Standard Guidance**, and shall require that all Subcontractors so comply. The Design-Builder shall include the Department DBE requirements in all subcontracts.

### **3. ILLEGAL IMMIGRANTS**

The Design-Builder shall follow the Illegal Immigrant provisions as provided in this **Contract Book 2 (Design-Build Contract)**.

### **4. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS - PRIMARY COVERED TRANSACTIONS**

The Design-Builder shall follow the debarment, suspension, and other responsibility matters provisions as provided in this **Contract Book 2 (Design-Build Contract)**.

### **5. CERTIFICATION FOR GRANTS, LOANS, AND COOPERATIVE AGREEMENTS.**

The Design-Builder shall follow the provisions as provided in this **Contract Book 2 (Design-Build Contract)**.



The Design-Builder agrees that if any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Contract, the Design-Builder shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

**6. GOALS AND TARGETS**

There is a DBE Utilization Goal of 14% for this Project. If a goal is stated, the Design-Builder shall follow the DBE provisions as provided in **Contract Book 2 (Contract)**.

**N. MISCELLANEOUS PROVISIONS**

**1. EMPLOYMENT OF DEPARTMENT WORKERS**

The Design-Builder shall not engage, on a full, part-time, or other basis during the period of this Contract, any professional or technical personnel who are or have been at any time during the period of the Contract in the employ of the Department, except regularly retired employees, without the written consent of the Department.

**2. COVENANT AGAINST CONTINGENT FEES**

The Design-Builder warrants that it has not employed or retained any company or person other than a bona fide employee working solely for the Design-Builder to solicit or secure this Contract, and that it has not paid or agreed to pay any company or person, other than a bona fide employee working solely for the Design-Builder, any fee, commission, percentage, brokerage fee, gifts, or any other consideration, contingent upon or resulting from the award or making of this Contract. For breach or violation of this warranty, the Department shall have the right to deduct from the Contract Amount or consideration, or otherwise recover, the full amount of such fee, commission, percentage, brokerage fee, gifts, or contingent fee.

**3. ENERGY POLICY AND CONSERVATION ACT**

Under this Contract, the Design-Builder shall give due consideration to and, as applicable, comply with the standards, orders, and requirements relating to energy efficiency contained in the Department energy conservation plans issued in compliance with the Energy Policy and Conservation Act (P.L. 94-165).

**4. ADDITIONAL EMPLOYMENT REGULATIONS**

The Design-Builder shall comply with the Vocational Rehabilitation Act of 1973 as approved by Congress on September 26, 1973, herein incorporated by reference, which prohibits employment discrimination against physically handicapped persons. Further, the Design-Builder shall comply with Section 2012 of the Vietnam Era Veterans Readjustment Act of 1974 which requires the Design-Builder to take affirmative action to employ and advance in employment qualified veterans of the Vietnam Era.

**5. *COPYRIGHTING***

The Design-Builder shall be prohibited from copyrighting any papers, reports, forms or other material which is a part of any work under this Contract without written approval from the Department. Publication rights to any documents produced are reserved by the Department.

**6. *GOVERNING LAW; JURISDICTION; VENUE***

The Design-Builder is assumed to be familiar with and observe and comply with those Federal, State, and local laws, ordinances, and regulations in any manner affecting the conduct of the work and those instructions and prohibitive orders issued by the Department and Federal Government regarding fortifications, military and naval establishments and other areas. The Design-Builder shall observe and comply with those laws, ordinances, regulations, instructions, and orders in effect as of the date of this Contract.

This Contract shall be governed by and construed in accordance with the laws of the State of Tennessee. The Design-Builder agrees that it will be subject to the exclusive jurisdiction of the courts of the State of Tennessee in actions that may arise under this Contract. The Design-Builder acknowledges and agrees that any rights or claims against the Department or its employees hereunder, and any remedies arising there from, shall be subject to and limited to those rights and remedies, if any, available under TCA § 9-8-101 through 9-8-407.

**7. *CONTRACT INTERPRETATION***

Notwithstanding anything in the Contract to the contrary, no field explanations or interpretations provided by the Department at any meetings, and no comments by the Department on Design Documents or Construction Documents, shall be deemed, construed or interpreted to (a) amend, supersede or alter the terms, requirements, limitations or meaning of any Contract Document or (b) release or relieve the Design-Builder from full responsibility for the design of the Project in accordance with the Contract. However, written interpretive engineering decisions from the designated Department contact person(s) pursuant to the Contract may be relied upon to provide information, and interpretations of ambiguous or uncertain requirements set forth in the Contract.

**8. *NOTICES***

Notices to be given hereunder shall be given in writing by personal delivery, facsimile, e-mailing or mailing the same, postage prepaid, to the Design-Builder or the Department at the addresses or numbers set forth in Sections C.2 and C.3, or as either Party may hereafter indicate pursuant to this Section. Any notice delivered by facsimile and email shall be deemed to be received when confirmation of successful transmission is generated by the transmitting machine. Any notice so mailed, personally delivered, facsimile or e-mail transmission shall be the sole responsibility of the Design-Builder to track and confirm receipt by the Department and shall be confirmed by telephone notice to the Department for the Project. Any notice shall be effective as to the Design-Builder upon delivery into the possession of one of the Design-Builder's designated management personnel, and as to the Department, upon

delivery to the Department. Regular, day-to-day communications may be transmitted through one of the methods set forth above, in person, by e-mail, or by other similar electronic transmission.

**9. DISCLOSURE OF TAX IDENTIFICATION NUMBER**

The Design-Builder shall provide its federal tax ID number to the Department. The Tax Identification Number provided pursuant to this authority will be used for the administration of State, Federal and local tax law.

**10. SEVERABILITY**

The Parties agree that if any term or provision of the Contract is declared by a court of competent jurisdiction to be illegal or otherwise invalid, the validity of the remaining terms and provisions shall not be affected, and the rights and obligations of the Parties shall be construed and enforced as if the Contract did not contain the particular term or provision held to be invalid.

**11. NO WAIVER**

The failure of the Department to enforce any provision of the Contract shall not constitute a waiver by the Department of that provision or any other provision of the Contract.

**12. MEDIA CONTACTS; CONFIDENTIALITY**

Unless otherwise specifically authorized in writing, the Design-Builder shall provide no news release, press release, or any other statement to a member of the news media regarding this Project without the Department's prior written authorization. The Design-Builder shall require this clause within all Subcontractors agreements.

**13. ORGANIZATIONAL CONFLICTS OF INTEREST**

The Design-Builder shall identify all relevant facts relating to past, present, or planned interest(s) of the Design-Builder's (including the Major Participants, proposed Design-Builder members, and their respective chief executives, directors, and Key Personnel) which may result, or could be viewed as, an organizational conflict of interest in connection with this Project.

The Design-Builder shall disclose:

- a. any current contractual relationships with the Department (by identifying the Department contract number and project manager);
- b. present or planned contractual or employment relationships with any current Department employee;
- c. any current relationships between the Major Participants, Key Personnel, and/or Design Professionals of the Design-Builder on other Department projects; and
- d. any other circumstances that might be considered to create a financial interest in the contract for the Project by any current Department employee if the Design-Builder is awarded the contract.

The Design-Builder must also disclose any current contractual relationships where the Design-Builder is a joint venture. The foregoing is provided by way of example, and shall not constitute a limitation on the disclosure obligations.

For any fact, relationship, or circumstance disclosed in this Section 14.13, the Design-Builder must identify steps that have been or will be taken to avoid, neutralize, or mitigate any organizational conflicts of interest.

In cases where Major Participants on different Design-Builder organizations belong to the same parent company, each Design-Builder must describe how the participants would avoid conflicts of interest through the qualification and proposal phases of the Project. All Organizational Conflicts of Interest shall be addressed on Form COI.

**14. THE DEPARTMENT'S INSURANCE**

The State of Tennessee is self-insured and such insurance shall cover the Department's operations and activities under the Contract.

**15. JOINT VENTURES AND PARTNERSHIPS**

If the Design-Builder is a joint venture or a partnership, each joint venture member or partner is executing this Contract on behalf of both itself and the Design-Builder, and each joint venture member or partner and Design-Builder shall be jointly and severally liable under this Contract.

**16. MERGER CLAUSE**

The Contract constitutes the entire Contract between the Parties on the subject matter addressed herein. The terms of this Contract cannot be waived or amended, in any manner whatsoever, except by written instrument signed by the Parties and containing all required State of Tennessee approvals. Any waiver, if made, shall be effective only in the specific instance and for the specific purpose given. There are no understandings, agreements, or representations, oral or written, regarding this Contract except as contained or incorporated by reference herein.

The Design-Builder's authorized representative, by his/her signature below, hereby acknowledges that he/she has read this Contract, understands it, and can affirm that the Design-Builder agrees to be bound by its terms and conditions. This Contract may be executed in several counterparts, each of which shall be an original, and all of which shall constitute but one and the same instrument.

**IN WITNESS WHEREOF**, the Parties have executed this Contract, which shall be effective as of the Effective Date.

**DESIGN-BUILDER**

**NAME:** \_\_\_\_\_

\_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_  
Company Officer Signature    Printed Name and Title    Date

**STATE OF TENNESSEE**  
**DEPARTMENT OF TRANSPORTATION**

This Contract is accepted this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, and  
is effective on the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Clay Bright, Commissioner

\_\_\_\_\_  
John Reinbold, General Counsel  
Approved as to Form and Legality

## **APPENDIX A**

### ***SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS***

The following, revised as noted, incorporates the Supplemental Specifications by reference for bidding purposes and will be printed with the contract after award. These Supplemental Specifications may be obtained from the Department’s website:

<https://www.tn.gov/tdot/tdot-construction-division.html>

Supplemental Specifications to the Standard Specifications Revision Date

Supplemental Specification to Section 100 -----	12/30/19
Supplemental Specification to Section 200 -----	12/30/19
Supplemental Specification to Section 300 -----	12/30/19
Supplemental Specification to Section 400 -----	12/30/19
Supplemental Specification to Section 500 -----	12/30/19
Supplemental Specification to Section 600 -----	12/30/19
Supplemental Specification to Section 700 -----	12/30/19
Supplemental Specification to Section 900 -----	12/30/19

**S T A T E**

**O F**

**T E N N E S S E E**

(Rev. 3-30-15)  
(Rev. 11-16-15)  
(Rev. 6-27-16)  
(Rev. 12-2-16)  
(Rev. 5-15-17)  
(Rev. 11-6-17)  
(Rev. 5-14-18)  
(Rev. 7-2-18)  
(Rev. 10-8-18)  
(Rev. 5-13-19)  
(Rev. 8-12-19)  
(Rev. 12-30-19)

January 1, 2015

**Supplemental Specifications - Section 100**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 101.03** (pg. 10) 5-15-17; Terms - Add the following definition for Specialty Items:

“**Specialty Item.** Work items identified in the contract which are not bid normally associated with highway construction and require highly specialized knowledge, abilities, craftsmanship, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract in general, these items are to be limited to minor components of the overall contract.”

**Subsection 102.11** (pg. 18), 3-30-15; Licensing of Bidders Add the following to the second paragraph:

“The Department may retain the Proposal Guaranty, not as a penalty, but as liquidated damages in the event a bidder does not have a license at the time of award.”

**Subsection 104.04** (pg. 27), 3-30-15; Maintenance of Traffic - Add the following as the first full paragraph on page 27:

“If a holiday falls on Saturday or Sunday, do not close lanes or restrict traffic from the preceding Friday at 6 am to the following Monday at 6 am.”

**Subsection 105.02** (pg. 37), 5-13-19; **Plans and Working Drawings**; Revise 8<sup>th</sup> paragraph:

Except for Strain Poles, Street Lighting Poles, High Mast Poles with Accompanying Lowering Devices, Photometrics and Cofferdams, the fabricator shall furnish the Division of Structures with as-built shop drawings electronically in \*.pdf or \*.tif format after the structure is complete and before final payment will be made.

**Subsection 105.02** (pg. 35-37), 12-30-19; **Plans and Working Drawings**; Revise 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> & 9<sup>th</sup> paragraphs:

Submit shop drawings in sets with the drawing numbers running consecutively in each set, ~~and appropriately bound if more than five sheets in a set.~~ Do not resubmit shop drawings marked “APPROVED” or “APPROVED AS NOTED” unless specifically instructed.

~~Shop drawings shall be a minimum of 8 1/2 x 11 inches in size. Legible half size copies (11 x 17 inches) of full size drawings are acceptable for submittal (see sheet format below). Submit for approval the minimum number of sets of shop drawings specified below. Only one set will be returned to the fabricator unless specifically requested and the additional set(s) requested to be returned is submitted along with those shown below. For Consultant designs, an additional set is required. For railroad structures, three additional sets are required. All shop drawings shall be submitted electronically. The preferred format for electronic submittals is \*.pdf format. Submittals shall be sent to the following email address: [TDOT.Structures.ShopDrawings@tn.gov](mailto:TDOT.Structures.ShopDrawings@tn.gov) Paper copies of shop drawings for steel girders will be required when requested by the designer for review. Submittals for the following items except structural steel girders (i.e., Bridge Girders) may be submitted electronically in \*.pdf or \*.tif format. Structural Steel Girders must be submitted in paper format as directed below.~~

~~Two Sets:—Structural Steel (Half size sets shall be submitted for approval. Four additional sets, two full size and two half size, will be required after final approval.)~~

~~Four Sets:—Energy Attenuation Devices, Overhead, Cantilever Sign Structures, and Cofferdams~~

~~Six Sets:—Metal Bridge Rails, Bearing Devices (shop drawings not required for plain elastomeric bearing pads), Bridge Deck Drains (shop drawings not required if fabricated according to applicable Standard Drawing), Navigation Lighting Support Brackets, Precast Prestressed Concrete Beams, Precast Prestressed Concrete Deck Panels, Precast Reinforced Concrete Beams, Precast Reinforced Concrete Box Culverts, when applicable, Post tensioned Concrete, Roadway Expansion Devices, Steel Stay In Place forms, and any other type of structural shop drawing not specifically listed.~~

Except for Strain Poles, Street Lighting Poles, High Mast Poles with Accompanying Lowering Devices, Photometrics and Cofferdams, the fabricator shall furnish the Division of Structures an ~~electronic copy of~~ as-built shop drawings ~~electronically in \*.pdf or \*.tif format~~ after the structure is complete and before final payment will be made. A \*.pdf file is the preferred format for electronic copies. Submittals shall be sent to the following email address: [TDOT.Structures.ShopDrawings@tn.gov](mailto:TDOT.Structures.ShopDrawings@tn.gov).



All working drawings shall be approved by the Engineer; such approval will be general in nature and will not operate to relieve the Contractor of its responsibility under the Contract for the successful completion of the Work. In addition to such approval, working drawings involved in construction over or under railroad tracks will require approval of the railroad company before approval is granted by the Engineer. Submit ~~four sets of~~ plans for any cofferdams, sheeting and bracing details for bents or piers adjacent to a track, and falsework for erecting the spans over tracks, and the method of installation for the protection of the tracks, to the Engineer. Do not begin such work until these plans are approved by the Department and the Chief Engineer of the railroad. Approval of these plans will not relieve the Contractor from liability. The above also applies in connection with the installation of pipes, culverts, and other work adjacent to or under railroad tracks. The Department will not pay for the cost of preparing working drawings separately. These costs will be included in the prices of the respective Contract items involved.

**Subsection 105.03** (pg. 38), 12-2-16; Conformity with Plans and Specifications - Add the following to the end of the section:

“Products listed on the QPL which fail to comply with Departmental performance expectations shall be removed from the QPL. Products removed from the QPL shall be replaced with an equivalent product from the QPL. At the Departments discretion, an equitable adjustment may be made to the contract for invoice price deviations.”

**Subsection 105.03** (pg. 38), 6-27-16; Conformity with Plans and Specifications - Add the following to the end of the section:

“All products must be listed on the Qualified Products List (QPL) and perform as specified at the time of use regardless of Letting date. Any products removed from the QPL or that do not perform as specified, must be supplied or replaced at the Contractor’s expense.”

**Subsection 105.06** (pg. 40), 3-30-15; Planning of the Operations-Preconstruction Conference - Replace 2<sup>nd</sup> sentence of 1<sup>st</sup> paragraph:

“The contractor must attend a preconstruction conference arranged by the Engineer.”

**Subsection 105.06** (pg.41), 12-30-19; **Planning of the Operations-Preconstruction Conference**; Add No. 12 to 1<sup>st</sup> paragraph:

**12. Submit schedule for meeting Certified Payroll time frames required under 29 CFR Sections 3.3, 3.4, and 5.5 for Contractor payroll and Subcontractor’s payroll on the contract. Submit the weekly pay period end days and payroll payment days for the Contractor and Subcontractors on the project.**

**Subsection 105.10** (pg. 46), 5-15-17; Authority and Duties of Inspectors - Revise 2<sup>nd</sup> sentence of the first paragraph:

“Such inspection may extend to any part or to all of the Work and to the preparation, fabrication, or manufacture of materials to be used.”

**Subsection 105.11** (pg. 46), 5-15-17; Inspection of Work - Revise the 1<sup>st</sup> sentence:

“The Engineer or its representative will inspect all materials and each part or detail of the Work .”

**Subsection 105.13** (pg. 48), 5-15-17; Completion of Specific Sections of a Project - Remove the 2<sup>nd</sup> paragraph.

**Subsection 105.15** (pg. 49), 5-15-17; Acceptance - Remove last paragraph:

**Subsection 105.19** (pg. 57 ), 12-30-19; **Basis of Payment**; Revise 1<sup>st</sup> paragraph:

The Department will make partial payments for Construction Stakes, Lines and Grades on the basis of a percentage of the lump sum price bid in accordance with the schedule shown in Table 105.18-1. Submit a certification of the personnel and ~~the name, license number, and qualifications of the Tennessee licensed Professional Engineer or a Tennessee Registered Land Surveyor who is performing the work as specified in 105.09, Construction Stakes, Lines, and Grades at the preconstruction meeting. No payment for Construction stakes, lines, and grades will be made until the certification has been received.~~

**Subsection 106.06** (pg. 61), 5-15-17; Field Laboratory - Revise the first paragraph of A. and subsection A.2:

“Provide a Type A Laboratory consisting of a building, room, or dedicated area having at least 120 square feet of floor area with a minimum width of 8 feet and a minimum height of 7 feet. Provide laboratory space that is floored, roofed, sealed inside, weather-tight, and furnished with electricity. Furnish the space with adequate work benches, cabinets, and drawers. Provide suitable heat and air conditioning, and equip the laboratory with a laboratory oven capable of maintaining a temperature of 230 °F ± 9 °F. Stove tops and hot plates may be used to determine moisture conditions of aggregates. Provide lights, electrical outlets, and adequate ventilation for the tests being performed.

When the determination of aggregate gradation is required, furnish the following equipment:

1. Scales of appropriate capacity and design to weigh the required samples. Scales are to be sensitive to within 0.2% of the sample to be weighed. Provide standard weights for scale calibration.
2. Screens of appropriate size and mesh to separate the samples into the required series of sizes. Woven wire cloth shall conform to AASHTO M 92. Screens for running gradations of coarse aggregates shall meet AASHTO T27.
3. A mechanical shaker approved by the Engineer and suitable for running both coarse and fine aggregate.
4. Facilities to perform wash tests according to AASHTO T 11 that include an adequate and suitable water supply.”

**Subsection 107.08** (pg. 69), 5-15-17; Protection of Streams, Lakes, and Reservoirs - Add the following to the end of the third paragraph:

“All costs associated with any support activities including obtaining permission from landowners, permits, and compliance are to be included in the bid cost for the project.”

**Subsection 107.08 A** (pg. 8-69), 8-12-19; **Protection of Streams, Lakes and Reservoirs**; Revise 4<sup>th</sup> and 8<sup>th</sup> paragraph, remove 10<sup>th</sup> paragraph: Add 2 new paragraphs after the 8<sup>th</sup> paragraph;

4<sup>th</sup> paragraph, revise the first sentence;

The Department will acquire the necessary permits related to waters of the United States as defined in 33 CFR Part 323 or waters of the State as defined in TCA §69-3-103 for construction indicated on the Plans.

8<sup>th</sup> paragraph, revise the first and last sentence;

Exercise every reasonable precaution throughout the life of the Project to prevent the discharge of any substance into the waters of the United States and waters of the State or to place or cause any substance to be placed where it,...

If a discharge as described above occurs, stop the Work, notify the Engineer, and the Tennessee Department of Environment and Conservation, Division of Water Resources, and take immediate actions to contain and remediate the discharge. Perform containment and remediation work at no cost to the Department.

10<sup>th</sup> paragraph, remove the entire paragraph;

Add 2 new paragraphs after the 8<sup>th</sup> paragraph;

Conduct and schedule operations so as not to interfere with the movement and habitat of species such as mussels, fish, and birds as indicated in plans or permits. Comply with the provisions and

requirements of all applicable permits and United States Fish and Wildlife Service Biological Opinion.

Exercise every reasonable precaution to prevent fish kills while performing any Work activity in waters of the State. Pay any costs incurred by the Tennessee Wildlife Resources Agency to monitor for fish kills during blasting or demolition of structures. If a discharge or change described above results in a fish kill, pay any fines or costs related to the fish kill.

**Subsection 107.08** (pg. 71), 11-6-17; Migratory Birds - Add the following as section E:

“E. Migratory Birds

The following procedure will be automatically implemented by TDOT, unless FWS approves in writing deviations due to special circumstances, or for a specific variance.

Cliff swallow and barn swallow nests, eggs, or birds (young and adults) will not be disturbed between April 15 and July 31. From August 1 to April 14, nests can be removed or destroyed, and measures implemented to prevent future nest building at the site (i.e., closing off area using netting).

Exceptions:

(1) If there are no eggs in the nests prior to April 15, TDOT will be allowed to destroy the nests and prevent further nest building at the site, by installing netting. Net openings shall be ½ inch or smaller after installation, and shall be installed securely and in such a manner that it will not pose a safety hazard. Absence of eggs prior to net installation must be documented by using appropriate means for determination, such as, but not limited to, site visits and photographs.

(2) If there are no birds (young or adult) left in any of the nests at a specific site prior to July 31, the nests can be removed or destroyed. Absence of birds must be documented by using appropriate means for determination, such as, but not limited to, site visits, photographs, and observations of no birds using the nests.

Osprey, Double Crested Cormorants, Great Horned Owls, Barn Owls, Black Vulture, and Eastern Phoebes:

If these avian species are encountered on a bridge project, TDOT Ecology should be contacted immediately for further assistance.

The Contractor will be assessed the amount of any and all fines and penalties assessed against and cost incurred by TDOT which are the result of the Contractor’s failure to comply with this specification. TDOT will not be responsible for any delays or costs due to the Contractor’s failure to comply. Additional compensation or contract time due to noncompliance will not be granted.

All costs incurred with this specification will not be measured or paid for separately, but will be considered included in the contract unit prices bid for other items of the contract.”

**Subsection 108.01** (pg. 78) 5-15-17; Subletting of Contract - Add the following list of specialty items:

“Do not sublet, allow second tier sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof or a right, title, or interest in the Contract without the Engineer’s written consent. If the Engineer consents to subletting or second tier subletting a portion of the Contract, the Contractor shall self-perform work amounting to not less than 30% of the total original Contract cost. For items designated in the Contract as “specialty items,” the Contractor may sublet or second tier sublet this work and deduct the cost of such specialty items from the total original cost before computing the amount of the Work required to be self-performed by the Contractor with its own organization.

As stated above, unless there is a Special Provision 108A in the proposal, the following items are designated as Specialty Items:

- Item 105-01 - Construction Stakes, Lines and Grades
- Item 202-01.02 – Removal of Asbestos
- Item 209 - EPSC
- Item 411-12.\*\*Shoulder Scoring
- Item 501-03.12 – Concrete Shoulder Rumble Strip
- Item 602-03 - Steel Structures
- Item 602-04 - Steel Structures
- Item 602-10.13 / .14 - Navigational Lighting
- Item 602-10.81 – Heat Straightening
- Item 603-02 - Repainting Steel Structures
- Item 603-05 - Containment and Disposal of Waste
- Item 604-04.01 - Applied Texture Finish (New Structures),
- Item 604-04.02 - Applied Texture Finish (Existing Structures)
- Item 604-04.62 - Clean and Texture Finish Median Barrier
- Item 604-05.31 - Bridge Deck Grooving (Mechanical)
- Item 604.07 – Retaining Wall
- Item 604-42.01 – Underwater Divers
- Item 606-26.05 – Core Drilling for Piles (Abandoned)
- Item 617 - Bridge Deck Sealant
- Item 624 – Retaining Wall Items
- Item 625-01.08,10,11 – Inclinator, Drilled Shaft Inspections
- Item 640 - Weigh Station Items
- Item 705 - Guardrail, Anchors, etc.
- Item 706 - Guardrail Items
- Item 707 - Fencing Items
- Item 712 - Traffic Control Items
- Item 713 - Signing Items
- Item 714 - Lighting Items
- Item 716 - Pavement Marking Items
- Item 720-03, 720-04, 720-05, 720-06, 720-07, 720-08, 720-09 – Railroad Highway Crossing

Item 721-01.06 – Irrigation System Repair  
Item 721-10, 721-11.20, 721-11.30, 721-12 – Landscape and Irrigation  
Item 725 – ITS items  
Item 730 - Traffic Signal Items  
Item 7\*\* - Utility Items  
Item 750.01 – Mitigation Site  
Item 801 - Seeding  
Item 802 - Landscaping Items  
Item 803-01 - Sodding  
Item 805 - Erosion Control  
Item 806 - Project Mowing”

**Subsection 108.03 C** (pg. 81), 12-30-19; **C. Project Durations Greater Than 24 Months or When Required By Contract**; Remove the 1<sup>st</sup> sentence, replace with new No. 1:

Develop a Critical Path Method (CPM) project execution schedule and subsequent updates as required or as specifically requested by the Engineer. Generate the CPM schedule using Primavera Project Management (P6) scheduling software.

- 1. Initial Project Schedule.** Within thirty (30) calendar days after the Contract Award, submit an Initial Project Schedule (IPS) to the Engineer for review and acceptance. A detailed plan shall be completed as described in Baseline CPM Schedule, for all work contemplated for the first one hundred and twenty (120) calendar days after Notice to Proceed. The IPS shall begin with the date of Award and also include all other work thereafter in sufficient detail to identify the Critical Path and identify all contractual milestones.

Submission of the IPS shall be in accordance with the CPM Schedule Submission Requirements. The IPS will be reviewed at the Pre-Construction Conference. IPS schedule must be accepted prior to Notice to Proceed.

**Subsection 108.03 C.1** (pg. 81), 12-30-19; **Baseline CPM Schedule**; Revise No. & 1<sup>st</sup> paragraph:

- 2. Baseline CPM Schedule.** Within **ninety (90)** calendar days after the Notice to Proceed, submit a draft baseline CPM schedule to the Engineer and hold a meeting to review. Define and sequence activities so as to accurately describe the Project and to meet Contract requirements, the scope of work, phasing, accommodations for traffic, and interim, milestone, and project completion dates. Use working days to create the schedule, beginning with the date of **Award**. **The baseline CPM shall include, in their entirety, the detailed activities representing the entire duration of the project.** Ensure that the CPM schedule identifies and includes the following:...

**Subsection 108.03 C.2** (pg. 83), 12-30-19; **Schedule Updates**; Revise No. & last paragraph:

- 3. CPM Schedule Submission Requirements. ....**

The Engineer and Contractor will review the draft baseline CPM schedule at **a meeting specific for the review of the schedule.** ~~the preconstruction conference~~ The Engineer will accept the draft baseline CPM schedule, provide review comments, or request additional information. Make appropriate adjustments or provide additional information. The Department may withhold payments or only make payments for the value of materials in accordance with **109.08** until the Engineer accepts the baseline CPM schedule. The Engineer’s acceptance is based solely on whether the baseline schedule meets the requirements of **108.03**. Review comments made by the Engineer on the initial schedule will not relieve the Contractor from compliance with the Contract. The Contractor is responsible for scheduling, sequencing, and prosecuting the Work to comply with the Contract requirements. The cost of preparing and updating the schedule is incidental to all Contract items.

**Subsection 108.03 C.3** (pg. 84), 12-30-19; **Schedule Updates**; Revise No. & last paragraph:

**4. Schedule Updates. ...**

Submit the updated schedule electronically to the Engineer. **The Engineer reserves the right to reject any schedule updates because of changes in relationships between activities on the critical path, inadequate or inaccurate narrative updates, or other deficiencies in the schedule updates as required in this subsection. If the Contractor fails to provide monthly schedule updates, or address the Engineer’s comments regarding the monthly schedule update, by the estimate payment date, the Engineer may withhold up to 5% of the monthly estimate payment, until such time as an acceptable update has been provided.**

**Subsection 108.09** (pg. 90) 5-14-18; Failure to Complete the Work on Time - Table 108.09-1: Modify the Daily Charge (\$/Day) as shown below:

**Table 108.09-1: Liquidated Damages for Failure to Complete the Work on Time**

Original Contract Amount (\$)	Daily Charge (\$/day)
0 to 500,000	400.00
> 500,000 to 1,000,000	580.00
> 1,000,000 to 2,000,000	800.00
> 2,000,000 to 10,000,000	1,000.00
>10,000,000 to 20,000,000	1,600.00
>20,000,000	2,500.00

**Subsection 109.01** (pg. 98-100) 11-16-15; Measurement of Quantities, E. Weight; Remove the 12<sup>th</sup> paragraph and replace with the following:

“The scales shall be checked by an independent certified scale company. The check shall be performed on a semiannual basis; January through June and July through December. The results shall be maintained onsite and made available for review to Departmental personnel. If deficiencies are reported, all corrections shall be performed, documented, and verified prior to supplying material for TDOT projects.”

**Subsection 109.01** (pg. 98-99) 5-15-17; Measurement of Quantities, E. Weight, Modify the 6<sup>th</sup> paragraph to the following:

“Employ a Certified Public Weigher as defined in the Certified Public Weigher Law of 1981, Tennessee Code Annotated, Section 47-26-801, et seq., as amended. The Engineer will measure all applicable materials in accordance with the Certified Public Weigher Law and Department policy on scales approved by the Engineer. Provide weight (haul) tickets in accordance with Department policy and as directed by the Engineer. These requirements apply to entities located both inside and outside the state of Tennessee”

**Subsection 109.01** (pg. 98-100) 5-15-17; Measurement of Quantities, E. Weight, Modify the 12<sup>th</sup> paragraph to the following:

“The scales shall be calibrated and certified by an independent certified scale company. The calibration and certification shall be performed on a semiannual basis; January through June and July through December. Scales shall be validated on a quarterly basis to ensure their continued accuracy. Validation shall be made by a verified known weight, or other scales that are approved by the Department or other State agency. A verified known weight shall be checked for continued accuracy each time the scales are calibrated. The results shall be maintained onsite and made available for review to Departmental personnel. If deficiencies are reported, all corrections shall be performed, documented, and verified prior to supplying material for TDOT projects.”

**Subsection 109.01** (pg. 98-100), 11-9-17; Measurement of Quantities E. Weight, Revise subsection to the following:

“E. Weight

The term “ton” will mean the short ton consisting of 2,000 pounds avoirdupois.

Unless otherwise specified, the Engineer will accept certified weights for materials measured or proportioned by weight that are shipped by rail or truck transport, provided that only the actual weight of the material used is paid for.



For bituminous materials, net certified scale weights or weights based on certified volumes in the case of rail or truck transport shipments, unless otherwise specified, will be used as a basis of measurement, subject to correction when bituminous material has been lost, wasted, or otherwise not incorporated in the Work.

In all cases where measurement of materials is based on certified weights, provide the Engineer with certified weigh bills showing the net tons of materials received in each shipment. The Engineer will not pay for materials in excess of the amounts represented by the certified weigh bills.

Certified Weigh Tickets for Asphalt Mixtures and Aggregate Materials shall list on the ticket:

1. Date
2. Time
3. The ticket number
4. Gross weight of the loaded truck
5. Tare weight of the truck
6. Net weight of the material to be paid
7. Running Daily Total for the particular material
8. Truck number
9. Truck Legal limit

Employ a Certified Public Weigher as defined in the Certified Public Weigher Law of 1981, Tennessee Code Annotated, Section 47-26-801, et seq., as amended. The Engineer will measure all applicable materials in accordance with the Certified Public Weigher Law and Department policy on scales approved by the Engineer. Certified Weigher licenses shall be posted near the scale beam or weight indicator in full view at all times. Certified Weigher shall be the only person allowed to operate the scale or weigh recording equipment. Provide weight (haul) tickets in accordance with Department policy and as directed by the Engineer. These requirements apply to entities located both inside and outside the state of Tennessee.

Certified Weigher shall weigh each load with the maximum load not to exceed the legal limit established by law. The proposed haul route shall be known prior to deployment.

Provide a standard brand of platform truck scales with a sufficient rated capacity to weigh the maximum gross load to which they will be subjected. Do not use truck scales to

measure weights in excess of the manufacturer's rated capacity. Clearly post the manufacturer's rated capacity on the scale manufacturer's plate and in the shelter provided for the weigher.

At the time of installation or modification of existing scales, test the scales before using to ensure they are within the allowable tolerances. Use a qualified scale technician to perform any alteration (e.g., electrical readout) or change in the rated capacity. Document all changes or alterations made by the scale technician and furnish a copy of the documentation to the Department.

House the recording mechanism of the scale in a suitable shelter furnished with adequate light, heat, chairs, tables, and storage drawers as needed for the convenience of the weigher. In addition, keep the scale platform and scale pit free of debris that could affect the accuracy of the scales.

Provide digital readout and scale printers as the primary weight indicator or as accessory equipment. The Department will inspect and approve all scale control and recording equipment.

Ensure the scale's accuracy within a tolerance of 0.5%. Provide a straight approach at each end of the platform scale in the same plane as the platform and of sufficient length and width to ensure the level positioning of vehicles longer than the scale platform during weight determinations. Weigh each truck and trailer with no brakes set on any wheel. Locate the scale platform so that surface water will drain away from it and to allow for an adequate foundation of concrete or other approved materials. Construct the foundation of sufficient strength and durability to withstand repeated capacity loading without affecting the accuracy of the scales.

The scales shall be calibrated and certified by an independent certified scale company. The calibration and certification shall be performed on a semiannual basis; January through June and July through December. Scales shall be validated on a quarterly basis to ensure their continued accuracy. Validation shall be made by a verified known weight, or other scales that are approved by the Department or other State agency. A verified known weight shall be checked for continued accuracy each time the scales are calibrated. The results shall be maintained onsite and made available for review to Departmental personnel. If deficiencies are reported, all corrections shall be performed, documented, and verified prior to supplying material for TDOT projects.

Weigh tickets shall be certified either manually or electronically. If certified manually, the Certified Weigher shall sign his official registered signature and place his seal on the

original ticket. The ticket shall be filled out in ink and delivered to the project site with the material.

For materials directly paid for by the ton, the Engineer will be furnished a daily recap of all materials delivered to the project. The daily recap sheet must list the ticket number, type of material by item number, and a quantity of materials for each load hauled. Any discrepancy between the certified weigh bills and the daily recap will be reviewed along with the contractor's initialed copy of weigh bills.

Due to possible variations in the specific gravity of aggregates, the tonnage used may vary from the proposal quantities and the Department will not make adjustments in the Contract unit price because of such variations.

The truck tare to be used in the weighing operation shall be the weight of the empty truck determined with full tank(s) of fuel and the operator seated in the cab. A daily weight shall be recorded at the beginning of each work day prior to use of truck. If preferred, a new tare may be determined for each load. When a new tare is obtained for each load, the requirement for full tank(s) of fuel shall be waived.

All weight of trucks shall be recorded to the nearest 20 pounds. The cost of providing facilities and equipment for the accurate weighing, proportioning, or measuring of materials is incidental to the associated pay items in the Contract."

**Subsection 109.01** (pg. 98-100), 10-8-18; Measurement of Quantities, E. Weight - Replace the last sentence to the previously modified 6<sup>th</sup> paragraph with the following:

"Loads in excess of the Legal Weight limit shall be rejected and no payment will be issued."

**Subsection 109.02** (pg. 100-101), 11-9-17; Replace the last paragraph:

"Document on the Prompt Payment Certification Form the actual amount paid to all subcontractors, during the estimate period for which the certification is being made. Ensure all Disadvantaged Business Enterprise (DBE) or certified Small Business Enterprise (SBE) are listed and classified on the form, including DBE or SBE off-site haulers and DBE or SBE material suppliers"

**Subsection 109.02** (pg. 100-101), 7-2-18; Scope of Payment - Remove paragraphs 5, 6 and 7, beginning with, "Provide a monthly payment certification...." and replace with the following:

**"Scope of Payment**

The Department will pay, and the Contractor agrees to accept, the compensation provided in the Contract for the work acceptably completed and measured for payment under each Contract item. Payment of a Contract item is full compensation for furnishing all materials, equipment, tools, labor, and incidentals required to complete the item; and for all risk, loss, damage, or expense arising out of the nature or the performance of the work, subject to **107.19** and **109.11**.

If the "Basis of Payment" clause in the Specifications relating to a unit price in the bid schedule requires that the price of the Contract item cover and be considered compensation for certain work or material essential to the item, the Department will not measure or pay for this same work or material under any other pay item that may appear elsewhere in the Specifications.

When two or more projects are included in the same Contract, the Contractor will be required to furnish any item listed in the Contract to any or all of the projects at the Contract unit price.

The Department requires that the Contractor pay subcontractors, material suppliers, and haulers promptly for their work after receipt of payment for the associated work from the Department. The Contractor shall pay each subcontractor, material supplier, and hauler for work performed or materials supplied under its subcontract no later than thirty (30) calendar days from the date the Contractor receives payment for the work from the Department. Any payment to the Contractor from which any amount has been withheld in accordance with **107.19** or **109.11** shall constitute full payment for the associated work, and the Contractor shall remain obligated to pay all subcontractors, material suppliers, and haulers fully and promptly for all associated work. The same prompt payment requirements apply to subcontractors at all tiers.

Ensure each subcontractor, including all Disadvantaged Business Enterprises (DBE), certified Small Business Enterprises (SBE), and DBE or SBE haulers or material suppliers, has registered for AASHTOWare Project Civil Rights & Labor (CRL) prior to commencing Work.

Document within CRL the actual amount paid to all subcontractors, material suppliers, and haulers during the monthly estimate period for which the certification is being made. The Department will withhold estimate payments if the required information is not submitted or if subcontractors, at any tier, material suppliers, or haulers are not paid after the thirty (30) calendar day time period. Any delay or postponement of payment beyond the thirty (30) calendar day time frame will be subject to terms listed in TCA §12-4-707(b). The Contractor shall remain obligated to pay all subcontractors, material suppliers, and haulers fully and promptly for all work associated with a pay estimate from the Department, notwithstanding any withholding of payment from the Contractor for failure to pay a subcontractor, material supplier, or hauler within thirty (30) calendar days.

The prime contractor, subcontractors, at any tier, material suppliers, or haulers shall not withhold any retainage from progress payments made to their subcontractors.

**Subsection 109.04** (pg. 106), 3-30-15; Replace C. Force Account, 4. Equipment, c. with:

“Idle or standby cost will not be paid for more than 8 hours in a day or 40 hours in a week”.

**Subsection 109.09.** (pg. 114); 5-13-19; **Payment for Stockpiled Materials**; Revise 5<sup>th</sup> paragraph No. 3:

When requesting payment for stockpiled materials, provide a written request to the Engineer that contains the following information:

1. Contract and Project numbers,
2. Item number and description as stated in the Contract proposal,
3. Quantity and unit of measure as stated in the contract proposal and/or project documents,
4. ....

STATE

OF

TENNESSEE

(Rev. 5-18-15)  
(Rev. 11-16-15)  
(Rev. 12-2-16)  
(Rev. 5-15-17)  
(Rev. 5-14-18)  
(Rev. 10-8-18)  
(Rev. 5-13-19)  
(Rev. 12-30-19)

January 1, 2015

Supplemental Specifications - Section 200

of the

Standard Specifications for Road and Bridge Construction

January 1, 2015

**Subsection 201.03 Clearing and Grubbing, A. General** (pg. 118-119), 5-15-17; remove the third paragraph:

**Subsection 201.03 Clearing and Grubbing, C. Clearing and Grubbing Activities, 5. Borrow Pit Areas** (pg. 120), 5-15-17; remove the last sentence in the last paragraph:

“In areas approved as borrow pits by the Engineer, clear and grub all trees, stumps, brush, and heavy vegetation.

In areas designated for obtaining construction material other than borrow, clear and grub trees, stumps, brush, and vegetation, and strip overburden lying above the material to be obtained.

Complete this work prior to removing borrow or construction materials.”

**Subsection 202.03 General** (pg. 125), 5-15-17; remove the last sentence of the 2<sup>nd</sup> paragraph:

“Remove materials designated for salvage in readily transportable pieces, and store the removed pieces at specified locations within the Project limits. Replace with new material, at no additional cost to the Department, those materials designated for salvage that are damaged during removal, transport, or storage operations. Take ownership of material not designated for the Department’s use, and dispose of such material beyond view from the Project limits.”

**Subsection 203.02 B. Borrow Excavation** (pg. 134), 5-15-17; remove the last sentence of the 1<sup>st</sup> paragraph:

“Borrow Excavation consists of material required for the construction of embankments or other portions of the work.”

**Subsection 203.02 B.3** (pg. 135), 5-13-19; **Borrow Excavation (Graded Solid Rock)**; Revise last paragraph:

Process the material using an acceptable method that produces the required gradation. The material shall meet the quality requirements of 903.25. Obtain the Engineer’s approval before using the material.

**Subsection 203.04** (pg. 139), 5-15-17; add 5. to the list of provisions:

- “1. The cost of this material is more economical than borrow excavation.
2. The material is available within the adjusted balance where the shortage exists or the material may be hauled outside the limits of adjusted balance if the cost of the material is more economical than borrow after considering the additional cost of overhaul.
3. The material can be excavated without blasting.
4. There is a minimum of 20 feet between the top of the existing slope and the top of the new slope and a minimum of 5 feet between the top of the new slope and right-of-way line or Control Access fence. The 20-foot minimum will not apply when the existing slope is 4:1 or flatter or to overlapping or near overlapping slopes in medians or between parallel roads or ramps. The Engineer may reduce the 20-foot minimum at the Contractor’s written request.
5. The material has not been designated as potentially acid producing material.”

**Subsection 203.04** (pg. 139-140), 5-15-17; add the 2<sup>nd</sup> paragraph as follows, revise the 5<sup>th</sup> paragraph to remove the reference to the *Procedures for Providing Offsite Waste and Borrow on TDOT Construction Projects*:

**“E. Borrow Areas**

Notify the Engineer before opening any borrow area to allow adequate time for the Engineer to take cross-section elevations and measurements of the ground surface after being stripped, and to test the borrow material before use. Obtain approval for the borrow area according to the *Procedures for Providing Offsite Waste and Borrow on TDOT Construction Projects*. Allow at least 14 days for

testing borrow materials or other material from roadside pits proposed for construction purposes.

Borrow materials shall not contain acid producing materials. Representative samples of the proposed borrow material shall be tested for pH (EPA600/2-78-054 or ASTM D4239). Material with a pH less than 5 is considered acid producing and will not be accepted.

Unless otherwise allowed, do not place borrow material until after the roadway excavation material has been placed in the embankments. If the Contractor places more borrow than is required and thereby causes a waste of excavation, the Department will deduct the amount of such waste from the measured borrow volume. Do not excavate beyond the dimensions and elevations established.

The Contractor may remove highway fencing to obtain borrow materials. Replace the fencing removed with new fence at no cost to the Department, and assume responsibility for confining livestock, as necessary.

Excavate borrow pits to be self-draining where possible and practicable, and of a shape that can be easily cross-sectioned.

After completing excavation operations, provide the area with a neat appearance. Cover all self-draining borrow areas with topsoil and stabilize. Provide and place topsoil and seeding (with mulch) as specified in **203.06** and **801**, respectively.

For borrow pits 1 acre or larger in size that are not self-draining, refer to Sections 53-801 through 53-809 of the TCA. Full information regarding the requirements to be complied with and the necessary permits that the property owner must secure for the construction of a pond, lake, borrow pits, etc., 1 acre or larger that is not constructed to drain, will be supplied upon application to the TDEC.”

**Subsection 203.07** (pg. 141-142), 5-15-17; replace the last paragraph:

“Ensure the offsite disposal grading plan is properly designed (including but not limited to slope stability and fill placement recommendations) regulated, and implemented.”



**Subsection 204.06 – 2** (pg.152-154), 5-14-18; replace Table 204.06-3 with the following:

**Table 204.06-3: Specification Limits for EFF**

<b>Property</b>	<b>Specification Limit</b>
Air content (ASTM D6023)	Maximum 30% <sup>(1)</sup>
Load Application (ASTM D6024)	24 hours maximum in any condition
Consistency	15 inches minimum as tested per <u>204.06.B.1</u>
Compressive strength (ASTM D4832) <sup>(2)</sup>	30 psi minimum at 28 days 100 psi maximum at 28 days

<sup>(1)</sup> When using air entrained mixture design  
<sup>(2)</sup> ASTM D4832 4 x 8 inch cylinder molds may be used. The preferred capping method to be used is wetsuit neoprene restrained in rigid retainers.

**Subsection 204.06 – 2** (pg.152-154), 5-18-15; replace Tables 204.06 with the following:

1. General Use Flowable Fill

**Table 204.06-2: Specification Limits for General Use Flowable Fill**

<b>Property</b>	<b>Specification Limit</b>
Load Application (ASTM D6024)	24 hours maximum in any condition
Consistency	15 inches minimum tested as specified in this <b>204.06.B.1</b>

2. Excavatable Flowable Fill (EFF)

**Table 204.06-3: Specification Limits for EFF**

<b>Property</b>	<b>Specification Limit</b>
Air content (ASTM D6023)	Maximum 30% <sup>(1)</sup>
Load Application (ASTM D6024)	24 hours maximum in any condition
Consistency	15 inches minimum as tested per <b>204.06.B.1</b>
Compressive strength (ASTM D4832) <sup>(2)</sup>	30 psi minimum at 28 days

<sup>(1)</sup> When using air entrained mixture design

<sup>(2)</sup> ASTM D4832 4 x 8 inch cylinder molds may be used. The preferred capping method to be used is wetsuit neoprene restrained in rigid retainers.

Page 154

## 3. Early Strength Flowable Fill (ESFF)

**Table 204.06-4: Specification Limits for ESFF**

<b>Property</b>	<b>Specification Limit</b>
Air content (ASTM D6023)	Maximum 30% <sup>(1)</sup>
Load Application (ASTM D6024)	6 hours maximum in any condition
Consistency	15 inches minimum as tested per <b>204.06.B.1</b>
Compressive strength (ASTM D4832) <sup>(2)</sup>	30 psi minimum at 24 hours

<sup>(1)</sup> When using air entrained mixture design

<sup>(2)</sup> ASTM D4832 4 x 8 inch cylinder molds may be used. The preferred capping method to be used is wetsuit neoprene restrained in rigid retainers.

**Subsection 204.06 B.1** (pg. 151-153), 12-30-19; **General Use Flowable Fill**; Revise 1<sup>st</sup> paragraph & Revise Tables 204.06-2, 204.06-3, & 204.06-4:

- 1. General Use Flowable Fill.** When not otherwise shown on the Plans, or specified in the Contract, provide general use flowable fill proportioned to meet the limits specified in Tables 204.06-1 and 204.06-2. **Alternate proportioning may be used if the trial batch proves satisfactory results.**

**Table 204.06-2: Specification Limits for General Use Flowable Fill**

Property	Specification Limit
<del>Load</del> <del>Application</del> <del>(ASTM D6024)</del>	<del>24 hours maximum in any condition</del>
Consistency	15 inches minimum tested as specified in this <u>204.06.B.1</u>

**Table 204.06-3: Specification Limits for EFF**

Property	Specification Limit
Air content (ASTM D6023)	Maximum 30% <sup>(1)</sup>
<del>Load</del> <del>Application</del> <del>(ASTM D6024)</del>	<del>24 hours maximum in any condition</del>
Consistency	15 inches minimum as tested per <u>204.06.B.1</u>
Compressive strength (ASTM D4832) <sup>(2)</sup>	30 psi minimum at 28 days 100 psi maximum of 28 days

<sup>(1)</sup> When using air entrained mixture design

<sup>(2)</sup> ASTM D4832 4 x 8 inch cylinder molds may be used. The preferred capping method to be used is wetsuit neoprene restrained in rigid retainers.

**Table 204.06-4: Specification Limits for ESFF**

Property	Specification Limit
Air content (ASTM D6023)	Maximum 30% <sup>(1)</sup>
<del>Load</del> <del>Application</del> <del>(ASTM D6024)</del>	<del>6 hours maximum in any condition</del>
Consistency	15 inches minimum as tested per <u>204.06.B.1</u>
Compressive strength (ASTM D4832) <sup>(2)</sup>	30 psi minimum at 24 hours

<sup>(1)</sup> When using air entrained mixture design

<sup>(2)</sup> ASTM D4832 4 x 8 inch cylinder molds may be used. The preferred capping method to be used is wetsuit neoprene restrained in rigid retainers.

**Subsection 204.06** (pages. 153-154) 11-16-15; Excavatable Flowable Fill - delete the first sentence of the first full paragraph after Table 204.06-3 on page 153, Early Strength Flowable Fill – delete the first sentence of the second paragraph below Table 204.06-4 on page 154

**Subsection 204.11** (pg. 162), 12-2-16; Revise Section B. Pipe Culverts as follows:

**“B. Pipe Culverts**

**1. Placing Backfill Material.** After the bedding has been prepared and the pipe installed, backfill the trench with bedding material, fine compactable soil selected from excavation or borrow, or both, as shown on the Plans. Before backfilling concrete pipe, allow the joints to cure as specified in **607.07**. Place the material along each side of the pipe in layers not more than 8 inches in loose depth. Moisten or dry, if necessary, each layer to near optimum moisture content and thoroughly compact with mechanical tampers. Thoroughly compact the material under the haunches of the pipe and ensure that the backfill material is in intimate contact with the side of the pipe. Uniformly place and raise backfill on both sides of the pipe for the full required length. Except as may be required for the imperfect trench method, place backfill material for the full depth of the trench.

**2. Placing Embankment Material.** When the top of the pipe is above the top of the trench, place and compact embankment material in layers of not more than 8 inches in loose depth for a width on each side of the pipe equal to at least twice the horizontal inside diameter of the pipe or 12 feet, whichever is less. The embankment on each side of the pipe, for a distance equal to the horizontal inside diameter of the pipe, shall be of the same material and compacted in the same manner as specified for backfill in **204.11.B.1**. For the remainder of the fill material, use soil that can be readily compacted and that contains no frozen lumps, chunks, or plastic clay, stones that would be retained on a 3-inch sieve, or other objectionable material. Compact the material as required for backfill or by rolling as specified in the applicable requirements of **204**. Place the embankment material evenly on both sides of the pipe for the full width of the roadbed up to an elevation a minimum of 1 foot above the top of the pipe. Above this elevation, and also above the top of a backfilled trench that is 1 foot or more above the top of the pipe, place embankment as specified in the applicable requirements of **205**, except for those requirements related to the imperfect trench method.

**3. Plastic Pipe.** For plastic pipe, work structural backfill into the haunch area and compact the materials by hand after placing the pipe. Special compaction means may be necessary in the haunch area. Place structural backfill in layers of not more than 8 inches in loose lift thickness and bring up evenly and simultaneously on both sides of the pipe to an elevation not less than 1 foot above the pipe. Use a vibratory plate to achieve a minimum compaction level of 90% Standard Proctor Density according to AASHTO T 99. Do not use hydrohammer type compactors over the pipe. Obtain the Engineer’s approval of all compaction equipment.”

**Subsection 205.04** (pg. 175) 10-7-19, Formation of Embankments, add the following sentence to the 2<sup>nd</sup> paragraph on the original page:

“The Department inspector conducting the density tests shall be a certified Nuclear Gauge Technician.”

**Subsection 205.04** (pg. 177-178), 5-13-19; **Formation of Embankments**; Revise 1<sup>st</sup> paragraph after **E**:

When the Plans require Solid Rock Fill, the material shall consist of sound, non-degradable rock (granite, gneiss, limestone, or other approved material). Material shall meet the quality requirements in 903.25. Do not use plastic soil or shale material. Place Solid Rock Fill as shown on the Plans or as directed by the Engineer.

**Subsection 206.03** (pg. 180-181), 5-15-17; remove the reference to the *Procedures for Providing Offsite Waste and Borrow on TDOT Construction Projects* in the next to last sentence of the first paragraph:

“Perform final dressing by hand work and machines to produce a uniform satisfactory finish to all parts of the roadway and other components of the Project. Shape the roadbed, shoulders, ditches, and slopes to within reasonably close conformity to the specified lines, grades, and cross-sections. Dress spoil banks, borrow areas, waste areas, and similar areas. Clear rock cuts of all loose fragments, and leave in a neat, safe, and workmanlike condition.”

**Subsection 209.01** (pg.190), 5-15-17; revise the 1<sup>st</sup> sentence of the 2<sup>nd</sup> paragraph:

“Implement erosion prevention and sediment control (EPSC) measures during all phases of construction. Ensure that all EPSC measures shown on the Stormwater Pollution Prevention Plan (SWPPP) are in place before beginning soil disturbing activities.”

**S T A T E**

**O F**

**T E N N E S S E E**

(Rev. 11-16-15)

(Rev. 6-27-16)

(Rev. 12-2-16)

(Rev. 5-15-17)

(Rev. 10-8-18)

(Rev. 5-13-19)

(Rev. 12-30-19)

January 1, 2015

**Supplemental Specifications - Section 300**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 303** (pg. 220), 10-8-18; Mineral Aggregate Base, Remove 303.04 Sodium Chloride from Index.

**Subsection 303.01** (pg. 220) 5-15-17; add the following sentence as the last sentence of the 2<sup>nd</sup> paragraph:

“Mineral aggregates base shall be Type A or Type B, whichever is shown on the Plans and called for in the bid schedule. Reclaimed Concrete Aggregate (RCA) may be used as an alternate for Type A or Type B base material.”

**Subsection 303.02** (pg. 220-221) 5-15-17; add the following sentence to the last sentence of the 1<sup>st</sup> paragraph:

“Depending upon whether the Plans require Type A or Type B base, provide mineral aggregate meeting 903.05. For Type A base, use aggregate of Grading D. For Type B base, the Contractor may use aggregate of Grading C or D. For RCA, use grading specified in 903.05-C.”

**Subsection 303.04** (pg. 221) 10-8-18; Sodium Chloride, remove all information pertaining to Sodium Chloride from subsection:

**Subsection 303.07** (pg. 222-223) 5-15-17; modify the 1<sup>st</sup> sentence of the 1<sup>st</sup> paragraph to the following:

“Construct Mineral Aggregate Base, Type A, Type B, or RCA in one or more layers, to the compacted thickness shown on the Plans.”

**Subsection 303.08** (pg. 223-224) 5-15-17; add the last sentence to the last paragraph of subsection A:

“For Mineral Aggregate Base, Type A, use the stationary plant method. For Mineral Aggregate Base, Type B, requiring the blending of two or more materials, use either the stationary plant method or the road mix method (mechanical mixer), except as provided for in **903.05**. For Mineral Aggregate Base, Type B, requiring additive, use either stationary plant mixing or road mixing. When using RCA as a replacement for Mineral Aggregate Base, Type A or Type B, use the intended method of mixing for the material listed above.”

**Subsection 303.08** (pg. 225) 10-8-18; Mixing, B. Use of Calcium Chloride and Sodium Chloride, Remove all information pertaining to Sodium Chloride:

**“B. Use of Calcium Chloride**

If using calcium chloride, incorporate it in either the solid or liquid form, at the approximate rate of 6 pounds per ton of aggregate, noting that:

- 6 pounds is equivalent to 1.29 gallons 60 °F 32% solution
- 6 pounds is equivalent to 1.02 gallons 60 °F 38% solution

For stationary plant mixing, proportion chloride material, in solid form, through a hopper equipped with an approved vibratory feeder and an adjustable opening capable of accurately controlling the flow of material. Proportion calcium chloride liquor using an approved calibrated meter that has a registering capacity capable of indicating the total amount of liquid used during any single day’s operation.

For road mixing, add the chloride material to the aggregate at the point in the mixing operation and in the manner directed by the Engineer.”

**Subsection 303.10** (pg. 225-227) 5-15-17; add subsection c.:

**“2. Density Requirements**

- a. **Type A Base.** The average density of each lot of Type A base, unless otherwise specified, shall be within 100% of maximum density as determined according to AASHTO T 99, Method D, with no individual test less than 97% of maximum density.
- b. **Type B Base.** The average density of each lot of Type B base, unless otherwise specified, shall be not less than 97% of maximum density as determined according to AASHTO T 99, Method D, with no individual test being less than 95% of maximum density.
- c. **RCA Base.** The average density of each lot of RCA base, unless otherwise specified, shall be not less than 100% of maximum density as determined according to AASHTO T 99, Method D, with no individual test less than 97% of maximum density. The moisture content shall be within  $\pm 3\%$  of the optimum moisture content as determined by an independent laboratory analysis. Mixing of the material with water shall be completed per Section 303.08.”

**Subsection 303.10 C.2.c** (pg 227), 5-13-19; **Density Requirements**; Revise paragraph:

- c. **RCA Base.** The average density of each lot of RCA base, unless otherwise specified, shall be not less than 100% of maximum density as determined according to AASHTO T 99, Method D, with no individual test less than 97% of maximum density. The moisture content shall be within  $\pm 3\%$  of the optimum moisture content as determined by Departmental analysis. Mixing of the material with water shall be completed per Section 303.08.

**Subsection 303.14** (pg. 228) 5-15-17; revise the first sentence of A.:

**“A. Mineral Aggregate for Mineral Aggregate Base, Type A or Type B, or RCA**

The Department will measure Mineral Aggregate for Mineral Aggregate Base, Type A, Type B, or RCA, by the ton, in accordance with **109.**”

**Subsection 303.14** (pg. 228) 10-8-18, C. Sodium Chloride, remove part C. which covers Sodium Chloride:

**Subsection 303.15** (pg 229) 10-8-18, Basis of Payment; remove item for Sodium Chloride:

**303.15 Basis of Payment**

The Department will pay for accepted quantities at the contract prices as follows:

<i>Item</i>	<i>Pay Unit</i>
Mineral Aggregate, Type_____Base	Ton
Calcium Chloride	Ton
Water	MG

The Department will pay for the work required to prepare the subgrade in accordance with 303.07 as provided for in the applicable Section or Subsection under which the work is performed.

**Subsection 303.15** (pg. 229), 12-30-19; **Basis of Payment**; Add subsection A & B:

**A. General**

The Department will pay for accepted quantities at the contract prices as follows:

...

**B. Adjustments**

**Specific Gravity.** In cases where the Bulk SSD specific gravity of the mineral aggregate exceeds 2.80, the Department will adjust the tonnage of mineral aggregate for payment by multiplying the tonnage of mineral aggregate used by a specific gravity of 2.80 and dividing by the higher specific gravity.



Subsection 307.03 (pg. 246) 11-16-15; Modify Table 307.03-3:

B. Recycled Asphalt Pavement for Bituminous Plant Mix Base, Table 307.03-3

**Table 307.03-3: Mixtures Using RAP**

Mix Type	% RAP (Non-processed) <sup>(1)</sup>	Maximum % RAP (Processed) <sup>(2)</sup>	Maximum % RAP Processed & Fractionated <sup>(3)</sup>	Maximum Particle Size (inches)
307-ACRL	0	00	-	-
307-AS	0	00	15	-
307-A	15	20	35	1-1/2
307-B	15	30	35	1-1/2
307-BM	15	30	35	3/4
307-BM2	15	30	35	3/4
307-C	15	30	35	3/8
307-CW	15	30	35	1/2
307-CS	0	15	25	5/16

<sup>(1)</sup> “Non-processed” refers to RAP that has not been crushed and screened or otherwise sized prior to its use.

<sup>(2)</sup> “Processed” refers to RAP that has been crushed and screened or otherwise sized such that the maximum recycled material particle size is less than that listed in Table 307.03-3 prior to entering the dryer drum.

<sup>(3)</sup> “Fractionated” refers to RAP that has been processed over more than one screen, producing sources of various maximum particle sizes (e.g., 3/4 to 1/2 inch, 1/2 inch to #4, etc.). The Contractor may use the larger percentages of fractionated RAP specified only if individual fractions of two different maximum particle size are introduced into the plant as separate material sources for increased control.

<sup>(4)</sup> RAP for 307-AS must be processed in a manner such that the minimum particle size is no smaller than 3/4” prior to solvent extraction. For RAP containing gravel as coarse aggregate, the maximum allowable RAP content shall be 10%.

2. Recycled Asphalt Shingles (RAS) RAS may be included to a maximum of 3% of the total weight of the mixture.

**Subsection 307.03** (pg. 246) 5-15-17; Modify Table 307.03-3:

B. Recycled Asphalt Pavement for Bituminous Plant Mix Base, Table 307.03-3

**Table 307.03-3: Mixtures Using RAP**

Mix Type	% RAP (Non-processed) <sup>(1)</sup>	Maximum % RAP (Processed) <sup>(2)</sup>	Maximum % RAP Processed & Fractionated <sup>(3)</sup>	Maximum Particle Size (inches)
307-ACRL	0	00	-	-
307-AS	0	10	10	-
307-A	15	20	35	1-1/2
307-B	15	30	35	1-1/2
307-BM	15	30	35	3/4
307-BM2	15	30	35	3/4
307-C	15	30	35	3/8
307-CW	15	30	35	1/2
307-CS	0	15	25	5/16

<sup>(1)</sup> “Non-processed” refers to RAP that has not been crushed and screened or otherwise sized prior to its use.

<sup>(2)</sup> “Processed” refers to RAP that has been crushed and screened or otherwise sized such that the maximum recycled material particle size is less than that listed in Table 307.03-3 prior to entering the dryer drum.

<sup>(3)</sup> “Fractionated” refers to RAP that has been processed over more than one screen, producing sources of various maximum particle sizes (e.g., 3/4 to 1/2 inch, 1/2 inch to #4, etc.). The Contractor may use the larger percentages of fractionated RAP specified only if individual fractions of two different maximum particle size are introduced into the plant as separate material sources for increased control.

**Subsection 307.03** (pg. 250) 6-27-16; C. revise the last paragraph to the following:

“Mix an approved antistripping agent with the asphalt cement at the dosage as specified in **921.06.B.**”

**Subsection 307.06** (pg.250), 12-30-19; **Preparing the Subgrade, Sub-base, or Surface;** Revise 1<sup>st</sup> paragraph:

The Plans will indicate whether the plant-mixed base is to be constructed on a treated or untreated subgrade or sub-base, on a granular base, or on an existing surface. Ensure that the surface upon which the plant mix base is to be constructed meets 205, 207, 302, 303, 304, or 309, whichever is applicable. If shown on the Plans, condition the surface as specified in 407.10. Condition existing mineral aggregate base as specified in 310. Construct prime coat or tack coat, ~~when shown on the Plans~~, as specified in 402 or 403, respectively.

**Subsection 307.06** (pg. 250) 12-2-16; add the following as the second paragraph:

“Do not place AS/ACRL which cannot be covered by the next course of pavement within the same construction season.”

**Subsection 309.02** (pg. 253-254), 5-13-19; **Materials;** Add material to list:

Provide materials as specified in:

Water .....	<b>302.03.B</b>
Portland Cement, Type I.....	<b>901.01</b>
Portland-Pozzolan Cement, Type IP.....	<b>901.01</b>
Crushed Stone or Slag, Grading D.....	<b>903.05</b>
Aggregate, Crushed or Uncrushed Gravel or Chert .....	<b>903.15</b>
Reclaimed Concrete Aggregate .....	<b>903.05.C</b>
Bituminous Material for Curing, Emulsified Asphalt, Types allowed for Tack Coat in <b>403</b> .....	<b>904.03</b>

**Subsection 309.14** (pg. 258-259), 12-30-19; **Basis of Payment;** Add subsection A & B:

**A. General**

The Department will pay for accepted quantities at the contract prices as follows:

....

**B. Adjustments**

**Specific Gravity.** In cases where the Bulk SSD specific gravity of the mineral aggregate exceeds 2.80, the Department will adjust the tonnage of mineral aggregate for payment by multiplying the tonnage of mineral aggregate used by a specific gravity of 2.80 and dividing by the higher specific gravity.

**Subsection 310.02** (pg. 260) 10-8-18, Materials, Remove materials information for sodium chloride:

**“310.02 Materials**

Provide materials as specified in:

Aggregate for Conditioning Base .....	<b>903.05</b>
---------------------------------------	---------------

Calcium Chloride, Type 1, Type 2 or Calcium Chloride Liquor ..... **921.02**

**Subsection 310.04** (pg.261) 10-8-18, Conditioning, remove sodium chloride from the 3<sup>rd</sup> paragraph:

**“310.04 Conditioning**

Condition the existing base by applying water, blading, and compacting as directed by the Engineer. Scarify sections of existing base that are pot-holed to the full depth of the pot holes. Scarify and shape warped and distorted sections as directed by the Engineer. Moisten the material as necessary, and mix, shape, and roll until the base is uniformly and thoroughly compacted. Continue applying water, blading, and rolling until a smooth, dense, well-bonded surface is obtained that meets the Engineer’s approval.

The Department will divide the completed base into lots of approximately 10,000 square yards for density testing purposes, and will perform five density tests in each lot. The average dry density shall be not less than 100% of maximum density as determined according to AASHTO T 99 Method D, and no individual test shall be less than 97% of maximum density. Smaller lots may be considered when approved or directed by the Engineer.

Distribute calcium chloride ~~or sodium chloride~~, when specified, at the approximate rate of 1 pound per square yard and incorporate it in the base material during blading and rolling operations as directed by the Engineer.

If additional material is to be added to the existing base, lightly scarify the existing base, add the material, and condition the base as specified above.

**Subsection 310.06** (pg. 262)10-8-18, Method of Measurement, Remove 3. Sodium Chloride information from the subsection, renumber 4. to 3.:

**“310.06 Method of Measurement**

The Department will measure:

1. Conditioning Mineral Aggregate Base by the linear mile, based on a horizontal measurement made along the median centerline of the Project for divided sections and along the centerline of the pavement for two-lane sections, excluding bridges.
2. Calcium Chloride by the ton in accordance with 303.14.D.
3. Water by M.G. (1,000 gallons) using calibrated tanks or distributors, or accurate water meters.

If the Contract requires the construction of a mineral aggregate base and a surface course, the Department will not directly measure or pay for conditioning of the base but will consider this work to be incidental to the unit price bid for the base material.

If the Contract requires the addition of base material to sections or the entire length of a previously constructed base, the Department will not directly measure or pay for conditioning of the base on the sections where base material is added. Sections where base material is not added will be measured for payment by the linear mile.

If the Contract requires a surface to be constructed on a previously constructed base and no additional material is added to the base, the Department will measure and pay for conditioning of the base by the linear mile.”

**Subsection 310.07** (pg. 262) 10-8-18, Basis of Payment, Remove all information for sodium chloride:

**“310.07 Basis of Payment**

The Department will pay for accepted quantities at the contract prices as follows:

*Item Pay Unit*

Conditioning Mineral Aggregate Base	Linear Mile
Calcium Chloride	Ton
Water	MG

Payment for Conditioning Mineral Aggregate Base is full compensation for conditioning all base on interchanges, approaches, service roads, ramps, frontage roads, roadside rest areas, and all other base within the limits of the Project that requires conditioning to receive a succeeding stage of construction under the Contract.”

**Subsection 313.03** (pg. 273) 11-16-15; B. Bituminous Treated Permeable Base, add the following sentence to the end of the paragraph:

“Recycled Asphalt Pavement (RAP) meeting the requirements of 307.03.B may be incorporated into asphalt treated permeable base up to 15% by weight of aggregate. RAP must be processed in a manner such that the minimum particle size is no smaller than ¾” prior to solvent extraction. Treated permeable base mixtures containing RAP shall contain at least 65% virgin asphalt binder. For RAP containing gravel as a coarse aggregate, the maximum allowable RAP content shall be 10%”

**Subsection 313.03** (pg. 273) 5-15-17; B. Bituminous Treated Permeable Base, revise the sentence added on 11-16-15 to the following sentence:

“Recycled Asphalt Pavement (RAP) meeting the requirements of 307.03.B may be incorporated into asphalt treated permeable base up to 10% by weight of aggregate. Treated permeable base mixtures containing RAP shall contain at least 65% virgin asphalt binder. For RAP containing gravel as a coarse aggregate, the maximum allowable RAP content shall be 10%.

Mix an approved antistrip agent with the asphalt cement at the dosage as specified in **921.06.B.**”

**Subsection 313.10** (pg. 276) 5-15-17; Basis of Payment, add the sentence as the third paragraph:

“The cost of antistrip additive used in Bituminous Plant Mix (Hot Mix) will be included in the price of Treated Permeable Base.”

**STATE**

**OF**

**TENNESSEE**

(Rev. 5-18-15)

(Rev. 7-13-15)

(Rev.11-16-15)

(Rev. 6-27-16)

(Rev. 12-2-16)

(Rev. 1-6-17)

(Rev. 5-15-17)

(Rev. 11-6-17)

(Rev. 5-14-18)

(Rev. 10-8-18)

(Rev.5-13-19)

(Rev. 12-30-19)

January 1, 2015

**Supplemental Specifications - Section 400**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 401.02**(pg. 278) 10-8-18, Mineral Aggregate Surface – Materials, Remove Sodium Chloride from the materials list:

**“401.02 Materials**

Provide materials as specified in:

Aggregate, Class B ..... **903.05.B**

Calcium Chloride, Type I, Type 2, or Calcium Chloride Liquor ..... **921.02**

The Engineer will accept aggregate for gradation as specified in **303.02.**”

**Subsection 401.06** (pg. 280) 10-8-18, Mineral Aggregate Surface – Method of Measurement, Remove 4. Sodium Chloride from the subsection:

**” 401.06 Method of Measurement**

The Department will measure:

1. Mineral Aggregate Surface by the ton in accordance with **109.**
2. Water added to the materials at the direction of the Engineer by the M.G. (1,000 gallons) using calibrated tanks or distributors, or accurate water meters.
3. Calcium Chloride by the ton in accordance with **303.14.D.**

When measuring Mineral Aggregate Surface, the Department will deduct the weight of all surface moisture on the aggregate at the time of weighing in excess of 8%.”

**Subsection 401.07** (pg. 280) 10-8-18, Mineral Aggregate Surface – Basis of Payment, Remove Sodium Chloride from the basis of payment list:

“The Department will pay for accepted quantities of Mineral Aggregate Surface, complete in place, at the contract prices as follows:

<i>Item Pay Unit</i>	
Mineral Aggregate	Ton
Calcium Chloride	Ton
Water	MG”

**Subsection 402.03** (pg. 282) 5-27-16; revise 0.2 to 0.05 in the range as shown in the 2<sup>nd</sup> paragraph:

“The distributor shall be designed, equipped, maintained, and operated so that bituminous material at even heat may be applied uniformly on variable surface widths at readily determined and controlled rates from 0.05 to 0.5 gallons per square yard, with uniform pressure, and with an allowable variation from any specified rate of plus or minus 0.02 gallons per square yard.”

**Subsection 403.02** (pg. 285-286) 10-8-18; Bituminous Materials, add RS-1, CRS-1 and remove emulsified from “Approved Emulsified Trackless Tack”, update Table 403.02-1 to adjust temperature range required and add approved trackless tack information:

Provide materials as specified in:  
Emulsified Asphalt, SS-1, SS-1h, CSS-1, CSS-1h, TST-1P, CQS-1h, CQS-1hp, RS-1, CRS-1.....904.03 or Approved Trackless Tack from the QPL.

Table 403.02-1: Tack Coat Application Temperatures

Material	Temperature Range
SS-1, SS-1h, CSS-1, TST-1P, CQS1h, CQS-1hp, CSS-1h,	70 to 160 °F
Approved Trackless Tack from the QPL	Per Manufacturer’s Recommendation

**Subsection 403.02** (pg. 285-286) 12-2-16; Bituminous Materials, remove trackless tack information from specifications and reference the QPL for approved Emulsified Trackless Tacks, remove trackless tacks from Table 403.02-1:

“Emulsified Asphalt, SS-1, SS-1h, CSS-1, CSS-1h, TST-1P, CQS-1h, CQS-1hp.....904.03 or Approved Emulsified Trackless Tack from the QPL.

Table 403.02-1: Tack Coat Application Temperatures

Material	Temperature Range
SS-1, SS-1h, CSS-1, TST-1P, CQS-1h, CQS-1hp and CSS-1h	60 to 140 °F

Subsection 403.02 (pg. 285-286) 11-16-15; Bituminous Materials, update the reference to 904.03, add TTT-3 to Table 403.02-1:

“Emulsified Asphalt, SS-1, SS-1h, CSS-1, CSS-1h, TST-1P, CQS-1h, CQS-1hp, TTT-1, TTT-2, TTT-3 .....904.03”

Table 403.02-1: Tack Coat Application Temperatures

Material	Temperature Range
SS-1, SS-1h, CSS-1, TST-1P, CQS-1h, CQS-1hp and CSS-1h	60 to 140 °F
TTT-1	160 to 180 °F
TTT-2	120 to 160 °F
TTT-3	100 to 180 °F

Subsection 403.05 (pg. 286) 11-16-15; A. Emulsified Asphalt, Add the following paragraph at the end of the subsection:

“Take a minimum of 3 cores throughout the length of the project for informational tack coat shear testing. Include the underlying layer. Not required for mats less than one inch thick.”

Subsection 403.05 A (pg. 287), 12-30-19; Emulsified Asphalt; Remove last paragraph:

~~a minimum of 3 cores throughout the length of the project for informational tack coat shear testing. Include the underlying layer. Not required for mats less than one inch thick.~~

Subsection 403.05 (pg. 287) 11-16-15; ) B. Test Strip, modify the 2<sup>nd</sup> paragraph to update the rate as 0.08 and 0.12:

“If placing the bituminous material upon a milled surface, apply the tack material at a rate of between 0.08 and 0.12 gallons of applied emulsion per square yard.”

Subsection 403.05 (pg. 287) 6-27-16; revise the last sentence of the 2<sup>nd</sup> paragraph:

“If placing the bituminous material upon a milled surface, apply the tack material at a rate of between 0.08 and 0.12 gallons applied emulsion per square yard.”



**Subsection 403.05** (pg. 287), 11-6-17; Revise the 1<sup>st</sup> sentence of the 1<sup>st</sup> paragraph:

“When the Contract requires bituminous material for fog sealing of shoulders, provide emulsified asphalt meeting **403.02** or an item from QPL 40A.”

**Subsection 404** (pg. 289-293) 1-6-17; Remove the entire subsection. All specifications regarding Double Bituminous Surface Treatment has been incorporated into subsection 405. All references shall be updated to subsection 405.

**Subsection 405** (pg. 294-298) 1-6-17; replace subsection 405 with the following:

**“405.01 Description**

This work consists of constructing a bituminous seal coat consisting of one or more applications each of bituminous material and cover aggregate.

**MATERIALS**

**405.02 Materials**

Provide materials as specified in:

Mineral Aggregate, Size Nos. 7, 8, 78, 89.....	903.13
Mineral Aggregate.....	903.14
Emulsified Asphalt, CRS-2p .....	904.03

Apply seal coat at a temperature range of 60 to 140 °F.

**EQUIPMENT**

**405.03 Equipment**

Provide a power broom or other mechanical sweeping equipment, equipment for heating bituminous material, a pressure distributor meeting the requirements of 402.03, pneumatic-tire and steel-wheel rollers, self-propelled mechanical aggregate spreading equipment that can be adjusted so as to spread accurately at the specified rate, and such other equipment and small tools as may be required to perform the work in a satisfactory manner.

**CONSTRUCTION REQUIREMENTS**

**405.04 Limitations**

Only apply bituminous material:

1. When the designated surface is dry, firm, and properly cured;
2. Between April 15 and October 1; and, unless otherwise directed,

3. When the ambient temperature in the shade and away from artificial heat is 70°F or more.

#### 405.05 Preparing the Designated Surface

Before placing seal coat, clean all surfaces to be sealed by sweeping with a motorized broom to remove any loose material. Clean depressions and cracks not reached by the power broom using hand brooms or pressurized air.

Cover any utility installations to prevent adherence of the bituminous mixture. Suitable covering includes plywood disks, sand, craft paper, roofing felt or other approved methods. Remove the protective coverings before opening the road to traffic. The cost for these adjustments shall be included in the bid price for other items.

The Plans will indicate whether the surface is to be constructed on a treated or untreated subbase, a granular base, an asphalt base, or on an existing surface. The surface of the base or sub-base upon which the construction is to be placed shall meet the requirements of the applicable Section of Part 3, Bases and Subgrade Treatments, of these Specifications.

Condition existing surface, if called for on the Plans, as specified in 407.10. Condition existing mineral aggregate base as specified in 310.

Construct and maintain Prime Coat or Tack Coat, if shown on the Plans, as specified in 402 or 403, respectively.

#### **405.06 Application**

##### A. Applying Bituminous Material:

Have all equipment calibrated prior to starting work. The TDOT inspector shall be present during calibration to determine aggregate spread rate and distributor rates. Distributor trucks shall have proper calibration of spray equipment. Spray nozzles should be clean, properly angled, and appropriately sized for the desired application rate. Stop work if the distributor is not applying material properly, such as gaps in application or streaking.

Place a 500 ft. test strip for the bituminous seal coat at the beginning of the project to assure proper coverage and proper equipment calibration. The test section is to verify break time of emulsion and chip retention. The test strip shall be able to carry normal traffic within 3 hours. If normal traffic cannot be carried, the emulsion shall be adjusted and another test strip is required.

At least 14 working days before the scheduled start of construction of any bituminous seal coat, submit a sample of aggregate intended for use for the determination of the appropriate application rates of bituminous material and aggregate. Apply emulsified asphalt by pressure distributor at a uniform rate in accordance with Table 405.06-1 below. The exact rate will be established by the Engineer.

Table 405.06-1: Application Rates for Bituminous Material

Aggregate Size (per 903.22)	Aggregate Spread Rate (lb/yd <sup>2</sup> )	Emulsion Shot Rate (gal/yd <sup>2</sup> )
7	25 – 30	0.30 – 0.45
78	22 – 28	0.28 – 0.38
8	20 – 25	0.20 – 0.35
89	17 – 23	0.17 – 0.28

Before beginning each spread, place building paper across the roadway surface with the forward edge exactly coinciding with the end of the preceding covered spread. Start distributors on the paper, the width of which shall allow the full force of all nozzles to be in effect before the forward edge of the paper is reached. If required by the Engineer, also stop the spread on building paper. Remove the paper immediately after its use, and dispose of properly. Immediately correct all defects in application.

The length of spread of bituminous material shall not exceed that which trucks loaded with cover material can immediately cover.

The spread of bituminous material shall not extend more than 6 inches wider than the width covered by the cover material. Do not allow the bituminous material to chill or otherwise impair retention of the cover material.

Do not allow traffic on the bituminous material until it has been covered with mineral aggregate.

Treat areas that are inaccessible to the distributor with either hand sprays or pouring pots as directed by the Engineer.

#### B. Application of Double Bituminous Surface Treatment:

##### First Application

Apply the first application of emulsified asphalt using pressure distributors at a uniform rate established by the Engineer within the range of 0.30 to 0.38 gallons per square yard. Apply each spread of bituminous material so as not to be more than 6 inches wider than the width covered by the immediate spread of cover aggregate. Each width of spread shall not be less than half the surface to be treated.

Before beginning each spread, place building paper across the roadway surface with the forward edge exactly coinciding with the end of the preceding covered spread. Start distributors on the paper, the width of which shall allow the full force of all nozzles to be in effect before the forward edge of the paper is reached. If required by the Engineer, also stop the spread on building paper. Remove the paper immediately after its use, and dispose of properly. Immediately correct all defects in application.

Treat areas that are inaccessible to the distributor with hand sprays or pouring pots as directed by the Engineer.

If treating less than the full width of the roadway, do not spread the aggregate on the inside 6 inches of either the first or second application until the adjacent lane has been treated. Immediately following each application, uniformly cover the applied bituminous material with Size No. 7 mineral aggregate that is reasonably free of surface moisture.

Spread the aggregate at a rate between 24 and 30 pounds per square yard, as established by the Engineer, using a self-propelled mechanical spreader; except on short projects of 1/2 mile in length or less, self-propelled mechanical spreading equipment will not be required. Back the truck on the aggregate being spread, without driving on or over uncovered bituminous material.

The length of bituminous material spread shall not exceed that which trucks loaded with cover material can immediately cover.

#### Second Application

Apply the second application of emulsified asphalt in the same manner as the first application, at a uniform rate established by the Engineer within the range of 0.20 and 0.35 gallons per square yard.

Spread mineral aggregate, Size No. 8, in the same manner as the first spread at a rate established by the Engineer within the range of 16 to 28 pounds per square yard.

Immediately after each spread of cover aggregate, broom to achieve uniform coverage. Use a power source, which is independent of the drive train that propels the equipment, to power the revolving brooms of mechanical sweeping equipment. Place additional aggregate by hand on thin or bare areas.

### **405.07 Spreading and Rolling Aggregate**

#### **A. Spreading**

Immediately after bituminous material has been applied, no more than two minutes, spread and embed the mineral aggregate cover in the bituminous material. Spread the aggregate as close to the application of bituminous material as is practicable, and cover each distributor load applied immediately. Aggregates shall be moistened and visually damp at the time of placement.

Spread the aggregate in accordance with the rates specified in Table 405.06-1. The exact rate will be established by the Engineer. Back the truck on the aggregate being spread, without driving on or over uncovered bituminous material. If treating less than the full width of roadway, do not spread the aggregate on the inside 6 inches of the bituminous spread until the adjacent lane is treated. Immediately after spreading the aggregate, perform hand-brooming to achieve uniform coverage. Place additional aggregate by hand on thin or bare areas.

The speed of the spreader shall be such that the aggregates are not rolling over, and starting and stopping of the spreader is minimized. Use of previously used (swept) aggregates is not permitted.

#### **B. Rolling – Bituminous Seal Coat**

Immediately after distributing the aggregate, roll the entire surface by moving in a longitudinal direction, beginning at the outer edges and progressing toward the center of the roadway, with

each trip of the roller overlapping the previous trip by half the width of the rear wheel. Perform initial rolling with a self-propelled pneumatic tire roller, and follow with steel-wheel rolling. The amount and sequence of rolling shall be as directed by the Engineer. Complete the initial rolling of the aggregate within 1 hour after applying the bituminous material.

Use power brooms to correct irregularities by sweeping the aggregates from areas of thick or heavy distribution to areas of thin or light distribution. Then continue rolling using both steel-wheel and pneumatic rollers until the aggregate is thoroughly embedded in the bituminous material. The Engineer may require additional rolling at a later date. Redistribute excess or loose aggregate that was thrown out of place.

Slow moving traffic may use the section or roadway upon which the aggregate has been spread.

### **Rolling and Curing – Double Bituminous Seal Coat**

Immediately after spreading and brooming the cover aggregate, roll the entire surface, beginning at the edges and progressing to the center. Begin rolling within 30 minutes after spreading the aggregate. Perform initial rolling with a self-propelled pneumatic tire roller, and follow with steel-wheel rolling. The amount and sequence of rolling shall be as directed by the Engineer.

Allow the first application of bituminous material and aggregate to cure for as long as deemed necessary by the Engineer before beginning the second application. Immediately before the second application of bituminous material, roll the surface with a steel-wheel roller.

For the second application of bituminous material and cover aggregate, repeat the same rolling and curing procedures as required for the first application.

The Contractor may allow slow-moving traffic to use sections of the roadway where the bituminous material has been covered with mineral aggregate.

### **405.08 Shoulders**

Restore shoulders that have been disturbed by the Contractor's construction operations at no cost to the Department. Remove all objectionable material placed on the shoulders by the Contractor as directed by the Engineer.

Construct shoulders, when specified, as provided for under **208**.

### **405.09 Maintenance and Protection**

Maintain in a satisfactory condition each completed section of seal coat until the entire Project is complete. Maintenance shall include making repairs where failures occur, and maintaining the seal coat in a smooth uniform condition; and brooming, dragging, and rolling when required.

After the final application, maintain the work in a satisfactory condition for at least 10 calendar days. If all other requirements of the Contract have been fulfilled, the Department will not charge working time during the 10-day maintenance period against the Contract time.

For final cleanup, sweep up all excessive quantities of loose, dislodged cover aggregate that may have collected along the edge of the completed seal coat, and dispose of this material as directed by the Engineer.

**405.10 Method of Measurement**

The Department will measure Mineral Aggregate and Bituminous Material by the ton in accordance with **109**. The Department may use net certified weights as a basis of measurement for mineral aggregate, subject to correction for aggregate that is lost, wasted, or otherwise not incorporated into the Work.

**405.11 Basis of Payment**

The Department will pay for accepted quantities of Bituminous Seal Coat, complete in place, at the contract prices as follows:

<i>Item</i>	<i>Pay Unit</i>
Bituminous Material	Ton
Mineral Aggregate	Ton

The Department will measure and pay for the work required to prepare the designated surface, as provided for under **405.05**, in accordance with the applicable Section or Subsection under which the work is performed.”

**Subsection 405.03** (pg. 295), 12-30-19; **Equipment**; Revise paragraph:

Provide a power broom or other mechanical sweeping equipment, equipment for heating bituminous material, a pressure distributor meeting the requirements of 402.03, two pneumatic-tire ~~and steel wheel~~ rollers, self-propelled mechanical aggregate spreading equipment that can be adjusted so as to spread accurately at the specified rate, and such other equipment and small tools as may be required to perform the work in a satisfactory manner.

**Subsection 405.05** (pg. 295) 5-14-18; Add the following as the second paragraph:

“Before placing seal coat, clean all surfaces to be sealed by sweeping with a motorized broom to remove any loose material. Clean depressions and cracks not reached by the power broom using hand brooms or pressurized air.

Remove pavement markers and adhesives. Abrade all types of existing striping. Work shall be accomplished without the pavement being gouged or damaged and in a manner which ensures the bituminous treatment will adhere in all areas applied. Work shall be performed to the satisfaction of the Engineer.”

**Subsection 405.11** (pg. 298), 12-30-19; **Basis of Payment**; Add subsection A & B:

**A. General**

The Department will pay for accepted quantities of Bituminous Seal Coat, complete in place, at the contract prices as follows:

.....

**B. Adjustments**

**Specific Gravity.** In cases where the Bulk SSD specific gravity of the mineral aggregate exceeds 2.80, the Department will adjust the tonnage of mineral aggregate for payment by multiplying the tonnage of mineral aggregate used by a specific gravity of 2.80 and dividing by the higher specific gravity.

**Subsection 407.02** (pg. 300-301) 12-2-16; Replace the 4<sup>th</sup> paragraph:

“If anti-stripping additive, other than hydrated lime, meeting 921.06.B.1 is required, use approved in-line blending equipment, as specified in 407.04.A.6, to add it at the mixing plant or inject it at the asphalt terminal. Manufacture’s documentation that asphalt binders will continue to meet requirements listed in subsection **904** after the anti-stripping additive is added shall be provided by the contractor with the mix design submittal. For mix designs submitted more than six months in advance, the documentation shall be resubmitted prior to use of the mix design with updated test results.”

**Subsection 407.02** (pg. 300) 11-16-15; Materials, add the following at the end of the fourth paragraph:

“If anti-stripping additive, other than hydrated lime, meeting **921.06.B.1** is required, use approved in-line blending equipment, as specified in **407.04.A.6**, to add it at the mixing plant or inject it at the asphalt terminal. Provide manufacture’s documentation ensuring asphalt binders will continue to meet requirements listed in Subsection **904** after anti-stripping additives are added.”

**Subsection 407.03 D.2.h.3** (pg. 308), 6-24-19; **Mix Design/Production Verification**; Revise the 1<sup>st</sup> & 2<sup>nd</sup> paragraph:

- (3) Place no more than 500 tons of mix until the verification testing, with the exception of TSR, is complete. Production may continue and mixture may be placed in excess of the first 500 tons; however, all mixture will be subject to price adjustment or removal at the discretion of the Engineer if the test results do not comply with the specifications.

Proceed, if the test results for the produced mix are within the limits required for production. The limits required for production are defined as meeting all of the following:

- (a) Meets all mix design requirements as specified in Table 407.03-2,
- (b) Gradation and Asphalt Cement Content of the mix are within the 90% pay factor for a single test per Table 407.20-2.
- (c) The average density of the test strip meets requirements per Table 407.15-1.

**Subsection 407.03 E. 1.** (pg. 313) 10-8-18, Tensile Strength Ratio, modify the second paragraph:

“1. **Tensile Strength Ratio.** Perform testing for stripping and moisture susceptibility of the mixture according to ASTM D 4867, Standard Test Method for Effect of Moisture on Asphalt-Concrete

Paving Mixtures For all mixtures requiring design, except OGFC, follow ASTM D4867. For OGFC follow ASTM D4867 except as noted:

- Modify step 8.6.1 so that the three conditioned samples are subjected to a partial vacuum of 26 inches Hg for 10 minutes to whatever degree of saturation achieved
- Subject the 3 condition samples to one freeze thaw cycle per note 6 listed in ASTM D4867 8.7. except as noted:
  - After 15h in freezer, remove samples and immediately immerse the still wrapped specimen in 77°F water for 2 hours
  - After 2 hours remove specimen from water bath and remove wrapping from specimen then immerse sample in 140°F water bath for 24 hours..

All specimens tested for stripping and moisture susceptibility shall meet the criteria specified in Table 407.03-4.”

**Subsection 407.03 E** (pg. 290), 12-30-19; **Testing Procedures;** Revise Table 407.03-04: Criteria for Stripping and Moisture Susceptibility:

**Table 407.03-4: Criteria for Stripping and Moisture Susceptibility**

Asphalt Cement	Minimum Tensile Strength	Minimum TSR
Polymer Modified	100 psi	80%
Non-Polymer Modified	80 psi	80%
411 OGFC	50 psi	80%

**Subsection 407.06** (pg. 327), 5-18-15; - A. Pavers. Replace the entire first paragraph with the following:

“Bituminous pavers shall be self-contained, power-propelled units provided with an activated screed, equipped to be heated, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the Plans. All screed extensions shall be full assembly extensions, including activated and heated screeds. Pavers shall include throw-back blades, reverse augers, or equivalent to place mix beneath the auger gearbox. Auger extensions shall be incorporated in a manner such that the maximum distance from the augers to the end plate shall be 18 inches. Screed extensions may extend beyond the 18-inch maximum from auger extensions only when extending for short-term temporary deviations in pavement width such as driveways. Do not use strike-off boxes, with the exception of sections with continuously varying width.”



**Subsection 407.09** (pg. 329-331), 5-14-18; Revise the following: 3. Add two sentences as the end of the paragraph, 4. Remove the first sentence, add two sentences as new first and second sentence, Add second paragraph as shown:

“3. Do not place bituminous plant mix, with a compacted thickness of 1.5 inches or less, between November 30 and April 1. Do not place bituminous plant mix, with a compacted thickness greater than 1.5 inches, between December 15 and March 16. Only place 411-TL, 411-TLD, and 411-OGFC mixtures when the pavement surface temperature and the ambient air temperature are a minimum of 55 °F and rising; limit placement to the period from April 1 to November 1. If the temperature meets the above requirements, outside of normal paving season, a request for a seasonal limitation waiver may be submitted for Departmental consideration. Requests shall be submitted in writing at least one week before the anticipated need.

4. If determined necessary by the Department, the Contractor may request a variance from the above required temperatures and seasonal limitations to pave at lower temperatures by submitting a Cold Weather Paving and Compaction Plan. All projects requiring a Cold Weather Paving and Compaction Plan shall utilize Intelligent Compaction to demonstrate proper coverage and compaction temperature at no additional cost to the Department; with the exception of small quantity projects, such as, but not limited to, bridge approaches, intersections, and temporary traffic shifts. Upon completion, the documentation showing appropriate coverage and compaction temperature shall be provided to the Department. Submit requests in writing at least one week before the anticipated need, and include a Paving and Compaction Plan for Cold Weather that meets the Department’s Procedure. The plan shall identify what practices and precautions the Contractor intends to use to ensure the mixture is placed and compacted to meet the specifications. The plan shall include compaction cooling curves estimating the time available for compaction, the intended production, haul, and compaction rates, with paver and roller speeds estimated. The Contractor may consider using such practices as the addition of rollers, reduced production and paving rates, insulated truck beds, and heating the existing surface.

In no cases will a cold weather paving and compaction plan or seasonal limitation waiver be approved for 411-OGFC, 411-TL, or 411-TLD.

If the specified densities are not obtained, stop all paving operations and develop a new plan. All mixture failing to meet specifications will be subject to price adjustments or removal and replacement at no cost to the Department.”

**Subsection 407.11** (pg. 332) 12-2-16; Add the following to the paragraph below Table 407.11-1:

“Minimum temperature for OGFC mixes shall be 280°.”

**Subsection 407.14** (pg. 335) 10-8-18; modify paragraph 3. 1<sup>st</sup> sentence by adding lift thickness:

“establish lift thickness or line, grade, and elevation”

**Subsection 407.14** (pg. 335), 12-30-19; **Spreading and Finishing**; Revise 5<sup>th</sup> paragraph:

Unevenness of texture, segregation (including end-of-load segregation) ~~as measured by a properly calibrated nuclear gauge~~, or tearing or shoving of bituminous mixture during the paving operation,

shall be reason to stop the paving. Only resume paving operations when the condition is corrected. Immediately remove unacceptable mix and replace at no cost to the Department. The Department will not allow excessive throwing back of the bituminous mixture. Any amount of mixture not fully adhered to the roadway shall be repaired prior to completion of the project. If the failure is not repaired the same day as originally placed, the method of repair must be approved by the Engineer prior to beginning of the repair. The repairs will be no additional cost to the Department.

**Subsection 407.15 C** (pg. 340), 12-30-19; **Test Strips**; Add to 1<sup>st</sup> paragraph:

Construct test strips for all A, B, BM, BM2, C, CW, D, and E mixes to establish rolling patterns, to calibrate nuclear gauges, to verify that the base course or surface course meets the density requirements of the specifications, and for mix design and production verification as required. Adjustments in roller patterns for mixes AS, A-CRL, CS, TL, TLD, and TLE, may be made at the direction of the Engineer.

**Subsection 407.15, C. Test Strips.** (pg. 340-341) 11-16-15; Add the following paragraph after the 7<sup>th</sup> paragraph of the subsection:

“Take an additional 3 cores after placement of the surface layer on the tack coat test strip described in subsection **403.05.B**. Include the underlying pavement layer for shear testing. These cores will be for informational testing only. Not required for mats less than one inch thick”

**Subsection 407.15 C** (pg. 341-342), 12-30-19; **Test Strips**; Remove from 8<sup>th</sup> paragraph:

~~“Take an additional 3 cores after placement of the surface layer on the tack coat test strip described in subsection 403.05.B. Include the underlying pavement layer for shear testing. These cores will be for informational testing only. Not required for mats less than one inch thick”~~

**Subsection 407.15** (pg. 341) 6-27-16; remove the 2<sup>nd</sup> sentence of the 8<sup>th</sup> paragraph:

“Take cores on the test strip at ten randomly selected locations as designated by the Engineer. Provide these cores to the Department for use in calibrating the nuclear gauge and to verify that the average density of the test strip meets the density requirements of the specifications. The Department will report all densities using the corrected nuclear gauge readings. Correction factors are specific to the nuclear gauges used during the test strip construction. If a different nuclear gauge needs to be used for acceptance, it will be necessary to cut new cores from the ongoing pavement construction to calibrate the new gauge.”

**Subsection 407.15** (pg. 341) 12-2-16; remove “randomly selected” from 1<sup>st</sup> sentence of the 8<sup>th</sup> paragraph as follows:

“Take cores on the test strip at ten locations as designated by the Engineer.”

**Subsection 407.15 A. 3. c.** (pg. 337-338) 5-15-17; update 10,000 square yards to 1,000 tons:

“c. Projects containing less than 1,000 tons or bituminous pavement.”

**Subsection 407.15 A. and B.** (pg. 337-342) 10-8-18;A. Add Roller Requirements by Mix Type, modify 1., 2., and 4., B. Modify Tables to condense into Table 407.15 – 1 Density Requirements for Bituminous Pavements, modify 1<sup>st</sup> sentence of the 1<sup>st</sup> paragraph below Table 407.15:

**407.15 Compaction**

**A. General**

After spreading and striking-off the bituminous mixture and adjusting surface irregularities, thoroughly compact the mixture using methods approved by the Engineer and that are capable of achieving the specified density while the material is in a workable condition. When no density requirements are specified, use a system of compaction for roadway pavements that has previously produced the required bituminous pavement densities. The Engineer may require a control strip and random density samples to evaluate the system.

In general, accomplish compaction using a combination of the equipment specified in **407.07**. As a minimum, meet the following roller requirements, but increase the number of rollers if the required results are not being obtained.

Table 407.15 - Roller Requirements by Mix Type

Mix Type	Roller Requirements
307-A, 307-B, 307-BM-2, 307-C, 307-CW (except surface)	3 Rollers (Intermediate Roller shall be Pneumatic)
307-AS, 307-ACRL, 411-D, 411-E, 307-CW (surface), 313-Asphalt Treated Permeable Base	3 Rollers (unspecified)
411-TL, 411-TLD, 411-TLE, 307-CS (when paved as a continuous layer)	2 Rollers (unspecified)
411-OGFC	2 rollers (both rollers shall be static steel double drum, 10 Ton minimum)
Any mix used for scratch paving	2 rollers (breakdown shall be pneumatic)

1. If the compaction effort is detrimental to the quality of the mat, immediately stop and re-evaluate rolling patterns and equipment. To modify the roller train from that which is specified for the mix, submit to the engineer a written request of the rollers to be substituted

- and a narrative explanation of how the specified equipment has been detrimental to the quality of the pavement.
2. The Department will only consider requests for substitution of equipment when it is shown that best practices are being followed and that the problem is not due to improper operation or poor maintenance of the equipment. If this request is approved by the Engineer, a new test strip and roller pattern shall be established.
  3. With the Engineer's approval, the Contractor may reduce the minimum number of rollers listed above to one roller of either the steel-wheel or vibratory type on the following types of construction and projects:
    - a. Shoulder construction,
    - b. Incidental construction such as bridge approaches and driveways, and
    - c. Projects containing less than 10,000 square yards of bituminous pavement.
  4. Compaction of 411-OGFC mixtures shall consist of a minimum of two passes before the material temperature has fallen below 185 °F. Unless otherwise directed by the Engineer, begin rolling at the low side and proceed longitudinally parallel to the road centerline. When paving in echelon, or abutting a previously placed lane, roll the longitudinal joint first, followed by the regular rolling procedure. When paving in echelon, rollers shall not compact within 6 inches of an edge where an adjacent lane is to be placed. Operate rollers at a slow uniform speed with the drive wheels nearer the paver, and keep the rollers as nearly as possible in continuous operation. Continue rolling until all roller marks are eliminated. Do not park rollers on the bituminous pavement.

To prevent adhesion of the mixture to the rollers, keep the wheels properly moistened with water or water mixed with very small quantities of detergent or other approved material. Limit excess use of liquid.

Do not refuel rollers on bituminous pavements.

Along forms, curbs, headers, walls and other places not accessible to the rollers, compact the mixture thoroughly using hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, the Contractor may use a trench roller to compact the mix.

## **B. Density Requirements**

Meet the applicable density requirements specified in Tables 407.15-1.

Table 407.15-1: Density Requirements for Bituminous Pavement

Mix Type	% of Maximum Theoretical Density (Lot Average)	No Single Test Less Than, % (Sub Lot)
Travel Lanes ADT < 1,000 A, B, BM, BM2, C, CW, D, E	90.0	87.0
Travel Lanes 1,000 < ADT < 3,000 A, B, BM, BM-2, C, CW, D, E	91.0	89.0
Travel Lanes ADT > 3,000 A, B, BM, BM-2, C, CW, D, E	92.0	90.0
Travel Lanes and Shoulders Any ADT CS, TL, TLD, TLE, OGFC	NA	NA
Shoulders B, BM, BM-2, D, E	88.0	85.0

Correct sublots that test below the minimum density so that the density of the area is equal to or above the minimum, at which point it can be used to determine the average density of the lot. Do not place any successive layers until the area has been corrected. As necessary to determine the classification of open graded or dense graded mixes and to measure segregation, use AASHTO T 269 or ASTM D3203.

Repair or replace defective mixture to the satisfaction of the Engineer and at no cost to the Department.

The Department will perform density testing in accordance with **407.20.B.5**.

**Subsection 407.20 A.** (pg. 345), 11-6-17; Revise the second paragraph as follows:

“The Department will pay for liquid anti-strip additive and hydrated lime anti-strip additive based on certified documentation of material costs not to exceed \$15 per gallon and \$90 per ton, respectively.”

**Subsection 407.20** (pg. 346) 5-18-15; Basis of Payment; B. Acceptance of Mixture; Modify the last paragraph to revise 500 tons to 1000 tons:

“When the total plan quantity of any mix is less than 1000 tons, the Department will accept the mix on the basis of visual inspection and Contractor Quality Control certification. The Department may run extraction, gradation analysis, or other tests deemed necessary for acceptance purposes.”

**Subsection 407.20 B.1** (pg. 346), 5-13-19; **Acceptance of the Mixture, General**; Revise 2<sup>nd</sup> & 3<sup>rd</sup> paragraph:

The Engineer will accept bituminous mixture at the plant with respect to gradation and asphalt content, on a lot basis. A standard size lot at the asphalt plant will consist of a continuous shift's production that does not start over at Midnight. The number of sublots in a lot will vary from n=1 to n=4 according to Table 407.20-1.

When the total plan quantity of any mix is less than 1000 tons, the Department will accept the mix on the basis of visual inspection and Contractor Quality Control certification. If the daily production of any mix is less than 100 tons, no tests will be required for that quantity of mix. The Department may run extraction, gradation analysis, or other tests deemed necessary for acceptance purposes.

**Subsection 407.20 B.3** (pg. 347-348), 12-30-19; **Acceptance of the Mixture**; Revise 3<sup>rd</sup> paragraph:

~~At least once per week~~Monthly, per mixture ~~during production~~, the Engineer shall check-determine the correction factor for the ignition oven used for acceptance of the mixture per AASHTO T 308 correction factors with a sample of the aggregate mixture proportions, blended at the optimum asphalt content and adjust the Asphalt Cement content for acceptance of the mixture accordingly. Adjust the correction factor accordingly.—Keep records of all correction factors for all mixtures. Adjusted payment for asphalt content and gradation will be based on the ignition furnace results as specified in Table 407.20-2. Use of this alternative equipment shall be at no additional cost to the Department.

**Subsection 407.20** (pg. 348) 10-8-18; Table 407.20-2, add OGFC information to table:

**Table 407.20-2: Acceptance Schedule of Payment  
(Asphalt Plant Mix Characteristics)**

Characteristics	Pay Factor	Average Arithmetic Deviation of the Lot Acceptance Test from the JMF	
		1 Test	2 Tests or more
All mixes except 411-OGFC	1.00	0.00-0.30	0.00-0.25
Asphalt Cement Content <sup>(1)</sup>	0.95	0.31-0.35	0.26-0.30
(Extraction or ignition oven)	0.90	0.36-0.40	0.31-0.35
	0.80 <sup>(2)</sup>	over 0.40	over 0.35
411-OGFC only	1.00	0.00-0.30	0.00-0.25
Asphalt Cement Content	0.90	0.31-0.35	0.26-0.30
(Extraction or ignition oven)	0.80	0.36-0.40	0.31-0.35
	0.60 <sup>(2)</sup>	over 0.40	over 0.35
Gradation	1.00	0.00-6.50	0.00-5.70
3/8 inch sieve and larger	0.95	6.51-7.08	5.71-6.20
	0.90	7.09-7.66	6.21-6.69
	0.80 <sup>(2)</sup>	over 7.66	over 6.69
Gradation	1.00	0.00-4.62	0.00-4.00
No. 4 sieve <sup>(3)</sup>	0.95	4.63-5.20	4.01-4.50
	0.90	5.21-5.77	4.51-5.00
	0.80 <sup>(2)</sup>	over 5.77	over 5.00
Gradation	1.00	0.00-3.80	0.00-3.30
No. 8, 16, 30 & 50 sieves <sup>(3)</sup>	0.95	3.81-4.46	3.31-3.91
	0.90	4.47-5.12	3.92-4.52
	0.80 <sup>(2)</sup>	over 5.12	over 4.52
Gradation	1.00	0.00-1.80	0.00-1.60
No. 100 & 200 sieves <sup>(3)</sup>	0.95	1.81-2.00	1.61-1.75
	0.90	2.01-2.20	1.76-1.90
	0.80 <sup>(2)</sup>	over 2.20	over 1.90

<sup>(1)</sup> Does not apply to 307 Grading A, AS, or ACRL mixes.

<sup>(2)</sup> If approved by the Engineer, the Contractor may accept the indicated partial pay. The Department may require removal and replacement at no cost. The Contractor may remove and replace at no cost to the Department at any time.

<sup>(3)</sup> When there is more than one reduced payment relating to gradation in 1 lot of material, only the greatest reduction in payment will be applied. Reductions applicable for any other reason will be cumulative.

Characteristics	Pay Factor	Average Arithmetic Deviation of the Lot Acceptance Test from the JMF	
		1 Test	2 Tests or more

**Subsection 407.20** (pg. 348) 11-16-15; Table 407.20 – 2, make the following changes:

**Table 407.20-2: Acceptance Schedule of Payment  
(Asphalt Plant Mix Characteristics)**

Characteristics	Pay Factor	Average Arithmetic Deviation of the Lot Acceptance Test from the JMF	
		1 Test	2 Tests or more
Asphalt Cement Content <sup>(1)</sup>	1.00	0.00-0.30	0.00-0.25
(Extraction or ignition oven)	0.95	0.31-0.35	0.26-0.30
	0.90	0.36-0.40	0.31-0.35
	0.80 <sup>(2)</sup>	over 0.40	over 0.35
Gradation	1.00	0.00-6.50	0.00-5.70
3/8 inch sieve and larger	0.95	6.51-7.08	5.71-6.20
	0.90	7.09-7.66	6.21-6.69
	0.80 <sup>(2)</sup>	over 7.66	over 6.69
Gradation	1.00	0.00-4.62	0.00-4.00
No. 4 sieve <sup>(3)</sup>	0.95	4.63-5.20	4.01-4.50
	0.90	5.21-5.77	4.51-5.00
	0.80 <sup>(2)</sup>	over 5.77	over 5.00

**Subsection 407.20** (pg. 349) 10-8-18; B.5, Add the sentence as the next to last sentences of the 1<sup>st</sup> paragraph:

**“Acceptance for Mix Density on the Roadway.** The Department will apply a deduction in payment, not as a penalty but as liquidated damages, for failure to meet the density requirements specified in **407.15**. As soon as practicable after the final rolling is completed on each lot, the Department will perform 5 density tests at locations determined by the Engineer, and will compute an average of all such tests. Deductions for failure to meet density requirements will be computed to the nearest 0.1% as a percentage of the total payment otherwise due for each lot. The percent of total payment to be deducted will be 5 times the percent the average in-place density for each lot that fails to meet **407.15**. The Department will make deductions in monies due the Contractor for failure to meet the density requirements under the item for Density Deduction. The Department will conduct acceptance testing for density in accordance with ASTM D2950 unless otherwise specified. For projects with total project tonnage per mix type less than 2,000 tons (not including small quantity jobs as defined in 407.20.B.1) the department may alternatively calculate in place density by cores (AASHTO T-166), in this case no cores will be taken for gauge correlation on the test strip. The Department inspector will be a certified Asphalt Roadway Technician.”



**Subsection 407.20** (pg. 350) 10-7-19; B.5. Acceptance for Mix Density on the Roadway, Revise the last sentence in the 1<sup>st</sup> paragraph:

“**Acceptance for Mix Density on the Roadway.** The Department will apply a deduction in payment, not as a penalty but as liquidated damages, for failure to meet the density requirements specified in **407.15**. As soon as practicable after the final rolling is completed on each lot, the Department will perform 5 density tests at locations determined by the Engineer, and will compute an average of all such tests. Deductions for failure to meet density requirements will be computed to the nearest 0.1% as a percentage of the total payment otherwise due for each lot. The percent of total payment to be deducted will be 5 times the percent the average in-place density for each lot that fails to meet **407.15**. The Department will make deductions in monies due the Contractor for failure to meet the density requirements under the item for Density Deduction. The Department will conduct acceptance testing for density in accordance with ASTM D2950 unless otherwise specified. The Department inspector conducting the density tests shall be a certified Nuclear Gauge Field Technician.”

**Subsection 407.20** (pg. 350) 11-16-15; B. 5. Acceptance for Mix Density on the Roadway, Replace the entire 2<sup>nd</sup> paragraph with the following:

“For density testing purposes, the Department will divide the pavement into lots of 1,000 tons. Five density tests will be performed in each lot and the average results compared with the requirements specified in Tables 407.15-1 to 407.15-4. At the beginning of a project or at any time it is deemed advisable, the Department may consider smaller lots to evaluate compaction methods or for other reasons as approved or directed by the Engineer.”

**Subsection 411.03** (pg. 357) 10-8-18; B. Proportioning, modify table 411.03-1 to add TLE requirements:

**“Table 411.03-1: Proportions of Total Mixture, Percent by Weight**

Surface Course	Effective Combined Mineral Aggregate	Asphalt Cement
Grading D	93.0 - 94.3	5.7 - 7.0 <sup>(1)</sup>
Grading E <sup>(2)</sup>	93.0 - 94.3	5.7 - 7.0 <sup>(1)</sup>
Grading E (shoulders)	92.0 - 94.7	6.0 - 6.5 <sup>(1)</sup>
Grading TL	92.5 - 94.3	5.7 - 7.5 <sup>(1)</sup>
Grading TLD	93.0 - 94.3	5.7 - 7.0 <sup>(1)</sup>
Grading TLE	93.0 - 94.3	5.7 - 7.0 <sup>(1)</sup>
Grading OGFC	92.0 - 94.0	6.0 - 8.0 <sup>(1)</sup>

<sup>(1)</sup> If the effective combined specific gravity of the aggregate exceeds 2.80, the above proportions may be adjusted as directed by the Engineer. The upper limit for flow values shall not apply to mixes with modified asphalt liquids.

<sup>(2)</sup> The minimum allowable asphalt cement content for 411E low volume mixtures is 5.3%.

**Subsection 411.03** (pg. 358-359) 10-8-18; B. Proportioning: 2. Grading E, modify subsection and Table 411.03-3 to add TLE requirements, remove riding surface phrase:

2. **Grading E and TLE.** In addition to the other requirements of these Specifications, the composition of the mineral aggregate shall be such that, when combined with the required amount of bitumen, the resultant mixture will meet Table 411.03-3.

**Table 411.03-3: Mixture Properties (High vs. Low Volume Roads)**

Mix	Traffic Volume	Stability Minimum lb-ft <sup>(1, 3)</sup>	Flow 0.01 inch <sup>(2)</sup>	Design Void Content % <sup>(1)</sup>	Production Void Content % <sup>(1)</sup>	VMA, Min % <sup>(1)</sup>
411E 411TLE	High Volume (ADT > 1,000)	2,000	8 - 16	4.0 ± 0.2	3 - 5.5	14
411E 411TLE	Low Volume (ADT ≤ 1,000)	1,500	8 - 16	3.5 ± 0.5	2 - 5	n/a

- <sup>(1)</sup> Tested according to AASHTO T 245 with 75 blows of the hammer on each side of the test specimen, using a Marshall Mechanical Compactor.
- <sup>(2)</sup> Flow will only be required when using a non-modified binder (PG 64-22 or 67-22)
- <sup>(3)</sup> Minimum stability for shoulder mixes will be 1,500 lb-ft and optimum asphalt cement content for shoulder mixes shall be as directed by the Regional Materials Supervisor.

**Subsection 411.03** (pg. 358-359) 10-8-18; C. Recycled Asphalt Pavement and Recycled Asphalt Shingles: modify Table 411.03-6 to add TLE requirements:

**Table 411.03-6: Use of Recycled Asphalt Pavement**

Mix Type	% RAP (Non-processed) <sup>(1)</sup>	Maximum % RAP (Processed) <sup>(2)</sup>	Maximum % RAP Processed and Fractionated <sup>(3)</sup>	Maximum Particle Size (inch)
411D (PG64-22, PG67-22)	0	15	20	1/2
411D (PG70-22, PG76-22, PG82-22)	0	10	15	1/2
411E & 411TLE(Roadway)	0	15	20	1/2
411E &	15	30	35	1/2

Mix Type	% RAP (Non-processed) (1)	Maximum % RAP (Processed) (2)	Maximum % RAP Processed and Fractionated (3)	Maximum Particle Size (inch)
411TLE (Shoulder)				
411TL (PG64-22, PG67-22)	0	15	15	5/16
411TL (PG70-22, PG76-22, PG82-22)	0	10	10	5/16
411TLD (PG64-22, PG67-22)	0	15	15	5/16
411TLD (PG70-22, PG76-22, PG82-22)	0	10	10	5/16

(1) “Non-processed” refers to RAP that has not been crushed and screened or otherwise sized such that the maximum recycled material particle size is less than that listed above prior to entering the dryer drum.

(2) “Processed” refers to RAP that has been crushed and screened or otherwise sized such that the maximum recycled material particle size is less than that above prior to entering the dryer drum.

(3) “Fractionated” refers to RAP that has been processed over more than one screen, producing sources of various maximum particle sizes (e.g., 3/4 to 1/2 inch, 1/2 inch to #4, etc.). The Contractor may use the larger percentages of fractionated RAP specified only if individual fractions of two different maximum particle size are introduced into the plant as separate material sources for increased control.

**Subsection 411.03** (pg. 363) 11-16-15; 2. Recycled Asphalt Shingles (RAS), change 5% to 3% in the 1<sup>st</sup> sentence of the 1<sup>st</sup> paragraph.

“Recycled Asphalt Shingles (RAS) may be included to a maximum of 3% of the total weight of mixture.”

**Subsection 411.03 B. Anti-strip Additive** (pg. 365) 6-27-16; revise the 2<sup>nd</sup> paragraph:

“Mix an approved anti-strip agent with the asphalt cement at the dosage as specified in **921.06.B.**”

**Subsection 411.09** (pg. 367), 5-13-19; **Method of Measurement**; Revise Table 411.09-1:

**Table 411.09-1: Asphalt Cement Content**

Mix Type	Asphalt Content, %
411-D	5.9
411-E Roadway	6.3
411-E Shoulder	6.3
411-TL	6.3
411-TLD	5.9
411-TLE Roadway	5.9
411-TLE Shoulder	5.9
411-OGFC	6.0

**Subsection 414.02** (pg. 369) 11-16-15; **Materials**, add the following paragraph to the end of the subsection:

“Ensure that no deleterious material is introduced into aggregate stockpiled at project site.”

**Subsection 414.02** (pg. 369) 11-6-17; Revise the last sentence:

“For a slurry seal, use a Type CQS-1h emulsified asphalt. For micro-surfacing use a type CQS-1hp or CSS-1hp emulsified asphalt.”

**Subsection 414.02** (pg. 369), 12-30-19; **Materials**; Revise 2<sup>nd</sup> paragraph:

For a slurry seal, use a Type CQS-1h emulsified asphalt. For micro-surfacing, use a type CQS-1hp ~~or CSS-1hp~~ emulsified asphalt.

**Subsection 414.06** (pg. 379-382) 5-14-18; Remove B. 3. a., update b. to a. and revise as follows:

“B. Quality Control

**3. Documentation.** Maintain a lot sheet as follows:

**a. Lot Sheet.** Divide the Project into lots of each day’s production. For each lot, maintain a lot sheet, providing the following information:

- (1) Contract Number, Route,
- (2) Date, Air Temperature, Pavement Surface Temperature
- (3) Control Settings, Calibration Values, Unit Weight of Emulsion (pounds per gallon), Percent Residue in Emulsion
- (4) Beginning and Ending Log Miles

- (5) Computer display readings for material usage (Beginning, Ending, and Total)
- (6) Length, Width, Total Area (square yards) of the construction completed for the day
- (7) Aggregate used (dry ton) Asphalt Emulsion used (ton), additives (gallon), water (gallon), and/or Portland Cement (ton)
- (8) Application Rate of asphalt emulsion, Combined Application Rate (pounds per square yard)
- (9) Mix Design (Percent Portland cement, Percent Emulsion, Percent Asphalt Cement)
- (10) Calibration Forms
- (11) Contractor's Authorized Signature"

**Subsection 414.12** (pg. 384) 10-8-18, Basis of Payment, add the following as the last sentence of the paragraph:

“The Department will pay for accepted quantities, determined in accordance with 414.11, at the contract prices, complete in place, which payment shall be full compensation for all equipment, materials, labor and incidentals necessary to complete the work. A price adjustment for Loss on Ignition (LOI) shall be applied on a project basis per 407.20.C.3.”

**Subsection 414.12** (pg. 384), 12-30-19; **Basis of Payment**; Add subsection A & B:

**A. General**

The Department will pay for accepted quantities, determined in accordance with 414.11, at the contract prices, complete in place, which payment shall be full compensation for all equipment, materials, labor and incidentals necessary to complete the work.

**B. Adjustments**

- 1. Loss on Ignition (LOI).** A price adjustment for Loss on Ignition (LOI) shall be applied on a project basis per 407.20.C.3.
- 2. Specific Gravity.** In cases where the Bulk SSD specific gravity of the mineral aggregate exceeds 2.80, the Department will adjust the tonnage of mineral aggregate for payment by multiplying the tonnage of mineral aggregate used by a specific gravity of 2.80 and dividing by the higher specific gravity.

**S T A T E**

**O F**

**T E N N E S S E E**

(Rev. 5-18-15)  
(Rev. 11-16-15)  
(Rev. 5-15-17)  
(Rev. 11-6-17)  
(Rev. 5-14-18)  
(Rev. 10-8-18)  
(Rev. 5-13-19)  
(Rev. 12-30-19)

January 1, 2015

**Supplemental Specifications - Section 500**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 501.03 A.1** (pg. 393), 5-13-19; **Proportioning, General**; Revise 1<sup>st</sup> paragraph:

Submit the proposed concrete design to the Engineer for approval. Determine the design using saturated surface dry aggregate weights. Verify the design by preparing trial batches meeting the requirements of these specifications. Ensure that the concrete design is prepared by a TDOT Certified Concrete Mix Design Technician, or by an approved independent testing laboratory under the direction of a registered professional Civil Engineer, licensed by the State of Tennessee. The TDOT Certified Concrete Mix Design Technician or the Civil Engineer shall certify that the information contained on the design is correct and is the result of information obtained from the trial batches. Prepare trial batches for design, including admixtures in the proper proportion, no more than 90 days before the design submittal. The approved mix design will expire at the end of each calendar year or if it does not meet the minimum 28-day requirements. All cost of concrete design, preparation, and submittal are the Contractor's responsibility.

**Subsection 501.03 A.2** (pg. 394), 5-13-19; **Design and Production Parameters**; Revise 4<sup>th</sup> Paragraph:

Admixtures to be incorporated into the concrete shall be compatible and incorporated into the concrete in accordance with the manufacturer's recommendations. Concrete mixtures utilizing multiple admixture manufacturers shall prove compatibility in accordance with the Department's Standard Operating Procedure 4-4.

**Subsection 501.03** (pg. 395), 5-18-15; 3. Mix Design Submittal; Replace the first paragraph with the following:

“Instead of the above mix design submittal, a request to use an existing design may be submitted for approval provided the design has been used on a state funded project within the last six (6) months. The approval of this concrete design submittal will not relieve the Contractor of the responsibility of providing concrete meeting the requirements of these Specifications. A temporary mix design may be issued if the 7-day or 14-day compressive strengths exceed the required 28-day strengths.”

**Subsection 501.03 A. Proportioning** (pg. 395) 5-15-17; Add water as 22. on the list of Design Submittal requirements, update the paragraph below the list to add water requirements:

**“A. Proportioning**

**3. Design Submittal.** Include the following information as a minimum in the proposed concrete design submittal:

1. Source of all aggregate
2. Brand and type of cement
3. Source and class of fly ash (if used)
4. Source and grade of ground granulated blast furnace slag (if used)
5. Specific gravity of cement
6. Specific gravity of fly ash (if used)
7. Specific gravity of ground granulated blast furnace slag (if used)
8. Admixtures (if used)
9. Gradation of aggregates
10. Specific gravities of aggregates (saturated surface dry)
11. Air content (if air entrainment is used)
12. Percentage of fine aggregate of the total aggregate (by volume)
13. Slump
14. Weight per cubic yard
15. Yield
16. Temperature of plastic concrete
17. Water/cement ratio (pound/pound)
18. 7-day compressive strength [minimum of two 4-inch x 8-inch cylinders]
19. 14-day compressive strength [minimum of two 4-inch x 8-inch cylinders]
20. 28-day compressive strength [minimum of two 4-inch x 8-inch cylinders]
21. Weight of each material required to produce a cubic yard of concrete
22. Water – submit testing results per Tables 921.01-1 & 921.01-2

Instead of the above mix design submittal, a request to use an existing design may be submitted for approval provided the design has been used on a state funded project within the last six (6) months. When submitting for the use of an existing mix design, the most current water testing results per 921.01 shall accompany the submittal. The approval of this concrete design submittal will not relieve the Contractor of the responsibility of providing concrete meeting the requirements of these Specifications. A temporary mix design may be issued if the 7-day or 14-day compressive strengths exceed the required 28-day strengths.”

**Subsection 501.03 A.3** (pg. 395), 5-13-19; **Mix Design Submittal**; Revise 2<sup>nd</sup> paragraph:

Instead of the above mix design submittal, a request to use an existing design may be submitted for approval within the current calendar year. When submitting for the use of an existing mix design, the most current water testing results per 921.01 shall accompany the submittal. The approval of this concrete design submittal will not relieve the Contractor of the responsibility of providing concrete meeting the requirements of these Specifications. A temporary mix design may be issued if the 7-day or 14-day compressive strengths exceed the required 28-day strengths.

**Subsection 501.03 A.3** (pg. 395-396), 12-30-19; **Mix Design Submittal**; Revise 3<sup>rd</sup> paragraph:

If proposing to use materials or admixtures from sources other than those shown on the approved concrete mix design, submit a ~~written request to the Regional Materials and Tests Engineer explaining the necessity for the change and include a~~ new mix design developed in accordance with this Subsection **501.03**. Do not place any concrete until the new design is approved. The Engineer will not accept concrete produced using materials that are not shown on an approved concrete design.

**Subsection 501.03 A.6** (pg. 398-399), 12-30-19; **Adjustments to Mix Proportions**; Remove entire subsection:

~~**6. Adjustments to Mix Proportions.** Meet the mix proportions approved by the Department during the progress of the work, except make the following adjustments as necessary with the Engineer's approval:~~

- ~~1. Maintain the cement content within 2% of the designated value by adjusting the proportions of materials as necessary.~~
- ~~2. If concrete of the desired plasticity and workability cannot be obtained with the proportions originally designed, adjust the aggregate weights as required, provided that the originally designated cement content is not changed except as specified in paragraphs (3), (4) and (5) below.~~
- ~~3. If it is found impossible to produce concrete having the required consistency without exceeding the maximum allowable water-cement ratio specified, increase the cement content so that the maximum allowable water-cement ratio will not be exceeded.~~
- ~~4. If for any reason the concrete must be placed by hand methods and the water-cement ratio established for the vibrated concrete cannot be maintained, adjust the mix proportions for placement by hand methods and increase the cement proportion by 38 pounds per cubic yard, or more if necessary, in order to maintain the water-cement ratio established for the vibrated concrete. The Department will not make additional payment to the Contractor for the cost of the additional cement.~~
- ~~5. Change the mix proportions if the character or source of materials changes.~~
- ~~6. Change the mix proportions or mixing procedure to maintain the air content within the specified limits.~~
- ~~7. Change the mix proportions to allow for the use of retarders or other chemical additives that may be required or approved.~~



**Subsection 501.03 B** (pg. 399), 5-13-19; **Quality Control and Acceptance of Concrete**; Revise 2<sup>nd</sup> paragraph:

Provide qualified technicians to perform sampling, testing, and inspection for process control. A TDOT Certified Concrete Plant Quality Control Technician shall provide process control of the concrete at the concrete plant. This technician shall be present at the concrete plant during all batching operations for the Project and shall have the primary responsibility during production of performing process control. A TDOT Certified Concrete Field Testing Technician or equivalent shall provide process control of the concrete at the placement site and shall be present during all concrete placement. A TDOT Certified Concrete Field Testing Technician or equivalent is not required to be at the placement site during small quantity placing operations but shall perform one complete set of tests during the life of the Project.

**Subsection 501.03.B** (pg. 399), 12-30-19; **Quality Control and Acceptance of Concrete**; Revise 2<sup>nd</sup> paragraph:

Provide qualified technicians to perform sampling, testing, and inspection for process control. A TDOT Certified Concrete Plant Quality Control technician shall provide process control of the concrete at the concrete plant. This technician shall be present at the concrete plant during all batching operations for the Project and shall have the primary responsibility during production of performing process control. A TDOT Certified concrete Field Testing or equivalent shall provide process control of the concrete at the placement site and shall be present during all concrete placement. A TDOT Certified Concrete Field Testing technician or equivalent is not required to be at the placement site during minor structures, as listed in 604.11 B, small-quantity-placem~~ent~~ing operations. ~~but shall perform one complete set of tests during the life of the Project.~~

**Subsection 501.03** (pg. 399-402) 11-16-15; B. Quality Control and Acceptance of Concrete, adjust the following:

- “1. Test to determine aggregate gradations (AASHTO T 27 with AASHTO T 11 when required). Conduct a combined belt gradation before work starts and at least daily to verify consistency if using a dynamic, multi-aggregate feed system.
3. Calibrate the weighing systems, aggregate feed flow rate and weigh bridges, water meters, and admixture dispensing systems before starting production.
4. Ensure accurate weighing or flow rate of the aggregates and cement, the proper metering of water and admixtures, and the quality of water.
6. Adjust mix proportions due to actual moisture content of both coarse and fine aggregates, with moisture content determined according to AASHTO T 255. If using a dynamic aggregate weighing system, multi-aggregate proportioning adjustments are to be made by using an in-bin moisture sensor.”
7. Conduct slump (AASHTO T119) or slump flow (ASTM C1611) and air tests (AASHTO T152).

Page 401- “Make, cure, and transport all early break cylinders (7-14 day, etc.) according to AASHTO T 23, and deliver to the Regional laboratory or other established satellite laboratories

for testing. Make all early break cylinders (7-14 day, etc.) for self-consolidating concrete according to ASTM C1758, and deliver to the Regional laboratory or other established satellite laboratories for testing.”

Page 402 - “Correct batch weights or aggregate feed flow rates to compensate for surface moisture on the aggregate at the time of use. The Contractor...”

**Subsection 501.03 B.12** (pg. 401), 5-13-19; **Quality Control and Acceptance of Concrete**; Add “r” to list:

12. A concrete delivery ticket shall accompany each load to the placement site. The ticket shall include as a minimum the following:
  - a. Date
  - b. Contract number
  - c. County
  - d. Class of concrete
  - e. Concrete design number
  - f. Number of cubic yards
  - g. Load number
  - h. Truck number
  - i. Maximum water allowed by design
  - j. Total water added at the plant
  - k. Maximum water allowed to be added on the project
  - l. Actual water added on project
  - m. Number of revolutions at mixing speed at plant
  - n. Number of revolutions at mixing speed at project
  - o. Time loaded
  - p. Time discharged
  - q. Actual and target batch weights of each component including each aggregate, chemical admixture and mineral admixture used
  - r. Signature of producer’s TDOT Certified Concrete Plant Quality Control Technician

**Subsection 501.03** (pg. 401) 5-14-18; B. Quality Control and Acceptance of Concrete, remove AASHTO T23 and replace with specification 604.15 C.”

“Make, cure, and transport all early break cylinders (7-14 day, etc.) in accordance with 604.15.C, and deliver to the Regional Laboratory or other established satellite laboratories for testing.”

**Subsection 501.04** (pg. 402) 11-16-15; replace the following:

**“A. Batching Plant, Multi-Aggregate Feed System, and Equipment,**

1. General. The batching plant shall include bins, weighing hoppers or belt feeds with weigh bridges and load cells, and scales. If using cement in bulk,...

2. Bins and Hoppers- Add the following new paragraph under the existing paragraph

For multi-aggregate feed systems, provide bins as noted with variable size openings and variable speed belts. Each bin must have a calibrated moisture sensor to adjust aggregate feed flow rates. Assure consistent, uninterrupted aggregate flow and consistent belt speeds once aggregate feed system is calibrated.

3. Scales- Add the following new paragraph under the last paragraph in the section.

For multi-aggregate feed systems, provide a dual idler weight bridge with load cells to accurately weigh the actual aggregate flow rate.”

**Subsection 501.04 A. 1.** (pg. 402), 11-6-17; General, Add the following after the first paragraph:

“All producers of concrete shall be on the Department’s approved producer list and be actively certified by the National Ready Mixed Concrete Association (NRMCA) Plant Certification Program.”

**Subsection 501.04** (pg. 404) 11-16-15; B. Mixers, remove the complete 4th paragraph.

**Subsection 501.04 B. 3.** (pg. 403), 11-6-17; Truck Mixers and Truck Agitators, Add the following to the beginning of the first paragraph:

“Truck mixers shall be certified by the National Ready Mix Concrete Association (NRMCA) Delivery Vehicle Certification Program Option A or Option B.”

**Subsection 501.09** (pg. 410) 10-8-18; Revise course to coarse in the 3<sup>rd</sup> paragraph of the subsection:

“Separately weigh the fine aggregate and each size of coarse aggregate into the hopper or hoppers in the respective amounts set by the Engineer. The coarse aggregates shall meet the gradation requirements for Size No. 467, as specified in **903.22**, or a blend of Size No. 4 and Size No. 67 that meets the required gradation for Size No. 467, specified in **903.22**.”

**Subsection 501.12 – Placing Concrete** (pg. 413-415) 5-15-17; replace the subsection:

**“501.12 Placing Concrete**

Either unload the concrete into an approved spreading device, or deposit it directly on the base, and mechanically spread the concrete in a manner that prevents segregation of the materials. When using central or transit mixed concrete, deposit it in an approved spreader. Place the mixture so as to minimize rehandling and relocation from point of placement. The mechanical spreader will not be required on areas too small to accommodate the paving equipment, projects that contain 10,000 square yards or less of concrete paving, and on variable width sections and ramps. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Do not place concrete on frozen grade.

Perform any necessary hand spreading with shovels or other approved tools. Do not allow workmen to walk in the freshly mixed concrete with boots or shoes coated with earth or other foreign substances.

If placing concrete adjacent to a previously constructed lane of pavement and mechanical equipment is to be operated on this existing lane of pavement, that lane shall meet the requirements for opening to traffic specified in **501.22**. If the existing lane is to only carry finishing equipment, the Contractor may begin paving the adjoining lanes after 7 days.

Deposit concrete as near to expansion and contraction joints as possible without disturbing them; do not dump concrete from the discharge bucket or hopper onto a joint assembly unless the hopper is well centered on the joint assembly.

Immediately remove all concrete materials that may fall on or be worked into the surface of a completed slab using approved methods.

When using the slip-form method of concrete paving, place the concrete with an approved slip-form paver meeting the requirements of **501.04.D.11**.

Ensure that the sliding forms are rigidly held together laterally to prevent spreading of the forms. The forms shall trail behind the paver for such a distance that no appreciable slumping of the concrete will occur and so that necessary finishing can be accomplished while the concrete is still within the forms. Before the concrete has hardened, correct any edge slump of the pavement, exclusive of edge rounding, in excess of 1/4 inch.

Operate the slip-form paver with as nearly a continuous forward movement as possible, and coordinate all operations of mixing, delivering, and spreading of concrete so as to provide uniform progress while minimizing the stopping and starting of the paver. If, for any reason, it is necessary to stop the forward movement of the paver, also immediately stop the vibratory and tamping elements. Apply no tractive force to the machine, other than that which is controlled from the machine. Replace slabs with random cracks before completion of paving operations.

Contractor may choose to utilize a single lift or two lift paving process according to the following requirements.

**A. Single Lift Pavement**

Use vibrators to thoroughly consolidate the concrete against and along the faces of all forms and along the full length and on both sides of all joint assemblies. Do not allow vibrators to come in contact with a joint assembly, the grade, or a side form. Do not operate the vibrator for longer than 5 seconds in any one location.

The Contractor may only use hand-operated vibrators on projects containing 10,000 square yards or less of concrete paving and on variable width sections. Only operate vibrators mounted on a machine while the machine is in motion.

Equip the slip-form paver with vibrators meeting the applicable requirements of **501.04.D.1** to vibrate the concrete for the full width and depth of the strip of pavement being placed.

## B. Two Lift Composite Pavement

When placing two lift composite pavements, the upper lift shall be of a lesser thickness as designated by contract design. It shall be placed such that the result is a wet-on-wet application. The lower lift will be one foot less in width than the upper lift.

Paving operations shall be adjusted and approved by the Engineer as necessary to assure a wet-on-wet monolithic pavement section. If the bonding between lifts or the consolidation of concrete is determined to be unsuitable by the Engineer, the lower lift shall be removed and replaced prior to the upper lift placement.

**1. Lower Lift.** Uniformly spread concrete with a spreader or slipform machine. Internal vibration will be required for the lower lift. Tie bars and dowel bars (with the use of dowel baskets) shall be placed in the lower lift at mid-depth of the finished concrete pavement thickness. The lower lift shall not require curing, texturing, or sawing before the upper lift is placed. The lower lift shall be struck off to provide a nominal lower lift thickness that complies with the pavement design. The upper lift shall be struck off to allow for the finished total pavement to conform to the cross section shown in the contract plans.

**2. Upper Lift.** Place the upper lift within 45 minutes following the placement of the lower lift. Placement of the upper lift shall be such that intermingling of the two concrete mixtures is minimal. External vibration for the upper lift will be allowed if proper consolidation and finishing can be demonstrated in accordance with **501.16**. Dowel bars can be inserted during the placement of the upper lift. Cure the upper lift only in accordance with **501.18**. At no time shall the total thickness be less than shown on the pavement design and the cross section shown in the contract plans.

Frequency of the vibrators shall be established based on the workability of the concrete mixture and past experiences. Electronic, internal, T-shaped, poker vibrators shall be used. Other types of vibrating equipment may be approved by the Engineer. Vibrator impulses shall be delivered directly to the concrete and the intensity of vibration shall be sufficient to consolidate the concrete thoroughly and uniformly throughout the depth and width of the lift. Increase in the speed of the vibrators will be allowed with the permission of the Engineer.

A paving plan shall be supplied to the Engineer for review and approval prior to pouring. The plan shall document procedures to ensure consistency of material properties during concrete placement and finishing, identify and eliminate potential for load misidentification, and maintain speed of production and paving. Concrete for each lift shall be produced from the same ready-mix facility.”

**Subsection 501.17** (pg. 424) 11-16-15; A. Surface Testing, modify the following:

- “3. Ramps where the design speed is greater than 40 miles per hour
  - (a) Test sections shall terminate 100 feet from a stop or slow speed yield condition
  - (b) Superelevated sections greater than 40 miles per hour design speed must be ground in accordance with **Table 501.17-1**
- 4. Ramps where the design speed is 40 miles per hour or less
  - (a) Test sections shall terminate 100 feet from a stop or slow speed yield condition
  - (b) Superelevated sections with a design speed of 40 miles per hour or less must be ground in accordance with **Table 501.17-2**

**Subsection 501.17** (pg. 425) 11-16-15; B. Pay Factors and Required Corrective Action, modify the following:

“Payment factors and required corrective actions relative to profile indexes for ramps with design speeds of 40 MPH or less shall conform to Table 501.17-2.

Table 501.17-2: Pay Factors & Corrective Action for Ramps with Design Speeds of 40 mph or less

<b>Profile Indexes</b>	<b>Pay Factor</b>	<b>Corrective Action</b>
<10 inches per mile	105%	None
10 to < 20 inches per mile	100%	None
20 to < 23 inches per mile	98%	Grind to 20 inches per mile
23 plus inches per mile	95%	Grind to 20 inches per mile

**Subsection 501.26 – Basis of Payment** (pg. 434) 5-15-17; add the following sentence to the 7<sup>th</sup> paragraph of the subsection:

The Department will pay for additional concrete, measured in accordance with **501.25**, at the purchase price, F.O.B. the unloading point, as verified by invoices, with no compensation allowed for further handling. The State will be reimbursed from monies due the Contractor for a decrease in concrete measured in accordance with **501.25** in an amount equal to the purchase price of the cement, F.O.B. the unloading point. No payment will be allowed for any changes in the proportions of the aggregates. No additional payment will be made if two-lift composite pavement alternate is selected.”

**STATE**

**OF**

**TENNESSEE**

(Rev. 5-18-15)

(Rev. 11-16-15)

(Rev. 6-27-16)

(Rev. 12-2-16)

(Rev. 5-15-17)

(Rev. 11-6-17)

(Rev. 5-14-18)

(Rev. 10-8-18)

(Rev. 5-13-19)

(Rev. 12-30-19)

January 1, 2015

**Supplemental Specifications - Section 600**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 602.17** (pg.459-477), 12-2-16; Entire Subsection: Replace all references to AASHTO M164 and AASHTO M253 with ASTM F3125, Grade A325 and A490

**Subsection 602.17** (pg. 459) 12-2-16; modify the first paragraph of A.:

“All high strength bolts, or equivalent fasteners, tightened to a high tension shall be coated with permitted coatings in accordance with ASTM F3125 for their respective grade. Use the bolts in holes conforming to 602.06, 602.07, and 602.08. All Grade A325 and A490 bolts, except Type 3 bolts used in weathering steel, shall be coated. Permitted coatings for Grade A325 and Grade A490 bolts are listed in ASTM F3125, Annex A1.”

**Subsection 602.17** (pg. 465–469), 12-2-16; Update Tables:

Bolt Diameter (inches)	Bolt Tension (pounds)	
	(GradeA325)	GradeA490 Bolts
½	12,000	15,000
5/8	19,000	24,000
¾	28,000	35,000
7/8	39,000	49,000
1	51,000	64,000
1-1/8	64,000	80,000
1-1/4	81,000	102,000
1-3/8	97,000	121,000
1-1/2	118,000	148,000

<sup>(1)</sup> Equal to 70% of the specified minimum tensile strength of bolts.

**Table 602.17-1: Minimum Bolt Tension <sup>(1)</sup>**

Bolt Diameter (inches)	Grade A325	Grade A490
	Snug Tension (kips)	Snug Tension (kips)
½	1	1
5/8	2	2
¾	3	4
7/8	4	5
1	5	6
1-1/8	6	8
1-1/4	8	10
1-3/8	10	12
1-1/2	12	15

**Table 602.17-3: Minimum Installation Tension**

Bolt Diameter (inches)	Grade A325	Grade A490
	Tension (kips)	Tension (kips)
1/2	12	15
5/8	19	24
3/4	28	35
7/8	39	49
1	51	64
1-1/8	64	80
1-1/4	81	102
1-3/8	97	121
1-1/2	118	148

**Table 602.17-4: Rotation from Snug Condition**

Bolt Length (measured in Step 1)	Grade A325	Grade A490
	Required Rotation	Required Rotation
Up to and including 4 diameters	2/3	2/3
Over 4 diameters, but not exceeding 8 diameters	1	5/6
Over 8 diameters to 12 diameters	1-1/6	1



Table 602.17-5: Turn Test Tension

Bolt Diameter (inches)	Grade A325 Tension (kips)	Grade A490 Tension (kips)
1/2	14	17
5/8	22	28
3/4	32	40
7/8	45	56
1	59	74
1-1/8	74	92
1-1/4	94	117
1-3/8	112	139
1-1/2	136	170

Table 602.17-6

Bolt Length (measured in Step 1)	Required Rotation (All Grades)
Up to and including 4 diameters	1/3
Over 4 diameters, but not exceeding 8 diameters	1/2

Table 602.17-7

Bolt Diameter (inches)	Grade A325 Torque (ft-lbs)	Grade A490 Torque (ft-lbs)
1/2	150	180
5/8	290	370
3/4	500	630
7/8	820	1020
1	1,230	1540
1-1/8	1,730	2160
1-1/4	2,450	3050
1-3/8	3,210	3980
1-1/2	4,250	5310

Table 602.17-8

Bolt Length (measured in Step 1)	Additional Required Rotation Grade A325	Additional Required Rotation Grade A490
Up to and including 4 diameters	1/3	¼
Over 4 diameters, but not exceeding 8 diameters	1/2	1/3

Table 602.17-9: DTI Requirements for A325 Bolts

Bolt Diameter (inches)	Verification Tension (kips)	Maximum Verification Refusals	DTI Spaces	Minimum Installation Refusals
½	13	1	4	2
5/8	20	1	4	2
¾	29	2	5	3
7/8	41	2	5	3
1	54	2	6	3
1-1/8	67	2	6	3
1-1/4	85	3	7	4
1-3/8	102	3	7	4
1-1/2	124	3	8	4

Table 602.17-11

Bolt Diameter (inches)	Bolt Tension (kips)	
	AASHTO M 164 Bolts (ASTM A325)	ASTM A490 Bolts
1/2	13	16
5/8	20	25
3/4	29	37
7/8	41	51
1	54	67
1-1/8	67	84
1-1/4	85	107
1-3/8	102	127
1-1/2	124	155

Table 602.17-12

Bolt Diameter (inches)	Number of Spaces	
	Bolts (Grade A325)	Grade A490 Bolts
1/2	4	N/A
5/8	4	N/A
3/4	5	6
7/8	5	6
1	6	7
1-1/8	6	7
1-1/4	7	8
1-3/8	7	8
1-1/2	8	N/A

**Subsection 602.19** (pg. 478), 6-27-16; add the following as the 2<sup>nd</sup> paragraph:

“All welders shall be qualified in accordance with the AASHTO/AWS D1.5, Bridge Welding Code, current edition. Welders shall be certified for each weld process and position which they will be using.”

**Subsection 602.39** (pg.488), 6-27-16; revise the title as follows:

“CONSTRUCTION REQUIREMENTS – ERECTION – REMOVAL”

**Subsection 602.42** (pg.489), 6-27-16; revise as follows:

“All contractors and subcontractors directly engaged in the erection or removal of structural steel, precast prestressed or mild steel reinforced concrete bridge beams or girders over active highway traffic lanes, on any route, railroad or any stream deemed navigable to commercial or pleasure water craft, shall submit an erection or removal plan prepared and stamped by a Professional Engineer licensed in the State of Tennessee. Include the following in these plans: the sequences of erection or removal, the generalized location of all pick points, and the plan to adequately stabilize the structure throughout the erection or removal process. Submit this plan to the Engineer at least 30 days before starting erection. At each stopping point in the erection or removal sequence, have a competent contractor’s representative inspect the beams to ensure adequate stability.

Do not begin any erection or removal work without the Engineer’s approval. The Engineer’s approval does not relieve the Contractor of the responsibility for the safety of its method or equipment or from carrying out the work in accordance with the Plans and Specifications.”

**Subsection 603.01 B** (pg. 499), 12-30-19; **Certification Requirements**; Revise entire subsection:

All contractors or subcontractors involved in field surface preparation or coating application shall be certified according to the Society for Protective Coatings (SSPC) Painting Contractor Certification Program (PCCP) or NACE International Institute Contractor Accreditation Program (NIICAP).

Contractors or subcontractors performing field coating application shall be certified according to SSPC QP1, Field Application or equivalent, including NIICAP AS-1 Field.

Contractors and subcontractors performing field surface preparation of existing structures shall be certified according to SSPC QP2, Field Removal of Hazardous Coatings or equivalent, including NIICAP AS-2 Hazard Waste Removal.

Ensure that all contractors and subcontractors that perform field surface preparation or field coating application are certified to the requirements of SSPC; QP1 or QP2, or NIICAP; AS-1 Field or AS-2 before Contract award, and remain certified for the duration of the Project. If a contractor’s or subcontractor’s certification expires or is suspended, do not allow that contractor to perform any work until the certification is reissued or reinstated. The Department will not consider any requests for time extensions for any delay in the completion of the Project due to an inactive certification and may apply liquidated damages. Provide a copy of the certifications to the Engineer before beginning work and notify the Engineer of all changes in certification status.

**Subsection 603.05 A & B.2** (pg. 499-500), XX-XX-19; **A. New Structures & B. Existing Structures**; Revise 1<sup>st</sup> paragraph subsection A & Revise No. 2 in subsection B:

**A. New Structures**

Prepare all metal surfaces to a condition equivalent to SSPC SP10/NACE 2 (Near White Blast Clean).

**B. Existing Structures**

- 2. **Blast Cleaning.** Use SSPC-SP10/NACE 2 for System A, or as shown on the Plans for Systems B and C. Blast cleaning shall leave a surface profile acceptable to the paint manufacturer.

**Subsection 604.02** (pg. 517-518), 5-15-17; A. General, add Class DS Concrete to the index:

**604.02 Materials**

**A. General**

Provide materials as specified in:

Hydraulic cement <sup>1</sup> .....	<b>901.01</b>
Fine Aggregate, (all Classes of concrete).....	<b>903.01</b>

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Coarse Aggregate  
 For Class A Concrete: Size No. 57 ..... **903.03**  
 For Class D Concrete: Size No. 57 ..... **903.03**  
 For Class DS Concrete: Size No. 57 ..... **903.03**  
 For Class L Concrete..... **903.19**  
 Joint Filler, Preformed Type ..... **905.01**  
 Steel Bar Reinforcement ..... **907.01**  
 Welded Steel Wire Fabric ..... **907.03**  
 Structural Steel..... **908.01**  
 Permanent Steel Bridge Deck Forms ..... **908.03**  
 Steel Castings..... **908.05**  
 Gray Iron Castings ..... **908.07**  
 Bronze Bearing Plates, Plain..... **908.09**  
 Bronze Bearing Plates, Self-Lubricating..... **908.10**

<sup>1</sup>Use Type I, Type IL, or Type IS unless otherwise specified or permitted, or Type I or Type IL cement with either fly ash and/or ground granulated blast furnace slag as a partial cement replacement unless otherwise specified or permitted. When using Type I or Type IL cement with either fly ash and/or ground granulated blast furnace slag as a partial cement replacement, comply with the requirements of **604.03**.

**Subsection 604.02 C.** (pg. 519), 11-6-17; Precast Box Sections, remove mylar reference in second paragraph:

“Submit shop drawings of the proposed precast box section and design calculations for approval before construction. As a minimum, the shop drawings shall include a plan and elevation view of the box culvert showing all precast sections, a typical precast box section showing dimensions and reinforcing, and notes and details required for construction. After obtaining the necessary approval, furnish the Structures Division a reproducible design file. . The Department will pay the Contractor for the precast box based on the price bid for the quantity of the items in the cast-in-place structure it replaces. Manufacture the precast reinforced box sections in accordance with Departmental procedures.”

**Subsection 604.03** (pg. 519-525), 5-13-19; **Classification, Proportioning and Quality Assurance of Concrete:** Combined supplemental specifications from 5-15, 11-15, 12-16, 5-17, 11-17, and 5-18; Replace entire subsection with the following:

**A. Classification and Proportioning and Quality Assurance**

**1a. Design and Production Parameters.** Proportion the concrete based on a pre-determined minimum cement content, and a water-cement ratio that does not exceed the maximum shown in Table 604.03-1. Below this limit, adjust the quantity of water to meet the slump requirements. The fine aggregate shall not exceed 44% by volume calculation of the total aggregate, with the exception of slip formed Class A concrete incorporated into parapets and median barriers.

For slip formed parapet and median barriers exclusively, the percentages of fine and coarse aggregate in an approved concrete mix design may be adjusted plus or minus 2%, such that the maximum percent by volume of fine aggregate does not exceed 46%.

Document mixture adjustments in the field book and daily concrete report. Ensure that the adjusted mix complies with all of the performance criteria specified in Table 604.03-1.

Table 604.03-1: Composition of Various Classes of Concrete

Class of Concrete	Min 28-Day Compressive Strength (psi)	Min Cement Content (pound per cubic yard)	Maximum Water/Cement Ratio (pound/pound)	Air Content % (Design $\pm$ production tolerance)	Slump (inches)
A	3,000	564	0.45	6 $\pm$ 2	3 $\pm$ 1 <sup>(1)</sup>
D, DS <sup>(2,3)</sup>	4,000	620	0.40	7 <sup>(3)</sup>	8 max <sup>(4)</sup>
L <sup>(3,5)</sup>	4,000	620	0.40	7 <sup>(3)</sup>	8 max <sup>(4)</sup>
S (Seal) <sup>(6)</sup>	3,000	682	0.47	6 $\pm$ 2	6 $\pm$ 2
X <sup>(7)</sup>					

<sup>(1)</sup> For slip forming, the slump shall range from 0 to 3 inches.

<sup>(2)</sup> Use Class DS concrete in riding surfaces as described in 903.03 and in accordance to Specification 903.24 requirements. Use Class D concrete in all other bridge decks except box and slab type structures unless otherwise shown on the Plans.

<sup>(3)</sup> Design Class D, Class DS, and Class L concrete at 7% air content. Acceptance range for pumping and other methods of placement is 4.5-7.5%. Sampling will be at the truck chute.

<sup>(4)</sup> Water reducing admixtures are acceptable; however, do not exceed the maximum water/cement ratio in order to achieve the required slump.

<sup>(5)</sup> The unit weight of air dried Class L concrete (lightweight concrete) shall not exceed 115 pounds per cubic foot as determined according to ASTM C567.

<sup>(6)</sup> The use of fly ash as a cement replacement will be allowed in Class S (Seal) concrete.

<sup>(7)</sup> Plan specific requirements.

Include chemical admixtures in the concrete mixture as specified in Table 604.03-2 based on the ambient air temperature and expected weather conditions.

Table 604.03-2: Use of Chemical Admixtures

Class of Concrete	Temperature less than 85 °F and falling	Temperature 85 °F or greater and rising
A	Type A or F	Type D or G or A and B
D, DS	Type A or F	Type A or F and B or G
L	Type F	Type F and B or G
S	Type D or G or A and B	Type D or G or A and B

If using a Type A, F, or G water reducer, then the allowable slump shall be a maximum of 8 inches.

Admixtures to be incorporated into the concrete shall all be from the same manufacturer, shall be compatible, and shall be incorporated into the concrete in accordance with the manufacturer's recommendations.

The fine aggregate in all Class L concrete shall be natural sand meeting **903.01**.

Do not use fine aggregate manufactured from limestone or other polishing aggregates in concrete to be used as a riding surface in traffic lanes.

**1b. Self-Consolidating Concrete (SCC) Design and Production Parameters.**

Proportion the concrete based on a pre-determined minimum cement content, and a water-cement ratio that does not exceed the maximum shown in Table 604.03-4. The fine aggregate shall not exceed 50% by volume calculation of the total aggregate volume. Maximum size of coarse aggregate shall not exceed a No. 67 stone. The Contractor may elect to use SCC as an alternate/option in replacement of Class A concrete.

Document mixture adjustments in the field book and daily concrete report. Ensure that the adjusted mix complies with all of the performance criteria specified in Table 604.03-4.

**Table 604.03-4: Composition of Self-Consolidating Concrete**

Class of Concrete	Min 28-Day Compressive Strength (psi)	Min Cement Content (pound per cubic yard)	Maximum Water/Cement Ratio (pound/pound)	Air Content % (Design $\pm$ production tolerance)	Slump Flow (inches)
SCC (2,3,4,5)	3,000 <sup>(1)</sup>	564	0.45	6 $\pm$ 2	26 $\pm$ 5
SH-SCC (2,3,4,5,6)	4,500	620	0.45	6 $\pm$ 2	26 $\pm$ 5

- (1) Or as shown on the Plans or approved shop drawings.
- (2) Acceptance range for the T50 test in accordance with ASTM C1611 shall be between 2-7 seconds.
- (3) Passing ability in accordance with ASTM C1621 shall be less than 2 inches for acceptance.
- (4) Visual Stability Index (VSI) shall not exceed 1.0 as per ASTM C1611 for acceptance.
- (5) Static segregation as measured by ASTM C 1610 shall not exceed 20%.
- (6) Air Content may be reduced if placed under water or underground if approved by the Engineer

Include chemical admixtures in the self-consolidating concrete mixture as specified in Table 604.03-5 based on the ambient air temperature and expected weather conditions. Approved viscosity modifying admixtures (VMA) may be used as part of the chemical admixtures if they are shown in the approved mixture design.

**Table 604.03-5: Use of Chemical Admixtures**

Class of Concrete	Temperature less than 85 °F and falling	Temperature 85 °F or greater and rising
SCC, SH-SCC	Type A or F Type S (Viscosity Modifying)	Type D or G or A and B Type S (Viscosity Modifying)

Dosage rates for any admixtures incorporated into the concrete shall be stated during the mix design submittal process. All admixtures shall be compatible and from the same manufacturer.

2. **Mix Design Submittal.** Submit the proposed concrete design to the Engineer for approval. Develop the design using saturated surface dry aggregate weights and trial batches meeting the requirements of these Specifications. The concrete design shall be prepared by a TDOT certified Class 3 concrete technician or approved independent testing laboratory under the direction of a registered civil engineer licensed by the State of Tennessee. The concrete plant technician or the civil engineer shall certify that the information contained on the design is correct and is the result of information gained from the trial batches. The concrete design shall produce an average compressive strength to indicate that the specified 28-day strength can be obtained in the field. Make all strength determinations using equipment meeting the requirements of, and in the manner prescribed by, AASHTO T 22. Provide concrete of the design strength specified in all applicable Special Provisions, Plans, and Standard Specifications. Build trial batches for design no more than 90 days before submitting the concrete design. The approved mix design will expire after 6 months if it is not used on a Department funded project and meet the minimum 28-day strength requirements. Assume responsibility for all costs of concrete design, preparation, and submittal.

As a minimum, include the following information in the proposed concrete design submittal:

1. Source of all aggregates
2. Brand and type of cement
3. Source and class of fly ash (if used)
4. Source and grade of ground granulated blast furnace slag (if used)
5. Specific gravity of cement
6. Specific gravity of the fly ash (if used)
7. Specific gravity of the ground granulated blast furnace slag (if used)
8. Admixtures (if used)
9. Gradations of aggregates
10. Specific gravity of aggregates (saturated surface dry)
11. Air content (if air entrainment is used)
12. Percentage of fine aggregate of the total aggregate (by volume)
13. Slump
14. Weight per cubic yard
15. Yield
16. Temperature of plastic concrete
17. Water/cement ratio (pound/pound)
18. 7-day compressive strength (minimum of two 4-inch x 8-inch cylinders)



19. 14-day compressive strength (minimum of two 4-inch x 8-inch cylinders)
20. 28-day compressive strength (minimum of two 4-inch x 8-inch cylinders)
21. Weight of each material required to produce a cubic yard of concrete
22. Water – submit testing results per Tables 921.01-1 & 921.01-2

In addition to the above mentioned items, for self-consolidating concrete include as a minimum the following information in the proposed SCC design submittal:

23. Slump flow, VSI, and T50, in accordance with ASTM C1611, shall be required in place of the slump test.
24. Passing ability in accordance with ASTM C1621.
25. Static segregation in accordance with ASTM C1610.
26. 7-day compressive strength (minimum of two 4-inch x 8-inch cylinders), in accordance with ASTM C1758.
27. 14-day compressive strength (minimum of two 4-inch x 8-inch cylinders), in accordance with ASTM C1758.
28. 28-day compressive strength (minimum of two 4-inch x 8-inch cylinders), in accordance with ASTM C1758.

Self-consolidating concrete (Classes SCC, SH-SCC and P-SCC) shall be verified prior to placement either at the ready mix facility or prestressed plant. The submitted mix design shall be reviewed by Headquarters Materials and Tests for specification compliance. The concrete producer shall then perform a trial batch verification of the submitted mix design in the presence of Regional Materials and Tests. The trial batch will ensure that all batch quantities and target admixture dosage rates are acceptable and meet TDOT specification prior to full mix design approval. If using a previously approved SCC design additional verification of the trial batch is not required. All quantities and identified admixture target dosage rates shall meet the tolerances specified in **501.09**

Instead of the above mix design submittal, an existing design may be submitted for approval provided the design has been used on a state funded project within the last six (6) months. When submitting for the use of an existing mix design, the most current water testing results per 921.01 shall accompany the submittal. The approval of this concrete design submittal will not relieve the Contractor of the responsibility of providing concrete meeting the requirements of these Specifications. A temporary mix design may be issued if the 7-day or 14-day compressive strengths exceed the required 28-day strengths.”

If proposing to use materials or admixtures from sources other than those shown on the approved mix design, submit a written request to the Regional Materials and Tests Engineer explaining the necessity for the change, and include a new mix design developed in accordance with the above provisions. Do not place any concrete until the new design is approved.

- 3. Partial Cement Replacement with Fly Ash or Ground Granulated Blast Furnace Slag.** Do not use concrete with fly ash or ground granulated blast furnace slag as a partial cement replacement in concrete when high early strength is specified.

When choosing to replace a portion of Type I or Type IL cement with fly ash or ground granulated blast furnace slag, ensure that the following requirements will be met before producing any concrete:

1. Store fly ash or ground granulated blast furnace slag in silos separate from each other and separate from the hydraulic cement.
2. Add the fly ash or ground granulated blast furnace slag to the concrete using methods and equipment that are approved by the Engineer and capable of uniformly distributing the materials throughout the mix.
3. The fly ash or ground granulated blast furnace slag may be weighed cumulatively in the weigh hopper with the cement, provided the cement is added first. The temperature of the fly ash or the ground granulated blast furnace slag shall not exceed 160 °F at the time of introduction to the mix.

When designing Portland cement concrete with Type I or Type II cement modified by the addition of fly ash and/or ground granulated blast furnace slag, meet the maximum cement replacement rates (by weight) and minimum substitution ratios (by weight) specified in Table 604.03-3 for the applicable type of modifier.

**Table 604.03-3: Type I or Type II Cement Modified by Fly Ash or Ground Granulated Blast Furnace Slag (GGBFS)**

Modifier	Maximum Cement Replacement Rate % (by weight)	Minimum Modifier Cement Substitution Rates (by weight)
GGBFS (grade 100 or 120)	35.0	1:1
Class "F" Fly Ash	25.0	1:1
Class "C" Fly Ash	25.0	1:1

The Contractor may use ternary cementitious mixtures (mixtures with Portland cement, ground granulated blast furnace slag, and fly ash) for Class A, Class D, and Class DS concrete provided that the minimum Portland cement content is 50%. The maximum amount of fly ash substitution in a ternary cementitious mixture shall be 20%. The Department will allow Type IS cement with ternary cementitious mixtures. When using a Type IS cement, do not use any additional slag as a partial replacement for the hydraulic cement.

## **B. Quality Control and Acceptance of Concrete**

Meet the requirements of **501.03.B**.

In addition, the Department will require an approved concrete design for non-critical items involving small quantities of concrete, but may accept these non-critical items at a reduced testing frequency in accordance with Department Procedures. This requirement applies to sidewalks, curbs and gutters, building foundations, slope paving, ditch paving, guardrail anchorages, small culvert headwalls 30 inches in diameter or less, fence posts, catch basins, manhole bases and inlets, small sign bases, and steel strain pole footings. The Contractor may use pre-approved, pre-packaged concrete mixtures for these applications if the quantity does not exceed 2 cubic yards per day, in which case no design will be required. If the quantity exceeds 2 cubic yards, prior approval must be obtained from the Engineer prior to placement.

Correct batch weights to compensate for surface moisture on the aggregate at the time of use. The Contractor may withhold some of the water from the mix at the plant and add it at the placement site as specified in **604.13**.

The Department will perform all acceptance testing and independent assurance sampling and testing in accordance with **501.03.B**.

### **C. High Early Strength**

When the Plans for structural or pavement repairs, or other type work, require high early strength concrete, the Contractor may use Type I, Type II, or Type III cement. If Type I or Type II cement is used, the minimum cement content shall be 714 pounds per cubic yard. If Type III cement is used, the minimum cement content shall be 620 pounds per cubic yard. The Contractor may substitute high early strength concrete, meeting these requirements, for Class A concrete when approved in writing by the Engineer.

When electing to use high early strength concrete, use the same source and gradation of fine and coarse aggregates as that specified for the concrete being substituted. The Department will not make additional payment if the Contractor decides to substitute high early strength concrete for Class A concrete. The unit price for the class of concrete for which the substitution is made shall be full compensation for the concrete.

#### **Subsection 604.03 A.1a** (pg. 521), 5-13-19; **Design and Production Parameters**; Revise 6<sup>th</sup> paragraph:

Admixtures to be incorporated into the concrete shall be compatible and incorporated into the concrete in accordance with the manufacturer's recommendations. Concrete mixtures utilizing multiple admixture manufacturers shall prove compatibility in accordance with the Department's Standard Operating Procedure 4-4.

#### **Subsection 604.03 A.1.b** (pg. 521), 5-13-19; **Self-Consolidating Concrete (SCC) Design and Production Parameters**; Revise 4<sup>th</sup> paragraph:

Dosage rates for any admixtures incorporated into the concrete shall be stated during the mix design submittal process. All admixtures shall be compatible and incorporated into the concrete in accordance with the manufacturer's recommendations. Concrete mixtures utilizing multiple admixture manufacturers shall prove compatibility in accordance with the Department's Standard Operating Procedure 4-4.

**Subsection 604.03.B** (pg. 524), 12-30-19; **Quality Control and Acceptance of Concrete**; Revise 2<sup>nd</sup> paragraph:

In addition, the Department will require an approved concrete design for minor structures as listed in 604.11 B. non-critical items involving small quantities of concrete including , but may accept these non-critical items at a reduced testing frequency in accordance with Department Procedures. This requirement applies to sidewalks, curbs and gutters, building foundations, slope paving, ditch paving, guardrail anchorages, small culvert headwalls 30 inches in diameter or less, fence posts, catch basins, manhole bases and inlets, small sign bases, and steel strain pole footings. The Contractor may use pre-approved, pre-packaged concrete mixtures listed in QPL 15 for these applications if the quantity does not exceed 2 cubic yards per day, in which case no design will be required. If the quantity exceeds 2 cubic yards, prior approval must be obtained from the Engineer prior to placement. All pre-packaged concrete mixtures are required to be mixed in a mechanical concrete mixing machine and in accordance with manufacturer's recommendations.

**Subsection 604.03 A.2** (pg. 521-523), 5-13-19; **Mix Design Submittal**; Revise 1<sup>st</sup> and 3<sup>rd</sup> paragraphs:

Submit the proposed concrete design to the Engineer for approval. Develop the design using saturated surface dry aggregate weights and trial batches meeting the requirements of these Specifications. The concrete design shall be prepared by a TDOT Certified Concrete Mix Design Technician-or approved independent testing laboratory under the direction of a registered civil engineer licensed by the State of Tennessee. The TDOT Certified Concrete Mix Design Technician or the civil engineer shall certify that the information contained on the design is correct and is the result of information gained from the trial batches. The concrete design shall produce an average compressive strength to indicate that the specified 28-day strength can be obtained in the field. Make all strength determinations using equipment meeting the requirements of, and in the manner prescribed by, AASHTO T 22. Provide concrete of the design strength specified in all applicable Special Provisions, Plans, and Standard Specifications. Build trial batches for design no more than 90 days before submitting the concrete design. The approved mix design will expire at the end of each calendar year or if it does not meet the minimum 28-day strength requirements. Assume responsibility for all costs of concrete design, preparation, and submittal.

Instead of the above mix design submittal, an existing design may be submitted for approval provided the design has been approved by the Department within the current calendar year. When submitting for the use of an existing design, the most current water testing results per 921.01 shall accompany the submittal. The approval of this concrete design submittal will not relieve the Contractor of the responsibility of providing concrete meeting the requirements of these Specifications. A temporary mix design may be issued if the 7-day or 14-day compressive strengths exceed the required 28-day strengths.

**Subsection 604.04** (pg. 525-527). 5-14-18; Remove the last 3 paragraphs from page 527 and insert the paragraphs as the 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> paragraph of the subsection:

#### **“604.04 Equipment**

Obtain the Engineer's approval as to the design, capacity, and mechanical condition of equipment and tools used to handle materials and perform the work. Have the equipment on the jobsite sufficiently ahead of the start of construction operations to be examined and approved by the Engineer. Use

equipment and construction processes that have sufficient capacity to accomplish the maximum continuous concrete placement, as governed by the construction joints shown on the Plans or as directed by the Engineer.

Meet the requirements for batching plants specified in **501.04.A**, except that when approved by the Engineer, the requirement for storage compartments in addition to weigh bins for fine and coarse aggregates may be waived, provided the batching tolerances specified in **501.09** are maintained.

Meet the requirements for mixers specified in **501.04.B**, except that the requirement for the boom-and-bucket attachment to the mixer will be waived.

Provide ample and satisfactory equipment for conveying concrete from the mixer to final position in the forms. Use closed chutes or pipes when concrete is to be dumped or dropped for a distance greater than 5 feet. Where steep slopes are required, equip the chutes with baffle boards, or use chutes in short lengths that will allow the direction of movement to be reversed.

Use vibrators of an approved type and design, and operate them under load at the rate recommended by the manufacturer and approved by the Engineer.

When placing concrete by pumping, do not use aluminum conduit.

Do not pour any concrete for bridge decks or slabs above grade before verifying the availability and operability of all necessary equipment, including finishing machines, continuous water source or portable tanks, water distribution equipment, two work bridges, vibrators, sprayers, a 12-foot straightedge, and appropriate backup items.

Provide at every concrete deck pour a portable, cold fogger capable of changing humidity and cooling air above fresh concrete. The fogger shall be designed to provide a maximum VMD (volume mean diameter) of 15 microns, and a throw distance of 60 feet.

The Contractor may mix concrete for minor structures, as identified in **604.11.B**, in a mobile volumetric continuous mixing plant.

Use a mobile mixing plant that is:

1. Designed to accurately batch aggregates and cement by volume based on weight.
2. Equipped to perform mixing by a continuous auger and/or paddles.
3. Capable of producing a uniform concrete mix meeting all requirements of the Specifications.
4. Capable of carrying in separate compartments all the necessary ingredients needed for the concrete mix.
5. Equipped with calibrated proportional devices for each material.
6. Equipped with proportioning controls that they may be set and secured for different materials and mixes.

7. Equipped with separate bins and gate openings for each type of material, including a watertight storage bin for cement. Cover the aggregate bins with tarpaulins or by other approved methods when required.

Ensure that a metal plate identifying the discharge speed and weight-calibrated constant of the machine is attached to each unit.

Make adequate standard volume measures, scales, and weights available for checking the accuracy of the proportioning mechanism.

Furnish a calibrated chart for the individual unit when required by the Engineer.

In the Engineer's presence, the producer or factory representative shall perform the calibration and gate settings according to the manufacturer's recommendations for the design to be used.

Provide a satisfactory method of setting the dosage for admixtures. If using admixtures other than air-entraining agents, add them in the manner and in the dosage recommended by the manufacturer.

**Subsection 604.04** (pg. 525-527); 5-13-19; **Equipment**; Remove 5<sup>th</sup>-11th paragraphs, Add subsection A. title, and add subsection B:

#### **A. General**

Obtain the Engineer's approval as to the design, capacity, and mechanical condition of equipment and tools used to handle materials and perform the work. Have the equipment on the jobsite sufficiently ahead of the start of construction operations to be examined and approved by the Engineer. Use equipment and construction processes that have sufficient capacity to accomplish the maximum continuous concrete placement, as governed by the construction joints shown on the Plans or as directed by the Engineer.

Meet the requirements for batching plants specified in 501.04.A, except that when approved by the Engineer, the requirement for storage compartments in addition to weigh bins for fine and coarse aggregates may be waived, provided the batching tolerances specified in 501.09 are maintained.

Meet the requirements for mixers specified in 501.04.B, except that the requirement for the boom-and-bucket attachment to the mixer will be waived.

Provide ample and satisfactory equipment for conveying concrete from the mixer to final position in the forms. Use closed chutes or pipes when concrete is to be dumped or dropped for a distance greater than 5 feet. Where steep slopes are required, equip the chutes with baffle boards, or use chutes in short lengths that will allow the direction of movement to be reversed.

Use vibrators of an approved type and design, and operate them under load at the rate recommended by the manufacturer and approved by the Engineer.

When placing concrete by pumping, do not use aluminum conduit.

Do not pour any concrete for bridge decks or slabs above grade before verifying the availability and operability of all necessary equipment, including finishing machines, continuous water source

or portable tanks, water distribution equipment, two work bridges, vibrators, sprayers, a 12-foot straightedge, and appropriate backup items.

Provide at every concrete deck pour a portable, cold fogger capable of changing humidity and cooling air above fresh concrete. The fogger shall be designed to provide a maximum VMD (volume mean diameter) of 15 microns, and a throw distance of 60 feet.

## **B. Volumetric Continuous Mixers**

Produce concrete specified in Table 604.03-1 in accordance with Section 604.03, in a volumetric continuous mixing plant provided that the manufacturer's equipment meets the tolerance requirements of Section 501.09. Use a volumetric continuous mixing plant that conforms to the following:

1. The unit shall be equipped with:
  - a) Calibrated proportioning devices for each ingredient added to the concrete mix and perform mixing by a continuous auger and/or paddles.
  - b) Equipped with proportioning controls that may be set and secured for different materials and mixes.
  - c) A working recording meter that is visible at all times and furnishes a ticket printout with the calibrated measurement of the mix being produced.
  - d) Separate bins and gate openings for each type of material, including a watertight storage bin for cement. Cover the aggregate bins with tarpaulins or by other approved methods when required.
2. The unit shall have a stamped plate from the Volumetric Mixer Manufacturers Bureau (VMMB) stating the equipment conforms to ASTM C685. The plate shall be attached in a prominent place and have the following plainly marked: the gross volume of the transportation unit in terms of mixed concrete, the discharge speed, and the mass calibrated constant of the machine in terms of volume.
3. The calibration will be performed in the presence of the Engineer by a Volumetric Mixer Operator certified by VMMB and holds a TDOT Concrete Mix Design Technician Certification. Perform the calibration of gate settings according to the manufacturer's recommendations for the mix design to be used. Inspections and calibrations shall be performed at a minimum of every 6 months, every 2500 cubic yards, or when a new mix design is to be used. The yield shall be maintained within a tolerance of  $\pm 1$  percent and verified using a minimum 2 cubic feet container every 500 cubic yards or a minimum of once per week.
4. The volumetric mixing plant shall be operated by a Volumetric Mixer Operator certified by VMMB and holds a TDOT Concrete Plant Quality Control Technician Certification. Any equipment adjustment that would cause any deviation from the approved concrete mix design shall not be made during the on-site production of concrete.

If the mixer fails to discharge a uniform mix at any time, production of concrete shall halt until any problems are corrected.

Each load of concrete produced by a volumetric continuous mixing plant shall be accompanied by a Concrete Delivery Ticket. The ticket shall include as a minimum the following:

- a. Date
- b. Contract number
- c. County
- d. Class of concrete
- e. Concrete design number
- f. Number of cubic yards
- g. Load number
- h. Truck number
- i. Maximum water allowed by design
- j. Total water added
- k. Time loaded
- l. Time discharged
- m. Signature of producer's TDOT Certified Concrete Plant Quality Control Technician.

The form shall be delivered to the Inspector at the site of the work. Loads that do not carry such information or do not arrive in satisfactory condition shall not be used.

**Subsection 604.04 B** (pg. 525-527), 12-30-19; **Volumetric Continuous Mixers**; Revise No. 3 & 4, add No. 5, add paragraph after No 5, revise delivery ticket list k, l, m, & add n:

A. Volumetric Continuous Mixers

....

- 3. ~~The volumetric mixing plant shall be operated and calibrated by a Volumetric Mixer Operator certified by VMMB and holds a TDOT Concrete Field Testing Technician Certification or equivalent. In the presence of the Engineer, perform the calibration of gate settings according to the manufacturer's recommendations for the mix design to be used before starting work. The calibration procedure shall account for the moisture content of the aggregates. The yield shall be maintained within a tolerance of ±1% and verified using a minimum 2 cubic feet container every 500 cubic yards or a minimum of once per week. ~~The calibration will be performed in the presence of the Engineer by a Volumetric Mixer Operator certified by VMMB and holds a TDOT Concrete Mix Design Technician Certification. Perform the calibration of gate settings according to the manufacturer's recommendations for the mix design to be used. Inspections and Recalibrations shall be necessary when indicated by the yield checks, performed at a minimum of every 6 months, every 2500 cubic yards, or at any time the Engineer deems necessary to ensure proper proportioning of the materials. when a new mix design is to be used. ~~The yield shall be~~~~~~



~~maintained within a tolerance of  $\pm 1$  percent and verified using a minimum 2 cubic feet container every 500 cubic yards or a minimum of once per week.~~

4. ~~Tests for aggregate moisture contents and gradations shall be performed by someone who holds a TDOT Concrete Plant quality Control Technician Certification or a TDOT Aggregate Technician Certification. The volumetric mixing plant shall be operated by a Volumetric Mixer Operator certified by VMMB and holds a TDOT Concrete Plant Quality Control Technician Certification. Any equipment adjustment that would cause any deviation from the approved concrete mix design shall not be made during the on-site production of concrete.~~
5. A TDOT Concrete Mix Design Technician or a registered Professional Engineer licensed by the State of Tennessee shall submit the Department in writing a concrete design in accordance with SOP 4-4.

If the mixer fails to discharge a uniform mix at any time, production of concrete shall halt until any problems are corrected.

Each load of concrete produced by a volumetric continuous mixing plant shall be accompanied by a Concrete Delivery Ticket. The ticket shall include as a minimum the following:

- a. Date
- b. Contract number
- c. County
- d. Class of concrete
- e. Concrete design number
- f. Number of cubic yards
- g. Load number
- h. Truck number
- i. Maximum water allowed by design
- j. Total water added
- k. ~~Time loaded~~ Water-cementitious materials ratio
- l. Time ~~loaded~~ discharged
- m. ~~Signature of producer's TDOT Certified Concrete Plant Quality Control Technician.~~ Time discharged
- n. Signature of producer's VMMB Certified Volumetric Mixer Operator

**Subsection 604.11 A & B** (pg. 539,540), 12-30-19; **Major Structures & Minor Structures**; Revise 2<sup>nd</sup> paragraph of A & Revise paragraph of B:

**A. Major Structures**

.....

When using lightweight aggregates, uniformly pre-saturate the aggregates ~~by sprinkling~~ and allow to drain. At time of use, ensure that the aggregates are in a saturated surface dry condition to minimize water absorption.

**B. Minor Structures**

~~For the following items of construction, the Contractor may substitute a mobile volumetric continuous mixing concrete plant, meeting the requirements of **604.04**, for the method specified in **501.09**.~~

The following are considered minor structures. See each Section for additional details:

- 611** Manholes, catchbasins, inlets, and pipe end walls
- 701** Cement concrete sidewalks, driveways and median pavement
- 702** Cement concrete curb, gutter, and combined curb and gutter
- 703** Cement concrete ditch paving
- 705** Guard rail
- 707** Fences
- 709** Rip-rap slope paving
- 713** Highway signing
- 714** Roadway and structure lighting

**Subsection 604.13** (pg. 541), 5-15-17; Mixing Concrete, add Class DS concrete to the 2<sup>nd</sup> paragraph, 3<sup>rd</sup> sentence:

- D.** “Do not retemper concrete by adding water or by other means. However, the Contractor may withhold a portion of the mixing water or chemical admixtures from transit mixers and add at the work site if all requirements of the approved mix design are met. Water added at the placement site for Class A, Class D, Class DS and Class L concrete shall not exceed 1 gallon per cubic yard. The total amount of water in the mix shall not exceed the maximum in the approved mix design. To achieve additional slump, use a water reducing admixture. If water, air entrainers, or chemical admixtures are added at the placement site, mix the concrete a minimum of 30 revolutions at mixing speed after making the additions. Do not use concrete that is not within the specified slump limits, air content limits, temperature limits, or time limits at the time of placement.”

**Subsection 604.13** (pg. 541), 5-14-18; Mixing Concrete, revise the 2<sup>nd</sup> and 3<sup>rd</sup> sentence of the 2<sup>nd</sup> paragraph:

“Do not retemper concrete by adding water or by other means. However, the Contractor may withhold a portion of the mixing water or chemical admixtures from transit mixers and add at the work site if all requirements of the approved mix design are met, provided the delivery ticket indicates the amount of water withheld. The total amount of water in the mix shall not exceed the

maximum in the approved mix design. To achieve additional slump, use a water reducing admixture. If water, air entrainers, or chemical admixtures are added at the placement site, mix the concrete a minimum of 30 revolutions at mixing speed after making the additions. Do not use concrete that is not within the specified slump limits, air content limits, temperature limits, or time limits at the time of placement.”

**Subsection 604.13** (pg. 541-542), 12-30-19; **Quality Control and Acceptance of Concrete**; Remove 4<sup>th</sup> & 5<sup>th</sup> paragraph:

~~When concrete placed in the items of construction specified in 604.11.B does not exceed 25 cubic yards per week, the Engineer may accept it on the basis of field testing for air, slump, and occasional strength tests with only random plant inspections as deemed necessary by the Engineer for control.~~

~~When the Engineer uses this basis of acceptance, the ready mix plant furnishing the concrete shall have been inspected and approved for use as specified in 604.04. In addition, ensure that the delivery ticket accompanying each load of concrete shows the class of concrete, the quantity of cement, aggregates, water, and additives used in the batch, and the time of batching. Ensure that the materials used in the concrete are tested and approved.~~

**Subsection 604.14** (pg. 542), 11-16-15; Consistency of Concrete, modify the following:

“The slump of the concrete when measured according to AASHTO T 119 shall meet 604.03 - **1A**. The slump flow of self-consolidating concrete when measured according to ASTM C1611 shall meet **604.03 1B**.”

**Subsection 604.15** (pg. 542-543), 11-16-15; B. Concrete Acceptance Cylinders, modify the following:

“The Department will test the specimens for compressive strength according to AASHTO T 22. Provide the necessary concrete for making test specimens and adequate curing and storage facilities at no additional cost to the Department.

Concrete cylinders submitted for testing beyond 28 days shall comply with the strength requirements specified in Table 604.15-1.

**Table 604.15-1: Strength Requirements**

Class of Concrete	Compressive Strength (psi) at:		
	Less than 31 days	31 to 42 days	43 days to 56 days
A, S, CP, SCC	3,000	3,300	3,500
D, L	4,000	4,400	4,600
X	Plans Requirement (Req)	Req. + Req. * (10%)	Req. + Req. * (15%)

If the acceptance cylinders fail to meet the specified strengths, the Contractor may drill core samples from the hardened concrete as verification of concrete strength instead of using the concrete cylinders. The Contractor must provide QC data from companion cylinders that meet or exceed the required strength, and TDOT Materials and Test shall perform a nondestructive test using a Swiss Hammer on the concrete to prove required strength is achieved. If the above mentioned requirements are met, the Contractor may then elect to drill a maximum of three core samples per set of cylinders from the hardened concrete. The Contractor shall obtain the cores in accordance with the Department's Standard Operating Procedure 4-2, and bear all costs of obtaining the cores and repairing the core holes."

**Subsection 604.15** (pg. 543), 5-15-17; Table 604.15-1: Strength Requirements, Add Class DS to Table, update 2<sup>nd</sup> paragraph 3<sup>rd</sup> sentence to remove "cylinders and":

**Table 604.15-1: Strength Requirements**

Class of Concrete	Compressive Strength (psi) at:		
	Less than 31 days	31 to 42 days	43 days to 56 days
A, S, CP, SCC	3,000	3,300	3,500
D, DS, L	4,000	4,400	4,600
SH-SCC	4,500	4,950	5,175
X	Plans Requirement (Req)	Req. + Req. * (10%)	Req. + Req. * (15%)

If the acceptance cylinders fail to meet the specified strengths, the Contractor may drill core samples from the hardened concrete as verification of concrete strength instead of using the concrete cylinders. The Contractor must provide QC data from companion cylinders that meet or exceed the required strength, and TDOT Materials and Test shall perform a nondestructive test using a Swiss Hammer on the concrete to prove required strength is achieved. If the above mentioned requirements are met, the Contractor may then elect to drill a maximum of three core samples per set of cylinders from the hardened concrete. The Contractor shall obtain the cores in accordance with the Department's Standard Operating Procedure 4-2, and bear all costs of obtaining the cores and repairing the core holes.

Acceptance for payment may be based on cores provided by the Contractor at its expense. These cores shall meet the strength requirements specified in Table 604.15-1. The Engineer will not accept concrete cores submitted for testing beyond 56 days.

**Subsection 604.15** (pg. 542-544) 5-14-18, Compressive Strength Tests of Concrete; revise the last sentence of A. and add subsection 604.15.C.:

**“604.15 Compressive Strength Tests of Concrete**

**A. General**

The Engineer will determine concrete strength by tests performed during the progress of the work, and will use these tests to determine the strength of the concrete for acceptance and pay purposes. The frequency of testing will be as specified in the sampling and testing schedule of the Department’s Standard Operating Procedures.

The frequency of testing for compressive strength to determine when forms may be removed, or when a structure may be put into service, shall be as requested by the Contractor or as deemed necessary by the Engineer in accordance with 604.15.C.

**B. Concrete Acceptance Cylinders**

The Department will test the specimens for compressive strength according to AASHTO T 22. Provide the necessary concrete for making test specimens and adequate curing and storage facilities at no additional charge to the Department.

Concrete cylinders submitted for testing beyond 28 days shall comply with the strength requirements specified in Table 604.15-1.

**Table 604.15-1: Strength Requirements**

Class of Concrete	Compressive Strength (psi) at:		
	Less than 31 days	31 to 42 days	43 days to 56 days
A, S, CP, SCC	3,000	3,300	3,500
D, DS, L	4,000	4,400	4,600
SH-SCC	4,500	4,950	5,175
X	Plans Requirement (Req)	Req. + Req. * (10%)	Req. + Req. * (15%)

If the acceptance cylinders fail to meet the specified strengths, the Contractor may drill core samples from the hardened concrete as verification of concrete strength instead of using concrete cylinders. The Contractor must provide QC data from companion cylinders that meet or exceed the required strength, and TDOT Materials and Tests shall perform a nondestructive test using a Swiss Hammer on the concrete to prove required strength is achieved. If the above mentioned requirements are met, the Contractor may then elect to drill a maximum of three core samples per

set of cylinders from the hardened concrete. The Contractor shall obtain the cores in accordance with the Department's Standard Operating Procedure 4-2, and bear all costs of obtaining the cores and repairing the core holes.

Acceptance for payment may be based on cores provided by the Contractor at its expense. These cores shall meet the strength requirements specified in Table 604.15-1. The Engineer will not accept concrete cylinders and cores submitted for testing beyond 56 days.

The average compressive strength of the two cores taken to represent the low test cylinders will be considered to be the acceptance strength of the in-place concrete, provided that the cores are obtained and tested within 56 days after concrete placement. In accordance with 603.31, the Engineer will accept at a reduced pay concrete that meets the required strengths specified in 604.03 for the respective class, but fails to meet the requirements in Table 604.15-1.

All concrete used shall undergo acceptance testing. The Department will determine the method to formally accept in-place concrete that is represented by acceptance cylinders that have been lost, damaged, or destroyed. These methods may include coring or non-destructive testing.

### C. Early Break Cylinders

Make and cure all test specimens according to AASHTO T 23, and the applicable procedures therein defined for *Field Cured Specimens*, unless otherwise specified by the Engineer. The Department will test the specimens for compressive strength according to AASHTO T 22. Provide the necessary concrete for making test specimens at no additional charge to the Department.

Field Cured Specimens, as defined in AASHTO T 23, shall be cured in accordance with AASHTO T23- *Section 10.2. - Field Curing*. Cylinders shall be representative of the concrete placed and shall be cured in the same manner and method as the placed concrete. Specimens shall be protected from the elements in the same manner as the formed work. If specimens are to be used for determining when a structure is capable of being put into service the specimens should be removed from the molds at the time of removal of the form work.

### Subsection 604.15 B (pg. 543-544), 12-30-19; Concrete Acceptance Cylinders; Revise 3<sup>rd</sup> paragraph:

If the acceptance cylinders fail to meet the specified strengths, the Contractor may drill core samples from the hardened concrete as verification of concrete strength instead of using the concrete cylinders. The Contractor must provide QC data from companion cylinders that meet or exceed the required strength, and TDOT Materials and Test shall perform a nondestructive test using a Swiss Hammer on the concrete to prove required strength is achieved. Companion cylinders shall be made out of the same sample as the acceptance cylinders. If the above mentioned requirements are met, the Contractor may then elect to drill a maximum of three core samples per set of cylinders from the hardened concrete. The Contractor shall obtain the cores in accordance with the Department's Standard Operating Procedure 4-2, and bear all costs of obtaining the cores and repairing the core holes.

**Subsection 604.16** (pg. 545) 5-15-17; Placing Concrete, A. General – revise the 1<sup>st</sup> paragraph to add Class DS in the first sentence:

“Unless otherwise specified, before placing a bridge deck overlay of Class D , Class DS, or Class L concrete, machine scarify the surface to be covered to a minimum depth of 1 inch. In areas inaccessible to machine scarifying, and in areas of spalling where steel reinforcement is exposed, remove deteriorated concrete using hand tools or other methods approved by the Engineer. After scarifying, clean the deck of all deleterious material. Do not allow traffic on the scarified deck.”

**Subsection 604.19** (pg. 551-552), 5-14-18; Removal of Forms and Falsework, Revise the 3<sup>rd</sup> paragraph and 1. to incorporate references to subsection 604.15:

“The Contractor may release and remove falsework and supports under concrete structures when the following conditions are met:

1. Representative specimens of the concrete, made and cured in accordance with 604.15.C, attain a compressive strength of 3000 pounds per square inch.”

**Subsection 604.23 B** (pg. 559), 5-13-19; **Water Method**; Revise 1<sup>st</sup> paragraph:

As soon as possible after applying curing compound to bridge decks and to other top slabs located above subgrade elevation, apply either a combination of damp burlap and white polyethylene sheeting or a white, co-polymer coated, absorbent, non-woven synthetic fabric, from a work bridge, taking care not to mar the surface of the deck. The sheeting material shall meet the performance requirements of ASTM C171. Immediately cover all other concrete slabs with materials suitable for use with the water cure. After placing the protective cover, immediately apply a mist spray and keep the cover thoroughly wet with a continuously fed soaker hose system for 120 hours.

**Subsection 604.27** (pg. 560), 11-16-15; Rideability of New or Resurfaced Bridge Decks and Roadway Approaches, A. General, revise the 1<sup>st</sup> paragraph to the following:

“On all highway sections with a posted speed greater than 40 miles per hour, the following rideability provisions shall apply to new or resurfaced bridge decks and roadway approaches.”

**Subsection 604.31** (pg. 567-568) 5-15-17; Basis of Payment, add Class DS to item and pay unit list:

#### **604.31 Basis of Payment**

The Department will pay for accepted quantities at the contract prices as follows:

<i>Item</i>	<i>Pay Unit</i>
Class A Concrete (Description)	Cubic Yard
Class D Concrete (Description)	Cubic Yard
Class DS Concrete (Description)	Cubic Yard
Class L Concrete (Description)	Cubic Yard
Class S Concrete (Description)	Cubic Yard
Steel Bar Reinforcement	Pound
Epoxy Coated Reinforcing	Pound
Scarifying	Square Yard
Applied Texture Finish	Square Yard
Hydro-demolition	Square Yard

**Subsection 606.04.B.1(b)** (pg. 578), 6-27-16; replace 1.b. with the following:

“(b) Except as provided in paragraph 2(b) below, develop an energy per blow in foot-pounds not less than 250 multiplied by R, where R is the required minimum bearing resistance of the pile in tons.”

**Subsection 606.07.A.** (pg. 581), 6-27-16; revise the 1<sup>st</sup> paragraph:

“Construct cast-in-place concrete piles of the design shown on the Plans and that consist of concrete cast in drilled holes or in steel shells or pipes driven to the required bearing. Use Class A concrete meeting **604**, or use Class X concrete, as required by design, meeting **604**. Provide and place suitable casing when required to prevent caving of the hole before concrete is placed.

**Subsection 607.02 A** (pg. 597), 12-30-19; **Materials;** Add to Materials list:

- Polypropylene (PP) Pipe.....914.12
- Steel Reinforced Thermoplastic Ribbed Pipe (SRTRP)...914.13

**Subsection 607.02 B. 1 & 2** (pg. 597-598), X-XX-19; **Materials;** Add to Materials list:

- 1. Pipe Diameters from 18 through 60 inches.** Provide materials meeting one of the following:
  1. Class III, IV, or V concrete pipe meeting either **914.02** or AASHTO M 86.
  2. Metal pipe meeting **915.02**.
  3. HDPE pipe meeting **914.10**.
  4. PVC pipe meeting **914.09**.
  5. **PP pipe meeting 914.12.**
  
- 2. Pipe Diameters Larger than 36 inches through 48 inches.** Provide materials meeting one of the following:
  1. Class III, IV, or V concrete pipe meeting **914.02**.



- 2. Metal pipe meeting **915.02**.
- 3. HDPE pipe meeting **914.10**.
- 4. **PP pipe meeting 914.12.**

**Subsection 607.02 D. 1 & 2** (pg. 599), 12-30-19; **Materials**; Add to Materials list:

- 1. **Pipe Diameters 15 through 36 inches.** Provide materials meeting one of the following:
  - 1. Class III, IV, or V concrete pipe meeting either **914.02** or AASHTO M 86.
  - 2. HDPE pipe meeting **914.10**.
  - 3. PVC pipe meeting **914.09**.
  - 4. **PP pipe meeting 914.12.**
  - 5. **SRTRP meeting 914.13.**
- 2. **Pipe Diameters Larger than 36 through 48 inches.** Provide materials meeting one of the following:
  - 1. Class III, IV, or V concrete pipe meeting **914.02**.
  - 2. HDPE pipe meeting **914.10**.
  - 3. **PP pipe meeting 914.12.**

**Subsection 607.07** (pg. 601), 12-30-19; **Materials**; Revise 6<sup>th</sup> paragraph:

HDPE, **PP**, **SRTRP**, and PVC pipe shall meet the performance requirement for soil-tightness, unless water-tightness is specified. Install joints so that the connection of pipe sections, for a continuous line, will be free from irregularities in the flow line.

**Subsection 611.02** (pg. 620), 11-6-17; **Materials**, revise the last sentence of the last paragraph to remove the mylar reference:

“After obtaining the necessary approval, furnish the Engineer an electronic reproducible design file..”

**Subsection 613.02** (pg. 633), 6-27-16; add the following section:

“Brick Paving Units .....912.05”

**Subsection 615.09** (pg. 644), 10-8-18; Table 615.09-1: Class P Concrete, Revise Table and footnote (4):  
**Table 615.09-1: Class P Concrete, Revise Table 615.09-1 and footnote (3).**

**Table 615.09-1: Class P Concrete**

Class of Concrete	Min 28-Day Compressive Strength (psi)	Min Cement Content (pound per cubic yard)	Maximum Water/Cement Ratio (pound/pound)	Air Content % (Design $\pm$ production tolerance)	Slump or Slump Flow (inches)
P	5,000 <sup>(1)</sup>	658	0.45	0-8 <sup>(2)</sup>	2 $\pm$ 1 <sup>(3)</sup>
P-SCC <sup>(4)</sup>	5,000 <sup>(1)</sup>	658	0.45	0-6 <sup>(2)</sup>	26 $\pm$ 5

(1) Or as shown on the Plans or approved shop drawings.

(2) Air entraining is optional with the Contractor, unless otherwise shown on the Plans or shop drawings.

(3) Not to exceed 3 inches before the addition of high range admixtures, and not to exceed 10 inches after the addition of high range admixtures. If water-cement ratio is equal to or less than 0.35 then the maximum slump is 10 inches. If the water-cement ratio is 0.36 – 0.45, the maximum slump is 8 inches.

(4) Maximum coarse aggregate size of a No. 67 stone.

**Subsection 615.09** (pg. 644), 11-16-15; Proportioning and Mixing of Concrete, update Table 615.09-1 and add the 3<sup>rd</sup> paragraph below the table, modify the last paragraph:

**Table 615.09-1: Composition of Prestress Concrete Classes**

Class of Concrete	Minimum 28-Day Compressive Strength (psi)	Minimum Pounds Cement per Cubic Yard	Maximum Water/Cement Ratio (pound/pound)	Air Content %	Slump or Slump Flow (inches)
P	5,000 <sup>(1)</sup>	658	0.45	0-8 <sup>(2)</sup>	2 $\pm$ 1 <sup>(3)</sup>
P-SCC <sup>(4)</sup>	5,000 <sup>(1)</sup>	658	0.45	0-6 <sup>(2)</sup>	25 $\pm$ 4

(1) Or as shown on the Plans or approved shop drawings.

(2) Air entraining is optional with the Contractor, unless otherwise shown on the Plans or shop drawings.

(3) Not to exceed 3 inches before the addition of high range admixtures, and not to exceed 10 inches after the addition of high range admixtures. If water-cement ratio is equal to or less than 0.35 then the maximum slump is 10 inches. If the water-cement ratio is 0.36 – 0.45, the maximum slump is 8 inches.

(4) Maximum coarse aggregate size of a No. 67 stone.

Comply with all applicable provisions of **604.03** except as modified herein.

Submit a concrete design to the Department for review and approval. In addition to the proportions, identify in the design submittal the source or brand of all materials and the type of cement to be used. The Contractor may use Type I or Type III cement, unless otherwise specified. Do not use calcium chloride. Use a retardant admixture when the ambient temperature is 75 °F or higher. The slump of the concrete shall be 2 inches with a tolerance of  $\pm 1$  inch at the time of placement. When an approved superplasticizer is to be used, the slump of the concrete shall be the same as above before the superplasticizer is added to the mix. After the addition of the superplasticizer, the slump may be increased to a maximum of 8 inches at the time of placement.

The slump flow of self-consolidating concrete shall be determined and within the design and production tolerances stated in **Table 615.09-1**. Include chemical admixtures in the self-consolidating concrete mixture as specified in **Table 604.03-5** based on the ambient air temperature and expected weather conditions. Approved viscosity modifying admixtures (VMA) may be used as part of the chemical admixtures if they are shown in the approved mixture design.

Handle, measure, and batch materials; mix concrete; and comply with the limitations of mixing as specified in **501.09**, **501.10**, and **501.11**, respectively.

Make concrete test specimens for Class P and Class P-SCC, in accordance with AASHTO T 23 and ASTM C1758 respectively, to determine the adequacy of the concrete design and the minimum time at which the stress may be applied to the concrete. Cure the test specimens used to determine the time at which stress may be applied in the same manner and under the same conditions as the bridge members. The initial curing of specimens to determine the design strength of the concrete shall be as specified above with additional curing water, as provided in AASHTO...

**Subsection 615.17** (pg. 652), 5-18-15; Table 615.17-1: Manufacturing Tolerances in Standard Sections, Update Table 615.17-1:

**Table 615.17-1: Manufacturing Tolerances in Standard Sections**

Description	Tolerance	
	I-Sections	Box Sections
Nominal Depth	± 1/2 inch	± 1/2 inch
Nominal Width	± 1/2 inch	± 1/2 inch
Nominal Length	Computed Elastic Shortening ±1/2 inch	Computed Elastic Shortening ±1/2 inch
Variation in Straightness, inches	1/4 inch x (Total Length in feet)/10	1/4 inch x (Total Length in feet)/10
Variation in Camber, inches	Beams in any 1 span not more than: 1/8 inch x (Total Length in feet )/10	Beams in any 1 span not more than: 1/8 inch x (Total Length in feet )/10
Location of Voids	-----	Length ± 1/2 in Wall Thickness ± 1/2 in
Bearing	Full Bearing - Full Width of Beam	Full Bearing on at Least 2/3 of Width of Beam
Tendon Placement	± 1/2 inch	± 1/2 inch
Reinforcing Steel Placement	± 1/2 inch	± 1/2 inch
Reinforcing Steel Concrete Cover	± 1/2 inch	± 1/2 inch
Reinforcing Steel Splice Lengths	Minus 1-1/2 inches	Minus 1-1/2 inches

**Subsection 619.03** (pg. 671,672), 12-30-19; **Proportioning**; Revise Table 619.03-02 Polymer Modified Concrete-Required Properties & Revise last paragraph:

**Table 619.03-2: Polymer Modified Concrete - Required Properties**

Property	Value
Slump (measured 4 to 5 minutes after discharge from a continuous mixer)	4 to 6 inches
Air Content	0 to 8 %
Water-Cement Ratio	Not more than 0.40 considering all the non-solids as part of the water
<b>Compressive Strength</b>	<b>As specified in plans</b>

The polymer admixture shall contain a minimum of 46% solids. ~~Submit to the Department in writing a-A concrete mix design is required for identifying constituent materials, the name and location of aggregate suppliers, and the type and brand of the cement and polymer proposed for use.~~ Do not place any concrete before obtaining the Department's approval of the design. Do not change materials without the Engineer's written approval.

**Subsection 619.04 A** (pg. 672-673), **EFFECTIVE 01-01-21; Mixer**; Revise entire subsection:

**A. Volumetric Continuous Mixers**

Produce PMC overlay in a volumetric continuous mixing plant provided that the manufacturer's equipment meets the tolerance requirements of Section 501.09. Use a volumetric continuous mixing plant that conforms to the following:

5. The unit shall be equipped with:
  - e) Calibrated proportioning devices for each material added to the concrete mix and perform mixing by a continuous auger and/or paddles.
  - f) Proportioning controls that may be set and secured for different materials and mixes.
  - g) Recording meter that is visible at all times and furnishes a ticket printout with the calibrated measurement of the mix being produced.
  - h) Separate bins and gate openings for each type of material, including a watertight storage bin for cement. Cover the aggregate bins with tarpaulins or by other approved methods when required.
6. The unit shall have a stamped plate from the Volumetric Mixer Manufacturers Bureau (VMMB) stating the equipment conforms to ASTM C685. The plate shall be attached in a prominent place and have the following plainly marked: the gross volume of the transportation unit in terms of mixed concrete, the discharge speed, and the mass calibrated constant of the machine in terms of volume.
7. The volumetric mixing plant shall be operated and calibrated by a Volumetric Mixer Operator certified by VMMB and holds a TDOT Concrete Field Testing Technician Certification or equivalent. In the presence of the Engineer, perform the calibration of gate settings according to the manufacturer's recommendations for the

mix design to be used before starting work. The calibration procedure shall account for the moisture content of the aggregates. The yield shall be maintained within a tolerance of  $\pm 1\%$  and verified using a minimum 2 cubic feet container every 50 cubic yards. Recalibrations will be necessary when indicated by the yield checks, and at any other times the Engineer deems necessary to ensure proper proportioning of the materials.

8. Provide equipment necessary for TDOT to perform tests to determine moisture and gradations of aggregates in accordance with SOP 1-1. If gradations are out of tolerance or aggregate moisture content varies by 5% or more, additional yield checks and/or calibration will be required.

If the mixer fails to discharge a uniform mix at any time, production of concrete shall cease until any problems are corrected.

Each load of concrete produced by a volumetric continuous mixing plant shall be accompanied by a Concrete Delivery Ticket. The ticket shall include as a minimum the following:

- a. Date
- b. Contract number
- c. County
- d. Class of concrete
- e. Concrete design number
- f. Number of cubic yards
- g. Load number
- h. Truck number
- i. Maximum water allowed by design
- j. Total water added
- k. Water-cementitious materials ratio
- l. Time loaded
- m. Time discharged
- n. Signature of producer's VMMB Certified Volumetric Mixer Operator

The form shall be delivered to the Inspector at the site of the work. Loads that do not carry such information or do not arrive in satisfactory condition shall not be used.

~~Use a continuous type mixer, calibrated to accurately proportion the specified mix, to mix and discharge the PMC overlay. Equip the mixer so that the proportions of the cement, natural sand, and coarse aggregate can be fixed by calibration of the mixer and cannot be changed without destroying a seal or other indicating device affixed to the mixer by the Engineer.~~

~~Equip the mixer with a flow meter for calibrating the water supply portion of the mixer. In addition, also equip the mixer with a cumulative type water meter that can be read to the nearest 0.1 gallon. The water meters shall be readily accessible, accurate to within 1%, and easy to read. The Engineer will check both water meters each time the mixer is calibrated.~~

~~Use approved methods to add the admixture so as to keep it separated as far as is practicable.~~

~~Calibrate the continuous type mixer to the Engineer's satisfaction before starting the work. Conduct yield checks for each 50 cubic yards of mix. Recalibration will be necessary when indicated by the yield checks, and at any other times the Engineer deems necessary to ensure proper proportioning of the ingredients. Do not use continuous type mixers that entrap unacceptable volumes of air in the mixture. Do not use batch type and drum type transit truck mixers or rotating drum batch type mixers to mix PMC overlay concrete. Keep the mixer clean and free of partially dried or hardened materials at all times. Ensure that the mixer consistently produces a uniform, thoroughly blended mixture within the specified air content and slump limits. Immediately repair or replace malfunctioning mixers.~~

**Subsection 619.11** (pg. 676), 12-30-19; **Curing**; Remove 6<sup>th</sup> paragraph:

~~Take a random 1 quart sample of the latex off each concrete mobile supplier and deliver it to the Division of Materials and Tests lab for evaluation. An engineer from the office of Bridge Inspection and Repair shall be present for the initial calibration of the concrete mobile. The Engineer will check and measure the volume of the latex, cement, aggregate, and water at the concrete mobile before and after as an approximate check of the calibration of the concrete mixer.~~

**Subsection 622.03** (pg. 686) 12-2-16; Add the following paragraph at the beginning of the section:

“Same-as designs shall not be submitted for Shotcrete.”

**Subsection 622.03** (pg. 687), 12-30-19; **Proportioning and Quality Assurance of Shotcrete**; Remove 1<sup>st</sup> paragraph:

~~Same as designs shall not be submitted for Shotcrete.~~

**Subsection 622.03** (pg. 687) 10-8-18; Proportioning and Quality Assurance of Shotcrete, Modify Table 622.03-2, add a sentence to the end of the paragraph between tables 622.03-1 and 622.03-2:

**Table 622.03-1: Shotcrete Performance Requirements**

Parameter	Value
3-Day Compressive Strength (psi)	2000
28-Day Compressive Strength (psi)	4000
Minimum Cementitious per cubic yard	660
Maximum Water/Cement (pound/pound)	0.45
Air Content (%)	7-10 <sup>(1)</sup>
7-Day Maximum Absorption (%)	8

<sup>(1)</sup> Air content acceptance range shall be between 7-10%, with sampling at the truck chute. Air entrainment is required for wet-mix shotcrete but not for dry-mix shotcrete.

Aggregate for shotcrete shall meet the strength and durability requirements of AASHTO M6/M80 and the gradation requirements specified in Table 622.03-2. An intermediate size aggregate may also be used as an additional component if needed to meet gradation. Aggregates failing to comply with Table 622.03-2 may be used if preconstruction testing as specified in **622.04** proves satisfactory results.

**Table 622.03-2: Gradation Requirements**

Sieve Size	Percent Passing by Weight
3/4 inch	100
1/2 inch	98-100
3/8 inch	90-100
No. 4	70-85
No. 8	50-70
No. 16	35-60
No. 30	20-50
No. 50	8-20
No. 100	0-10

**Subsection 622.03 A** (pg. 687-688), 12-30-19; **Proportioning**; Revise 5<sup>th</sup> paragraph:

Chemical admixtures to be incorporated into the shotcrete shall ~~all be from the same manufacturer, and shall be incorporated into the shotcrete according to the manufacturer's recommendations, subject to the Engineer's approval.~~ be compatible and incorporated into the concrete in accordance with the manufacturer's recommendations. Concrete mixtures utilizing multiple admixture manufacturers shall prove compatibility in accordance with the Department's Standard Operating Procedure 4-4. Ensure that accelerators (if used) are compatible with the cement used, are non-corrosive to steel, and will not promote other detrimental effects such as cracking and excessive shrinkage.

**Subsection 622.03** (pg. 686-688) 5-14-18; Add subsection C: Placement of Shotcrete:

**"C. Placement of Shotcrete**

An ACI-certified Shotcrete Nozzleman shall be utilized to properly place shotcrete."



**S T A T E**

**O F**

**T E N N E S S E E**

(Rev. 6-27-16)

(Rev. 12-2-16)

(Rev. 5-15-17)

(Rev. 11-6-17)

(Rev. 10-8-18)

(Rev. 5-13-19)

(Rev. 12-30-19)

January 1, 2015

**Supplemental Specifications - Section 700**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 705.06** (Page 719), 5-13-19; **Installation of Posts**; Revise 3<sup>rd</sup> Paragraph:

To validate proper installation of posts, for each guardrail contractor/installer doing work for the Department, the Regional Operations and Materials and Tests offices may select any post for verification. If the posts are found to be in accordance with the Plans and Specifications, the Contractor may re-install the posts if they were not damaged during the pulling process. If the post length is found to be deficient, the Department will require the contractor/installer to remove the entire run of guardrail or end terminal and replace it properly at no cost to the Department.

**Subsection 709.02 E** (pg. 738), 6-24-19; **Machined Riprap**; Revise last paragraph:

When using rock or stone as riprap, ensure that the material meets the quality requirements in 903.25. Obtain the Engineer's approval of the material before using.

**Subsection 712.04** (pg. 758), 12-30-19; **General**; Revise 3<sup>rd</sup> paragraph:

The Contractor may splice stationary U-Post sign supports that are 3 lbs/ft or less, provided the splice is a minimum of 18 inches. In addition, drive the stubs for the splice as required above and so as not to extend above 18 inches from ground level. A splice is only allowable with U-Posts and shall not be permitted for any other post types (square tube, round post, I-beam, etc.). Fasten the splice with four bolts, two placed at each end of the splice. In general, work being performed at spot locations and of short duration will necessitate the use of portable supports properly weighted for stability.

**Subsection 712.04** (pg. 759), 12-2-16; A. Flaggers, add ABET Accredited University Programs to the list of flagger training:

- “1. American Traffic Safety Services Association (ATSSA)
2. National Safety Council (NSC)
3. Tennessee Transportation Assistance Program (TTAP)
4. ABET Accredited University Programs”

**Subsection 712.04** (pg. 759). 11-6-17; A. Flaggers, replace the last paragraph with the following:

“The Department will review and determine if an alternative training program is acceptable prior to use. Alternative training programs shall meet all MUTCD requirements and follow FHWA guidance.

The Department will consider flaggers to be a general requirement of traffic control and will not make direct payment for such.

Coordinate flagging operations in a manner that causes as little delay to the traveling public as possible. Delays shall be kept within 2 minutes or ¼ mile, but shall not exceed 5 minutes or a 1 mile maximum, unless prior authorization is granted by the Department.”

**Subsection 712.04.B** (pg.759-760) 12-2-16; revise the second paragraph of B. THP Troopers and Uniformed Law Enforcement Officers:

“B. THP Troopers and Uniformed Law Enforcement Officers

When a THP Trooper is not available, the Contractor may provide a Uniformed Law Enforcement Officer if approved by the Engineer and the Regional Safety Coordinator or Regional Operations Office. All Uniformed Law Enforcement Officers shall provide marked law enforcement vehicle equipped with blue lights and have the authority to write traffic tickets and make arrests within the project site. The Uniformed Law Enforcement Officer shall maintain a detailed written log of enforcement activities and shall submit the log to the Engineer for verification each month.”

**Subsection 712.04 G.** (pg. 762), 11-6-17; G. Lane Closures, add the Type of Facility and Requirement table to the end of the subsection, revise the last sentence:

“G. Lane Closures

Hold the length of a lane closure to the minimum length required to accomplish the Work. Locate advanced warning signs for the Project so as to not overlap with the advanced warning signs for lane shifts and lane closures.

Use drums in all transition tapers for lane closures on multi-lane roads.

Contractor’s Staff performing lane closure shall have the following certifications to close lanes on TDOT facilities and shall be onsite during each lane closure performed.

Type of Facility	Requirement
Two Lane	Flagging Operations Certification (Shall comply with Subsection 712.04 A)
Multi-Lane	*ATSSA Traffic Control Technician Training or equivalent
Controlled Access Freeways & Expressways	*ATSSA Traffic Control Technician Training or equivalent

\*Proof of certification shall be provided to the Engineer at the Pre-Construction Meeting.”

**Subsection 712.09** (pg. 769), 12-2-16; change Uniformed Police Officer to Uniformed Law Enforcement in the last paragraph:

“The Department will pay for Uniformed Law Enforcement Officers provided by the Contractor at the invoice price of the work plus 5%, not to exceed \$50 per hour for the hours present on the Project. No compensation will be made for drive time.”

**Subsection 713.04** (pg. 772) 5-15-17; Construction Methods and Requirements; add steel requirement as the last paragraph:

“Ensure steel meets all specifications in **602.04.**”

**Subsection 713.04.C.6** (pg. 774), 6-27-16; replace C.6. with the following:

“6. Concrete. Use either (1) Class A concrete meeting 604.03 or (2) Class X concrete with a f’c as identified in the plans or required by the design. If Class X concrete is required, use a mix meeting the minimum requirements of **604.03** for Class A concrete, but with a cementitious material quantity necessary to produce the specified strength.”

**Subsection 713.04.C.8** (pg. 774), 6-27-16; add sentence to the end of 8.:

“8. Setting Anchor Bolts and Stubs. Set anchor bolts and stubs for sign supports to proper locations and elevations with templates, and carefully check them after constructing the sign foundation and before the concrete has set. Anchor rods shall conform to the requirements of section **730.11**”

**Subsection 714** (pg. 779-800), 11-6-17; Revise the subsection as follows:

**“MATERIALS**

**714.02 Materials**

Provide materials as specified in **917** and as follows:

Portland Cement Concrete, Class A .....	<b>604</b>
Crushed Stone Grading D.....	<b>903.05</b>
Steel Bar Reinforcement for Concrete Structures.....	<b>907.01</b>
Welded Steel Wire Fabric .....	<b>907.03</b>
Gray Iron Castings.....	<b>908.07</b>
Inorganic Zinc Paint .....	<b>910.03</b>
Cement Concrete Curing Materials .....	<b>913</b>
Conduit.....	<b>917.05 or 917.07</b>

Within 30 days after the issuance of the work order, submit to the Engineer, four collated sets of the manufacturer’s descriptive literature and technical data, fully describing the types of lighting equipment proposed for use. In the descriptive literature, identify the manufacturer and model, and include sufficient information for the Engineer to determine if the equipment or material meets the requirements of the Plans and these Specifications. Include with these sets of submittal data a list of the materials submitted along with descriptive material for, but not limited to, the following items when applicable:

1. Complete photometric data of luminaires as published by the manufacturer with independent testing laboratory results.
2. Computer printouts showing illumination levels throughout each interchange area where high mast luminaires are to be installed.
3. General details of light standards, breakaway bases, and bracket arms. For light standards taller than 30 feet, submit one set of design calculations and six prints of “Design” or “Shop” drawings to the Division of Structures for approval purposes. The Department will review these drawings at the earliest possible date, and will return two prints marked “Approved for Fabrication,” or “Returned for Revisions as Noted.” Respond by taking appropriate action to ensure the earliest possible correction of these items so as not to delay the installation.
4. Highmast tower details with a set of design calculations for each height including access hole, base, anchorage, head frame, and lowering device. Include specification references for materials and location, type, size, and extent of welds. In addition to the set of design calculations, submit six prints of “Design” or “Shop” drawings for each highmast tower height to the Division of Structures for approval purposes, in a manner similar to that specified in Item 3 above for light standards taller than 30 feet.
5. Dimension sheets and performance data on all related equipment.

The Engineer will retain one copy and forward one copy each to the the local entity (city or county engineer) and the Traffic Operations Division for their review.

Also include with the submittal sets detailed scale drawings of all non-standard or special equipment and of all proposed deviations from the Plans. Deviations from the Plans or Specifications require approval from the Traffic Operations Division. Include a letter requesting deviations or alternate materials in the submittal for Traffic Operations Division approval. Upon request, submit for approval sample articles of materials proposed for use. The

Department will not be liable for any materials purchased, labor performed, or delay to the Work prior to such approval.

In addition to the above, include with each submittal a notarized letter certifying that all lighting system materials listed in the submittal conform to the Plans and Specifications. Also submit to the Engineer a statement from the Maintaining Agency that the system is acceptable to the Agency.

**714.03 Codes**

Furnish material and perform all work in strict accordance with the latest revision of the National Electrical Code, the National Electrical Safety Code, the Illuminating Engineering Society (IES) publications, ANSI standards, and the codes, regulations, and rules prevailing in the area in which the Work is being performed, as applicable.

**714.04 Reserved****CONSTRUCTION REQUIREMENTS****714.05 Conduit**

Install conduit of the type and size specified at the locations shown on the Plans, or as directed by the Engineer. Install pull or drag wires of the type and size specified in conduit at the locations shown on the Plans.

**A. Underground Conduit**

- 1. General.** Underground conduit shall consist of encased or direct burial conduit. Install conduit in a trench excavated to the dimensions and lines specified.

Before beginning any excavation, determine the location of all electrical, drainage, and utility lines in the vicinity, and perform work so as to avoid damaging these facilities. Ensure that the conduit will be located so as to avoid conflict with proposed guardrail, sign posts, and other features.

Build conduit runs in straight lines where possible. Where sweeps are necessary, use standard long sweep conduit bends when feasible, and meet the minimum radius required by the National Electric Code. Install pull boxes at intervals so that the tensile strength of the conductors will not be exceeded.

Obstructions encountered when excavating trenches for underground conduit may require minor changes, such as in locations of conduit runs and pull boxes. Obtain the Engineer's approval before making such changes. Where possible, provide a minimum of 12 inches between the finished lines of conduit runs and utility facilities, such as gas lines, water mains, and other underground facilities not associated with the electrical system. Where the conduit run is adjacent to concrete walls, piers, footings, and similar structures, maintain a minimum of 4 inches of undisturbed earth or firmly compacted soil between the conduit and the adjacent concrete or, when the conduit is encased, between the encasement and the adjacent concrete.

Unless shown on the Plans, do not excavate trenches in existing pavement or surfaced shoulders to install conduit. If it is necessary to place a conduit under an existing pavement, install the conduit by jacking or other approved means with galvanized rigid steel conduit or schedule 80 PVC conduit.

Keep jacking and drilling pits at least 10 feet from the edge of the paved shoulder or sidewalk unless otherwise directed by the Engineer. When the Plans specifically allow excavation of a trench through an existing pavement or surfaced shoulder, restore the pavement and/or surface and base to their original condition. Do not leave boring pits open for extended periods of time.

Unless otherwise specified, cut trenches for conduit on a slight grade for drainage, and make the walls of the trench essentially vertical. Tamp the bottom of the trench as necessary to produce a firm foundation for the conduit.

Excavate trenches for rigid metallic conduit, with or without encasement, to a minimum depth of 18 inches, plus conduit diameter, measured from the finished subgrade.

Sheet and brace the trenches as required, and adequately support all pipe and other structures exposed in trenches as necessary to prevent damage.

Ream metallic conduit after threads are cut. Ream other conduit as necessary. Cut all ends square and to butt solidly in the joints to form a smooth raceway for cables.

Ensure that conduit joints form a water-tight seal. Coat metallic conduit threads with pipe compound and then securely connect. Make conduit joints with the materials and in the manner recommended by the conduit manufacturer and as approved by the Engineer.

Install conduit bushings in conduit where necessary and required for protection of the conductors. When the conduit is installed for future use, ensure that the ends of metallic conduit runs are properly threaded and capped, and that the ends of non-metallic conduit runs are satisfactorily plugged or capped to prevent water or other foreign matter from entering the conduit system.

**a. Encased Conduit.** Place encased conduit under roadway and paved shoulders unless trenching is required for installation at the locations shown on the Plans. Unless otherwise specified, construct encasement as follows:

- (1) Construct the encasement of Class A concrete meeting the requirements of **604**.
- (2) Extend the encasement of conduit under roadway pavements or surfaces to the outer edges of the surfaced or paved shoulders, or 1 foot beyond the outer edge of the sidewalk, or 1 foot beyond the outer edge of the curb when no shoulder or sidewalk is indicated.
- (3) Extend the conduit at least 6 inches beyond the encasement.
- (4) Encase the pipe with a minimum of 3 inches of concrete.
- (5) Plug the ends of the conduit temporarily to prevent the entrance of concrete or other foreign material.
- (6) Do not encase any conduit with concrete until inspected and approved by the Engineer.
- (7) Cure concrete encasement as specified in **604.23**, except that the curing period may be reduced to 24 hours if backfilling is to proceed at the time specified in **714.05.A.2**.

**b. Direct Burial Conduit.** When rock is encountered in the bottom of the trench, install the conduit on a bed of well compacted fine grain soil at least 4 inches thick.

- 2. Backfilling Conduit.** Do not backfill encased conduit until the concrete encasement has cured a minimum of 24 hours. After the Engineer has inspected and approved the installation of direct burial conduit, promptly backfill to the required grade with approved material in layers not exceeding 6 inches in loose depth, and compact each layer as directed by the Engineer.

#### **B. Conduit on Structures**

Install conduits, conduit fittings, hangers, expansion fittings, and accessories on as shown on the Plans and, unless otherwise specified, in accordance with the following:

1. Run conduit parallel to beams, trusses, supports, pier caps, and similar features in the most direct manner.
2. Install horizontal runs on a slight grade, without forming low spots, to ensure proper drainage.
3. Run conduits with smooth, easy bends.
4. Hold conduits in boxes with locknuts and provide bushings for protection of the conductors.

#### **C. Testing Conduit**

After completing the installation of conduit, test it with a metallic mandrel in the presence of the Engineer. Use a mandrel having a diameter 1/4 inch smaller than the conduit, and a length of 2 inches. Repair, to the Engineer's satisfaction, all conduits that will not allow passage of the mandrel. If repairs cannot be accomplished, remove and replace the conduit at no additional cost to the Department.

After the mandrel test, scour all conduits with a stiff wire brush having a slightly larger diameter than the conduit.

Test conduits that have been installed under a previous contract with a mandrel and clean as described above before installing the cables.

#### **714.06 Pull Boxes**

Construct pull boxes in accordance with the design, dimensions, and at the locations shown on the Plans. Construct concrete pull boxes of Class A concrete meeting the requirements of **604**. Place non-metallic pull boxes only in non-traffic bearing locations and not in paved areas.

Provide a cast iron frame and cover or reinforced concrete cover, as shown on the Plans, with each pull box.

Plug unused conduit entrance holes and openings for conduit to be extended by others with suitable plugs of plastic, bituminous fiber, or other approved material to prevent the entrance of foreign matter.

#### **714.07 Underground Cable for Lighting Circuits**

Underground cable for lighting circuits shall consist of direct burial cable, preassembled cable in duct, or cable in conduit, as shown on the Plans.

If it is necessary to install a cable under an existing pavement or surfaced shoulder, install conduit, when specified, in accordance with the applicable provisions of **714.05**, and place the cable within the conduit.

Construct walls of trenches for cables to be essentially vertical. Unless otherwise specified, install underground cable as follows:

1. Excavate trenches for direct burial cable to a minimum depth of 24 inches plus the cable diameter as measured from finished subgrade.
2. In general, locate the trenches to avoid conflict with proposed guardrail, sign posts, and other features.
3. Protect direct burial cable, and preassembled cable in duct, in trenches by cushioning with sand or earth that passes a 1/4-inch screen. Place the cable, or preassembled cable in duct, and sand or earth in the trench so that a minimum 3-inch thickness of the cushion material will completely surround each cable.

#### **A. Direct Burial Cable**

Do not unreel cables and pull into the trench from one end. Unreel the cables, lay them alongside the trench, and then lay in the trench. Allow the cables to “snake” slightly in the trench to provide adequate slack for settling of earth. Ensure that there are no crossovers of cable in the trench. Where cable is brought up into the base of the lighting standard, leave sufficient slack for making the connections inside the standard.

#### **B. Preassembled Cable in Duct**

When installing in the trench, do not pull preassembled cable in duct taut, but allow it to “snake” in the ditch to provide not less than 18 inches slack per 100 feet of trench. The minimum bending radius on the cable duct shall be 18 inches. Where the duct is brought into the base of the lighting standard or into a pull box, leave sufficient length for trimming the duct to expose enough cable to allow for the connections to be made inside the standard or pull box.

#### **C. Cable in Conduit**

Carefully pull cables in conduits into place using approved methods so that the cable will be installed without electrical or mechanical damage. Pull all cables within a single conduit at the same time. If necessary to ease the pulling, use a lubricant of the type recommended by the cable manufacturer. When cables are pulled through hand holes in pole shafts, place a pad of firm rubber or other suitable material between the cable and the edges of the opening to prevent cable damage.

After the cable has been installed in the conduit, seal the ends of buried conduit with approved pliable and non-hardening material to prevent the entrance of dirt, moisture, or other foreign material.

#### **D. Splices**

Splice conductors as shown on the Plans. Only make splices at accessible points, such as handholes and pull boxes, unless otherwise shown on the Plans. After making a conductor splice, insulate it with heat-shrinkable tubing, supplied by the manufacturer, with an adhesive coating on the inner wall.

#### **E. Ground Wire**

Install ground conductors of the type and size shown on the Plans, and to be continuous in trenches with direct burial cable, and continuous inside preassembled cable in duct, and in conduit. Connect the ground conductors



to the ground rod at all control points, to the ground lug in pole foundations, and to all metallic conduit runs using a grounding bushing, except that the connections to conduit in pole foundations may be omitted. Make all connections as shown on the Plans.

#### **F. Backfilling Underground Cable**

Backfill cable as specified in **714.05**.

#### **G. Cable Identification**

To assist in the identification of circuits at the pull boxes, mark the phase conductors with colored rubber-based, or equivalent, paint. When final connections are made, provide permanent tape wire markers to identify the branch circuit conductors (X1A, X1B, etc.), neutral (X1N, etc.), and the ground (g).

### **714.08 Light Standards**

Install light standards of the designated design, kind, size, and class in accordance with and at the locations shown on the Plans. Ensure that the installed standards, complete with the bracket arm(s) and luminaire(s) as specified, provide the mounting height shown on the Plans. Determine the pole height as required by bracket arm upsweep, slope conditions, and similar characteristics.

#### **A. Foundations for Light Standards**

Consider transformer bases to be an integral part of the lighting standard unless otherwise specified.

##### **1. Bolt-Down Base Pole Foundations**

- a. Concrete Foundations.** Excavate a hole of the size and depth shown on the Plans. Remove and dispose of all excavated material as directed by the Engineer. Place anchor bolts of the type and size specified according to the pole manufacturer's recommendations, and securely hold to ensure proper position in the completed foundation. Ensure that no realignment of anchor bolts will occur after the foundation is poured. Accurately place reinforcing steel and securely hold to avoid displacement.

Accurately place conduits in foundations, orient them in the proper direction to accommodate service cables, and securely hold to avoid displacement.

Place Class A concrete in the excavated area against undisturbed earth to an elevation 4 inches below the finished ground line, and in an approved form from 4 inches below said ground line to the finished top of foundation elevation, as specified. Construct the foundation with a continuous concrete pour. Chamfer the edges of the top and formed portion of the foundation. Apply a Class 2 finish, as specified in **604.21.B**, to the portion of the foundation above grade and within 4 inches of grade.

- b. Metal Foundations.** Install metal foundations where shown on the Plans and, if desired, at locations where installation is possible without predrilling the hole.
- 2. Prestressed Concrete Butt Base Pole Foundations.** Excavate prestressed concrete butt base lighting standard foundations using manual or mechanical methods. Dig or drill the holes to the depth and the diameter shown on the Plans. Place and compact in the bottom of the hole 6 inches of crushed stone, meeting the requirements of **903.05**, Grading D.

3. **Wood Poles.** Excavate for wood poles as specified for prestressed concrete butt base pole foundations in **714.08.A.2**. Dig or drill the holes to the depth shown on the Plans and in such diameter to allow satisfactory use of mechanical tamping equipment.

#### B. Light Standard Installation

Handle the standards or poles as recommended by the manufacturer and approved by the Engineer. Accomplish erection without marring the finish or otherwise damaging the standard. Ground the light standards as shown on the Plans. When installing lighting on a bridge, review the proposed bridge plans or the completed structure before ordering the standards.

1. **Bolt-Down Base Poles.** Set standards with bolt-down bases on foundations constructed as specified in **714.08.A.1**. Use metal shims supplied with the poles to plumb the pole, if the twin bracket arm type is used; and, unless otherwise specified, to rake or lean the pole backward 4 inches, if the single bracket arm type is used.
2. **Prestressed Concrete Butt Base Poles.** Place prestressed concrete butt base lighting standards in the hole and on the layer of crushed stone prepared as specified in **714.08.A.2**. Position the pole in the center of the hole at grade and hold in place. Rake the lighting standards with single bracket arms as specified for poles with bolt-down bases in **714.08.B.1**. Set lighting standards with two bracket arms plumb. Fill the space surrounding the pole butt-base with crushed stone, applied in 6-inch layers. The crushed stone shall meet the same requirements specified for the stone foundation in **714.08.A.2**. Moisten the stone backfill material as necessary, and thoroughly compact each layer with mechanical tamping equipment. Continue the backfill with crushed stone to the depth of the bottom edge of the cable entrance in the butt-base. After completing the installation of the electrical cable, continue placing the crushed stone backfill in 6-inch layers, and compact to a depth of 1 foot below grade. Backfill the remaining 12 inches with soil in two equal layers, and thoroughly compact each layer.
3. **Wood Poles.** Place wood poles in holes excavated as specified in **714.08.A.2**. Set the pole in the center of the hole, with any vertical curvature of the pole located in the plane of the lines, and rake in a direction opposite that of the unbalanced stress where a guy or underbrace is specified. Backfill the hole with approved material applied in 6-inch layers, and thoroughly compact each layer with mechanical tamping equipment. Install cross arms and guying components, when specified, as shown on the Plans.

#### C. Highmast Tower Installation

Install standards with lowering devices on foundations constructed as shown on the Plans. Ensure that the standards are plumb. Assemble the shaft in the Engineer's presence. Do not perform any field welding between sections of the shaft. Erect the tower according to the manufacturer's recommended procedures and under the manufacturer's supervision. Make adjustments to align all parts and ensure operation. Arrange for the manufacturer or its representative to instruct the local utility in the proper operation of the lowering device.

#### 714.09 Bracket Arms

Install, on the lighting standards, bracket arms of the specified type, design, kind, dimensions, and number as shown on the Plans.

**714.10 Luminaires**

Use the following luminaire types on the roads and bridges: High Intensity Discharge (HID) which includes High Pressure Sodium (HPS) and Metal Halide (MH); Fluorescent and Induction lamps; and Light Emitting Diode (LED).

Install luminaires of the design and size shown on the Plans, and level according to the manufacturer's recommendations, as shown on the Plans and as approved by the Engineer. Provide glare shields on luminaires when shown on the Plans.

Clamp the pole and bracket cable in the proper terminals on the terminal board in the luminaire, and then splice the cable to the proper phase and neutral conductors outside of the handhole in the pole base. After other required circuit splices are made outside of the handhole, place all of the wire inside the handhole. Leave slack in all cables for future maintenance. Attach a suitable identification tag to each of the phase cables.

Clean luminaire reflector surfaces and glassware after installation. Perform cleaning, if required, according to the luminaire manufacturer's recommendations.

Ensure that luminaires for sign lighting are adjustable both horizontally and vertically.

**High Intensity Discharge (HID)**

High Intensity Discharge (HID) luminaires shall meet IES standards from LM-51-00 to LM-35-02. The HID luminaire shall be covered by a one-year written warranty starting from the system acceptance date. All of the other electrical and mechanical component parts of the HID shall be covered by a five-year written warranty starting from the system acceptance date. The signed warranty certificate shall be submitted prior to final payment.

**Light Emitting Diode (LED)**

Light Emitting Diode (LED) luminaires shall be manufactured in accordance with ANSI C136.37-2011 (or recent version). All testing and data sheets for proposed LEDs shall be included in the submittal package and shall include, but not limited to, the following: Illuminating Engineering Society of North America (IESNA): LM-79-08, LM-80-08, RP-8-14, TM-3-95 and TM-15-07 (all should be up-to-date versions). In addition to these requirements, the LEDs shall meet the following requirements:

1. Finished surface: Furnish luminaires with the color mentioned in the plans. The surface of luminaire housing shall meet UL-1598 listed for wet locations, ASTM B117 for salt chamber exposure, and ASTM D1654 for rust creepage.
2. Thermal Management: the luminaire shall start and operate in the ambient temperature range of -25C to +25C.
3. Optical Assembly: The LED optical assembly package shall have a minimum Ingress Protection rating of IP 66 according to ANSI/IEC 60529. The luminaire shall have a standardized refractor/reflector to meet the required optical distribution as required by the plans. The optical assembly shall utilize high brightness, long life, minimum 70 color rendering index (CRI), (3000 K-5700 K) color temperature (+/-300 K) LEDs binned according to ANSI C78.377. Lenses shall be UV-stabilized acrylic or glass. Provisions for house-side shielding shall be provided when specified.

4. Prevent the entrance of wildlife by limiting openings around the pipe tenon mounting area.
5. Electrical Parts (including Safety Testing) shall comply with an ANSI C136.41 with 7-pin receptacle that is fully pre-wire for LED driver's control.
6. Documents for the materials submitted need a certification from a National Voluntary Laboratory Accreditation Program (NVLAP) and that lab must be recognized by the U.S. Department of Energy.

**LED Luminaire Warranty**

The entire LED luminaire and all of its component parts shall be covered by a 10 year written warranty covering materials, fixture finish, and workmanship. Failure is when one or more of the following occur:

1. Negligible light output from more than 10 percent of the LED packages.
2. Condensed moisture inside the optical assembly.
3. Driver that continues to operate at a reduced output below 15 percent of the rated nominal output. The warranty period shall start from the system acceptance date. The signed warranty certificate shall be submitted prior to final payment.

**714.11 Lamps**

Install lamps of the design, type, and size, and at the locations shown on the Plans.

**714.12 Installation of Overhead Wires**

Install overhead wiring, when specified, as shown on the Plans.

**714.13 Cable Markers**

When shown on the Plans, place precast or cast-in-place concrete cable markers, of the dimensions indicated, at all locations where lighting cables make an abrupt change in direction. Construct the markers of Class A concrete meeting **604**. Imprint an arrow on each marker to indicate the direction of the cable run as it approaches and leaves the marker. Also imprint the circuit number on the marker.

Recess the markers into the ground approximately 3 inches, unless otherwise specified.

**714.14 Control Center**

Furnish and install a service pole or poles of the design, type, size, and class, and at the locations shown on the Plans. Install the service pole(s) as specified in **714.08** and as shown on the Plans. Set the service pole(s) plumb.

Notify the power company, at least 30 days before connection, of the need to furnish power to operate the lighting system.

Unless otherwise specified, furnish and install all the control center equipment and electrical supply facilities. The electrical supply facilities shall include the necessary service conduit from the control cabinet to the delivery point designated on the Plans.

Construct a concrete slab, of the dimensions and thickness indicated, around the service pole foundation. Construct the slab of Class A concrete meeting the requirements of **604**, and reinforce the slab, if specified, as shown on the Plans.

Construct a 6-foot chain-link fence and gate of the size specified around the control center as shown on the Plans and as specified in **707**.

#### **714.15 Field Painting**

After erection is completed, thoroughly clean steel standards that are not galvanized, and then apply two coats of inorganic zinc paint meeting the requirements of **910.03**. Perform painting as specified in **603**.

If the shop coat of prime paint is damaged, cover the damaged areas with a coat of the same type of paint as used for the original primer coat, and allow it to completely dry before applying the first coat of aluminum paint.

If the finish on galvanized steel materials is scratched, chipped, or otherwise damaged, the Engineer will reject the material, or may allow it to be repaired as specified in **713.04.B**.

#### **714.16 Testing After Installation**

Install all materials and equipment to form a complete installation ready for operation, unless otherwise specified.

After the installation is completed, test the lighting system in the presence of a Department representative and the Maintaining Agency. Tests shall include insulation resistance, voltage, current, and performance tests. Unless otherwise specified, perform the tests in accordance with the following:

##### **D. Voltage Tests**

Take a voltage reading at the control center at the load side of the circuit protection device and the last lighting standard served in each branch circuit. In cases where the circuit feeds in two or more directions, take the voltage reading at the light most remote from the control point or as directed by the Engineer. Unless otherwise specified, with the complete lighting system energized and all lamps operating, the voltage of this last standard shall not be less than 90% of the nominal rated voltage of the luminaire supply circuit, and the voltage at the last underpass luminaire in each branch circuit shall not be less than the minimum operating voltage recommended by the manufacturer of the luminaire ballast.

##### **E. Current Test**

Conduct current tests at each control center at the load side of each circuit protection device, using a clamp-on type ammeter. Current, in amperes, in each supply conductor shall not be greater than the rated current of a luminaire times the number of luminaires in the circuit.

##### **F. Grounding Resistance Test**

Conduct ground resistance tests with a "megger," manufactured by the James H. Biddle Company, or a "vibraground" manufactured by Associated Research Incorporated or approved equal.

Adhere to the following when conducting this test:

1. Ensure that no equipment, such as ballast or oil switches, is connected at the time of the test.
2. Test only one conductor at a time.
3. Isolate the conductor being tested from ground.
4. Ensure that the other phase conductor and the neutral are grounded during each test.

**G. Performance Tests**

Prior to acceptance and after all faults have been corrected, operate the lighting system, including automatic control equipment and other specified apparatus, for a continuous 48-hour period without interruption or failure attributable to poor workmanship or defective material. After the 48 hours of continuous operation, the Engineer will inspect all lights and equipment for normal operation. Make all necessary repairs or replacements to the Engineer's satisfaction.

Make arrangements with the Servicing Agency to purchase the electric power necessary to conduct all tests.

Furnish the Engineer five copies of the test results, together with five copies of a statement from the Maintaining Agency that the system is acceptable to the Agency.

**714.17 Repair of Seeded and Sodded Areas**

If areas previously seeded or sodded are disturbed during the performance of the work described in this Section, reseed (with mulch) or re-sod such areas as specified in **801** or **803**, respectively. Perform these repairs as the work progresses to minimize erosion of disturbed areas.

**H. 714.18 Disposal of Excess or Unsuitable Material**

Dispose of excess or unsuitable material as specified in **203.07**.

**714.19 Final Cleanup**

Perform final cleanup as specified in **104.10**. Remove existing foundations, designated for removal, to a minimum of 6 inches below grade. Before final inspection, touch-up finishes, clean surfaces including signs that are lighted, and perform such other work as directed by the Engineer to ensure the effectiveness and neat appearance of the work.

**COMPENSATION**

**714.20 Method of Measurement**

When the bid schedule contains an item for Roadway and Structure Lighting on a lump sum basis, measurement will be for the sum total of all items to be furnished and installed.

When the bid schedule contains items for various elements of Roadway and Structure Lighting, the Department will make measurement for payment as follows:

**A. Conduit**

The Department will measure:

1. Encased Conduit and Direct Burial Conduit by the linear foot of conduit for each kind, number, and size installed as indicated, and
2. Conduit (Structures) of the kind and size specified by the linear foot of each individual kind and size of conduit placed.

**B. Pull Boxes**

The Department will measure Pull Boxes by the unit, per each.

**C. Cable**

The Department will measure Cable of the type, and number and size of conductors specified, by the linear foot from the center to center of pull boxes, light standards, and similar features, for each type and number and size of conductors. No additional allowance will be made for slack length, length inside equipment or standards, and similar instances requiring additional length of wire.

**D. Preassembled Cable in Duct**

The Department will measure Preassembled Cable in Duct by the linear foot from the center to center of pull boxes, light standards, and similar features. No additional allowance will be made for slack length.

**E. Light Standards**

The Department will measure Light Standards of the kind and design specified by the unit, per each.

**F. Luminaires**

The Department will measure Luminaires of the size, type, and design specified by the unit, per each, regardless of their classifications (i.e. LED, HID).

**G. Overhead Conductors**

The Department will measure Overhead Conductors of the gauge, type, and kind specified by the linear foot between supports. No allowance will be made for slack length.

**H. Cable Markers**

The Department will measure Cable Markers by the unit, per each.

**I. Control Center**

The Department will measure the Control Center on a lump sum basis. Such measurement will be for the sum total of all items to be furnished and installed at the control center, except as specified in **714.20.J** and **714.20.K**.

**J. Class A Concrete**

The Department will measure Class A Concrete used to construct the concrete slab around the service pole at the control center by the volume in cubic yards, as determined from the specified thickness shown on the Plans

and surface measurements for width and length. The Department will not measure reinforcement for the concrete slab for payment, but will consider the costs thereof as incidental to the item for Class A Concrete.

**K. Chain-Link Fence and Gate**

The Department will measure and pay for Fence and Gates in accordance with **707.08** and **707.09**, respectively.

**L. Navigational Lighting and Overhead Sign Lighting**

The Department will measure Navigational Lighting and Overhead Sign Lighting furnished and installed in accordance with the Plans on a lump sum basis.

**M. Incidental Items**

The Department will consider incidental, and will not directly measure, the following:

1. Excavation and backfilling performed in connection with this construction.
2. The removal and satisfactory disposal of existing pavement, surface, and base required to install conduit, and for restoring the base, pavement, and surface to their original condition.
3. Furnishing, installing, and subsequently removing sheeting, bracing, and supports needed to install conduit.
4. Labor, materials, equipment, electrical energy, and incidentals required to conduct the performance tests specified in **714.16.D**.
5. Reseeding, resodding, and otherwise restoring to their original condition areas that were disturbed during the performance of the work described in this Section.

**714.21 Basis of Payment**

When the bid schedule indicates payment will be made for Roadway and Structure Lighting on a lump sum basis, such payment is full compensation for all materials, labor, equipment, and incidentals necessary to produce a completely integrated, operative, and finished installation of a Roadway and Structure Lighting System, as shown on the Plans.

When the bid schedule contains items for various elements of Roadway and Structure Lighting, the Department will make payment as follows:

**A. Conduit**

1. **Encased Conduit.** The Department will pay for Encased Conduit at the contract unit price per linear foot, complete in place, for each kind, number, and size installed as indicated. Such payment is full compensation for all excavation, sheeting when required, backfilling, disposal of excess or unsuitable material, furnishing and placing or installing all materials and accessories, including grounding materials, concrete, and reinforcement when specified, all bends, joints, fittings and appurtenances, and installing the encased conduit complete.
2. **Direct Burial Conduit.** The Department will pay for Direct Burial Conduit of the kind, number, and size specified at the contract unit price per linear foot, complete in place. Such payment is full compensation



for all excavation, sheeting when required, backfilling, jacking of conduit, disposal of excess or unsuitable material, furnishing and placing or installing all materials and accessories, including grounding materials, bedding materials when required, all bends, joints, fittings and appurtenances, and installing the conduit complete.

3. **Conduit (Structures).** The Department will pay for Conduit (Structures) of the kind and size specified at the contract unit price per linear foot, complete in place. Such payment is full compensation for furnishing and installing all materials, including conduits, hangers, expansion fittings, grounding materials, and associated hardware and accessories, and installing the conduit complete.

**B. Pull Boxes**

The Department will pay for Pull Boxes at the unit price per each, complete in place. Such payment is full compensation for furnishing and installing or constructing pull boxes and for all excavation, backfilling, and other work connected therewith.

**C. Cable**

The Department will pay for Cable of the type, and number and size of conductors, as specified, at the contract unit price per linear foot, complete in place. Such payment is full compensation for furnishing and installing the cable and grounding materials, making splices, joints and connections, and for trenching, furnishing, and placing cushion and backfill material, and disposing of excess or unsuitable excavated material.

**D. Preassembled Cable in Duct**

Preassembled Cable in Duct of the kind and size specified will be paid for at the contract unit price per linear foot, complete in place. Such payment is full compensation for furnishing and installing the cable duct, grounding materials, making splices and connections, and for trenching, furnishing, and placing cushion and backfill material, and disposing of excess or unsuitable excavated material.

**E. Light Standards**

The Department will pay for Light Standards of the type specified at the contract unit price per each, complete in place. Such payment is full compensation for furnishing and installing the complete light standards, including the foundation, standard, bracket arm or arms, associated hardware and wiring, grounding materials, excavation, backfilling materials, and backfilling. The Department will measure foundations for high mast towers separately.

**F. Luminaires**

The Department will pay for Luminaires of the size and type specified at the contract unit price per each, regardless of their classifications (i.e. LED, HID), complete in place. Such payment is full compensation for furnishing and installing the complete luminaire, including the ballast(s), lamp(s), glare shields where required, and associated hardware and wiring.

**G. Overhead Conductors**

The Department will pay for Overhead Conductors of the gauge, type, and kind specified at the contract unit price per linear foot, complete in place.

**H. Cable Markers**

The Department will pay for Cable Markers of the design specified at the contract unit price per each, complete in place. Such payment is full compensation for furnishing and installing the marker complete, including the excavation, backfilling, and removal and disposal of excess or unsuitable excavated materials.

**I. Control Center**

The Department will pay for the Control Center at the contract unit price per lump sum, complete in place. Such payment is full compensation for furnishing and installing all equipment and materials, including service pole(s) when specified, and photoelectric relays, relay cabinets, multiple relays, lightning arrestors, fuse cutouts, and all other equipment, materials, associated hardware, and accessories, as shown on the Plans. Payment for the Control Center is full compensation for furnishing and installing all electrical supply facilities from the delivery point for electrical energy, as shown on the Plans, to the control center.

**J. Class A Concrete**

The Department will pay for Class A Concrete, measured as specified in **714.20.J**, at the contract unit price per cubic yard, complete in place.

**K. Navigational Lighting and Overhead Structure Lighting**

The Department will pay for Navigational Lighting and Overhead Structure Lighting by the lump sum complete in place including all materials and labor.”

**Subsection 714.02** (pg. 781), 5-13-19; **Materials**; Revise last paragraph:

In addition to the above, include with each submittal a notarized letter certifying that all lighting system materials listed in the submittal conform to the Plans and Specifications. Also submit to the Engineer a statement from the Maintaining Agency that all lighting system materials listed in the submittal are acceptable to the Agency.

**Subsection 716.05** (pg. 813), 10-8-18, Snowplowable Reflective Pavement Marker, Add the following as the third sentence:

“Contour the pavement at each snowplowable marker location to match the bottom of the marker casting. Install markers according to the manufacturer’s recommendations. For asphalt surfaces, only use the dry saw method to apply snowplowable reflective pavement markers. When using the dry saw method, provide a vacuum system to contain the dust. For other surfaces, regardless of the saw method used, ensure that the saw cut is clean, dry, and free of all dust or residue before applying the adhesive. Accompany each shipment of adhesive with a written statement from the adhesive manufacturer certifying that the material furnished conforms to the recommendations of the marker manufacturer, and stating the minimum temperature at which the adhesive can be satisfactorily mixed and applied.”

**Subsection 730.11** (pg. 835), 6-27-16; Revise the title:

“AnchorRods”

**Subsection 730.11** (pg. 835), 6-27-16; revise the first paragraph:

“Furnish, with anchor-base type poles, anchor rods meeting the requirements of ASTM F1554, Grade as required by design. Fit each anchor bolt with two heavy hex nuts. Hot-dip galvanize all nuts and not less than 10 inches of the threaded ends of anchor bolts according to ASTM A153. The anchor bolts shall be capable of resisting at yield strength stress the bending moment of the shaft at its yield strength stress.”

**Subsection 730.32.A.** (pg. 868), 6-27-16; revise the last paragraph of subsection 730.32 A.:

“Provide a welded frame handhole, 5 x 8 inches minimum and located with a clear distance above the base of no less than the pole diameter, “D”.”

**Subsection 730** (pg. 828-880), 11-6-17; replace section with the following:

**SECTION 730 – TRAFFIC SIGNALS**

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**730.02 Regulations and Code .....21**  
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**DESCRIPTION****730.01 Description of Work**

This work consists of furnishing and installing all necessary materials and equipment to complete in-place traffic signal systems, modify existing systems, or both, all as shown on the Plans or the Standard or Special Details, and as specified in these Specifications. Unless otherwise shown on the Plans or specified in the Special Provisions, all materials shall be new.

Where existing systems are to be modified, incorporate the existing material into the revised system, salvage it, or abandon it as specified or as directed by the Engineer.

Furnish and install all incidental parts that are not shown on the Plans or specified herein, but that are necessary to complete the traffic signal or other electrical systems, or that are required for modifying existing systems, as though such parts were shown on the Plans or specified herein. Include the costs of such incidentals in bid price for other items. All systems shall be complete and in operation to the Engineer's satisfaction at the time of completion of the work.

**GENERAL REQUIREMENTS****730.02 Regulations and Code**

Ensure that all equipment provided conforms to NEMA Standards Publication, Traffic Control Systems, latest revision, or the Radio Manufacturers Association, whichever is applicable. In addition to the requirements of these Specifications, the Plans, and the Special Provisions, all material and work shall conform to the requirements of the NEC and the NESC; the Standards of ASTM, ANSI, ITE, and IMSA; the MUTCD; and other applicable local ordinances.

Wherever reference is made to the NEC, or the Standards mentioned above, consider the reference to mean the code or standard that is in effect on the date of advertising the bids or authorization for force account.

**730.03 Submittal Data Requirements**

Within 30 days after the issuance of the work order, submit to the Engineer, the Traffic Operations Division, and the local entity (city or county engineer), one collated set of the manufacturer's descriptive literature and technical data that fully describes the types of signal equipment proposed for use. In the descriptive literature, identify the manufacturer and models and include sufficient information for the Engineer to determine if the equipment or material meets the requirements of the Plans and these Specifications. Include with these sets of submittal data a list of the materials submitted along with descriptive material for, but not limited to, the following items:

1. Controller
2. Cabinet and Exhaust Fan
3. Detectors
4. Signal Heads including Lamp Information and Mounting Hardware
5. Loop Wire and Loop Sealant
6. Shielded Detector Cable
7. Signal Cable
8. Cable for Span Wire, Guys, and similar features
9. Pull Boxes
10. Conduit
11. Coordination Equipment

Also include in the submittal sets detailed scale drawings of all non-standard or special equipment and of all proposed deviations from the Plans. Upon request, submit for approval sample articles of materials proposed for

use. The Department will not be liable for any materials purchased, labor performed, or delay to the Work prior to such approval.

In addition to the above, submit to the Engineer a notarized letter certifying that all traffic signal materials listed in the submittal conform to the Plans and Specifications along with a copy of a statement from the maintaining agency that the system is acceptable to the agency. Any material substitutions requested by the maintaining agency shall meet minimum Department standards and shall be approved by the Department in writing prior to purchase or installation. The Department will not be liable for any materials purchased; labor performed, or delay to the Work regarding such approval.

Submit an electronic copy in PDF format of “Design” or “Shop” drawings, indicating the proposed dimensions and material specification for each of the supports and mast arms involved, to the Division of Structures for approval purposes within 30 days after the work order is issued. The Department will review these drawings at the earliest possible date, and will return the electronic copy marked “Approved for Fabrication,” or “Returned for Revisions as Noted.” Respond by taking appropriate action to ensure the earliest possible correction of these items so as not to delay the installation.

**730.04 Mill Test Reports and Certification**

Provide Mill Test Reports (MTR) or Certifications of Conformance to the Specifications for Materials and Design for all materials incorporated into the Work. Supply the following prior to acceptance of the structures:

1. MTRs for MAJOR structural items only, as identified in Table 730.04-1, shall include both physical and chemical descriptions of the material as supplied to the fabricator. When physical properties are altered during the fabrication, supplement the MTR covering chemical composition with certified test reports indicating the physical properties of this material after fabrication.
2. Certifications of Conformance to the Specifications for all remaining material not covered by MTR as identified in Table 730.04-1.
3. Certification that all welding was performed by operators qualified as follows: Steel welders to AWS and aluminum welders to ASME.
4. Certification of Conformance to the Specification for the Design of all components not completely dimensioned and detailed on the Standard Drawing.

**Table 730.04-1: Required Mill Test Reports and Certifications**

<b>Component Materials</b>	<b>MTR</b>	<b>Certification</b>
Tubes for arms and poles	X	
Base Castings	X	
Anchor Bolts	X	
Pole tops, misc. fittings, and hardware		X
Fabricated or cast-type arm connections		X
Galvanizing		X

**730.05 Working Drawings**

Provide within the controller cabinet and to the local maintaining agency an electrical schematic diagram of the cabinet and system wiring. Submit manufacturer’s instructions for installation, maintenance, and operation of all equipment to the local maintaining agency and also place a copy within the controller cabinet. Place all such materials inside a plastic envelope mounted in the cabinet.

**730.06 Guarantee**

Guarantee the Traffic Signal System(s) installed under these Specifications, including all equipment, parts, and appurtenances in connection therewith, to the City or County and State against defective workmanship and materials for a period of not less than 1 year following the date the signal system is installed and made operational, except in no case shall this guarantee expire prior to 3 months after the final acceptance of the Project. Upon completion of the Project, turn over to the government agency responsible for maintaining the signal installation all warranties or guarantees on equipment and materials that are offered by the manufacturers as normal trade practice.

**730.07 Training**

Provide to the maintaining agency and/or the Department a training session on the controller and associated cabinet equipment to be supplied on the Project. The training session shall last for a minimum 4 hours unless the maintaining agency and/or the Department determines a lesser time is adequate. Train the user in the complete operation and programming features of all controllers. Provide this training prior to the acceptance of the Project at a facility agreed upon by the maintaining agency.

After the required training, certify to the Engineer that training has been completed.

This training requirement shall not apply if a training program meeting these criteria has been provided to the maintaining agency by this vendor and/or manufacturer on the equipment being bid within 18 months prior to the date of the invitation to bid. This requirement shall apply if the bidder is proposing new, upgraded, or modified equipment not covered in the previous training program.

**MATERIALS AND INSTALLATION****730.08 Excavating and Backfilling**

Perform excavation needed to install conduit, foundations, and other equipment, so as to cause the least possible damage to the streets, sidewalks, and other improvements. Excavate trenches no wider than necessary to properly install the electrical equipment and foundations. Do not begin excavating until immediately before installing conduit and other equipment. Place the material from the excavation where it will cause the least disruption and obstruction to vehicular and pedestrian traffic and the least interference with the surface drainage.

Backfill the excavations and compact to at least the density of the surrounding material. Remove all surplus excavation material and dispose of outside the highway right-of-way, in accordance with **203.07**, or as directed by the Engineer.

After backfilling, keep excavations well-filled, and maintain in a smooth and well-drained condition until permanent repairs can be made.

At the end of each day's work, and at all other times when construction operations are suspended, remove all equipment and other obstructions from that portion of the roadway used by public traffic, and park a minimum of 30 feet from the edge of pavement unless otherwise protected by guardrail, bridge rail, or barriers installed for other purposes.

Perform excavation in the street or highway so as to restrict no more than one traffic lane in either direction at any time. Do not obstruct traffic during hours of peak flow unless otherwise approved by the Engineer. Incorporate construction signing in accordance with the MUTCD.

**730.09 Removing and Replacing Improvements**

Replace or reconstruct, with the same kind of materials as found on the Work, improvements, such as sidewalks, curbs, gutters, Portland cement concrete and asphalt concrete pavement, bituminous surfacing, base material, and all other improvements removed, broken, or damaged by the Contractor.

Before removing the sidewalk and pavement material, use an abrasive type saw to cut, to a minimum depth of 2 inches, the outline of all areas to be removed in Portland cement concrete sidewalks and in all pavements. Use any method satisfactory to the Engineer to cut the remainder of the required depth. Make cuts neat and true with no shatter outside the removal area.

Whenever a part of a square or slab of existing concrete sidewalk or driveway is broken or damaged, remove the entire square or slab and reconstruct the concrete as specified above.

Perform all work in accordance with these Specifications, or the applicable local ordinance, whichever is of a higher standard. Consider this removal and replacement work to be incidental to other items.

**730.10 Foundations**

Construct foundations for posts, standards, and cabinets of Class A Portland cement concrete.

Pour foundations for posts, standards, and pedestals after the post, standard, pedestal, or anchor bolts or reinforcing steel is in proper position. Form the exposed portions to present a neat appearance. Rest the bottom of concrete foundations on firm undisturbed ground.

Construct forms to be true to line and grade. Finish tops of footings for posts and standards, except special foundations, to curb or sidewalk grade or as ordered by the Engineer. Use rigid forms, securely braced in place. Place conduit ends and anchor bolts by means of a template until the concrete sets. Moisten both the forms and the ground that will be in contact with the concrete before placing concrete. Do not remove forms until the concrete has cured for at least 12 hours and hardened sufficiently to allow form removal without causing damage to the concrete.

Apply an ordinary surface finish to exposed surfaces of concrete. Wherever the edge of a concrete foundation or sidewalk section is within 18 inches of any existing concrete improvement, extend the sidewalk section to meet the existing improvement.

Where obstructions prevent the construction of planned foundations, construct a foundation satisfactory to the Engineer.

**730.11 Anchor Rods**

Furnish, with anchor-base type rods, anchor bolts meeting the requirements of ASTM F1554, grade as required by design. Fit each anchor bolt with two heavy hex nuts. Hot-dip galvanize all nuts and not less than 10 inches of the threaded ends of anchor bolts according to ASTM A153. The anchor bolts shall be capable of resisting at yield strength stress the bending moment of the shaft at its yield strength stress.

Set standards, posts, and pedestals plumb by adjusting the nuts before the foundation is finished to final grade. Do not use shims or similar devices for plumbing or raking. After plumbing or raking has been completed, cut off anchor bolts 1/4 inch above the top nut, and paint the exposed surface with rust protective paint.

Furnish all anchor bolts and nuts required for relocating existing standards and posts.

**730.12 Pull Boxes**

Construct and install pull boxes as shown on the Plans and the Standard Drawings or as directed by the Engineer. Additional pull boxes may be required where conduit runs are more than 150 feet long. The maximum spacing



between pull boxes shall be 150 feet, unless otherwise directed by the Engineer. Install pull boxes wherever practicable out of the line of traffic. Set covers level with the pavement, or with the curb or sidewalk grade, or with the surrounding ground as required.

Place electrical conductors within pull boxes so as to be clear of the metal frame and cover.

Rest the bottom of the pull box firmly on a bed of crushed stone with a minimum depth of 12 inches below the bottom, and extending 6 inches beyond the outside edge of the pull box, unless otherwise directed by the Engineer.

#### **A. Concrete Pull Boxes**

Construct concrete pull boxes of a mixture of one part cement, two parts sand, and four parts gravel or 1-inch crushed stone with reinforcement placed as shown on the Standard Drawings. Reinforcement shall consist of welded wire reinforcement, 4 x 4 inches - No. 4/4 at 85 pounds per 100 square feet, meeting the requirements of **907.03**. Pull boxes may be poured in place or precast. The color of the pull box concrete material shall match the surrounding concrete color.

Install a cast iron frame and cover of the dimensions shown on the Drawings in each pull box. Provide castings of Class 30, meeting the requirements of **908.07**. The covers shall have a roughened top surface of 1/8 inch in relief. Provide notches for removing the cover. Inscribe the words "TRAFFIC SIGNALS" on top of the covers with letters 1-1/2 inches high and 1/8 inch in relief as shown on the Drawings.

The frame shall have a minimum weight of 42 pounds. The cover shall be of the "Extra Heavy" type with a minimum weight of 54 pounds.

#### **B. Reinforced Plastic or Epoxy Mortar Pull Boxes**

Ensure that pull boxes composed of reinforced plastic or epoxy mortar are designed and tested to temperatures of -50 °F and meet the requirements of the following: ASTM D543, ASTM D570, ASTM D790, and ASTM D635, and are based on a 30,000-pound single axle load over a 10 x 20 inch area. The top of the pull box shall consist of a concrete frame (ring) and cover. The color of the pull box concrete material shall match the surrounding concrete color. Inscribe the words "TRAFFIC SIGNALS" on top of the covers.

### **730.13 Transformer Base**

Fabricate the transformer base from steel plate and sheet, and design it to harmonize with the shaft. Provide each transformer base with:

1. One 7-1/2 x 9 inch minimum handhole, with a cover secured with stainless steel fastening screws;
2. Four galvanized steel bearing plates to fasten the base to the anchor bolts;
3. Four galvanized steel bolts, nuts, and washers to fasten base and standard; and
4. One 1/2-inch, 13 UNC grounding nut welded to the inside of the base opposite the handhole opening.

Ensure that the strength of the transformer base is comparable with that of the shaft.

When a transformer base is required, no handhole will be required in the shaft.

### **730.14 Conduit**

Furnish and install plastic and steel conduit in accordance with these Specifications and close conformity with the lines shown on the Plans or as established by the Engineer.

Threads shall be clean cut, straight, and true and of sufficient length to allow proper coupling. Do not use long running threads on any part of the Work. Protect threads in transit and during installation, and provide conduit with proper supports and protection during construction to prevent damage. Properly thread, ream, and cap all ends of pipe installed for future connections to prevent water and foreign matter from entering the conduit system. Provide threaded ends with approved conduit bushings.

Signal conduit shall be a minimum 2 inches in diameter, and detector conduit a minimum 1 inch in diameter, unless otherwise specified or directed by the Engineer. Conduit for service connections shall be 1 inch in diameter. Do not use conduits smaller than 1 inch in diameter unless otherwise specified, except grounding conductors at service points shall be enclosed in 3/4-inch diameter conduit. Larger-sized conduit may be used, at no additional cost to the Department, in which case it shall be for the entire length of the run with no reducing couplings allowed.

#### **A. Materials**

Provide conduits and fittings of the type as shown in the construction plans or as directed by the Engineer and as follows:

##### **1. Steel Conduit**

- a. Rigid conduit and fittings shall be heavy-wall, hot dipped galvanized steel conforming to Federal Specification WW-C-581-d(3) and ANSI C80.1. It shall be galvanized inside and out and shall meet the requirements of ASTM A53. Each length shall bear the label of Underwriters Laboratories, Inc.
- b. Flexible conduit shall be galvanized flexible steel meeting Federal Specification WW-C-581-d(3), ANSI C80.1 and UL Standard 6 with a minimum 40-mil thickness of polyvinyl chloride (PVC) coating conforming to ASTM D746.

**2. Plastic Conduit.** For plastic conduit, provide high impact PVC, Schedule 40 or Schedule 80.

**3. High-Density Polyethylene (HDPE).** Materials used for the manufacture of HDPE conduit and fittings shall be per ASTM F2160 and consist of a Standard Dimension Ratio (SDR) 9-11. No other substitutions shall be allowed unless directed by the Engineer. HDPE conduit can be used with preassembled cable and rope-in-conduit.

#### **B. Installation**

All bends shall be in strict compliance with the NEC.

Lay conduits to a minimum depth of 6 inches below subgrade but not less than 24 inches below pavement grade except when approved by the Engineer; conduit may be laid at a depth of not less than 24 inches below top of curb when placed in back of the curb. Place conduit runs for detectors parallel to existing or proposed curbs and not more than 18 inches behind the curb face unless other specified. Place steel conduit or Schedule 80 PVC conduit under existing pavements by approved jacking or drilling methods. Do not disturb pavements without the Engineer's approval. Where trenching is allowed in a traffic bearing area, use PVC conduit (Schedule 40) encased in concrete.

Conduits shall be continuous and extend from end point (i.e. pull box, foundation signal pole, pedestal pole, etc.) to another end point, or as directed by the Engineer. Conduit splicing shall not be permitted between end points.

After completing the installation of the conduit, test all conduits installed under the Contract with a mandrel having a diameter 1/4-inch smaller than the conduit and a length of 2 inches. Repair, to the Engineer's satisfaction, all conduits that will not allow passage of the mandrel; if repairs cannot be accomplished, remove

and replace the conduit at no additional cost to the Department. After the mandrel test, scour all conduits with a stiff wire brush slightly larger in diameter than the conduit. Clear all conduits in the Engineer's presence.

Extend conduits terminating in anchor base standards and pedestals approximately 2 inches above the foundation and slope them toward the hand-hole opening. Conduits shall enter concrete pull boxes from the bottom and shall terminate not less than 2 inches nor more than 4 inches above the bottom of the box and near the box walls to leave the major portion of the box clear.

Clean existing underground conduit to be incorporated into a new system by blowing with compressed air, or by other means approved by the Engineer.

**730.15 Conductors**

Furnish and install conductors in accordance with these Specifications and close conformity as shown on the Plans, or as directed by the Engineer.

Traffic Control Conductors shall be rated at 600 volts. Run all conductors, except loop conductors and cables run along messengers, in conduit, except where run inside poles. Where signal conductors are run in lighting standards containing high voltage street lighting conductors, encase the signal conductors in flexible or rigid metal conduit. Where telephone circuits are introduced into controller foundations, encase the telephone conductors in flexible metal conduit and in conformance with the NEC.

Conductors for traffic loops shall be continuous AWG No. 14 XLP stranded wire to the detector terminals or spliced with shielded detector cable within a pull box, conduit, or pole base.

Detector cable shall be two conductor twisted pair shielded AWG No. 14 stranded meeting IMSA Specification No. 50-2.

**730.16 Cable**

All signal cable shall conform to applicable IMSA Specification No. 19-1 or 20-1. Use stranded cable color coded AWG No. 14 for all signal and accessory circuits. Retain the same color identification for the entire length of a circuit run.

**730.17 Wiring**

1. Terminate all wiring to screw terminals using lugs.
2. Make all splices with solderless connectors, and insulate splices with weatherproof tape applied to a thickness equal to the original insulation.
3. Attach cables to messenger with non-corrosive lashing rods or stainless steel wire lashings.
4. All wiring within enclosed cabinets shall be neatly formed and harnessed and shall have sufficient length for access and servicing.

**730.18 Service Connection**

Coordinate service connection details and metering with the local utility as directed by the Engineer and in conformance with the City and County requirements. Obtain the necessary service for each installation.

**730.19 Sealant**

Provide sealant material selected from the Qualified Products List maintained by the Department's Material and Test Division for sealing saw-cuts. The sealant material shall resist the upward movement of loop and lead-in and shall

exhibit stable dielectric characteristics, including a low permittivity and high dielectric strength. It shall bond to the roadway paving material, preventing entry of moisture, and shall remain flexible without melting through the anticipated temperature and weather conditions.

**730.20 Strand Cable**

Span cable for suspending signal heads between pole supports shall be 7-strand, Class A, copper-covered steel wire strand or greater, meeting the requirements of ASTM A460, with a minimum breaking strength as noted on the Plans. An acceptable alternate is 7-strand steel wire with a Class A zinc coating meeting the requirements of ASTM A475, with a minimum breaking strength as shown on the Plans.

Strand cable for messenger wire (other than span wire as specified above) and pole guy cable use shall be of the diameter(s) shown on the Plans and shall meet the requirements of ASTM A475 for zinc-coated steel wire strand, 7-strand Siemens-Martin Grade with a Class A zinc coating or greater.

A Figure 8 cable combining the messenger cable and conductor cable in an insulated jacket is an acceptable alternate to conductor cable lashed to a messenger cable.

**730.21 Bonding and Grounding**

Make metallic cable sheaths, conduit, transformer bases, anchor bolts, and metal poles and pedestals mechanically and electrically secure to form a continuous system, and ensure they are effectively grounded. Bonding and grounding jumpers shall be copper wire or copper strap of not less than the same cross-sectional area as No. 6 AWG.

Furnish and install a ground electrode at each service point. Ground electrodes shall be one-piece lengths of copperweld ground rod not less than 8 feet in length and 1/2 inch in diameter, installed in accordance with the NEC. Ground the conduit and neutral as required under the NEC, except that grounding conductors shall be No. 6 AWG or approved equal, as a minimum. Enclose exposed ground conductors in 1/2-inch diameter conduit, and bond to the electrode with a copperweld ground clamp.

**730.22 Field Test**

Prior to completing the work, conduct the following tests on all traffic signal and lighting circuits in the Engineer's presence:

1. Test for ground in circuit.
2. Conduct a megger test on each circuit between the circuit and ground. The insulation resistance shall be not less than the values specified in Section 119 of the NEC.
3. Conduct a functional test to demonstrate that each part of the system functions as specified or intended herein.
4. Test all detector loops and leads before and after they are sealed in the pavement to ensure there are no shorts to ground in the system and to ensure that the loop plus lead-in inductance is within the operating range of the detector.

Replace or repair, in a manner approved by the Engineer, all faults in material or in the installation revealed by these tests. Repeat the applicable testing until no fault appears.

**730.23 Inspection**

After completion of the installation and before final acceptance of the Project, conduct a full operational check of the system under actual traffic conditions in the presence of the Engineer. The operational check shall cover a

minimum time period of 30 calendar days. During this period, perform all necessary adjustments and replace all malfunctioning parts of the equipment required to place the system in an acceptable operational condition at no additional cost to the Department. Perform all work and furnish all materials required under these Specifications subject to the direct supervision, inspection, and approval of the Engineer. Provide the Engineer and authorized representatives free access to the work, and to all plants, yards, shops, mills, and factories where, or in which, articles or materials to be used or furnished in connection with such work are being prepared, fabricated, or manufactured. Provide full and sufficient information to determine that the performance of the work, the character of materials, and the quality of workmanship and materials meets the intent of these Specifications.

Only perform work in the presence of the Engineer or the Inspector appointed by the Engineer, unless permission to do otherwise has first been obtained. The Engineer may reject any work that is performed or constructed in the absence of the Engineer or Inspector, without such permission having been granted, either expressly or by implication.

The inspection of the work shall not relieve the obligation to properly fulfill the Contract as specified. If the Engineer finds a part of the work, or the materials used in the work, to be defective or unsuitable at any time prior to final acceptance, repair or replace such defective or unsuitable work or material.

Request the presence of an Engineer or Inspector in connection with the work under these Specifications at least 24 hours before such services will be required.

## **SIGNAL HEADS**

### **730.24 Signal Heads**

Signal heads shall meet the latest requirements published in the Equipment and Materials Standards of the Institute of Transportation Engineers (ITE) for Adjustable Face Vehicle Traffic Control Signal Heads” and the National Electrical Code. The arrangement of traffic signal heads shall be mounted as shown on the Plans or as specified by the Engineer and be in accordance with the latest versions of the MUTCD and the TDOT Traffic Design Manual.

All circular indications shall use 12-inch lenses unless otherwise shown on the Plans. All arrow indications shall use 12-inch lenses. All new vehicle signal heads installed at any one intersection shall be of the same style and from the same manufacturer. All exposed metal signal housings, doors, visors, backplates and framework parts shall be painted with a powder coated finish and be in accordance to the MUTCD specifications. Suspensions for span wire mounting of multi-faced signal heads and signal head clusters (such as a 5-section signal head) shall include an approved swivel type balance adjuster for proper vertical alignment.

Signal head housings shall be cast aluminum and all associated parts/hardware shall be of non-corrosive material. In addition to these requirements, comply with the following:

#### **A. Optical Units**

Traffic signal indications shall be LED type and meet the Institute for Transportation Engineers (ITE) latest LED specifications. All LED indications shall have a five year warranty.

#### **B. Signal Head Mounting and Mounting Brackets**

Furnish signal heads that either have integral serrations or are equipped with positive lock rings and fittings designed to prevent heads from turning due to external forces. Lock ring and connecting fittings shall have serrated contacts. Provide signals with water-tight fittings.

Support bracket-mounted signal heads, as shown on the Plans, by mounting brackets consisting of assemblies of 1-1/2 inch standard pipe size. Ensure that all members are either plumb or level, symmetrically arranged, and securely assembled. Conceal all conductors within poles and mounting assembly. Secure each slip fitter to the pole.

**C. Directional Louvers**

Where shown on the Plans, furnish and install louvers in the hoods of the signal head sections designated.

Directional louvers shall have a snug fit in the signal hoods. Construct the outside cylinder and vanes from a non-ferrous metal or galvanized sheet steel. Louvers shall be painted with a powder coated finish.

**D. Back Plates**

Where shown on the Plans, furnish and attach back plates to the signal heads. All back plates shall be louvered and constructed of 3,003, half-hard, 0.051-inch minimum thickness aluminum sheet. Other materials such as plastic or fiberglass may be used where approved. In fabricating back plates, bend back the inside vertical edges, adjacent to the signal head, to form mounting brackets for attaching to the signal. Form back plates in two or more sections and bolt together, thus allowing for installation after signal heads are in place. Back plates shall have a dull black appearance in the front and back.

**E. Wiring**

Signal head leads shall be No. 18 AWG stranded with 221 °F thermoplastic insulation. Wire a separate white (common) lead to each socket shell; and wire a colored lead, corresponding to the color code shown on the Plans, to each socket terminal. Provide leads of sufficient length to allow connection to the terminal block specified. Provide each complete signal head with a minimum 4-point terminal block, properly mounted in a signal section. Stud type terminal blocks shall have not less than 1/4-inch edge clearance to any portion of the stud. Exterior wiring shall have a 360-degree drip loop in advance of entering the head.

**F. Pedestrian Signals**

Pedestrian signal heads shall meet the latest requirements published in the Equipment and Materials Standards of the Institute of Transportation Engineers (ITE) for Adjustable Face Pedestrian Signal Heads”, the National Electrical Code and be compatible with NEMA standards. The arrangement of pedestrian signal heads shall be mounted as shown on the Plans or as specified by the Engineer and be in accordance with the latest versions of the MUTCD and the TDOT Traffic Design Manual. The pedestrian indications shall be LED symbols and in conformance with the Institute for Transportation Engineers (ITE) latest LED specifications. All LED indications shall have a five year warranty.

In addition, where pedestrian signal heads are provided, they shall:

1. include a pedestrian change interval countdown display where the calculated pedestrian change interval is more than 7 seconds;
2. include Accessible Pedestrian Signals and pedestrian pushbuttons complying with MUTCD Accessible Pedestrian Signals section;
3. incorporate a locator tone meeting the requirements of the MUTCD Accessible Pedestrian Signals;
4. include a pedestrian pushbutton with tactile vibrating arrow button and audible sound.

The pedestrian countdown display shall conform to the latest FCC regulation on Emission of Electronic Noise.

The manufacturer must supply certification, which includes a copy of the test report by an independent technical laboratory as to the compliance with ITE specifications (where it applies). The report shall also indicate that the tests were performed only after the modules received a thirty (30) minute operational warm-up period immediately preceding the tests.

The housing door, door latch, and hinges shall be of aluminum, or polycarbonate or approved equal. Hinge pins shall be stainless steel. Provide the door with a neoprene gasket capable of making a weather resistant, dust-proof seal when closed.

All pedestrian signal heads, mountings, outside of hoods, and pedestrian push button housings shall have a powder coated finish (if aluminum) or colored resin (if polycarbonate) in accordance to MUTCD specifications.

**G. Signal Head Installation**

Install signal heads and pedestrian signal heads with the faces completely covered until the entire installation is ready for operation.

**CONTROLLERS – GENERAL**

**730.25 Controllers**

Controller equipment shall be permanently marked with the manufacturer’s name or trademark, part number, and serial number.

Controllers must meet the following applicable industry standards and amendments:

NEMA TS2 Controller ..... NEMA TS-2-2016

ATC Controller ..... AASHTO/ITE/NEMA ATC 5.2b

All NEMA TS2 and ATC controllers must provide functionality that meets or exceeds operational characteristics, including NTCIP support, as described in NEMA TS-2-2016.

NEMA TS2 Type 2 controllers shall be used when downward compatibility to existing TS1 cabinets is desired.

Except for replacing controllers in existing systems, all new installations must include controllers that capture high resolution event-based data elements to provide the automated traffic signal performance measures.

The manufacturer must supply certification of the conformance to the above requirements at the time of the bid.

In addition to the above requirements, the controller shall:

- 5. have all timing values entered via a front panel mounted keyboard. This keyboard shall be an integral part of the controller unit;
- 6. have an English language menu for programming or reading all controller features;
- 7. continue to operate the intersection as values are inspected or altered;
- 8. include the ability to upload and/or download the controller software operating system and user programmed database to or from external media (datakey, usb, sd card etc).
- 9. support Flashing Yellow Arrow for Permissive Left-turn Movements applications.

**Surge Protection Devices**The cabinet shall have Surge Protective Devices (SPDs) for the main AC power input, all signal head field wiring terminals, interconnect cable terminals and loop lead-in cable terminals which are located in the cabinet. Furnish SPDs to provide effective defense against high transient voltages caused by lightning discharges or other sources. SPDs must be unobstructed and accessible from the front side of any panel used in the cabinet. The SPD for the main AC power input of the cabinet must be connected on the load side of the cabinet circuit breaker. SPDs must meet the following minimum requirements:

- 1. AC power SPD:
  - a. Must be UL 1449 4<sup>th</sup> Edition Listed
  - b. Parallel connected device
  - c. UL Nominal Surge Rating (In): 20kA
  - d. UL Short Circuit Current Rating (SCCR): 150kA minimum
  - e. Surge current rating: 50kA per phase minimum

- f. Visual status indication
  - g. Remote signalization contacts for monitoring purposes
  - h. 10 year manufacturer’s warranty minimum
2. DC power SPD:
- a. Must be UL 1449 4<sup>th</sup> Edition recognized
  - b. Parallel connected device
  - c. UL Nominal Surge Rating (In): 10kA minimum
  - d. Must provide protection between all +/-Gnd connections
  - e. Surge current rating: 20kA per phase minimum
  - f. Visual status indication
  - g. Remote signalization contacts for monitoring purposes
  - h. 10 year manufacturer’s warranty minimum
3. Data and communication SPD:
- a. Must be UL 497B listed
  - b. 10 year manufacturer’s warranty minimum
4. Signal and interconnect cable field wiring terminal SPD:
- a. Clamp the surge voltage to a level no greater than twice the peak operating voltage of the circuit being protected
  - b. Withstand a surge current of 1000A with an 8 by 20 μs waveform six times (at 1 second intervals between surges) without damage to the suppressor
  - c. 10 year manufacturer’s warranty minimum
5. Loop lead-in cable field wiring terminal SPD:
- a. Protect the detector unit loop inputs against differential (between the loop lead) surges, and against common mode (between loop leads and ground) surges
  - b. Clamp the surge voltage to 25 V or less when subjected to repetitive 300A surges
  - c. Withstand repetitive 400A surges with an 8 by 20 μs waveform without damage
  - d. 10 year manufacturer’s warranty minimum

All SPDs must be installed according to the SPD manufacturer’s instructions and not affect the operation of equipment. SPD leads must be kept as short and straight as possible.

**CABINETS – GENERAL**

**730.26 Cabinets**

Cabinets must be permanently marked with a label including the manufacturer's name or trademark, model/part number, and the year and month of manufacture. The label should be placed on the inside of the main door using a water resistant method. The label must be visible after installation.

Cabinets shall be provided as a complete unit and have all terminals and facilities necessary for traffic signal control as shown on the plans and shall meet at a minimum, the following requirement:

NEMA TS2 Controller Cabinet ..... NEMA TS 2 2016

The manufacturer must supply certification of the conformance to the above requirements at the time of the bid.

Cabinets shall also be in accordance with the latest version of the TDOT Traffic Design Manual.

Two paper copies of the cabinet wiring diagram shall be provided with each cabinet. The nomenclature of signal heads, vehicular movements and pedestrian movements on the wiring diagram must be in accordance with the signal



operating plan. Documentation must include a list identifying the termination points of cables used for vehicular and pedestrian signal heads, detector loop lead-ins, and pedestrian pushbutton wires. A heavy duty, resealable plastic bag must be mounted on the backside of main cabinet door for storing cabinet documentation.

House the controller in a rigid, weatherproof cabinet, constructed, finished, and equipped as follows, and as shown on the Standard Details:

1. **Material.** Provide weather-tight cabinets fabricated from aluminum sheet or cast aluminum alloy with a minimum 0.125-inch thickness. All welds on fabricated cabinets shall be internal and continuous; spot welding is not acceptable. Painting of cabinets is only required if the final finish presents an unsightly appearance.
2. **Doors.** Type III, IV, and V cabinets shall have a hinged front opening door that shall include substantially the full area of the front of the cabinet. Equip the door with a positive hold fast device to secure the door in at least two open positions: one position at approximately 90 degrees and the other at 120 degrees or more. The holdfast device shall be easily secured and released without the use of tools. Equip doors for Type II, III, IV, and V cabinets with a switch compartment, and provide the manual switches, specified in **730.26.6.k**, with a hinged front opening auxiliary door. Each door shall have a gasket to provide a weatherproof seal when closed.

Provide the main door with a No. 2 pin-tumbler cylinder lock, and the auxiliary door with a standard police sub-treasury lock. Provide four keys for each lock.

Provide a switch which is to be tied to the cabinet light so that cabinet light will be on when the door is open and off when the door is closed.

3. **Cabinet Mounting.** Mount cabinets as shown on the Plans or Standard Details.
4. **Ventilation.** Unless otherwise specified, provide ventilation as follows:
  - a. On all cabinets housing controllers, mount a screened, rain-tight vent, 1-1/2 inches in diameter or larger, on the cabinet top.
  - b. Provide screened or filtered inlet ventilation openings, equal to or greater in area than top vents, located in the bottom or lower back side of Type I and II cabinets or around the lower 8 inches portion of Type III cabinets.
  - c. Construct the vents so as to project within the cabinet no more than necessary to provide for lock nuts and gaskets to retain the vent.
  - d. Locate vents so as to not interfere with the mounting of controller equipment.
5. **Cabinets with Exhaust Fans.** Exhaust fans shall consist of an electric fan with ball or roller bearings and a capacity of at least 100 cubic feet per minute. Mount the fan in a rain-tight housing attached to the top of the controller cabinet.

The fan shall be controlled by a thermostat having a temperature differential between turn-on and turn-off of 15 °F (-0, +5 °F), adjustable for turn-on through a minimum calibrated range of from 100 °F to 150 °F.

Whenever a fan is to be installed, provide the air inlet filter and filter holder shown in the Standard Details, or approved equal. Internally seal other air inlets. Provide exhaust fans in all cabinets that house controllers, with the exception of flasher controllers.

**6. Auxiliary Equipment.** With the exception of cabinets used in special applications (Type I and II), provide all cabinets with the following:

- a. Substantial shelves or brackets to support controller and auxiliary equipment.
- b. Panel for terminals arranged for adequate electrical clearance. Panels should be located in the cabinet as described below:

- Detectors	Lower left wall
- AC power	Lower right wall
- Auxiliary/police switches	Door
- Load switch bay	Back wall

c. The cabinet shall include an LED light and GFI duplex receptacle which can be used when the main circuit breaker is off.

d. Control panel assembly consisting of:

- 1. Power supply connections made to a 30-ampere circuit breaker mounted on the cabinet separate from the signal terminal panel. The circuit breaker shall be a magnetic trip type, having an interrupting capacity of at least 2,000 amperes at 125 volts AC. The circuit shall trip between 101% and 125% of rated load, with an inverse time delay characteristic provided. Instantaneous tripping shall occur at ten times the nominal rating. All controllers shall be internally fused.
  - 2. Service line surge protection.
  - 3. Electrical service termination point sized to accept No. 4 AWG copper wire.
  - 4. Ground fault receptacle.
  - 5. Porcelain lamp receptacle to accept a standard traffic signal lamp. If LED lenses are utilized, the shall be dimmable and switchable to reduce glare at night time.
  - 6. Circuit breakers in accordance to the National Electric Code for:
    - (a) Main power input to provide all power associated with normal operation.
    - (b) Flasher power input to provide all power associated with flash operation.
    - (c) Service power to provide power for the lamp and duplex receptacle and cabinet light.
  - 7. Copper ground bus (minimum of 12 positions).
- e. Flasher mechanism independent of controller. The cabinet shall be wired for and include a NEMA flasher mounted on the back panel. All cabinets shall have a two-circuit flasher. The flasher shall have output indicators mounted on the front of the flasher case and shall be rated at a minimum of 15 amperes.
- f. General purpose relays, where required to perform specified functions. All relays external to the controller or appurtenances shall meet NEMA standards. In addition:
- Flash transfer relays shall be of heavy-duty type and have a minimum contact rating of 10 amperes. Contacts shall be of silver material to reduce contact pitting.
  - Unless otherwise specified, each cabinet shall include six (6) flash transfer relays.

- Flash transfer relays shall support Flashing Yellow Arrow for Permissive Left-turn Movements applications.

- g. Type II, III, IV, and V cabinets, when specified as housing for traffic actuated controllers, with two or more insulated terminal blocks mounted within the housing, one or more for terminating each field wire.
- h. A minimum of 12 available bare ground positions tied to AC Common Return.
- i. Earth (driven) ground tie point to terminate a single No. 4 AWG copper ground.
- j. A tie point to tie all ground systems within the cabinet to a single reference point. All grounds (AC - return, Chassis, and Logic Ground) must be referenced to a single ground point at the electric service.
- k. A panel (police subpanel) shall contain the following:
  - 1. A main power switch, which shall be wired to remove all cabinet power when in the Off position
  - 2. An Automatic Flash switch, which shall be wired as follows:
    - (a) The Flash position shall cause the cabinet to provide Flash Operation. The controller shall continue to operate, and Stop Time shall be applied to the controller.
    - (b) Auto/Manual switch to activate Manual Control Enable.
    - (c) Manual control pushbutton switch with self-coiling cord. Cord shall attach to a 2 position terminal strip via fork type connector
    - (d) Upon return from Flashing to Automatic, the controller shall initialize in the Start-Up Display condition as programmed in the controller, typically major road phases.
  - 3. A panel mounted inside the main door shall contain the following switches:
    - (a) A technician Stop-Time switch to apply Stop Time to each controller ring.
    - (b) An Interval Advance switch, enabled only by the Stop Time switch, to be momentary pushbutton switch to apply Interval advance to the timer.
    - (c) A Signal On-Off switch, which shall remove the AC power applied to the signal heads for normal operation while the controller continues to operate.
    - (d) Individual phase vehicle and pedestrian detector test switches to be miniature toggle of the On-Off Momentary type to place:
      - i. No Call - Call provided by detectors
      - ii. Locked detector call
      - iii. Momentary detector call

Insulate or shield switch terminals on back of main cabinet door so that no live parts are exposed.

Leads from the terminal block to the auxiliary door switches shall be no less than No. 18 AWG stranded, with TW plasticized polyvinyl chloride or nylon insulation enclosed in

an insulating loom, and shall be of sufficient length to allow full opening of the main cabinet door.

1.

The cabinet shall be wired with the appropriate number of load switches to accommodate vehicular and pedestrian phasing according to plans. At a minimum cabinets shall include 16 load switch bases. The load switch wiring shall support Flashing Yellow Arrow for Permissive Left-turn Movement applications.

m. All cabinet wiring shall be neatly routed and labeled, laced and permanently secured. All cable shall be secured to the panel, where practical. There shall be no holes drilled through the cabinet walls to mount panels or secure cables.

n. All terminals in the cabinet shall be of the barrier type. The following field connector terminals shall be provided:

- Four (4) signal output positions per load switch bay (R-Y-G-FL).
  - Ten (10) positions per phase for vehicle loop detector harness.
  - One position per phase for pedestrian detector inputs.
- o. Cabinets shall have SDLC communication between the controller, MMU, Detector Rack, Radar Detector (if applicable) and Video Detection (if applicable).

p. Cabinets should have an electrical outlet (Non GFI) that has 120 VAC from the OUTPUT side of the Main Power Surge unit.

q. Cabinets shall support Flashing Yellow Arrow for Permissive Left-turn Movements applications.

r. All cabinets shall be supplied with a Malfunction Management Unit (MMU) and shall meet at a minimum, the following requirement:

NEMA TS2 Malfunction Management Unit ..... NEMA TS 2 2016

The manufacturer must supply certification of the conformance to the above requirements at the time of the bid.

According to NEMA TS2 the MMU shall be able to detect the presence of voltage on conflicting on conflicting field connection terminals, the absence of proper voltages on all the signal field connection terminals of a channel, and shall be capable of monitoring for the presence of satisfactory operating voltages within the Controller Unit (CU) and the MMU itself. The MMU shall be able to operate as a Type 16 with sixteen channels or as a Type 12 with twelve channels (compatible with NEMA TS1 cabinets).

The MMU should have an Ethernet port.

**730.27 Auxiliary Equipment for Traffic Signal Controllers**

Furnish and install the following auxiliary equipment in each cabinet for traffic actuated controllers.

**A. Load Switches**

Provide each cabinet complete, with the necessary number of NEMA load switches and Flash Transfer relays necessary to effect the specified signal sequence and phasing. Load switches shall:

1. Meet NEMA standards.
2. Have front-face mounted LED indicators to indicate the “On” condition of both the Input and Output circuits.

3. Use replaceable “cube” type circuitry or encapsulated discrete component construction. No unencapsulated discrete component construction are acceptable.

**B. Time Clock Switches**

Where shown on the Plans, provide time clock switches of solid state circuitry, continuous duty, with a 7-day cycle clock operating from the 120-volt AC service line. Provide switching for a minimum of one independent output and ensure the time of day selection is adjustable to within 1 minute of the desired time. Provide a battery backup system that can maintain time keeping and memory a minimum of 24 hours after power interruption. Furnish an omitting device as an integral part of the time switch to allow the switching operation to be skipped for any preselected day or days of the week. The time clock shall automatically compensate for daylight savings time changes. When the time clock is supplied as an internal component of the controller, supply the clock feature to provide for the selection of Maximum Green II on time of day, day of week, week of year basis. Time clocks shall meet NEMA environmental specifications.

When required in the traffic signal plans, the auxiliary equipment listed below shall meet the following requirements:

- A. Uninterruptable Power Supply (UPS) – An UPS shall power the traffic signal cabinet in the event of a power failure for a minimum of 3 hours.

UPS assemblies should include off-the-shelf deepcycle AGM batteries.

Loss of utility power, transfer from utility power to battery power, and transfer back to utility power must not interfere with normal operation of connected equipment. In the event of UPS failure or battery depletion, connected equipment must be energized automatically upon restoration of utility power.

Removal and replacement of the UPS must not disrupt the operation of the equipment being protected.

All harnesses necessary to connect and operate the system must be included. All connectors must be keyed to prevent improper connection.

UPS assemblies shall be installed in accordance with the manufacturer’s recommendations.

An UPS operation and maintenance manual shall be provided in the cabinet where the UPS is installed with cabinet wiring schematics, electrical interconnection drawings, parts layout and parts lists.

The UPS shall include a manufacturer’s warranty covering defects for a minimum of three years (5 years for the external batteries) from the date of final equipment acceptance. The warranty must include provisions for providing a replacement UPS within 10 calendar days of notification for any UPS found to be defective during the warranty period at no cost to the maintaining agency.

- B. Communications - Wireless - consist of installing a Wireless Network Communications Link with all necessary hardware in accordance with the plans and standard drawings to provide a data link between field devices (i.e. Traffic Signal Controllers).

Each link shall consist of Master ODU (Out Door Unit, Antenna) connected to a data switch within one of the signal cabinets and a Slave ODU connected to a data switch within the other signal cabinet. Each ODU is aligned to face the opposing ODU. The cable length between the ODU and its associated data switch may not exceed 300 feet.

The Wireless Network Communications Link components at each of the linked traffic signal cabinets shall include an ODU, a LPU (Lightning Protection Unit), power supply mounting hardware, and CAT 5e cabling. The ODU is pole mounted per manufacturer’s specifications. The LPU and power supply are mounted within the traffic signal cabinet. CAT 5e cable is installed between the ODU and LPU.

For the applicable frequency spectrum of the radios being deployed, perform a spectrum analysis to ensure no competing equipment in the area. Ensure the radio path site survey test is performed using the supplied brand of radio equipment to be deployed. Typically, if the ODUs can be mounted with clear line of sight between them, this is sufficient to ensure proper operation. If this is not possible, it may be determined that a repeater station is necessary to complete the intended link. Provide the test results to the ENGINEER for review and approval. Submit copies of the test results and colored copies of the frequency spectrum scan along with an electronic copy of this information. The ENGINEER will approve final locations of the ODUs and any necessary repeater stations.

Install each ODU in such a manner that avoids conflicts with other utilities (separation distances in accordance with the guidelines of the NESC) and as specified in the ODU manufacturer's recommendations. Secure the ODU mounting hardware to the pole and route the CAT 5E cable such that no strain is placed on the RJ-45 connectors. Align each antenna/radio to be perpendicular to the ground (using bubble level) and to face the opposing radio.

C. Fiber optic cables - Multi-mode type fiber optic cable shall be 50  $\mu\text{m}$  core diameter, with at least 12 fibers per cable unless otherwise specified in the plans. Single-mode type cable shall be between 8-9  $\mu\text{m}$  core diameter, with at least 12 fibers per cable unless otherwise specified. A fiber optic drop cable shall be a minimum of 6 fibers (each type) and be spliced into the trunkline in a splice enclosure either aerially or in a pull box. 50ft. of slack shall be provided, either lashed to a span aerially, or coiled in a pull box for underground installations. Termination panels shall be provided with sufficient size to provide for a neat installation, and enough panel space to accommodate the specified number of fibers for termination. ST connectors shall be used unless otherwise specified. Any necessary jumpers shall be provided for installed equipment.

### MISCELLANEOUS TRAFFIC SIGNALS

#### 730.28A Flashing School Signals

When shown on the Plans, provide flashing school signals that conform to the following:

1. The signal shall produce two alternate flashing lights within the marginal limits of a school speed limit sign. Details of the sign construction shall be as shown on the Plans. Sign colors shall conform to the MUTCD and be constructed of materials complying with these specifications.
2. The two LED lenses shall be yellow in color and a minimum of 8 inches in diameter. The LED lenses shall be part of a weather-proof and water-tight optical unit. The LED lenses shall meet the same requirements for vehicular signal head LED lenses. Mount the lenses in the sign using a molded endless rubber gasket with the sign being mounted to the signal case.
3. Provide a two circuit type flasher unit to provide alternating equal on-off operation. The flashing mechanism shall produce between 50 and 60 flashes per minute through two 120-volt, 60-cycle AC, 15-ampere circuits. The flasher shall be of solid state construction.
4. Wire the unit for external circuits.
5. The signal shall be actuated by time switch meeting **730.27**. Locate the timing device in a remote mounted control cabinet.
6. Where an illuminated speed limit indication is shown on the Plans, the numeral message shall be illuminated in Portland Orange in a rectangular lens and illuminated only during the period when the signal produces two alternately flashing amber lights.

In addition, the Time Clock Unit/Switch used for Flashing School Signals shall be a programmable module that allows a user to define the time and day that the school speed zone flasher assembly will initiate and terminate flashing operation. The module shall be installed within the pole-mounted signal cabinet provided as part of project. The time clock shall be compatible with the cabinet's wiring relays and termination panels and the battery power supply system. The time clock switch provided shall also have the following features/capabilities outlined below:

1. Daylight Savings Time shall be a user-programmable setting, in addition to having automated compensation per TDOT specifications.
2. The unit shall provide a minimum 12-character, multi-line alpha-numeric LCD back-lit display capable of displaying all programming parameters.

3. The unit shall be capable of being programmed manually (using an integral keyboard pad) or programmed externally using an optional software program via a laptop computer and cable connection (compatible software program is a separate and distinct item from the time switch unit, and if required, will be separately specified and noted in list of estimated project quantities).
4. Unit shall provide automatic Leap Year compensation.
5. The time clock switch shall be capable of up to minimum 24-hours of capacitive back-up operation, 48 hours desirable, in the event of power interruption.
6. Unit shall be compatible with the supplied solar powered power system / battery unit
7. Time clock switch shall be capable of being programmed for one (1) Normal / Main program, and an additional minimum of 12 Exception periods /programs allowing holiday, vacation and custom skip plans. The exception programs will allow for the Normal / Main program to be skipped or allow for flasher operation on alternative schedules (i.e. early release days, summer school, etc).
8. Unit shall conform to TDOT standard specification subsection 730.27 – Auxiliary Equipment for Traffic Actuated Controller – Time Clock Switches except as superseded herein.
9. Unit shall have non-volatile program memory to allow retention during power loss.

730.28B-Solar Power Flashers. When required, the solar power flasher equipment listed below shall meet the following requirements:

1. Solar panel and mounting equipment shall be installed on cantilever pole shaft as illustrated on layout detail sheet and as directed by manufacturer instructions.
2. Solar power unit assembly shall include all required mounting equipment, wiring/cables, battery supply, battery charging unit and other ancillary equipment necessary to operate the solar panel and properly charge the battery. The photovoltaic array shall include mounting bracket assembly to permit adjustment of the array to optimal sun exposure. The photovoltaic module shall be mounted and aligned per manufacturer recommendations to maximize solar exposure.
3. Battery unit shall meet manufacturer specifications required to operate and power L.E.D. signal displays and continuous time clock switch operation. Battery shall be compatible with cabinet equipment, including the time clock switch and the flasher signal displays. Battery unit shall meet minimum environmental and performance specifications required for system operation as recommended by solar panel and time clock switch manufacturers.
4. Solar panel and battery supply shall be of a size and power rating necessary to provide required power to time switch clock and flasher signal displays. Obtain the power load requirements from the solar power equipment manufacturer and provide as required. On a typical school day, it should be expected that the flasher system will operate up to four (4) hours per day with the time clock continuously operating to maintain its clock timer. Provide a solar system sizing report from the manufacturer indicating the power supply requirements of the proposed system required to meet the expected power demand.
5. The photovoltaic modules shall be warranted for a minimum of five (5) years from date of installation.

6. The battery system shall be a gelled-electrolyte type battery with capacity to provide a minimum of five (5) days continuous operation of the flasher assembly without charging. Batteries shall be field replaceable. Batteries shall have prorated warranty of a minimum of five (5) years from date of installation.

**730.28C Portable Traffic Signals**

Portable Traffic Signals (PTS) consists of furnishing, installing and configuring a complete PTS system that may be used in construction zones or in other temporary signal locations. The work will be at various sites throughout the state of Tennessee and will consist of providing all labor, materials, equipment and incidentals necessary to make functional the PTS in accordance with these specifications.

The PTS shall be trailer or cart mounted units that provide for easy transportation and quick setup and deployment. There shall be 2 unit options and each unit shall be self-contained.

1. Type 1 units are typically used for long term projects (i.e. projects 5 days or longer in duration) and shall include 2 signal heads per trailer with an upper signal head mounted on an overhead mast arm that can be extended over the travel lane, and a lower signal head mounted on the vertical upright of the trailer.
2. Type 2 units are typically used for short term projects (i.e. projects 4 days or shorter in duration) and shall include 1 signal head that is mounted on the vertical upright of the trailer or cart. Cart-mounted units shall be successfully crash tested to NCHRP 350 TL-3, or equivalent MASH standards. If the project duration is extended beyond 4 days, then Type 1 units should be substituted in lieu of the Type 2 units for all PTS within the signal system.

The PTS shall be MUTCD Compliant and utilize standard ITE signal heads, and adhere to the ITE Specifications and Standards for Vehicle Traffic Control Signal Heads, Light Emitting Diode (LED) Circular Signal Supplement. The unit shall be solar powered and communicate via a wireless or hardwire connection. The unit shall include all the major components listed below or be able to perform the functions of these components. The major components of the unit shall include but are not limited to the trailer or cart, telescoping mast arm (on Type 1 units only), signal head(s) and back plates, traffic signal controller with operating software, solar charging system with batteries, input and output devices, flasher units, conflict monitor, relays, communications system and other equipment required for the safe operation and installation of the unit.

The PTS signal heads and all applicable components of the PTS shall meet the physical display and operational requirements of conventional traffic signals as specific in the MUTCD.

1. For Type 1 units, each unit shall contain 2 signal heads with an upper signal head mounted on an overhead mast arm that can be extended over the travel lane with a minimum clearance of 17 feet measured from the bottom of the signal head unit to the road surface. The lower signal head shall be mounted to the vertical upright of the trailer at a minimum height of 8 feet from the bottom of the signal head unit to the road surface. The signal heads shall also include black back plates that can be easily removed. The signal heads shall have the ability to be rotated 180 degrees to face in the opposite direction and shall have the ability to rotate and lock in approximately 10 degree increments to position the signal head for the optimum visibility to motorists.
2. For Type 2 units, the signal head of the unit shall be mounted to the vertical upright at a minimum height of 8 feet from the bottom of the signal head unit to the road surface. The signal head shall also include black back plate that can be easily removed. The PTS shall be easily rotated to position the signal head for optimum visibility to motorists.

The PTS shall include a solid-state controller with operating temperature range of -40°F to +180°F and compliance with NEMA TS-5 Performance Standard. The controller or programming module shall have an easy to read front panel indicator display. The display shall be backlit and have the capability to facilitate programming and display the currently operating program for each vehicular approach. The controller shall be capable of operating the PTS



system in a fixed time, traffic actuated, or manual control mode. Each PTS in a connected system shall have the capability to serve as either the master or slave signal. Each PTS shall include a Conflict Monitor Unit (CMU), or Malfunction Management System (MMS) to ensure phase conflicts do not exist during operation.

1. A minimum of 5 automatic time-of-day timing plans within a 24-hour period should be available in fixed time mode. The operating system should have the ability to control a minimum of 4 traffic phases with programmable cycle time adjustments and user adjustable red, amber, minimum green and maximum green times. The operating system shall also have the capability of facilitating standby modes of red, red flash and yellow flash.
2. The system shall also have the ability to operate in vehicle actuation mode when vehicle detection detectors are used. The operating system shall have the capability to allow the PTS to be connected to and controlled by a standard NEMA controller.
3. The system shall have the capability to be configured and controlled remotely using a handheld wireless remote control with the capability of being operated at a distance up to ¼ mile from the master.
4. The system shall have the capability of remote monitoring for reporting, at a minimum, signal location and status, battery voltage and system defaults. The remote monitoring shall have capability to alert designated individuals if a fault condition occurs.
5. The operating system shall include password protection to prevent unauthorized programming.

The PTS shall communicate with all other PTS within the signal system via license-free wireless 900 MHZ radio link communications. The radio units shall maintain communications at a minimum distance of 1 mile. The radio system shall conform to the applicable Federal Communications Commission (FCC) requirements, including FCC 90.17, and all applicable state and local requirements. The PTS shall be in direct communication at all times either by wireless or hardwire connection to provide for the required conflict monitor.

The system shall also have the ability to operate in vehicle actuation mode when vehicle detection detectors are used. For Type 1 units, the PTS detector shall be a high-definition, multi-beam, microwave radar stop bar detector for each vehicular approach. The Type 1 radar detector shall have a minimum range of 140 feet and shall be mounted at a minimum height of 17 feet measured from the top of the road surface. For Type 2 units, the PTS detector shall be a radar detector for each vehicular approach. The Type 2 radar detector shall have a minimum range of 140 feet and shall be mounted and have complete radar detection functionality at a minimum height of 8 feet measured from the top of the road surface.

The PTS shall be equipped with a solar power array, charging unit and battery system. For Type 1 units, the number and size of batteries shall be sufficient to operate the signal for a minimum of 21 days at 70 degrees without additional charging or assist from the solar array. An on-board battery charger shall be compatible with both the solar array and with a 120V AC power source. The solar panel array shall provide for a minimum of 440 watts of solar collection capability. For Type 2 units, the PTS shall have batteries sufficient to operate the signal for a minimum of 5 days at 70 degrees without additional charging or assist from a solar array. All instrumentation for the electrical system and battery compartment shall be mounted in a lockable weatherproof enclosure. Solar panels shall be secured to the mounting brackets for theft prevention. All wiring for the unit shall be protected against weather and damage.

The trailer or cart, and all mounted components, shall conform to the wind loading requirements (90 mph minimum) as described in the AASHTO Standard Specifications for Highway Signs, Luminaries and Traffic Signals. The wind load calculations shall be completed by an independent third-party contractor, and stamped by a U.S. Registered Professional Engineer. The trailer or cart shall be made of structural steel and shall include 4 leveling/stabilizer jacks capable of lifting the trailer or cart a minimum of 6 inches. The trailer or cart shall be equipped with a hydraulic or electric lift system sufficient for 1 person to be able to raise and lower the vertical upright and/or horizontal mast arm to and from the operating position. For Type 1 or 2 units, the trailer or cart shall be equipped to provide legal and safe transport on the public highway system at speeds up to 55 mph. All exterior metal surfaces,

except signal heads and back plates, shall be powder-coat painted highway safety orange.

The PTS work shall meet the following general contractor requirements:

1. Be responsible for locating the PTS in the appropriate location based on MUTCD and ITE standards for visibility to motorists and for safe operation.
2. Be responsible for providing all hardware, software, communications equipment and licenses to operate a complete PTS system.
3. Be responsible that all PTS equipment is installed according to the manufacturer's recommendations including wireless or hardwire connections.
4. Be responsible for transport, setup, configuration, operation and monitoring of the PTS throughout the entire project. The Engineer shall approve all timing and settings that are used for operation of the signal.
5. As directed by the Engineer, it may be necessary to relocate the PTS during the project. The cost of the relocation shall be included in the PTS price bid.

**DETECTORS**

**730.29 Detectors**

Provide detectors, of the type shown on the Plans, to actuate signal phases of traffic actuated controllers. Provide ample lightning protection to provide effective defense against high transient voltages caused by lightning discharges or from other sources. The lightning protection unit must withstand repeated 400-ampere surges on a 9 x 20 microsecond waveform. Also, the unit must be a two-stage device capable of clamping a minimum of one hundred 300-ampere surges to 25 volts within 40 nanoseconds for surge applied across the two detector leads.

**A. Inductive Loop Detection System**

Inductive loop detector units (loop amplifiers) shall meet at a minimum, the following requirement:

NEMA TS2 Inductive Loop Detector Units ..... NEMA TS 2 2016

Loop amplifiers may be single or multi-channel and shall be of the totally self-contained type.

All loop amplifiers shall be of the type to provide both "Extended" and "Delayed" outputs.

The loop detector amplifier shall be full automatic, requiring no adjustments to effect operational ability other than setting of the operating frequency and sensitivity. The amplifier shall:

1. Sense any legal motor vehicle traveling at speeds up to 65 miles per hour.
2. Have both a "Pulse" and "Presence" Output:
  - a. Pulse output shall generate an output of 125 ±25 millisecond output for each vehicle entry.
  - b. Presence output shall provide a continuous output for up to 60 minutes as long as a vehicle is within the detection zone.
3. Provide at least four user selectable sensitivity ranges.
4. Be supplied with at least three frequency ranges for crosstalk minimization.

5. Have a front-face mounted indicator to indicate active output of the internal relay. This indicator shall indicate the presence of:
  - a. Normal Output
  - b. Delayed Output
  - c. Extended Output
6. Have a front-panel mounted “Reset” switch that when pressed shall cause the unit to completely re-tune itself.
7. Have Delayed or Extended timing features with the following ranges:
  - a. Delayed output of 0 to 30 seconds in 1-second increments.
  - b. Extended output of 0 to 10 seconds in 1/4-second increments.
8. Have internal diagnostics to determine the operational ability of the loop. These diagnostics shall determine if a loop is opened or shorted, and shall provide a visible indication of such condition. Additionally, if such a condition occurs, the amplifier unit shall default to a “constant” output.
9. Provide output by a mechanical relay, which shall be “off” to provide an output.
10. Have all delay functions wired to the associated plan phase green to inhibit that function during controller phase green.
11. Be able to operate with loop lead-in lengths of at least 2,000 feet.

Comply with the details of the detector loop installation as shown on the Plans or Standard Drawings.

B. Video Detection System (VDS)– when specified in the plans, the equipment shall consist of all items necessary to provide a complete functional video detection system that process images and provide detection outputs to the traffic signal controller.

VDS shall be capable of NEMA TS2 operation.

VDS shall be waterproof and weather resistant.

VDS shall provide user-defined detection zone programming via a graphical user interface (GUI) and any necessary equipment for future programming. The configuration database shall have the ability to be stored on a removable data storage external to the video card,

VDS shall display programmable detection zones and detection activations overlaid on live video inputs. It shall detect vehicles in real time as they travel across each detection zone.

VDS shall have a minimum of 24 programmable detection zones per camera.

VDS shall be capable of:

1. shadow rejection without special hardware;
2. non-impaired operation under light intensity changes;
3. maintained operation during various weather conditions (e.g. rain, fog, snow)
4. anti-vibration, 5% rejection based on image change;
5. ability to select direction of flow parameters;
6. ability to properly detect directionally;
7. ability to configure presence, pulse, extend and delay outputs;
8. ability to set up a minimum of six detection zones per camera view to count the number of vehicles detected and store the information for retrieval;
9. variable focus providing a minimum of 4 to at least 40 degree horizontal field of view;
10. store detection zones in non-volatile memory;

VDS shall have no splices between the processors and the cameras.

VDS shall provide LED indicators to show active detection.

VDS camera shall have an internal heater to assure proper operation of the equipment during low temperatures.

VDS shall have surge ratings as set forth in NEMA specifications.

VDS shall have a two-year warranty and updates of all software shall be available without charge during the warranty period.

C. Radar Vehicle Detection System (RVDS)\_– when specified in the plans, the equipment shall consist of all items necessary to provide a complete functional RVDS that process high-definition, multi-beam radar electromagnetic waves and provide detection outputs to the traffic signal controller.

RVDS shall be capable of NEMA TS2 operation.

An RVDS shall consist of the following components: Radar sensor (1), detector rack interface module (1) power and surge protection panel or module (1) (cabinet interface devices that combine one or more of the above components shall be acceptable as well), and all associated equipment required to setup and operate in a field environment including software, serial and ethernet communication ports, cabling, electrical connectors and mounting hardware.

The RVDS shall be able to operate in all types of weather conditions including: rain, snow, sleet, ice, fog and windblown dust.

Lightning and surge protection will be provided for power connections and communications links to the radar RVDS.

The RVDS shall provide a “fail safe” operation that triggers when communication between the radar vehicle sensor and the interface module is broken. Contact closure from the interface module will occur on all programmed detector channels associated with the affected radar sensor when the fail safe is triggered and will remain in this state until communication is re-established between the interface module and the radar vehicle sensor.

The RVDS shall comply with all applicable Federal Communications Commission (FCC) requirements. The manufacturer will provide documentation of compliance with FCC specifications.

The RVDS shall maintain frequency stability without the use of manual tuning elements by the user.

The RVDS as a minimum must provide a minimum of 4 separate RF channels selectable by the user to avoid interference with other devices working on the same frequency.

The communication port(s) shall support a communication speed that will not introduce excessive latency between when a vehicle is detected and the contact closure in the traffic signal cabinet.

RVDS interface modules that utilize the detector rack must operate at 12V or 24V DC. Shelf mounted interface modules must operate within a range of 89V to 135V AC, 60 Hz single phase. Power to the RVDS radar sensor must be from the transient protected side of the AC power distribution system in the traffic control cabinet in which the RVDS is installed.

RVDS documentation shall include a comprehensive user guide as well as quick reference guide(s).

RVDS shall have the ability to configure presence, pulse, extend and delay outputs.

D. Wireless Magnetometer Detection System (WMDS)\_ - when specified in the plans, the equipment shall consist of all items necessary to provide a complete functional wireless magnetometer detection system that process changes to earth magnetic field and provide detection outputs to the traffic signal controller.

WMDS shall be capable of NEMA TS2 operation.

The WMDS shall consist of the following components: In-pavement sensors, all wireless communication equipment needed to establish communication links to the controller cabinet, interface modules compatible with NEMA TS-2 V2.06b cabinet detector rack, surge protection for the WMDS and system software for set-up and monitoring of the WMDS.

The WMDS must be capable of detecting a variety of vehicle types including motorcycles, automobiles and large trucks. The system must allow the user to select sensitivity levels that adjust the amount of hysteresis to the magnetic field needed to achieve contact closure to the assigned detector channel. Magnetometer sensitivity level adjustments must allow for different levels of vehicle detection.

WMDS shall have the ability to configure presence, pulse, extend and delay outputs.

WMDS equipment failure such as: the sensor, communications link, access point radio, repeater radio (if used) or interface module, shall result in constant vehicle call “fault state” on the affected detector channel to the traffic controller.

WMDS detection accuracy must be comparable to properly operating inductive loops.

The WMDS shall provide real-time vehicle detection (within 150 milliseconds (ms) of vehicle arrival). Once detection is achieved by the sensor, the traffic controller must receive contact closure to the assigned detector channel within the 150 ms time frame.

The WMDS in-pavement sensor must operate on batteries without the need for underground power or communication cable connections to the unit.

The average operating life span of the sensor under battery power must be a minimum of 10 years.

The interface module must provide 2 or 4 detector channels. Sensors must be assignable to the available detector channels on the interface module using software provided with the WMDS.

The front face of the module shall identify detector channel 1 and detector channel 2. Each must use an LED to indicate contact closure on the channel. When vehicle detection is achieved, the LED will be on and contact closure applied to the detector channel. During periods of no vehicle detection the LEDs will be in an off state and no contact closure will be applied to the detector channel.

The interface module will use an LED indication to indicate a "fault state" with the WMDS. When the fault state is active contact closure will be applied to the appropriate detector channel.

### **E. Pedestrian Push Buttons**

Where shown on the Plans, furnish and install pedestrian push buttons of substantial tamper-proof construction. They shall consist of a direct push type button and single momentary contact switch in a cast metal housing. Operating voltage for pedestrian push buttons shall not exceed 24 volts.

Provide a weatherproof assembly, constructed to prevent electrical shocks under any weather condition.

Where a pedestrian push button is attached to a pole, the housing shall be shaped to fit the curvature of the standard or post to which it is attached to provide a rigid installation.

Unless otherwise specified, install the push button and sign on the crosswalk side of the pole.

Pedestrian push buttons shall have a transient protection that meets NEMA specifications.

730.30 (Reserved)

730.31 (Reserved)

## **TRAFFIC SIGNAL SUPPORTS**

### **730.32 Cantilever Signal Supports**

This Subsection applies to the manufacture of steel poles and mast arms for the support of traffic signals. The height of poles, shaft dimensions and wall thickness shall meet the design requirements and mounting height of traffic signals as set forth in these Specifications and shown on the Plans. The Plans indicate bracket arm lengths.

Furnish poles consisting of a straight or uniformly tapered shaft, cylindrical or octagonal in cross-section, having a base welded to the lower end and complete with anchor bolts. All castings shall be clean and smooth with all details well defined and true to pattern. Steel castings shall conform to ASTM A27, Grade 65-35. Gray iron castings shall conform to ASTM A126, Class A.

All mast arms shall be compatible with the poles in material, strength, shape, and size.

**A. Anchor Base**

Secure an anchor base of one-piece cast steel or steel plate of adequate strength, shape, and size to the lower end of the shaft. Place the base so as to telescope the shaft, and weld at the top and bottom faces with continuous fillet welds so that the welded connection develops the full strength of the adjacent shaft section to resist bending action. Provide each base with a minimum of four holes to receive the anchor bolts. Provide cast steel bases with removable cast iron covers for anchor bolts and tapped holes for attaching covers with hex head cap screws.

Provide a welded frame handhole, 5 x 8 inches minimum and located with a clear distance above the base of no less than the pole diameter, "D". Weld a 1/2-inch 13 UNC grounding nut to the inside of the pole at a point readily accessible for wiring.

**B. Shaft**

Fabricate shafts from the best, hot-rolled basic open hearth steel. The shaft shall have only one longitudinal electrically welded joint and may have electrically welded intermediate transverse full penetration circumferential joints, at intervals of not less than 10 feet. The shaft shall be longitudinally cold-rolled to flatten the weld and increase the physical characteristics so that the metal will have a minimum yield strength of 48,000 pounds per square inch. Where transverse full penetration circumferential welds are used, the shaft fabricator shall furnish to the Engineer certification that: (1) all such welds have been radiographed and ultrasonically tested by an independent testing laboratory using a qualified Nondestructive Testing (NDT) technician and (2) the NDT equipment has been calibrated annually.

Fit the shaft with a removable pole cap, a J-hook wire support welded inside near the top, and a flange plate assembly to match that welded to the butt end of the mast arm.

**C. Mast Arms**

Provide mast arms fabricated and certified in the same manner as the upright shafts and that have the same physical characteristics.

The mast arms shall meet the design requirements necessary to support rigidly mounted traffic signals as shown on the Plans. All arms shall include a removable cap at the tip, grommeted wire outlets, and signal hanger assemblies of the type and number shown on the Plans, and a flange plate welded to the butt end to provide a rigid connection to the mast. The assembly shall be constructed so that all wiring can be concealed internally.

Connect mast arms to the upright pole at a height necessary to provide a minimum clearance of 16 feet 6 inches and a maximum clearance of 19 feet under the traffic signal heads. Install separate signal heads to provide the same clearance.

**D. Finish**

Galvanize steel poles, mast arms, and hardware in accordance with ASTM A123.

Galvanize all steel and cast iron components, hardware, and threaded fasteners, except anchor bolts, after fabrication in accordance with ASTM A123, or A153 or A385, as applicable.

**730.33 Steel Strain Poles**

Provide steel strain poles consisting of a uniformly tapered or equivalent upright shaft fitted with a removable pole top, J-hook wire support and 45-degree wire inlet near the top, a span wire clamp, a 5 x 8 inch handhole with reinforced frame and cover, bent anchor bolts, and all other accessories needed to make a complete installation. The pole and all of its component parts shall be designed to support tethered traffic signals of the type and number

shown on the Plans, suspended from a span wire assembly. Fabricate and certify the poles as specified for the upright shafts in **730.32**.

Determine the shaft length required to meet field conditions and vertical clearances of signal heads over the roadway. The signal head clearance shall be a minimum of 16 feet 6 inches and a maximum of 19 feet. Fasten the span wire no closer than 1 foot 6 inches from the top of the pole.

Unless otherwise specified, provide all strain pole traffic signal supports with a one-piece anchor type base, fabricated from drop forged or cast steel of sufficient cross-section to fully develop the ultimate strength of the poles. Fasten the base to the pole with a welded connection that develops the full strength of the pole. Provide the base with a minimum of four holes of sufficient size to accommodate the proper size anchor bolts that are capable of resisting at yield strength stress, the bending moment of the shaft at its yield strength stress. Provide removable cast iron covers for the anchor bolts.

The shaft shall be fabricated from material providing a minimum yield strength of 48,000 pounds per square inch after fabrication.

Galvanize the steel poles and hardware in accordance with ASTM A123.

Galvanize all steel and cast iron components, hardware, and threaded fasteners, except anchor bolts, after fabrication in accordance with ASTM A123, or A153 or A385, as applicable.

### **730.34 Pedestal Support Signal Poles**

Provide pedestal poles consisting of one upright pole with suitable base and other accessories or hardware as required to make a complete installation.

All poles shall be made of one continuous piece from top of base connection for the entire height of the pole. The cross-section shall be either cylindrical or octagonal and may or may not be uniformly tapered from butt to tip.

The cross-section at the tip shall have a 4-1/2 inch outside diameter.

#### **A. Type "A" Pedestal (Aluminum)**

Pedestals shall be of uniform octagonal or cylindrical cross-section of the tubular tapered type fabricated of one full length sheet.

Bases shall be octagonal or square in shape, of the ornamental type fabricated of cast material. Provide a handhole in each base.

Caps shall be of the nipple or tenon type mounting fabricated of cast material.

Furnish bases with four steel anchor bolts of sufficient size and length to securely anchor the base to the concrete footing. Weld the shaft to the cast metal base. Refer to the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (current edition).

Type A pedestal shaft shall be fabricated from aluminum tubing 6063-T4 heat treated to T-6 temper after fabrication, and meeting ASTM B221.

Type A anchor base shall be made of sand-cast aluminum alloy 356-T6 meeting ASTM B26 - SF 70A-T5 specifications.

#### **B. Type "B" Pedestal (Steel)**

Pedestals shall be fabricated from a 4-1/2 inch (outside diameter) seamless steel pipe.

Bases shall be octagonal in shape of the ornamental type fabricated of cast or malleable iron and shall have minimum height of 12 inches. The top opening of the base shall be threaded to receive the shaft. Provide a handhole in each base.

Furnish bases with four steel anchor bolts of sufficient length to securely anchor the base to the concrete footing.

### **730.35 Wooden Pole Signal Supports**

#### **A. General**

Provide wooden poles of the class and length shown on the Plans and that meet **917.11**. Set poles to the depth shown on the Plans, and fit them with all the necessary hardware to make the installation complete.

The signal head clearance shall be 16 feet 6 inches minimum and 19 feet maximum. Fasten the span wire at least 2 feet below the top of the pole.

#### **B. Guying Components**

Guy clamps shall be steel, 3-bolt type, 6 inches in length, and of the proper strand size to fit the wire used. The clamp bolts shall have upset shoulders fitting into the clamp plate. Substitution of the cable grip is subject to the Engineer's approval.

Attach guy wire to the pole with a 5/8-inch diameter x 12-inch length single strand angle-type eye bolt with 2 x 2 inch square cut washers, lock washer, and square nut.

Instead of the eye bolt specified above, an angle single strand eye of drop forged steel may be used, fastened on threaded end of span wire eye bolt.

Sidewalk guy fittings shall consist of 2-inch inside diameter standard galvanized steel pipe of required length with malleable iron pole plate and guy clamp. Fasten the pole plate to the pole with a 3/8-inch thru bolt and 1/2-inch lag screws.

All guying components and hardware shall be galvanized in accordance with ASTM A123 or A153.

Anchors for guys shall be of the pressed steel four-way expanding fluke type or of the steel or malleable iron sliding plate type. The minimum unexpanded diameter shall be 8 inches, and the minimum expanded area shall be 110 square feet. Coat anchors with a black asphaltic paint.

Guy anchor rods shall be drop-forged steel, 3/4-inch diameter and 7-foot minimum length, threaded, of the single thimble eye type, with a square anchor bolt nut.

### **730.36 Pole Location**

Install all signal support poles at the locations shown on the Plans or where directed by the Engineer.

## **COMPENSATION**

### **730.37 Method of Measurement**

Measurement for traffic signals will be on a per item basis for each item to be furnished and installed, as specified herein and shown on the Plans.



With regard to items for signal head assemblies, each item to be furnished, installed, or both furnished and installed shall be distinguished with a code number as follows:

1. The first digit is the number of faces per assembly.
2. The second digit will indicate the number of 12-inch lenses per assembly (including arrow lenses).
3. The third digit is the quantity of 8-inch lenses per assembly.
4. The letter "A" indicates an arrow lens and the digit following the "A" indicates the number of 12-inch arrow lenses per assembly.
5. The letter "H" or "V" indicates the arrangement of arrow signal lenses to be horizontal or vertical with respect to solid ball indications.

EXAMPLE:

1 5 0 A 2 H

Digits indicate the following:

1 = one face

5 = five 12-inch lenses

0 = zero 8-inch lenses

A2 = two 12-inch arrow lenses

H = Arrow lenses placed horizontally with respect to circular indications

#### **A. Removal of Signal Equipment**

The Department will measure items of equipment or material designated or required for removal on a per each intersection basis. Removal and salvage of all signal heads, poles, control equipment, cabinets, span wire, cable, and similar features to be performed at an intersection shall be included as a unit cost per each intersection. This includes the cost of stockpiling salvable equipment for pick-up by the appropriate agency, as noted in the Plans.

#### **Signal Head Assembly (includes Pedestrian Signal Heads)**

The Department will measure signal heads of the type shown on the Plans by the individual assembly complete in place, per each. This item shall include the signal heads, terminals, lamps, attachment hardware, cable connection, and testing.

#### **Pull Box**

The Department will measure each pull box of the type required as one complete unit, installed, per each. This item includes the pull box, excavation, backfilling, crushed stone base, and other incidental items as called for in the Plans or Standard Drawings.

#### **Electrical Service Connection**

The Department will measure Electrical Service Connections on a per each signal installation basis. This item includes the electrical service supplied to the weatherhead by the local utility, all necessary materials and labor for connection of the electrical service from the controller to the weatherhead, the wiring of the controller and detectors, and all incidentals necessary to render a complete and operable system.

#### **Signal Cable**

The Department will measure the length of Signal Cable of each size (number of conductors) installed in linear feet to the nearest foot from point to point along the routing for each cable.

The Department will make horizontal measurements by center to center measurement from:

1. Pole to pole
2. Pole to signal head (when terminating in a signal head)
3. Pull box to pull box
4. Pull box to pole
5. Pull box to pole-mounted or base-mounted controller

For cable inside mastarms, the Department will measure from center of vertical support to signal head where cable terminates.

The Department will make vertical measurement by one of the following:

1. For cable inside poles or conduit risers, the distance from ground level to the point of attachment of the span wire.
2. For cable inside mast arm supports, the distance from ground level to the mast arm connection.
3. For cable to pole-mounted controller,
  - a. From ground level to bottom of controller.
  - b. From bottom of controller to point of attachment of span wire.
4. For cable to pole-mounted signal head or pushbutton,
  - a. From ground level to bottom of signal head or pushbutton
  - b. From bottom of signal head or pushbutton to point of attachment of span wire.

The Department will make no additional allowance for slack length, length inside equipment or supports (except as noted), length for the required 360-degree drip loop, and similar instances requiring additional length of cable.

### **Span Wire**

The Department will measure Span Wire Assembly, Tether Wire Assembly, and Messenger Cable by type in linear feet to the nearest foot. The measurement will be made from center to center of poles. These items include attachment hardware, strain insulators, and other hardware shown in the Plans as part of the assembly. The Department will make no additional allowance for slack length and other instances requiring additional length of wire.

### **Steel Conduit Riser Assembly**

The Department will measure conduit riser assemblies per each for each size conduit riser installed on the outside of a pole, as shown on the Plans. This item includes conduit, weatherhead, conduit, fittings, nuts, washers, banding, clamps, grounding, and other items necessary for installation.

### **Conduit**

The Department will measure conduit in linear feet to the nearest foot for each size and type of conduit installed.

The Department will measure underground conduit along the conduit by one of the following:

1. From the face of curb to the center of a pull box, pole or controller foundation,
2. From center to center of pull boxes,
3. From center to center of a pull box and a pole or controller foundation, or
4. From center to center of pole foundations or pole foundation and controller foundation.

The Department will add:

1. 1 foot to the above measurements for each entry to a pull box or pole foundation and each exit of a pull box or pole foundation.
2. 3 feet to the measurement for each capped extra entry (conduit stub) or exit to a pull box or pole foundation installed, as shown on the Plans.
3. 3 feet to the measurement for each connection between underground conduit and above ground riser.
4. 3 feet to the measurement for each entry or exit to a foundation for a base-mounted controller.

This item includes trenching, backfilling, sealing, capping, fittings, bushings, banding, grounding, and other accessories and hardware required for installation of the conduit system.

### **Vehicle Loop Detector (Amplifier)**

The Department will measure vehicle detector loop amplifier per each unit, including the cable and associated hardware necessary to electrically connect the amplifier to the controller and loop lead in.

The Department will measure two and four channel card rack type amplifiers per each unit, including the cable, card rack(s), and associated hardware necessary to electrically connect the amplifiers to the controller and loop lead-ins.

### **Shielded Detector Cable**

The Department will measure the two-conductor shielded detector cable installed between the controller cabinet and the loop detector wires in linear feet to the nearest foot.

The Department will make horizontal measurements (overhead and underground) by one of the following:

1. From center to center of pull boxes,
2. From center to center of pull box and pole,
3. From center to center of poles, or
4. From center to center of pull box or pole and controller foundation.

The Department will make vertical measurements by one of the following:

1. From ground level to the point of attachment of span wire, inside pole or conduit riser,
2. From the bottom of controller cabinet to the point of attachment of span wire, or
3. From ground level to the bottom of controller.

The Department will make no additional allowance for slack length, length inside equipment or supports (except as noted), splices, and similar instances requiring additional length of cable.

### **Saw Slot**

The Department will measure the length of saw slot for installation of detection loop and lead wiring in linear feet to the nearest foot. Measurement for detection loops in the traffic lanes will be made based on the loop size shown on the Plans (the nominal length plus the nominal width) times 2. The Department will make no additional allowance for saw overruns to obtain full depth of saw slot or diagonal cuts to prevent sharp bends in the loop wire. The Department will measure saw slot for detection loop leads from the conduit entry at the face of curb or edge of pavement and along the route of the lead-in to the detection loop.

This item includes backing rods, or polyethylene foam sealant, loop sealant, and all other incidentals necessary to render a complete and operable system.

**Loop Wire**

The Department will measure the length of loop wire for installation of detection loops and lead-ins in linear feet to the nearest foot. Measurement will be made from the pull box or pole to the detection loop, around the loop the required number of turns and back to the pull box, pole, or point of splice. The Department will make no additional allowance for slack length, length inside equipment or supports, splices, and similar instances requiring additional length of wire.

This item includes electrical connections, testing, and all other incidentals necessary to render a complete and operable system.

**Controller**

The Department will measure controllers as one complete unit, installed, per each. This item includes all auxiliary equipment shown the Plans to provide signalization control as shown on the Plans, and all hardware, including the cabinet (and cabinet foundation, if base-mounted), necessary for installation.

**Wood Pole**

The Department will measure Wood Poles, of the type and size shown on the Plans, per each, installed.

**Guying Device**

The Department will measure Guying Devices, of the type shown on the Plans, per each, installed. This item includes the guy wire, anchor, clamps, and all other components shown on the Plans necessary for installation.

**Steel Strain Pole**

The Department will measure Steel Strain Poles of the type and size shown on the Plans, per each, installed. This item includes the pole, foundation, anchor bolts, grounding, and all other hardware shown on the Plans necessary for a complete installation.

**Cantilever Signal Support**

The Department will measure Cantilever Signal Supports, of the type and size shown on the Plans, per each, installed. This item includes the vertical pole shaft, mast arm, foundation, anchor bolts, grounding, and all other hardware shown on the Plans necessary for a complete installation.

**Service Cable**

The Department will measure two conductor power service cable, of the type and size shown on the Plans, in linear feet to the nearest foot, installed. Horizontal runs will be measured center to center of poles. Vertical runs will be measured from the ground to the weatherhead inside a pole or conduit riser, or from the ground to the bottom of the controller, or from the bottom of the controller to the weatherhead. This item includes all necessary attachment hardware. The Department will make no additional allowance for slack length or other instances requiring additional length of cable.

**Pedestrian Pushbutton with Sign**

The Department will measure Pedestrian Pushbutton with Sign as one complete unit, in place, per each. This item includes the pushbutton, sign, mounting hardware, wiring of pushbutton, testing, and all other incidentals necessary for a complete installation.

**Pedestrian Signal Display with Pushbutton and Sign**

The Department will measure Pedestrian Signal Display with Pushbutton and Sign as one complete unit, in place, per each. This item includes the signal heads, terminals, lamps, cable connections, pushbutton, sign, all attachment hardware, testing, and other incidentals necessary for a complete installation.

**Portable Traffic Signal**

The Department will measure Portable Traffic Signal, of the type shown on the Plans or as directed by the Engineer, per each, installed. This item includes the all of the software and hardware necessary for a complete installation.

**730.38 Basis of Payment**

The Department will pay for accepted quantities, complete in place, at the contract prices as follows:

<i>Item</i>	<i>Pay Unit</i>
Traffic Signal	Lump Sum
Removal of Signal Equipment	Each
Signal Head Assembly (Description)	Each
Install Pull Box (Description)	Each
Electrical Service Connection	Each
Signal Cable – (Description)	Linear Feet
Span Wire Assembly ( ___ pounds min. break strength)	Linear Feet
Tether Wire Assembly – ___" Diameter	Linear Feet
Messenger Cable – ___" Diameter	Linear Feet
Riser Assembly (Description)	Each
Conduit ___" Diameter (Type)	Linear Feet
Vehicle Detector (Description)	Each
Shielded Detector Cable	Linear Feet
Saw Slot	Linear Feet
Loop Wire	Linear Feet
Controller (Description)	Each
Wood Pole (Description)	Each
Guying Device (Description)	Each
Steel Strain Pole (Description)	Each
Cantilever Signal Support (Description)	Each
Service Cable	Linear Feet
Pedestrian Pushbutton with Sign	Each
Pedestrian Signal Display with Pushbutton and Sign	Each
Portable Traffic Signal (Type)	Each

The unit price to be paid includes the cost of furnishing and installing, complete in place, each of the various types of equipment required by the Summary of Quantities shown on the Plans. Total payment is full compensation for all materials, labor, equipment, and incidentals necessary to produce a completely operative and finished installation of a traffic signal or traffic signal system as shown on the Plans and as specified herein, including restoration of pavements, sidewalks, and appurtenances damaged or destroyed during construction and tests. All additional materials and labor not specifically shown or called for, which are necessary to complete the traffic signal installation or traffic signal system described, will be considered incidental to the system and no additional allowance will be made.

**STATE**

**OF**

**TENNESSEE**

(Rev. 5-18-15)

(Rev. 11-16-15)

(Rev. 6-27-16)

(Rev. 12-2-16)

(Rev. 5-15-17)

(Rev. 11-6-17)

(Rev. 5-14-18)

(Rev. 10-8-18)

(Rev. 5-13-19)

(Rev. 12-30-19)

January 1, 2015

**Supplemental Specifications - Section 900**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 901.01** (pg. 918), 5-14-18; Add the following sentence as the second paragraph of the subsection:

Provide hydraulic cement, selected from the Department’s QPL, which conforms to the following for the kind and type specified or allowed:

- Portland cement.....AASHTO M 85
- Portland blast-furnace slag cement (Type IS) AASHTO M 240
- Portland-pozzolan cement (Type IP).....AASHTO M 240
- Portland-limestone cement (Type IL) .....AASHTO M 240

The maximum allowable equivalent alkalis is 0.60% for all cements and blended cements used in concrete riding surfaces with aggregates meeting the requirements of 903.24. This includes Class CP, A Paving, and DS concrete mixtures.

**Subsection 901.01** (pg. 918), 5-13-19; **Hydraulic Cement**; Revise 1<sup>st</sup> paragraph:

Provide hydraulic cement, selected from the Department’s Producer List that conforms to the following for the kind and type specified or allowed:

**Subsection 903.01** - Table 903.01-1 (pg. 920), 5-18-15; Replace Note (1) with the following:

“(1)If the fine aggregate is manufactured from crushed stone and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 5%.

**Subsection 903.01** (pg. 920), 5-13-19; **Fine Aggregate for Concrete**; Revise No. 3:

3. Provide fine aggregate meeting the quality requirements in 903.25.

**Subsection 903.01** - Table 903.01-1, Table 903.01-2 (pg. 921), 5-15-17; replace Tables 903.01-1 and 903.01-2 with the following Tables:

**Table 903.01-1: Limits of Deleterious Substances in Fine Aggregate for Concrete**

Substance	Maximum Permissible Limits Percent by Weight
Clay Lumps	0.5
Coal and Lignite	0.5
Material Passing the No. 200 Sieve <sup>(1)(3)</sup>	3.0
Other deleterious substances (such as shale, alkali, mica, coated/grains, soft and flaky particles) <sup>(1)(2)</sup>	3.0

<sup>(1)</sup> If the fine aggregate is manufactured from crushed stone and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 10%.

<sup>(2)</sup> Determine other organic impurities according to AASHTO T 267.

<sup>(3)</sup> If the fine aggregate is manufactured from crushed gravel and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 3.5%.

**Table 903.01-2: Gradation Requirements for Fine Aggregate**

Sieve Size	Total Percent Passing by Weight
3/8 inch	100
No. 4	95-100
No. 16	50-90
No. 50	5-35
No. 100	0-20
No. 200 <sup>(1)</sup>	0-3

<sup>(1)</sup> If the fine aggregate is manufactured from crushed stone and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 10%.

**Subsection 903.02** (pg. 921), 5-13-19; **Fine Aggregate for Mortar**; Revise 1<sup>st</sup> paragraph:

Provide mortar sand that conforms to AASHTO M 45, meets the quality requirements in 903.25, and that is uniformly graded from coarse to fine within the limits specified in Table 903.02-1.

**Subsection 903.03** (pg. 922-923) 11-16-15; Coarse Aggregate for Concrete, modify the 4<sup>th</sup> and 5<sup>th</sup> paragraphs, update Table 903.03-1: Coarse Aggregate Sizes to the following:

“Coarse aggregate in Portland cement concrete bridge decks and overlays on interstates and four or more lane highways consisting of Size No. 57 shall meet 903.24.

The coarse aggregates for travel lanes and bridge decks shall be crushed and consist of stone, slag, gravel, quartzite, gneiss, or combination thereof with an absorption of plus 4 material not to exceed 5%. Do not use uncrushed gravel, pea gravel, or any other uncrushed particles. Crushed gravel, if used, shall consist of siliceous washed particles after processing, of which at least 70% by count of the material retained on the No. 4 sieve contains a minimum of two fractured faces. One face shall be fractured for the approximate average diameter or thickness of the particle.”

Table 903.03-1

<b>Application</b>	<b>Coarse Aggregate Size <sup>(1)</sup></b>
Structural concrete	No. 57
Self-Consolidating concrete	Maximum-No.67
Prestressed concrete	No. 57 or 67
Precast concrete	Any size fraction
Concrete curbing placed by machine-extrusion methods	No. 7, 57, 67, or 78
Cement treated permeable base <sup>(2)</sup>	No. 57
<sup>(1)</sup> Gradation shall conform to <b>903.22</b> .	
<sup>(2)</sup> Aggregate shall meet the quality requirements specified below.	

**Subsection 903.03** (pg. 922) 5-15-17; Coarse Aggregate for Concrete, add the following as the 4<sup>th</sup> paragraph:

“Coarse aggregate in two-lift composite pavements shall consist of Size No. 467 in the lower lift, graded as specified in 903.22. Coarse aggregate in the upper lift shall be Size No. 57 or 67 graded as specified in 903.22 and shall meet 903.24 riding surface requirements.”



**Subsection 903.03** (pg. 923), 5-13-19; **Coarse Aggregate for Concrete**; Revise 6th paragraph and Table 903.03-1:

For other uses of concrete, provide coarse aggregate of the sizes specified in Table 903.03-1, or as otherwise shown or directed. If proposing to use a coarse aggregate size not specified in Table 903-03.1 or shown on the plans, submit a written request to Regional Materials and Tests explaining the necessity for the change.

**Table 903.03-1: Coarse Aggregate Sizes**

<b>Application</b>	<b>Coarse Aggregate Size <sup>(1)</sup></b>
Structural concrete	No. 57
Self-Consolidating Concrete	Maximum No. 67
Prestressed concrete	No. 57 or 67
Precast concrete	Any size fraction
Concrete for Bridge Repair	No. 7, 57, 67, or 78
Concrete curbing placed by machine-extrusion methods	No. 7, 57, 67, or 78
Cement treated permeable base <sup>(2)</sup>	No. 57

<sup>(1)</sup> Gradation shall conform to 903.22.  
<sup>(2)</sup> Aggregate shall meet the quality requirements specified below.

**Subsection 903.03-2** (pg. 924) 5-15-17; Revise Table 903.03-2: Limits of Deleterious Substances in Coarse Aggregate for Concrete, update Material passing No. 200 Sieve and Footnote 2:

**Table 903.03-2: Limits of Deleterious Substances in Coarse Aggregate for Concrete**

<b>Substance</b>	<b>Maximum Percent by Weight</b>
Soft or non-durable fragments (fragments that are structurally weak such as shale, soft sandstone, limonite concretions, gypsum, weathered schist, or cemented gravel), and organic impurities as determined by AASHTO T 267 <sup>(1)</sup>	3
Coal and lignite <sup>(1)</sup>	1
Clay lumps <sup>(1)</sup>	0.25
Material passing the No. 200 sieve <sup>(1) (2)</sup>	1.5
Thin or elongated pieces (length greater than 5 times average thickness)	10
Other local deleterious substances <sup>(1)</sup>	1

<sup>(1)</sup> The sum of the percentages of these materials (i.e., soft or non-durable fragments, coal and lignite, clay lumps, material passing the No. 200 sieve, and other local deleterious substances) shall not exceed 5.0.  
<sup>(2)</sup> For crushed aggregate, if all the material finer than the No. 200 sieve, as determined in accordance with AASHTO T 11, consists of the dust of fracture, essentially free of clay or shale, this limit may be increased to 2.0.

**Subsection 903.03 B** (pg. 924), 5-13-19; **Soundness**; Revise subsection:

**B. Quality Requirements**

The coarse aggregate shall meet the quality requirements in 903.25.

**Subsection 903.04** (pg.925), 5-13-19; **Aggregate for Lean Concrete Base**; Remove entire subsection:

**Subsection 903.05** – Aggregate for Mineral Aggregate Base and Surface Courses (pg. 925) 5-15-17; add reference to subsection **903.05 C.** in the second paragraph of subsection A.:

**“903.05 Aggregate for Mineral Aggregate Base and Surface Courses**

Provide crushed stone, crushed slag, crushed or uncrushed gravel, or crushed or uncrushed chert that may be blended with crushed recycled concrete or screened reclaimed asphalt pavement (RAP), together with material such as manufactured sand or other fine materials that are either naturally contained or added as needed to conform to these Specifications.

Provide aggregate of Types A and B, as specified below.

**A. Type A Aggregate**

Provide hard, durable particles or fragments of stone, slag, gravel, or chert, and other finely divided mineral matter.

The Contractor may use recycled concrete aggregate per 903.05 C. or reclaimed asphalt pavement, at a maximum rate of 25% by weight, for Type A aggregate, provided the combined aggregate blend meets all the requirements specified below. Crush and screen the recycled concrete and asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the recycled stockpiles free of bricks, steel, wood, and all other deleterious materials. “

**Subsection 903.05 A** (pg. 925-926), 5-13-19; **Type A Aggregate**; Revise Nos. 1, 2, & 3, & Remove Table 903.05-01:

1. **Crushed Stone.** Provide stone free of silt and clay and having a coarse aggregate portion (retained on the No. 4 sieve) that conforms to the quality requirements specified in 903.25.
2. **Crushed Slag.** Provide material that:
  - a. Is free of silt and clay,
  - b. Meets the quality requirements in 903.25,
  - c. Is reasonably uniform in density, and
  - d. Has a dry-rodded weight of at least 70 pounds per cubic foot.
3. **Gravel and Chert.** Screen gravel and chert. All oversize material may be crushed and fed uniformly back over the screen. The coarse aggregate portion shall conform to the quality requirements specified in 903.25. The portion of the material passing the No. 40 sieve shall be non-plastic, or shall have a liquid limit of not greater than 30 and a plasticity index of not more than eight.

**Subsection 903.05** – Aggregate for Mineral Aggregate Base and Surface Courses (pg. 925-926) 5-15-17; add reference to subsection **903.05 C.** in the second paragraph of subsection B.:

“For Provide crushed or uncrushed gravel, crushed or uncrushed chert, crushed stone or crushed slag, and other finely divided particles.

The Contractor may use recycled concrete aggregate per 903.05 C. or reclaimed asphalt pavement; at a maximum rate of 30% by weight; for Type B aggregate, provided the combined aggregate blend meets all the requirements specified below. Crush and screen recycled concrete and asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the recycled stockpiles free of bricks, steel, wood, and all other deleterious materials.”

**Subsection 903.05** – B. Type B Aggregate (pg. 927), 5-18-15; Replace the 1<sup>st</sup> paragraph of subsection 3. With the following:

- “3. Do not use material having clay content greater than 12%, as determined by hydrometer analysis performed in accordance with AASHTO T 88. Material may be used having a clay content exceeding 12% if a plasticity index-fines product does not exceed 3 when calculated by the following formula”

**Subsection 903.05 B** (pg. 927), 5-13-19; **Type B Aggregate**; Revise 3<sup>rd</sup> paragraph:

Provide Type B aggregate meeting the same requirements as specified in **903.05.A** for Type A aggregate, with the following exceptions:

1. The aggregate shall meet the quality requirements in 903.25 for Mineral Aggregate Base – Type B.
2. Screen Type B aggregate. Oversize materials may be wasted or crushed and returned over the screen and uniformly blended with the other material.
3. Do not use material having a clay content greater than 12%, as determined by hydrometer analysis performed in accordance with AASHTO T 88. Material may be used having a clay content exceeding 12% if a plasticity index-fines product does not exceed 3 when calculated by the following formula:

$$\frac{\% \text{ Passing No. 40 sieve} \times \text{P. I. of Minus No. 40 Material}}{100}$$

**Subsection 903.05** – Aggregate for Mineral Aggregate Base and Surface Courses (pg. 928) 5-15-17; add section C to the bottom:

**C. Reclaimed Concrete Aggregate.** Provide material comprised of concrete reclaimed from the demolition of a concrete structure or pavement. Reclaimed Concrete Aggregate may only be used as a mineral aggregate base course, subbase or shoulder course. The material shall be free of any materials classified as Solid or Hazardous Waste, especially asbestos, lead and mercury, with test

results submitted by the contractor to the Project Supervisor. These test results shall be certified and notarized. The percentage of wear as determined in accordance with AASHTO T 96 shall not exceed 50. Deleterious substances shall be kept to a minimum, and may not be higher than the amounts listed on Table 903.05-3.

Table 903.05-3: Deleterious Materials

Material	Maximum Permissible Limits Percent by Weight
Brick	5
Bituminous Concrete Materials	5
Weathered Rock	2
Wood	0.1
Metals	0.1

The gradations of the coarse and fine fractions of aggregate shall be such that, when combined in proper proportions, the resultant mixture will fall within the grading specified in Table 903.05-4.

Table 903.05-4: RCA Grading Tolerances

Sieve Size	Total Percent Passing per Weight
1 ½ inch	100
1 inch	85-100
¾ inch	60-95
3/8 inch	50-80
No. 4	40-65
No. 16	20-40
No. 100	5-18

**Subsection 903.05 C** (pg. 928), 5-13-19; **Reclaimed Concrete Aggregate**; Revise 1<sup>st</sup> paragraph:

**C. Reclaimed Concrete Aggregate**

Provide material comprised of concrete reclaimed from the demolition of a concrete structure or pavement. Reclaimed Concrete Aggregate may only be used as a mineral aggregate base course, subbase or shoulder course. The material shall be free of any materials classified as Solid or Hazardous Waste, especially asbestos, lead and mercury, with test results submitted by the contractor to the Project Supervisor. These test results shall be certified and notarized. The aggregate shall meet the quality requirements in 903.25. . Deleterious substances shall be kept to a minimum, and may not be higher than the amounts listed on Table 903.05-3.

**Subsection 903.06 A** (pg. 929), 5-13-19; **Coarse Aggregate (retained on a No. 4 sieve)**; Revise 1<sup>st</sup> paragraph:

Provide crushed stone, crushed granite, crushed gravel, crushed slag, or a combination of these materials. This material shall conform to the physical properties of ASTM D692 and the quality requirements of 903.25., The aggregate shall contain no more than 5% soft or nondurable particles.

**Subsection 903.06 B** (pg.929), 5-13-19; **Fine Aggregate (passing a No. 4 sieve)**; Revise 1<sup>st</sup> paragraph:

Provide limestone fines, natural sand, sand manufactured from stone, gravel, or slag, or combinations of these materials, consisting of hard, tough grains free from injurious amounts of deleterious substances. The fine aggregate shall meet the quality requirements in 903.25. Do not use fine aggregate or screenings containing calcium sulfate (CaSO<sub>4</sub>/gypsum) if more than 5% of the material passing the No. 8 sieve is chemically composed of sulfur trioxide (SO<sub>3</sub>).

**Subsection 903.06 - C. Combined Aggregate Grading** (pg. 930) 11-16-15; add the following sentence at the end of the first paragraph:

“For mixtures including recycled asphalt pavement, RAP, and/or recycled asphalt shingles, RAS, stockpiles will not be considered as contributing to the required minimum of three stockpile sizes.”

**Subsection 903.11 - Aggregate for Asphaltic Concrete Surface Coarses (Hot Mix)** (pg. 934) 11-16-15; add the following sentence at the end of the first paragraph:

“For mixtures including recycled asphalt pavement, RAP, and/or recycled asphalt shingles, RAS, stockpiles will not be considered as contributing to the required minimum of three stockpile sizes.”

**Subsection 903.11** (pg. 934) 11-16-15; **A. Coarse Aggregate (retained on a No. 4 sieve)**, revise the 1<sup>st</sup> paragraph and subsection 3:

“Provide aggregate, consisting of crushed stone, crushed slag, crushed gravel, crushed granite, crushed quartzite, crushed gneiss, or natural combinations of these materials.”,

“3. Combined aggregate shall consist of siliceous particles processed from washed material, of which at least 70% by count of the material retained on the No. 4 sieve shall have a minimum of two fractured faces, one of which must be fractured for the approximate average diameter or thickness of the particle. Do not add pea gravel or uncrushed particles. The absorption of the crushed aggregate retained on the No. 4 sieve shall not exceed 5% when tested in accordance with AASHTO T 85.”

**Subsection 903.11 A** (pg. 934), 5-13-19; **Coarse Aggregate (retained on a No. 4 sieve)**; Revise paragraph and No. 1:

Provide aggregate, consisting of crushed stone, crushed slag, crushed gravel, crushed granite, crushed quartzite, crushed gneiss, or natural combinations of these materials. The coarse aggregate shall meet the physical requirements of ASTM D692, with the following exceptions and additions:

1. Sodium The aggregate shall meet the quality requirements in 903.25.

**Subsection 903.11 - A. Coarse Aggregate (retained on a No. 4 sieve)** (pg. 934), 5-18-15; revise subsection 2. as follows:

“2. Material retained on the No. 4 sieve shall contain a maximum of 10% elongated pieces (length greater than five times the average thickness)”

**Subsection 903.11 B** (pg. 935), 5-13-19; **Fine Aggregate (passing a No. 4 sieve)**; Revise No. 2:

2. Fine aggregate shall meet the quality requirements in 903.25.

**Subsection 903.11 C. Combined Aggregate Grading** (pg. 936) 10-8-18; Table 903.11-2 Revise Table to add TLE information:

**Table 903.11-2: Asphalt Concrete Surface Course Mixture Designation  
Design Range of Gradations**

Sieve Size	Total Percent Passing by Weight				
	Grading D	Grading E	Grading TL	Grading TLD/TLE	Grading OGFC
3/4 inch	--	--	--	--	100
5/8 inch	100	100	--	--	--
1/2 inch	95-100	95-100	100	100	85-100
3/8 inch	80-93	80-93	100	90-100	55-75
No. 4	54-76	54-76	89-94	54-76	10-25
No. 8	35-57	35-57	53-77	35-57	5-10
No. 30	17-29	17-29	23-42	17-33	--
No. 50	10-18	10-18	--	10-18	--
No. 100	3-10	3-11	9-18	3-10	--
No.	0-6.5	0-8	6-14	4-7	2-4

**Subsection 903.11 C. 2.** (pg. 937) Grading E, add TLE to the title:

**“Grading E and TLE.** When using Grading E as a surface for traffic lanes, 50% to 80% of the mineral aggregate shall be composed of crushed limestone, and the remaining 50% to 20% shall be natural sand, slag sand, sand manufactured from gravel or other approved non-skid aggregates, or any combination of these materials, with the following exceptions:

The sand percentage on the Job Mix Formula (JMF) shall range from 20% to 50%. However, if needed to meet or improve the specified design criteria, the Contractor may alter the limestone and sand percentage by 5% from the percentage shown on the original JMF. If altering the aggregate percentages shown on the original JMF, submit a revision of the original design showing the altered percentages of aggregate.

b. When using Grading E for surfacing of shoulders or other non-traffic lane construction, the mineral aggregate may be composed entirely of limestone, including Size No. 10 (screenings) and manufactured sand, but in no case shall the mineral aggregate for this construction consist of less than 50% limestone.

c. Recycled Asphalt Pavement (RAP) milled from Department or other State Highway Agency projects shall be assumed to contain 75% non-skid material.”

**Subsection 903.11 C.3.** (pg. 938), 6-27-16; revise the 1<sup>st</sup> paragraph of subsection C.3 to the following:

**“3. Grading OGFC.** A minimum of 75% of the aggregate shall meet the requirements specified in 903.24 for Surface Mixtures (Non-Skid Aggregates). The coarse aggregate shall have at least 90% crushed aggregate with two fractured faces and 100% with one fractured face as determined in accordance with ASTM D5821. The coarse aggregate shall have a LA Abrasion value of less than 40% and a maximum absorption of 3.0%.”

**Subsection 903.11** (pg. 938), 12-2-16; Add the following to C. as subsection 5.:

**“5. Grading C, CS, CW.** The mixture shall meet all requirements of **903.06**. When using Grading C, CS, or CW as a final riding surface for traffic lanes and the design ADT is greater than 1000, a minimum of 75% of the aggregate shall meet the requirements specified in **903.24** for Surface Mixtures (Polish-Resistant Aggregate) for the appropriate levels.”

**Subsection 903.12** (pg. 938) 11-16-15; A. Aggregate for Slurry Seal, revise the 1<sup>st</sup> paragraph a A. as shown; delete the 2<sup>nd</sup> paragraph:

“The aggregate shall be crushed slag, crushed granite, or crushed stone (crushed stone as specified in 903.24), meeting the requirements of ASTM D692, except the gradation shall be as specified in Table 903.12-1. The aggregate shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 45.

**Subsection 903.12 A** (pg. 938), 5-13-19; **Aggregate for Slurry Seal**; Revise 1<sup>st</sup> paragraph:

The aggregate shall be crushed slag, crushed granite, or crushed stone (crushed stone as specified in **903.24**), meeting the requirements of ASTM D692, except the gradation shall be as specified in Table 903.12-1. The aggregate shall meet the quality requirements in 903.25. The aggregate shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 45.

**Subsection 903.12** (pg. 939) 11-16-15; B. **Aggregate for Micro-Surface**: modify the first paragraph, delete the second paragraph:

“The aggregate shall be crushed slag, crushed granite, or crushed stone (crushed stone as specified in **903.24**) meeting the gradation limits specified in Table 903.12-2 and the physical properties of ASTM D692, except the percent of fractured pieces shall be 100. The aggregate shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 65. Polish-resistant aggregates will not be required for leveling courses, provided they will be covered with riding surface mixtures.

**Subsection 903.12 B** (pg. 939), 5-13-19; **Aggregate for Micro-surface**: Revise 1<sup>st</sup> paragraph:

The aggregate shall be crushed slag, crushed granite, or crushed stone (crushed stone as specified in **903.24**) meeting the gradation limits specified in Table 903.12-2 and the physical properties of ASTM D692, except the percent of fractured pieces shall be 100. The aggregate shall meet the quality requirements in 903.25. The aggregate shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 65. Polish-resistant aggregates will not be required for leveling courses, provided they will be covered with riding surface mixtures.

**Subsection 903.12** (pg. 939) 5-15-17; B. **Aggregate for Micro-Surface**: Add the following as the 2<sup>nd</sup> paragraph:

“If blending aggregates from more than one source, use automated proportioning and blending equipment which has individual bins for each aggregate source used to produce a stockpile meeting the job mix formula gradation. Proportion and blending equipment shall be calibrated at the beginning of production. All aggregate sources shall meet the requirements of **Table 903.24-1**. Do not blend aggregates with a front end loader. Proportion the aggregate to produce a uniform gradation meeting the requirements specified in Table 903.12-2. The contractor shall provide a Type A laboratory as defined by **106.06** capable of verifying gradation at the location where blending occurs.”

**Subsection 903.13** (pg. 940), 12-2-16; modify the last sentence of the 1<sup>st</sup> paragraph:

“Provide aggregate consisting of crushed stone, crushed slag, or crushed gravel, meeting the quality requirements of ASTM D692, except that at least 50% by count of crushed gravel aggregates shall have at least one fractured face. Crushed slag aggregate retained on the No. 4 sieve shall contain no more than 20% by weight of glassy particles. Provide aggregates meeting the requirements of **903.24 except, if ADT is less than 1000.**”



**Subsection 903.13** (pg. 940), 5-13-19; **Aggregate for Bituminous Seal Coat**; Revise 1<sup>st</sup> paragraph:

Provide aggregate consisting of crushed stone, crushed slag, or crushed gravel, meeting the physical requirements of ASTM D692, except that at least 50% by count of crushed gravel aggregates shall have at least one fractured face. The aggregate shall meet the quality requirements of 903.25. Crushed slag aggregate retained on the No. 4 sieve shall contain no more than 20% by weight of glassy particles. Provide aggregates meeting the requirements of **903.24** except, if ADT is less than 1000.

**Subsection 903.15** (pg. 941), 5-15-17; revise the 3<sup>rd</sup> paragraph:

“The Contractor may use recycled concrete aggregate per 903.05 C. or reclaimed asphalt pavement (RAP), at a maximum rate of 25% by weight; provided the combined aggregate blend meets all the requirements specified above. If blending, crush and screen the recycled concrete and/or asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the reclaimed asphalt pavement stockpiles free of bricks, steel, wood, and all other deleterious materials. The virgin and reclaimed pavement blend shall meet the quality requirements specified in Table **903.05-1**.”

**Subsection 903.15** (pg.941), 5-13-19; **Aggregate for Aggregate-Cement Base Course**; Revise 3<sup>rd</sup> paragraph:

Recycled concrete aggregate per 903.05C or reclaimed asphalt pavement (RAP) may be used at a maximum rate of 25% by weight, provided the combined aggregate blend meets all the requirements specified above. If blending, crush and screen the recycled concrete and/or asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the reclaimed asphalt pavement stockpiles free of bricks, steel, wood, and all other deleterious materials. The virgin and reclaimed pavement blend shall meet the quality requirements specified in 903.25.

**Subsection 903.17** (pg. 941), 5-13-19; **Aggregate for Underdrains**; Revise 1<sup>st</sup> paragraph:

Provide crushed stone, crushed slag, or washed gravel meeting the physical requirements of ASTM D692, the quality requirements of 903.25, and the gradation requirements specified for Size 6, 7, 8, 57, or 78 in **903.22**.

**Subsection 903.18** (pg. 942), 5-13-19; **Aggregate for Sand-Asphalt Surface Course**; Remove entire subsection:

**Subsection 903.19** (pg. 942-943), 5-13-19; **Lightweight Aggregates for Structural Concrete**; Revise Subsection:

Provide lightweight aggregate conforming to AASHTO M 195, with the following additions:

1. Produce the lightweight aggregate by fusing raw shale, slate, or clay in a rotary kiln, to yield particles having a wear of not more than 40% when tested in accordance with AASHTO T 96.
2. The lightweight coarse aggregate shall conform to the gradation requirements for size 3/4 inch to No. 4, as shown in Table 1 of AASHTO M 195.
3. The aggregate shall meet the quality requirements in 903.25.
4. Concrete with approximately 6% air content made from the aggregate shall have a minimum durability factor of 90% when tested in accordance with AASHTO T 161.
5. Use material listed on the Department's QPL.

**Subsection 903.24** (pg. 946), 5-18-15; Modify the 1<sup>st</sup> paragraph to the following:

“Provide coarse aggregate consisting of crushed gravel, crushed granite, crushed slag, crushed quartzite, crushed gneiss, or crushed sandstone. Other crushed aggregate may be used provided it has the chemical, physical, and performance characteristics specified in Table 903.24-1.”

**Subsection 903.25** (pg. 947), 5-13-19; **Aggregate Quality Requirements:** Add new Subsection.

**Table 903.25-1: Fine Aggregate Quality Requirements**

<b>Application</b>	<b>Sodium Sulfate Soundness Loss AASHTO T 104, %max</b>	<b>L A Abrasion AASHTO T 96, %max</b>	<b>Absorption AASHTO T 84, %max</b>
Concrete (903.01)	10	40 <sup>(1)</sup>	N/A
Mortar (903.02)	10	N/A	N/A
Hot Mix Asphalt Mix Base and Leveling Courses (903.06)	12	40 <sup>(1)</sup>	N/A
Hot Mix Asphalt Surface Courses (903.11)	12	40 <sup>(1)</sup>	N/A
Slurry Seal (903.12)	12	40 <sup>(1)</sup>	N/A
Microsurface (903.12)	12	40 <sup>(1)</sup>	N/A

<sup>(1)</sup>Applicable for fine aggregate manufactured from limestone or dolomite.

**Table 903.25-2: Coarse Aggregate Quality Requirements**

<b>Application</b>	<b>Sodium Sulfate Soundness Loss AASHTO T 104, %max</b>	<b>L A Abrasion AASHTO T 96, %max</b>	<b>Absorption AASHTO T 84, %max</b>
Concrete (903.03)	9	40	5
Mineral Aggregate Base – Type A (903.05)	15	50	N/A
Mineral Aggregate Base – Type B (903.05)	20	50	N/A
Reclaimed Concrete Aggregate (903.05)	N/A	50	N/A
Hot Mix Asphalt Mix Base and Leveling Courses (903.06)	9	50	5
Hot Mix Asphalt Surface Courses (903.11)	9	40	5 <sup>(1)</sup>
Bituminous Seal Coat (903.13)	12	40	N/A
Double Bituminous Surface Treatment (903.14)	12	40	N/A
Aggregate Cement Base Course (903.15)	15	50	N/A
Underdrains (903.17)	12	50	N/A
Lightweight Concrete (903.19)	9	40	10
Machined Riprap (709.02)	12	N/A	N/A
Graded Solid Rock (203.02)	12	N/A	N/A
Solid Rock Fill (205.04)	12	N/A	N/A
Masonry Stone (921.07)	12	N/A	N/A

<sup>(1)</sup>Maximum absorption for OGFC is 3.0%

**Subsection 904.01** (pg. 948-950), 5-13-19; **Asphalt Cements:** Combined supplemental specifications from 5-15, 11-15, 6-16, 12-16, and 11-17; Replace entire subsection with the following:

#### **904.01 Asphalt Cements**

Only obtain asphalt cement for use on Department projects from Certified Asphalt Cement Suppliers that have an approved Quality Control Plan in accordance with the Department's Standard Operating Procedures.

Asphalt cement shall conform to AASHTO M 320 and Department procedures. Direct Tension testing is not required.

Instead of PG 64-22, the Contractor may use asphalt cement graded to PG 67-22. PG 67-22 shall conform to the requirements of AASHTO M 320 when the applicable tests are conducted at 67 °C and -12 °C, and the dynamic shear of the rolling thin film, pressure aged vessel sample is tested at 26.5 °C.

To modify the asphalt, properly blend one or more modifier(s) consisting of styrene butadiene (SB), styrene butadiene styrene (SBS), or styrene butadiene rubber (SBR), or Ground Tire Rubber (GTR) to a PG 64-22 or PG 67-22 base asphalt.

GTR used to modify asphalt shall meet the requirements of 921.17. Blending of GTR into asphalt cement shall occur only at the asphalt terminal. ”

Polyphosphoric acid may be used as a modified not exceeding 0.5% by weight of asphalt binder and may only be used when the primary modifier is one of the styrene-based products listed above.

In addition to the above, asphalt cement modified with GTR shall meet the following requirement. The temperature difference determined by the Separation Test shall not exceed 15 °F. The separation test shall consist of taking the difference in softening point, as determined by the Ring and Ball Test (AASHTO T53), between the top and bottom thirds of a specimen prepared per ASTM D7173.

In addition to the above requirements, the asphalt cements shall meet the requirements specified in Table 904.01-1.

**Table 904.01-1: Requirements for Asphalt Cement**

<b>Property*</b>	<b>PG 64-22, PG 67-22</b>	<b>PG 70-22</b>	<b>PG 76-22</b>	<b>PG 82-22</b>
Non-recoverable creep compliance at 3.2kPa, Jnr(3.2), kPa <sup>-1</sup> at 64°C, Max	4.5	1.0	0.5	0.5
% Difference in Non-Recoverable Creep Compliance, Jnr(diff) at 64°C, %, Max	75	75**	n/a	n/a

\* Tested in accordance with AASHTO T350.

\*\* Shall be waived if Jnr(3.2) is equal to or less than 0.5

PG76-22 and PG82-22 grade asphalts shall meet the requirements for Indication of Elastic response as defined in Appendix X1 of AASHTO M332. PG70-22 grade asphalts shall have a minimum percent recovery at 3.2 kPa of 29%.

Furnish a certification to the Engineer on each project stating that the asphalt cement provided meets the Department’s specification. Ensure that quality control and compliance testing are completed in accordance with the asphalt supplier’s approved quality control plan and Department procedures. Identify on the certification, the type(s) of modifier used.

In addition, the asphalt cement supplier shall provide a temperature-viscosity curve for PG 64-22 and PG 67-22 asphalt cements with a recommended mixing temperature range. In order to develop a temperature-viscosity curve, it may be necessary to run the viscosity test at a higher temperature, based on the softening point of the modified asphalt cement.

**Subsection 904.01** (pg. 949), 12-30-19; **Asphalt Cements**; Add to end of 4<sup>th</sup> paragraph:

The use of Re-refined Engine Oil Bottoms (REOB) or Vacuum Tower Asphalt Extender (VTAE) is prohibited.

**Subsection 904.01** (pg. 949), 5-13-19; **Asphalt Cements**; Revise paragraph below Table 904.01-1:

PG76-22 and PG82-22 grade asphalts shall meet the requirements for Indication of Elastic response as defined in AASHTO R92. PG70-22 grade asphalts shall have a minimum percent recovery at 3.2 kPa of 29%.

**Subsection 904.03** (pg. 951) 11-16-15; Emulsified Asphalts, Add “TTT-3” to 904.03-1 with the following requirements:

Saybolt-Furol Viscosity @ 77 °F, seconds	10-100
Particle Charge	Positive
Sieve Test, %	0.1 Max
Residue by	Distillation <sup>(1)</sup>
Residue, %	50 Min
Demulsibility, %	65 Min
Penetration	40-90

<sup>1</sup>-Distill at 350°F

**Subsection 904.03** (pg. 954), 12-2-16; Revise Table 904.03-1(c) to remove TTT-1, TTT-2, and TTT-3:

**Table 904.03-1(c): Test Requirements for Emulsified Asphalt**

Practices	AASHTO Test Method	CRS-2P	RS-2	RS-1
Saybolt-Furol Viscosity @ 77 °F, seconds	T59	n/a	n/a	20-100
Saybolt-Furol Viscosity @ 122 °F, seconds	T59	100-400	75-400	n/a
Storage Stability Test, 24- h, %	T59	1 Max	1 Max	1 Max
5-day Settlement, %	T59	n/a	n/a	n/a
Particle Charge	T59	Positive	n/a	n/a
Sieve Test, %	T59	0.1 Max	0.1 Max	0.1 Max
Residue by	T59	<i>Evaporation</i>	Distillation	Distillation
Residue, %	T59	65 Min	63 Min	55 Min
Demulsibility,	T59	40 Min	60 Min	60 Min

<b>Practices</b>	<b>AASHTO Test Method</b>	<b>CRS-2P</b>	<b>RS-2</b>	<b>RS-1</b>
%				
Distillate, %	T59	n/a	n/a	n/a
Oil Test, %	T59	n/a	n/a	n/a
Stone Coating	T59	n/a	n/a	n/a
Float Test, seconds	T50	n/a	n/a	n/a
Penetration	T49	75-175	100-200	100-200
Elastic Recovery, % (2)	T301	50 Min	n/a	n/a
Ductility @ 77 °F, cm	T51	40 Min	40 Min	40 Min
Ductility @ 40 °F, cm	T51	n/a	n/a	n/a
R&B Softening Point, °F	T53	125 Min	n/a	n/a
Original G*/sind @ 82 °C	T315	n/a	n/a	n/a

**Subsection 904.03** (pg.954), 5-18-15; Replace with the following:

**Subsection 904.03, Table 904.03-1(c). Modify** as follows for TTT-1, TTT-2:

**Table 904.03-1(c): Test Requirements for Emulsified Asphalt**

<b>Practices</b>	<b>AASHTO Test Method</b>	<b>CRS-2P</b>	<b>RS-2</b>	<b>RS-1</b>	<b>TTT-1</b>	<b>TTT-2</b>
Saybolt-Furol Viscosity @ 77 °F, seconds	T59	n/a	n/a	20-100	20-100	10-100

Practices	AASHTO Test Method	CRS-2P	RS-2	RS-1	TTT-1	TTT-2
Saybolt-Furol Viscosity @ 122 °F, seconds	T59	100-400	75-400	n/a	n/a	n/a
Storage Stability Test, 24- h, %	T59	1 Max	1 Max	1 Max	1 Max	1 Max
5-day Settlement, %	T59	n/a	n/a	n/a	n/a	n/a
Particle Charge	T59	Positive	n/a	n/a	n/a	Positive
Sieve Test, %	T59	0.1 Max	0.1 Max	0.1 Max	0.1 Max	0.1 Max
Residue by	T59	<i>Evaporation</i>	Distillation	Distillation	Distillation	Distillation (1)
Residue, %	T59	65 Min	63 Min	55 Min	50 Min	50 Min
Demulsibility, %	T59	40 Min	60 Min	60 Min	n/a	n/a
Distillate, %	T59	n/a	n/a	n/a	n/a	n/a
Oil Test, %	T59	n/a	n/a	n/a	n/a	n/a
Stone Coating	T59	n/a	n/a	n/a	n/a	n/a
Float Test, seconds	T50	n/a	n/a	n/a	n/a	n/a
Penetration	T49	75-175	100-200	100-200	0-20	40-90
Elastic Recovery, % (2)	T301	50 Min	n/a	n/a	n/a	n/a
Ductility @ 77 °F, cm	T51	40 Min	40 Min	40 Min	n/a	n/a
Ductility @ 40 °F, cm	T51	n/a	n/a	n/a	n/a	n/a
R&B Softening Point, °F	T53	125 Min	n/a	n/a	60-75	n/a
Original G*/sind @ 82 °C	T315	n/a	n/a	n/a	1.0 Min	n/a



Practices	AASHTO Test Method	CRS-2P	RS-2	RS-1	TTT-1	TTT-2
<sup>(1)</sup> Distill at 350 °F						
<sup>(2)</sup> Straight-sided mold, 20-cm elongation, 5min hold, 25 °C						

**Subsection 905.01** (pg. 956) 5-14-18, Revise subsection, add part C. Polypropylene Foam Type:

**“905.01 Preformed Joint Fillers (Non-Extruding and Resilient Types)**

Provide preformed joint fillers as shown on the Plans. When designated, punch holes in preformed joint filler to admit the dowels.

Furnish the filler for each joint in a single piece for the full depth and width required for the joint unless otherwise directed by the Engineer. If the Engineer approves the use of more than one piece for a joint, fasten the abutting ends securely, and hold to shape by stapling or using other positive means of fastening satisfactory to the Engineer.

**A. Bituminous Type**

Provide bituminous type preformed joint fillers conforming to AASHTO M 213.

**B. Non-Bituminous Types**

Provide non-bituminous types of preformed joint filler conforming to AASHTO M 153, Type I, II, or III, as specified.

**C. Polypropylene Foam Type**

Provide semi-rigid, closed-cell, polypropylene foam, preformed expansion joint filler conforming to ASTM D8139. ”

**Subsection 908.04** (pg. 968), 5-18-15, High Strength Bolts, A. Specifications; Add the following to the first paragraph:

“Unless otherwise shown on the Plans, mechanically galvanize all bolts, nuts and washers in accordance with ASTM B695 Class 50.”

**Subsection 908.04** (pg. 968), 12-2-16, High Strength Bolts, A. Specifications; revise the first paragraph:

“Unless otherwise shown on the Plans, all bolts, nuts and washers shall be coated with acceptable coating in accordance with ASTM F3125 for the respective grade.”

**Subsection 908.04** (pg. 968) 12-2-16; revise A. Specifications, 1.:

“A. Specifications: 1. Bolts. ASTM F3125, Grade 325 and Grade 490 - High Strength Bolts for Structural Joints”

**Subsection 908.04** (pg. 970) 12-2-16; Revise C. Testing, 3. Assemblies, subsection f., update Table 908-04-2:

C. Testing, 3. Assemblies, f. Table 908.04-2 The minimum rotation, from a snug tight condition (10% of the specified proof load), shall be as specified in Table 908.04-2.

**Table 908.04-2: Rotation from Snug Tight Condition**

<b>Bolt Length</b>	<b>Minimum Rotation from Snug</b>
Up to and including 4 diameters	240 degrees (2/3 turn)
Over 4 diameters, but not exceeding 8 diameters	360 degrees (1 turn)
Over 8 diameters	480 degrees (1-1/3 turn)

(Note: These values differ from those shown in ASTM F3125.)

**Subsection 908.07** (pg. 973), 5-14-18; Add the following as the last sentence in the subsection:

“Furnish the Engineer a certification from the manufacturer identifying each heat number and certifying that the requirements from AASHTO M 105 and the above additions have been met.”

**Subsection 909.01B**(pg. 977), 12-2-16; Remove the 4<sup>th</sup> paragraph referencing a tolerance of 5% from B. Steel Posts and Braces.

**Subsection 909.01 C** (pg. 978), 12-30-19; **Wood Posts and Braces**; Revise last paragraph 909.01 C;

**909.01 Stock Fence...**

**C. Wood Posts and Braces...**

Treat posts, braces, and anchors with a preservative treatment, conforming to **911.02.A**. **All preservatives must be registered with the U.S.EPA under FIFRA.** Fabricate or frame the timbers before treatment.

**Subsection 909.02** (pg. 980-981), 12-2-16; Remove the word minimum from Table 909.02-1:

**Table 909.02-1: Post and Braces**

<b>Application</b>	<b>Material</b>	<b>ASTM Specification</b>	<b>Nominal Diameter (inches)</b>	<b>Outside Diameter (inches)</b>
Line Posts	Galvanized steel pipe	F1083	1.5	1.900
	Aluminum alloy standard (ANSI Schedule 40) pipe	B429, Alloy 6063, Temper T6	1.5	1.900
	Triple coated steel pipe with a 0.120-inch wall thickness	F1043, Group I-C	1.5	1.900

<b>Application</b>	<b>Material</b>	<b>ASTM Specification</b>	<b>Nominal Diameter (inches)</b>	<b>Outside Diameter (inches)</b>
End, Corner, and Pull Posts	Galvanized standard steel pipe	F1083	2.0	2.375
	Aluminum alloy standard (ANSI Schedule 40) pipe	B429, Alloy 6063, Temper T6	2.0	2.375
	Triple coated steel pipe with a 0.130-inch wall thickness	F1043, Group I-C	2.0	2.375
End and Corner Braces	Galvanized standard steel pipe	F1083	1.25	1.660
	Aluminum alloy standard (ANSI Schedule 40) pipe	B429, Alloy 6063, Temper T6 (for corner posts: B241)	1.25	1.660
	Triple coated steel pipe with a 0.111-inch wall thickness	F1043, Group I-C	1.25	1.660

**Subsection 909.03** (pg. 983), 12-2-16; Remove the last paragraph of the subsection.

**Subsection 909.01 C** (pg. 978), XX-XX-19; **Wood Posts and Braces**; Revise 2<sup>nd</sup> sentence 909.06, Revise paragraph 909.07:

**909.06 Timber Rail...**

Provide treated timber, when specified, conforming to 911.02-~~A~~.

**909.07 Guard Rail Posts**

Provide railing posts of the section, weight, and length shown on the Plans. The posts may be made of wood, conforming to 911.02-~~A~~, or steel, conforming to ASTM A36 and galvanized in accordance with ASTM A123.

**Section 911** (pg. 996-999), 12-30-19; **Timber and Timber Piles**; Revise Entire Section:

**SECTION 911 – LUMBER, TIMBERS AND TIMBER PILES**

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911.02 <del>Untreated and</del> -Treated <b>Lumber</b> and Timbers.....	997
911.03 Timber Piles .....	998

**911.01 Lumber & Timbers**

**A. General**

Refer to AASHTO M 168 for grading and terminology. This Section primarily addresses bridge and miscellaneous roadway materials. ~~When using lumber or timbers in buildings (houses or similar type structures), use one of the preservative type treatments noted in AASHTO M 133, applied in accordance with and at the rates specified in the current AWWA procedure for such treatment.~~

**B. Species of Wood**

Use Southern Yellow Pine, ~~of at least medium grain,~~ in accordance with Southern Pine Inspection Bureau (SPIB) Specifications or as ~~unless~~ otherwise shown on the Plans.

**C. Grades of Lumber and Timber**

~~Lumber ordered in multiple lengths shall be graded after having been cut to length. When shown on the Plans or specified in the Contract,~~ Provide lumber and timbers for permanent use in structures that is grade marked or hammer stamped by a recognized acceptance agency. ~~Provide timber~~ that conforms to the following:

- 1. Yard Lumber.** Provide yard lumber with a grade of C Finish, when a choice quality grade for finish purposes, ~~that is reasonably clear and without defects or blemishes that will detract~~

~~from a finish and appearance is a requirement, especially when painted.~~

- a. **No. 1.** Provide #1 Grade lumber and timbers for general construction and utility purposes where strength is a consideration. ~~Sound and tight knotted stock. Size of defects and blemishes limited.~~
  - b. **No. 2.** Provide #2 Grade lumber and timbers for general construction and utility purposes where strength is not a consideration. ~~Allows somewhat (approximately 50%) larger and coarser defects than No. 1. May be considered grain tight lumber.~~
- 2. Structural or Stress Rated Lumber and Timber.** As specified or otherwise noted in the plans, provide lumber and timbers of a structural grade conforming to the grading rules of the Southern Pine Inspection Bureau (SPIB). Allowable stress shall be in accordance with the current SPIB grading rules.
- 3. Stress Grades for Structural Purposes.** Where the Specifications or Plans call for standard stress grades for various structural purposes, provide material of the grades shown on the Plans.

## 911.02 ~~Untreated and~~ Treated Lumber and Timbers

### ~~A. Treated Timber~~

~~Treated lumber and timbers refers to timber of the species called for, shall conform to the requirements of 911.01 and are to be treated by a pressure method to retain the minimum quantity retention of preservative per cubic foot of the specified preservative wood for the designated use as outlined in American Wood Protection Association (AWPA) Standard U1, Commodity Specification A: Sawn Products. Use preservatives meeting the requirements of AASHTO M 133, for the particular type provided. All preservatives must be registered with the U.S.EPA under FIFRA.~~

~~For timber that is to be pressure treated, no heartwood requirement or sapwood limitation shall apply.~~

The Engineer will not accept treated structural lumber or timbers for use unless it has been inspected and found satisfactory both before and after treatment. Material that is grade marked and or tagged bearing the mark of an agency accredited under the American Lumber Standards Committee, Inc. (ALSC) shall be acceptable. Alternatively, the manufacturer may furnish a notarized Certificate of Compliance which includes the tally, grade, and preservative retention of material provided.

### ~~B. Untreated Timber, Heart Requirements~~

~~Ensure that all timber to be used without preservative treatment shows not less than the following amounts of heartwood:~~

- ~~1. Stringers, floorbeams and flooring: 80% of heart of any girth.~~
- ~~1. Caps, sills, and posts: 75% of heart on each of the four sides measured across the side.~~
- ~~1. Bracing, struts, rails, and similar: 80% of heart on both sides measured across the side.~~

## 911.03 Timber Piles

**A. General**

Provide untreated or treated timber piles in accordance with ASTM D25 Standard Specification for Round Timber Pile.

~~Cut timber piles from live, solid, sound trees, preferably during the winter season. Ensure that timber is free from defects such as injurious ring shakes, large, loose or unsound knots, decay, or other defects that might impair its strength or durability. Sound knots are allowable provided the greatest diameter of the knot does not exceed 4 inches or one third of the diameter of the pile at the point where it occurs. Saw the butts square.~~

~~Fabricate round piles to meet the minimum diameters specified in Table 911.03-1, for the tip and a section 3 feet from the butt, measured under the bark~~

**Table 911.03-1: Timber Pile Diameters**

<b>Length of Pile</b>	<b>Tip Diameter (inches)</b>	<b>Butt End Diameter (inches)</b>
20 feet and under	8	11
Over 20 feet up to 40 feet	8	12
Over 40 feet up to 60 feet	7	12
Over 60 feet	6	13

The diameter of the piles at the butt shall not exceed 18 inches.

~~Square piles shall have the dimensions shown on the Plans.~~

~~Cut piles above the ground swell. Peel all piles so as to remove all the rough or outer bark and at least 80% of the inner bark.~~

~~Do not leave any strips of inner bark larger than 3/4 x 8 inches on the pile. Provide a space of at least 1 inch wide between strips. Ensure that at least 80% of any circumference is free from inner bark.~~

~~Provide piles that have a uniform taper from butt to tip and are straight grained, and meet the following requirements.~~

- ~~1. A line drawn from the center of the butt to the center of the tip shall not fall outside the center of the pile more than 0.75% of the length at any point.~~
- ~~1. Piles shall be free from reverse bends.~~
- ~~1. In short bends, the distance from the center of the pile to a line stretched from the center of the pile above the bend to the center of the pile below the bend shall not exceed 4% of the length of the bend or 2 1/2 inches.~~
- ~~1. Trim all knots close to the body of the piles. Piles shall be free from twist exceeding half the~~

~~circumference in any 20 feet of length.~~

~~**A. Untreated Timber Piles**~~

~~Provide untreated timber piles conforming to the general requirements for timber piles specified in 911.03.A, with the following additions:~~

- ~~1. For piles that will be below water level at all times, the Contractor may provide untreated timber piles of any species of wood that will satisfactorily withstand driving.~~
- ~~1. For use in exposed work, provide untreated timber piles from one of the following species: white oak, post oak, cypress, or southern yellow pine, except loblolly pine. Ensure the piles have a diameter or heartwood of not less than 80% of the required diameter of the pile.~~

~~**CB. Treated Preservative Treatment of Timber Piles**~~

~~Pressure preservative treat timber piles with a preservative specified in AASHTO M133 and in accordance with AWWA U1, Commodity Specification E: Round Timber Piling, UC4C. Provide treated timber piles conforming to the general requirements for timber piles specified in 911.03.A, with the following additions: All preservatives must be registered with the U.S.EPA under FIFRA.~~

- ~~1. The Contractor may provide treated timber piles of any species that will satisfactorily withstand driving and that will take the required preservative treatment.~~
- ~~2. Treat the timber piles with a preservative conforming to AASHTO M 133 in accordance with requirements of the current AWWA procedure~~

**Subsection 912.05** (pg. 1001), 6-27-16; Add subsection 912.05 – Brick Paving Units:

**“912.05 Brick Paving Units**

Provide brick of the kind and grade specified.

**A. Masonry Brick**

- 1. Sidewalk: ASTM C902, Class SX, Type 1
- 2. Crosswalks and Roadway: ASTM C1272, Type R

**B. Concrete Brick and Truncated Dome Concrete Brick**

Provide brick conforming to ASTM C936

**C. Truncated Dome Brick**

Provide brick conforming to ASTM C902, Class SX, Type 1”

**Subsection 914.08** (pg. 1006), 5-13-19; **Precast, Concrete Box Sections**; Revise 1<sup>st</sup> paragraph:

For culverts, storm drains, and sewers, provide precast reinforced concrete box sections conforming to ASTM C1577. Manufacture all precast concrete box sections in accordance with the Department’s



**Subsection 914.07** (pg. 1005), 12-30-19; **Plastic and polyethylene Corrugated Tubing**; Revise subsection:

Provide tubing conforming to AASHTO M 252 or ASTM F~~667405~~ for Heavy Duty Tubing, with the following exception:

Tubing having an elongation greater than 5% but less than 10% is acceptable provided the minimum pipe stiffness requirements in Table 1 are met when tested in accordance with ASTM F~~667405~~, Section ~~89.75~~, using a 12-inch base plate.

**Subsection 915.02** (pg. 1007), 6-27-16; modify the description of 915.03, remove zinc coated, iron from 915.02 A. update the first paragraph of 915.02 A., Remove subsection B. Aluminum Coated Steel Pipe, Revise C. to become B., revise D to become C, Remove 1<sup>st</sup> and 2<sup>nd</sup> paragraphs of D now C, revise E to become D, update 915.03 to match index title: :

**“SECTION 915 – METALLIC PIPE**

915.01 Ductile Iron or Cast Iron Pipe .....	1007
915.02 Corrugated Metal Pipe Culverts, Pipe Arches, and Underdrains.....	1007
915.03 Polymer Pre-coated, Corrugated Steel Pipe, Culverts, and Underdrains....	1008

**915.01 Ductile Iron or Cast Iron Pipe**

Provide ductile iron pipe conforming to ASTM A716 for the specified diameters and strength classes. Unless otherwise specified, either smooth, corrugated, or ribbed pipe may be furnished. For pipe diameters in excess of 48 inches, conform to ANSI Standard for Cast Iron Pit Cast Pipe, or as otherwise specified in the Contract, for the specified diameter and strength class.

Provide cast iron drain pipe conforming to ASTM A74. Unless otherwise specified, provide ductile iron pressure pipe for water lines or sewer construction conforming to the requirements of ASTM A377 for the diameters and working pressures specified.

**915.02 Corrugated Metal Pipe Culverts, Pipe Arches, and Underdrains**

**A. Corrugated Steel Pipe, Pipe Arches, and Underdrains**

Provide corrugated steel pipe, pipe arches, or underdrains, including special sections, such as elbows and flared ends, that conform to AASHTO M 36, aluminum-coated Type 2 meeting AASHTO M274. Special Sections shall be the same thickness as the pipe, arch, or underdrain to which they are joined. Furnish shop-formed elliptical pipe and shop-strutted pipe only where shown on the Plans.

**B. Corrugated Aluminum Pipe, Pipe Arches, and Underdrains**

When using corrugated aluminum pipe, pipe arches, or underdrains, conform to the applicable requirements of AASHTO M 196. Use special sections, such as elbows and flared end sections that conform to the applicable requirements of AASHTO M 196 and that are of the same gauge as the conduit to which they are joined.

**C. Structural Plate Corrugated Steel and Aluminum Structures**

Corrugated aluminum alloy structural plate for pipe, pipe arches, and arches shall conform to the requirements of AASHTO M 219.

**D. Bituminous Coating**

When material supplied for any of the items specified above are to be bituminous-coated, ensure that the metal to be coated is free of grease, dirt, and other contaminants. Bituminous coating and paving shall conform to the requirements of AASHTO M 190. Apply the coating in accordance with the manufacturer’s recommended procedures and as directed by the Department.”

**915.03 Polymer Pre-coated, Corrugated Steel Pipe, Culverts and Underdrains**

Provide polymer pre-coated corrugated steel pipe conforming to AASHTO M 245, Grade 250/250, unless otherwise specified.”

**Subsection 916.05 E.** (pg. 1012); 12-2-16, Add sentence to first paragraph:

“Fabricators must be AISC certified as specified in **602.04 A.4.**”

**Subsection 917.02.A.6.** (pg. 1023), 6-27-16; Revise the following:

“**6. Anchor Bolts.** Use anchor rods of high strength steel meeting the requirements of ASTM F 1554, Grade to be determined by design. Fit each anchor bolt with a hex nut and lock-washer.”

**Subsection 917.11** (pg. 1031), 12-30-19; **Service Poles and Wood Standards;** Revise 1<sup>st</sup> paragraph:

**917.11 Service Poles and Wood Standards**

Provide wood service poles and standards of the class and length shown on the Plans. Unless otherwise specified, provide poles and standards of treated southern pine, classified according to the latest American Standard Dimensions of Southern Pine Poles, and that meet the requirements of ANSI 05.1. Treat the poles with pentachlorophenol or other approved treatment at the rate recommended by the local power authority, unless otherwise specified. The treatment shall conform to **911.03.C**.

**Subsection 918.01** (pg. 1033-1035), 5-14-18; Revise the 1<sup>st</sup> paragraph and 3<sup>rd</sup> paragraph of A. General, Revise Table 918.01-1, Table 918.01-2, Table 918.01-4, Table 918.01-5, Revise the last paragraph of B. Seed Groups, Revise Table 918.01-6 Temporary Seeding:

**A. General**

Provide seed meeting the rules and requirements of the Tennessee Department of Agriculture Chapter 0080-05-06.

Pack grass seed in new bags or bags that are sound and not mended.

The vendor shall notify the Department before making shipments to allow the Department to arrange for inspection and testing of stock.

The vendor shall furnish the Department a certified laboratory report from a Society of Commercial Seed Technologists accredited commercial seed laboratory or from a State seed laboratory showing the analysis of the seed to be furnished. The report from an accredited commercial seed laboratory shall be signed by a Registered Member of the Society of Commercial Seed Technologists. The Department may take samples of the seed to check against the certified laboratory report. Sampling and testing will be in accordance with the requirements of the Tennessee Department of Agriculture.

Use commercial grade 10-10-10 fertilizer or equivalent.

**B. Seed Groups**

When a seed group is used, provide mixtures meeting the requirements specified in Tables 918.01-1 through 918.01-5, unless otherwise specified.

**Table 918.01-1: Group A (February 1-July 1)**

<b>Kind of Seed</b>	<b>Quantity, Percent by Weight</b>
Kentucky 31 Fescue	80
Korean Lespedeza	15
Annual Rye Grass	5

**Table 918.01-2: Group B (June 1-August 15)**

<b>Kind of Seed</b>	<b>Quantity, Percent by Weight</b>
Kentucky 31 Fescue	5575
Korean Lespedeza	15
German Millet	10

**Table 918.01-3: Group B1 (April 15 - August 15)**

<b>Kind of Seed</b>	<b>Quantity, Percent by Weight</b>
Bermudagrass (hulled)	70
Annual Lespedeza	30

**Table 918.01-4: Group C (August 1-December 1)**

<b>Kind of Seed</b>	<b>Quantity, Percent by Weight</b>
Kentucky 31 Fescue	70
EAnnual Rye Grass	20
White Clover	10

**Table 918.01-5: Group C1 (February 1-December 1)**

<b>Kind of Seed</b>	<b>Quantity, Percent by Weight</b>
---------------------	------------------------------------

Crown Vetch	25
Kentucky 31 Fescue	70
Annual Rye Grass	5

Uniformly mix seed when forming Groups. Do not mix Group seed until each type seed that is used to form the Group has been tested separately and meets DOA requirements for purity and germination.

**C. Over-Seeding**

Groups A, B, and C, when sown on slopes 3:1 and steeper, shall be over seeded with Sericea Lespedeza at the rate of 15 pounds per acre. When over-seeding is performed between February 1 and July 1, use Scarified Sericea Lespedeza with an additional 2 pounds per acre of Weeping Lovegrass. Between July 1 and December, use unhulled Sericea Lespedeza. Only use Group C1 when shown on the Plans.

**D. Temporary Seeding**

For temporary seeding, use seed groups and approved varieties as specified in Table 918.01-6.

**Table 918.01-6: Temporary Seeding**

Seed Group (Season)	Kind of Seed	Percent by Weight
<b>Group D</b> (January 1 – May 1)	ItAnnual Rye Grass	33-1/3%
	Korean Lespedeza	33-1/3%
	SSpring Oats	33-1/3%
<b>Group E</b> (May 1 – July 15)	SSorghum-Sudan Crosses <sup>(1)</sup>	100%
	or StGerman Millet <sup>(2)</sup>	100%
<b>Group F</b> July 15 – January 1	BCereal Rye	66-2/3%
	ItAnnual Rye Grass	33-1/3%

**Subsection 918.04** (pg. 1036), 12-2-16; add as a 2<sup>nd</sup> paragraph:

“For small quantities less than 100 units of seeding or sod, bagged pelletized or agricultural limestone meeting the Department of Agriculture Tennessee Liming Materials Act may be utilized.”

**Subsection 918.04** (pg. 1036), 5-13-19; **Agricultural Limestone**; Revise 1<sup>st</sup> and 2<sup>nd</sup> paragraphs:

Provide agricultural limestone  
-meeting the Department of Agriculture Tennessee Liming Materials Act ~~utilized~~

**Subsection 921** (pg. 1049), 11-6-17, Section 921 – Miscellaneous Materials, add Ground Tire Rubber to the Index:

“921.17 Ground Tire Rubber .....1060”

**Subsection 921.01** (pg. 1049), 5-18-15, Water; Replace subsection with the following:

“For mixing concrete, use water that is reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter, and other substances injurious to the finished product. Water provided by a municipal utility may be used without testing.

All other water shall have quality results submitted in accordance with the frequency listed in Table 921.01-01. All water quality results shall adhere to Table 921.01-2.

**Table 921.01-1 Testing Frequency for Mixing Water**

Water Source	Testing Frequency <sup>(1)</sup>
Municipal	NA
Non-Municipal	Every 3 months; tested annually after 4 consecutive passing tests

(1) The frequency may vary at the discretion of the Department.

**Table 921.01-2 Quality Requirements for Mixing Water**

Maximum Concentration in Mixing Water	Limits	ASTM Test Method <sup>(1)</sup>
Chloride Ion Content, ppm	500	C114
Alkalies as (NaO2 + 0.658 K2O), ppm	600	C114
Sulfates as SO4, ppm	3000	C114
Total Solids by mass, ppm	50000	C1603
pH	4.5-8.5	<sup>(2)</sup>
Resistivity, Minimum, kohm-cm	0.500	D1125
Soluble Carbon Dioxide, ppm	600	D513
Calcium and Magnesium, ppm	400	D511
Iron, ppm	20	<sup>(2)</sup>
Phosphate, ppm	100	D4327

(1) Other methods (EPA or those used by water testing companies) are generally acceptable.

(2) No ASTM method available.

**Subsection 921** (pg. 1049) 10-8-18, Miscellaneous Materials, Remove 921.03 Sodium Chloride from the Content list:

921.01 Water ..... 1052  
 921.02 Calcium Chloride ..... 1053  
 921.04 Lime ..... 1053  
 921.05 Select Material for Soil-Cement Base ..... 1054  
 921.06 Chemical Additives ..... 1054  
 921.07 Masonry Stone ..... 1056  
 921.08 Waterstops ..... 1056  
 921.09 Grout ..... 1059

921.10 Precast Manholes and Catch Basins ..... 1059  
 921.11 Manhole Steps ..... 1059  
 921.12 Geotextile and Geosynthetic Material ..... 1060  
 921.13 Precast Prestressed Bridge Deck Panels ..... 1060  
 921.14 Applied Textured Finish Material ..... 1061  
 921.15 Fly Ash ..... 1063  
 921.16 Ground Granulated Blast Furnace Slag ..... 1063

**Subsection 921.01** (pg. 1049), 5-14-18, Water; Remove Resistivity, Soluble Carbon Dioxide, Calcium and Magnesium, Iron, and Phosphate from Table 921.01-2 Quality Requirements for Mixing Water:

**Table 921.01-2 Quality Requirements for Mixing Water**

Maximum Concentration in Mixing Water	Limits	ASTM Test Method <sup>(1)</sup>
Chloride Ion Content, ppm	500	C114
Alkalies as (NaO <sub>2</sub> + 0.658 K <sub>2</sub> O), ppm	600	C114
Sulfates as SO <sub>4</sub> , ppm	3000	C114
Total Solids by mass, ppm	50000	C1603
pH	4.5-8.5	<sup>(2)</sup>

- (1) Other methods (EPA or those used by water testing companies) are generally acceptable.
- (2) No ASTM method available.

**Subsection 921.03** (pg. 1050) 10-8-18, Miscellaneous Materials, Remove subsection 921.03 Sodium Chloride:

**Subsection 921.06** (pg.1051) 11-16-15; B. Bituminous Additives - 1. Anti-Stripping Additive, replace the ASTM C977 reference with AASHTO M 303.

“Use hydrated lime conforming to AASHTO M 303 or other heat-stable asphalt anti-stripping additive containing no ingredient harmful to the bituminous material or the workmen and that does not appreciably alter the specified characteristics of the bituminous material when added in the recommended proportions.”

**Subsection 921.06** B. Bituminous Additives (pg.1052) 10-10-16; revise the 3<sup>rd</sup> paragraph to the following:

“When using an anti-stripping additive other than hydrated lime, use a dosage rate of 0.3%, unless either gravel is used as a coarse aggregate or test results indicate moisture susceptibility, in which case mix at a dosage rate of 0.5%.

**Subsection 921.06 B. 2.** (pg. 1052) 11-6-17; B. Bituminous Additives, 2. Silicone Additives, Remove description and add the following sentence:

“2. Silicone Additives. The amount of silicone added to asphalt cement shall not exceed 2 oz. of silicone per 5500 gallons asphalt cement.”

**Subsection 921.07** (pg. 1053), 5-13-19; **Masonry Stone**; Revise 2<sup>nd</sup> paragraph:

Masonry stone shall meet the quality requirements in 903.25.

**Subsection 921.10** (pg. 1056), 5-13-19; **Precast Manholes and Catch Basins**; Revise 1<sup>st</sup> paragraph:

Provide precast manholes and catch basins that conform to ASTM C478 and that are made in accordance with the Department’s Standard Operating Procedure 5-3.

**Subsection 921.15** (pg. 1060), 5-13-19; **Fly Ash**; Revise 3<sup>rd</sup> paragraph:

Obtain fly ash from an approved source as shown on the Department’s Producer List.

**Subsection 921.15** (pg. 1060), 5-13-19; **Fly Ash**; Revise Table 921.15-1:

**Table 921.15-1: Fly Ash Requirements**

Property	Fly Ash Class	
	F	C
<b>A. Chemical Requirements: Uniformity Requirements</b>		
The loss on ignition of individual samples shall not vary from the average established by the 10 preceding tests, or by all preceding tests if the number is less than 10, by more than: Loss on ignition, max variation, percentage points from average	1.0	1.0
<b>B. Physical Requirements: Pozzolanic Activity Index</b>		
With Portland cement, at 7 days, min, % of control	60	60
With Portland cement, at 28 days, min, % of control	75	75

**Subsection 921.16** (pg. 1060), 5-13-19; **Ground Granulated Blast Furnace Slag**; Revise 2<sup>nd</sup> paragraph:

Obtain ground granulated blast furnace slag from an approved source as shown on the Department’s ~~QPL~~ Producer List.

**Subsection 921.17** (pg. 1060) 11-6-17; Ground Tire Rubber, add the following subsection:

**“921.17 Ground Tire Rubber**

Provide Class 30-1 Ground Tire Rubber (GTR) as defined by ASTM D5603 except for as noted in table 921.17-1. The material shall also be certified to meet the requirements of Table 921.17-01. Include certification of the GTR with the bill of lading for the modified asphalt cement.

**Table 921.17-1: Requirements for Ground Tire Rubber**

Property	Specification
Specific Gravity	1.15 +/- 0.05
Moisture Content	0.75% Max
Ferrous Metal Content	0.01% Max
Fiber Content	0.5% Max
Ash (ASTM E1131)	10% Max



## APPENDIX B

### SPECIAL PROVISIONS

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SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION	102LC
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BITUMINOUS PLANT MIX ROADWAY DENSITY	407DEN
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*RFP Contract Book 2 (Design-Build Contract)*  
*Interstate 65 Interchange at Buckner Road, Williamson County*

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**STATE**

**OF**

**TENNESSEE**

Rev: October 10, 2016

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**EMPLOYING AND CONTRACTING WITH ILLEGAL IMMIGRANTS**

The State shall endeavor to do business only with those contractors and subcontractors that are in compliance with the Federal Immigration and Nationality Act. This policy shall apply to all State Contractors including subcontractors. This policy statement is issued to establish implementation guidance to procuring state agencies and contractors reflecting the requirements of *Tennessee Code Annotated* §12-3-309 regarding the employment of illegal immigrants in the performance of state contracts.

1. The Contractor hereby attests, certifies, warrants, and assures that the Contractor shall not knowingly utilize the services of an illegal immigrant in the performance of this Contract and shall not knowingly utilize the services of any subcontractor who will utilize the services of an illegal immigrant in the performance of this Contract. The Contractor shall reaffirm this attestation, in writing, by submitting to the State a completed and signed copy of the “Attestation form” provided by the Department, semi-annually during the period of this Contract.
2. Prior to the use of any subcontractor in the performance of this Contract, and semi-annually thereafter, during the period of this Contract, the Contractor shall obtain and retain a current, written attestation that the subcontractor shall not knowingly utilize the services of an illegal immigrant to perform work relative to this Contract and shall not knowingly utilize the services of any subcontractor who will utilize the services of an illegal immigrant to perform work relative to this Contract.
3. The Contractor shall maintain records for its employees used in the performance of this Contract. Said records shall include a completed federal Department of Homeland Security Form I-9, *Employment Eligibility Verification*, for each employee and shall be subject to review and random inspection at any reasonable time upon reasonable notice by the State.

The Contractor understands and agrees that failure to comply with this section will be subject to the sanctions of *Tennessee Code Annotated* § 12-3-309 for acts or omissions occurring after January 1, 2007. This law requires the Chief Procurement Officer, Department of General Services, to prohibit a contractor from contracting with, or submitting an offer, proposal, or bid to contract with the State of Tennessee to supply goods or services for a period of one year after a

contractor is discovered to have knowingly used the services of illegal immigrants during the performance of this contract.

For the Purposes of this policy, “illegal immigrant” shall be defined as a non-citizen who has entered the United State of America without federal government permission or stayed in this country beyond the period allowed by a federal government-issued visa authorizing the non-citizen to enter the country for specific purposes and a particular time period.

**STATE**

**OF**

**TENNESSEE**

(REV. 3-30-15)

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**TENNESSEE DEPARTMENT OF TRANSPORTATION STANDARD**

**SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION**

**DESCRIPTION**

Any and all references concerning the March 1, 2006 Standard Specifications for Road and Bridge Construction shall be interpreted as the January 1, 2015 Standard Specifications for Road and Bridge Construction.

The following Special Provisions have been incorporated into the January 1, 2015 Standard Specifications for Road and Bridge Construction:

- 107SHP
- 407G
- 411TL
- 411TLD
- 411OGFC
- 716ST

Any reference to these Special Provisions shall refer to the January 1, 2015 Standard Specifications for Road and Bridge Construction.

**STATE**

**OF**

**TENNESSEE**

(Rev. 6-19-95)  
(Rev. 6-1-04)  
(Rev. 06-20-2011)

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**BUY AMERICA REQUIREMENTS**

All manufacturing processes for iron and steel products, and coatings applied thereon, used in this project shall occur in the United States except that if the proposal has bid items for furnishing domestic and foreign iron and steel, the bidder will have the option of (1) submitting a bid for furnishing domestic iron and steel, or (2) submitting a bid for furnishing domestic iron and steel and a bid for furnishing foreign iron and steel. If option (2) is chosen the bid will be tabulated on the basis of (a) the total bid price using the bid price for furnishing domestic iron and steel and, (b) the total bid price using the bid price for furnishing foreign iron and steel.

For the total bid based on furnishing foreign iron and steel to be considered for award, the lowest total bid based on furnishing domestic iron and steel must exceed the lowest total bid based on furnishing foreign iron and steel by more than 25 percent. The 25 percent differential applies to the total bid for the entire project, not just the bid prices for the steel or iron products.

Iron and steel products are defined as products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed from iron and steel made in the United States. Iron products are included, however, pig iron and processed, pelletized, and reduced iron ore may be purchased outside the United States.

**Manufacturing begins with initial melting and continues through the coating stage. Any process which modifies chemical content, physical size or shape, or the final finish is considered a manufacturing process.** Coatings include epoxy, galvanizing, painting or any other surface protection that enhances the value and/or durability of a material.

The contractor shall provide a certification to the Engineer with each shipment of iron and steel products to the project site that the manufacturing processes for the iron and steel products occurred in the United States. No steel shall be placed until the contractor ensures the requirements of this Special Provision are met.

The above requirements do not prevent a minimal use of foreign materials, if the cost of such materials used does not exceed 0.1 percent of the total contract cost or \$2,500.00, whichever is greater. If steel

not meeting the requirements of this Special Provision is used, the contractor shall provide a written statement to the Department prior to its use indicating where the steel will be incorporated in the work, the value of the steel, the percentage of the contract amount, and the appropriate invoices shall be submitted as documentation.

The contractor shall be responsible for all cost associated with any steel that is permanently incorporated into the project that does not meet the requirements of this Special Provision without prior written approval from the Department, up to and including removal and replacement.

**S T A T E**

**O F**

**T E N N E S S E E**

September 10, 2020

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**PROHIBITION ON CERTAIN TELECOMMUNICATION AND VIDEO**

**SURVEILLANCE SERVICES OR EQUIPMENT**

Installation of telecommunication and video surveillance equipment, services or systems shall contain no components from providers as listed in Title 2 Code of Federal Regulations (CFR) Part 200.216.

The prohibition on certain telecommunication and video surveillance services or equipment regulation in Title 2 CFR 200.216 shall apply to this contract. Take all necessary and reasonable steps in accordance with Title 2 CFR 200.216 to ensure that no prohibited telecommunication and video surveillance services or equipment are included in any of the work in this contract. As defined in Title 2 CFR 200.471, the regulation provides clarity that the telecommunications and video surveillance costs associated with Title 2 CFR 200.216 are unallowable for services and equipment from the providers.

It is prohibited from installing equipment, services, or systems that use covered telecommunications equipment or services from providers described in section 889 of the National Defense Authorization Act for Fiscal Year 2019 (NDAA 2019).

As described in section 889 of the NDAA 2019, "covered telecommunications equipment or services" means:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);
- Video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);
- Telecommunications or video surveillance services provided by such entities or using such equipment; or
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country. The term "covered foreign country" means the People's Republic of China.

Any prohibited equipment installed must be removed and replaced at the contractor's expense with acceptable equipment.



**STATE**

**OF**

**TENNESSEE**

Rev. 9-03-2013

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**AIR QUALITY FOR MOWING**

**Description.** The contractor will be required, absent an immediate safety issue determined by the Engineer, to cease mowing operations in the non-attainment counties listed below on Air Quality Action or Alert days within those counties. The appropriate TDOT representative will direct the contractor to suspend mowing operations upon the notification that an Action/Alert day forecast has been issued. Forecasts are issued by AIRNOW the day before the Action/Alert Day in the afternoons at the following web address:

<http://airnow.gov/index.cfm?action=airnow.fcsummary&stateid=50>

This will be the only authority for notifications used by TDOT. TDOT notification to the contractor will be made by the Close of Business (COB) the day prior to the Action/Alert Day.

The cessation of mowing operations will apply to any Action/Alert day forecast notification. The cessation of mowing operations shall remain in place until the Action/Alert day forecast is terminated. On these days, the contractor may mow outside of the non-attainment counties if the contract includes mowing in additional counties not listed below. Also, no trimming operations with weed trimmers will be allowed during these Action/Alert days. All working days that the contractor must cease mowing operations shall be added to the total number of days the contractor has to complete the disrupted mowing cycle.

**Basis of Payment.** All costs associated with the cessation of work caused by an Air Quality Action or Alert days will be compensated, on a per day basis, at the unit price bid for Item Number 717-10.01, INVOLUNTARY WORK SUSPENSION.

Payment will be made only when the contractor is actively mowing in one of the listed counties when an Air Quality Action/Alert day in that county has been declared and he is directed to cease mowing operations.

No payment will be made for any Air Quality Action/Alert day that occurs after mowing operations have been completed for a cycle. In addition, no payment will be made if after mobilizing for a mowing cycle an Air Quality Action/Alert day is declared before the contractor commences mowing operations.

<b><u>Non-Attainment Area</u></b>
<b>Counties</b>
<b>CHATTANOOGA REGION</b>
Hamilton
<b>CLARKSVILLE REGION</b>
Montgomery
<b>NASHVILLE REGION</b>
Davidson
Rutherford
Sumner
Wilson
Williamson
<b>KNOXVILLE REGION</b>
Anderson
Jefferson
Knox
Loudon
Roane (only areas around TVA Plant)
<b>MEMPHIS REGION</b>
Shelby
<b>GREAT SMOKY MTNS.</b>
Blount
Cocke (only areas within Park)
Sevier

**S T A T E**

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**T E N N E S S E E**

January 1, 2015

Rev. 12-22-14

Rev. 2-13-17

Rev. 6-26-17

**SPECIAL PROVISION**

**REGARDING**

**WATER QUALITY AND STORM WATER PERMITS**

**Scope**

The conditions of this Special Provision apply to all construction on this project pursuant to the following:

1. Section 404 of the Federal Clean Water Act (33 U.S.C. §1344), and all implementing regulations, including without limitation regulations of the U.S. Army Corps of Engineers governing permits for discharges of dredged or fill material into waters of the United States in 33 CFR Part 323; and
2. The Tennessee Water Quality Control Act (T.C.A. §69-3-101, et seq.) and all implementing regulations, including without limitation the Rules of the Tennessee Department of Environment and Conservation governing NPDES permits in Chapter 1200-4-10, and Aquatic Resource Alteration permits in Chapter 1200-4-7; and
3. Section 26a of the TVA Act of 1933 as amended (49 Stat. 1079, 16 U. S. C. sec. 831y1.) and all implementing regulations, including without limitation the regulations of the Tennessee Valley Authority governing construction in the Tennessee River System in 18 C.F.R., Part 1304; and
4. The Tennessee Wildlife Resources Agency Reelfoot Lake Watershed Management permit program (T.C.A. section 70-5-1.), and all implementing regulations, including without limitation regulations authorizing any activity, practice, or project which has or is likely to have the effect of diverting surface or subsurface water from the Lake or have the effect of draining or otherwise removing water from Reelfoot Lake; and
5. Coast Guard Bridge Permit (USCG) (Section 9 of the Rivers and Harbors Appropriation Act of 1899) and all implementing regulations, including but not without limitation for projects which impact streams deemed navigable by the U.S. Coast Guard.

**Responsibility**

It is understood and agreed that the Contractor assumes all responsibilities of the permittee as indicated in the permit that relates to protection of the "waters of the United States" and/or "waters of the State of Tennessee."

It is also understood and agreed that the Contractor shall be responsible for obtaining any additional permits required by the Contractor's method of construction, including without

limitation haul roads, temporary channels or temporary ditches, or off-site waste and/or borrow areas.

It is also understood that the Contractor shall be responsible for implementing the provisions of the Water Quality (including, but not limited to, TDEC ARAP, USACE 404, TVA Section 26a, Coast Guard, TWRA) and Storm Water [including, but not limited to, National Pollution Discharge Elimination System (NPDES), Statewide Stormwater Management Plan (SSWMP)] Permits and requirements that pertain to construction activities.

The Contractor by signing this contract is indicating that the Contractor has reviewed a copy of the permit provisions, including NPDES Permit provisions at <http://www.tdot.state.tn.us/construction/permits/npdes.pdf>, the site specific SWPPP, the contract plans, Standard Specifications and contract Special Provisions and finds the permit requirements and erosion prevention and sediment control (EPSC) procedures to be reasonable, workable, and binding.

It is also understood that the Contractor shall not be released from the project site responsibilities under the NPDES permit provisions until the Notice of Termination (NOT) is submitted to TDEC by the TDOT Regional Construction Supervisor. The NOT is a certification that the construction project site is permanently stabilized and that all construction related discharges have ceased. This means that the use of EPSC measures to alleviate concerns of surface erosion and transport of sediment to surface water conveyances or to waters of the state is no longer necessary. Furthermore, it means that permanent controls, hard surfaces and/or vegetation, employed at the site are deemed adequate to prevent erosion and sediment transport and no other potential sources of construction-related pollution are on the project.

It is also understood that the Contractor shall not be released from any warranty provided for EPSC plantings, including sod and trees. If the entire project is complete as outlined in **Subsection 105.15** of the **Standard Specifications**, the Contractor shall be required to supply a performance bond as outlined in **Subsection 802.15** of the **Standard Specifications** to cover any warranty for EPSC plantings.

### **NPDES Permit Required Action**

The Contractor (or their representative) shall accompany the EPSC inspector (TDOT personnel or TDOT hired consultant) on all EPSC inspections of the entire construction project including permitted locations and potentially impacted streams as well as attend all QA/QC Project Assessments.

EPSC Inspections shall be conducted as required in the most current TN Construction General Permit.

EPSC inspections shall be performed on the schedule established in the TN Construction General Permit until the site is permanently stabilized to determine if the permit requirements are being met. Where sites or portion(s) of construction sites have been temporarily stabilized, or runoff is unlikely due to winter conditions (e.g. site covered with snow or ice), such inspection only has to be conducted once per month until thawing or precipitation results in runoff or construction activity resumes. Written notification of the intent to change the inspection frequency and the justification for such request must be submitted to the TDOT Project Supervisor and the TDEC Central Office before proceeding.

An individual representing the Contractor, who holds a current TDEC “*Fundamentals of Erosion Prevention and Sediment Control Level I*” certification shall accompany the EPSC inspector on all required EPSC inspections. The Contractors project supervisor(s) shall also hold

a current TDEC “*Fundamentals of Erosion Prevention and Sediment Control Level I*” certification. Proof of required personnel training for the individual(s) shall be provided to the TDOT Project Supervisor prior to beginning of construction.

The TDOT EPSC inspector shall document all deficiencies on the required TDOT EPSC Inspection Report form (provided in the SWPPP). The Contractor (or their representative) shall sign the TDOT EPSC Inspection Report form and any supporting documentation indicating that he is in agreement with the report, recommendations and repair schedule as stated within the documentation.

Additionally, the Contractor shall make necessary maintenance and repairs relative to deficiencies in these permit conditions or requirements within twenty-four (24) hours after an inspection identifies the maintenance or repair need, and/or when directed to do so by the TDOT Project Supervisor, unless conditions make a particular activity impracticable. Any such conditions that make immediate repairs impracticable shall be documented and provided to the TDOT Project Supervisor, via the inspection report, and be accompanied by an expected repair schedule based on forecasted weather conditions.

The Contractor further agrees that he will execute two (2) copies of the Notice of Intent (NOI) form of the permit (provided by the Department), indicating his acceptance of the stipulations contained therein. The Contractor further agrees, that should he fail to execute said copies and return them to the TDOT Construction Division within ten (10) calendar days after submittal of the contract proposal to him, that the Department may at its discretion cancel the award with the Contractor forfeiting his bid bond.

Further, the Contractor agrees to review the site specific Stormwater Pollution Prevention Plan (SWPPP) that will be made available prior to or at the pre-construction conference, for any additional EPSC requirements. The Contractor shall sign and submit two copies of the SWPPP signature page (provided by the Department within the site specific SWPPP). The Contractor may submit for review and approval changes/revisions to the SWPPP to better prevent erosion and sediment transport at any time after contract execution. Rejection of any submittals does not relieve the contractor of any liability for appropriate Best Management Practices (BMPs).

If at any time during this contract, the requirements for the Water Quality Permits and/or the Storm Water Permits for Construction Related Activities are changed/revised/updated, the Contractor shall be notified in writing by the Department of such requirements. The Contractor shall comply with the new requirements within thirty (30) days of the Department notification.

If at any time the Contractor becomes aware that sedimentation is occurring or has occurred in streams impacted by the specified project, the Contractor shall immediately notify the TDOT Project Supervisor to evaluate the EPSC measures employed. A determination of the cause for sedimentation will be made by the Department. The Contractor shall immediately repair or replace defective EPSC measures, and install, as applicable, additional or other EPSC measures with the goal of eliminating future sedimentation. Once a remediation plan is provided by the Department, the Contractor shall, within twenty-four (24) hours after notification, begin the remediation as required. Based on the cause of sedimentation, the Department will determine if the cost of remediation will be performed at the Contractor’s expense.

### **Failure to Comply**

In the event a Notice of Violation (NOV) or Order pursuant to the Tennessee Water Quality Control Act or the Federal Clean Water Act is issued on this project, any and all fines will be the

sole responsibility of the Contractor as outlined in **Subsection 107.01** of the **Standard Specifications for Road and Bridge Construction**.

Failure of the Contractor to comply with this Special Provision or take immediate corrective actions required within twenty-four (24) hours (unless documented conditions make a particular maintenance or repair activity impracticable immediately) shall be reason for the TDOT Project Supervisor to suspend all other work on the Project, except erosion prevention and sediment control (EPSC) and traffic control, applying non-refundable deductions of monies from the Contract per calendar day from monies due to the Contractor for any EPSC work on the Project. This deduction can be made for each location, as determined by the TDOT Project Supervisor, for each calendar day that the deficiency is allowed to remain and charged as item description "*Failure to Comply with Permit Deduction*". A deduction shall be made from monies due the Contractor, not as a penalty, but as liquidated damages, as indicated in **Subsection 108.09** of the **Standard Specifications for Road and Bridge Construction January 1, 2015**, as amended.

If the Contractor does not make necessary corrections/adjustments in a timely manner as required above, the Department will implement the provisions of **Subsection 209.07** and **Subsection 109.08** of the **Standard Specifications for Road and Bridge Construction** that provides for the Department making repairs and recovering the costs thereof from the Contractor.

The Department will not participate in any payment or reimbursement for fines and will not authorize time extensions due to delays in project progress for work stoppage, to remedy the violations stated within the NOV, required by the TDOT Project Supervisor as stated in **Subsection 105.01** of the **Standard Specifications for Road and Bridge Construction**.

#### **Spill Prevention, Control, and Countermeasure**

To help prevent the discharge of oil into navigable waters, the U.S. Environmental Protection Agency (EPA) developed the Spill Prevention, Control, and Countermeasure (SPCC) Program. The SPCC Program is under the authority of Section 311 (j)(1)(C) of the Federal Water Pollution Control Act (Clean Water Act) in 1974. The rule may be found at Title 40, Code of Federal Regulations (CFR), Part 112. Additional information regarding the preparation and requirements of a SPCC Plan can be found at: <http://www.epa.gov/oem/content/spcc/>.

If applicable based upon the total aggregate capacity of aboveground oil storage, the contractor shall develop a site specific SPCC Plan per EPA requirements. This plan shall be provided to the Project Supervisor as part of the required submittals during the project Pre-Construction Meeting or at which time the conditions on the project site meet the applicable criteria. The contractor shall be responsible for obtaining any other necessary local, state, and federal permits as applicable. The SPCC Plan and/or permits shall be kept on-site.

The contractor shall be responsible complying with all aspects of the site specific SPCC Plan including but not limited to: performing any required inspections as directed by the SPCC Plan as well as implementing material and spill management practices per the project's Stormwater Pollution Prevention Plan (SWPPP). In the event, where a release containing a hazardous substance in an amount equal to, or in excess of a reportable quantity established under either 40 CFR 117 or 40 CFR 302 occurs during a 24-hour period, the contractor shall immediately notify the Project Supervisor.

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Date 11-19-2020  
County: Williamson  
Contract No. DB2001

SPECIAL PROVISION

REGARDING

PROJECT COMPLETION AND LIQUIDATED DAMAGES

All temporary lane closures and road closures on Interstates and State Routes must be approved by the Department in advance. Requests for temporary lane closure approvals and state trooper requests must be sent to the Department at least seven (7) calendar days in advance.

There will be periods when the Contractor will not be allowed to have closures due to major events and holidays specified in subsection 104.04 of the Standard Specifications, or as directed by the Engineer.

Temporary lane closures may be allowed from 8:00 PM to 6:00 AM, or as directed by the Engineer. For each hour or portion thereof, which any traffic lane on I-65 remains closed outside the allowable closure hours, the sum of \$7,000 per hour per lane shall be deducted from monies due the Contractor, not as a penalty, but as liquidated damages. No full closures on Interstate 65 will be allowed.

Temporary lane closures may be allowed from 8:00 PM to 6:00 AM, or as directed by the Engineer. For each hour or portion thereof, which any traffic lane on Lewisburg Pike SR-106 remains closed outside the allowable closure hours, the sum of \$3,000 per hour per lane shall be deducted from monies due the Contractor, not as a penalty, but as liquidated damages.

Local street lane closures involving Buckner Lane/Buckner Road intersection and associated local streets, requests for approval must be sent to the City of Spring Hill at least seven (7) calendar days in advance. The City of Spring Hill has specific requirements for local street lane closures including the placement of message boards and detour signs a minimum of seven (7) calendar days in advance of closure. A detour plan for short-term and extended lane closures shall be submitted in advance with the request to the City of Spring Hill.

Flaggers may also be required by the City to ensure safe movement of vehicular traffic during local street lane closures. Any traffic lane that remains closed outside the allowable closure hours, the sum of \$2,000 per hour per lane shall be deducted from monies due the Contractor, not as a penalty, but as liquidated damages.

All lane closures and operations must be coordinated with other construction contracts in the area.

The Design-Builder may utilize rolling roadblocks on I-65 weeknights from 9:00 PM to 6:00 AM. If needed, blasting shall be permitted weekdays no earlier than 9:00 AM and must be completed before 3:00 PM. Rolling roadblocks shall not exceed 30 minutes in duration. For each 30 minutes, or portion thereof, in excess of the allotted 30 minute period that any lane remains closed, the sum of \$ 7000 per hour per lane shall be deducted from monies due the Contractor, not as a penalty, but as liquidated damages. Traffic shall be allowed to return to normal flow before beginning another rolling roadblock.

**Maintenance**

Failure to complete pothole mitigation as described in RFP Book 3 Section 11.2 within a 24-hour period will result in the sum of \$2000 per occurrence per day (or portion thereof) until pothole mitigation is complete being deducted from monies due the Contractor, not as a penalty, but as liquidated damages.

Failure to temporarily delineate damaged safety apparatuses, such as, but not limited to, guardrail, bridge rail, concrete barrier, cable barrier systems and attenuators that present a hazard to the traveling public within 24 hours of discovery or notification will result in the sum of \$2000 per occurrence per day (or portion thereof) until temporary delineation is complete being deducted from monies due the Contractor, not as a penalty, but as liquidated damages.

Failure to complete permanent repairs within 10 calendar days of discovery or notification will result in the sum of \$2000 per occurrence per day (or portion thereof) until permanent repair is complete being deducted from monies due the Contractor, not as a penalty, but as liquidated damages.

Failure to begin and provide continuous mowing cycles on operational roadways per the Design-Builders submitted and concurred maintenance plan within 2 weeks will result in the sum of \$2000 per occurrence per day (or portion thereof) until the cycle has begun. See RFP Book 3 Section 12.0 for mowing requirements.

**Environmental**

As outlined in the NPDES CGP, the Department will perform the monthly Environmental Quality Assurance Project Compliance Assessments (QA Inspections) on this Project, which will include any waste and borrow areas. Failure to comply with the regulations and have repeat non-conformances on QA Inspections, Water Quality violations or a NOV, the Department shall increase the frequency of QA inspections to twice per month. The extra QA inspection shall occur until the project has been brought back into compliance for two consecutive QA inspections. Until QA inspections return to once a month, each additional QA inspection in the sum of \$1,500.00 shall be deducted from monies due the Contractor, not as a penalty, but as liquidated damages.

**Project Completion**

Failure to complete all work specified in the contract on or before the completion date set forth in RFP Book 2 Section D-3, a sum of money equal to \$15,000 per Calendar Day after the Design-Builder's established completion date shall be deducted from monies due to the Design-Builder, not as a penalty, but as liquidated damages.

Where provisions of this Special Provision conflict with Subsection 108.09 of the Standard Specifications, as amended, and Contract Book 3, this Special Provision prevails.



**STATE**

**OF**

**TENNESSEE**

(Rev. 10-01-06)

(Rev. 11-03-08)

(Rev. 01-03-13)

January 1, 2015

**SPECIAL PROVISION**  
**REGARDING**  
**PAYMENT ADJUSTMENT FOR FUEL**

This special provision covers the method of payment adjustment for fuel price increases or decreases. Payment adjustments will be made in monthly increments based on the estimated fuel consumed on major items of work, the estimated price per gallon of fuel at the time of letting, and the percentage change of the Producer Price Index for Light fuel oils, Series ID Number WPU0573, published by the U.S. Department of Labor, Bureau of Labor Statistics.

The estimated price per gallon of fuel for this contract is \$1.48.

The October 2020 Price Index (Ib) for light fuel oils shall be used for this contract. Adjustments will be based on the price index in effect for the month in which the item was installed.

Fuel consumption for payment adjustment shall be based on the following:

Item Number	Description of Work	Gallons	Unit of measure
		per unit	
203	Any Road and Drainage Excavation	0.25	Cubic Yard
203	Any Borrow Excavation (Rock)	0.36	Cubic Yard
203	Any Borrow Excavation (Other than Solid Rock)	0.25	Cubic Yard
203	Any Borrow Excavation (Rock)	0.16	Ton
203	Any Borrow Excavation (Other than Solid Rock)	0.11	Ton
203-05	Undercutting	0.25	Cubic Yard
203	Any Embankment (in-place)	0.25	Cubic Yard
303, 309, 312	Any Aggregate Base	0.79	Ton
313, 501	Treated Permeable Base or Lean Concrete Base	0.10	Square Yard
307	Any Bituminous Plant Mix Base (HM)	2.98	Ton
411	Any Bituminous Concrete Surface (HM)	2.98	Ton
501	Any Portland Cement Concrete Pavement		
	≤ 10 in. thickness	0.25	Square Yard
	> 10 in. thickness	0.30	Square Yard

No payment adjustment for fuel shall be made on any item of work which is not listed above.

No payment adjustment for fuel shall be made unless the price index varies 5% or more from the index indicated in this Special Provision.

Where the price index varies 5% or more, the payment adjustment will be made as follows:

$$PA = [(Ic \div Ib) - 1] \times Fe \times Fp$$

Where:

PA =Payment Adjustment (may be plus or minus)

Ic =Index for Current Month

Ib =Index for Bidding

Fe =Estimated Fuel in Gallons used based on above table and work paid for during adjustment month.  $[\sum (\text{Pay quantity} \times \text{Gallons per unit}) = Fe]$

Fp = Fuel Price for Bidding

The Project Engineer will compute the payment adjustment for fuel on work sheets similar to the one attached and will furnish a copy of the calculations upon request to the prime contractor and approved subcontractors.

Upon the expiration of the allocated working time, as set forth in the original contract or as extended by Change Order, payment adjustments for fuel will continue to be made only when the "Index for Current Month" is **less** than the "Index for Bidding" and varies 5% or more.

Payment adjustment, for fuel provided after the expiration of the allocated working time and where the "Index for Current Month" **exceeds** the "Index for Bidding", will **not** be made until after the contract records have been approved by Final Records (FR)/Materials & Tests (MT) and a Final Estimate is ready to be processed. Upon contract record approval by FR/MT, fuel payment adjustments shall be calculated for each month where the allocated working time has expired, the "Index for Current Month" **exceeds** the "Index for Bidding", and the indices vary 5% or more. The calculation of the fuel payment adjustment shall be made using the "Index for Current Month" or the "Index for Contract Completion Date" in accordance with the following formulas:

The "Index for Contract Completion Date" is the fuel index in effect on the allocated Contract Completion date or the completion date as extended by Change Order.

"Index for Current Month" is **less** than "Index for Contract Completion Date"

$$PA = [(Ic \div Ib) - 1] \times Fe \times Fp$$

"Index for Current Month" is **greater** than "Index for Contract Completion Date"

$$PA = [(Icd \div Ib) - 1] \times Fe \times Fp$$

Where:

- PA = Payment Adjustment (may be plus or minus)
- Ic = Index for Current Month
- Ib = Index for Bidding
- Icd= Index for Contract Completion Date (or as extended by Change Order)
- Fe = Estimated Fuel in Gallons used based on above table and work paid for during adjustment month. [ $\sum$  (Pay quantity x Gallons per unit)= Fe]
- Fp = Fuel Price for Bidding

Payment Adjustment for fuel will be made under:

Item No.	Description	Pay Unit
109-01.01	Payment Adjustment for Fuel	Dollar

Monthly Payment Adjustment for Fuel Worksheet

Project No. \_\_\_\_\_

Contract No. \_\_\_\_\_

County \_\_\_\_\_

Fuel Price (Fp) \_\_\_\_\_ Price Index Bidding (Ib) \_\_\_\_\_ Current Price Index (Ic) \_\_\_\_\_

Index for Contract Completion Date (or as extended by Change Order) (Icd) \_\_\_\_\_

Estimate Period: Work Performed \_\_\_\_\_ Adjustment Paid \_\_\_\_\_  
(Month/Yr)

Item	Unit	Quantity	Fuel Factor		Total Fuel
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____
_____	_____	_____	X	_____	_____

Total Fuel for Month (Fe) \_\_\_\_\_

$$PA = [(Ic \div Ib) - 1] \times Fe \times Fp$$

$$PA = [(Icd \div Ib) - 1] \times Fe \times Fp$$

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**T E N N E S S E E**

(Rev. 05-16-16)

(Rev. 04-01-19)

(Rev. 11-08-19)

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**PAYMENT ADJUSTMENT FOR BITUMINOUS MATERIAL**

This Special Provision covers the method of payment adjustment for bituminous materials.

**100% Virgin Bituminous Material**

A payment adjustment will be made to compensate for increases and decreases of 5% or more in the contractor's bituminous material cost. The normal bid items in the contract covering the bituminous material shall not be changed. Payment adjustments (+/-) shall be paid under "Payment Adjustment for Bituminous Material" and calculated as described herein:

A "Basic Bituminous Material Index" will be established by the Tennessee Department of Transportation prior to the time the bids are opened. This "Basic Bituminous Material Index" is the average of the current quotations on P.G. 64-22 from suppliers furnishing asphalt cement to contractors in the State of Tennessee. These quotations are the cost per ton f.o.b. supplier's terminal.

The "Basic Bituminous Material Index" for this project is **\$425.00** per ton.

The "Monthly Bituminous Material Index" is also established on the first day of each month by the same method. A payment adjustment shall be made provided the "Monthly Bituminous Material Index" varies 5% or more (+/-) from the "Basic Bituminous Material Index".

Where the price index varies 5% or more, the payment adjustment will be made as follows:

$$PA = [Ic - Ib] \times T$$

Where:

- PA = Price Adjustment for Adjustment Month
- Ib = Basic Bituminous Material Index
- Ic = Monthly Bituminous Material Index
- T = Tons bituminous material for Adjustment Month

Payment adjustment will be applied to all asphalt cement, asphalt emulsion, or bituminous material used for paving on this project.

Upon the expiration of the allocated working time, as set forth in the original contract or as extended by Change Order, payment adjustments for bituminous material will continue to be

made only when the "Monthly Bituminous Material Index" is **less** than the "Basic Bituminous Material Index" and varies 5% or more.

Payment adjustment, for bituminous material used after the expiration of the allocated working time and where the "Monthly Bituminous Material Index" **exceeds** the "Basic Bituminous Material Index", will **not** be made until after the contract records have been approved by Final Records (FR)/Materials & Tests (MT) and a Final Estimate is ready to be processed. Upon contract record approval by FR/MT, payment adjustments for bituminous material shall be calculated for each month where the allocated working time has expired, the "Monthly Bituminous Material Index" **exceeds** the "Basic Bituminous Material Index", and the indices vary 5% or more. The calculation of the bituminous payment adjustment shall be made using the "Monthly Bituminous Material Index" or the "Bituminous Material Index for Contract Completion Date" in accordance with the following formulas:

The "Bituminous Material Index for Contract Completion Date" is the Monthly Bituminous Material Index in effect on the allocated Contract Completion Date or on the completion date as extended by Change Order.

The "Monthly Bituminous Material Index" is **less** than the "Bituminous Material Index for Contract Completion Date".

$$PA = [Ic - Ib] \times T$$

The "Monthly Bituminous Material Index" is **greater** than the "Bituminous Material Index for Contract Completion Date".

$$PA = [Icd - Ib] \times T$$

Where:

- PA = Price Adjustment for Adjustment Month
- Ib = Basic Bituminous Material Index
- Ic = Monthly Bituminous Material Index
- Icd = Bituminous Material Index for Contract Completion Date (or as extended by Change Order)
- T = Tons

**FOR REFERENCE ONLY**

SiteManager calculates the price adjustment based on the actual amount of asphalt cement (residue) in the emulsion using the following percentages:

- tack coats and shoulder sealants (e.g. SS-1, SS-1h, CSS-1, Css-1h) 63% residue
- prime coats (e.g. AE-P) 54% residue
- scrub seals and microsurfacing (e.g. CQS-1HP) 65% residue
- chip seals (e.g. CRS-2, CRS-2P) 69% residue
- hot in-place recycle (ARA-3P) 60% residue

**Mixes Containing Recycled Bituminous Material**

The quantity of virgin asphalt cement in tons subject to payment adjustment in recycled mixes shall be the product of the total tons of each mix multiplied by the difference between (1) the percent of asphalt cement specified for bidding purposes and (2) the percent of asphalt cement obtained from the recycled asphaltic material (RAP) used in each mix. No payment adjustment under this special provision for increases and decreases in the contractor's cost for virgin asphalt cement in recycled mixes will be allowed for asphalt cement content in excess of the percent specified for bidding purposes, as all payment adjustments for asphalt cement in the mix design of recycled mixes in excess of the percent of asphalt cement specified for bidding purposes will be made in accordance with the Standard Specifications.

No payment adjustment for bituminous material containing RAP shall be made unless the "Monthly Bituminous Material Index" varies 5% or more from the "Basic Bituminous Material Index" indicated in this Special Provision.

Where the price index varies 5% or more, the payment adjustment will be made as follows:

$$PA = \frac{[Ic - Ib] \times [BA - RA]}{100} \times Tm$$

- PA = Price Adjustment for Adjustment Month
- Ib = Basic Bituminous Material Index
- Ic = Monthly Bituminous Material Index
- BA = Percent asphalt specified for bidding purposes
- RA = Percent asphalt obtained from recycled asphaltic material used in each mix
- Tm = Tons asphalt mix for adjustment month

Upon the expiration of the allocated working time, as set forth in the original contract or as extended by Change Order, payment adjustments for bituminous material containing RAP will continue to be made only when the "Monthly Bituminous Material Index" is **less** than the "Basic Bituminous Material Index" and varies 5% or more.

Payment adjustment, for bituminous material containing RAP provided after the expiration of the allocated working time and where the "Monthly Bituminous Material Index" **exceeds** the "Basic Bituminous Material Index", shall **not** be made until after the contract records have been approved by Final Records (FR)/Materials & Tests (MT) and a Final Estimate is ready to be processed. Upon contract record approval by FR/MT, payment adjustments for bituminous material containing RAP shall be calculated for each month where the allocated working time has expired, the "Monthly Bituminous Material Index" **exceeds** the "Basic Bituminous Material Index", and the indices vary 5% or more. The calculation of the bituminous payment adjustment shall be made using the "Monthly Bituminous Material Index" or the "Bituminous Material Index for Contract Completion Date" in accordance with the following formulas:

The "Bituminous Material Index for Contract Completion Date" is the Monthly Bituminous Material Index in effect on the allocated Contract Completion Date or on the completion date as extended by Change Order.

The “Monthly Bituminous Material Index” is **less** than the “Bituminous Material Index for Contract Completion Date”.

$$PA = [Icd - Ib] \times \frac{[BA - RA]}{100} \times Tm$$

The “Monthly Bituminous Material Index” is **greater** than the “Bituminous Material Index for Contract Completion Date”.

$$PA = [Ic - Ib] \times \frac{[BA - RA]}{100} \times Tm$$

Where:

PA =	Price Adjustment for Adjustment Month
Ib =	Basic Bituminous Material Index
Ic =	Monthly Bituminous Material Index
Icd =	Bituminous Material Index for Contract Completion Date (or as extended by Change Order)
BA =	Percent asphalt specified for bidding purposes
RA =	Percent asphalt obtained from recycled asphaltic material used in each mix
Tm =	Tons asphalt mix for adjustment month



**STATE****OF****TENNESSEE**

September 8, 2016

January 1, 2015

**SPECIAL PROVISION****REGARDING****MEASUREMENT AND PAYMENT**

Insert the following before the penultimate paragraph in Subsection 109.01:

In lieu of platform scales, a computer controlled weighing system connected to the hydraulic lifting system on front end loaders, or similar machines, may be used for weighing rock materials obtained from the excavation as provided in Subsection 104.09 or from temporary sources established to supply stone solely to the project where approved by the Engineer, subject to the following conditions:

1. The operator of the weighing system shall be a Certified Public Weigher as prescribed in Title 47, Chapter 26, Part 8, T.C.A.
2. The accuracy of the weighing system shall be within 1%  $\pm$ .
3. The weighing system shall be checked for accuracy at least once each day, or as often as deemed necessary by the Engineer. Verified weights equal to the capacity of the loading equipment shall be available on the project at all times for checking the accuracy of the weighing system.

With the bucket empty, the zero reading shall be checked each day before any material is loaded and again after one or two trucks are loaded and thereafter as determined by the operator or as directed by the Engineer.

The operation and checking of the weighing equipment shall be in accordance with the recommendations of the manufacturer of the equipment. A copy of the manufacturer's Operators Manual shall be furnished the Engineer prior to beginning weighing operations.

4. If the weighing system exceeds the 1%  $\pm$  tolerance during any scale check, use of the weighing equipment shall cease until the scales are brought back within required tolerance.
5. The weighing system shall have a digital display capable of displaying the following:

- a. The weight of each bucket to the nearest 0.01 metric ton (ton) as the material is loaded.
  - b. The accumulated weight loaded into each hauling unit.
  - c. The total of the accumulated weights recorded on each sheet or roll of the printout (see Item No. 7 below).
6. The computer controlled weighing equipment shall be capable of printing weigh tickets on a continuous sheet or roll which provides the following data:
- a. Item number for rock material being weighed.
  - b. Identification number for haul unit. (Each haul unit shall have an identification number prominently displayed.)
  - c. Date and time each haul unit is loaded.
  - d. Weight of rock material in each bucket weighed to nearest 0.01 metric ton (ton).
  - e. Total weight of rock material in each haul unit.
  - f. Total weight loaded during each shift or other unit of time as may be requested by the Engineer.
7. The weigh tickets will not accompany each haul unit to the placement site but will be retained on the printout in the loading unit; and the original printout shall be given to the Engineer's representative at the conclusion of the day's work, or upon request. Each continuous sheet or roll, or portion thereof, shall have the Certified Weigher's stamp affixed along with his/her signature.
8. The Department's Inspector at the delivery site will visually inspect each load and keep a record of the haul unit number and time of arrival. In the event a discrepancy between weigh tickets and the Inspector's record arises, the Inspector's record shall govern.
9. Under normal operations the computer controlled weighing system shall be capable of calibration by means of the programming buttons, switches or keys on the control panel or keyboard without resorting to internal adjustments.
10. If at any time the Engineer deems that the computer controlled weighing system is not performing satisfactorily, he will direct the Contractor to discontinue its use and weigh the rock material on platform scales as described above in this Subsection.

STATEOFTENNESSEE

(Rev. 5-15-17)

(Rev. 4-15-19)

(Rev. 11-9-20)

January 1, 2015

SPECIAL PROVISIONREGARDINGBITUMINOUS PLANT MIX PAVEMENTS (HOT MIX)ROADWAY DENSITYDescription

This work consists of the requirements for acceptance of asphalt roadway density by use of core samples, and for testing and acceptance of asphalt longitudinal joint density.

Meet all requirements of **407** of the Standard Specifications except as modified.

**407.03.D.2.h - Contractor Quality Control System. Add the following between the second and third paragraphs:**

Conduct quality control testing of surface and binder mixes for roadway density throughout placement to verify that the mixture being placed meets specified density requirements. A Quality Control Plan (QCP) for this density testing is required. Acceptable methods of quality control testing include coring, nuclear gauge testing, and non-nuclear gauge testing. Document all tests and records from the control strip (if any). Make quality control records available upon request to the Department.

**407.07 - Rollers. Replace the entire subsection with the following:**

Provide a sufficient number and type of self-propelled rollers to achieve proper compaction and obtain the specified densities.

**407.15 - Compaction. Replace the entire subsection with the following:**

**A. General**

After the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly compacted. Use a method that shall be capable of compacting the mixture to the specified density while it is in a workable condition. Rollers shall not park or be refueled on the bituminous pavements.

**B. Density Requirements**

Meet the applicable density requirements for travel lanes and joints as specified in Table 407DEN-1 and Table 407DEN-2.

1. Mix Types: All Travel Lanes for A, B, BM, BM-2, C, CW, D, E
2. All levels of ADT
3. %Gmm values specified are for lot averages.

**Table 407DEN-1**

<b>Travel Lane Density</b>		
% Gmm		% Pay
Min	Max	
99.0	100	90
98.0	<99	94
97.0	<98	98
96.0	<97	100
95.0	<96	101
94.0	<95	102
93.0	<94	101
92.0	<93	100
91.0	<92	98
90.0	<91	94
89.0	<90	90
88.0	<89	86
	<88	*

**Table 407DEN-2**

<b>Joint Density Incentive/Disincentive</b>		
% Gmm		\$/L.F./Lot
Min	Max	
98.0	100	*
97.0	<98	-0.70
96.0	<97	-0.42
95.0	<96	0.00
94.0	<95	0.00
93.0	<94	0.07
92.0	<93	0.14
91.0	<92	0.07
90.0	<91	0.00
89.0	<90	-0.14
88.0	<89	-0.42
87.0	<88	-0.70
86.0	<87	-0.98
	<86	*

\*Shall be removed and replaced at no cost to the Department or as directed by the engineer.

% Pay for travel lanes shall be applied to the theoretical quantity of the mix on the travel lanes only, even when the shoulder and travel lane are placed concurrently. No incentive shall be paid for the second travel lane unless the joint for that lot is a minimum of 90.0%.

Any lot of joint density tests averaging below 87% shall be sealed at no cost to the Department. Approved sealers are listed on the Department’s Qualified Products List (QPL), Listing #40 for Pavement Sealers. Sealing of deficient longitudinal joint lots will only be required for surface mixes. No incentive/disincentive shall be applied to a longitudinal joint between a travel lane and a shoulder.

Meet the applicable density requirements for shoulders as specified in Table 407DEN-3.

1. Mix Types: All shoulder mixes
2. All levels of ADT
3. %Gmm values specified are for lot averages.

**Table 407DEN-3**

<b>Shoulder Density</b>		
% Gmm		% Pay
Min	Max	
98.0	100	*
97.0	<98	96
96.0	<97	98
95.0	<96	100
94.0	<95	100
93.0	<94	100
92.0	<93	100
91.0	<92	100
90.0	<91	100
89.0	<90	100
88.0	<89	100
87.0	<88	98
86.0	<87	94
85.0	<86	90
	<85	*

\* Shall be removed and replaced at no cost to the Department or as directed by the engineer.

% Pay for shoulders shall be applied to the theoretical quantity of mix on the shoulder even when the travel lane and shoulder are placed concurrently.

**407.20.B.5 - Acceptance of the Mixture. Replace the entire subsection with the following:**

**5. Acceptance for Mix Density on the Roadway**

- a. **General.** The Department will apply a deduction in payment, not as a penalty but as liquidated damages, for failure to meet the density requirements as specified in **407.15.B**. As soon as practical after the final rolling is completed on each lot, 5 density tests (1 per subplot) shall be performed by the Department at random locations determined by the Engineer, and an average of all such tests shall be computed. Any deduction for failure to meet density requirements or incentive for exceeding density requirements shall be

computed to the nearest 0.1% as a percentage of the total payment otherwise due for each lot.

Consecutive lots with density deductions is cause to stop production as directed by the Engineer. Adjust the rolling operation and Quality Control Plan to achieve the required density. Construct a test strip of not more than 250 tons to demonstrate to the Engineer that the changes made produce densities meeting the requirement without deductions. Only resume full production after the Engineer has accepted the test strip.

- b. Travel Lane, Turning Lane, Ramp or Shoulder Density.** For density acceptance purposes, the pavement shall be divided into lots of 1,000 tons for surface mixes (D, E, C, and CW), 2,000 tons for intermediate mixes (B, BM, and BM2), and 3,000 tons for base mixes (A). Lots shall be divided into 5 even sublots. One core will be tested in each subplot and the average for the entire lot shall be compared with the requirements in Table 407DEN-1 for travel lanes or Table 407DEN-3 for shoulders. When possible, attention should be provided to avoid cutting cores in areas where signal/loop wire may be affected. If test location selections indicate testing locations in these areas, a new random number should be selected. At the beginning of a project or at any time advisable, the Department may consider smaller lots to evaluate compaction methods or for other reasons as approved or directed by the Engineer.
- c. Joint Density.** For density acceptance purposes, joints shall use the same length lot and longitudinal coring location as the last adjoining lane to be paved. The average of the 5 cores for the entire lot shall be compared with the requirements in Table 407DEN-2. At the beginning of a project or at any time advisable, the Department may consider smaller lots to evaluate compaction methods or for other reasons as approved or directed by the Engineer.
- d. Test Method.** Five randomly selected cores (4" min./ 6" max. diameter), from each lot, will be tested to determine density compliance and acceptance. The density (bulk specific gravity) determination for a compacted asphalt mixture shall be performed in accordance with AASHTO T-166, Method A only.

All core samples shall be COMPLETELY DRY before testing. Air drying is permitted provided core samples are weighed at 2-hour intervals until dry in accordance with AASHTO T166, Section 6.1. Cores may also be dried in accordance with ASTM D 7227.

The Bulk Specific Gravity ( $G_{mb}$ ) of the cores shall be averaged for each lot.

For **lanes and shoulders** the maximum theoretical gravity ( $G_{mm}$ ) from acceptance testing for that shift's production will be averaged and the percent density will be determined for compliance by dividing the  $G_{mb}$  average for each lot by the  $G_{mm}$  daily average.

For **joints** the maximum theoretical gravity ( $G_{mm}$ ) from acceptance testing for both adjoining lanes shall be averaged, and the percent density will be determined for compliance by dividing the  $G_{mb}$  average for each lot by the  $G_{mm}$  daily average.

Obtain the cores at the locations randomly selected by the Engineer. The Department will test the cores by a certified plant technician.

If a lot is split between two days, determine the percent density of each individual core using the daily  $G_{mm}$  average from the day the subplot (represented by the core being tested) was paved.

After obtaining the cores, all core holes shall be properly filled and compacted in kind with hot mix asphalt at no additional cost to the Department.

Cores shall be clearly labeled in a discrete, sequential manner (i.e. – M1, M2, ..., M30; J1, J2, ..., J15) throughout the course of the project. After testing, cores shall be retained along with copies of test results and will be periodically obtained by regional materials and tests for spot-check verification testing. The cores may be discarded, if regional materials and tests determines that they are no longer needed for payment or dispute resolution.

- e. **Incentive/Disincentive Payment.** The Department shall apply the incentive disincentive payment in accordance with the tables in **407.15.B**.

Any deduction in monies due the Contractor for failure to meet the density requirements shall be made under the item for Density Deduction.

Any incentive payment due the Contractor shall be under the item for Density Incentive.

STATE

OF

TENNESSEE

August 14, 2017  
(Rev. 10-17-19)

January 1, 2015

SPECIAL PROVISION

REGARDING

INTELLIGENT COMPACTION (IC) FOR HOT MIX ASPHALT (HMA)

DESCRIPTION

This work consists of the requirements for modification of standard HMA compaction equipment for the purpose of tracking and documenting location, and temperature. Compaction equipment and procedures shall meet all requirements listed in Standard Specifications sections **407.07** and **407.15** except as modified herein.

EQUIPMENT

**A. Rollers**

Install Intelligent Compaction equipment meeting the requirements listed herein on the first (breakdown) and second (intermediate) roller in the roller train. Roller type(s) are to be as required per Standard Specification **Table 407.15 – Roller Requirements by Mix Type**. The IC systems may be either an integrated system or an added-on/retrofit systems.

**B. Global Navigational Satellite System (GNSS)**

Rollers shall be equipped with a GNSS units to monitor the equipment locations and track the number of roller passes utilizing the same reference system. GNSS system shall have a survey tolerance of not greater than 2.0 in in both the horizontal (x and y) directions.

GNSS receivers shall utilize the Universal Transverse Mercator (UTM) or Tennessee State Plane coordinate system. Once declared, the coordinate system utilized shall be the same for both rollers for the entire project.

GNSS data shall be in the following format:

1. Time: Military, local time zone, hhmmss.ss
2. GNSS: Latitude/Longitude, degrees/minutes; ddm.mmmmmmm or decimal degrees; dd.ddddddd
3. Grid: Meters, 0.001 m

**C. Temperature Measurement**

Rollers shall be equipped with non-contact temperature sensors for both the forward and reverse directions for measuring pavement surface temperatures. Temperature sensor shall be accurate to  $\pm 3^{\circ}\text{F}$ .



**D. Integrated On-Board Documentation System**

An on-board documentation system that is capable of displaying real-time color-coded maps of IC data as defined under Project IC Data. .

The Intelligent Compaction System shall be capable of transferring the Project IC Data by means of cellular data upload to cloud storage during the day's production

**E. Cloud Storage and Cloud Computing**

Provide a system of cloud storage and cloud computing. The cloud storage shall be sufficient to contain all Project IC Data associated with the contract and accessible to the Department. The cloud computing system shall support real-time visualization/mapping of the Project IC Data.

Project IC Data is to be uploaded throughout the project in real-time if data cellular coverage allows, but not less than once per day otherwise. If cellular data coverage for uploading the data at the project site is unavailable, upload the data prior to the next day's production by other means.

Provide the Department with unlimited review access to the intelligent compaction records through cloud storage and cloud computing starting from the beginning of the project paving until project finalization.

**CONSTRUCTION REQUIREMENTS****A. Project IC Data**

Track and record the Project IC Data for the contract. Project IC data shall consist of:

1. Location of the roller in real time,
2. Number of roller passes at a given gridded location,
3. Pavement surface temperatures associated with each roller pass, and
4. The roller speed associated with each roller pass.

All data is to be gridded in one foot by one foot grid.

At the end of the project, provide a copy of the final Project IC Data for each pavement layer in a separate digital file to the Department formatted in the most current version of Veta. Veta is available at [www.intelligentcompaction.com](http://www.intelligentcompaction.com).

Export the raw or gridded data:

1. Directly into Veta if a file format compatible with Veta is available, or
2. Through a direct transfer of data from cloud storage to Veta.

Ensure that the date/time stamp is reflective of the local time zone for both mapped and exported data.

**B. System Failure**

In the event that the intelligent compaction system does not work due to failure of the system, work may continue for the day's production. The Intelligent Compaction system must be operational prior to starting the next day's production.

Notify the Engineer if real time data cannot be uploaded to cloud storage due to lack of cellular data or satellite coverage. Notification must be made each day if real time uploading of data is unavailable. In instances where the file is not uploaded in real time to the cloud storage, it must be uploaded by other means prior to the next day's paving.

**C. Weekly Intelligent Compaction Quality Control Report**

During construction, monitor in real time the roller passes performed during compaction and the temperature at the first pass of the breakdown roller to ensure that they meet the roller pattern established on the test strip (**407.15.C**). For OGFC, the roller pattern shall ensure that a minimum of 2 and a maximum of 5 passes are performed.

Submit weekly (Sunday to Saturday) a report to the Engineer with the percentage of occurrences of each cumulative roller pass count and the temperature of the first pass of the breakdown roller at each location on the mat. Use the Weekly Intelligent Compaction Quality Control Report Form, which is available at: <https://www.tn.gov/tdot/materials-and-tests/field-operations.html>.

**File Name**

Name Veta project files (\*.VETAPROJ) using filenames CNXXXX\_ROUTE\_HMA\_YYY standardized format where XXXX is replaced by the contract number (e.g. Z999), YYY is replaced with the mix type (e.g. D, BM2, TLD, etc) and ROUTE is replaced with the five character State Route or Interstate designation (e.g. SR001 or I0040).

**COMPENSATION****Method of Measurement & Basis of Payment**

The Department will not measure and pay for Intelligent Compaction directly, and will consider such work incidental to other items of work relating to the placement of Asphalt. Each mix ton of accepted mix shall be accounted for in a Weekly Intelligent Compaction Quality Control Report.

**STATE**

**OF**

**TENNESSEE**

April 4, 2011

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**ASPHALT PAVEMENT SAFETY EDGE**

**Description**

The contractor shall attach a device to the screed of the paver such that material is confined at the end gate and extrudes the asphalt material in such a way that results in a consolidated wedge-shape pavement edge of approximately 25 to 30 degrees as it leaves the paver (measured from a line parallel to the pavement surface). The device shall maintain contact to the graded material adjacent to the pavement and must be adjustable to allow for transition to cross roads, driveways and obstructions without requiring the paver to be stopped routinely. The device shall constrain the asphalt head and increase the density of the extruded profile. To achieve desired results, rolling is not required on the wedge. The desired pavement edge angle is 30 degrees but angles as steep as 38 degrees are acceptable after the mat has been rolled for compaction.

The contractor shall use the TransTech Shoulder Wedge Maker, the Advant-Edge Edger or Ramp Champ, Carlson's Safety Edge Endgate or an equivalent device that produces the same wedge consolidation results. If the contractor uses a similar device, he must provide proof that his device has been used on previous projects with acceptable results (proof shall consist of, at a minimum, approval and endorsement of another State D.O.T. or FHWA Division). Short sections of handwork will be allowed when necessary for transitions and turnouts or otherwise authorized by the engineer. Conventional single plate strike off devices will not be allowed.

No direct payment will be made for the Safety Edge and all cost of furnishing and/or operation of this device will be included in other items.

Contact information for these wedge shape compaction devices is as follows:

1. **TransTech Systems, Inc.**  
1594 State Street  
Schenectady, NY 12304  
1-800-724-6306  
<http://www.transtechsys.com>
  
2. **Advant-Edge Paving Equipment LLC**  
33 Old Niskayuna Road  
Loudonville, NY 12211  
Ph. 814-422-3343  
<http://www.advantedgepaving.com>

3. **Carlson Paving Products, Inc.**  
18425 50th Ave E, Tacoma WA 98446  
Phone (253) 875-8000 | Toll Free 1-800-216-2108 | General Fax# (253) 846-2703  
<http://www.carlsonpavingproducts.com>

STATEOFTENNESSEE

(Rev. 12-01-02)

January 1, 2015

(Rev. 02-01-07)

(Rev. 10-20-07)

(Rev. 05-11-10)

(Rev. 10-8-18)

SPECIAL PROVISIONREGARDINGSECTION 411 – ASPHALTIC CONCRETE SURFACE (HOT MIX)

This provision sets up pavement smoothness requirements and how testing procedures, acceptance, and payment practices, will be handled by the Department.

Completed pavement surfaces of traffic lanes, including those on bridge deck surfaces on both the mainline and ramps between freeways that do not have stop or yield conditions shall be tested for smoothness with the Road Profiler in accordance with Department procedures.

For projects on all interstates and controlled access freeways that require the placement of BM or BM2 as a binder layer, the binder layer shall be tested for smoothness as soon as practicable after placement of the binder layer but prior to the placement of the final wearing surface. The binder layer shall have a maximum International Roughness Index (IRI) of 70 in./mi. Any lot, or fraction thereof, of the binder layer that is greater than 70 in./mi. shall be corrected prior to placement of the final surface mix. Ramps with posted speeds less than 45 MPH shall be excluded. All corrective action shall be approved by the Engineer and shall be completed at the Contractors expense including, but not limited to, grinding and asphalt leveling.

The Contractor shall be paid monies due for items in the surface mix based on the payment table below. Any lot (one mile or fraction thereof) of pavement where the Road Profiler's IRI value exceeds 80 inches per mile, as shown in the payment table below, will require corrective action. Any unacceptable lot(s) will be divided into 0.1-mile sub-lots for closer evaluation. The Contractor, at his discretion, shall choose those sub-lots, within the unacceptable lot, to correct in order to bring the overall lot into the acceptable smoothness range. However, the Contractor may not choose more than 3 sub-lots for repair, unless they are adjacent to each other and there are no more than 6 transverse joints. Otherwise, the entire lot will require corrective action. The minimum corrective action shall be the length of the entire sub-lot of 0.1 mile. The only acceptable corrective action is mill and inlay. Payment for the corrected one mile lot(s) will be based on the Road Profiler's International Roughness Index after corrective action has been taken.

Each lot of pavement will be tested by one pass of the Road Profiler. If corrective action is required, a second pass will then be made to determine the payment for the corrected lot(s).

Payment table for smoothness based on Road Profiler International Roughness Index values

SPECIFICATION			
411B			
Road Profiler Value IRI (IN/MI)	Percentage paid on bid price of surface items	Road Profiler Value IRI (IN/MI)	Percentage paid on bid price of surface items
Less than 35	110%	58	97%
35	110%	59	96%
36	109%	60	95%
37	108%	61	94%
38	107%	62	93%
39	106%	63	92%
40	105%	64	91%
41	104%	65	90%
42	103%	66	88%
43	102%	67	86%
44	101%	68	84%
45	100%	69	82%
46	100%	70	80%
47	100%	71	77%
48	100%	72	74%
49	100%	73	71%
50	100%	74	68%
51	100%	75	65%
52	100%	76	61%
53	100%	77	57%
54	100%	78	53%
55	100%	79	49%
56	99%	80	45%
57	98%	Greater than 80	Mill and Inlay*

\* The mill and inlay shall be the thickness as specified on the plans for the surface layer.

**STATE**

**OF**

**TENNESSEE**

(Rev. 3-18-96)  
(Rev. 4-01-05)  
(Rev. 7-15-05)

January 1, 2015 |

**SPECIAL PROVISION**

**REGARDING**

**SECTION 602 STEEL STRUCTURES**

The cost of structural steel inspection (QA), limited to the rates established below, will be paid by the Department:

<b>Steel Structures (Weight Range)</b>	<b>Inspection Cost</b>
Up to 833,000 pounds (First 377,850 Kgs.)	\$25,000.00 L.S. (\$25,000 L.S)
If Total Structural weight is between 833,000 and 2,500,000 pounds (Kgs. Between 377,850 and 1,134,000)	\$0.03 per pound (\$0.065 per Kg.)
If Total Structural weight is greater than 2,500,000 pound (Kgs. Over 1,134,000)*	\$75,000 L.S. plus \$0.01 per pound greater than 2,500,000 pounds (\$0.022 per Kg.)

\*For Complex Structures (Trusses, Box Member Bridges when box members are over fifty percent of the structure) and projects with more than five steel bridges:

If Total Structural weight is greater than 2,500,000 pound (Kgs. Over 1,134,000)	\$75,000 L.S. plus \$0.02 per pound greater than 2,500,000 pounds (\$0.044 per Kg.)
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The above rates shall be applied as specified in **Subsection 602.04** of the Standard Specifications.

**STATE**

**OF**

**TENNESSEE**

January 1, 2015

(Rev. 02-09-09)

(Rev. 10-24-12)

(Rev. 12-18-14)

**SPECIAL PROVISION**

**REGARDING**

**THREE SIDED PRE-CAST CULVERT AND BRIDGE STRUCTURES OR PRE-CAST  
ARCHES**

**Description:** This work shall consist of furnishing all materials, labor, tools, equipment and other necessary items required to design, fabricate, and install three sided pre-cast culvert and bridge structures, or pre-cast arches.

**Design Submittal Guidelines**

The Contractor's three-sided pre-cast culvert or arch culvert structure shall conform to the requirements of this Special Provision and the following design submittal guidelines:

- A. Structural: The Contractor is required to submit to the Division of Structures for approval a foundation report at each site, pre-cast structure design drawings, and design calculations. A Professional Engineer licensed in the State of Tennessee shall stamp all design drawings and calculations

The pre-cast system shall provide an equivalent or greater hydraulic opening as the cast-in-place or pre-cast structure specified in the contract plans along with an equivalent or greater hydraulic efficiency. Structures with less area of opening, a significantly different span to height ratio, submerged by design flood, or requiring an increase in proposed road grade when the design flood or 100 year flood overtops the road or structure located in a FEMA Flood Insurance Study will require submittal of a hydraulic analysis for review and approval. The hydraulic analysis should be submitted to the Hydraulics Section following TDOT Design Procedures for Hydraulic Structures or to the Design Division per TDOT Design Division Drainage Manual, if the 50 year flow is less than 500 cubic feet per second for the subject structure, the hydraulic design should be submitted to roadway design manager.

Roadway Design:



The proposed pre-cast system shall not affect the 13 controlling geometric design elements of the roadway. The proposed structure shall not require a Design Exception or need for any additional ROW or easement.

No changes on the roadway plans shall be made without an approval of the Design Division. Proposed changes on plans shall be prepared and stamped by an engineer prior to submittal to the Design Division for review.

Any minor change in roadside geometry such as, roadway side slopes, the distance from the outside edge of the traveled way to the inlet or outlet face of proposed structure, roadside ditch locations, relocation of guardrail and/or guardrail end terminals as well as any modifications in the clear zone should be submitted to the Design Division for review and approval.

- B. Currently there are five (5) systems that have been approved to be used on State Projects as long as **all** requirements of this Special Provision are satisfied. The five (5) systems are as follows:

**CONSPAN Bridge System** supplied by Contech Construction Products, Nashville TN

**HYSpan Bridge System** supplied by Permatile Concrete Products, Bristol TN/VA.

**BEBO Bridge System** supplied by Contech Construction Products, Nashville TN

**AQUA-ARCH System** supplied by Sherman Dixie, Nashville TN

**REDI-SPAN System** supplied by Tricon Pre-Cast, Houston TX

**FOLEY ARCH System** supplied by Foley Products Company, Newnan, GA 30263

Footnotes:

- a. Modifications made to the above Bridge Systems beyond the requirements of this Special Provision shall be approved before use on State Projects. These revised details shall be submitted to the Division Structures for review and Engineering Approval. Contractor shall allow a minimum of 3 weeks for review, comment and Approval of the changes by the Engineer before the system can be installed on the project.
- b. The Contractor shall be fully aware of the constructability of the proposed system he proposes. Due to the geometry and availability of sizes of the pre-cast units, some of the approved systems may be more sensitive to handling, installation, wing-wall requirements, and backfill and roadway sub grade placement. The systems are paid for in-place and the repair of any damage to the units that occurs during any phase of the installation shall be the sole responsibility of the Contractor.

The Contractor has the option to propose another pre-cast system. The Division Structures will have 60 days, after receipt of all pertinent information, to review and approve/disapprove any new system submitted by the Contractor.

- C. The construction or fabrication of the pre-cast units shall not begin until the pre-cast system has been approved by Division of Structures and/or Roadway Design Division. All approved

pre-cast elements must be manufactured in a commercial pre-casting facility and fabricated under the purview of the Division of Materials and Tests inspectors.

### **FOUNDATION PROTECTION DESIGN PARAMETERS**

The following are the requirements for foundation investigation, footing design, footing placement and scour protection:

- A) Adequate sub-surface investigation shall be provided at each site to determine the location of the rock line in the area of the proposed footings. The results of this investigation will determine the type of footing needed and the required scour protection (if required). If the Contractor elects to use one of the approved scour protection systems and place a strip footing on in-place material, a more detailed foundation investigation shall be performed at the site to determine the allowable bearing pressure and the predicted settlement of the underlying material. The Contractor at his own expense shall provide the foundation investigation, if not provided in the contract plans.
- B) A strip footing or pre-cast footing can be used if the footing is bearing on rock or adequate scour protection and bearing is provided for the footing. A strip footing not bearing on rock without an approved scour protection can only be used if the footing is placed below the 500-year scour elevation except as provided in (c), below. A scour investigation of the underlying material at the site of the culvert shall be undertaken by the Contractor to determine this probable scour depth if acceptable scour protection system will not be provided for the strip footing.
- C) The structure footings and wing-wall footings shall be founded on suitable material. A bottom slab is required when rock is not available or the footing cannot be reasonably placed below the 500-year scour elevation or an approved scour protection system is not provided. When a bottom slab is required, all unsatisfactory material shall be removed and replaced with satisfactory bearing material according to section 204.10 of the TDOT Road and Bridge Specifications before placement of slab. A cut-off wall will be provided at the inlet and outlet end of the structure and poured monolithically with the bottom slab.
- D) If a concrete box culvert with a bottom slab is specified on the contract plans, the bottom slab or the approved scour protection system shall be shown on the proposed pre-cast system drawings. All cost associated with the bottom slab or the approved scour protection system shall be included in the linear foot cost of the pre-cast system. If a concrete slab bridge is specified on the contract plans and the initial rod soundings at the site shows a change in conditions, the pre-cast system structure drawings shall be revised to either show a bottom slab or an approved scour protection system. The bottom slab will be paid according to Section 109.04 "Method of Payment for Extra Work" of the Standard Specifications. The extra work prices includes the cost of all forms, placement, reinforcing steel, concrete and all material and labor required for complete placement of the bottom slab. If an approved scour protection is used in lieu of a concrete slab, the Contractor will be

paid for according Section 109.04. The cost of the scour protection shall be similar in the cost to the placement of a concrete slab.

- E) Strip footings on rock: The bottom of footing shall follow the rock surface along the wall line. Holes 1.5 inch in diameter and 2'6" in depth shall be drilled on 12-inch centers into competent rock. The holes shall be air blown to remove all debris and filled with non-shrink grout. All grouting material shall be approved by the Division Materials and Test and placed in the drilled holes as recommended by the grout manufacturer. If the hole cannot be de-watered then the grout must be placed through a tremie tube or pressured pumped with the initial pump nozzle at bottom of hole. Number 8 reinforcing bars shall be rotated full depth of holes. Slight tapping will be allowed during the bar rotation process but tapping without rotation will not be allowed.

**APPROVED SCOUR PROTECTION MATERIALS:**

In lieu of a bottom concrete slab the Contractor can provide adequate scour protection with the following systems:

- A) 12 inch thick Reno mattress. The top of the baskets of the Reno mattress shall coincide with the existing streambed elevation.
- B) Pre-cast articulating concrete block mat system connected by interwoven stainless steel cable. The system shall provide the required geo-textile fabric placed underneath the system to prevent the migration of fines through the blocks. The block mat system shall be anchored to the underlying material. The block mat shall be sized to the stream velocities at the particular site and the top of the blocks will coincide with the existing streambed elevation.
- C) Rip-Rap sized appropriately for stream velocities underlain by geo-textile fabric to prevent migration of fines between rocks.

**OBSERVING CONSTRUCTION PERMIT CONDITIONS:**

Proposals to construct pre-cast alternatives to the contract plans, the pre-cast alternatives shall be compatible with the project permits. Otherwise, the Contractor must apply for and obtain any new or revised permits based on approved alternate plans. No time for obtaining such permits will be eligible for contact extensions request.

**DESIGN REQUIREMENTS****SPECIFICATIONS:**

Standard Specifications for Road and Bridge Construction of the Tennessee Department of Transportation (March 1, 1996 Editions and Supplemental Specifications)

Tennessee Department of Transportation Earth Retaining Structures Manual

AASHTO Load Resistance Factor Design Standard Specifications for the Design of Highway Bridges, Current Edition with Addenda.

Three sided pre-cast culvert and bridge structures, or pre-cast arches shall be cast in a certified precast plant under plant controlled conditions, and in accordance with the TDOT procedure for the Manufacture and Acceptance of pre-cast concrete drainage structures, noise wall panels, and retaining wall panels”.

**LOADINGS:**

Live Load: HL93 Live Load with tandem load as appropriate.

Earth Load: Based on Soil Weight of 120 psf and 1.15 Soil-Structure interaction factor.

Lateral Earth Pressure: maximum of 0.50 times soil weight; minimum of 0.25 times soil weight. And as specified in Art. 17.8 of the AASHTO Standard Specifications for the Design of Highway Bridges, 1996 Edition with Addenda.

**NON-UNIFORM LOADS:**

The pre-cast system designs in standard fills assume uniform loading on each exterior wall. Non-uniform loads that significantly affect the loading on the culvert shall be accounted for in the design of the system. (for example, if bridge culvert runs along the toe of an embankment or next to a retaining wall)

**WINGWALLS:** Wing walls shall be designed as free standing units and in accordance with AASHTO Bridge Design Specifications, current edition and the requirements of the TDOT Earth Retaining Structures Manual. Pre-approved wall systems under the procedures outlined in the Manual need not to be re-approved as wing-walls, if acceptable to the site conditions. MSE wing-walls is subject to approval on a site by site basis. If approved for the site, the backfill material for the MSE walls shall be a free-draining material with the appropriate sacrificial coating on the metal straps. Any non-approved pre-cast retaining wall system used for wing-walls is subject to approval by the Engineer on a project by project basis.

**HEADWALLS AND CURBS:** Pre-cast or cast-in-place headwalls and/or curbs shall be positively attached to the pre-cast system sections.

**RAILING REQUIREMENTS:** If the contract plans shows that the culvert/bridge requires a traffic railing attached to the structure, the traffic railing and attachment shall be detailed on the proposed design drawings and shall meet the crash test requirements of NCHRP 350. The type of proposed bridge rail shall be consistent with the rail on the contract drawings.

**DEBRIS DEFLECTION WALL:** See Standard Drawings STD-15-17 & 18. A debris deflection wall shall be constructed on the inlet end of the pre-cast structure when specified on the plans unless the Engineer deems such deflectors inappropriate for the proposed alternative pre-cast system. The Engineer will be the final arbiter in such cases. Details of the wall and method of attachment to the pre-cast unit shall be specified on the pre-cast system design drawings.

**PAVED OUTLET DETAILS:** See Standard Drawings STD-15-16. Paved outlets shall be used when specified on the plans. If required, details shall be shown on the alternate design drawings.

**LOW FLOW CHANNEL CONSTRUCTION:** See Standard Drawing STD-15-16A. Low flow channel Standard drawing shall be used as shown on the alternate design drawings.

**STAGE CONSTRUCTION REQUIREMENTS:** If the structure is specified to be stage constructed on the plans, the pre-cast system design drawings shall be detailed and designed to accommodate the phasing requirements. The number of traffic lanes and lane widths shall not be reduced in order to accommodate the use of culvert system. Any temporary shoring that may be required to stage construct the culvert shall be included in the cost of the culvert system.

**WALL DRAINAGE:** Four (4) inch diameter weep holes at six (6) foot center to center spacing to be placed in the wing-walls and exterior walls. See Standard Drawing STD-15-14 for further notes and details for placement of weep hole and aggregate drains.

### **MATERIAL SPECIFICATIONS:**

**Concrete:** Shall be Class "A" (Cast-in-place) with minimum concrete strength,  $f'c = 3000$  psi or greater as required by design. Pre-cast shall be Class "P" with a minimum concrete strength,  $f'c = 4000$  psi or greater as required by design.

**Reinforcing Steel:** Shall be ASTM A615 Grade 60, See Section 604 and 907 of the Standard Specifications and Supplemental Specifications 600, when fill on the structure is less than one (1) foot, epoxy coated reinforcing steel shall be used in the top mat of the top slab and curbs including the tie stirrup bars in the curb.

**Reinforcing Bar Support Details:** See Standard Drawing STD-9-1.

**Curing Concrete :** All cast-in-place concrete shall be cured in accordance with Article 604.24 of the Standard Specifications. All pre-cast concrete shall be cured in accordance with Article 615.11 and for handling, placing and consolidating the concrete for pre-cast members shall be in accordance with Article 615.10.

**Concrete Finish:** See Standard Specifications Article 604.22. In general, curbs, edges of slabs, exposed faces and ends of wing-walls, debris deflection walls, ends of interior walls, and exposed face of end-walls shall receive a class II finish.

### **HANDLING AND PLACEMENT OF PRE-CAST UNITS**

The pre-cast units shall be stored, erected, and supported according to manufacture recommendations. A representative from the manufacture shall be present during off loading of the units if stored on site, during erection of the members and during the placement of the structural backfill. The location of the lifting points shall be supported by design calculations. The location of the lifting points and any special instructions shall be clearly shown on the

culvert drawings. It is the Contractor responsibility to insure that the units get installed properly. Any damage that occurs to the units due to fabrication, storage, or installation and in addition to problems that may occur due to the use of the pre-cast system will be corrected at no added cost to the project.

**BACKFILL REQUIREMENTS**

The order of placement of structural backfill around the culvert shall be specifically detailed on the design drawings and a manufacture representative shall be present during the placement of the backfill. At a minimum, back filling of the pre-cast system shall be in accordance with Section 204.11 of the Standard Specifications. The requirements for stepping of boundary slopes to prevent wedge action, for proper layering and compacting of backfill, and for maintaining (at all times) equal heights of backfill against the exterior walls of the culvert shall be strictly enforced. See Standard Drawings STD-15-14 & 15 for other details and notes.

**METHOD OF PAYMENT**

The “Three Sided Precast Culvert Structure – Barrel (Size)” units will be paid for as follows:

**Pre-cast Culvert units:** The pre-cast culvert system units will be paid by the linear foot of barrel.

- 607-50.60 LF THREE SIDED PRECAST CULVERT STRUCTURE – BARREL (SIZE)
- 607-50.61 LF THREE SIDED PRECAST CULVERT STRUCTURE – BARREL (SIZE)
- 607-50.62 LF THREE SIDED PRECAST CULVERT STRUCTURE – BARREL (SIZE)
- 607-50.63 LF THREE SIDED PRECAST CULVERT STRUCTURE – BARREL (SIZE)
- 607-50.64 LF THREE SIDED PRECAST CULVERT STRUCTURE – BARREL (SIZE)

**Wing wall,** cut off walls, and all concrete other that the structure barrel and runners except bottom if required to be included in the linear foot cost of the pre-cast system.

**Bottom slab:** If slab-bridge was set-up on contract plans and due to poor foundation material a bottom slab was required, the bottom slab shall be constructed by the Section 109.04. Otherwise the bottom slab and/or scour protection to be included in the linear foot cost of the pre-cast system.

The cost of the following will be included in the above items for the pre-cast structure complete in place:

Any additional foundation information that will be required to determine the location of competent rock and the scour potential of the underlying material. All engineering costs for the design and preparation of design drawings for the culvert system and wing-walls. All material and labor cost for the complete fabrication and installation of the pre-cast units. All material and labor cost for the complete installation of all wing-walls either cast-in-place or pre-cast. All material and labor cost for the design, placement, concrete, reinforcing steel, and any other incidentals required for the complete installation of the

bottom slab when the contract plans structure with a bottom slab is specified. If phase construction of the structure is required by the plans, the cost of any temporary shoring or adjustments in the culvert system that is required to maintain the number of traffic lanes and lane widths as noted on the plans will be included in these items. If required, the cost of the bridge rail along with the required attachments to the structure and any modification that will be required in order to meet NCHRP 350 requirements. The additional cost of having representative from the manufacture at the site during various phases of installation of the pre-cast system shall be included in items bid on for the pre-cast system.

The excavation for the pre-cast system will be paid for under Roadway Road and drainage excavation. See Standard Drawings STD-15-2, 14, & 15 for pay limits of excavation. The structural backfill Class "A" Grading "D" will be paid for under item 303-01.02 "Granular Backfill (Bridges). See Standard Drawings STD-15-2, 14, & 15 for limits of placement. Any additional foundation fill material required for culverts with a bottom slab will be paid for under Roadway item 204-08 "Foundation Fill Material" per cubic yard. If a concrete slab bridge is specified on the contract plans and a bottom slab is required due to the location of suitable bearing material or scour requirements, the bottom slab will be paid according to Section 109.04 "Method of Payment for Extra Work" of the Standard Specifications. The extra work prices includes the cost of all forms, placement, reinforcing steel, concrete and all material and labor required for complete placement of the bottom slab. If an approved scour protection is used in lieu of a concrete slab, the Contractor will be paid for according Section 109.04 but the cost of the scour protection shall be similar in the cost to the placement of a concrete bottom slab.

**STATE****OF****TENNESSEE**

(Rev. 10-7-19)

January 1, 2015

**SPECIAL PROVISION****REGARDING****SLIP LINING OF ROADWAY CULVERTS****Description**

This work consists of furnishing, installing, grouting and providing all labor, material and equipment necessary to rehabilitate existing roadway culvert pipe by the slip lining method.

The required hydraulic capacity of the host pipe shall be determined and then improved or maintained by the use of slip lining products. The slip lining process will require the complete grouting of the annular void between the hosts and insert pipe unless approved otherwise. If the Engineer's hydraulic and geometric evaluation indicates that downsizing of the existing line is acceptable, a variety of materials listed below may be used for insertion.

When necessary, hydraulic advantages may be gained by improvements to inlet details on inlet controlled culverts. (See TDOT Drainage Manual 6.04.3.2 I Improved Inlets). Where improved inlets create low pressure on the culvert pipes, pipe liner joints shall be watertight, and testable to the limits of the required pressure.

See Table 607G-1 for Slip lining Pipe Dimension.

**Materials**

Provide materials for pipe liner that are acceptable for slip lining pipe and include one of the following;

- a. Corrugated High Density Polyethylene Pipe (HDPE),
- b. Profile Walled PVC,
- c. Corrugated Polypropylene Pipe (PP),
- d. Solid Wall High Density Polyethylene Pipe (SWHDPE),
- e. Steel Reinforced Polyethylene Pipe (SRPE),
- f. Machine Spiral Wound PVC or HDPE Pipe,
- g. Glass Fiber Reinforced Plastic Pipe, or
- h. Smooth Wall Carbon Steel Plate Pipe.

Submit manufacturer's detailed product data with complete information on pipe liner materials (pipes, joints, gaskets, fittings, entrance bells), physical properties, dimensions, installation minimum/maximum allowable parameters such as maximum recommended external grout



pressure, axial compressive stress, minimum bending radius or maximum joint angular deflection.

Pipe liner materials other than those stated above may be submitted for consideration and approval by the Engineer based on meeting the design requirements as stated. Secure written product approval from the Manufacturer before commencing any work.

#### **A. Corrugated High Density Polyethylene Pipe (HDPE)**

##### **1. Pipe**

The pipe liner shall consist of a HDPE profile wall pipe that conforms to the requirements of AASHTO M 294 for Corrugated Polyethylene Pipe Type “S” or “D”.

##### **2. Joints**

Join HDPE profile wall pipe liner by thermal fusion (extrusion welding) per manufacturer specifications, or provide a positive mechanical joint that meets the requirements of ASTM D 3212, consist of an integrally formed bell and spigot connection with a rubber gasket meeting ASTM F477, or a connection meeting equivalent performance standards such that joints shall meet the requirements of ASTM D3212.

If mechanically restrained joints are required to line the host pipe, the pipe joints shall be restrained to allow the pipe to be pulled or pushed into the host pipe without joint separation.

#### **B. Profile Wall Poly Vinyl Chloride (PVC)**

##### **1. Pipe**

Pipe liner shall consist of PVC corrugated pipe with a smooth interior that conforms to the requirements of AASHTO M304, Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter or ASTM F 949.

Use pipe made of PVC compound with a cell classification of 1245B per ASTM D 1784.

##### **2. Joints**

Join the PVC pipe liner with a PVC coupling that uses elastomeric sealing gaskets. The assembled joint shall meet the performance requirements of ASTM D 3212.

The joint shall be able to be pulled or pushed into the host pipe without joint separation. Ensure that elastomeric seals meet the requirements of ASTM F 477.

#### **C. Corrugated Polypropylene Pipe (PP)**

##### **1. Pipe**

Polypropylene pipe and fittings shall meet the requirements contained in AASHTO M330 type “S” or “D” wall, and or ASTM F2736/ASTM F2764.

Extruded Pipe and Fittings shall be made of virgin polypropylene compounds as described in AASHTO M330 and or ASTM F2736/ASTM F2764.

Polypropylene compounds shall be comprised of the base polypropylene resin and all additives, colorants, UV inhibitors, and stabilizers.

The pipe and fittings shall be free of foreign inclusions and visible defects such as cracks, holes, foreign inclusions or other injurious defects.

## **2. Joints**

Joints shall be water-tight over the range of head pressure expected for the pipe. Joints shall consist of an integrally formed bell and spigot connection with a rubber gasket meeting ASTM F477 or a connection meeting equivalent performance standards such that joints shall meet the requirements of ASTM D3212.

The ends of the pipe shall be square and clean so as not to adversely affect joining or connecting.

## **D. Solid Wall High Density Polyethylene Pipe (HDPE)**

### **1. Pipe**

High density polyethylene pipe and fittings shall meet the requirements in the AASHTO LRFD Bridge Design Specifications, Section 12, as a solid wall HDPE pipe meeting the requirements of Specification AASHTO M 326.

The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties. Pipe shall be solid wall with a smooth interior and exterior with no corrugations or ferrous elements.

Pipe and pipe fittings shall be manufactured from high density compounds in accordance with ASTM D3350, cell classification 345464C or (345474C) with a designation of PE 3408or (PE 4710) and a minimum Standard Dimension Ratio (SDR) of 32.5.

Each pipe segment shall be marked on the outside with a coded number which identifies the manufacturer, SDR, size, materials, machine, date and shift on which the pipe was extruded.

Pipe[s] shall be specifically applicable for installation and use in the project environment.

### **2. Joints**

Joints shall be water-tight and soil tight meeting AASHTO M 326 over the range of head pressure expected for the pipe.

Joints shall be butt-fused in accordance with ASTM F2620 and the manufacturer's recommendations or shall be capable of being joined into a continuous length by an

interlocking method such that joints meet the requirements of ASTM D3212. Screw-type or threaded joints will not be allowed unless a positive lock is included in the joint system or the perimeter of the joint is extrusion welded at the bearing assembly prior to insertion. Internal beads resulting from butt fusion shall be limited to a 0.25 inch (6 mm) projection perpendicular to the inside wall of the pipe. Trim beads larger than a 0.25 inch (6 mm) 360 degrees around the interior of the pipe. External beads resulting from butt fusion need not be trimmed unless the bead projection will negatively impact pipe installation or migration of annulus grout.

## **E. Steel Reinforced Polyethylene Pipe (SRPE)**

### **1. Pipe**

The pipe profile is manufactured using a high quality stress-rated thermoplastic meeting the requirements of ASTM F2562 “Standard Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage” or AASHTO Designation MP-20, Bridge Construction Section 26 & Design Section 12.

Virgin high density polyethylene stress-rated resins are used to manufacture the pipe and complimentary fabricated fittings. Resins shall conform to the minimum requirements of cell classification 345464C as defined and described in the latest version of ASTM D3350 “Standard Specification for Polyethylene Plastics Pipe and Fittings Materials”.

### **2. Joints**

Low Head (LH) Joints (30” – 72”) shall be gasketed, stress-rated high density polyethylene bell and spigot joints (meeting the requirements set forth in the above Material Properties paragraph) that have been laboratory tested to 3 psi when tested in accordance with ASTM D3212 “Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

High Performance (HP) Joints (30” – 72”) shall be gasketed, bell and spigot joints where both the bell and spigot are reinforced with steel that is fully encased in stress-rated high density polyethylene (meeting the requirements set forth in the above Material Properties paragraph) and that have been laboratory tested to 15 psi when tested in accordance with ASTM D3212 “Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals”.

Welded Coupler (WC) Joints (36” – 120”) shall utilize plain ended pipe welded together with a polyethylene coupler by way of electro fusion welding or extrusion welding technology. The welded connections provide a true, infield watertight system. The field installed welded coupler joints shall remain watertight and can achieve zero leakage rates on appropriate applications. The welded coupler joints have been laboratory tested to 30 psi in accordance with ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals”.

**F. Machine Spiral Wound PVC or HDPE Pipe****1. Profile Strip**

Provide extruded PVC profile strip in accordance with the requirements of ASTM F1697 except as noted below.

Provide extruded HDPE profile strip in accordance with the requirements of ASTM F1741 “standard Practice for Installation “OD” Machine Spiral wound PVC Pipe Liner for Rehabilitation of Existing Sewers and conduit” modified for SPR PE (HDPE) pipe liner.

Pipe made from similar grade HDPE as new sewer and drainage pipe, meeting cell classification of 335420C (or E) in accordance with ASTM D 3350.

Continuous welding process seals subsequent strip of profile creating a seamless pipe line of high stiffness, consistent material properties.

Structural stand-alone liner – does not rely upon the grout for strength but only to transfer the load.

All profile strips shall be specifically applicable for installation and use in the project.

**2. Joints**

Joints shall meet the requirements of ASTM D3212, and gaskets meeting the requirements of ASTM F477. The joint shall consist of a single, mechanical interlock between profile strips supplemented with sealant and is created continuously as the profile is wound into the pipe. Once wound into place within the host pipe, joints shall be considered completed and the pipe shall not be intentionally or otherwise expanded or permitted to translate in any direction at the joint. Joints shall be water-tight over the range of head pressure expected for the pipe.

The completed pipe liner shall be provided such that the outside diameter of the pipe is not increased, nor the internal diameter of the pipe is decreased at the joint.

**G. Glass Fiber-Reinforced Plastic Pipe****1. Pipe**

Provide centrifugally cast fiberglass reinforcement plastic mortar pipe (CCFRMP) in accordance with ASTM D3262, cell classification Type 1, Liner 2, Grade 3. All pipes shall be specifically applicable for installation and use in the project environment.

Minimum pipe stiffness shall be 36 psi (248) kPa when tested in accordance with ASTM D2412.

The glass fibers shall be a commercial grade of E-type glass fibers with the amount, location and orientation of the chopped glass-fiber reinforcement specifically designed for each application.

Sand shall be minimum 98 percent silica kiln-dried and graded.

The polyester wall resin shall be an isophthalic, orthophthalic or other approved resin with a minimum tensile elongation of 2 percent.

Fiberglass liner shall be shown by tests to be resistant to long-term corrosion. Testing shall be performed in accordance with ASTM D3681 using 1.0N sulfuric acid for sanitary sewage.

Each pipe segment shall be marked on the inside and outside to identify the manufacturer's number, diameter, stiffness, ASTM designation and lot number.

**2. Joints**

Provide pipe with joints designed so that neither the outside diameter of the pipe is increased, nor the internal diameter of the pipe is decreased at the joint. Joints shall be water-tight over the range of head pressure expected for the pipe. Joints shall meet the performance requirements of ASTM D4161. Field connect pipe[s] with low-profile, fiberglass bell-spigot joints or flush fiberglass bell-spigot joints, when the fit requires. Utilize elastomeric sealing gaskets as the sole means to maintain joint water-tightness. Gaskets shall meet the requirements of ASTM F477. Joints at tie-ins, when needed, may utilize gasket-sealed closure couplings.

**H. Smooth Wall Carbon Steel Plate Pipe**

**1. Pipe**

The pipe liner shall consist of arc welded straight seam pipe with .20 minimum copper content for improved corrosion resistance, for use in culvert rehabilitation and pipe linings. The pipe liner may be round, elliptical, arch shaped, or other special sections as specified. All round and non-round pipe liner sections of a smooth wall carbon steel plate pipe must conform to the following requirements:

- a. All pipe must be domestic with melted and manufactured in USA (MMU), made from new unused steel plates, and shall be straight seam pipe. Longitudinal seams welded after rolling must be welded by the automatic double submerged arc weld (DSAW) method. Joints or midwelds welded after rolling must be welded by automatic or semiautomatic DSAW, flux cored arc weld (FCAW) or gas metal arc weld (GMAW) methods, and splices and repair welds done before rolling must be welded by automatic, semiautomatic or manual DSAW, FCAW, GMAW methods.
- b. Each heat number of steel used for the pipe liner must be tested for chemical composition and tensile requirements that meet the following:

Carbon:	0.26 max
Manganese:	1.65 max, *See Note
Phosphorous:	0.035 max

Sulfur: 0.035 max  
 Copper: 0.20 max  
 Tensile Strength: 60,000 PSI min  
 Yield Strength: 36,000 PSI min

\*For each 0.01 percent reduction of carbon below the maximum concentration shown above, a 0.05 percent increase of manganese is allowed up to a maximum concentration of 2 percent manganese.

- c. Pipe liner wall thicknesses should be no less than .500 (½”) wall, or as determined by ASHTO HL-93 load bearing analysis. The minimum specified wall thickness to be used for round pipe liner made to this specification shall be .500 nominal wall, and the wall thickness at any point shall not be more than 12.5% under the specified nominal wall thickness.
- d. The minimum specified wall thickness to be used for elliptical, arch, and other non-round pipe liner sections shall be .500, and the wall thickness at any point shall not be thinner than .015 under the specified wall thickness.

**2. Joints**

Welded steel pipe liner joints must be full penetration welds in accordance with AWS D1.1, allowing for Bevel X Plain End joint configuration.

Table 607G-1: SLIPLINING PIPE DIMENSION

Pipe Materials (Size Dimension)	Nominal Pipe Size (in.)		
	12 - 36	42 - 60	66 - 120
Corrugated HDPE (Inner)	X		
Profile Wall PVC (Inner)	X		
Corrugated PP (Inner)	X	X	
Solid Wall HDPE (Outer)	X	X	
SRPE (Inner)	X	X	X
Spiral Wound PVC	X	X	X
Spiral Wound HDPE		X	X
Glass Fiber Reinforced (Inner)		X	X
Smooth Wall Carbon Steel Plate Pipe	X	X	X

**I. Grout for Annular Space**

Provide grout for the annular space in accordance with this Specification and with the manufacturer's published recommendations.

The grout shall be nonstructural or structural based upon the type of slip liner system provided. If the pipe liner provided cannot meet the stated requirements for factor of safety against buckling or crushing, then a structural grout must be used regardless of the pipe lining system used in order to fulfill the factor of safety requirements as stated herein.

Utilize material specifications for solidification of the annular void between host and the inserted liner with low density flowable fill or cellular grout. The cellular grout with a density between 40 and 80 lbs. per cubic foot may be used. Reduced density flowable fill grout with a density between 80 and 120 lbs. per cubic foot may be used.

Grout shall be mixed in small quantities as needed, and shall not be re-tempered or used after it has begun to set, unless otherwise specified or directed. The grout shall consist of one part portland cement and two parts sand by volume mixed with sufficient water to form a grout of proper consistency. When non-shrinking or non-shrinking fast-setting grout is specified, it shall be formulated by the incorporation of an admixture, or a pre-mixed grout may be used. The formulation and the admixture or the premixed grout used will be subject to the approval of the Engineer, and shall be mixed and used in accordance with the recommendations of the manufacturer.

For pipe 12"-36" when justified by structural design factors the use of grout is not required.

**Equipment**

Provide all necessary equipment for satisfactory completion of the work including restoration of the site.

**Pipe Stockpiling and Handling**

Pipe and fittings shall be stockpiled in a safe manner at each contractor staging area or pit location. The stockpiling shall be arranged to cause a minimum of interference to pedestrian and stored outside the safety clear zone of vehicular traffic.

When handling slip lining pipe, take all precautions necessary to avoid damaging the pipe. Pipe with cuts greater than 10% of the wall thickness shall be rejected or replaced at no cost to the Department.

Pipe storage areas shall be approved by the Engineer.

**Construction Requirements**

The existing culvert pipe shall be cleaned by whatever means necessary to remove all obstructions which may be encountered that would prevent insertion of the slip liner into the host pipe as approved by the Engineer. All drainage structures and ditches shall remain open at all times.

As Directed by the Engineer, reestablish the flow-line of eroded inverts with grout meeting the requirements of Subsection 918.21 of the specifications. Premixed grout may be used subject to approval of the Engineer.

A detailed plan on holding the liner pipe on the invert of the host pipe shall be submitted to the Engineer for approval.

Where required, a bullnose device shall be pulled through the existing culvert to facilitate the slip lining installation. The bullnose device shall be of appropriate diameter to return the culvert to its approximate shape.

The annular void shall be completely grout filled without deflecting the insertion pipe greater than 1.5 percent.

Provide end seals at the open points of each run of pipe to be grouted

Penetration of the host pipe shall be permitted for host pipe constructed with Corrugated Metal Pipe (CMP) to facilitate grouting of the annular void. Multiple fill pipes will be required.

The annular void shall be grouted solid by injecting grout from one end of the pipe run and allowing it to flow toward the other end. Venting of the annular void shall be performed to assure uniform filling of the void space during the grouting process. An open ended, high point tap or equivalent vent must be provided and monitored at the bulkhead opposite to the point of grouting.

After installation of the pipe liner is complete, seal the inlet end of the pipe with a water tight seal between the pipe liner and the existing pipe. The seal shall be one recommended by the pipe manufacturer and approved by the Engineer.

All incidental work, such as brush removal, flow-line adjustments, etc., shall be accomplished by the contractor.

Upon acceptance of the installation work and testing, clean-up and restore the project area affected by operations as approved by the Engineer.

### **Method of Measurement**

The Department will measure the pipe liner to Slip Line the existing pipe by the linear feet installed and accepted.

The Department will measure the Cement by each per 94 lb bag. If pre-mixed grout is used, the amount of cement in each bag, or other units of pre-mixed grout, must be determined and expressed in equivalent 94 pound bag units for payment purposes.



**Basis of Payment**

The Department will pay for accepted quantities at the contract prices as follows:

Item		Pay Unit
607-65.20	Site Preparation	Each
607-65.XX	(Desc) Pipe To Slip Line (Desc)	Linear Feet
719-03	Cement	Bag

Such payment is full compensation for furnishing and installing pipe liner, clearing, reestablishing pipe flow lines, site restoration, and all other labor, materials and any incidentals necessary to complete the work.

All cost incurred in grouting eroded inverts of existing culvert pipes shall be included in the contract bid price for cement (per 94 pound bag).

**STATE**

**OF**

**TENNESSEE**

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**SPRAY APPLIED PIPE LINERS (SAPL)**

**Description:**

This specification shall govern all work, materials, and equipment required for pipe and culvert rehabilitation using a “spray applied method” for the purpose of eliminating infiltration and exfiltration, repair of voids, and restoration of the structural integrity of the pipe or culvert.

**Material:**

Products meeting this provision shall have been submitted and evaluated through AASHTO’s National Transportation Product Evaluation Program (NTPEP) or AASHTO Product Evaluation List (APEL). Only products that are on the TDOT Qualified Products List (QPL) 42, SPRAY APPLIED PIPE LINERS (SAPL), may be used.

Grouts for the reestablishment of pipe inverts and for filling voids shall meet the requirements of section 921.09- Type 1 of the Standard Specifications. Alternate grouts recommended by the SAPL manufacturer may be used upon approval of the Engineer.

**Spray Applied Pipe Lining Method**

The spray applied lining material shall be used to form structurally enhanced monolithic liner covering all interior surfaces of the structure, including benches and inverts of manholes.

The spray applied slip lining shall conform to the minimum physical requirements as tested and approved during the initial NTPEP Evaluation. The physical requirements must be verified by an independent, certified, third party testing laboratory within the last five years.

Submit to the project engineer manufacturer's detailed product data with complete information on liner pipe materials (pipes, joints, gaskets, fittings, entrance bells), physical properties, dimensions, installation minimum / maximum allowable parameters such as maximum recommended external grout pressure, axial compressive stress, minimum bending radius or maximum joint angular deflection.

The SAPL will include applying a self-leveling grout to repair eroded inverts followed by the application of a TDOT approved spray applied liner process.

**Equipment**

Applicator must use approved equipment designed and manufactured by the material supplier specifically for the application of the spray applied liners. Other models may be approved after review by the manufacturer.

The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.

**Existing Pipe Inspection**

Applicator shall inspect all surfaces specified to receive a protective coating prior to the existing pipe preparation.

The interior of the host pipe shall be thoroughly inspected to determine the location of any conditions which may prevent proper installation, and it shall be recorded so that these conditions can be corrected.

Applicator shall notify Owner of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair mortar and protective coating.

**Existing Pipe Prep**

All aspects of the existing pipe prep shall be in accordance with the manufacturer's recommendation.

Any and all obstructions shall be removed using a high pressure water jet or other means necessary to the satisfaction of the project engineer. The pipe preparation will also include the following:

- removal of any loose and unsound material
- cleaning and preparing the area to be sprayed
- elimination of active infiltration prior to liner application
- repair and filling of voids
- repair and sealing of the invert and benches
- repair of collapsed pipe sections by jacking or other approved methods

**Application of Repair Material**

Grout all voids beneath and around the pipe where infiltration, erosion, or scour have occurred and reestablish the invert of the pipe.

Repair materials shall be used to; fill voids, bug holes, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the protective coating applicator.

Repair materials must be compatible with the specified coating and shall be applied in accordance with the manufacturer's recommendations.

The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds should not be used unless approved for compatibility with the specified protective coating.

Areas where structural steel has been exposed or removed shall be repaired with a non-shrink grout or approved alternate per the Project Engineer's recommendations.

Application of the repair materials, if not performed by the coating certified applicator, should be inspected by the protective coating certified applicator to ensure proper finishing for suitability to receive the specified coating.

**Application of Spray Applied Liner (SAPL)**

The applicator shall be approved and trained by the manufacturer using the specially designed equipment for the application.

Application procedures shall conform to the requirements and recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

Apply the SAPL to a minimum thickness of 1.0 inch for Geopolymer and Cementious based material: and a minimum thickness of 0.5 inch for resin based material, unless otherwise specified.

Ground water shall not be permitted to infiltrate into the host pipe during the liner process.

**Method of Measurement**

Grouts for the reestablishment of pipe inverts and for filling voids will be measured by the cubic foot (CF).

The spray applied pipe liner (SAPL) shall be measured by the linear foot (CF) of pipe repaired and accepted. The Department will measure, in place, end to end along the centerline of the pipe section repaired.

**Basis of Payment**

607-25.02	SPRAY APPLIED PIPE LINER (SAPL)	Cubic Foot (CF)
607-25.01	SAPL TYPE 1 GROUT (REPAIR)	Cubic foot (CF)

Payment for grout is full compensation for all labor, materials, and equipment used for the batching, mixing, pumping placing, and finishing of grout, and all other incidentals necessary to complete the work.

Such payment for the spray applied pipe liner is full compensation for all labor, materials, and equipment used for the proper repair of the pipe including inspection, cleaning, drying, removing obstructions, preparation of pipe, repairing voids, jacking collapsed areas of pipe, diversion of existing water sources, application of materials, and all other incidentals necessary to complete the work.

**STATE**

**OF**

**TENNESSEE**

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Rev. 5-16-16

Rev. 5-14-18

**SPECIAL PROVISION**

**REGARDING**

**RETAINING WALLS**

**General Description**

This Special Provision covers the design requirements, submittal of wall design drawings and supporting calculations, materials, construction, measurement, and payment for earth retaining walls. The scope of work for retaining wall construction includes, but is not limited to, the following as required:

1. All grading necessary for wall construction,
2. Undercutting and backfilling of weak surficial zones, and or ground improvement as required by plans
3. Temporary Shoring/Wall
4. Compaction of wall foundations
5. General and local dewatering as required for proper execution of the work
6. Construction of leveling pads
7. Formwork, placement of reinforcing steel, placement and curing of concrete
8. Texture coating or architectural treatment
9. Placement of drainage materials
10. Installation of piling
11. Placement of soil reinforcing devices
12. Placement and compaction of backfill
13. Preparation and erection of wall units
14. Construction of any required caps, copings, or end sections

All items included in the construction of the retaining wall shall conform to this Special Provision, the *Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction*, henceforth referred to as the Standard Specifications, American Society for Testing Materials Standards (ASTM), Federal Highway Administration (FHWA) Technical Publications, the current edition of the *AASHTO LRFD Bridge Construction Specifications*, and the current *AASHTO LRFD Bridge Design Specifications* with interims, henceforth referred to as the AASHTO LRFD. The architectural treatment and/or texture finish of the walls shall be in accordance with the contract plans.

### Design Criteria

The design of all types of earth retaining walls shall be in accordance with this Special Provision and the following Specifications as required:

1. AASHTO *LRFD Bridge Design Specifications* with interims
2. Publication no. FHWA-NHI-10-024, *Mechanically Stabilized Earth Walls and Reinforced Soil Slopes*
3. (FHWA Report No. FHWA-SA-99-018, 1999) *Geotechnical Engineering Circular No. 4, Ground Anchors and Anchored Systems*

The soil and/or rock properties and specific design values required for wall design are provided in the contract plans.

### Submittal Requirements for Contractor/Supplier Prepared Design Plans

The Contractor shall utilize the information contained on the Retaining Wall Conceptual drawing as well as information shown elsewhere in the plans (i.e. utility sheets or traffic control/phasing sheets) to prepare his bid for the wall during the project bidding process and to prepare wall design plans during the construction of the project. The final design shall be submitted subsequent to contract award and a minimum of sixty (60) days prior to start of wall construction and shall include detailed design computations and all details, dimensions, quantities and cross sections necessary to construct the wall. Acceptable wall types will be identified on the concept drawing. Specific wall systems for the Acceptable Wall Types shall be selected from the Department's Qualified Products List (QPL 38) in effect at time of bid letting. In certain circumstances for a particular project, TDOT may elect to provide a complete, detailed wall design in the contract plans. The Contractor shall not bid for nor shall the Contractor submit plans for wall types and/or specific wall systems not listed as an Acceptable Wall Type on the Retaining Wall Conceptual Drawing and related drawings. If a specific wall design is provided for in the contract plans, the Contractor shall not bid for or submit plans for other wall types or design. (See Section 8 for the limited conditions under which other wall types or designs may be considered).

The plans shall be prepared to include but not be limited to the following items:

1. A plan and elevation sheet or sheets for each wall containing the following:
  - a. An elevation view of the wall showing grades at the top of the wall, every 50 feet along the wall and at all horizontal and vertical break points. Elevations at the top of leveling pads and footings, the distance along the face of the wall to all steps in the footings, and leveling pads, the designation as to the type of panel or module, the length, size and number of tiebacks, nails, mesh or strips and all the distances along the face of the wall to where changes in length of the reinforcing elements occur and the location of the original and final ground line should be shown. The Contractor shall be responsible for field verifying original ground elevations.
  - b. A plan view of the wall shall indicate the offset from the construction

centerline to the face of the wall at all changes in horizontal alignment, the limit of the widest module, tiebacks, nails, mesh or strip and the centerline of any drainage pipe which is behind, under, in front of or passes through the wall.

- c. Any general or special notes, standard or special drawings, or other unique provisions required for construction of the wall.
  - d. All horizontal and vertical curve data affecting wall construction.
  - e. Cross sections showing limits of construction and in fill sections, limits and extent of select granular backfill material placed above original ground.
  - f. Limits and extent of reinforced soil volume
  - g. Limits and extent of any ground improvements as required by the contract plans.
  - h. Limits and extent of temporary shoring/retaining walls.
2. Details
- a. All structural details including reinforcing bar bending details. Bar bending details shall be in accordance with CRSI standards.
  - b. All details for foundations and leveling pads, including details for steps in the footings or leveling pads.
  - c. Wall Elevation drawings shall delineate the changes in wall design height with corresponding changes in reinforcement type and/or lengths for the design section.
  - d. For each delineated wall design segment the Applied Factored Bearing Load at both the Service and Strength Limit States shall be shown.
  - e. All modules and facing elements shall be detailed. The details shall show all dimensions necessary to construct the elements, all reinforcing steel in the element, and the location of reinforcement element attachment devices embedded in the facing.
  - f. All details for construction of the wall around drainage facilities, overhead sign footings, abutment piles or other obstructions shall be clearly shown.
  - g. All details for connections to traffic barriers, coping, parapets, noise walls and attached lighting shall be shown.
  - h. All details for drainage behind wall or reinforced soil volume.
  - i. If vehicular impact protection is required due to the wall system not satisfying the minimal design requirements of Section 5.0, details of the barrier wall and end terminals shall be shown on the Contractor/Supplier Design plans for the proposed wall.
3. Detailed design computations which clearly demonstrate compliance with design requirements provided in this specification.
4. Limits of design responsibility, if any.
5. Each design submittal shall include a detailed list of quantities for each wall unit. The quantities shall include but not be limited to: concrete cast in-place, pre-cast concrete, select backfill material, backfill material, reinforcing steel,



geomembrane/geogrid reinforcement, modular blocks, structural steel, pre-stressing steel, etc. If known, all materials sources shall be identified so acceptance and verification sampling and testing can be conducted. All quantities listed are for informational purposes only and do not necessarily constitute a pay item or quantity. All retaining walls shall only be paid for under the respective retaining wall bid item measured and described herein.

6. The Contractor's wall plans shall be signed, stamped and dated by a qualified registered Professional Engineer licensed in the State of Tennessee.
7. Submittals and Approval

Four sets of design drawings and detail design computations shall be submitted to the Structures Division. The computations shall include a detailed explanation of any symbols and computer programs used in the design of walls. Structures Division will submit two of their four copies to the Division of Materials and Tests.

Each design drawing shall contain in the title block the project number, county, structure name, structure number, station and contract number. Design drawings shall be submitted in sets with the drawing numbers running consecutively in each set, and if more than five (5) sheets in a set, shall be appropriately bound.

All designs and construction details will be checked by the Structures Division and the Materials and Tests Division against the pre-approved design drawings and procedures for that particular system. Review of the wall submittal will occur within 30 days of receipt. If there are design or plans issues requiring revisions then the Structures Division will inform the appropriate TDOT Construction Office and provide a listing of the required revisions. Depending on the required revisions the 30 day review timeframe may be extended. Approval of the detailed design and plans shall be made by the Structures Division and Materials and Tests Division. Notification to proceed shall be made by the Structures Division.

After approval, the Contractor shall submit additional sets of the design drawings (full size and half size) as determined by the Structures Division for Departmental distribution. Also, an electronic copy of the design drawings and detail design computations shall be submitted to the Structures Division and the Materials and Tests Division upon completion of the project.

8. Other Submission Requirements

As discussed in the previous sections, the Contractor shall bid for and, subsequently, (for the Contractor for which the project was awarded) prepare plans for and be prepared to construct the wall type(s) given on the Retaining Wall Conceptual Drawing or, under special circumstances, the specific wall type and design as provided by in the Contract Plans. The Contractor awarded the project may only under the circumstances discussed below request that a

wall type, wall system, or associated construction for a wall (i.e., foundation improvement requirements, construction sequence requirements, etc.) be changed, altered, or eliminated from those requirements set forth in the plans.

The Contractor may request the Department consider a change in the wall type, specific system, and associated construction through the submission of a Value Engineering Change Proposal (VECP) unless the contract prohibits submission of a VECP. Furthermore, any conditions of a VECP, such as a minimum cost savings required by the contract must be followed. The Department's agreement to review a VECP for a retaining wall shall in no way imply subsequent acceptance of the VECP or any part thereof. Any costs associated with preparation and submittal of a VECP shall be borne by the Contractor and no construction scheduling changes or time delays shall be caused by the Contractor's submission of the VECP and the Department's review of the VECP. If the proposed change involves a wall system not on the Approved Wall System list, then the contractor must coordinate with the system supplier to gain approval of the system and shall be aware of the approval requirements and time considerations for this approval process.

The Contractor may request the Department consider a change in the wall type, specific system, and/or associated construction if the Contractor determines that project conditions exist that substantially differ from those conditions upon which the decision to specify in the plans a particular wall type(s), wall system, or associated construction was made. An example of this would be where a soldier pile-lagging wall is specified as the only wall type due to right-of-way constraints not allowing for a typical wall type to be built, then subsequently it is determined TDOT can acquire or has sufficient right- of-way available to make another wall type feasible.

The request for consideration of changing of a wall type, system, or associated construction shall be made in writing and be submitted to the Construction Engineer. The Construction Engineer will distribute the request to the Regional Construction Engineer, Structures Division, Geotechnical Engineering Section, Design Division, and Right-of-Way Division, if applicable. The parties will review the request and provide recommended action (approval, rejection, alterations) to the Construction Engineer. If necessary, a plans revision will be made. Note that the Contractor's submission of a request does not imply acceptance by the Department and that the request process shall not be justification for a project schedule change or time extension. The Department reserves the right to require the Contractor to construct the wall as shown in the plans if there are no conditions that exist which render the contract plan wall requirement not constructible.

The Contractor must provide documentation in the request to demonstrate that the proposed change does not in any way cause additional cost to the wall and associated construction or to other aspects of the project. If the Contractor judges that a change involving wall construction must be made due to differing site conditions, the Contractor must follow procedures given in Sections 104.02 and 104.03 of TDOT Standard Specifications for Road and

Bridge Construction.

### **Requirements for retaining wall protection provided by the retaining wall system**

When noted on the plans that a retaining wall is located in a hazard zone subject to vehicular impact, the Contractor shall be aware that retaining wall protection against vehicular collision for the wall may be required. If the retaining wall facing meets any one of the following criteria, an independent barrier wall shall be provided in front of the wall and included in the square foot cost of the wall:

1. Any retaining wall facing that is constructed of non-reinforced concrete (cast-in-place concrete gravity walls are exempt from this requirement and do not require protection.
2. Any dimension of a retaining wall facial panel that is less than 5'0" x 5'0" x 6" thick reinforced panel.
3. Any type of crib retaining walls.
4. A cast in place reinforced facing that has a thickness less than 6 inches.

### **Materials Approval**

The materials used in the construction of the earth retaining walls shall conform to this Special Provision and/or the Standard Specifications. Prior to delivery of any material used in the retaining wall construction, the materials must be accepted in conformance with the specifications associated with the wall type being constructed.

### **Materials**

Unless otherwise stated in specific retaining wall specifications, the materials used in the construction of earth retaining walls shall conform to the following specifications:

1. Concrete Class "A" shall be in accordance with Section 604 of the Standard Specifications.
2. Concrete Class "D" shall be in accordance with Section 604 of the Standard Specifications.
3. Reinforcing steel shall conform to ASTM A 615, Grade 60.
4. The sources for all backfill material shall be approved in conformance with the Standard Specifications before the material is delivered to the job site. Any select backfill material must be approved or tested for compliance prior to construction.
5. Lifting hooks and threaded inserts shall be of the size indicated on the working drawings.
6. When required, imbedded items must be galvanized in accordance with AASHTO M 232 or ASTM A 153.
7. Acceptance of materials furnished for work will be in accordance with the TDOT "Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1) and certified test reports as specified in Section 106 – Control of Materials supplemented by routine tests run by the Department as defined in the various applicable sections of the Standard

- Specifications.
8. Clearing and grubbing, removal of structures and obstructions, and excavation and undercutting shall be performed in accordance with the provisions of Sections 201, 202, and 203, respectively, of the Standard Specifications. Cost of these items, however, shall be included in the square foot price bid for retaining walls as shown in contract plans.
  9. Reinforced Concrete Facing Panels - The panels shall be fabricated in accordance with the TDOT Procedure for the "Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels."
  10. Stone masonry shall be in accordance with Section 612 of the Standard Specifications.
  11. All fabricated or precast retaining wall assemblies shall be selected from the TDOT's Qualified Products List.

All concrete, reinforcing steel, and backfill materials shall be tested at the specified frequencies in accordance with the TDOT "Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)".

### **Method of Measurement**

The method of measurement shall be square foot area of the wall face, measured from the top of footing (or bottom of wall for walls without footings) to the top of the wall excluding any appurtenances in accordance with drawing number W-MSE-1 (in this document). Appurtenances are defined herein as barriers, fences, sign supports, noise wall support posts, and other fixtures. Coping, caps, end sections and moment slabs will **not** be considered appurtenances and are to be considered as part of the wall face.

### **Basis of Payment**

The earth retaining wall, complete in place and accepted, shall be paid for at the contract square foot bid price. The bid price for walls shall include as required: grading and compaction of the wall foundation, undercutting and backfilling of weak surficial zones, installation of ground improvement, footing excavation, presplitting, sheeting, shoring, drilling, piles, lagging, grouting, concrete, reinforcing steel, reinforcement strips or mesh, tie strips or rods, fasteners, connectors, wire mesh baskets, prefabricated modular components, post tensioning, performance testing and evaluation, architectural treatment and/or texture finish, drainage system, water-stops and joint sealing material, coping, caps, end sections, moment slabs, and all miscellaneous material and labor for the complete installation of the wall. If the contractor's design requires the use of select granular backfill, the unit price bid for the wall shall be full compensation for any additional backfill costs due to the use of select backfill material.

If required for retaining wall protection against vehicle impact, the cost of the barrier wall and end terminals shall be included in the square foot cost of the wall.

Additional area of wall required due to unforeseen foundation conditions or other reasons and approved by the Engineer will be paid for on the basis of the unit price bid except as noted below.

The mechanically stabilized earth wall, complete in place and accepted as noted above, shall be paid for at the contract square foot bid price. No increase in unit price will be

paid for increases in wall height less than or equal to 10 feet as compared to the contract plans and wall heights. Wall height increases greater than 10 feet will be paid for by supplemental agreement.

The cast-in-place concrete cantilever or counterfort retaining wall, complete in place and accepted shall be paid for at the contract square foot bid price except as noted below.

If the actual driven quantity of concrete piles driven varies more than 10% from the estimated quantity based on the estimated lengths, an increase or decrease based on the contract bid price, or in the absence of a bid item, a unit price of twenty eight (28) dollars, per linear foot of additional or reduced pile length will be added or deducted accordingly from the price paid for the retaining wall. If the Engineer orders additional test piles, they will be paid for at the contract bid price, or in the absence of a bid item, a unit price of forty (40) dollars per linear foot. If the contractor changes friction pile types or sizes, additional load test(s) may be required at the Engineer's discretion and at the contractor's expense.

If the contractor uses a different type of pile than those that have estimated lengths shown on the contract plans, the price of the wall shall include all costs associated with piles and pile installation with no additional payment for any variation in pile lengths. All pile types and pile driving procedures, lengths, and bearings shall be in accordance with the Standard Specifications and shall be approved by the Engineer

The contractor shall show the estimated quantity of point bearing steel piles on the design drawings submitted for approval. If the actual quantity of steel piles driven differs more than 10% from this approved quantity because of variation in the rock line, the cost of the retaining wall will be increased or decreased accordingly based on the contract bid price, or in the absence of a bid item, a unit price of thirty five (35) dollars per linear foot, for the adjusted piling quantity .

If the Engineer orders changes in the work which alters the surface area of the wall without increasing the height of the wall, payment will be increased or decreased accordingly based on the square foot bid price. If the Engineer orders changes in the work which increases the height of the wall, the unit price bid for the wall sections that were increased up to a maximum of 10 feet will be adjusted according the following tables. Adjustments exceeding 10 feet will be made by supplemental agreement.



## **Specific Wall Construction and Materials Requirements**

### **A. Cast-in-Place (CIP) Concrete Gravity Retaining Walls**

#### **1. Construction**

The construction of the wall shall be in accordance with this Special Provision and the Standard Specifications.

### **B. Cast-In-Place (CIP) Concrete Cantilever And Counterfort Retaining Walls**

#### **1. Construction**

The construction of the wall shall be in accordance with this Special Provision and the Standard Specifications. If the use of piles is anticipated, the foundation information shown on the contract plans shall include the skin friction (Fs) and end bearing (Qb) values, or the location of the rock line. Based on this information, estimated pile lengths shall be shown on the contract plans for fifty (50) and one hundred (100) tons ultimate bearing capacity for Size 1 concrete friction piles. The contractor shall estimate point bearing steel pile refusal lengths based on the given rock line information.

Concrete friction piles shall be installed to provide a minimum factor of safety of 2.0 if a load test is used and a minimum factor of safety of 3.0 if a load test is not used. Pile types, load test procedures, and driving equipment shall be in accordance with the Standard Specifications and shall be approved by the Engineer. The number and location of test piles and load tests shall be approved by the Engineer. Test pile lengths shall be ten (10) feet longer than the estimated pile lengths. Test piles shall be driven in accordance with the Standard Specifications, and shall be required at least every fifty (50) feet along the wall, unless otherwise approved by the Engineer. No pile shall be any farther than five hundred (500) feet from a load test, if a load test is used, unless otherwise approved by the Engineer. The length of production piles to be driven and the required bearing based on the driving equation shall be determined by the Engineer based on the required design bearing, the results of the test piles and load tests (if used), and applicable safety factors. Driven pile lengths and final bearings shall be approved by the Engineer.

Point Bearing Steel Piles shall be driven to refusal. Pile tips shall be used when indicated on the contract plans.

All reinforcing steel projecting from footing into the wall in the back face (fill side) shall be epoxy coated.

### **C. Concrete Crib Walls (See QPL 38 for Approved Manufacturer/Supplier)**

#### **1. Materials**

The following items are the construction materials requirements necessary for crib wall design fabrication. All materials shall be approved prior to use.

- Pre-Cast Concrete Crib Units

The pre-cast crib units are to be made of Class D Portland cement concrete conforming to Section 604 of the Standard Specifications.

- Crib Backfill

All backfill material shall be tested prior to use and at the established frequencies in the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”.

- The crib backfill material shall consist of an AASHTO classified A-1-a, A-1-b, or A-3 soil with the additional requirement no more than ten percent by weight pass the #200 sieve.
- The unit weight of the crib fill should be a minimum 115 lb. per cubic foot.
- Filter protection (geotextile) may be required.

- Backfill Behind the Crib Type Structure

All backfill material shall be tested prior to use and at the established frequencies in the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”.

- If a filter blanket is placed behind the wall, native soil may be used as backfill behind the structure.
- Select fill, as defined in 4.2.1 of this document, can be used as backfill behind the structure. The backfill unit weight must be a minimum of 115 pcf. An internal angle of friction can be assumed equal to 35 degrees.

## 2. Fabrication of Precast Concrete Crib Units

- All pre-cast concrete shall be produced in an approved plant in accordance with the TDOT Procedure for the “Manufacture and Acceptance of Precast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels”.

Out-of-state producers shall provide documentation of material quality before the manufacture of any pre-cast products (i.e. aggregate quality reports, cement/steel mill test reports, etc.)

The fabricator shall provide two precast modular units to the Engineer for approval.

- These approved precast modular units will serve as standard models. The finished exposed faces of the production precast modular units should be similar to the exposed faces of the model precast modular units.
  - One of the model precast modular units should be kept at the production plant for relative comparison to future modular units. The other model should be kept on the construction site for comparison to the other delivered units.
- To assure uniform unit production steel forms must be used.
  - The placement of reinforcing steel within the precast units should conform to the design placement shown in the shop drawings.



- Final acceptability of the precast units shall be determined on the basis of compression tests, production defects and tolerances, and visual inspection. The manufacturer shall furnish all sampling and testing facilities.
- Section 604 of the Standard Specifications states the units shall be steam or moist cured until developing the specified compressive strength set forth in the shop drawings. Any unit not developing the specified compressive strength shall be rejected.
- The precast units should not be delivered before samples have attained the required compressive strength of 4,000 psi ( $f'_c$ ).
- Prior to shipment, the finished units are subject to visual inspection by the Engineer. Individual crib units may be rejected for any of the reasons listed below.
  - i. Variations in the exposed face texture relative to the approved model face texture.
  - ii. The length or height of the unit not satisfying the unit allowable tolerance limit of 3/16".
  - iii. Honeycombed or open texture units which are not properly repaired.
  - iv. Individual defects which could affect the structural integrity of the unit Variations in the exposed face texture relative to the approved model face texture.
- TDOT will verify products before shipment in accordance with the TDOT Procedure for the "Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels". If products are manufactured out of state, TDOT may verify at the project site PRIOR to the placement of the units. The Contractor, or producer, shall notify the Regional Materials and Tests Division that products need to be verified.
- Upon delivery, the exposed surface of the precast units shall be examined. If the exposed faces of any of the units are below the standards of the approved model on site, the units shall be replaced or properly repaired until conforming to the appearance, strength, and durability of the approved model.
- The date of manufacture shall be clearly and permanently marked on one of the inside surfaces of each unit. Each shipment must be accompanied with a certification letter as stated in the TDOT Procedure for the "Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels."

### 3. Construction

- The Contractor should perform any soil improvement, such as undercutting and backfilling before foundation preparation.

- Compact the top 12” of soil on which the structure will rest to at least 95% of the maximum laboratory dry density as specified in AASHTO T-99.
- No Crib-type wall should be built upon frozen ground.
- Following excavation for the crib wall system, the Contractor shall notify the Engineer for approval of the footing depth and character of the foundation material. No crib wall system work shall proceed until approval has been granted.
- The correct batter of the wall shall not exceed ½” per 10 ft. of wall height.
- The crib backfill should be placed and compacted to at least 95% of the maximum laboratory dry density (AASHTO T-99) in layers no thicker than 12”.
- Backfilling behind the crib system shall follow erection as closely as possible. The wall height should never be greater than three feet above the backfill.
- Any underdrain shall be placed in accordance with the details of the working plans.
- The Contractor shall furnish, install, operate, and maintain satisfactory dewatering systems as required to maintain the site in a dry and workable condition. These systems shall be continued as long as necessary. No separate measurement or payment will be made for dewatering.

**D. Bin Wall (See QPL 38 for Approved Manufacturer/Supplier)**

**1. Materials**

- Filler for horizontal joints between modular units shall be resin-bonded cork filler or closed cell foam, cross linked polyethylene polymer, conforming to test requirements of AASHTO M 153 or ASTM D 1752 (Type II) or equal. Filter fabric placed behind front vertical joints shall be at least 6” wide and conform to section 918.27 of the TDOT Standard Specifications).
- Backfill: All select granular material shall be free from shale and organic or otherwise deleterious material and conform to the following gradation limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
6 inch	100
3 inch	75-100
No. 200	0-15

The Contractor, at his option, may produce the select granular material by processing the excavation from the project or from approved material from other sources. No direct payment will be made for producing the select granular material.

All backfill material shall be tested prior to use and at the established frequencies in the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”.

- Bearing pads shall be rubber of size, and manufacture shown on shop drawings, with the following properties perpendicular to the pad thickness:
  - i. Compression- minimum ultimate strength 8000 psi
  - ii. Initial Cracking Strain- 40% of thickness
  - iii. Hardness (Shore A) – 75 +/- 5
  - iv. Tensile Strength- ASTM D 412, die “C”, 1000 psi +/- 100 psi
  - v. Tear Strength- ASTM D 624, die “B” – 360 psi minimum
- Acceptance of materials furnished for work will be in accordance with the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1) and certified test reports as specified in Section 106 – Control of Materials supplemented by routine tests run by the Department as defined in the various applicable sections of the Standard Specifications.

## 2. Construction

- Bin Fabrication
  - All pre-cast concrete shall be produced in an approved plant in accordance with the TDOT Procedure for the “Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels”.

Out-of-state producers shall provide documentation of material quality before the manufacture of any pre-cast products (i.e. aggregate quality reports, cement/steel mill test reports, etc.)

Before proceeding with production, a model precast modular unit shall be provided by the fabricator for the Engineer’s approval to establish a guide and standard for the type of finish to be furnished on the exposed face. This model shall be kept at the fabricator’s plant to be used for comparison purposes during production. Formed surfaces other than the exposed face shall not require a special finish
  - Forms: Forms for the units shall be constructed of steel with dimensional tolerances that will assure the production of uniform units. Finish for the front face of the wall shall be in accordance with the finish specified on the contract plans.
  - i. Mixing and Placing Concrete: The concrete mix as designed shall be proportioned and mixed in a batch mixer to produce a homogeneous concrete. The transporting, placement, and compaction of concrete shall be by methods that will prevent segregation of the concrete materials and the displacement of the reinforcement steel from its proper position in the form. Concrete shall be carefully placed in the forms and vibrated sufficiently to produce a surface free from imperfections such as honeycomb, segregation or cracking. Clear form oil of the same manufacture shall be used throughout the casting operation.
  - ii. Reinforcing Steel: All reinforcing steel for the precast modules and other components shall be fabricated and placed in accordance with plans and Standard Specifications.

- Testing and Inspection: Acceptability of the precast units at the casting yard shall be determined on the basis of compression tests and visual inspection during casting. The manufacturer shall furnish such facilities and assistance as is required to carry on the sampling and testing in an expeditious and satisfactory manner. The manufacturer shall document and provide all test data and certify in accordance with the TDOT Procedure for the “Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels”.
- iii. Curing: The units shall be steam or moist cured as specified in Section 604 of the Standard Specifications for a sufficient length of time so that the concrete will develop the specified compressive strength. Any panel which does not reach specified strength within 28 days shall be rejected.
- Compressive Strength: Compressive tests to determine the minimum strength requirements shall be made on cylinders. A minimum of six cylinders for determining when the units may be put into service will be made from each day’s production and cured in accordance with AASHTO T 23 or ASTM C 31. The 28 day compressive strength shall be at least 5000 psi. Compressive strength tests shall be in accordance with AASHTO T 22 or ASTM C 39.
- Rejection: The quality of materials, the process of manufacture, and the finished units shall be subject to inspection by the Engineer prior to shipment. Precast units may be subject to rejection on account of failure to conform to the requirements set forth herein. Individual units may be rejected because of any of the following:
  - Variations in the exposed face that substantially deviate from the approved model as to texture in accordance with precast concrete industry standards.
  - Dimensions not conforming to the following tolerances:
    - Face of panel, length or height: plus/minus 3/16”
    - Deviation from square when measured on diagonal: 5/16” for modules up to 10’ wide, 3/4” for larger units.
  - Honeycombed or open texture not properly repaired.
  - Defects which would affect the structural integrity of the unit.
- Shipment: The precast units shall not be shipped until they have achieved the required concrete strength ( $f'c$ ) of 5000 psi. TDOT will verify products before shipment in accordance with the TDOT Procedure for the “Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels”. If products are manufactured out of state, TDOT may verify at the project site PRIOR to the placement of the units. The Contractor, or producer, shall notify the Regional Materials and Tests Division that products need to be verified

- Repairs at Plant: Before shipment, surfaces of all precast units shall be examined. If the exposed face of a unit is below the standard of the approved model then it shall be properly repaired to conform to the balance of the work with respect to appearance, strength and durability.
- Handling and Storage: Handling devices, as required, shall be provided in each precast modular unit for the purpose of handling and placing. Care shall be taken during storage, transporting, hoisting and handling of all units to prevent cracking or damage. Units damaged by improper storing, transporting or handling shall be replaced or repaired to the satisfaction of the Engineer.
- Marking: The date of manufacture and production lot number shall be clearly and permanently marked on the rear face of each unit.
- Erection:
  - i. Foundation Preparation: The foundation for the bin wall shall be graded to the elevations and dimensions shown on the contract plans. Prior to wall construction, the top 12 inches of the foundation shall be compacted to at least 95% of the maximum laboratory dry density as determined by AASHTO T 99. Any foundation soils found to be unsuitable or incapable of sustaining the required compaction shall be removed and replaced. After the excavation for each location of the bin wall has been performed, the Contractor shall notify the Engineer. No concrete leveling footing shall be placed until the depth of excavation and the character of the foundation material has been approved by the Geotechnical Engineering Section of the Division of Materials and Tests and permission has been given to proceed by the Engineer.
  - ii. At each unit foundation level, either a precast or cast-in-place footing and/or leveling pad shall be provided as shown on the shop drawings. The footings shall be given a wood float finish and shall reach the required compressive strength of 3000 psi, before placement of wall modules. The completed footing surface shall be constructed in accordance with grades and cross slopes shown on the shop drawings. When tested with a 10' straight edge, the surface shall not vary more than 1/8" in 10'. Any additional depth of footing required to level the top surface and bear on approved foundations shall be at the Contractor's expense.
  - iii. The modular units shall be installed in accordance with the manufacturer's recommendations. Special care shall be taken in setting the bottom course of units to true line and grade. Joint filler and neoprene pads, when required, shall be installed in the horizontal joints. Joints at corners or angle points shall be closed as shown on the plans or in accordance with recommendation of the manufacturer.
  - iv. All units above the first course shall interlock with the lower courses.

- Vertical joints shall be staggered with each successive course, or as shown on shop drawings. The vertical joint opening on the front face of the wall shall not exceed 3/4".
- v. The interior of each successive course of precast modular units shall be filled with select granular backfill. The maximum lift thickness shall be 2 feet, and shall then be thoroughly consolidated with a vibratory tamping device.
  - vi. Backfill behind the wall shall be compacted to at least 95 percent of the maximum laboratory dry density as defined in AASHTO T 99 to within one foot of the top of the wall. The top 12 inches shall be compacted to at least 100 percent of the maximum laboratory dry density.
  - vii. When erecting a battered wall, placement of backfill behind the wall shall closely follow erection of successive courses of units. At no time shall the difference in elevation between the backfill and the top of the last erected course exceed seven feet.
  - viii. The overall vertical tolerance of the wall shall not exceed 1/2 inch per 10 feet of wall as shown per plans.
  - ix. Underdrain, if required, shall be placed in accordance with the details shown on the plans or shop drawings.
  - x. Storm Drains: Where required, precast concrete wall units shall be provided with the appropriate storm drain openings cast into units at the appropriate elevation and locations indicated on drainage profiles. Catch basins shall be located so pipes will enter perpendicular (plan view) to the precast wall units or below the leveling footing as shown on the plans. Construction of catch basins and placement of storm drains must be coordinated with the bin wall construction.
  - xi. Cooperation between contractors: Contractors must coordinate all phases of the work to prevent delays and expedite construction.
  - xii. Dewatering: The Contractor shall furnish, install, operate, and maintain satisfactory dewatering systems as required to maintain the site in a dry and workable condition so as to permit grading and compaction of the wall foundation and proper erection and backfill of the wall. These systems shall include all equipment and materials, and shall be continued as long as necessary. No separate measurement or payment will be made for dewatering.
  - xiii. Technical Consultations: The fabricator will be required as a part of the contract to provide onsite technical expertise to the Contractor and/or the State upon request. Response to requests shall be required within five (5) days of the request. The cost of

furnishing such technical consultations shall be at no cost to the State.

- **On Site Inspection**  
The quality of materials, the process of manufacture, and the finished member shall be subject to inspection and approval by the Engineer. Any bin wall units damaged prior to acceptance shall be repaired or reconstructed as directed by the Engineer. All costs of repairs or reconstruction shall be at the Contractor's expense.

## **E. Gabion Wall (See QPL 38 for Approved Manufacturer/Supplier)**

### **1. General:**

This section covers the furnishing, assembling, filling with stone and tying open wire mesh rectangular compartmented gabions placed on filter cloth or filter stone as specified herein, and in reasonably close conformity with the lines, grades, dimensions, and cross-sections shown on the plans or as directed by the Engineer, and the design, working drawings, materials, construction, measurement and payment for gabions.

Included in the scope of this section are: grading and compaction of the wall foundation, general and local dewatering as required for proper execution of the work, installation of wall drainage systems as specified on the plans, erection of units, the placement of stone within the units and compaction of the soils behind the units as well as the construction of any required reinforced concrete appurtenances such as caps, copings, or end sections as specified on the plans. For the purposes of this section, the gabions foundation shall include all areas underlying the gabion wall. All other items included in the construction of the retaining wall not specifically mentioned herein this manual shall conform to the applicable sections of the *Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction, January 1, 2015* and the current *AASHTO LRFD Bridge Design Specifications* with interims. Future reference to the *Tennessee Department of Transportation Standard Specification For Road And Bridge Construction- January 1, 2015* will be made as Standard Specifications.

### **2. Design Criteria**

The current AASHTO LRFD Bridge Design Specifications with interims shall be used as the basis for design for the Gabion Wall utilized as a gravity type retaining wall.

### **3. Submittals**

Working drawings and design calculations shall be submitted to the Engineer for review and approval at least 60 days before wall construction is to begin. See Chapter I, Section 4.0 for contractor/supplier submittal responsibilities. The Contractor shall not start work on the bin wall until the working drawings have been approved by the Engineer. Approval of the Contractor's working drawings shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work.

### **4. Materials**

- Gabion Wire Mesh

Gabion basket units shall be fabricated from either a double twisted hexagonal wire mesh (metallic or PVC coated as required in contract plans) or welded wire mesh (metallic or PVC coated as required in contract plans) that meets property requirements described in:

ASTM Designation: A974 – 97 (Reapproved 2011)  
Standard Specification for  
Welded Wire Fabric Gabions and Gabion Mattresses  
(Metallic-Coated or Polyvinyl Chloride (PVC) Coated)

ASTM Designation: A975 – 11  
Standard Specification for  
Double–Twisted Hexagonal Mesh Gabions and Revet  
Mattresses (Metallic-Coated Steel Wire or Metallic-Coated  
Steel Wire With Poly(Vinyl Chloride) (PVC) Coating)

All other components of the gabion construction such as selvedge wire, lacing wire, spiral connectors, clips, galvanization, PVC coating shall be in accordance with the above specifications.

- Stone Fill

All stone fill shall be approved by the Engineer and shall be of suitable quality to ensure durability. When the stone is subjected to five alterations of sodium sulfate soundness testing, in accordance with AASHTO T-104, the weighted percentage of loss shall not be more than twelve percent. The inclusion of objectionable quantities of shale, dirt, sand, clay, rock fines, and other deleterious material will not be permitted. Stone fill shall be of well-graded mixture with sizes ranging between 4 inches and 10 inches in diameter, based on U.S. Standard square mesh sieves. No stone shall have minimum dimension less than 4 inches. Stone fill material selected for use in the gabions shall meet the minimum in-place density specified on the plans.

- Filter Cloth

All filter cloth shall meet the applicable requirements of Section 918.27, Sub-Section 27, of the Standard Specifications.

- Filter Stone

All filter stone shall meet the applicable requirements of Grading Size 68 or 57. See the Standard Specifications section 903.22.

## 5. Construction

- Clearing and Grubbing

Clearing and grubbing, removal of structures and obstructions, and excavation and undercutting shall be performed in accordance with the provisions of Sections 201, 202, and 203, respectively, of the Standard Specifications. Cost of these items, however, shall be included in the square foot price bid retaining walls as shown in contract plans.



- Foundation Preparation

Foundation preparation for the gabions shall be made to the required depth below the finished surface and to such a width as to permit the proper installation of the gabions. Prior to wall construction, the top 12 inches of the foundation shall be compacted to at least 95% of maximum laboratory dry density as specified in AASHTO T 99. All soft and unsuitable material shall be removed and replaced with suitable material, which shall then be compacted. The finished subgrade shall be smooth and uniform, with no protruding debris or rock formations. A Size 57 stone may be required to obtain the smooth uniform surface and shall be in reasonably close conformity with the dimensions and designs shown on the plans or established by the Engineer. No gabions shall be constructed upon frozen foundation material.

- Filter Cloth or Filter Stone

Upon final foundation preparation and acceptance by the Engineer, the filter cloth or filter stone shall be placed directly on the foundation at those locations shown on the plans or as directed by the Engineer. All end and side laps shall be a minimum of 18 inches for the filter cloth.

- Assembly (Fabrication)

Gabions shall be fabricated in such a manner that the sides, ends, lid, and diaphragms can be assembled at the construction site into rectangular baskets. Gabions shall be of single unit construction, i.e., the base, lid, ends, and sides shall be either woven into a single unit or one edge of these members connected to the base section of the gabion in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh. Gabion units shall be equally divided, by diaphragms of the same mesh and gauge as the body of the gabions, into cells whose length does not exceed the horizontal width. The gabion shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that no additional tying at this juncture will be necessary. All perimeter edges of the mesh forming the gabion shall be securely joined so that the joints formed by tying the selvages or installation of spiral ties have at least the same strength as the body of the mesh. Lacing wire or connecting wire shall be supplied in sufficient quantity for securely fastening all diaphragms and edges of the gabion.

- Assembly (Field)

- i. Empty gabion units shall be placed on the filter blanket when required on contract drawings and shall be assembled individually to the lines and grades indicated on the Plans. Or as directed by the Engineer, with the sides, ends, and diaphragms erected in such a manner to ensure the correct position. All adjoining empty gabion units must be connected by tie wire lacing along the perimeter of their contact surfaces in order to obtain a monolithic structure. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at

intervals of not more than 5 inches. All lacing wire terminals shall be securely fastened. The use of expedient clip connections for this purpose or as final lid closing will not be permitted. After adjoining empty basket units are set to line and grade and common sides with adjacent units thoroughly laced, they shall be placed in tension and stretched to remove any kinks from the mesh and to a uniform alignment. The stretching of empty basket units shall be accomplished in such a manner as to prevent any possible unraveling and distortion.

- ii. Stone filling operations shall carefully proceed with placement by hand or machine so as not to damage galvanized wire coating, to assure a minimum of voids between the stones, to prevent damage to the underlying filter blanket, and to ensure the maintenance of alignment throughout the filling process. The maximum height from which the stone may be dropped into the basket units shall be 36 inches. Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to ensure a neat and compact appearance. The last layer of stone shall be leveled with the top of the gabions to allow for the proper closing of the lid and to provide an even surface that is uniform in appearance.
- iii. Lids shall be stretched tight over the stone fill using crowbars or lid closing tools until the lid meets the perimeter edges of the front and end panels. The lid shall then be tightly laced with tie wire along all edges, ends and internal cell diaphragms by continuous stitching with alternating single and double loops at intervals of not more than 5 inches. Special attention shall be given to see that all projections or wire ends are turned into the baskets. Where shown on the drawings or as directed by the Engineer, or where a complete gabion unit cannot be installed because of space limitations, the basket unit shall be cut, folded and wired together to suit existing site conditions. The mesh must be cleanly cut and the surplus mesh cut out completely or folded back and neatly wired to an adjacent gabion face. The assembling, installation, filling, lid closing, and lacing of the reshaped gabion units shall be carried out as specified above.

- Backfill

Backfilling of the gabion wall shall follow erection as closely as possible and in no case should the height of the wall be greater than seven feet above the backfill. Underdrains, if required, shall be placed in accordance with the details shown on plans. Gabion walls backfill shall have a density of 100 pounds per cubic foot or as specified on contract plans and shall be compacted to at least 95 percent of the maximum laboratory dry density as defined in AASHTO T 99 to within one foot of the top of the wall. The top 12 inches shall be compacted to at least 100 percent of the maximum laboratory dry density. The backfill material shall consist of broken or crushed stone, gravel, sand, slag or other suitable coarse granular material to insure proper drainage. Shale, clay or cinders shall not be permitted as

backfill material. Prior to placement, the backfill material must be approved by the Engineer. The Contractor shall furnish, install, operate, and maintain satisfactory dewatering system as required to maintain the site in a dry and workable condition so as to permit grading and compaction of the wall foundation and proper erection and backfill of the wall. These systems shall include all equipment and materials, and shall be continued as long as necessary. No separate measurement or payment will be made for dewatering or dewatering systems.

All backfill material shall be tested prior to use and at the established frequencies in the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”.

- Vertical Wall Tolerance

The overall vertical tolerance of the wall (plumbness from top to bottom) shall not deviate more than ½ inch per 10 feet of wall height from the contract drawings batter of the wall.

- On Site Inspection

The quality of materials, the process of manufacture, and the finished members shall be subject to inspection and approval by the Engineer. Any gabions damaged prior to acceptance shall be repaired or reconstructed as directed by the Engineer. All costs of repairs or reconstruction shall be at the Contractor’s expense.

#### **F. Segmental, Precast Facing Mechanically Stabilized Earth (MSE) Wall (See QPL 38 for Approved Manufacturer/Supplier)**

##### **1. Materials**

General - The Contractor shall make arrangements to purchase or manufacture the facing elements, reinforcing mesh or strips, attachment devices, joint filler, and all other necessary components. Materials not conforming to this section or the Standard Specifications or from sources not listed in the contract document shall not be used without written consent from the Engineer.

Out-of-state producers shall provide documentation of material quality before the manufacture of any pre-cast products (i.e. aggregate quality reports, cement/steel mill test reports, etc

- Reinforced Concrete Facing Panels - The panels shall be fabricated in accordance with the TDOT Procedure for the “Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels.”
  - i. Acceptability of the precast units will be determined on the basis of compressive strength tests, production tolerances, and visual inspection. The Contractor, or the supplier, shall furnish facilities and perform all necessary sampling and testing in an expeditious and satisfactory manner as directed by the Engineer.
  - ii. The Portland cement shall be types 1, 2, or 3 and shall conform to the requirements of AASHTO M 85 (ASTM C 150). Concrete for precast panels shall be Class D (4000 psi) as specified in Section

- 604 of the TDOT Standard Specifications. Admixtures containing chlorides shall not be used.
- iii. The panels shall be cast using steel forms. The front face of the panel (face exposed to view when installed in the wall) shall be cast against a steel form or architectural form liner. The back face is to be float finished. The concrete in each panel shall be placed without interruption and shall be consolidated by the use of an approved vibrator, supplemented by such hand tamping as may be necessary to force the concrete into the corners of the forms and prevent the formation of stone pocket or cleavage planes. Clear form oil of the same type shall be used throughout the casting operation.
  - iv. Unless otherwise indicated on the plans or elsewhere in the Standard Specifications, the concrete surface for the front face shall have a Class 1 finish as defined by Section 8.12 of AASHTO, Division II, and for the rear face a uniform surface finish. The rear face of the panel shall be float finished sufficiently to eliminate open aggregate pockets and surface distortions in excess of 1/4 inch. The panels shall be cast on a flat area. The strips or other galvanized attachment devices shall not contact or be attached to the face panel reinforcement steel.
  - v. Curing and forms removal shall be in accordance with the requirements of Section 604.20 and 604.24 of the Standard Specifications, unless otherwise approved by the Engineer. The forms shall remain in place until they can be removed without damage to the panel.
  - vi. The units shall be fully supported until the concrete reaches a minimum compressive strength of 1000 psi. The units may be shipped after reaching a minimum specified compressive strength of 4000 psi. TDOT will verify products before shipment in accordance with the TDOT Procedure for the "Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels and Retaining wall panels". If products are manufactured out of state, TDOT may verify at the project site PRIOR to the placement of the units. The Contractor, or producer, shall notify the Regional Materials and Tests Division that products need to be verified.
  - vii. Marking - The date of manufacture, the production lot number, and the piece mark shall be clearly scribed on an unexposed face of each panel.
  - viii. Handling, Storage, and Shipping - All units shall be handled, stored, and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracks, fractures, and excessive bending stresses. Panels damaged during handling or storage at the casting plant shall be repaired at the plant as directed by the Engineer. Any panels damaged during handling, storing, or shipping may be rejected upon delivery at the option of the Engineer. Panels in storage shall be supported in firm blocking located immediately

adjacent to embedded connection devices to avoid bending the connection devices.

- ix. Tolerances - All units shall be manufactured within the following tolerances:
- Panel Dimensions - Position panel connection devices within 1 inch, except for all other dimensions within 3/16 inch.
  - Panel Squareness - Squareness as determined by the difference between the two diagonals shall not exceed 1/2 inch.
  - Angular distortion with regard to the height of the panel shall not exceed 3/16 inch in 5 feet.
  - Panel Surface Finish - Surface defects on smooth formed surfaces measured over a length of 5 feet shall not exceed 1/8 inch. Surface defects on the textured-finish surfaces measured over a length of 5 feet shall not exceed 5/16 inch.
- x. Steel - In accordance with the Standard Specifications.
- xi. Compressive Strength - Acceptance of the concrete panels, with respect to compressive strength, will be determined on the basis of production lots. A production lot is defined as a group of panels that will be represented by a single compressive strength sample and will consist of a single day's production as defined in the certify in accordance with the TDOT Procedure for the "Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels".
- xii. During the production of the concrete panels, the Engineer will sample the concrete in accordance with AASHTO T 141 (ASTM C 172). A single compressive strength sample, consisting of a minimum of six (6) cylinders, will be randomly selected for every production lot.
- xiii. Cylinders for compressive strength tests shall be prepared in accordance with AASHTO T 23 (ASTM C 31) on 6" x 12" or 4" x 8" specimens. For every compressive strength sample, a minimum of two (2) cylinders will be cured in the same manner as the panels and tested for acceptance no later than twenty-eight (28) days. The average compressive strength of these two cylinders, when tested according with AASHTO T 22 (ASTM C 39), will determine the compressive strength of the production lot.
- xiv. If the Contractor wishes to remove forms or ship the panels prior to 28 days, a minimum of two (2) additional cylinders will be cured in the same manner as the panels. The average compressive strength of these cylinders when tested in accordance with AASHTO T 22, will determine whether the forms can be removed and the panels are acceptable.
- xv. Acceptance of a production lot will be made if the compressive strength test result is greater than or equal to 4,000 psi when tested for acceptance no later than 28 days.

- xvi. In the event that a production lot fails to meet the specified compressive strength requirements, the production lot shall be rejected. Such rejection shall prevail unless the manufacturer, at their own expense, obtains and submits cores for testing and the results show that the strength and quality of the concrete placed within the panels of the production lot is acceptable. The cores shall be taken from the panels within the production lot and tested in accordance with the specifications of AASHTO T 24 (ASTM C 42). Two cores per each cylinder that failed will be required. In addition, any or all of the following defects shall be sufficient cause for rejection:
- Defects that indicate imperfect molding.
  - Defects indicating honeycombing or open texture concrete.
  - Defects in the physical characteristics of the concrete such as cracked or severely chipped panels.
  - Color variation on front face of panel due to excess form oil or other reasons.
  - Damage due to handling, storing or shipping.
- xvii. The Engineer shall determine whether spalled, honeycombed, chipped or otherwise defective concrete shall be repaired or rejected. Repair of concrete, if allowed, shall be done with a TDOT approved cementitious polymer patching mortar in a manner satisfactory to the Engineer. Repair to concrete surface which will be exposed to view after completion of construction must be approved by the Engineer.
- Soil Reinforcing and Attachment Devices - All reinforcing and attachment devices shall be shop fabricated and carefully inspected to ensure they are true to size and free from defects that may impair their strength and durability.
    - i. Reinforcing Strips - Reinforcing strips shall be hot rolled from bars to the required shape and dimensions. Their physical and mechanical properties shall conform to either AASHTO M 183 (ASTM A 36) or AASHTO M 223 (ASTM A 572) grade 65 or equal. Galvanization shall conform to the minimum requirements or AASHTO M 111 (ASTM A 123).
    - ii. Tie Strips - The tie strips shall be shop- fabricated of hot rolled steel conforming to the minimum requirements of ASTM 570, Grade 50 or equivalent. Galvanization shall conform to AASHTO M 111 (ASTM A 123). Tie straps may be partially bent before shipment to the precast yard. Minimum bending radius shall be one inch. Final bending may be accomplished at the precast yard.
    - iii. Reinforcing Mesh - Reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of AASHTO M 32 (ASTM A 82) and shall be welded into the finished mesh fabric in accordance with AASHTO M 55 (ASTM A

- 185). Galvanization shall be applied after the mesh is fabricated and conform to the minimum requirements of AASHTO M 111 (ASTM A 123).
- iv. Fasteners - Fasteners shall be high strength hexagonal cap screw bolts and nuts conforming to AASHTO M 164 (ASTM A 325). Galvanizing fastener elements, including washers, shall be in accordance with AASHTO M 232 (ASTM A 153). Bolts and nuts nominal diameter will be shown in the plans and supplied in accordance with the fasteners as specified previously.
  - v. Steel Strap Connections - The steel strap connection bar and plate shall meet the same requirements as the reinforcing and tie strips specified above. Bolts, nuts, and washers shall conform to the requirements for the fasteners specified above. Coatings for connecting devices shall be as specified below.
  - vi. Clevis Loop and Mesh Loop - Clevis loops and mesh loops shall be fabricated of cold drawn steel wire conforming to the requirements of AASHTO M 32 (ASTM A 82) and welded in accordance with AASHTO M 55 (ASTM A 185) and shall develop a minimum stress of  $0.9 F_y$ .
  - vii. Connector Bar - Connector bar shall be fabricated of cold drawn steel wire conforming to the requirements of AASHTO M 32 (ASTM A 82).
  - viii. Holes for bolts shall be punched in the location shown. Surfaces resulting from punching holes for bolts shall be galvanized in accordance with AASHTO M 111 (ASTM A 123). Those parts of the connecting devices which are threaded shall be galvanized in accordance with AASHTO M 232 (ASTM A 153). Alignment pins are to be hot dip galvanized.
  - ix. All connecting devices shall be to the dimensions shown on the plans. Connecting members and soil reinforcement devices shall be assembled prior to galvanization. All connecting devices shall be true to size and free from defects that may impair their strength or durability.
  - x. Any damage sustained to any part of the connecting devices, bolts or reinforcing devices during any phase of fabrication, storage or erection shall be repaired to the satisfaction of the Engineer at no increase in contract cost.
- Geosynthetic Reinforcement Material- Where geosynthetic reinforcements are used for the construction of MSE walls the following requirements shall apply:
    - i. Geotextiles and Thread for Sewing - Woven or nonwoven geotextiles shall consist only of long chain polymeric filaments or yarns formed into a stable network such that the filaments or yarns retain their position relative to each other during handling, placement, and design service life. At least 95 percent by weight of the long chain polymer shall be polyolefin or polyester. The

material shall be free of defects and tears. The geotextile shall conform as a minimum to the properties indicated for Separation, Medium Survivability indicated under AASHTO T 288. The geotextile shall be free from any treatment or coating that might adversely alter its physical properties after installation.

- ii. Geogrids - The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation.
- iii. Required Properties - The specific geosynthetic material(s) shall be preapproved by the Department and shall have certified long-term strength ( $T_{al}$ ) as determined by:
  - Long-Term strength ( $T_{al}$ ) based on  $T_{al} = T_{ULT}/(RF_D) * (RF_{ID}) * (RF_{CR})$  where  $RF_{CR}$  is developed from creep tests performed in accordance with ASTM D 5262,  $RF_{ID}$  obtained from site installation damage testing and  $RF_{ID}$  from hydrolysis or oxidative degradation testing extrapolated to 75 or 100 year design life.
  - Ultimate Strength (TULT) based upon minimum average roll values (MARV) (lb/ft), ASTM D4595.
  - Pullout Resistance Factor developed in accordance with Chapter 3 of chapter 3 of FHWA-SA-96-071.
- iv. Certification - The Contractor shall submit a manufacturer's certification that the geosynthetics supplied meet the respective index criteria set when the geosynthetic was approved by the Department, measured in full accordance with all test methods and standards specified and as set forth in this document.

The manufacturer's certificate shall state that the furnished geosynthetic meets the requirements of this document as evaluated by the manufacturer's quality control program. The certificates shall be attested to by a person having legal authority to bond the manufacturer. In case of dispute over validity of value, the Engineer can require the Contractor to supply test data from a Department approved laboratory to support the certified values submitted.
- v. Manufacturing Quality Control: The geosynthetic reinforcement shall be manufactured with a high degree of quality control. The manufacturer is responsible for establishing and maintaining a quality control program to ensure compliance with the requirements of this document. The purpose of the QC testing program is to verify that the reinforcement geosynthetic being



supplied to the project is representative of the material used for performance testing and approval by the Department.

Conformance testing shall be performed as part of the manufacturing process and may vary for each type of product. As a minimum, the following index tests shall be considered as applicable for an acceptable QA/QC program:

<b><u>Property</u></b>	<b><u>Test Procedure</u></b>
Specific Gravity (HDPE only)	ASTM D 1505
Wide Width Tensile	ASTM D 4595; GRI:GG1
Melt Flow (HDPE and PP only)	ASTM D 1238
Intrinsic Viscosity (PET only)	ASTM D 4603
Carboxyl End Group (PET only)	ASTM D 2455

- vi. Sampling, Testing, and Acceptance - Sampling and conformance testing shall be in accordance with ASTM D 4354. Conformance testing procedures shall be as established under 4.3.5. Geosynthetic product acceptance shall be based on ASTM D 4759.

The quality control certificate shall include:

- Roll numbers and identification
  - Sampling procedures
  - Result of quality control tests, including a description of test methods used
- vii. Select Granular Backfill Material for use with Geosynthetic Reinforcement – The backfill material shall conform to the requirements as stated below in Select Granular Backfill Material. except that the maximum size of the backfill shall be 3/4 inch, unless full scale installation damage tests are conducted in accordance with ASTM D 5818.
- Joint Materials - Installed to the dimensions and thicknesses in accordance with the plans or approved shop drawings.
    - i. If required, provide flexible foam strips for filler for vertical joints between panels, and in horizontal joints where pads are used, where indicated on the plans.
    - ii. Provide in horizontal joints between panels preformed EPDM rubber pads conforming to ASTM D 2000 for 4AA, 812 rubbers, neoprene elastomeric pads having a Durometer Hardness of 55 ± 5, or high density polyethylene pads with a minimum density of 59 lb/ft<sup>3</sup> in accordance with ASTM D 1505.
    - iii. Cover all joints between panels on the back side of the wall with a geotextile meeting the minimum requirements for filtration applications as specified by AASHTO M 288. The minimum width and lap shall be 12 inches. Adhesive used to attach the filter fabric to the back of the panels shall be approved by the wall supplier.

- Select Granular Backfill Material - All backfill material used in the Mechanically Stabilized Earth structure volume, as shown on the plans, shall be reasonably free (maximum of 0.1%) from organic and otherwise deleterious materials, and it shall be approved by the Engineer prior to use. The material shall conform to the following gradation limits and be tested at the established frequencies in the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”. The Contractor shall also provide test data from an approved laboratory certifying that the material meets the following:

- i. Gradation as determined by AASHTO T 27.

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

Note: Size Nos. 1 through 78 as listed in order of Table 1 Standard Sizes of Processed Aggregate in Section 903.22 of Standard Specifications meet the above gradation requirements.

- ii. In addition, the backfill must conform to all of the following requirements:
  - Soundness - The material shall be substantially free from shale or other soft, poor durability particles. The material shall have a sodium sulfate loss of less than 12 percent after five (5) cycles determined in accordance with AASHTO T 104.
  - The material shall exhibit an angle of internal friction of not less than 34 degrees as determined by the standard direct shear test AASHTO T 236 on the portion finer than the No. 4 sieve, using a sample of the material compacted to 95 percent of AASHTO T 99. No testing is required for backfills where 80 percent of sizes are greater than 3/8 inch.
  - Electrochemical requirements - The backfill shall meet the following criteria:

REQUIREMENTS	TEST METHOD
ph = 5-10	AASHTO T 289 – 91
Resistivity > 3000 ohm centimeters <sup>1</sup>	AASHTO T 288 – 91
Chlorides < 100 parts per million	AASHTO T 291 – 91
Sulfates < 200 parts per million	AASHTO T 290 – 91
Organic Content < 1 %	AASHTO T 267 – 86

1. If the resistivity is greater or equal to 5000 ohm centimeters the chloride and sulfates requirements may be waived.

- Unit weight- The unit weight of the backfill material (at optimum condition) shall meet the requirements of the approved shop drawings or plans.
- Concrete Leveling Pad, Traffic Barrier and Coping - The concrete shall conform to the requirements of the Standard Specifications for Class A concrete.
- Acceptance of Material - The Contractor shall furnish the Engineer a Certificate of Compliance certifying the above materials comply with the applicable contract specifications. A copy of all test results performed by the Contractor necessary to assure contract compliance shall be furnished to the Engineer.

Acceptance will be based on the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”.

## 2. Construction

- a. Foundation Preparation - The foundation for the MSE wall shall be graded level for a minimum width equal to the width of the reinforced volume and leveling pad plus one (1) foot, or as shown on the plans, using the top of the leveling pad as the grade elevation. Prior to wall construction, the foundation shall be compacted to 95 percent of optimum density, as directed by the Engineer. Any foundation soils found to be unsuitable shall be removed as directed by the Engineer and replaced with select granular backfill material compacted to 95 percent of AASHTO T 99. The contractor shall conduct any ground improvements required by the contract plans as part of foundation preparation.

At each panel foundation level, a precast reinforced or a cast-in-place unreinforced concrete leveling pad of the type shown on the plans shall be provided. The concrete shall be Class “A” concrete with compressive strength of 3000 psi (28 day strength). The leveling pad shall be cured a minimum of 12 hours before placement of wall panels.

- b. Wall Erection - Where a proprietary wall system is used, a field representative shall be available during the erection of the wall to assist the fabricator, Contractor, and Engineer. If there is more than one wall of the same type on the project, this requirement will apply to construction of the initial wall only. After construction of the initial wall, the representative will be available on an as-needed basis, as requested by the Engineer, during construction of the remainder of the walls. Wall erection shall be in conformance with the latest edition of the MSE wall construction manual as published by the wall supplier. For erection, panels are handled by means of a lifting device set into the upper edge of the panel. Precast concrete panels shall be placed such that a final vertical face will be obtained.

It shall be the responsibility of the Contractor to consult with the designer/supplier and to utilize the proper methods necessary to achieve a vertical face for the final wall. Panels should be placed in successive horizontal lifts as backfill placement proceeds. As backfill material is placed behind the panels, the panels shall be maintained in position by means

of temporary wedges or bracing according to the wall supplier's recommendations. External bracing shall also be required for this initial lift. The wedges shall remain in place until the fourth layer of panels is placed, at which time the bottom layer of wedges shall be removed. Each succeeding layer of wedges shall be removed as the succeeding panel layers are placed. When the wall is completed, all wedges shall be removed. No wedges shall be used as a means of leveling panels on leveling pads. Wedges placed below the ground line on the front face of the wall shall be removed before this area is backfilled.

Tolerances and alignment shall be as follows:

- i. Horizontal and vertical joint openings between panels shall be uniform. The maximum allowable offset in any panel joint shall be 3/4 inch.
- ii. Vertical tolerance (plumbness) and horizontal alignment tolerances as the wall is constructed shall not exceed 3/4 inch when measured along a 10 foot straightedge.

The overall vertical tolerance of the wall (plumbness from top to bottom)

in its final position shall not exceed 3/4 inch per 10 feet of wall height.

Cast-in-place concrete shall be placed on top of wall panels to allow precast coping elements on top of the wall to be brought to proper grade.

Prior to placing any select backfill material on any soil reinforcement device, all connections to the panels shall be completed.

- c. Backfill Placement - Backfill placement shall closely follow the erection of each lift of panels. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials including panels, soil reinforcements, and connections, or misalignment of the facing panels or reinforcing elements. Any wall materials which may become damaged or disturbed during backfill placement, or due to wall settlement prior to completion of the project shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Engineer. Any misalignment or distortion of the wall facing panels due to placement of backfill outside the limits of this section shall be corrected, as directed by the Engineer at the Contractor's expense. Backfill placement methods near the facing shall assure that no voids exist directly beneath the reinforcing elements.

Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T 99. When the backfill supports a spread footing of a bridge or other structural load, the top 5 feet shall be compacted to 100 percent of the maximum density. For backfills containing more than 30 percent retained on the 3/4 inch sieve, a method compaction consisting of a minimum of 2 passes of a steel drum roller or truck equipment equivalent or larger than a Caterpillar D-6 Bulldozer shall be used.

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall be placed at a moisture content not more than 2 percentage points less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T 99.

At each soil reinforcement device level, backfill shall be compacted to the full length of reinforcement devices and be sloped to drain away from the wall before placing and attaching the next layer of reinforcement devices. The compacted backfill shall be level with the connecting device before the reinforcement device can be connected. Compaction within three feet of the back face of the wall facing panel shall be achieved with at least three (3) passes of a light weight mechanical tamper, roller, or vibratory system.

Unless otherwise indicated on the plans or directed by the Engineer, soil reinforcement devices shall be placed at 90 degrees to the face of the wall. The maximum lift thickness before compaction shall be ten (10) inches and shall closely follow panel erection. The Contractor shall decrease this

lift thickness, if required, to obtain the specified density.

At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to rapidly direct runoff or rainwater away from the wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

## **G. Prefabricated Modular Block Facing Mechanically Stabilized Earth (MSE) Wall (See QPL 38 for Approved Manufacturer/Supplier)**

### **1. Materials**

General - The contractor shall make arrangements to purchase or manufacture the facing elements, reinforcing mesh or strips, attachment devices, joint filler, and all other necessary components. Materials not conforming to this section or from sources not listed in the contract document shall not be used without written consent from the Engineer.

- Concrete Modular Block Facing - The concrete modular blocks shall be either hollow or solid concrete structural retaining wall units, machine made from Portland cement, water, and mineral aggregates with or without the inclusion of other materials. The units are intended for use in the construction of mortarless, modular block retaining (MBW) walls.
  - i. Cementious Materials - Materials shall conform to the following:
    - Portland Cement - AASHTO M 85 (ASTM C 150).
    - Blended Cements – Type IP -AASHTO M 240 (ASTM C 595).
    - Pozzolans – Class C or Class F fly ash -AASHTO M 295 Blast Furnace Slag Cement – grade 100 or 120- AASHTO M 302 (ASTM C 989).
  - ii. Aggregates - Aggregates shall conform to the following specifications, except that grading requirements shall not necessarily apply:
    - Normal Weight Aggregates – TDOT Standard Specification sections 903.01 and 903.03.
    - Lightweight Aggregates - TDOT Standard Specification section 903.19.
  - iii. Other Constituents - Air-entraining agents, coloring pigments, integral water repellants, finely ground silica, and other constituents shall be previously established as suitable for use in concrete MBW units and shall conform to applicable AASHTO Standards or, shall be shown by test or experience to be not detrimental to the durability of MBW units or any material customarily used in masonry construction.
  - iv. Physical Requirements. Prior to delivery to the work site, the units shall conform to the following physical requirements:
    - 1. Minimum required compressive strength = 4,000 psi (Average 3 coupons)
    - 2. Minimum required compressive strength = 3,500 psi

(Individual coupon)

3. Maximum water absorption = 5%
4. Maximum number of blocks per lot = 2,000

Also, prior to delivery, TDOT will conduct verification testing on the modular blocks in accordance with the TDOT "Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)

If products are manufactured out of state, TDOT may verify at the project site PRIOR to the placement of the units. The Contractor, or producer, shall notify the Regional Materials and Tests Division that products need to be verified.

- v. Tolerances. Blocks shall be manufactured within the following tolerances:
  - The length and width of each individual block shall be within 1/8 inch of the specified dimension. Hollow units shall have a minimum wall thickness of 1-1/4 inch.
  - The height of each individual block shall be within 1/16 inch of the specified dimension.
  - When a broken face finish is required, the dimension of the front face shall be within 1 inch of the theoretical dimension of the unit.
  - Finish and Appearance. All units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the construction. Minor cracks (e.g. no greater than 1/32 inch in width and no longer than 25 % of the unit height) incidental to the usual method of manufacture or minor chipping resulting from shipment and delivery, are not grounds for rejection.

The face or faces of units that are to be exposed shall be free of chips, cracks or other imperfections when viewed from a distance of 30 feet under diffused lighting. Up to five (5) percent of a shipment may contain slight cracks or small chips not larger than 1 inch.

Color and finish shall be as shown on the plans and shall be erected with a running bond configuration.

- If pins are required to align MBW units, they shall consist of a non-degrading, polymer or galvanized steel and be made for the express use with the MBW units supplied.
- Cap units shall be cast to or attached to the top MBW units in strict accordance with the manufacturer's requirements and the adhesive manufacturer's recommended procedures. The Contractor shall provide a written 10 year warranty acceptable to the Department that the integrity of the materials used to

attach the cap blocks will preclude separation and displacement of the cap blocks for the warranty period.

- vi. Sampling and Testing. Acceptance of the concrete block with respect to compressive strength and absorption will be determined on a lot basis. The lot will be randomly sampled in accordance with ASTM C 140. Compressive strength and absorption tests shall be performed by the manufacturer and submitted to the Department. Compressive strength test specimens shall be cored or shall conform to the saw-cut coupon provisions of section 6.2.4 of ASTM C 140. Blocks represented by test coupons that do not reach an average compressive strength of 4,000 psi or an individual strength of 3500 psi, or have less than 5 % absorption will be rejected.
- vii. Rejection. Blocks shall be rejected because of failure to meet any of the requirements specified above. In addition, any or all of the following defects shall be sufficient cause for rejection.
  - Defects that indicate imperfect molding.
  - Defects indicating honeycomb or open texture concrete.
  - Cracked or severely chipped blocks.
  - Color variation on front face of block due to excess form oil or other reasons.

Blocks may also be rejected if TDOT verification test results do not comply with the requirements specified above.

- Unit Fill - The unit fill and drainage aggregate shall be a well graded crushed stone or granular fill meeting the following gradation:

U.S. Sieve Size	Percent Passing
1 inch	100-75
3/4 inch	50-75
No. 4	0-60
No. 40	0-50
No. 200	0-5

- Geosynthetic Reinforcement Material - The following requirements shall apply for geosynthetic reinforcement material:
  - i. Geotextiles and Thread for Sewing - Woven or nonwoven geotextiles shall consist only of long chain polymeric filaments or yarns formed into a stable network such that the filaments or yarns retain their position relative to each other during handling, placement, and design service life. At least 95 percent by weight of the long chain polymer shall be polyolefin or polyester. The material shall be free of defects and tears. The geotextile shall



conform as a minimum to the properties indicated for Separation, Medium Survivability indicated under AASHTO T 288. The geotextile shall be free from any treatment or coating that might adversely alter its physical properties after installation.

- ii. Geogrids - The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation.
- iii. Required Properties - The specific geosynthetic material(s) shall be pre-approved by the Department and shall have certified long-term strength ( $T_{al}$ ) as determined by:
  - Long-Term strength ( $T_{al}$ ) based on  $T_{al} = T_{ult}/(RF_D)*(RF_{ID})*(RF_{CR})$  where  $RF_{CR}$  is developed from creep tests performed in accordance with ASTM D 5262,  $RF_{ID}$  obtained from site installation damage testing and  $RF_{ID}$  from hydrolysis or oxidative degradation testing extrapolated to 75 or 100 year design life.
  - Ultimate Strength ( $T_{ULT}$ ) based upon minimum average roll values (MARV) (lb/ft), ASTM D4595.
  - Pullout Resistance Factor developed in accordance with chapter 3 of FHWA-SA-96-071.
- iv. Certification - The Contractor shall submit a manufacturer's certification that the geosynthetics supplied meet the respective index criteria set when the geosynthetic was approved by the Department, measured in full accordance with all test methods and standards specified and as set forth in this section of the TDOT Earth Retaining Structures Manual. The manufacturer's certificate shall state that the furnished geosynthetic meets the requirements of this document as evaluated by the manufacturer's quality control program. The certificates shall be attested to by a person having legal authority to bond the manufacturer. In case of dispute over validity of values, the Engineer can require the Contractor to supply test data from a Department approved laboratory to support the certified values submitted.
- v. Manufacturing Quality Control: The geosynthetic reinforcement shall be manufactured with a high degree of quality control. The manufacturer is responsible for establishing and maintaining a quality control program to ensure compliance with the requirements of the TDOT Earth Retaining Structures Manual. The purpose of the QC testing program is to verify that the geosynthetic being supplied to the project is representative of the material used for performance testing and approval by the

Department.

Conformance testing shall be performed as part of the manufacturing process and may vary for each type of product. As a minimum the following index tests shall be considered as applicable for an acceptable QA/QC program:

<u>Property</u>	<u>Test Procedure</u>
Specific Gravity (HDPE only)	ASTM D 1505
Wide Width Tensile	ASTM D 4595; GRI:GG1
Melt Flow (HDPE and PP only)	ASTM D 1238
Intrinsic Viscosity (PET only)	ASTM D 4603
Carboxyl End Group (PET only)	ASTM D 2455

- vi. Sampling, Testing, and Acceptance - Sampling and conformance testing shall be in accordance with ASTM D 4354. Conformance testing procedures shall be as established under section 4.3.5. Geosynthetic product acceptance shall be based on ASTM D 4759.

The quality control certificate shall include:

- Roll numbers and identification
  - Sampling procedures
  - Result of quality control tests, including a description of test methods used.
- vii. Select Granular Backfill Material for use with Geosynthetic Reinforcement - The backfill material shall conform to the requirements as stated below in Select Granular Backfill Material except that the maximum size of the backfill shall be 3/4 inch, unless full scale installation damage tests are conducted in accordance with ASTM D 5818.

All backfill material shall be tested prior to use and at the established frequencies in the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”.

- Soil Reinforcing and Attachment Devices - Where steel reinforcing and attachment devices are used in the construction of the MSE wall the following requirements shall apply.
  - i. Reinforcing Strips - Reinforcing strips shall be hot rolled from bars to the required shape and dimensions. Their physical and mechanical properties shall conform to either AASHTO M 183 (ASTM A 36) or AASHTO M 223 (ASTM A 572) grade 65 or equal. Galvanization shall conform to the minimum requirements or AASHTO M 111 (ASTM A 123).
  - ii. Tie Strips - The tie strips shall be shop-fabricated of hot rolled steel conforming to the minimum requirements of ASTM A 570,

Grade 50 or equivalent. Galvanization shall conform to AASHTO M111. Tie straps may be partially bent before shipment to the precast yard. Minimum bending radius shall be one inch. Final bending may be accomplished at the precast yard.

- iii. Reinforcing Mesh - Reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of AASHTO M 32 (ASTM A 82) and shall be welded into the finished mesh fabric in accordance with AASHTO M 55 (ASTM A 185). Galvanization shall be applied after the mesh is fabricated and conform to the minimum requirements of AASHTO M 111
- iv. Fasteners - Fasteners shall be high strength hexagonal cap screw bolts and nuts conforming to AASHTO M 164 (ASTM A 325). Galvanizing fastener elements, including washers, shall be in accordance with AASHTO M 232 (ASTM A 153). Bolts and nuts nominal diameter will be shown in the plans and supplied in accordance with the fasteners as specified previously.
- v. Steel Strap Connections - The steel strap connection bar and plate shall meet the same requirements as the reinforcing and tie strips specified above. Bolts, nuts, and washers shall conform to the requirements for the fasteners specified above. Coatings for connecting devices shall be as specified below.
- vi. Clevis Loop and Mesh Loop - Clevis loops and mesh loops shall be fabricated of cold drawn steel wire conforming to the requirements of AASHTO M 32 and welded in accordance with AASHTO M 55 and shall develop a minimum stress of  $0.9 F_y$ .
- vii. Connector Bar - Connector bar shall be fabricated of cold drawn steel wire conforming to the requirements of AASHTO M 32.

Holes for bolts shall be punched in the location shown. Surfaces resulting from punching holes for bolts shall be galvanized in accordance with AASHTO M 111. Those parts of the connecting devices which are threaded shall be galvanized in accordance with AASHTO M 232. Alignment pins are to be hot dip galvanized.

All connecting devices shall be to the dimensions shown on the plans. Connecting members and soil reinforcement devices shall be assembled prior to galvanization. All connecting devices shall be true to size and free from defects that may impair their strength or durability.

Any damage sustained by any part of the connecting devices, bolts or reinforcing devices during any phase of fabrication, storage or erection shall be repaired to the satisfaction of the Engineer at no increase in contract cost.

Select Granular Backfill Material - All backfill material used in the Mechanically Stabilized Earth structure volume, as shown on the plans, shall be reasonably free (maximum of 0.1%) from organic and otherwise deleterious materials, and it shall be approved by the Engineer prior to use. The material shall conform to the following gradation limits and be tested

at the established frequencies in the TDOT “Procedures for the Sampling and Testing, and Acceptance of Materials and Products (SOP 1-1)”. The Contractor shall also provide test data from an approved laboratory certifying that the material meets the following:

i. Gradation as determined by AASHTO T 27.

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

Note: Size Nos. 1 through 78 as listed in order of Table 1 Standard Sizes of Processed Aggregate in Section 903.22 of Standard Specifications meet the above gradation requirements.

ii. In addition, the backfill must conform to all of the following requirements:

- Soundness - The material shall be substantially free from shale or other soft, poor durability particles. The material shall have a sodium sulfate loss of less than 12 percent after five (5) cycles determined in accordance with AASHTO T 104.
- The Plasticity Index (P.I.), as determined by AASHTO T 90, shall not exceed 6.
- The material shall exhibit an angle of internal friction of not less than 34 degrees as determined by the standard direct shear test AASHTO T 236 on the portion finer than the No. 4 sieve, using a sample of the material compacted to 95 percent of AASHTO T 99. No testing is required for backfills where 80 percent of sizes are greater than 3/8 inch.
- Electrochemical requirements - The backfill shall meet the following criteria:

REQUIREMENTS	TEST METHOD
ph= 5-10	AASHTO T 289 – 91
Resistivity > 3000 ohm centimeters <sup>1</sup>	AASHTO T 288 – 91
Chlorides < 100 parts per million	AASHTO T 291 – 91
Sulfates < 200 parts per million	AASHTO T 290 – 91
Organic Content < 1%	AASHTO T 267 – 86

1. If the resistivity is greater or equal to 5000 ohm centimeters the chloride and sulfates requirements may be waived.

- Unit weight- The unit weight of the backfill material (at optimum condition) shall meet the requirements of the approved shop drawings or plans.
- Concrete Leveling Pad, Traffic Barrier and Coping - The concrete shall conform to the requirements of the Standard Specifications for Class A concrete.
- Acceptance of Material - The contractor shall furnish the Engineer a Certificate of Compliance certifying the above materials comply with the applicable contract specifications. A copy of all test results performed by the Contractor necessary to assure contract compliance shall be furnished to the Engineer.

## 2. Construction

- a. Wall Excavation - Unclassified excavation shall be in accordance with the requirements of the Standard Specifications and in reasonably close conformity with the limits and construction lines shown on the plans. Temporary excavation support as required shall be the responsibility of the Contractor.
- b. Foundation Preparation - The foundation for the MSE wall shall be graded level for a minimum width equal to the width of the reinforced volume and leveling pad plus one (1) foot, or as shown on the plans, using the top of the leveling pad as the grade elevation. Prior to wall construction, the foundation shall be compacted to 95 percent of optimum density, as directed by the Engineer. Any foundation soils found to be unsuitable shall be removed as directed by the Engineer and replaced with select granular backfill material compacted to 95 percent of AASHTO T 99 methods. The contractor shall conduct any ground improvement required by the contract plans as part of foundation preparation.

At each block foundation level, a precast reinforced or a cast-in-place unreinforced concrete leveling pad of the type shown on the plans shall be provided. The concrete shall be Class A concrete with compressive strength of 3000 psi (28 day strength). The leveling pad shall be cured a minimum of 12 hours before placement of wall panels.

- c. Wall Erection - Where a proprietary wall system is used, a field representative shall be available during the erection of the wall to assist the fabricator, Contractor, and Engineer. If there is more than one wall of the same type on the project, this requirement will apply to construction of the initial wall only. After the initial wall, the representative will be available on an as-needed basis, as requested by the Engineer, during construction of the remainder of the walls. Wall erection shall be in conformance with the latest edition of the MSE wall construction manual as published by the wall supplier.

It shall be the responsibility of the Contractor to consult with the designer/supplier and to utilize the proper methods necessary to achieve a vertical face for the final wall. Blocks should be placed in successive horizontal lifts as backfill placement proceeds per the manufacturer's recommendations.

Cast-in-place concrete shall be placed on top of wall panels to allow precast coping elements on top of the wall to be brought to proper grade.

Prior to placing any select backfill material on any soil reinforcement device, all connections to the blocks shall be completed.

- d. Backfill Placement - Backfill placement shall closely follow the erection of each lift of blocks. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials including blocks, soil reinforcements, and connections, or misalignment of the facing blocks or reinforcing elements. Any wall materials which may become damaged or disturbed during backfill placement, or due to wall settlement prior to completion of the project shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Engineer. Any misalignment or distortion of the wall facing blocks due to placement of backfill outside the limits of this section shall be corrected, as directed by the Engineer. Backfill placement methods near the facing shall assure that no voids exist directly beneath the reinforcing elements.

Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T 99. When the backfill supports a spread footing of a bridge or other structural load, the top 5 feet shall be compacted to 100 percent of the maximum density. For backfills containing more than 30 percent retained on the  $\frac{3}{4}$  inch sieve, a method compaction consisting of a minimum of 2 passes of a steel drum roller or tracked equipment equivalent or larger than a Caterpillar D-6 Dozer shall be used.

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T 99.

At each soil reinforcement device level, backfill shall be compacted to the full length of reinforcement devices and be sloped to drain away from the wall before placing and attaching the next layer of reinforcement devices. The compacted backfill shall be level with the connecting device before the reinforcement device can be connected. Compaction within three feet of the back of the wall facing shall be achieved with at least three (3) passes of a light weight mechanical tamper, roller, or vibratory system.

Unless otherwise indicated on the plans or directed by the Engineer, soil reinforcement devices shall be placed at 90 degrees to the face of the wall. The maximum lift thickness before compaction shall be ten (10) inches and shall closely follow modular block erection. The Contractor shall decrease this lift thickness, if required, to obtain the specified density.

At the end of each day's operation, the Contractor shall slope the last level

of backfill away from the wall facing to rapidly direct runoff or rainwater away from the wall face. In addition, the contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

## **H. Anchored Wall (See QPL 38 for Approved Manufacturer/Supplier)**

**Part A** - Part A covers specifications for permanent ground anchor walls exclusive of the ground anchors.

### **1. Design Criteria**

Unless otherwise directed the Contractor shall select the type of wall element to be used. The wall shall be designed for shear, moment, and lateral and axial capacity in accordance with AASHTO LRFD procedures. The Contractor shall be responsible for determining the length of the wall element and required section necessary to resist loadings due to earth, and water forces while controlling ground movements. Structure design life and corrosion protection requirements for sheet-piles and soldier beams will be provided on the contract drawings. Soil properties, safety factors, anchor tendon corrosion protection requirements, wall finish and color requirements, and appurtenance locations are given in the contract plans or specifications.

The Contractor shall be familiar with the requirements for ground anchors described in Part B, "Ground Anchors". The contractor shall incorporate all dimensional and location restrictions on ground anchor locations, spacing, and length of anchor bond length and unbonded length that may affect the design of the wall system covered by this section.

- The wall system shall be designed to resist maximum anticipated loadings calculated for the effects of any special loadings shown on the contract plans.
- The wall shall be designed to ensure stability against passive failure of the embedded portion of the vertical wall elements (below the base of excavation).
- The axial load carrying capacity of the embedded portion of the vertical wall elements (below the base of the excavation) shall be evaluated.. The wall shall be designed to resist vertical loads including vertical anchor forces and the weight of the lagging and the vertical wall elements. Relying on transfer of vertical load into the soil behind the wall by friction shall not be permitted, unless approved by the Engineer.
- Permanent facing shall be precast or cast-in-place reinforced concrete. Architectural facing treatments, if required, shall be as indicated on the contract drawings. The facing shall extend a minimum of 2.0ft below the gutter line or, if applicable, the ground line adjacent to the wall unless otherwise indicated on the contract drawings.
- The Contract Plans will provide minimum requirements of design elements in order to provide global stability requirement such as minimum embedment of vertical pile elements or minimum lengths of unbonded (free-length) zone for anchors. The wall design shall provide these minimum requirements.
- Wall Drainage. The wall drainage system shall operate by gravity and

shall be capable of relieving water pressures on the back face of the wall under anticipated worst case water pressure conditions. When drainage systems are incorporated into the specific design, hydrostatic head on the back of the wall shall not exceed 6 inches above the elevation of the drainage collection pipe.

## 2. Materials

The Contractor shall not deliver materials to the site until the Engineer has approved the submittals outlined in section 3.0. The Contractor shall protect the materials from the elements by appropriate means. Prestressing steel strands and bars shall be stored and handled in accordance with the manufacturer's recommendations and in such a manner that no damage to the component parts occurs. All steel components shall be stored under cover and protected against moisture.

- Soldier Beam and Structural Steels
  - i. Steel Soldier Beams - Steel soldier beams shall be of the type and weight indicated on the approved working drawings. Steel soldier beams shall conform to the requirements of AASHTO M 183 (ASTM A 36) or AASHTO M 223 (ASTM A 572) unless otherwise specified.
  - ii. Steel Sheet Piles - Steel sheet piles shall be of the type and weight indicated on the approved working drawings. Steel sheet piles shall conform to the requirements of AASHTO M 202 (ASTM A 328) or AASHTO M 270 (ASTM A 709) Grade 50.
  - iii. Steel Plate - Steel used to fabricate steel studs and other devices shall conform to the requirements of AASHTO M 169 (ASTM A 108)
  - iv. Steel Tube - Steel tube shall conform to the requirements of ASTM A 500.
  - v. Reinforcing Steel - Reinforcing steel shall conform to ASTM A 615. The required Grade of all reinforcing shall be shown on the plans.
- Concrete
  - i. Cement - Portland cement shall be Type I or II and shall conform to AASHTO M 85.
  - ii. Structural Concrete - Structural concrete shall conform to the requirements of Section 604 of the TDOT Standard Specifications Structural concrete shall be Class A with a minimum 28-day compressive strength of 3000 psi, unless otherwise noted on the contract drawings.
  - iii. Lean-Mix Concrete Backfill - Lean-mix concrete backfill shall consist of Type I or Type II Portland cement, fine aggregate and water. Each cubic yard of lean-mix concrete backfill shall consist of a minimum of one sack (94lbs) of Portland cement.



- iv. Precast Concrete - Precast concrete elements such as panels shall be made by an approved plant in accordance with the TDOT Procedure for the “Manufacture and Acceptance of Pre-cast Concrete Drainage Structures, Noise Wall panels, and Retaining wall panels”.

Out-of-state producers shall provide documentation of material quality before the manufacture of any pre-cast products (i.e. aggregate quality reports, cement/steel mill test reports, etc.)

Unless otherwise shown on the contract drawings, Portland cement concrete used in precast elements shall conform to Class D with a minimum 28-day compressive strength of 4000 psi

- Drainage Materials
  - i. Drainage Aggregate - Drainage aggregate to be used as a drainage medium shall conform to section 903.17 of the Standard Specifications.
  - ii. Preformed Permeable Geocomposite Drains – The preformed permeable geocomposite drains shall be continuous and a minimum of one (1) foot wide. The drains shall be placed in sections with a minimum overlap of one (1) foot and be spliced to assure continuous drainage.
  - iii. Pipe and Perforated Pipe - Pipe and perforated pipe shall conform to section 610 of the Standard Specifications.
- Lagging
  - i. Temporary Timber Lagging - Temporary timber lagging shall be construction grade rough cut and shall be a minimum of 3 inches thick. Where necessary, the Contractor shall provide certification that the timber conforms to the grade, species, and other specified requirements. If the timber is to be treated with a preservative, a certificate of compliance shall be furnished.
  - ii. Permanent Timber Lagging – Permanent timber lagging shall conform to all requirements of section 2.d.i. and shall be constructed from structural stress-graded lumber.

### 3. Construction

- General Considerations
  - i. Wall elements for anchored walls designed and constructed in accordance with this manual shall be either continuous interlocking sheet-piles or steel soldier beams that are either driven or placed in pre-drilled holes that are subsequently backfilled with lean mix or structural concrete.
- Excavation
  - i. Excavation below a level of anchors shall be limited to 2 feet below the anchor level and shall not commence below this level until anchors at that level have been installed, load tested, locked

off and accepted by the Department. Placement of timber lagging shall immediately follow excavation in the front of the wall.

- Driven Sheet Pile and Soldier Beam Installation.
  - i. Driven sheet piles and soldier beams shall be driven to the specified minimum tip elevation shown on the approved working drawings. The Contractor shall select a sheet pile or soldier beam section that satisfies all design criteria. The Contractor shall select a driving method and pile driving and ancillary equipment consistent with the expected ground conditions at the site. The sheet-pile or soldier beam shall be driven to the specified minimum tip elevation or to the approved elevation based on bearing capacity without damaging the sheet pile or soldier beam. The interlocks between adjacent sheet piles shall not be damaged. Equipment shall be used to permit the impact energy to be distributed over the tops of the sheet pile or soldier beam.
- Soldier Beam Installation in Pre-drilled Holes
  - i. Excavations required for soldier beam placement shall be performed to the dimensions and elevations on the approved working drawings. The methods and equipment used shall be selected by the Contractor.
  - ii. The Contractor shall ensure that the sidewalls of the pre-drilled holes (i.e. shafts) do not collapse during drilling. Uncased shafts may be used where the sides and the bottom of the shaft are stable and may be visually inspected prior to placing the soldier beam and concrete. Casing or drilling muds shall be used where the sides of the shaft require additional support.
  - iii. The Contractor shall provide equipment for checking the dimensions and alignment of each shaft excavation. The dimensions and alignment shall be determined by the Contractor but shall be observed by the Inspector. The Inspector will check the alignment of the drilling equipment at the beginning of shaft construction and periodically thereafter. Final shaft depth shall be measured after final cleaning by the Contractor.
  - iv. Loose material shall be removed from the bottom of the shaft. No more than 2 feet of standing water shall be left in the bottom of the shaft prior to beginning soldier beam installation.
  - v. The soldier beam shall be placed in the shaft without difficulty and aligned prior to general placement of concrete. The Contractor may place up to 2 feet of concrete at the bottom of the shaft to assist in aligning the soldier beam. The soldier beam shall be blocked or clamped in place at the ground surface, prior to placement of concrete.
  - vi. For shafts constructed without casing or drilling muds, concrete (either structural or lean-mix backfill) may be placed by free-falling the concrete from the ground surface down the shaft and

around the soldier beam. If casing is used, the placement of concrete shall begin prior to casing removal. Remove the casing while the concrete remains workable. For shafts constructed using slurry, concrete shall be placed using the tremie method from the bottom of the shaft. The tremie pipe shall be withdrawn slowly as the level of the concrete rises in the shaft and the level of the tremie pipe outlet shall never exceed the height of the slurry.

- Wall Tolerances
  - i. Soldier beams shall be placed at the locations shown on the approved working drawings and shall not deviate by more than 1 foot along the horizontal alignment of the wall. The wall shall not deviate from the vertical alignment shown of the contract drawings by more than 4 inches in each plane.
  - ii. The soldier beam or sheet pile tip shall be installed to within 1 foot of the specified tip elevation shown on the approved working drawings.
  - iii. Whenever a soldier beam deviates in location or plumbness by more than the tolerance given in these guidelines, the Contractor, at his option, may provide corrective measures such as 1) rebuilding soldier beams; 2) redesigning soldier beam; 3) adjust soldier beam spacing by adding additional soldier beams; 4) redesigning concrete facing; 5) building up the soldier beam section, or 6) other methods.
- Welding and Splicing
  - i. Splicing of sheet piles or soldier beams shall not be permitted, unless approved by the Department. All structural welding of steel and steel reinforcement shall be performed by certified welders qualified to perform the type of welding shown on the shop drawings. All sheet piles or soldier beams shall be cutoff to a true plane at the elevations shown on the approved working drawings. All cutoff lengths shall remain the property of the Contractor and shall be properly disposed.
- Timber Lagging Installation
  - i. Timber lagging shall be placed from the top-down in sufficiently small lifts immediately after excavation to prevent erosion of materials into the excavation. Prior to lagging placement, the soil face shall be smoothed to create a contact surface for the lagging. Large gaps behind the lagging shall be backfilled and compacted prior to applying any loads to the ground anchors.
  - ii. A gap shall be maintained between each vertically adjacent lagging board for drainage between adjacent lagging sections. In no case shall lagging be placed in tight contact to adjacent lagging.
- Drainage System Installation
  - i. The Contractor shall handle preformed permeable geocomposite drains in such a manner as to ensure the geocomposite drain is not

damaged in any way. Care shall be taken during placement of the geocomposite drain not to entrap dirt or excessive dust in the geocomposite drain that could cause clogging of the drainage system. Delivery, storage, and handling of the geocomposite drains shall be as provided in the plans or based on manufacturer's recommendations.

- ii. Drainage geocomposite strips shall be placed and secured tightly against the timber lagging with the fabric facing the lagging. A continuous sheet of drainage geocomposite that spans between adjacent soldier beams shall not be allowed. Seams and overlaps between adjacent composites shall be made according to the special provisions or manufacturer's recommendations and specifications. Repairs shall be performed at no additional cost to the Department and shall conform to the plans or manufacturer's recommendation.
  - iii. Where drainage aggregate is used to construct a vertical drain behind the permanent wall and in front of the lagging, the drainage aggregate shall be placed in horizontal lifts. The construction of the vertical drain should closely follow the construction of the precast facing elements. Care should be exercised to ensure that connection devices between wall elements and facing elements are not damaged during the placement of the drainage aggregate.
  - iv. Perforated collector pipe shall be placed within the permeable material to the flow line elevations and at the location shown on the approved working drawings. Outlet pipes shall be placed at the low end of the collector pipe and at other locations shown or specified in the approved working drawings.
- Concrete Facing Installation

For permanent cast-in-place and precast concrete facings, concrete manufacture, handling, placement, and finishing shall conform to the requirements in Section 8 "Concrete Structures" of the *AASHTO - LRFD Bridge Construction Specifications with in t e r i m s*. Connections used to secure the facing to wall elements shall conform to the details shown on the approved working drawings. The exposed surface of the concrete facing shall receive a Class I finish as specified in Section 8 "Concrete Structures," unless a special architectural treatment is specified.

**Part B, Anchored Wall** (See QPL 38 for Approved Manufacturer/Supplier) – Part B covers specifications for the design, construction and testing of Permanent Ground Anchors.

### 1. Description

The work covered under this section includes the furnishing of all materials, labor, tools, equipment, and other incidental items for the designing, detailing, and construction of permanent ground anchors. All other items included in the construction of the permanent ground anchors not specifically mentioned herein shall

conform to all applicable sections of the *Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction*, henceforth referred to as the Standard Specifications, the current *AASHTO LRFD Bridge Design Specifications* with latest revisions, the current *AASHTO LRFD Bridge Construction Specifications* with interims, and the latest version of Post Tensioning Institute (PTI) Standards, including: 1. PTI, “*Post Tensioning Manual*”, 2. PTI “*Specification for Unbonded Single Strand Tendons*”, 3. PTI “*Recommendations for Prestressed Rock and Soil Anchors.*”

Unless otherwise noted the Contractor shall select the ground anchor type, drilling method, grouting method, and grout pressures, determine the ground anchor capacity, bond length, free stressing (unbonded) length, and anchor diameter. The Contractor shall be responsible for installing ground anchors that will develop the load-carrying capacity indicated on the approved working drawings in accordance with the testing subsection of this section. The anchor tendon shall be protected from corrosion as shown on the approved working drawings and in accordance with the requirements of this specification.

## 2. Design Criteria

- Unless otherwise directed the Contractor shall select the type of tendon to be used. The tendon shall be sized so the design load does not exceed 60 percent of the specified minimum tensile strength of the prestressing steel. The lock-off load for the tendon shall be chosen based on anticipated time or activity dependent load changes, but shall not exceed 70 percent of the specified minimum tensile stress of the prestressing steel. The prestressing steel shall be sized so the maximum test load does not exceed 80 percent of the specified minimum tensile strength of the prestressing steel.
- The Contractor shall be responsible for determining the bond length necessary to develop the design load indicated on the approved working drawings. The minimum bond length shall be 15 feet for strand tendons in rock and 10 feet for bar tendons in rock. The minimum bond length shall be 15 feet for strand and bar tendons in soil. The minimum tendon bond length shall be 10 feet.
- The free stressing length (unbonded length) for rock and soil anchors shall not be less than 10 feet for bar tendons and 15 feet for strand tendons. The free stressing length shall extend at least 5 feet or 20 percent of the height of the wall, whichever is greater, behind the critical failure surface. The critical failure surface shall be evaluated using slope stability or similar procedures.

## 3. Submittals

Requirements for submittals are as outlined above and also include the following:

- Contractor qualifications as outlined in Part A, of these anchored wall design and construction requirements.
  - The working drawings and design submission shall include the following:
    - a) A ground anchor schedule giving:
      - Ground anchor number

- Ground anchor design load
  - Type and size of tendon
  - Minimum total anchor length
  - Minimum bond length
  - Minimum tendon bond length
  - Minimum unbonded length
- b) A drawing of the ground anchor tendon and the corrosion protection system including details for the following:
  - Spacers and their location
  - Centralizers and their location
  - Unbonded length corrosion protection system
  - Bond length corrosion protection system
  - Anchorage and trumpet
  - Anchorage corrosion protection system
- Certificates of Compliance for the following materials , if used. The certificate shall state that the materials or assemblies to be provided will fully comply with the requirements of the contract.
  - a) Prestressing steel, strand or bar
  - b) Portland cement
  - c) Prestressing hardware
  - d) Bearing plates
  - e) Corrosion protection system
- The Contractor shall submit to the Engineer for review and approval or rejection mill test reports for the prestressing steel and the bearing plate steel. The Engineer may require the Contractor to provide samples of any ground anchor material intended for use on the project. The prestressing steel and bearing plates shall not be incorporated in the work without the Engineer's approval.
- The Contractor shall submit to the Engineer for review and approval or rejection calibration data for each test jack, load cell, primary pressure gauge and reference pressure gauge to be used. Testing cannot commence until the Engineer has approved these calibrations.
- The Contractor shall submit to the Engineer within twenty calendar days after the completion of the ground anchor work a report containing the following:
  - a) Prestressing steel manufacturer's mill test reports for the tendons incorporated in the installation
  - b) Grouting records indicating the cement type, quantity injected and the grout pressures
  - c) Ground anchor test results
  - d) As-built drawings showing the location and orientation of each ground anchor, anchor capacity, tendon type, total anchor length, bond length, unbonded length, and tendon bond length as installed

and locations of all instruments installed by the Department.

- Existing Conditions – Prior to beginning work, the Department shall provide utility location plans to the Contractor. The Contractor is responsible for contacting a utility location service to verify the location of underground utilities before starting work. The Contractor shall survey the condition of adjoining properties and make records and photographs of any evidence of settlement or cracking of any adjacent structures. The Contractor's report of this survey shall be delivered to the Department before work begins.

#### 4. Materials

- General
  - a) The Contractor shall not deliver materials to the site until the Engineer has approved the submittals outlined in Section 3.0.
  - b) The Contractor shall protect all materials from theft, vandalism, and the elements by appropriate means. Prestressing steel strands and bars shall be stored and handled in accordance with the manufacturer's recommendations and in such a manner that no damage to the component parts occurs. All steel components shall be protected from the elements at all times. Cement and additives for grout shall be stored under cover and protected against moisture.
- Anchorage Devices
  - a) Stressing anchorages shall be a combination of either steel bearing plate with wedge plate and wedges, or a steel bearing plate with a threaded anchor nut. The steel bearing and wedge plate may also be combined into a single element. Anchorage devices shall be capable of developing 95 percent of the specified minimum ultimate tensile strength of the prestressing steel tendon. The anchorage devices shall conform to the static strength requirements of Section 3.1.6 (1) and Section 3.1.8 (1) and (2) of the latest edition of the PTI "*Guide Specifications for Post-Tensioning Materials.*"
  - b) The bearing plate shall be fabricated from steel conforming to AASHTO M 183 or M 222 specifications, or equivalent, or may be

a ductile iron casting conforming to ASTM A 536.

- c) The trumpet shall be fabricated from a steel pipe or tube or from PVC pipe. Steel pipe or tube shall conform to the requirements of ASTM A 53 for pipe or ASTM A 500 for tubing. Steel trumpets shall have a minimum wall thickness of 0.1 inch for diameters up to 4 inches and 0.2 inch for larger diameters. PVC pipe shall conform to ASTM A 1785, Schedule 40 minimum. PVC trumpets shall be positively sealed against the bearing plate and aligned with the tendon to prevent cracking during stressing.
- d) Anchorage covers shall be fabricated from steel or plastic with a minimum thickness of 0.1 inch. The joint between the cover and the bearing plate shall be watertight.
- e) Wedges shall be designed to preclude premature failure of the prestressing steel due to notch or pinching effects under static and dynamic strength requirements of Section 3.1.8 (1) and 3.1.8 (2) of the PTI *“Post Tensioning Manual.”* Wedges shall not be reused.
- f) Wedges for epoxy coated strand shall be designed to be capable of biting through the epoxy coating and into the strand. Removal of the epoxy coating from the strand to allow the use of standard wedges shall not be permitted. Anchor nuts and other threadable hardware for epoxy coated bars shall be designed to thread over the epoxy coated bar and still comply with the requirements for carrying capacity.

- Prestressing Steel

- a) Ground anchor tendons shall be fabricated from single or multiple elements of one of the following prestressing steels:
  - Steel bars conforming to AASHTO M 275
  - Seven-wire, low relaxation strands conforming to AASHTO M 203
  - Compact, seven-wire, low-relaxation strands conforming to ASTM A 779
  - Epoxy coated strand conforming to ASTM A 882
  - Epoxy coated reinforcing steel bars conforming to ASTM A 775
- b) Centralizers shall be provided at maximum intervals of 10 feet with the deepest centralizer located 1 foot from the end of the anchor and the upper centralizer for the bond zone located no more than 5 feet from the top of the tendon bond length. Spacers shall be used to separate the steel strands of strand tendons. Spacers shall be provided at maximum intervals of 10 feet and may be combined with centralizers.



- Prestressing Steel Couplers

Prestressing steel bar couplers shall be capable of developing 100 percent of the minimum specified ultimate tensile strength of the prestressing steel bar. Steel strands used for a soil or rock anchor shall be continuous with no splices, unless approved by the Engineer.

- Centralizers

- a) Centralizers shall be fabricated from plastic, steel or material, which is non-detrimental to the prestressing steel. Wood shall not be used. The centralizer shall be able to support the tendon in the drill hole and position the tendon so a minimum of 2 inches of grout cover is provided and shall permit grout to freely flow around the tendon and up the drill hole.
- b) Centralizers are not required on pressure injected anchors installed in coarse grained soils when the grouting pressure exceeds 145 psi or on hollow stem-augured anchors when they are grouted through the auger with grout having a slump of 9 inches or less.

- Spacers

Spacers shall be used to separate elements of a multi-element tendon and shall permit grout to freely flow around the tendon and up the drill hole. Spacers shall be fabricated from plastic, steel or material, which is non-detrimental to the prestressing steel. Wood shall not be used. A combination centralizer-spacer may be used.

- Tendon Bond Length Encapsulations

When the contract plans require the tendon bond length to be encapsulated to provide additional corrosion protection, the encapsulation shall be fabricated from one of the following:

- a) High density corrugated polyethylene tubing conforming to the requirements of AASHTO M 252 and having a minimum wall thickness of 0.06 inch except pre-grouted tendons, which may have a minimum wall thickness of 0.04 inch.
- b) Deformed steel tubing or pipes conforming to ASTM A 52 or A 500 with a minimum wall thickness of 0.2 inch.
- c) Corrugated, polyvinyl chloride tubes manufactured from rigid PVC compounds conforming to ASTM D 1784, Class 13464- B.
- d) Fusion-bonded epoxy conforming to the requirements of AASHTO M 284.

- Heat Shrinkable Sleeves

Heat shrinkable sleeves shall be fabricated from a radiation cross-linked polyolefin tube internally coated with an adhesive sealant. Prior to shrinking, the tube shall have a nominal wall thickness of 0.025 inch. The adhesive sealant inside the heat shrinkable tube shall have a nominal thickness of 0.02 inch.

- Sheath

A sheath shall be used as part of the corrosion protection system for the unbonded length portion of the tendon. The sheath shall be fabricated from one of the following:

- a) A polyethylene tube pulled or pushed over the prestressing steel. The polyethylene shall be Type II, III or IV as defined by ASTM D 1248 (or approved equal). The tubing shall have a minimum wall thickness of 0.06 inch.
- b) A hot-melt extruded polypropylene tube. The polypropylene shall be cell classification B55542-11 as defined by ASTM D 4101 (or approved equal). The tubing shall have a minimum wall thickness of 0.06 inch.
- c) A hot-melt extruded polyethylene tube. The polyethylene shall be high density Type III as defined by ASTM D 1248 (or approved equal). The tubing shall have a minimum wall thickness of 0.06 inch.
- d) Steel tubing conforming to ASTM A 500. The tubing shall have a minimum wall thickness of 0.2 inch.
- e) Steel pipe conforming to ASTM A 53. The pipe shall have a minimum wall thickness of 0.2 inch.
- f) Plastic pipe or tube of PVC conforming to ASTM D 1784 Class 13464-B. The pipe or tube shall be Schedule 40 at a minimum.
- g) A corrugated tube conforming to the requirement of the tendon bond length encapsulation Subsection 4.g. above.

- Bondbreaker

The bondbreaker shall be fabricated from a smooth plastic tube or pipe having the following properties: (1) resistant to chemical attack from aggressive environments, grout, or corrosion inhibiting compound; (2) resistant to aging by ultraviolet light; (3) fabricated from material non-detrimental to the tendon; (4) capable of withstanding abrasion, impact, and bending during handling and installation; (5) enable the tendon to elongate during testing and stressing; and (6) allow the tendon to remain unbonded after lockoff.

- Cement Grout

Type I, II, III or V Portland cement conforming to AASHTO M 85 shall be used for grout. The grout shall be a pumpable neat mixture of cement and water and shall be stable (bleed less than 2 percent), fluid, and provide a minimum 28-day compressive strength of at least 3000 psi measured in accordance with ASTM C 109 at the time of stressing.

- Admixtures

Admixtures which control bleed, improve flowability, reduce water content, and retard set may be used in the grout subject to the approval of the Engineer. Admixtures, if used, shall be compatible with the prestressing steels and mixed in accordance with the manufacturer's recommendation. Expansive admixtures may only be added to the grout used for filling sealed encapsulations, trumpets, and anchorage covers. Accelerators shall not be permitted.

- Water

Water for mixing grout shall be potable, clean, and free of injurious quantities of substances known to be harmful to Portland cement or prestressing steel.

- Corrosion Inhibiting Compound

The corrosion inhibiting compound placed in either the free length or the trumpet areas shall be an organic compound (i.e. grease or wax) with appropriate polar moisture displacing, corrosion inhibiting additives and self-healing properties. The compound shall permanently stay viscous and be chemically stable and nonreactive with the prestressing steel, the sheathing material, and anchor grout.

- Grout Tubes

Grout tubes shall have an adequate inside diameter to enable the grout to be pumped to the bottom of the drill hole. Grout tubes shall be strong enough to withstand a minimum grouting pressure of 145 psi. Post-grout tubes shall be strong enough to withstand post-grouting pressures.

## 5. Construction

### 1. Tendon Storage and Handling

- Tendons shall be handled and stored in such a manner as to avoid damage or corrosion. Damage to the prestressing steel, the corrosion protection, and/or the epoxy coating as a result of abrasions, cuts, nicks, welds or weld splatter will be cause for rejection by the Engineer. The prestressing steel shall be protected if welding is to be performed in the vicinity.

Grounding of welding leads to the prestressing steel is forbidden. Prestressing steel shall be protected from dirt, rust, or other deleterious substances. A light coating of rust on the steel is acceptable. If heavy corrosion or pitting is noted, the Engineer shall reject the affected tendons.

- The Contractor shall use care in handling and storing the tendons at the site. Prior to inserting a tendon in the drill hole, the Contractor and the Inspector shall examine the tendon for damage to the encapsulation and the sheathing. If, in the opinion of the Inspector, the encapsulation is damaged, the Contractor shall repair the encapsulation in accordance with the tendon supplier's recommendations. If, in the opinion of the inspector, the smooth sheathing has been damaged, the Contractor shall repair it with ultra-high molecular weight polyethylene tape. The tape should be spiral wound around the tendon to completely seal the damaged area. The pitch of the spiral shall ensure a double thickness at all points.
- Banding for fabricated tendons shall be padded to avoid damage to the tendon corrosion protection. Upon delivery, the fabricated anchors or the prestressing steel for fabrication of the tendons on site and all hardware shall be stored and handled in such a manner to avoid mechanical damage, corrosion, and contamination with dirt or deleterious substances.
- Lifting of the pre-grouted tendons shall not cause excessive bending, which can debond the prestressing steel from the surrounding grout.
- Prestressing steel shall not be exposed to excessive heat (i.e. more than 446° F).

b. Anchor Fabrication

- Anchors shall be either shop or field fabricated from material conforming to part 4 of this section and as shown in the approved working drawings and schedules.
- Prestressing steel shall be cut with an abrasive saw or, with the written approval of the prestressing steel supplier, an oxyacetylene torch.
- All of the tendon bond length, especially for strand, must be free of dirt, manufacturer's lubricants, corrosion-inhibitive coatings, or other deleterious substances that may significantly affect the grout- to-tendon bond or the service life of the tendon.
- Pre-grouting of encapsulated tendons shall be done on an

inclined, rigid frame or bed by injecting the grout from the low end of the tendon.

c. Drilling

- Drilling methods shall be left to the discretion of the Contractor, whenever possible. The Contractor shall be responsible for using a drilling method to establish a stable hole of adequate dimensions, within the tolerances specified. Drilling methods may involve, amongst others, rotary, percussion, rotary/percussive or auger drilling; or percussive or vibratory driven casing.
- Holes for anchors shall be drilled at the locations and to the length, inclination and diameter shown on the approved working drawings. The drill bit or casing crown shall not be more than 0.12 inch smaller than the specified hole diameter. At the ground surface the drill hole shall be located within 1 foot of the location shown on the approved working drawings. The drill hole shall be located so the longitudinal axis of the drill hole and the longitudinal axis of the tendon are parallel. In particular, the ground anchor hole shall not be drilled in a location that requires the tendon to be bent in order to enable the bearing plate to be connected to the supported structure. At the point of entry the ground anchor shall be installed within plus/minus three (3) degrees of the inclination from horizontal shown on the approved working drawings. At the point of entry the horizontal angle made by the ground anchor and the structure shall be within plus/minus three (3) degrees of a line drawn perpendicular to the plane of the structure unless otherwise shown on the approved working drawings. The ground anchors shall not extend beyond the right of- way or easement limits shown on the contract drawings.

d. Tendon Insertion

- Tendons shall be placed in accordance with the approved working drawings and details and the recommendations of the tendon manufacturer or specialist anchor contractor. The tendon shall be inserted into the drill hole to the desired depth without difficulty.

Each anchor tendon shall be inspected by Department field personnel during installation into the drill hole or casing. Damage to the corrosion protection system shall be repaired, or the tendon replaced if not repairable. Loose spacers or centralizers shall be reconnected to prevent shifting during insertion. Damaged fusion bonded epoxy coatings shall be repaired in accordance with the manufacturer's recommendations. If the patch is not allowed to

cure prior to inserting the tendon in the drill hole, the patched area shall be protected by tape or other suitable means.

- e) The rate of placement of the tendon into the hole shall be controlled such that the sheathing, coating, and grout tubes are not damaged during installation of the tendon. Anchor tendons shall not be subjected to sharp bends. The bottom end of the tendon may be fitted with a cap or bullnose to aid its insertion into the hole, casing or sheathing.

- Grouting

- The Contractor shall use a neat cement grout or a sand-cement grout. The cement shall not contain lumps or other indications of hydration. Admixtures, if used, shall be mixed in accordance with the manufacturer's recommendation.
- The grouting equipment shall produce a grout free of lumps and undispersed cement. A positive displacement grout pump shall be used. The pump shall be equipped with a pressure gauge to monitor pressures. The pressure gauge shall be capable of measuring pressures of at least 145 psi or twice the actual grout pressure used by the Contractor, whichever is greater. The grouting equipment shall be sized to enable the grout to be pumped in one continuous operation. The mixer should be capable of continuously agitating the grout.
- The grout shall be injected from the lowest point of the drill hole. The grout may be pumped through grout tubes, casings, hollowstem-augers, or drill rods. The grout can be placed before or after insertion of the tendon. The quantity of the grout and the grout pressures shall be recorded. The grout pressures and grout takes shall be controlled to prevent excessive heave or

- After the tendon is installed, the drill hole may be filled in one continuous grouting operation except that pressure grouting shall not be used in the free length zone. The grout at the top of the drill hole shall not contact the back of the structure or the bottom of the trumpet.
- If the ground anchor is installed in a fine-grained soil using drill holes larger than 6 inches in diameter, then the grout above the top of the bond length shall be placed after the ground anchor has been tested and stressed. The Engineer will allow the Contractor to grout the entire drill hole at the same time if the Contractor can demonstrate that their particular ground anchor system does not derive a significant portion of its load-carrying capacity from the soil above the bond length portion of the ground anchor.
- If grout protected tendons are used for ground anchors anchored in rock, then pressure grouting techniques shall be utilized. Pressure grouting requires that the drill hole be sealed and that the grout be injected until a minimum 50 psi grout pressure (measured at the top of the drill hole) can be maintained on the grout for at least five (5) minutes.
- The grout tube may remain in the hole on completion of grouting if the tube is filled with grout.
- After grouting, the tendon shall not be loaded for a minimum of three (3) days.

f. Anchorage Installation

- The anchor bearing plate and the anchor head or nut shall be installed perpendicular to the tendon, within plus/minus three (3) degrees and centered on the bearing plate, without bending or kinking of the prestressing steel elements. Wedge holes and wedges shall be free of rust, grout and dirt.
- The stressing tail shall be cleaned and protected from damage until final testing and lock-off. After the anchor has been accepted by the Engineer, the stress tail shall be cut to its final length according to the tendon manufacturer's recommendations.
- The corrosion protection surrounding the unbonded length of the tendon shall extend up beyond the bottom seal of the trumpet or 4 inches into the trumpet if no trumpet seal is provided. If the protection does not extend beyond the seal or sufficiently far

enough into the trumpet, the Contractor shall extend the corrosion protection or lengthen the trumpet.

- The corrosion protection surrounding the unbonded length of the tendon shall not contact the bearing plate or the anchor head during testing and stressing. If the protection is too long, the Contractor shall trim the corrosion protection to prevent contact.

**g. Corrosion Protection**

- Protection Requirements

Corrosion protection requirements shall be determined by the Department and shall be shown on the contract plans. The corrosion protection systems shall be designed and constructed to provide reliable ground anchors for temporary and permanent structures.

- Anchorage Protection
  - All stressing anchorages permanently exposed to the atmosphere shall receive a grout-filled cover, except, for restressable anchorages where a corrosion inhibiting compound must be used. Stressing anchorages encased in concrete at least 2 inches thick do not require a cover.
  - The trumpet shall be sealed to the bearing plate and shall overlap the unbonded length corrosion protection by at least 4 inches. The trumpet shall be long enough to accommodate movements of the structure and the tendon during testing and stressing. On strand tendons, the trumpet shall be long enough to enable the tendon to make a transition from the diameter of the tendon along the unbonded length to the diameter of the tendon at the wedge plate without damaging the encapsulation.
  - The trumpet shall be completely filled with grout, except restressable anchorages must use corrosion inhibiting compounds. Compounds may be placed any time during construction. Compound filled trumpets shall have a permanent seal between the trumpet and the unbonded length corrosion protection. Grout must be placed after the ground anchor has been tested and stressed to the lock-off load. Trumpets filled with grout shall have either a temporary seal between the trumpet and the unbonded length corrosion protection or the trumpet shall fit tightly over the unbonded length corrosion protection for a minimum of 4 inches.



- Unbonded Length Protection
  - a) Corrosion protection of the unbonded length shall be provided by a combination of sheaths, sheath filled with a corrosion inhibiting compound or grout, or a heat shrinkable tube internally coated with a mastic compound, depending on the tendon class. The corrosion inhibiting compound shall completely coat the tendon elements, fill the void between them and the sheath, and fill the interstices between the wires of 7-wire strands. Provisions shall be made to retain the compound within the sheath.
  - b) The corrosion protective sheath surrounding the unbonded length of the tendon shall be long enough to extend into the trumpet, but shall not come into contact with the stressing anchorage during testing. Any excessive protection length shall be trimmed off.
  - c) For pre-grouted encapsulations and all Class I tendons, a separate bond breaker or common sheath shall be provided for supplemental corrosion protection or to prevent the tendon from bonding to the grout surrounding the unbonded length.

- Unbonded Length/Bond Length Transition

The transition between the corrosion protection for the bonded and unbonded lengths shall be designed and fabricated to ensure continuous protection from corrosive attack.

- Tendon Bond Length Protection for Grout Protected Tendons (Class II)
  - a) Cement grout can be used to protect the tendon bond length in non-aggressive ground when the installation methods ensure that the grout will remain fully around the tendon. The grout shall overlap the sheathing of the unbonded length by at least 1 inch.
  - b) Centralizers or grouting techniques shall ensure a minimum of 0.5 inch of grout cover over the tendon bond length.
- Tendon Bond Length Protection for Encapsulated Tendons (Class I)
  - a) A grout-filled, corrugated plastic encapsulation or a grout-filled, deformed steel tube shall be used. The prestressing steel can be grouted inside the encapsulation prior to being placed.
  - b) Centralizers or grouting techniques shall ensure a minimum of 0.5 inch of grout cover over the encapsulation.

- Epoxy

A fusion-bonded epoxy may be used to provide a layer of protection for the steel tendon in addition to the cement grout.

- Coupler Protection

- a) On encapsulated bar tendons (Class I), the coupler and any adjacent exposed bar sections shall be covered with a corrosion-proof compound or wax-impregnated cloth tape. The coupler area shall be covered by a smooth plastic tube, complying with the requirements set forth in 4.9, overlapping the adjacent sheathed tendon by at least 1 inch. The two joints shall be sealed each by a coated heat shrink sleeve of at least 6 inches in length, or approved equal. The corrosion-proof compound shall completely fill the space inside the cover tube.
- b) Corrosion protection details for strand couplers, if specifically permitted, shall be submitted for approval of the Engineer.

#### h. Stressing, Load Testing, and Acceptance

- General

Each ground anchor shall be tested. No load greater than ten (10) percent of the design load can be applied to the ground anchor prior to testing. The maximum test load shall be no less than 1.33 times the design load and shall not exceed 80 percent of the specified minimum ultimate tensile strength of the prestressing steel of the tendon. The test load shall be simultaneously applied to the entire tendon. Stressing of single-element tendons shall not be permitted.

- Stressing Equipment

a) The testing equipment shall consist of:

- a) A dial or vernier scale capable of measuring to the nearest .001 inch shall be used to measure the ground anchor movement. The movement measuring device shall have a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum test load and it shall have adequate travel so the ground anchor movement can be measured without resetting the device at an interim point.
- b) A hydraulic jack and pump shall be used to apply the test load. The jack and a calibrated primary pressure gauge shall be used to measure the applied load. The jack and primary pressure gauge shall be calibrated by an independent firm as a unit. The calibration shall have been performed within forty-five (45) working days of

the date when the calibration submittals are provided to the Engineer. Testing cannot commence until the Engineer has approved the calibration. The primary pressure gauge shall be graduated in 100 psi increments or less. The ram travel shall be at least 6 inches and preferably not be less than the theoretical elongation of the tendon at the maximum test load. If elongations greater than 6 inches are required, re-stroking can be allowed.

- c) A calibrated reference pressure gauge shall also be kept at the site to periodically check the production (i.e. primary pressure) gauge. The reference gauge shall be calibrated with the test jack and primary pressure gauge. The reference pressure gauge shall be stored indoors and not subjected to rough treatment.
- d) The Contractor shall provide an electrical resistance load cell and readout to be used when performing an extended creep test.
- e) The stressing equipment shall be placed over the ground anchor tendon in such a manner that the jack, bearing plates, load cells and stressing anchorage are axially aligned with the tendon and the tendon is centered within the equipment.
- f) The stressing equipment, the sequence of stressing and the procedure to be used for each stressing operation shall be determined at the planning stage of the project. The equipment shall be used strictly in accordance with the manufacturer's operating instructions.
- g) Stressing equipment shall preferably be capable of stressing the whole tendon in one stroke to the specified test load and the equipment shall be capable of stressing the tendon to the maximum specified test load within 75 percent of the rated capacity. The pump shall be capable of applying each load increment in less than 60 seconds.

- h) The equipment shall permit the tendon to be stressed in increments so that the load in the tendon can be raised or lowered in accordance with the test specifications, and allow the anchor to be lift-off tested to confirm the lock off load.
  - i) Stressing equipment shall have been calibrated, within an accuracy of plus or minus two (2) percent, a maximum of 45 days prior to use. The calibration certificate and graph shall be available on site at all times. The calibration shall be traceable to the National Institute of Standards and Technology (NIST).
- Load Test Setup
  - a) Dial gauges shall bear on the pulling head of the jack and their stems shall be coaxial with the tendon direction. The gauges shall be supported on an independent, fixed frame, such as a tripod, which will not move as a result of stressing or other construction activities during the operation.
  - b) Prior to setting the dial gauges, the Alignment Load (AL) shall be accurately placed on the tendon. The magnitude of the AL depends on the type and length of the tendon.
  - c) Re-gripping of strands, which would cause overlap wedge bites, or wedge bites on the tendon below the anchor head, shall be avoided.
  - d) Stressing and testing of multiple element tendons with single element jacks is not permitted.
  - e) Stressing shall not begin until the grout has reached adequate strength.
- Performance Tests
  - a) Five (5) percent of the ground anchors or a minimum of three (3) ground anchors, whichever is greater, shall be performance tested in accordance with the procedures described in this section. The Engineer shall select the ground anchors to be performance tested. The remaining ground anchors shall be tested in accordance with the proof test procedures as outlined in 5.h. below.
  - The performance test shall be made by incrementally loading and unloading the ground anchor in accordance with the schedule provided in section 5.h. The load shall be raised from one increment to another immediately after recording the ground anchor movement. The ground anchor movement shall be measured and recorded to the nearest

0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment of load. The load shall be monitored with the primary pressure gauge. The reference pressure gauge shall be placed in series with the primary pressure gauge during each performance test. If the load determined by the reference pressure gauge and the load determined by the primary pressure gauge differ by more than ten (10) percent, the jack, primary pressure gauge and reference pressure gauge shall be recalibrated at no expense to the Department. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

- The maximum test load in a performance test shall be held for ten (10) minutes. A load cell shall be used to monitor small changes in load during constant load-hold periods.
- The jack shall be adjusted as necessary in order to maintain a constant load. The load-hold period shall start as soon as the maximum test load is applied and the ground anchor movement, with respect to a fixed reference, shall be measured and recorded at 1 minute, 2, 3, 4, 5, 6, and 10 minutes. If the ground anchor movement between one (1) minute and ten (10) minutes exceeds .04 inch, the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the ground anchor movement shall be recorded at 15, 20, 30, 40, 50 and 60 minutes.
- Steps for the Performance Test – The steps for the performance test are detailed in the table on the following page:

Step	Loading	Applied Load	Record and Plot Total Movement ( $d_{ti}$ )	Record and Plot Residual Movement ( $d_{ri}$ )	Calculate Elastic Movement ( $d_{ei}$ )
1	Apply alignment load (AL)				
2	Cycle 1	0.25DL	$d_{t1}$		$d_{t1} - d_{r1} = d_{e1}$
		AL		$d_r$	
3	Cycle 2	0.25AL	$d_2$		$d_{t2} - d_{r2} = d_{e2}$
		0.50DL	$d_{t2}$		
		AL		$d_{r2}$	
4	Cycle 3	0.25DL	$d_3$		$d_{t3} - d_{r3} = d_{e3}$
		0.50DL	$d_3$		
		0.75FL	$d_3$		
		AL		$d_{r3}$	
5	Cycle 4	0.25DL	$d_4$		$d_{t4} - d_{r4} = d_{e4}$
		0.50DL	$d_4$		
		0.75DL	$d_4$		
		1.00DL	$d_{t4}$		
		AL		$d_{r4}$	
6	Cycle 5	0.25DL	$d_5$		$d_{t5} - d_{r5} = d_{e5}$
		0.50DL	$d_5$		
		0.75DL	$d_5$		
		1.00DL	$d_5$		
		1.2DL	$d_5$		
		AL		$d_{r5}$	
7	Cycle 6	0.25DL	$d_6$		
		0.50DL	$d_6$		
		0.75DL	$d_6$		
		1.00DL	$d_6$		
		1.2DL	$d_6$		
		1.33DL	$d_{t6}$ , zero reading for creep test		
8	Hold load for 10 minutes while recording movement at specified times. If the total movement measured during the load hold exceeds the specified maximum value then the load hold should be extended to a total of 60 minutes.				
9	Cycle 6 cont=d	AL		$d_{r6}$	Cycle 6: $d_m - d_{r6} = d_{e6}$
Notes: AL = Alignment Load, DL = Design Load, $d_i$ = total movement at a load other than maximum for cycle, $i$ = number identifying a specific load cycle.					

- **Proof Tests**

The proof test shall be performed by incrementally loading the ground anchor in accordance with the following schedule. The load shall be raised from one increment to another immediately after recording the ground anchor movement. The ground anchor movement shall be measured and recorded to the nearest 0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment load. The load shall be monitored with the primary pressure gauge. At load increment other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

**Proof Test Schedule**

<b>Step</b>	<b>Load</b>
1	AL
2	0.25DL
3	0.50DL
4	0.75DL
5	1.00DL
6	1.20DL
7	1.33DL
8	Reduce to lock-off load
9	AL (optional)
10	Adjust to lock-off load

- The maximum test load in a proof test shall be held for (10) minutes. The jack shall be adjusted as necessary in order to maintain a constant load. The load-hold period shall start as soon as the maximum test load is applied and the ground anchor movement with respect to a fixed reference shall be measured and recorded at 1, 2, 3, 4, 5, 6, and 10 minutes. If the ground anchor movement between one (1) minute and ten (10) minutes exceeds 0.04 inch, the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the ground anchor movements shall be recorded at 15, 20, 30, 40, 50, and 60 minutes.
- **Extended Creep Tests**
  - a) The Department shall determine if extended creep testing is required and select those ground anchors that are to be creep tested. If creep tests are required, at least two (2) ground anchors shall be tested. The stressing equipment shall be capable of measuring and maintaining the hydraulic pressure within 50 psi.
  - b) The extended creep test shall be made by incrementally loading and unloading the ground anchor in accordance with the performance test schedule provided in 5.8.5. At the end of each

loading cycle, the load shall be held constant for the observation period indicated in the creep test schedule below. The times for reading and recording the ground anchor movement during each observation period shall be 1, 2, 3, 4, 5, 6, 10, 15, 20, 25, 30, 45, 60, 75, 90, 100, 120, 150, 180, 210, 240, 270 and 300 minutes as appropriate for the load increment. Each load-hold period shall start as soon as the test load is applied. In a creep test, the primary pressure gauge and reference pressure gauge will be used to measure the applied load and the load cell will be used to monitor small changes in load during constant load-hold periods. The jack shall be adjusted as necessary in order to maintain a constant load.

- c) The Contractor shall plot the ground anchor movement and the residual movement measured in an extended creep test. The Contractor shall also plot the creep movement for each load hold as a function of the logarithm of time.

**Extended Creep Test Schedule**

<b>Load</b>	<b>Observation period (min)</b>
AL	
0.25DL	10
0.50DL	30
0.75DL	30
1.00DL	45
1.20DL	60
1.33DL	300

- **Ground Anchor Acceptance Criteria**

A performance-tested or proof-tested ground anchor with a 10 minute load hold shall be acceptable if the: (1) ground anchor resists the maximum test load with less than 0.04 inch of movement between 1 minute and 10 minutes; and (2) total elastic movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

- a) A performance-tested or proof-tested ground anchor with a 60 minute load hold shall be acceptable if the: (1) ground anchor resists the maximum test load with a creep rate that does not exceed 0.08 inch in the last log cycle of time; and (2) total elastic movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.
- b) A ground anchor subjected to extended creep testing is acceptable if the: (1) ground anchor resists the maximum test load with a creep rate that does not exceed 0.08 inch in the last log cycle of time; and (2) total elastic movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.



- c) The initial lift-off reading shall be within plus or minus five (5) percent of the designated lock-off load. If this criterion is not met, then the tendon load shall be adjusted accordingly and the initial lift-off reading repeated.
- Procedures for Anchors Failing Acceptance Criteria
  - a) Anchors that do not satisfy the minimum apparent free length criteria shall be either rejected and replaced at no additional cost to the Department or locked off at no more than 50 percent of the maximum acceptable load attained. In this event, no further acceptance criteria are applied.
  - b) Re-groutable anchors which satisfy the minimum apparent free length criteria but which fail the extended creep test at the test load may be post grouted and subjected to an enhanced creep criterion. This enhance criterion requires a creep movement of not more than 0.04 inch between 1 and 60 minutes at test load. Anchors which satisfy the enhanced creep criterion shall be locked off at the design lock-off load. Anchors which cannot be post grouted or regroutable anchors that do not satisfy the enhanced creep criterion shall be either rejected or locked off at 50 % of the maximum acceptable test load attained. In this event, no further acceptance criteria are applied. The maximum acceptable test load with respect to creep shall correspond to that where acceptable creep movements are measured over the final log cycle of time.
  - c) In the event that the anchor fails, the Contractor shall modify the design and/or construction procedures. These modifications may include, but are not limited to, installing additional anchors, modifying the installation methods, reducing the anchor design load by increasing the number of anchors, increasing the anchor length, or changing the anchor type. Any modification of design or construction procedures shall be at no change in the contract price. A description of any proposed modifications must be submitted to the Engineer in writing. Proposed modifications shall not be implemented until the Contractor receives written approval from the Engineer.
- Anchor Lock-Off
  - a) After testing has been completed, the load in the tendon shall be such that after seating losses (i.e. wedge seating); the specified lock-off load has been applied to the anchor tendon.
  - b) The magnitude of the lock-off load shall be specified in the approved working drawings, or as determined by the designer.
  - c) The wedges shall be seated at a minimum load of 50%  $F_{pu}$ . If the lock-off load is less than 50%  $F_{pu}$ , shims shall be used under the wedge plate and the wedges seated at 50%  $F_{pu}$ . The shims shall then be removed to reduce the load in the tendon to

the desired lock-off load. Bar tendons may be locked off at any load less than 70%  $F_{pu}$ .

- Anchor Lift-Off Test

After transferring the load to the anchorage, and prior to removing the jack, a lift-off test shall be conducted to confirm the magnitude of the load in the anchor tendon. This load is determined by reapplying load to the tendon to lift off the wedge plate (or anchor nut) without unseating the wedges (or turning the anchor nut). This moment represents zero time for any long time monitoring.

**STATE**  
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**OF**

**TENNESSEE**  
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**SPECIAL PROVISION**  
**REGARDING**  
**DRILLED SHAFT SPECIFICATIONS**

**625.01 Description.** This work shall consist of constructing cast-in-place reinforced concrete drilled shafts and rock sockets, as required, to serve as a structural foundation. This work shall provide reinforced concrete shafts cast in cylindrically excavated holes extending sufficiently into soil or sound rock to adequately support the structure and all externally applied loads for which the shaft was designed. The drilled shaft foundation, including the rock socket, where required, shall be constructed in accordance with these Specifications, as shown on the Plans and in accordance with other Specifications included in the contract documents.

**625.02 Qualifications of Drilled Shaft Contractor.** The Contractor/Subcontractor performing the work described herein shall have staff on-site (driller and/or foreman or superintendent) experienced in the drilled shaft specialty and have installed drilled shafts of both diameter and length similar to those shown on the Plans. The Contractor shall have staff (as defined above) on site that has a minimum of three years of experience in the geologic conditions associated with the project site prior to the bid date for this project. This work shall be performed under the supervision of the Contractor's/Subcontractor's superintendent, who is knowledgeable and experienced in the method of constructing drilled shafts as required by the project. The Contractor's/Subcontractor's equipment shall have the capacity to undertake the work and shall be sufficient to complete the work within the specified contract time. The Contractor shall furnish evidence of experience and expertise that the Contractor/Subcontractor meets the following requirements:

The Contractor's/Subcontractor's ability to construct the drilled shafts for this project shall be supported by a list containing a description of at least five projects either on-going or completed in the last two years on which the Contractor's/Subcontractor's staff (driller, foreman or superintendent), responsible for the drilled shaft construction, have installed drilled shafts of similar size as shown in the Plans and with similar excavation techniques anticipated for this project. This list of projects shall contain a brief description of the project as well as names and phone numbers of the project owner's representatives who can verify the Contractor's/Subcontractor's staff participation on the project.

**625.03 Drilled Shaft Work Plan.** The Contractor shall develop a work plan for all the drilled shafts and submit the plan for review and acceptance by the Engineer 30 days prior to beginning construction of the drilled shafts. The Drilled Shaft Work Plan shall provide detailed project specific information, including the following:

1. Work experience in accordance with required qualifications mentioned in **Subsection 625.02**.
2. List and size of proposed equipment including: cranes, kelly bars, drill rigs, vibratory hammers, augers, core barrels, cleanout buckets, airlifts and/or submersible pumps, tremies and/or concrete pumps, casing (diameters, thicknesses and lengths), etc.
3. Details of the sequence and proposed schedule of drilled shaft construction, including the anticipated order in which shafts will be constructed
4. Details of excavation methods
5. Details of proposed methods to clean the excavation bottom
6. Details of the method(s) to be used to ensure shaft stability (i.e., prevention of caving, bottom heave, etc. using temporary casing, slurry, or other means) during excavation and concrete placement. If appropriate, this shall include a review of method suitability to the anticipated site and subsurface geotechnical conditions
7. Details of reinforcement placement including support and method to center in the excavation
8. Details of concrete placement including proposed operational procedures for the concrete tremie or pump (if applicable); including initial placement, how the tremie or pump will be raised during concrete placement and what type of discharge control will be used to prevent concrete contamination when the tremie or pump is initially placed in the excavation.
9. If applicable, details of casing installation and temporary casing removal including order of telescoped casing removal and minimum concrete head in each casing during removal
10. Required submittals for concrete mix designs
11. Details on how drilling spoils will be handled including environmental control procedures used to prevent the loss of concrete and spoils
12. Detailed procedures for mixing, using, maintaining, and disposing of the slurry shall be provided. A detailed mix design (including all additives and their specific purpose in the slurry mix), and a discussion of its suitability to the anticipated subsurface geotechnical conditions, shall also be provided for the proposed slurry
13. Other information shown in the Plans or requested by the Engineer

The Engineer will review the Drilled Shaft Work Plan for conformance with the Plans and Specifications. Within 15 days of receiving the plan, the Engineer will notify the Contractor of any additional information required and/or changes that may be necessary to satisfy the Plans, Specifications and special provisions. Any part of the plan that is unsatisfactory will be rejected and the Contractor shall submit changes for re-evaluation. The Engineer will respond to the Contractor within 7 days after receiving the proposed changes.

Review of the Drilled Shaft Work Plan by the Engineer does not relieve the Contractor of the responsibility to perform the work in accordance with Plans and Specifications. The Drilled Shaft Work Plan is intended to provide an opportunity for the Contractor to explain his approach to the work and to allow the Engineer to comment on equipment and procedures before field operations begin.

**625.04 Preconstruction Conference.** After the Drilled Shaft Work Plan has been reviewed by the Project Supervisor, a drilled shaft preconstruction conference shall be scheduled with the Contractor/Drilling Subcontractor to discuss construction and inspection of the drilled shafts. At a minimum, the attendees should include the General Contractor's Superintendent, the Drilling Subcontractor's Superintendent, the State's representatives, the Geotechnical Engineer, the Structural Engineer and members of the Inspection Team. This conference shall be completed prior to beginning any drilled shaft work.

### Construction Requirements

**625.05 Material.** All material shall be in accordance with the Plans and in accordance with other Specifications included in the contract document.

**625.06 Self-Consolidating Concrete.** Drilled shafts shall be constructed of the class concrete and concrete strength specified on Plans, and all material, proportioning, mixing and transporting of concrete shall be in accordance with *TDOT Standard Specifications for Road and Bridge Construction* except as modified below. The concrete mix for drilled shafts shall be dense, homogeneous, fluid and resistant to segregation, and shall consolidate under self-weight such that vibrating or rodding will not be required as specified in **604.03 1b**. Self-Consolidating Concrete (SCC) Design and Production Parameters. The concrete mix shall have a set time that ensures that fluidity is maintained throughout the shaft concrete placement and removal of temporary casing, if used.

**625.07 Casing.** When applicable, the Contractor shall select the rigid casing used to stabilize shaft during construction unless casing is specified on Plans. A casing with sufficient strength to safely resist all imposed loads, including those from the soil and ground water, shall be used. The Contractor must insure the stability of casing during all drilled shaft operations.

Shop Drawings. Shop drawings for permanent steel casings shall be submitted to and approved by the Engineer prior to installation of the casings.

Condition of Casings. Casings shall be smooth, clean and watertight. Out-of-round tolerance shall not exceed one inch at any portion of the casing. The Contractor shall demonstrate the casing is within tolerance after installation. Telescoping casing shall not be allowed in bridges located in Seismic Zones 3 or 4.

Extent of Casing Length. Permanent casings, if required, shall be continuous wherever possible or practical. The permanent casing shall terminate at the specified elevation. Where drilled shafts are located in open water areas, casings shall be extended at least 18 inches above the datum defined water elevation as shown on the plans. Contractor shall be responsible for casing adjustments at the time of installation due to water fluctuations.

Use of Teeth or Cutting Edge. The casing may be fabricated with teeth or a cutting edge to facilitate insertion into the rock.

Splices. Splicing of permanent casings is not desirable and will only be permitted when approved by the Engineer. If splices are required, the welding process shall be in accordance

with the requirements specified in subsection **602.19**. The Contractor shall be fully responsible for the adequacy of welds during driving.

Welding. Welding of casings shall be in accordance with the current edition of *AASHTO/AWS Bridge Welding Code* and *TDOT Standard Specification for Road and Bridge Construction* and as specified in Plans, except that shop welding of casings will not require radiographic inspection. Inspection of welds will be of a visual nature. If evidence indicating poor welding is found, the Engineer may require ultrasonic testing at the contractor's expense.

**625.08 Slurry.** Drilling slurry will be defined as mineral slurry, polymer slurry, natural slurry formed during the drilling process, water or other fluids used to maintain stability of the drilled shaft excavation to aid in the drilling process or to maintain the quality of the rock socket. In addition, the terms mineral slurry and polymer slurry, as used herein, will be defined as the final mixed composite of all additives, including manufactured mineral or polymer slurry additives required to produce the acceptable drilling slurry.

Slurry Usage. Drilling slurry shall be used if detailed in the approved installation plan, if in accordance with the contract documents or if approved in writing by the Engineer. Drilling slurry may be used at the Contractor's option if the slurry is not in accordance with the contract documents; however, any slurry shall be approved by the Engineer prior to use. Drilling slurry, when used, will be non-compensable and effect on time of performance due to the use of the slurry will be non-excusable.

General Properties. The material used to make the slurry shall not be detrimental to the concrete or surrounding ground strata. Mineral slurries shall have both a mineral grain size that remains in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Polymer slurries shall have sufficient viscosity and gel characteristics to transport excavated material to suitable screening systems or settling tanks. The percentage and specific gravity of the material used to make the slurry shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. If approved by the Engineer, the Contractor may use water and on-site soils as drilling slurry. In that case, the range of acceptable values for density, viscosity and pH, as shown in the following table for bentonite slurry, shall be met, except that maximum density (unit weight) shall not exceed 70 pounds/cubic foot. When water is used as the drilling fluid to construct rock sockets in limestone, dolomite, sandstone or other formations that are not erodible, the requirements for slurry testing will not apply.

Preparation. Prior to introduction into the shaft excavation, the manufactured mineral or polymer slurry admixture shall be pre-mixed thoroughly with clean, fresh water and for adequate time in accordance with the slurry admixture manufacturer's recommendations allotted for hydration. Potable water can be used for mixing although stream or river water may be used when approved by the engineer. Slurry tanks of adequate capacity will be required for slurry mixing, circulation, storage and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without written approval from the Engineer. Adequate de-sanding equipment will be required as necessary to control slurry properties during the drilled shaft excavation in accordance with the values provided in the table below. De-sanding will not be required for signposts or lighting mast foundations unless specified in the contract documents.

Control Tests. Control tests using a suitable apparatus shall be performed by the Contractor on the slurry to determine density, viscosity, sand content and pH of freshly mixed slurry, recycled slurry and slurry in the excavation. Tests of slurry samples from within one foot of the bottom and at mid-height of the shaft shall be conducted in each shaft excavation during the excavation process to establish a consistent working pattern. A minimum of four sets of tests shall be conducted during the first eight hours of slurry use on the project. When the results show consistent behavior, the testing frequency may be decreased to one set every four hours of slurry use, or as otherwise approved by the Engineer. Reports of all tests, signed by an authorized representative of the Contractor, shall be furnished to the Engineer on completion of each drilled shaft. An acceptance range of values for the physical properties will be as shown in the table below.

Sampling. When slurry samples are found to be unacceptable, the Contractor shall bring the slurry in the shaft excavation to within specification requirements. Concrete shall not be poured until re-sampling and testing results produce acceptable values. Prior to placing shaft concrete, the Contractor shall take slurry samples from within one foot of the bottom and at mid-height of the shaft. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be removed. Disposal of all slurry shall be done in areas approved by the Engineer. The Contractor shall perform final shaft bottom cleaning after suspended solids have settled from the slurry mix.

Range of Acceptable Values for Mineral and Polymer Slurries in Fresh Water Without Additives					
Property	Bentonite	Emulsified Polymer	Dry Polymer	Units	Test Method
<b>Density (Unit Weight)</b>					
At Introduction	63.5- 66.8	< 63	< 63	lb/ft3	Density Balance
Prior to Concreting	63.5- 70.5	< 63	< 63		
<b>Marsh Funnel Viscosity</b>					
At Introduction	32 – 60	33 – 43 <sup>b</sup>	50 – 80 <sup>b</sup>	sec/qt	Marsh Funnel
Prior to Concreting	32 – 60	33 – 43 <sup>b</sup>	50 – 80 <sup>b</sup>		

<b>pH</b>					
At Introduction	8 – 10	8 – 11	7 – 11	--	pH Paper or
Prior to Concreting	8 – 10	8 – 11	7 – 11	--	pH Meter
<b>Sand Content</b>					API Sand
At Introduction	< 4	< 1	< 1	Percent by Volume	Content Kit
Prior to Concreting	< 2	< 1	< 1		
<b>Maximum Contact Time<sup>a</sup></b>	4	72	72	Hours	

a. Without agitation and sidewall cleaning.

b. Higher viscosities may be required to maintain excavation stability in loose or gravelly sand deposits.

**625.09 Protection of Existing Structures.** All precautions shall be taken to prevent damage to existing structures and utilities as stated in Standard Specifications for Road and Bridge Construction or plans general notes. These measures shall include, but are not limited to, monitoring and controlling the vibrations from the driving of casing or drilling of the shaft, and selecting construction methods and procedures that shall prevent excessive caving of the shaft excavation.

**625.10 Technique Shafts.** When required by the contract documents, the Contractor shall demonstrate the adequacy of methods and equipment used during construction of the first drilled shaft, which shall be an out of position technique shaft, constructed with reinforcement as identified for production shafts on the Plans. This technique shaft shall be drilled in the position as directed by the Engineer and drilled to the maximum depth for any production shaft shown on the Plans. If at any time the Contractor is unable to demonstrate, to the satisfaction of the Engineer, the adequacy of methods or equipment and alterations required, an additional technique shaft(s) may be required. Technique shafts shall be cut off three feet below ground line, buried or otherwise disposed of as specified in the contract documents or as directed by the Engineer. Once approval has been given to construct production shafts, no changes will be permitted in the methods of equipment used to construct the shaft without approval from the Engineer. When a technique shaft is not required, construction of the first production shaft will be used to determine if the methods and equipment used by the Contractor are acceptable. Failure at any time to demonstrate to the Engineer the adequacy of methods or equipment will be cause for the Engineer to require appropriate alterations in equipment or method by the Contractor to eliminate unsatisfactory results.

**625.11 Construction Sequence.** Where construction of a footing is applicable, excavation to footing elevation shall be completed before shaft construction begins, unless otherwise authorized by the Engineer. Any disturbance to the footing area caused by shaft installation shall be repaired by the Contractor prior to pouring the footing. When drilled shafts are to be installed



in conjunction with embankment placement, the Contractor shall construct drilled shafts after placement of fills. Drilled shafts constructed prior to the completion of fills shall not be capped until the fills have been placed as near to final grade as possible, leaving only the necessary work room for construction of the caps.

**625.12 General Equipment and Methods.** The Contractor shall perform excavations through whatever material is encountered to the dimensions and elevations shown on the Plans. The Contractor's methods and equipment shall be suitable for the intended purpose and for whatever material is encountered.

Equipment. The Contractor shall provide equipment capable of constructing shafts to a depth equal to the deepest shaft tip elevation shown on the Plans plus 15 feet, or as otherwise specified in the contract documents. When a rock socket is identified on the Plans at a shaft location, the definition of "shaft tip elevation", for the purposes of this subsection, shall be taken to refer to the bottom of the rock socket.

Excavation Methods. Excavations required for shafts and rock sockets shall be completed in a continuous operation. The Contractor shall be responsible for ensuring the stability of the shaft excavation and the surrounding soil. When obstructions, either expected or unexpected, are encountered, the Contractor shall notify the Engineer promptly. The dry method, wet method, temporary casing method, permanent casing method if specified, or combinations, as necessary, shall be used to produce sound, durable concrete drilled shafts free of defects. The permanent casing method shall be used only when required by the contract documents or approved by the Engineer. Blasting excavation methods will not be permitted. When a rock socket is required, the Engineer will be the sole judge as to what constitutes the top of sound rock. The Engineer may order in writing additional depths of rock socket below the top of sound rock as considered necessary to improve the foundation. If the top surface of the sound rock is found to be inclined across the width of the shaft, the Contractor shall immediately notify the Engineer. The Contractor shall use an airlift, or other method approved by the Engineer, to clean the bottom of the shaft excavation.

**625.13 Dry Construction Method.** The dry construction method shall be used only at sites where the groundwater table and site conditions, generally stiff to hard clays or rock above the water table, are suitable to permit construction of the shaft in a relatively dry excavation and where the sides and bottom of the shaft remain stable without any caving, sloughing or swelling and allow visual inspection prior to concrete placement. The dry method shall consist of drilling the shaft excavation, removing accumulated seepage water and loose material from the excavation and placing the shaft reinforcing and concrete in a relatively dry excavation. The dry construction method shall be used only when shaft excavations have 12 inches per hour or less of seepage and less than 3" of standing water.

**625.14 Wet Construction Method.** The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. This method shall consist of drilling the shaft excavation below the water table, keeping the shaft filled with water, natural slurry formed during the drilling process, mineral slurry or polymer slurry to control seepage, groundwater movement and stability of the hole perimeter until excavation to the final depth and placement of the reinforcing cage and concrete has been completed. This procedure

will require placing the shaft concrete with either a tremie or concrete pump beginning at the shaft bottom, and displacing the water or slurry as concrete is placed. Temporary partial depth casings near the ground surface shall be provided to aid shaft alignment and position and to prevent sloughing of the top of the shaft excavation. Where drilled shafts are located in open water areas, shafts shall be constructed by the wet method using casings extending from above the water elevation to the Plans casing tip elevation or top of rock socket to protect the shaft concrete from water action during placement and curing. The casing shall be installed in a manner that produces a positive seal at the bottom of the casing.

**625.15 Temporary Casing Construction Method.** The temporary casing construction method shall be used at all sites where the stability of the excavated hole, the effects of groundwater cannot be controlled by other means, or other conditions exist in which the Engineer deems it necessary. In this method, the hole shall be advanced through caving material by the wet method in accordance with Subsection **625.14**. When a formation is reached that is nearly impervious, a casing shall be placed in the hole and sealed. Drilling may proceed by the dry method to the projected depth. The placement of concrete shall proceed by the dry or wet method, except that the casing shall be withdrawn after the concrete is placed. In the event seepage conditions prevent use of the dry method, excavation shall be completed by the wet method. Before and during casing withdrawal, a 5-foot minimum head of fresh concrete above the bottom of the casing shall be maintained at such a level that fluid trapped behind the casing is displaced upward out of the shaft excavation without mixing with or displacing the shaft concrete. Casing extraction shall be at a slow, uniform rate with the pull in line with the axis of the shaft. Temporary casings shall be removed while the concrete is still workable and the slump of the concrete is between four and eight inches. Vibratory hammers shall not be used for casing installation or removal within 50 feet of other shafts that have been completed less than 24 hours earlier. The reinforcing cage shall not be damaged or displaced when withdrawing the temporary casing.

**625.16 Permanent Casing Construction Method.** The permanent casing construction method shall be used only when required by the contract documents or authorized by the Engineer. The casing shall be continuous between top and bottom elevations shown on the Plans. Vibratory hammers shall not be used for casing installation within 50 feet of shafts which have had concrete poured within the past 24 hours

**625.17 Time Limitations.** When bentonite slurry is used, the Contractor shall adjust construction operations such that the maximum time that slurry is in contact with the bottom five feet of the shaft, the time from the end of drilling to the beginning of concrete placement, does not exceed four hours without agitation. If the four-hour limit is exceeded, the bottom five feet of the shaft shall be over reamed prior to performing other operations in the shaft. For rock sockets constructed in shale using polymer slurry, concrete placement shall begin within 72 hours of starting the rock socket excavation to avoid degradation of the shaft sidewall. Before concrete placement begins, foundation inspection, when required, cleaning operations and reinforcing steel placement shall be completed and approved by the Engineer. These operations will be included in the 72 hour time limit. If concrete placement is not begun within the time limit, the Contractor shall take corrective measures to the satisfaction of the Engineer.

**625.18 Level of Slurry.** During construction, the level of slurry not be less than five feet above the water table and shall be maintained at a height sufficient to prevent caving of the excavation. If the Engineer determines that the slurry construction method is failing to produce the desired final results, the Contractor shall discontinue operations and propose an alternate method for approval from the Engineer. Correction for a failed slurry construction method will be non-compensable and any effect on time of performance non-excusable.

**625.19 Slurry Manufacturer's Representative.** When manufactured mineral or polymer slurry additives are to be incorporated into the drilling slurry mix, the Contractor shall provide the technical assistance of a representative of the mineral or polymer slurry additive manufacturer at the site prior to introduction of the slurry into the first shaft where slurry use will be required, and during drilling and completion of a minimum of one shaft to adjust the slurry mix to the specific site conditions.

**625.20 Cleaning of Shaft or Casing Sidewalls.** Cleaning of the shaft or casing sidewalls shall occur by a method approved by the Engineer as necessary to remove the depth of softening or to remove excessive slurry cake buildup.

**625.21 General Excavation Considerations.** The Plans will indicate the top of shaft elevations and the estimated bottom of shaft elevations between which the drilled shaft shall be constructed. Drilled shafts may be extended or shortened as approved by TDOT Soils and Geology and TDOT Structures if the foundation material encountered is unsuitable or better than anticipated, or based on the results of load tests.

**625.22 Time Restrictions.** Drilled shaft excavation shall begin only if the Contractor can complete the excavation, perform foundation inspection and testing, and place the reinforcement and concrete as a continuous daily operation. No two shaft within 50 feet of another shaft shall be excavated at the same time. Shafts shall not be constructed within 24 hours of the completion of an adjacent shaft if the center-to-center spacing is less than three shaft diameters.

**625.23 Disposal of Excavated Material.** Excavated material removed from the shaft and any drilling fluids used shall be disposed of in accordance with the contract documents, as directed by the Engineer, and in compliance with federal and state regulatory requirements

**625.24 Worker Entry Into Shaft Excavation.** The Contractor shall not allow workers to enter the shaft excavation for any reason, unless both a suitable casing has been installed and adequate safety equipment and procedures have been provided to workers entering the excavation.

**625.25 Rock and Obstructions.** Subsurface obstructions at drilled shaft locations shall be removed by the Contractor. The Contractor shall employ special procedures or tools when the hole cannot be advanced using conventional equipment. Blasting will not be permitted. Any man-made material that significantly limits excavation advancement such as concrete, steel, timber, etc. will be classified as an "obstruction". Drilling tools lost in the excavation will not be considered obstructions and shall be promptly removed by the Contractor. The presence of an obstruction for pay purposes must be verified by the Engineer or his representative. Removal of obstruction(s) will be paid at two times the unit price bid for Item Drilled Caisson (Rock) L.F.

for the shaft length from the first occurrence of the obstruction until such depth that the shaft is advanced to the point of removal of the obstruction and normal shaft excavation methods can resume. Boulders or rock layers of such size that do not allow the use of soil excavation tools as described above will not be considered an obstruction but will be considered Drilled Caisson Rock as described above.

**625.26 Inspection Equipment.** The Contractor shall maintain at the job at all times, all equipment suitable for use in the shaft inspection.

**625.27 Removal of Excess Sediment.** Final shaft depth shall be measured with approved methods after final cleaning by airlift, or other method approved by the Engineer. Unless otherwise stated in the contract documents, a minimum of 50 percent of the base of each shaft shall have less than ½ inch of sediment at the time of concrete placement. The maximum depth of sediment or any debris at any place on the base of the shaft shall not exceed 1 ½ inches. Shaft cleanliness will be verified by the Engineer for wet or dry shafts.

**625.28 Inspection, Supervision, and Records.** The Contractor shall provide aid to the Engineer in maintaining accurate records during all phases of the drilled shaft installation. The Contractor's supervisor shall provide the Engineer with any information required for the drilled shaft inspection reports. The Contractor shall provide bosun chairs, gas meters, safety equipment, lights, mirrors, weighted tape measures, steel probes, cameras, personnel and all assistance that may be required for the Engineer to inspect the drilled shaft excavations. Contractor shall perform any corrective work found necessary as a result of inspections. Necessary time shall be allowed for performance of these inspections.

**625.29 Inspection for Side Walls.** At the Engineer's request, the Contractor will lower the Inspector to the level of the bottom of the casing and allow visual examination of the side walls of the rock socket to confirm the top of rock socket has been reached once the casing has been extended to the top of rock. Preferably, the sidewall inspection should not be performed until the drilled shaft excavation has extended to the anticipated base of rock socket and before any inner casing is set below the top of rock. Should the observed rock excavation reveal soil inclusions or voids, the drilled shaft excavation shall be extended as directed by the Engineer. Where groundwater cannot be controlled or other conditions prevent safe down-hole entry, side wall inspection will be performed using a camera. The camera should include any light source needed to allow for clear imaging. The Contractor will be responsible for providing sufficient proof that casing has been properly seated into rock and that side walls are free from soil inclusions or voids.

**625.30 Inspection of Bottom of Shaft.** Where groundwater can be effectively controlled (that is, less than one foot of standing water is maintained in excavation bottom) after reaching the anticipated base of rock socket, the Contractor will lower the Inspector to the level of the bottom of the socket and allow visual examination of the bottom of the shaft. Temporary casing should extend to the base of the rock socket to allow the Inspector to safely enter the excavation. Where groundwater cannot be controlled or other conditions prevent safe down-hole entry, bottom of shaft inspection will be performed using a camera. The camera should include any light source needed to allow for clear imaging. The Contractor will be responsible for providing sufficient

proof that excess sediment has been removed in accordance with Subsection 625.27. The determination of the shaft's tip elevation after excavation to the anticipated base of rock socket will either be made by the Engineer's judgment of conditions found in previously performed test borings drilled within the dimensions of the rock socket, examination of rock socket shaft excavation results (recovered cores or observation of shaft drilling response) or by examination of rock cores taken at least 8 feet below the shaft bottom as discussed in **Subsection 625.31**.

**625.31 Core Drilling.** When required by contract documents, core drilling shall be performed as described in the contract plans and paid for under Core Drilling and Sampling at the contract unit price. When core drilling is not included in the contract documents and is required by site conditions and directed by the Engineer, core drilling shall be paid at the contract unit price for Concrete Coring. The Engineer may require rock core samples to be taken a minimum depth of 8 feet and up to a maximum depth of 20 feet below the bottom of the drilled shaft excavation to either aid in predetermining acceptable rock socket elevations prior to beginning of shaft excavation or to provide information to determine the acceptability of a completed rock socket. Core sampling should be performed in accordance with ASTM D 2113 using a double or triple wall core barrel of NX (54.7 mm / 2.16 in.) or NQ (47.5 mm / 1.87 in.) size. The Contractor will perform this core sampling or schedule his qualified representative to do this work.

**625.32 Log of Excavated Material.** The Contractor shall maintain a log of cored material for each foundation inspection hole, and such logs shall be delivered to the Project Supervisor within 24 hours of completion of the boring. The log shall include the following:

- (a) The amount of NX or NQ cored per run and the amount recovered. All core loss shall be noted and explained. Clay layers shall be noted and located on the log by depth.
- (b) The Rock Quality Designation (RQD) for the NX or NQ core. The bedding thickness and degree of weathering shall also be noted.
- (c) Location and elevation of holes.

**625.33 Storage and Labeling of Rock Cores.** Rock cores shall be stored in structurally sound core boxes and shall be protected from the elements. The core boxes shall be properly labeled to indicate location, depth, beginning elevation, Contractor and date, and shall be delivered to the Engineer.

**625.34 Reinforcing Steel Cage Fabrication and Placement.** The reinforcing steel cage, consisting of the longitudinal bars, ties, spirals, cage stiffener bars, spacers, centering devices, and other necessary appurtenances, shall be completely assembled as a unit, and shall be placed immediately after the shaft excavation is inspected and accepted, and just prior to shaft concrete placement. Temporary internal cage stiffeners shall be removed as the cage is placed in the shaft such that interference with the placement of concrete does not occur. The Contractor shall verify the stability of the reinforcing steel cage. The Contractor shall submit verification calculations to the Engineer for review and approval. Calculations shall be sealed by an engineer licensed in the State of Tennessee.

**625.35 Reinforcing Ties, Splices and Clearances.** All reinforcing steel in the shaft shall be tied at every intersection and supported such that the steel remains within the allowable tolerances specified herein during placement of concrete or casing removal. The reinforcing steel cage shall have sufficient rigidity to prevent racking or permanent deformations during delivery or installation.

Concrete Cover			
Shaft Diameter	Uncased	Casing Remains	Casing Withdrawn
3'-0" or less	3"	3"	4"
>3'-0" & <5'-0"	4"	4"	4"
5'-0" or larger	6"	6"	6"

**625.36 Spacers.** Rolling spacers for reinforcing steel shall be used to minimize disturbance of the shaft sidewalls and to facilitate removal of the casing during concrete placement. Sets of concrete spacers or other approved non-corrosive spacing devices shall be used at sufficient vertical intervals, near the bottom and along the shaft at intervals not exceeding five feet, to ensure concentric location of the cage within the shaft excavation. When the vertical steel is greater than one inch in diameter, the maximum spacing may be increased to 10 feet. As a minimum, a set of spacers shall be provided within two feet of both the top and bottom of the shaft. In addition, one set of spacers shall be provided at both two feet above and below each change in shaft diameter. Non-corrosive spacers shall be provided at a minimum of one spacer per 30 inches of circumference of cage with a minimum of three at each vertical level to maintain the required reinforcement clearances. The spacers shall be of adequate dimension to maintain the specified clearance between the outside of the reinforcing cage and the side of the excavated hole or casing.

**625.37 General Considerations.** Accumulations of water in casings and excess sediment at the base shall be removed as described herein before the concrete is placed. No concrete shall be placed until all casings, if used, within a 15 foot radius have been installed. Within the 15-foot radius, all driving or vibratory installation methods shall be discontinued until the concrete in the last shaft has set at least five days. Concrete placement shall begin as soon as possible after completion of the excavation, inspection and setting of the reinforcing cage, and shall proceed in a continuous operation from the bottom of the shaft to the Plans construction joint or above as specified herein. An unplanned stoppage of work may require an emergency construction joint during the shaft construction.

**625.38 Placement of Concrete in the Shaft.** Concrete shall be placed for each shaft with the flow of concrete directed down the center of the shaft. Concrete shall be placed by free fall or through a tremie or concrete pump. The free fall placement method will only be permitted in dry holes. Concrete placed by free fall shall fall directly to the base without contacting either the reinforcing cage or hole sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

**625.39 Time Limitations.** The Contractor shall maintain a continuous pour until shaft is complete. All admixtures shall be adjusted for the conditions encountered on the job so the concrete remains in a workable plastic state throughout the two-hour placement limit. Prior to concrete placement, the Contractor shall provide test results of both a trial mix and a slump loss test conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets the two-hour requirement. The Contractor may request a longer placement time if a concrete mix is provided that will maintain a slump of 4 inches or greater over the longer placement time in the entire shaft as demonstrated by trial mix and slump loss tests. The trial mix and slump loss tests shall be conducted using concrete and ambient temperatures approved for site conditions.

**625.40 Concrete Placement by Tremie.** Tremies used to place concrete shall consist of a tube of sufficient length to discharge concrete at the shaft base elevation. The tremie shall have sufficient weight to rest on the shaft bottom before the start of concrete placement and to prevent curling of the tremie line during placement of the concrete. The tremie shall not contain aluminum parts that may come in contact with the concrete. A tremie shall consist of a watertight tube having an inside diameter of no less than 10 inches and fitted with a hopper at the top. The inside and outside surfaces of the tremie shall be clean and smooth to permit both flow of concrete and unimpeded withdrawal during concrete placement. The tremie wall thickness shall be adequate to prevent crimping or sharp bends that restrict concrete placement.

**625.41 Tremie Operation.** Underwater placement of concrete shall not begin until the tremie is at the shaft base elevation. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations. The tremie discharge end shall remain immersed as deep as practical in the concrete, but shall be no less than five feet at all times. The tremie shall be supported such as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be sealed closed at the start of work to prevent water from entering the tube before the tube is filled with concrete. After placement has started, the level of the concrete in the tremie shall be maintained above the level of slurry or water in the borehole at all times to prevent water or slurry intrusion into the shaft concrete. If water enters the tube after placement is started, the tremie shall be withdrawn, the discharge end resealed, and the placement restarted. The flow of concrete shall be continuous until the work is completed.

**625.42 Removal of Tremie Orifice From Concrete.** If at any time during the concrete pour, when using the wet construction method, the tremie line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete surface, the entire drilled shaft will be considered defective. Corrections made by the Contractor will be non-compensable and any effect on time of performance non-excusable.

**625.43 Concrete Placement by Pump.** Concrete pumps and lines may be used for concrete placement by either the wet or dry construction method. All pump lines shall have a minimum diameter of 5 inches and shall be constructed with watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the shaft base elevation. For the wet construction method, a plug or similar device shall be used to separate the concrete from the fluid in the hole until pumping begins. The plug shall either be removed from the excavation or

shall be of a material that does not cause a defect in the shaft if the plug is not removed. The discharge orifice shall remain at least 5 feet below the surface of the fluid concrete. If at any time during the concrete pour the pump line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete level, the shaft will be considered defective. . Corrections made by the Contractor will be non-compensable and any effect on time of performance non-excusable.

**625.44 Adjustment of Concrete Free Fall or Rate of Concrete Flow.** If the free fall concrete causes the shaft excavation to cave, the Contractor shall control the movement of concrete by reducing the free fall of the concrete or the rate of flow of concrete into the excavation. The Contractor shall be responsible for proposing, developing, and after approval from the Engineer, implementing corrective work.

**625.45 Drop Chutes.** Drop chutes may be used to direct placement of free fall concrete down the center of the shaft excavations. Drop chutes shall be a smooth tube constructed either as a continuous one-piece unit or as removable sections. Aluminum drop chutes will not be permitted. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement

**625.46 Construction Joints.** Construction joints shall not be utilized unless otherwise approved by the structural Engineer. All planned reinforcing steel shall extend uninterrupted through joints. Surfaces of fresh concrete at horizontal construction joints shall be rough floated sufficiently to thoroughly consolidate the surface and to intentionally leave the surface in a roughened condition.

**625.47 Concrete Curing.** Portions of drilled shafts exposed to a body of water shall be protected from the action of water by leaving the forms in place for at least seven days after concrete placement or until the shaft concrete reaches a minimum strength of 3,375 psi. After placement, the temporarily exposed surfaces of the shaft concrete shall be cured to prevent loss of water.

**625.48 Construction Tolerances.** During excavation of the shaft, the Contractor shall monitor the plumbness, alignment and dimensions of the shaft. Any deviation exceeding the allowable construction tolerances specified herein shall be corrected with a procedure approved by the Engineer. Drilled shaft excavations constructed in such a manner that the concrete shaft cannot be completed within the required tolerances will not be accepted. Correction methods shall be submitted by the Contractor for the Engineer's approval. Drilled shaft construction shall not begin until approval has been obtained. When a shaft excavation is completed with unacceptable tolerances, the Contractor shall propose, develop and, after approval from the Engineer, implement corrective work. Redesign drawings and computations submitted by the Contractor shall be signed by a professional Engineer registered to practice in the State of Tennessee. The following construction tolerances will apply to drilled shafts unless stated otherwise in the contract documents:

- (a) Temporary casing diameters shall provide a final shaft diameter as shown on the Plans. When approved by the Engineer, the Contractor may provide a larger casing at the



Contractor's expense.

- (b) Shafts shall be constructed such that the center of the top of the shaft is within 3 inches of Plans position in the horizontal plane at the plan elevation for the top of the shaft.
- (c) For shafts in rock, the vertical alignment of a vertical shaft excavation shall not vary from the Plans alignment by more than ¼ inch per foot of depth. For shafts in soil, the vertical alignment of a vertical shaft excavation shall not vary from the Plans alignment by more than 3/16 inch per foot of depth.
- (d) The bottom of the shaft excavation shall be normal to the axis of the shaft within a tolerance of 3/8 inch per foot of shaft diameter.
- (e) Shaft steel reinforcing bar shall be no higher than six inches above Plans location or three inches below Plans elevation.

**625.49 Integrity Testing.** The completed shaft shall be subjected to the testing methods, specified by Plans, such as concrete coring or sonic logging testing, to determine the extent of any defects that may be present. If CSL testing is indicated in the plans, TDOT will supply a CSL consultant to perform the testing. If testing reveals voids or discontinuities in the concrete which indicate that the shaft is not structurally adequate, the shaft will be retested within 3 to 7 days of receiving the initial testing report. In the event retesting confirms the initial test, further measures as specified in **625.50** shall be conducted at the Contractor's expense.

The placement of concrete in additional drilled shafts shall be discontinued until the Contractor demonstrates the adequacy of the shaft construction method to the satisfaction of the Engineer. Any additional work required by the Contractor as a result of shaft defects will be non-compensable and any effect on time of performance non-excusable.

**625.50 Concrete Coring.** At locations where concrete coring is to be provided, as indicated in the contract documents or as directed by the Engineer, the following will apply. Upon completion of placing concrete and after waiting a minimum of 48 hours, the top surface of concrete shall be cleaned of laitance and any unsound concrete, and then one core hole, or as specified on the plans, shall be drilled completely through the shaft concrete and the rock socket to approximately one foot below the bottom of the rock socket of each shaft. Provisions for the inspection of the concrete surface shall be in accordance with the applicable requirements described herein. Core holes shall be drilled at locations specified by the Engineer. The holes shall be drilled to recover NX (54.7 mm / 2.16 in.) or NQ (47.5 mm / 1.87 in.) size cores. The core samples recovered shall be labeled as to the location from which the samples were taken. The samples shall be delivered to the Engineer for examination. If the cores indicate defective concrete in the shaft, which in the judgment of the Engineer impairs the strength of the completed shaft, the Contractor shall drill additional cores as directed by the Engineer. If the concrete is found to be defective, the Contractor shall submit to the Engineer in writing a proposal for correction, and those corrective procedures shall be approved by the Engineer before such corrective work is undertaken. The cored holes in non-defective concrete shall be filled with grout such that all voids are filled. Grout shall be non-shrink and obtain a

compressive strength equal to or in excess of that specified for the drilled shaft concrete. Grout shall be selected from TDOT Qualified Products List or alternate submitted for TDOT approval. No direct payment will be made for grout and grouting.

### **625.51 Sonic Logging Testing.**

If CSL testing is indicated on a project with CEI oversight, the CEI shall supply a CSL consultant to perform the testing. Shafts six feet in diameter and larger require the addition of 3D tomography. Testing will be performed after the shaft concrete has cured as specified in Table 625.51 – 1. The Contractor shall provide reasonable access to the shaft top for performance of the sonic logging testing.

**Table 625.51 Sonic Logging Time Requirements**

Shaft Diameter	Minimum Cure Time (prior to testing)
4 to 6 ft.	72 hours
6 to 8 ft.	96 hours
>8 ft.	120 hours

Installation of Pipes. The Contractor shall furnish and install  $\geq 1 \frac{1}{2}$ " nominal inside diameter steel pipes with 0.145" minimum wall thickness, ASTM A 53, Standard Weight, for use in sonic testing of each drilled shaft. Pipes shall be installed in each drilled shaft at the locations shown on the Plans, as required by the testing agency or as directed by the Engineer. The pipes shall be sufficiently regular and free from defects to permit the free and unobstructed passage of the probes. The pipe shall be installed such that all internal joints are flush. Stiffening devices such as mandrels, tape or similar material to seal the joints shall not be used. Pipe shall be watertight with clean internal and external faces, the latter to ensure a good bond between the concrete and the pipes. The pipes shall be fitted with a screw-on watertight shoe and cap and shall be securely fixed to the interior of the reinforcement cage with a minimum cover of three inches from the shaft periphery. The pipes shall be as near to parallel as possible, equally spaced and vertical. Where several sections of pipe are required to reach the full length, joints shall be made watertight. The pipes shall be filled with water and plugged or capped before shaft concrete is poured. The upper end of the pipe shall not be left open after the pour. The pipes shall extend at least three feet above the top of the concrete in the shaft to compensate for water displaced by insertion and removal of the transmitter, receiver, and cable. For shafts with a rock socket, the lower end of the pipes shall extend to the bottom of the rock socket. Care shall be taken during the drilled shaft concrete pour to not damage the pipes. If a tremie is used, the tremie shall not be permitted to rest on top of the pipes during the pour. After completion of the sonic logging and final acceptance of the drilled shaft, the Contractor shall fill the access pipes with grout. All cost associated with materials and installation of steel pipes for sonic logging testing shall be included in the cost of Drilled Shaft Concrete.

Sonic Logging Equipment. The sonic logging equipment furnished by the CSL consultant shall consist of all necessary supplies, support equipment and power to perform the sonic logging testing requirements as described herein.

Sonic Logging Test Procedure. The drilled shaft shall be tested between three and 7 days after concrete placement. The following procedures shall apply:

- (a) Pipes shall be checked to ensure the pipes are free from blockages and are filled with water.
- (b) Levels shall be taken on top of each pipe, each pipe shall be plumbed and the length shall be recorded.
- (c) Testing shall be performed between each pair of adjacent pipes around the shaft perimeter and also in pairing combinations between each pipe with all other pipes in the shaft.
- (d) All tests shall be carried out with the probes in the same horizontal plane unless the Engineer directs that defects be further evaluated with the probes on different horizontal planes.
- (e) The probes shall be raised simultaneously from the bottom of the pipes ensuring that all slack is taken out of the cables before the analyzer is switched on, and that the distance between transducers remains constant during the course of the test. The speed of ascent shall be less than 12 inches per second. Measurements shall be taken at three inch intervals or less. Anomalies indicated by longer pulse first-arrival times (FAT) and significantly lower amplitude per energy signals shall be reported. If anomalies are detected, additional tests with two or more sources per receiver vertical offsets of greater than or equal to 20 inches shall be conducted between the same tubes unless the anomaly is within 20 inches of the bottom of the shaft.
- (f) The CSL Consultant shall provide accurate measurements of probe depths on the logs.

Record of Testing. Preliminary results of the testing shall be provided on site prior to the CSL consultant leaving the site. A detailed CSL report and test data shall be submitted to the Engineer within seven days. The CSL report shall be signed and sealed by a Professional Engineer. The CSL report shall include, but is not limited to, the following: project identification and dates of testing, a table and schematic showing shafts tested with accurate identification of tube coordinates and collar elevation, name of personnel that performed the tests and interpretation and those personnel's affiliation, equipment used, data logs, interpretation, analysis, and results. The data logs shall include XY plots of FAT, amplitude and velocity versus depth. CSL data shall be processed to provide easy to understand 2D cross-sections between tubes for all tube pair combinations. These plots shall be annotated by the CSL consultant as appropriate to delineate anomalous results. For shafts six feet in diameter and larger, 3D tomography will be required along with CSL testing. If 3D tomography is requested, the data shall be submitted to the Engineer within ten days. If offset surveys are performed as part of 3D tomography, data plots shall include 3D volumetric images for the entire shaft, color-coded, to indicate velocity variations along the shaft. Locations and geometry of anomalies or unconsolidated zones shall be identified in 3D color images with detailed discussion. The results for CSL and 3D surveys shall be based on the percentage decrease in velocity as correlated to the

following Concrete Condition Rating Criteria (CCRC). The velocity datum of good concrete shall be established by averaging the velocities in the good concrete along the drilled shaft. Deviations from the velocity datum shall be used for determining the Concrete Condition Rating.

<b>Concrete Condition Rating Criteria</b>				
		<b>Overall Rating shall be the lower of the two criteria</b>		
<b>Concrete Condition Rating</b>	<b>Rating Symbol</b>	<b>Velocity Reduction</b>	<b>Signal Distortion/Strength</b>	<b>Indicative Results</b>
Good	G	0 to 10%	None / normal Energy Reduction ≤ 6 dB	Acceptable concrete
Questionable	Q	10% to 20%	Minor / lower Energy reduction = 6.1 to 9 dB	Minor concrete contamination or intrusion. Questionable quality concrete.
Poor	P/D	> 20%	Severe / much lower Energy reduction > 9 dB	Defects exist, possible water slurry contamination, soil intrusion, and or poor quality concrete.
Water	W	V= 4760 to 5005 ft/sec (≈60% reduction)	Severe / much lower Energy reduction > 12 dB	Water intrusion, or water filled gravel intrusion with few or no fines present.
No Signal	NS	No signal received	None	Soil intrusion or other severe defect absorbed the signal, tube debonding if near top.

<sup>a</sup> The baseline velocity shall be 13,000 feet per second for normal weight concrete with f'c = 3 to 5 ksi.

Correction of Unacceptable Results. The CSL consultant shall immediately inform the Engineer of any suspected anomalies, honeycombing or poor concrete quality detected by testing. The Contractor and CSL consultant shall duly perform further tests as directed by the Engineer to evaluate the extent of any detected anomalies. Core drilling, or other investigative methods as approved by the Engineer, shall be performed to further investigate the anomaly. If a defect is confirmed, the Contractor shall bear all costs involved with the shaft coring, grouting and remediation. Within 14 days of the completion of testing, the Contractor shall provide a report signed and sealed by a Professional Engineer registered in the State of Tennessee providing the results of the additional investigations and recommendations to accept or repair the shaft. The report shall also contain recommendations for modification of construction procedures to prevent defects for subsequent shaft installations. The dates of the completion of drilling, cleaning, steel placement and concrete pour shall also be provided. Construction above the top of shaft shall not be performed until the shaft has been accepted by the Engineer.

**625.52 Drilled Shaft Load Tests.** All load tests, when required by the contract documents, shall be completed and submitted to the Engineer for review and approval before construction of any production drilled shafts. The locations of load test shafts, the maximum loads to be applied, the test equipment to be furnished by the Contractor, and the actual sequence of the load testing shall be as shown on the Plans or as specified in the contract documents. After completion of testing, test shafts not used as production shafts shall be cut off at an elevation three feet below the finished ground line. The portion of shafts cut off shall be disposed of by the Contractor, at the Contractor's expense, in a manner approved by the Engineer.

## **Compensation**

### **625.53 Method of Measurement.**

Drilled Shaft Excavation (Soil). Accepted drilled shafts will be measured for payment to the nearest 0.10 vertical foot of length along the axis of each shaft. For shafts without a rock socket, measurement will be from the Plans elevation for the top of shaft to the bottom of the shaft. For shafts with a rock socket, measurement will be from the Plans elevation for the top of shaft to the top of the rock socket as defined in section "Drilled Shaft Excavation (Rock)".

Drilled Shaft Excavation (Rock). For pay purposes Drilled Shaft Excavation (Rock), the "top of rock" is defined as the elevation at which natural material cannot be drilled by conventional drilling tools and requires the use of special rock augers, core barrels, air tools, or specialized removal methods. The accepted rock sockets and drilling through rock will be measured for payment to the nearest 0.10 vertical foot of length along the axis of the shaft for the cumulative length of rock, as determined by the Engineer.

Drilled Shaft Concrete. Drilled shaft concrete shall include all cost for materials, placement concrete, and installation of steel pipes, as required by contract documents, for Sonic Logging Testing. Drilled shaft concrete will be measured by the cubic yard and computed from the dimensions indicated on the Plans or ordered in writing by the Engineer.

Drilled Shaft Reinforcing Steel. Drilled shaft reinforcing steel will be measured and computed for payment by the pound, unless otherwise stipulated in the Plans, in accordance with **subsection 604.30** of the Standard Specifications for Road and Bridge Construction .

Drilled Shaft Casing (Permanent). Permanent drilled shaft casing will be measured by the vertical foot of permanent casing installed. Additional permanent drilled shaft casing installed for the convenience of the Contractor will not be measured for payment.

Drilled Shaft Casing (Temporary). Temporary Drilled shaft Casing will not be measured for payment and shall be incidental to the work.

Foundation Probe Holes. Foundation probe holes will be measured for payment to the nearest 0.10 linear foot of length along the axis of each hole and paid for as Item Rock Drilling Bridges.

Foundation Core Holes. Measurement for payment for foundation core holes will be to the nearest 0.10 linear foot of length along the axis of each hole.

Concrete Coring. Measurement for payment for concrete cores will be to the nearest 0.10 vertical foot of length along the axis of the shaft from the top of concrete to a point determined

by the Engineer, and may extend the entire length of the shaft plus one foot below the bottom of the rock socket.

Sonic Logging Testing. When testing is not performed by the CEI, sonic logging testing of drilled shafts, as required, will be measured for payment per each drilled shaft.

Drilled Shaft Load Tests. Load tests will be measured for payment per each load test performed.

#### **625.54 Basis of Payment.**

Drilled Shaft (Soil). Payment will be considered full compensation for all temporary steel casing required, costs of drilling, excavation, slurry, dewatering, cleaning, and incidental work and materials required to complete the excavation. Payment for any drilled shaft excavation will be at the contract unit price per vertical foot for the diameter of the drilled shafts specified. No additional compensation will be made for concrete required to fill an oversized casing or for oversized excavation.

Drilled Shaft (Rock). Payment will be considered full compensation for drilling, excavation, slurry, cleaning, dewatering, and incidental work and material required to complete the excavation. For payment purposes the length of any rock socket installed and accepted shall be paid for at the contract unit price per vertical foot for the diameter of the rock socket specified. If the method of construction requires that drilled shaft casing be seated into the sound rock such that the bottom of the casing is below the determined top of sound rock elevation, payment for excavation below the top of the sound rock layer (top of the rock socket) will be included in the payment for the rock socket. In the event that the Engineer orders additional rock socket construction, payment for the additional length will be at the contract unit price per vertical foot of rock socket. Payment will be considered full compensation for the additional excavation into rock including all incidentals necessary to complete the work down to the elevation designated by the Engineer. Additional reinforcing steel and concrete shall be paid for at the contract unit bid price.

Obstructions. Removal of obstruction(s) will be paid at two times the unit price bid for Item Drilled Shaft (Rock) V.F. for the shaft length from the first occurrence of the obstruction until such depth that the shaft is advanced to the point of removal of the obstruction and normal shaft excavation methods can resume.

Drilled Shaft Concrete. Include all costs associated with furnishing and placing concrete in the drilled shaft in the unit price bid per cubic yard for Drilled Shaft Concrete in accordance with the Contract Plans. Include all costs associated with furnishing and installing Sonic logging access tubes and any required extensions in the unit price bid per cubic yard for Item Drilled Shaft Concrete. No payment will be made for construction delays resulting from the initial sonic logging testing of the drilled shaft. The Department will pay the costs for the initial sonic logging testing. The Contractor shall pay for all costs associated with coring, engineering design, cost required to correct defects and any construction delay costs, if a defect is found based on the sonic logging. The Contractor shall pay the costs of sonic logging testing to re-test the repaired drilled shafts.

Drilled Shaft Reinforcing Steel. Include all costs associated with furnishing and placing reinforcing steel, including but not limited to spacers, ties, and splices, in the drilled shaft at the

unit price bid per pound for Reinforcing Steel in accordance with Subsection **604.31** of the Standard Specifications.

Drilled Shaft Casing (Permanent). Include all costs associated with furnishing and installing permanent casing in the drilled shaft in the unit price bid per vertical foot of Drilled Shaft Casing. Temporary Casing, including all costs associated with installation and removal, shall be included in the bid price for item Drilled Shaft Excavation.

Foundation Core Holes. When core drilling is required by contract documents, payment will be at the contract unit price per linear foot for Item Core Drilling and Sampling. Payment will be considered full compensation for drilling or coring the holes, extracting and packaging the samples or cores, laboratory testing, delivering the samples or cores to the specified TDOT location and for all other expenses necessary to complete the work. When Core Drilling is not included in the contract documents and is required by site conditions and directed by the Engineer, Core Drilling shall be paid at the contract unit price for Item Concrete Coring. Payment shall be full compensation for completing the core drilling as specified above.

Concrete Coring. Payment for concrete coring will be considered full compensation for all material, labor, tools, equipment, grouting and incidentals necessary to complete the work. The field measured quantity shall be paid at the contract unit price per vertical foot for Item Concrete Coring.

Sonic Logging Testing. When testing is not performed by the CEI, payment for sonic logging testing of drilled shafts, when required by contract documents, or directed by the Engineer, will be made at the contract unit price per each drilled shaft for sonic logging testing. No payment will be made for supplementary sonic logging testing to evaluate defects. Payment for sonic logging testing will be considered full compensation for providing all equipment, conducting the actual probing measurements as specified, furnishing reports, removing equipment, and all tools, labor and any incidentals necessary to complete the work. The number of sonic logging inspections may vary from the estimated quantities, but the contract unit price shall prevail regardless of the variation.

Drilled Shaft Load Tests. When required by contract documents, drilled shaft load test will be paid at the contract unit price per each and will be considered full compensation for all costs related to performing and reporting load tests as specified.



**STATE**

**OF**

**TENNESSEE**

(Rev. 02-03-07)

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS**

**Scope:**

The design requirements of this Special Provision shall apply to Section 713-Highway Signing, Section 714-Roadway and Structure Lighting, and Section 730-Traffic Signals of the Standard Specifications for Road and Bridge Construction, January 1, 2015

**Description:**

The design of the supports for overhead sign bridges, cantilever and butterfly configurations, high mast lighting, luminaires and traffic signals shall be in accordance with the American Association of Highway and Transportation Officials (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, current edition, with addenda.

**General Conditions:**

All overhead sign bridge, cantilever and butterfly sign structures, traffic signal mast arm structures and high mast light poles, as well as any luminaire poles 90-ft or greater in height, shall be designed using the Fatigue Category 1 provisions found in the subject specifications except that, design for galloping-induced fatigue, is excluded. Fatigue designs are not required for luminaire poles less than 90-ft in height, span-wire poles or roadside sign poles.

In lieu of designing for galloping-induced fatigue in mast arm pole assemblies, a 60-inch by 16-inch by 0.125 gauge aluminum or galvanized steel panel shall be installed near the end of the mast arm with the long axis of the panel collinear with the long axis of the mast. The panel shall be mounted at such a height as to provide a least a 6-inch clearance from the top of the signal assembly or sign blank located on the mast arm within the length of the anti-galloping panel. The panel and attachment hardware shall be shown on the shop drawings, and is considered an item included in the price bid for the mast arm assembly.

Additionally, all mast arm connections to the support pole shall be accomplished using a wrap-around ring stiffener assembly.

The following design coordinating instructions are as follows:

- The Basic Wind Speed shall be 90 mph.
- The Design Life/Recurrence Interval shall be 50-years.
- The speed for calculating Truck-induced gust loads shall be 65 mph.

**S T A T E**

**O F**

**T E N N E S S E E**

(Rev. 07-01-04)

(Rev. 10-01-06)

(Rev. 10-31-11)

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**TRAFFIC CONTROL SUPERVISOR**

At the preconstruction conference the Contractor shall designate a Worksite Traffic Supervisor other than the Superintendent to be responsible for initiating, installing, and maintaining all traffic control devices in accordance with all applicable special provisions, standard drawings, plans, specifications, and the most current edition of the Manual on Uniform Traffic Control Devices.

**Qualifications.** The Worksite Traffic Supervisor shall be certified by the American Traffic Safety Services Association Worksite Traffic Supervisor Certification Program, or the National Highway Institute by having satisfactorily completed training in “Design and Operation of Work Zone Traffic Control” taught by the University of Tennessee Transportation Center. In addition, they shall have at least one-year’s experience directly related to worksite traffic control in a supervisory or responsible capacity.

**Responsibilities.** The Worksite Traffic Supervisor shall:

1. Oversee all operations which contribute to the convenience, safety and orderly movement of traffic.
2. Be available on a twenty-four hour basis with access to all manpower, equipment and materials needed to maintain traffic control devices and handle traffic related situations.
3. Maintain documentation to become part of the final project records of all daily activities including deficiencies found, how they were corrected and the personnel, equipment and traffic control devices utilized.
4. Correct routine deficiencies within a twenty-four (24) hour period after discovery.
5. Be available on the site within 45 minutes after notification of an emergency situation, prepared to effect corrective measures immediately.
6. Make daily inspections of all traffic control devices (at least every third inspection shall be at night).

7. Prepare and submit for approval any revisions to the existing traffic control plan sufficiently in advance to allow Department review prior to implementation.
8. Coordinate project traffic control activities with appropriate local law enforcement and emergency agencies.
9. Coordinate public awareness of changing traffic conditions through TDOT.
10. Educate all employees of the Contractor utilized as flaggers on proper flagging procedures.

**Emergency Maintenance.** Emergency maintenance shall consist of maintenance, repair, or replacement of traffic control devices that have been damaged, vandalized, or otherwise rendered ineffective to the extent that a serious hazard exists. The Traffic Control Supervisor shall cause such emergency work to begin within two (2) hours after being notified. When emergency maintenance is required during nonworking hours, devices that are classified as “unacceptable” according to ATSSA Quality Standards for Workzone Traffic Control Devices may be used, provided that the devices are effective in reducing the existing hazard, and further provided that they are replaced not later than the next business day. The Traffic Control Supervisor shall keep the Resident Engineer informed of the name, address, and telephone number of the individual responsible for performing emergency maintenance.

**Failure to Comply.** In the event a routine traffic control deficiency is not corrected within twenty-four (24) hours after discovery, a deduction in the amount of one hundred dollars (\$100.00) shall be made from monies due the Contractor for each calendar day that the deficiency is allowed to remain, not as penalty, but as liquidated damages.

In the event that immediate action is not taken to correct an emergency situation, a deduction in accordance with Subsection 712.04 shall be made from monies due the Contractor. In addition, if deemed necessary by the Engineer due to lack of response by the Contractor, State Maintenance Forces may be mobilized to correct the emergency situation with all costs of the corrective action being assessed against monies due the Contractor. This assessment for costs incurred shall be in addition to the assessment of the amount in accordance with Subsection 712.04.

The preceding assessments shall be in addition to any liquidated damages which may be assessed in accordance with Subsection 108.07.

**Basis of Payment.** The labor costs involved in the provision of the Traffic Control Supervisor, and any equipment, tools, or incidentals necessary to complete the work, are to be compensated fully by the lump sum price bid for Traffic Control Supervisor, Item No. 712-01.04.

**STATE****OF****TENNESSEE**

November 8, 2019

January 1, 2015

**SPECIAL PROVISION**  
**REGARDING**  
**DIGITAL SPEED LIMIT SIGN ASSEMBLY**  
**(VARIABLE SPEED ZONE)**

**DESCRIPTION**

This work shall consist of the furnishing, installation, and operation of a work zone Digital Speed Limit Sign Assembly on interstates and freeways with speed limits greater than 55 MPH or facilities that have significant traffic volumes and impacts. The signs are regulatory speed limit signs with LED displays for the speed limit numbers.

The purpose of Digital Speed Limit Sign Assembly is to easily change work zone speed limits between activities that necessitate the need for a lower speed limit and the ones that do not.

**EQUIPMENT**

Digital Speed Limit Sign Assembly shall meet the following criteria.

1. Have a minimum dimension of 48" wide x 60" high. The speed limit sign (R2-1) shall be black on white with high intensity white prismatic sheeting mounted on aluminum.
2. The Digital Speed Limit sign shall be mounted such that the bottom of the sign is 7' above roadway.
3. The LED panel shall be a minimum of 28" wide x 18" high. The display on the LED panel shall be white.
4. The LED numbers shall have a minimum 5 wide by 7 high pixel array with a minimum height of 18".
5. The LED panel shall have auto brightness/dimming capability.
6. A black on orange "WORK ZONE" -plaque shall be mounted above the Speed Limit sign. It shall be 48" wide x 12" high with high intensity prismatic orange sheeting mounted on aluminum.

7. The Digital Speed Limit Sign Assembly shall have flashing beacons. Beacons shall be 12" diameter LED circular yellow. They shall be mounted above and below sign assemblies and are to be centered horizontally. The beacons shall alternately flash at rates not less than 50 or more than 60 times per minute.
8. The Digital Speed Limit Sign Assemblies shall have operational software and wireless communications that allows for remote operation and data monitoring.
9. The Digital Speed Limit Signs may be trailer mounted or stationary mounted. The unit shall be Solar powered and have the ability to operate continuously. It shall be supplemented with a battery backup system which includes a 110/120 VAC powered on-board charging system
10. The batteries, when fully charged; shall be capable of powering the display for 20 continuous days with no solar power. The unit shall be capable of being powered by standard 110/120 VAC power source. Store the battery bank and charging system in a lockable, weather and vandal resistant box.
11. See TDOT Qualified Products List No.44 for approved products that meet these specifications.

### **CONSTRUCTION REQUIREMENTS**

The Speed Limit shall be continuously displayed on the signs. The speed limits are the sole authority of TDOT. All speed limits are to be ordained by the State Traffic Engineer in order to have a lawfully enforceable speed limit.

1. The Traffic Engineer or designee will approve all Work Zone Speed Limits based on activities and conditions that warrant.
2. All existing static Speed Limit signs within the work zone speed zone shall be covered or removed at the time of Digital Speed Limit Sign Assembly installation. Signs shall be covered with an opaque, form fitting, tear resistant material that fully obscures any text.
3. The Contractor will be responsible for coordinating with the Engineer when the Work Zone Speed Limits are to be changed and will have to seek approval by the Engineer or his designee before the Speed Limit is changed.
4. Sign placement shall begin within the advanced warning area with one (1) sign placed on the Right side of the road. Subsequent signs shall be positioned at intervals no greater than 2 miles with one (1) placed after each entrance ramp within the work zone.
5. Placement of signs shall be on the right side of the road unless infeasible or as directed by engineer. Placement of signs shall not interfere with the function of roadside devices such as guard rail or terminals
6. Flashing beacons shall be activated at the time of any workers present, no earlier than 30 minutes prior to workers arriving and be deactivated at the conclusion of work no later than

30 minutes after all workers depart.

- 7. On a weekly basis for the duration of the project, supply a printable copy of the Tracking Report, reflecting the times of the speed limit changes along with their corresponding speed values.

**METHOD OF MEASUREMENT**

The Department will measure by each the Digital Speed Limit Sign Assembly, complete in place and accepted, according to the number of Digital Speed Limit Sign Assemblies required per the spacing requirements. Payment will be made for each sign used for the duration of the project.

**BASIS OF PAYMENT**

The Department will pay for accepted quantities, complete in place, at the contract price as follows:

Item No.	Description	Unit
712-08.09	DIGITAL SPEED LIMIT SIGN ASSEMBLY	EACH

Such payment is full compensation to furnish, coordinate, install, maintain, operate, track, monitor, subsequently remove Digital Speed Limit Sign Assemblies as well as provide the weekly Tracking Report shall be included. The expense of covering or removal, and subsequent restoration of existing Speed Limit or Minimum Speed Limit signs, including any necessary supports, shall be included in the pay item for the Digital Speed Limit Sign Assembly. All installations, relocations and removals, of supplemental signs, including signs and necessary supports, shall be included in the pay item for Digital Speed Limit Sign Assembly.

**STATE****OF****TENNESSEE****(Rev. 1-27-17)****(Rev. 11-6-17)****January 1, 2015****SPECIAL PROVISION****REGARDING****PORTABLE QUEUE WARNING SYSTEM**

**Description:** A Portable Queue Warning System shall be utilized to provide protection of traffic queues caused by construction operations. The system shall consist of portable radar sensors, a portable changeable message sign, and queue protection truck(s). The deployment of the system shall clearly alert motorists of speed differentials ahead. The Contractor shall maintain and update the system as required throughout the duration of the project.

**Equipment:** The contractor shall provide the following minimum equipment for each traveling direction where traffic flow is reduced due to the installation of a temporary lane or shoulder closure or due to temporarily shifting traffic.

1. A truck mounted attenuator that meets or exceeds NCHRP-350 TL-3 or MASH requirements.
  - Mobile queue warning truck cab & chassis must meet and/or exceed manufacturers recommended gross vehicle weight (GVW) requirements.
  - A minimum of Four (4) strobe lights (with auto-dimmers) positioned rear facing
  - Two (2) mounted under rear bumper
  - Two (2) mounted at cab level
  - A truck mounted message board with a full matrix display and a minimum panel size of 72" W x 35" H mounted as per manufacturer specifications.
  - All Queue truck operators shall have the following mandatory training: Four Hour National Traffic Incident Management (TIM) Responder Training for Queue Truck Operators or approved equal training program developed by ATSSA or The National Safety Council
2. Four (4) portable microwave radar sensors – to include cellular communication capabilities, battery life of 20 consecutive days and provide up to three (3) miles of queue warning in advance of the hazard. Radar sensors shall be installed as per manufacturer's recommendations and evenly spaced between work zone and Portable Changeable Message Sign (PCMS).



3. One (1) full matrix portable changeable message sign (PCMS) capable of communicating with the microwave radar sensors, and able to function as an early detection system. PCMS shall be installed approximately 3.0 to 3.5 miles in advance of the work zone.
4. Either a radar system mounted to the PCMS or the independent portable microwave radar sensors shall be capable of collecting traffic speed data and the processed data shall be user configurable and used to trigger pre-programmed messages to the PCMS advising motorists of impending traffic delays or stopped traffic conditions.
5. Weekly traffic data reports shall be made available to the project engineer and should include: Speed data per sensor location, travel time and queue lengths in both graphical and numerical formats.
6. Radar and PCMS units shall be capable of rapid deployment for daily operations. Radar and PCMS units on Projects approximately 3 miles in length or less may remain in place throughout project duration if approved by the project engineer.

**Maintenance of Traffic:** The following procedures will be followed until free flow traffic conditions are present: (“free flow” is defined as the absence of a temporary lane or shoulder closure or absence of a temporary shift of traffic lanes with no queue present).

- Portable Queue Warning system equipment shall utilized during planned lane closures and other project activities expected to cause a queue.
- The PCMS shall be installed approximately 3-3.5 miles in advance of the work zone and should change messages in real time pertinent to traffic conditions. Messages shall be determined by the Project Engineer at the Preconstruction Conference.
- The queue protection truck shall be positioned approximately no further than ½ mile upstream from the back of the slow moving traffic, and may be used to protect the workers inside the work zone in the event of no queue being present.
- The queue protection truck shall be positioned on the shoulder and clear of the traveled way so as not to impede traffic.
- The queue protection truck shall relocate as needed to maintain a minimum approximately ½ mile distance from the back of the slow moving traffic.
- Trucks shall be continuously manned by a driver when in use. Trucks shall not be parked on the shoulder without a driver.
- The message board mounted to the queue truck shall display an appropriate message such as “stopped traffic ahead” or “caution: slow traffic ahead”.
- Microwave Radar Sensors shall be spaced evenly between the work zone and the PCMS and shall communicate with the PCMS in real time.

- Queue length estimates and traffic conditions shall be reported to the TDOT District Operations Supervisor or designee at the following periods:
  1. At 30 minute intervals
  2. At significant changes
  3. Duration of work is complete
  4. When free flow traffic is achieved

The portable queue warning system shall be mobilized when lane or shoulder restrictions exist. The system is intended to remain in place for the duration of lane or shoulder restrictions and shall be de-mobilized when all lane and shoulder restrictions are removed. If the Engineer deems necessary, the portable queue warning system may be deployed at any time.

**Emergency Call Out:** When approved by the Engineer, additional queue protection truck(s) may be called out and shall be mobilized in one hour or less. Maximum queue truck coverage area for emergency incidents shall be 5 miles from the limits of construction. Payment will be made at the bid rate per DAY as compensation for use of the queue truck(s) and driver(s) for each day in which the contractor must provide emergency queue trucks to the project work at the Engineer's request.

**Method of Measurement:**

Item 712-08.14, PORTABLE QUEUE WARNING SYSTEM, shall be paid for each complete queue warning system providing queue protection each day. Systems that are left in place for the duration of the project shall not be paid for time when work is not being performed.

Item 712-08.13, QUEUE PROTECTION TRUCK (EMERGENCY CALL OUT), shall be paid for each truck providing emergency queue protection each day. Idle or standby time shall be included in the bid price.

**Basis of Payment:** The following items shall be paid by the DAY defined as a work shift and shall include all incidentals.

Item 712-08.13, QUEUE PROTECTION TRUCK (EMERGENCY CALL OUT), DAY shall include the QUEUE PROTECTION TRUCK, labor, and all related equipment.

Item 712-08.14, PORTABLE QUEUE WARNING SYSTEM, Day, shall include queue protection truck, radar sensor(s), message board, labor and all related equipment outlined above and used as a part of the portable queue warning system and costs associated with those items during any given day.

STATEOFTENNESSEE

Rev. 10-9-17

January 1, 2015

**SPECIAL PROVISION****REGARDING****TRAFFIC QUEUE PROTECTION**

**Description:** When construction activities are performed on control-access or limited access facilities, the Contractor shall pursue efforts for the protection of traffic queues caused by project operations and clearly demonstrate adequate good faith efforts as described herein. The queue protection truck is expected to alert motorists (inside or outside of project limits) of all stopped traffic caused by construction activities or incidents within the project limits.

**Equipment:** The contractor shall provide a minimum of one (1) queue protection truck for each traveling direction where traffic flow is reduced. One (1) additional queue protection truck shall be onsite in reserve. The system deployed must fulfill the following minimum requirements:

1. A truck mounted attenuator that meets or exceeds NCHRP TL-3 requirements.
2. Four (4) round yellow strobe lights (with auto-dimmers) positioned rear facing
  - Two (2) mounted under rear bumper
  - Two (2) mounted at cab level
3. One (1) standard cab mounted light bar.
4. A truck mounted message board with a minimum of 3 Lines and 8 Characters per line.
5. Four Hour National Traffic Incident Management (TIM) Responder Training for Queue Truck Operators.

**Maintenance of Traffic:** The following procedures will be followed until free flow traffic conditions are present:

- The queue protection truck shall be positioned no further than ½ mile upstream from the back of the slow moving traffic.
- The queue protection truck shall be positioned on the shoulder and clear of the traveled way so as not to impede traffic.
- The queue protection truck shall relocate as needed to maintain approximately ½ mile distance from the back of the slow moving traffic.
- The 2nd queue protection truck shall be held in reserve, on site, and

support the primary truck if conditions prevent repositioning by reverse. This truck shall not be paid for idle time.

- Trucks shall be kept in project limits during planned lane closures and other project activities expected to cause a queue.
- Queue length estimates and traffic conditions shall be reported to the TDOT District Operations Supervisor or designee at the following periods:
  1. At 30 minute intervals
  2. At significant changes
  3. When free flow traffic is achieved

The queue protection truck shall be mobilized as directed by the District Operations Supervisor or designee and shall be de-mobilized when free flow conditions are reached.

**Basis of Payment:** The queue protection truck, all related equipment, and labor shall be paid for as Item No. 712-08.10, per hour. All costs are to be included in the price bid. Idle time shall not be paid.

**STATE****OF****TENNESSEE**

October 17, 2019  
(Rev. 6-30-20)

January 1, 2015

**SPECIAL PROVISION****REGARDING****CONTRAST PAVEMENT MARKINGS****Description**

This work shall consist of the placement of a Contrast Pavement Marking system on concrete surfaces. The Contrast Pavement Marking System shall consist of either a white and black or yellow and black pavement marking. (see Details 716CPM-1, 2, & 3) The Contrast Pavement Marking system shall be used on lane lines, edge lines and dotted lines and meet current Standard Specifications except as noted in this Provision.

**Materials**

Provide materials that are specified as follows:

**A. Thermoplastic Pavement Marking**

1. White and Yellow thermoplastic pavement marking material shall meet requirements of **919.01** for the screed extrusion or ribbon dispenser methods.
2. Black contrast thermoplastic pavement marking material shall conform to material requirements in **919.01** for screed extrusion or ribbon dispenser methods or **919.02** for the spray method. The intermix glass beads for the black thermoplastic pavement marking material shall consist of only Type 1 glass beads for all application methods.
3. All thermoplastic systems shall provide white and black, or yellow and black thermoplastic as matching systems from the same manufacturer.

**B. Alternate Contrast Pavement Markings**

An alternate to contrast thermoplastic pavement marking material shall be selected from the Department' Qualified Products List (QPL List 1: Section B) and is Preformed Tape with a thickness of 80 mils minimum or Preformed Thermoplastic Material with a thickness of 90 mils minimum.

### C. Certification

1. Furnish a manufacturer's certification to the Engineer for each lot furnished, certifying that the material supplied conforms to all requirements specified.
2. The certification shall include or have attached typical results of all required tests and the requirements it represents.

### Construction Requirements

Apply the Contrast Pavement Marking system according to the manufacturer's recommendations and specified in **716.03**. Apply to concrete surfaces with the proper application temperatures and after surface preparation as recommended by the material manufacturer.

Do not apply Contrast Pavement Marking to existing or new concrete surfaces unless the ambient air temperature and the temperature of the concrete pavement is 50°F or higher.

To ensure optimum adhesion of the thermoplastic pavement marking material to concrete surfaces, apply a binder sealer material as recommended by the manufacturer.

#### A. Two Pass Application

1. Apply the black thermoplastic pavement marking material to the concrete surface at a thickness of 40 mils according to the manufacturer's recommendations.
2. Apply the white or yellow thermoplastic pavement marking material by the extruded or ribbon dispensed methods on top of the black thermoplastic pavement marking at a thickness of 100 mils according to the manufacturer's recommendations and Standard Specifications. The white or yellow pavement marking will be applied on top of the black pavement marking to create the Contrast Pavement Marking System with a total thickness of 140 mils.

#### Detail: 716CPM-1 Contrast Pavement Marking, Two-Pass Application



#### B. One Pass Application

Apply the White or yellow thermoplastic pavement marking material with black contrast thermoplastic pavement marking material simultaneously by the extruded or ribbon dispensed methods at a thickness of 110 mils according to the manufacture's recommendations.

**Detail: 716CPM-2 Contrast Pavement Marking, One-Pass Application**

110 mils



**C. Alternate Contrast Pavement Markings**

Apply the QPL approved Preformed Tape or Preformed Thermoplastic to the concrete surfaces according to manufacturer’s recommendations and as specified in **716.06**.

**Traffic Control**

1. Traffic control shall be completed in accordance with the plans and/or contract documents.
2. All traffic control operations shall apply with the MUTCD at a minimum. Any changes must be approved by the engineer.

**Method Of Measurement**

The Department will measure the length of each of these markings, complete in place and accepted, as listed in the bid schedule, along the center of each line. Only the marked line will be measured for payment.

The Department will measure the pavement marking words and symbols complete in place and accepted, by each for these markings.

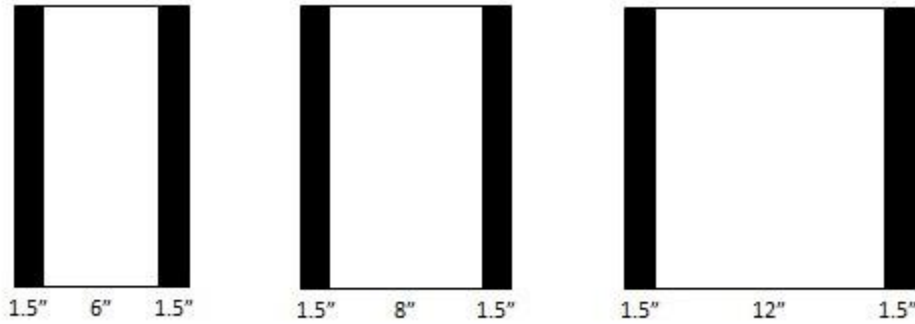
**Basis Of Payment**

The Department will pay for accepted quantities, complete in place, at the contract prices as follows:

<b>Item No.</b>	<b>Description</b>	<b>Unit</b>
716-09.86	CONTRAST PAVEMENT MARKING 6 INCH	LINEAR MILE
716-09.88	CONTRAST PAVEMENT MARKING 8 INCH	LINEAR MILE
716-09.89	CONTRAST PAVEMENT MARKING 12 INCH	LINEAR FEET
716-09.90	CONTRAST PAVEMENT MARKING 6 INCH DOTTED	LINEAR FEET
716-09.87	CONTRAST PAVEMENT MARKING, WORDS, AND SYMBOLS	EACH

Such payment is full compensation for preparation, layout, materials, labor, equipment, tools, royalties, and all other incidentals necessary to complete the work.

**Detail: 716CPM-3: Contrast Pavement Marking System**



Contrast Pavement Marking, 6-inch with 1-1/2 inch black border

Contrast Pavement Marking, 8-inch with 1-1/2 inch black border

Contrast Pavement Marking, 12-inch with 1-1/2 inch black border



**STATE**

**OF**

**TENNESSEE**

January 1, 2015

(Rev. 10-08-2015)  
(Rev. 09-06-2016)  
(Rev. 09-11-2018)  
(Rev. 10-02-2019)  
(Rev. 10-09-2020)

**SPECIAL PROVISION**

**REGARDING**

**REMOVAL AND DISPOSAL OF LITTER**

**Description.** This work shall consist of removal and disposal of litter from the entire highway rights-of-way where accessible (fence to fence where applicable), including shoulders and excluding the travel lanes on designated interstate and state routes.

**Definitions.**

**Litter.** Any object or group of objects foreign to the right-of-way which has been discarded or abandoned and is or may become visible from the edge of the roadway or shoulder as a result of mowing, vegetation management, maintenance operations, or traffic. Examples under this definition include but are not limited to paper, plastic, bottles, cans, wood, tires, portions of tire, and metal products.

**Continuous Operation.** The uninterrupted performance of work on successive working days until the completion of all of the items of work specific to litter removal in the contract are approved by the Engineer.

**Working Day.** A calendar day, exclusive of State recognized holidays, which weather or other conditions not under the control of the Contractor, will permit litter operations to proceed for at least five (5) hours of the day with the normal working force engaged in performing the controlling item or items of work which are normal to progress at the time, as determined by the Engineer.

**Equipment.** The contractor shall furnish all necessary equipment for the satisfactory performance of the work. All vehicles used on the project will be equipped with at least two 6" diameter flashing amber lights, visible in both directions and with a covering device to prevent the litter from being blown from the vehicle.

**Work Schedule.** The litter removal for each section of road shall be accomplished on a schedule that will assure that the spacing between the beginnings of each cycle is constant

throughout the entire life of the contract. For example, if there are twenty-six (26) cycles to be accomplished they are to be started and completed every two weeks. The maximum cycle time allowed for sections with fewer than twelve (12) cycles shall be thirty (30) calendar days. For contracts which require fewer than twelve (12) cycles the Engineer will notify the Contractor in writing at least five (5) working days prior to the beginning of each litter cycle. Work shall begin on the date specified by the Engineer and shall be a continuous operation. Each litter cycle shall begin at the same location and proceed as established in the preconstruction conference or as directed by the Engineer (see Section 105.06 of the January 1, 2015 Standard Specifications). The contractor shall supply sufficient resources to accomplish the work during the allotted cycle time.

**Time and Frequency Litter.** The number of litter cycles will be indicated in the Special Notes and will correspond to the mowing schedule. One litter cycle will be reserved for winter pick-up (if needed) and scheduled at the discretion of the Engineer. In addition, the Engineer may eliminate an entire cycle or require a partial litter cycle at certain locations. In the event the department experiences an increase in revenue, one additional litter cycle may be added to correspond to the mowing schedule as directed by the Engineer. A litter cycle will be considered complete when litter has been removed from the right-of-way specified in the Special Notes and all quantities associated with litter removal have been accepted as complete by the Engineer.

Litter removal operations on controlled access roads in Davidson, Hamilton, Knox, and Shelby shall not be performed during rush hour traffic from 6:00 A.M to 9:00 A.M and 3:00 P.M to 6:00 P.M. However, the contractor shall be allowed to work in the direction opposite to rush hour traffic during these times.

Litter removal shall be performed only during the hours of daylight Monday through Saturday, or as directed by the Engineer. If work is performed on Sunday, the Contractor will be charged a Working Day.

**Litter Removal and Disposal.** All litter shall be bagged and removed daily from the right-of-way. All litter accumulated each cycle by the Contractor will be removed from the right-of-way to a Class I dumpsite facility. All fees associated with disposal of litter removed from the state right-of way shall be included in the unit price bid for litter (item no. 719-02). The Contractor shall supply the Engineer with copies of dump tickets for each load deposited at the qualified dumpsite facility.

**Acceptance of Work.** The Department may accept a portion of the project before the entire project is completed. Such portion(s) shall be of reasonable length as determined by the Engineer, and shall be clean and free of litter when the inspection is made.

**Additional Work.** The Contractor may be required to remove litter in areas not specifically detailed in the Special Notes under the direction of the Engineer. Additional work shall be limited to the counties and systems which are designated in the Special Notes. Payment will be made at the contract unit price for litter removal (item no. 719-02).

**Traffic Control.** The Contractor shall maintain work zone traffic control and all traffic control devices for litter removal operations according to the requirements contained herein, the State of Tennessee's currently adopted edition of the Manual on Uniform Traffic Control Devices (MUTCD) defined under the Rules of Tennessee Department of Transportation Chapter 1680-3-1, and the Standard Specifications. Although Traffic Control may be included in the cost of other items, the contractor will be responsible for submitting certifications per Materials & Tests Division Standard Operating Procedures.

**Warning Signs.** The Contractor shall furnish portable signs in accordance with the "Manual on Uniform Traffic Control Devices" to notify the traveling public of litter operations. The Contractor shall place these signs on the highway during litter operations and remove them immediately after the operation ceases. Signs at the beginning point shall be forty-eight inches (48") by forty-eight inches (48") in size; diamond-shaped with black letters on an orange background with a black border with eight-inch high letters. These signs shall be dual mounted, one on each shoulder, for both directions of travel.

**Safety Requirements.** The Contractor shall comply with OSHA standards, including the use of Class 3 reflective shirts or vests at all times.

Notification to the Engineer shall be made immediately of any personal injury, accidents involving contractor's equipment, or accidents involving the motoring public.

While equipment is not in use, it shall be parked or stored off the pavement or shoulder of the highway in an inconspicuous place more than thirty (30) feet from edge of pavement or as directed by the Engineer.

The Contractor shall be required to have the company name and phone number on all work zone support vehicles on the left and right sides in a location that is visible to the public. The lettering for the company name and phone number shall consist of a reflectorized material with a minimum height of three inches (3") or five inches (5") in height if non- reflectorized.

**Method of Measurement.** Litter pickup and disposal will be measured by the centerline mile. Measurement will be made longitudinally along the centerline of the project including bridges, and such single measurement shall include removal and disposal of all litter on interchanges; State maintained cross roads, and service roads within the lateral limits of the rights-of-way excluding the travel lanes.

**Basis of Payment.** Removal and disposal of litter will be paid for at the contract unit price per centerline mile which shall be full compensation for mobilization and performance of the work in accordance with the stipulations, provisions and requirements contained herein.

All costs for traffic control as defined above shall be included in the unit bid price for litter removal Item No. 719-02.

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T E N N E S S E E

(Rev. 12-18-95)

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**TEMPORARY TRAFFIC CONTROL (SIGNALIZATION)**

Delete **Subsection 730.01** of the Standard Specifications and substitute the following:

**730.01 - Description of Work** - This work shall consist of furnishing, erecting, and maintaining all signalization equipment and materials installed in accordance with the provisions of the current edition of the "Manual for Uniform Traffic Control Devices for Streets and Highways", Federal Highway Administration, and these Specifications, or as specified by the plans or directed by the Engineer for the purpose of safely directing traffic through construction zones.

Material and equipment, while not required to be new, shall nevertheless, be in good condition and ready for use. If the Contractor elects to use a traffic signal controller that is not new, certification shall be submitted that the equipment has been tested to the original manufacturers' specifications and is in good working condition, and that all applicable NEMA environmental standards are met.

All equipment necessary for the satisfactory performance of this work shall be on hand and approved before the work will be permitted to begin. All construction requirements for this work shall be as prescribed in **Section 712 - Temporary Traffic Control**.

Delete **Subsection 730.03** of the Standard Specifications and substitute the following:

**730.03-Submittal Data Requirements** - Within 30 days after the issuance of the work order, the Contractor shall submit to the Engineer and to the Division of Materials and Tests one collated set of the manufacturer's descriptive literature and technical data which fully describes the types of signal equipment he proposes to use. A copy of the transmittal letter for this submittal shall be provided to the Engineer. Descriptive literature shall include the manufacturer, models, etc. and be adequate to determine if the equipment or material meets the requirements of the Plans and specifications. These sets of submittal data shall include a list of the materials submitted along with descriptive material for, but not limited to, the following items:

Controller  
Cabinet and Exhaust Fan  
Detectors  
Signal Heads including Lamp Information and Mounting Hardware  
Loop Wire and Loop Sealant  
Shielded Detector Cable  
Signal Cable  
Cable for Span Wire, Guys, etc.  
Pull Boxes  
Conduit  
Coordination Equipment  
Wood Poles

In addition to the above, the Contractor shall submit to the Engineer a notarized letter certifying that all traffic signal materials listed in the submittal are in conformance with the Plans and Specifications.

If the signal equipment has been approved previously by the Department, a certified letter referencing the Contract and a statement confirming that the equipment has been tested in accordance with **Section 730.01**, may be submitted in lieu of the two (2) sets of the manufacturers descriptive material described above. The submittal sets shall also include detailed scale drawings of any non-standard or special equipment and of any proposed deviation from the Plans. If requested to do so, the contractor shall submit for approval sample articles of any materials proposed for use. The Department will not be liable for any materials purchased, labor performed, or delay to the work prior to such approval.

Add the following after the fifth paragraph of **Subsection 730.24**:

If polycarbonate signal heads are provided, they shall be the same in appearance as metal signals except the lenses, housings, doors and visors shall be molded of polycarbonate resin and shall withstand 70 ft-lb impact without fracture or permanent deformation. The color of the signal shall be Federal yellow and shall be homogenous throughout. Reflectors shall be "ALZAK" process coated aluminum or approved equal material and shall conform to the latest revised specifications of the ITE Technical Report No. 1.

Delete 6 (K.) under Controller Cabinets in **Subsection 730.25** and substitute the following:

- K. All cabinet housing solid-state controllers shall be supplied with a signal conflict monitor which meets the NEMA standards. The signal conflict monitor (SCM) shall be wired to sample the following cabinet functions:
  - 1. Each phase Red/Yellow/Green/Walk display.
  - 2. Controller plus 24 volt output.

3. Controller Voltage Monitor function.

The following conditions shall be sensed by the monitor and the SCM shall place the cabinet in the Flash Mode:

1. Absence of an active AC input on a channel.
2. Green/Yellow both active on a channel.
3. Yellow/Red both active on a channel.
4. Green/Green active on conflicting channels.
5. Green/Walk active on conflicting channels.
6. Green/Yellow active on conflicting channels.
7. Absence of the 24 VDC required to operate the load switches.
8. Controller Voltage Monitor circuit indicates a controller malfunction.
9. Defeatable per channel operation that times the Phase Yellow Clearance interval. If the Phase Yellow Clearance is less than 3.0 seconds, the intersection shall be placed in the FLASH mode.

The SCM shall be wired in the cabinet in such a manner that the cabinet will provide ONLY FLASH operation if the SCM is not properly mounted.

The SCM shall be provided with front panel indicators to display the following:

1. AC power is active.
2. Channel active indicators.
3. Failed status.
  - a. Plus 24 VDC I.
  - b. Plus 24 VDC II.
  - c. Conflict.
  - d. Controller Voltage Monitor.
  - e. Absence of Signal.
  - f. Power Failure after conflict.

The SCM shall have a defeatable "Start in Flash Period" which shall be user adjustable over the range of 4-10 seconds. This circuitry shall guarantee a minimum flash operation period of the intersection when power is applied to the monitor.

The monitor shall be provided with a front-panel reset switch and power fuse.

The type of monitor required shall be as specified previously, but in no case will a cabinet be acceptable which has phase red/yellow/green/ or walk displays which are not monitored by the SCM.

The signal monitor sampling inputs shall be terminated at the point in the cabinet which is closest to the field termination point.

Add the following after the fourth paragraph of **Subsection 730.29**:

Microwave Vehicle Detector

Microwave vehicle detectors shall be self-contained units capable of emitting a low power microwave beam over one or more lanes of traffic. The microwave vehicle detector shall have the following requirements:

1. Shall have directional detection capability with a detection range of 5 to 50 meters (16 to 160 feet) measured from the detector over the approach traffic lane.
2. Shall have pan and tilt adjustability.
3. Shall have a detection delay of a minimum of one third of a second before an output is generated.
4. Shall be housed in an aluminum enclosure.

STATE

OF

TENNESSEE

July 23, 2001  
Sheet 1 of 6

SPECIAL PROVISION

REGARDING

VIDEO DETECTION FOR TRAFFIC SIGNALS

This specification establishes the minimum requirements for a system that detects vehicles on a roadway by video image processing.

1.0 FUNCTIONAL CAPABILITIES

Generally, the system shall include video cameras, image processing units, and all appurtenances as recommended by the manufacturer for proper operation. A manufacturer may meet the functional aspects of this specification by integrating the optics, image processing hardware, and a general purpose CPU in one sealed enclosure.

1.1 AVAILABLE SYSTEM CONFIGURATION

The proposed video vehicle detection system shall be available in various configurations to allow maximum deployment flexibility. Each configuration shall have identical user interface for system setup and configuration. The communications protocol to each configuration shall be identical and shall be hardware platform independent.

Wired camera systems shall be able to transmit NTSC or PAL video signals, with minimal degradation, up to 1000 feet under ideal conditions.

Wireless camera systems shall be able to transmit NTSC or PAL video signals, with minimal degradation, up to 500 feet under normal conditions, and up to 900 feet under ideal electromagnetic interference conditions.

1.2 SYSTEM INTERFACES

VIDEO INPUT: Each video input shall accept RS170 (NTSC) or CCIR (PAL) signals from an external video source (camera sensor or VCR). The interface connector shall be located on the video processing unit.

VIDEO LOCK LED: A LED indicator shall be provided to indicate the presence of the video signal. The LED shall illuminate upon valid video synchronization and turn off when the presence of a valid video signal is removed



**VIDEO OUTPUT:** One video output shall be provided. The video output shall be RS170 or CCIR compliant and shall pass through the input video signal.

**SERIAL COMMUNICATIONS:** A serial communications port shall be provided. The serial port shall be compliant with RS232. The serial communications interface shall allow the user to remotely configure the system and/or to extract calculated vehicle/roadway information. The interface protocol shall be documented and interface software shall be provided. The interface protocol shall support multi-drop or point-to-multipoint communications. Each video vehicle detection system shall have the capability to be addressable.

**DETECTION LEDS:** LED's shall be provided on the front panel. The LED's shall illuminate when a contact closure output occurs.

### **1.3 GENERAL SYSTEM FUNCTIONS**

Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device or via a laptop computer.

The video detection processing unit (VDPU) shall store a minimum of two different detection zone patterns.

The VDPU shall detect vehicles in real time as they travel across each detection zone.

The VDPU shall have an RS232 port for communications with an external computer. The VDPU RS232 port shall be multi-drop capable.

The VDPU shall accept new detection patterns from an external computer through the RS-232 port when the external computer uses the correct communications protocol for downloading detection patterns. A WINDOWS™-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

The VDPU shall send its detection patterns to an external computer through the RS-232 port when requested when the external computer uses the correct communications protocol for uploading detection patterns.

The VDPU shall default to a safe condition, such as a constant call on each active detection channel, in the event of unacceptable interference with the video signal.

The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all defined detection zones in a constant call mode. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

## 2.0 VEHICLE DETECTION

### 2.1 DETECTION ZONES

A minimum of 128 detection zones (a minimum of 24 detection zones per camera) shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region.

A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single phase of traffic movement.

The VDPU's memory shall be non-volatile to prevent data loss during power outages.

The selection of the detection zone pattern for current use shall be available.

The VDPU shall provide dynamic zone reconfiguration (DZR). DZR enables normal operation of existing detection zones when one zone is being added or modified during the setup process. The vehicle detection equipment shall output a constant call on any detector channel corresponding to a zone being modified.

Detection zones shall be directional to reduce false detections from objects traveling in directions other than the desired direction of travel in the detection area.

The VDPU shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDPU shall output a constant call during the background learning period.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs.

A minimum of six detection zones per camera view shall have the capability to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in at least the periods of 1, 5, 15, 30 or 60 minutes.

### 3.0 VEHICLE DETECTION HARDWARE

The VDPU hardware shall be powered by 120 VAC 60 HZ single-phase power. Surge ratings shall be as set forth in NEMA specifications. Power consumption shall not exceed 135 watts.

#### 3.1 DETECTION OUTPUTS

The VDPU shall include ports for transmitting TS1 and TS2 detections to a traffic controller. The TS1 contact closure port shall be a 37-pin "D" connector. The TS2 port shall be a 15-pin "D" connector.

#### 3.2 VIDEO INPUTS

The VDPU shall be able to accept a minimum of four video input connections suitable for RS170 video inputs. Each video input shall include a switch selectable 75-ohm or higher impedance termination to allow camera video to be routed to other devices, as well as input to the VDPU for vehicle detection. The video inputs to the VDPU shall include transient voltage suppression and isolation. Amplification that shall assure the 1-volt peak to peak video signal integrity is maintained despite video cabling losses and externally induced transients shall be provided. The amplifier shall have a minimum common mode rejection at 60 hz or 90 db.

#### 3.3 VIDEO OUTPUTS

The VDPU shall be able to provide a minimum of one video output connection.

#### 3.4 MECHANICAL

The VDPU shall operate satisfactorily in a temperature range from -34 °C TO +60 °C and a humidity range from 0%RH TO 95%RH, non-condensing as set forth in NEMA specifications.

The VDPU enclosure shall include provisions to be bonded to a good earth ground.

The VDPU shall include an RS232 port for serial communications with a remote computer.

This port shall be a 9-pin "D" subminiature connector on the front of the VDPU.

The VDPU shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS232 port and without modifying the VDPU hardware.

#### 4.0 CAMERA

The video cameras used for traffic detection shall be furnished by the VDPU supplier and shall be qualified by the supplier to ensure proper system operation.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 0.1 lux to 10,000 lux.

The camera shall use a CCD sensing element and shall output monochrome or color video with resolution of not less than 380 lines horizontal.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

The camera shall be powered by 120-240 VAC.

The camera enclosure shall be equipped with separate, weather-tight connections for power and setup video cables at the rear of the enclosure. These connections may also allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole using a lens adjustment module (LAM) supplied by the VDPU supplier. Video and power shall not be connected within the same connector.

The video signal output by the camera shall be black and white or color in RS170 or CCIR format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

#### 5.0 INSTALLATION

**CAMERAS** - The coaxial cable to be used between the camera and the VDPU in the traffic cabinet shall be Belden 8281 or a 75 ohm, precision video cable with 20 gauge solid bare copper conductor (9.9 ohms/m), solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and black polyethylene outer covering.

The signal attenuation shall not exceed 0.78 db per 100 feet at 10 mhz. Nominal outside diameter is 0.304 inches. The coax cable shall be a continuous unbroken run from the camera to the VDPU. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. 75-ohm connectors shall be used at both the camera and cabinet ends. The coaxial cable, connector, and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions shall be followed to ensure proper connection.

## **6.0 WARRANTY**

The supplier shall provide a two-year warranty on the video detection system.

During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

During the warranty period, updates of all software shall be available from the supplier without charge.

## **7.0 MAINTENANCE, SUPPORT, AND TRAINING**

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.

The supplier shall maintain an ongoing program of technical support for the video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on site technical support services.

Installation and training support shall be provided by a factory-authorized representative and shall be a minimum IMSA-level II certified signal technician.

## **8.0 COMPENSATION**

Vehicle Detection (Video) shall be measured and paid for per camera furnished and installed, and shall be full compensation for each camera and the associated VDPU, cable, appurtenances, training, warranty, and support as outlined herein.

Payment will be made under item 730-13.02, Vehicle Detection (Video), per each.

**STATE**

**OF**

**TENNESSEE**

(Rev. 01-08-2015)  
(Rev. 09-06-2016)  
(Rev. 06-26-2017)  
(Rev. 10-02-2019)  
(Rev. 09-25-2020)  
(Rev. 10-09-2020)

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**RIGHTS-OF-WAY MOWING**

**Description.** This work shall consist of mowing of the rights-of-way for vegetation control in accordance with the Plans, Specifications and as directed by the Engineer. A mowing cycle shall be one complete mowing of the areas along state highways and interstates designated within this contract and shall be completed within twenty (20) working days that are suitable for mowing.

**Definitions.**

**Continuous Mowing Operation.** A Continuous Mowing Operation is an operation conducted for a minimum of five (5) hours per day over a twenty (20) working day cycle which consists of one or more mechanical mowers working independently or in coordination to cut vegetation on state rights-of-way deemed Mowable Acres by the Engineer.

**Working Day.** A calendar day, exclusive of State recognized holidays, which weather or other conditions not under the control of the Contractor, will permit a continuous mowing operation with the normal working force engaged in performing the controlling item or items of work which are normal to progress at the time, as determined by the Engineer.

**Mowable Acres.** All areas within rights-of-way where mechanical mowers and finish mowers can cut vegetation and safely traverse slopes without significant damage to existing ground.

**Mowing.** The work associated with cutting or trimming vegetation primarily consisting of, but not limited to, grasses and invasive weeds to provide a consistent and aesthetically pleasing standing vegetation height as directed by the Engineer.

**Swath Mowing.** The work associated with cutting one fifteen (15) foot wide swath of vegetation parallel to the edge of pavement on each shoulder and one fifteen (15) foot wide swath of vegetation parallel to the edge of pavement in each direction within the median. For medians less than sixty (60) feet, the entire median will be mowed (see sheet 7 for Typical Mowing Diagram).

**Mechanical Mower.** A commercial quality piece of equipment which is capable of mowing vegetation in excess of two (2) acres per hour at least five (5) hours per day.

**Finish Mower.** A commercial quality piece of equipment specifically designed to address mowing of vegetation around roadside obstacles or areas not accessible to conventional mowers in an attempt to prevent damage and provide a consistent vegetation height by means other than a mechanical mower. The cost associated with this work shall be included in the unit price bid for mowing 806-01 or swath mowing 806-02.13. Finish mowers do not meet the requirements for mechanical mowers as described in this special provision and cannot be utilized for continuous mowing operations on state highways or interstates.

**Hand Trimming.** The work associated with cutting or trimming vegetation in proximity to roadside obstacles or in areas not accessible to mechanical mowers in an attempt to prevent damage and provide a consistent vegetation height by means other than a mechanical mower.

**Roadside Obstacles.** Items located within the right of way, both natural and man-made which may include but are not limited to trees, signposts, delineator posts, light posts, steel beam guardrail, and associated posts, cable barrier rail, barrier walls, retaining walls, utility poles, catch basins, fallen rock, bridge end abutments, mailboxes, established/planted trees and shrubs, landscaped beds, and wildflower areas.

**General.** All mowing operations shall be performed to the satisfaction of the Engineer. Standing vegetation shall be cut to a height of four (4) inches while maintaining a consistent vegetation profile within all mowing limits adjacent to the roadway. The Contractor shall mow only those areas that are designated as mowable acres, including, if present, a minimum of five (5) feet up the back slope from the bottom of the ditch, and five (5) feet behind all guardrails as shown in The Typical Mowing Diagram on sheet 7. Vegetation including small trees, shrubs, and bushes with a stem diameter of up to two (2) inches which are inside of and encroaching upon the established mowing limits shall be cut by the Contractor using a mower or hand trimming methods as directed by the Engineer. Areas that were recently cleared or chipped will be included in mowable acres. Extreme care shall be taken not to damage the trees, plants, and shrubs, which are designated by the Engineer to remain. Hand trimming may be required as directed by the Engineer for areas of vegetation inside the designated mowable acres which are not accessible to mechanical mowers. As work progresses, mowing and trimming shall be conducted in such a manner to provide a consistent standing vegetation height in all mowing limits adjacent to the roadway (see sheet 7 for Typical Mowing Diagram). The Contractor shall mow as close as practicable to all roadside obstacles. Hand trimming is required atop earth berms, within all rip rap areas, and around all roadside obstacles.

Guardrail and cable barrier rail located on interstates will be sprayed by TDOT personnel except for those located in the following counties: Davidson, Hamilton, Knox, and Shelby. Spraying by TDOT does not relieve the Contractor from hand trimming if needed. The Contractor shall not apply herbicides on state rights-of-way. See the Special Notes regarding the special types of mowing, the number of cycles and incidentals. See sheet 7 for a typical mowing diagram detailing the required mowing limits. Actual dimensions & mowing limits shall be discussed at the pre-construction conference.

The Department reserves the right to perform spot mowing with its own forces on all State right-of-way as necessary. Minor quantity adjustments may be made due to the Tennessee Department of Transportation's Wildflower Program, Adopt a Plot Program, designated research areas, environmental no-mow areas, and Adopt A Highway Program.

**Time and Frequency Mowing.** The number of mowing cycles will be indicated in the Special Notes, but may be increased or decreased by one mowing cycle to coincide with extreme weather conditions. In the event the department experiences an increase in revenue, one additional mowing cycle may be added as directed by the Engineer. Also, the Engineer may require a partial mowing cycle at certain locations. A notice to begin work will be issued to the Contractor at least five (5) working days prior to the date the mowing cycle is to begin. Work shall begin on the date specified in the notice. Mowing operations shall proceed in the same route sequence as performed during litter operations. Submit a planned mowing sequence to the Engineer for approval before each mowing cycle begins. Any deviations from the approved mowing sequence may be allowed at the discretion of the Engineer. A failure to begin mowing operations on the date specified in the notice will result in the assessment of liquidated damages (see SP108B). The mowing cycle shall be twenty (20) working days suitable for mowing unless otherwise documented in the Special Notes.

Mowing shall be performed only during the hours of daylight Monday through Saturday, or as directed by the Engineer. If work is performed on Sunday, the Contractor will be charged a Working Day.

**Mowing Operations.** Work shall begin for each mowing cycle on the date specified in the notice to begin work. Once a mowing cycle begins, the Contractor shall maintain a Continuous Mowing Operation until the mowing is complete. A mowing cycle will be considered complete when all mowing and hand trimming is completed to the satisfaction of the Engineer. Hand trimming shall be performed as close to mowing operations as practically possible.

Failure to complete hand trimming within five (5) working days of the termination of mechanical mowing represents a failure to maintain a continuous mowing operation.

When mowing within twelve (12) feet of the edge of pavement or shoulder, mechanical mowers shall not discharge vegetation and debris toward the roadway. When mowing is required in proximity to the roadway, any vegetation or debris deposited on the roadway as a result of the mowing operation will be removed from edge of pavement to edge of pavement, or between



curb and gutter, whichever applies, at the end of each working day. Any cost associated with the removal of vegetation clippings, foreign objects, or gravel that is deposited on the roadway, the shoulder, or in a curb and gutter section as a result of the mowing operation shall be included in the unit price bid for mowing (item no. 806-01) or swath mowing (item no. 806-02.13).

Swath mowing shall follow as closely as practical to the boundary between the shoulder of the roadway and the point at which vegetation begins. In cases where a continuous swath cannot be maintained on ramps, at bridges, and when encountering assets of the state, the swath shall deviate away from the edge of pavement then terminate, or the swath shall deviate away from then back to the edge of pavement in as tight a space as practical. Any vegetation that cannot be cut by the mower between the edge of pavement and the edge of the swath shall be cut using hand trimming, and the cost shall be included in the unit price bid for swath mowing (item no. 806-02.13). All interchanges and ramps will be mowed completely during a Swath mowing operation.

The Contractor shall mow in the direction of traffic when less than thirty (30) feet from the paved surface.

**Equipment.** Prior to beginning work, the Contractor shall provide the Engineer with a schedule of equipment which will be used to accomplish work under the terms of the contract. The Contractor shall certify to the Engineer that the equipment to be used on this project is suitable for mowing along public highways. All equipment used for mowing operations shall be utilized as described by the manufacturer's recommendations and maintained in safe operating conditions. Mowing on slopes that exceed the equipment manufacturers specifications shall not be allowed. Any equipment that the Engineer determines to be unsuitable for use or hazardous to highway users shall not be used. The Contractor shall provide sufficient equipment and accessory items necessary for efficient operation and the completion of the mowing cycle in the designated time. Any special equipment requirements will be noted in the Special Notes. Zero-turn mowers are considered finish mowers and can be utilized for mowing around roadside obstacles but do not meet the requirements for continuous mowing operations under the terms of this special provision. The cost associated with this work shall be included in the unit price bid for mowing (item no. 806-01 or swath mowing (item no. 806-02.13).

All rotary mowers must be equipped with safety chains to prevent damage to property caused by flying debris propelled out from under the mower. No disc type mowers will be allowed. Chains shall be a minimum of 5/16 inch in size, and links spaced side by side around the mower's front, sides, and rear. Chains shall be spaced at no less than twelve (12) strands of chain per foot and shall be laced horizontally one row from the bottom with 1/4" steel cable secured by cable clamps on each end. When sitting on level ground, at a level cutting height of seven (7) inches, the chains shall be long enough to drag the ground. Flaps or semi-rigid guards will not be allowed as a substitute for chains. Maximum cutting widths for rigid frame rotary mowers shall be 120 inches (10 ft.). Maximum cutting widths for all other mower types shall not exceed 180 inches (15 ft.) without the approval of the Engineer.

**Safety Requirements.** Mechanical mowers and finish mowers shall be equipped so as to conform to prevailing Occupational Safety Health Act (OSHA) Standards, including flashing

amber lights and slow-moving equipment emblems.

The Contractor shall comply with OSHA standards, including the use of Class 3 reflective shirts or vests at all times.

Notification to the Engineer shall be made immediately of any personal injury, accidents involving contractor's equipment, or accidents involving the motoring public.

While equipment is not in use, it shall be parked or stored off the pavement or shoulder of the highway in an inconspicuous place more than thirty (30) feet from edge of pavement or as directed by the Engineer. Under no circumstances shall mechanical mowers or finish mowers be parked or stored in medians. When batwing mowers are being moved from one site to another under their own power with the mowers raised, the mower shall be disengaged.

Handheld, pushed, or riding trimmers using string or blades are not considered mechanical mowers and cannot be considered as part of a continuous mowing operation under the terms of this special provision.

The Contractor shall be required to have a mechanical leaf blower on site to address any vegetation or debris deposited on state routes. The cost associated with this work shall be included in the unit price bid for mowing 806-01 or swath mowing 806-02.13.

The Contractor shall be required to have the company name and phone number on all tractors and work zone support vehicles on the left and right sides in a location that is visible to the public. The lettering for the company name and phone number shall consist of a reflectorized material with a minimum height of three inches (3") or five inches (5") in height if non-reflectorized.

Equipment Cleaning. The Contractor will be required to clean any piece of equipment moved into Tennessee if the equipment is moving from an area infested with invasive species of concern listed below:

- Cogon Grass

Prior to moving equipment into Tennessee, the Contractor shall notify the Engineer of the location of the equipment's most recent operation. The Contractor shall not move any equipment that last operated in an area infested with an invasive species of concern into Tennessee without having cleaned such equipment of seeds, soil, vegetative matter, and other debris that could contain or hold seeds. If the Contractor cannot verify the location of its most recent operation, then the Contractor shall assume that the location is infested with invasive species of concern.

Prior to moving from an area identified as infested with invasive species of concern to, or through Tennessee, the Contractor shall clean such equipment of seeds, soil, vegetative matter, and other debris that could contain or hold seeds, and shall notify TDOT prior to moving any equipment subject to the cleaning requirements set forth above. The Contractor shall advise TDOT of its cleaning measures and make the equipment available for inspection. TDOT shall

have two (2) days, excluding weekends and state holidays, to inspect and approve for use equipment after it has been made available. After satisfactory inspection, the Contractor may move the equipment as planned. Equipment shall be considered clean when a visual inspection does not disclose seeds, soil, vegetative matter, and other debris that could contain or hold seeds. The Contractor shall not be required to disassemble equipment.

**Traffic Control.** The Contractor shall maintain traffic and all traffic control devices for mobile mowing operations according to the requirements contained herein, the State of Tennessee's currently adopted edition of the Manual on Uniform Traffic Control Devices (MUTCD) defined under the Rules of Tennessee Department of Transportation Chapter 1680-3-1, and the Standard Specifications. Although Traffic Control may be included in the cost of other items, the Contractor will be responsible for submitting certifications per Materials & Tests Division Standard Operating Procedures. Under no circumstances shall a mower cross the pavement edge line without complying with Mobile Operations requirements found in the MUTCD.

**Warning Signs.** The Contractor shall furnish portable signs in accordance with the "Manual on Uniform Traffic Control Devices" to notify the traveling public of the operations of mowing equipment. The Contractor shall place these signs on the highway during the operation of mowers and remove them immediately after the operation ceases. Signs at the beginning point shall be 48" by 48" in size; diamond-shaped with black letters on an orange background with a black border with eight-inch high letters. These signs shall be dual mounted, one on each shoulder, for both directions of travel.

**Damage to Property.** The Contractor shall carry on his operation in such a manner that he does not damage the existing ground areas, trees, shrubs, guardrail, utilities, delineators, or other structures. The Contractor shall not mow during wet conditions where turf damage or ruts would occur. In the event damage occurs to the right-of-way because of mowing operations, the Contractor shall replace or repair same, at his own expense, in like kind, and as directed by the Engineer. If damaged property resulting from the Contractor's operations has to be repaired or replaced by the Department, the cost of such work shall be deducted from monies due to the Contractor.

The Contractor shall take all necessary precautions to prevent damage to passing vehicles and to both public and private property. This shall include roadside obstacles, vehicles and any other property which may be damaged by the mowing operation. Payment for work may be withheld until the damaged property has been repaired or replaced.

The Contractor shall respond to all claims of damage from the public within seventy-two (72) hours after notification of damage. Failure to settle claims for damages in a timely manner may result in actions by the Department to preclude the Contractor from performing work on future projects.

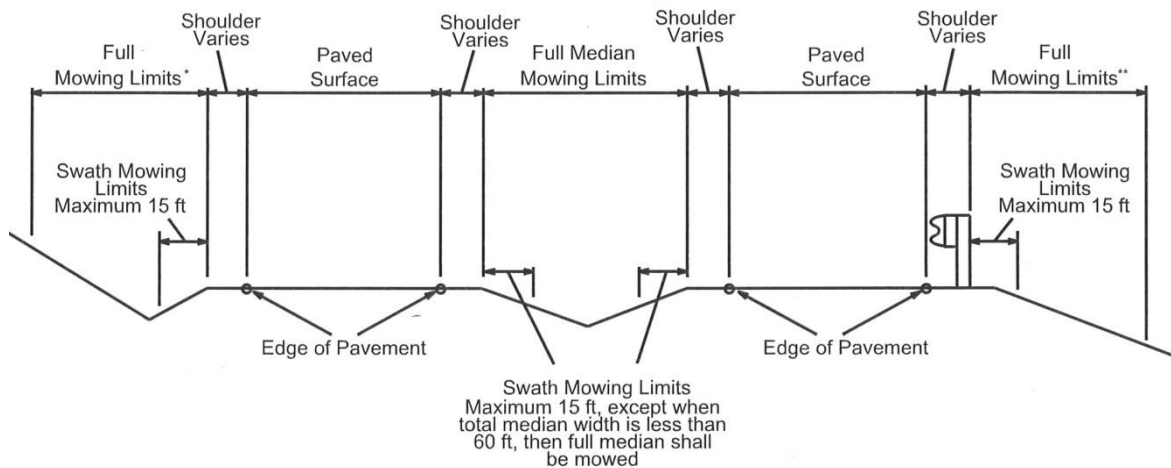
**Additional Work.** The Contractor may be required to mow in areas not specifically detailed in the Special Notes under the direction of the Engineer. Additional work shall be limited to the counties and systems which are designated in the Special Notes. Payment for additional work will be made at the contract unit price for mowing (item no. 806-01) or swath mowing (806-

02.13.)

**Method of Measurement.** Mowing shall be measured by the acre based on the quantities shown in the Special Notes for each mowable area. Each mowing cycle or partial cycle will be measured separately. A mowing cycle includes the mowing of all tabulated areas shown in the Special Notes one time.

**Basis of Payment.** The accepted quantities of mowing will be paid for at the contract unit price per acre. All costs for traffic control as defined above shall be included in the unit bid price for mowing Item No. 806-01 or swath mowing Item No. 806-02.13.

**TYPICAL MOWING DIAGRAM**  
**(NOT TO SCALE)**



**NOTES:**

\* Cut a minimum of 5 ft up the back slope from the bottom of the ditch, or as directed by the engineer.

\*\* Cut a minimum of 5 ft behind all guardrail, or as directed by the engineer.

**S T A T E**

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**T E N N E S S E E**

January 1, 2015 |

**SPECIAL PROVISION**

**REGARDING**

**EQUAL EMPLOYMENT OPPORTUNITY**

Reference:

Federal-Aid Highway Program Manual

Transmittal 147, June 26, 1975

Replaces FHWA Order Interim 7-2(1)

**Specific Equal Employment Opportunity Responsibilities**

**GENERAL**

- a) Equal employment opportunity requirements not to discriminate and to take affirmative action to assure equal employment opportunity as required by Executive Order 11246 and Executive Order 11375 are set forth in Required Contract Provisions (Form FHWA-1273 or PR-1316, as appropriate) and these Special Provisions which are imposed pursuant to Section 140 of Title 23, U.S.C., as established by Section 22 of the Federal-Aid Highway Act of 1968. The requirements set forth in these Special Provisions shall constitute the specific affirmative action requirements for project activities under this contract and supplement the equal employment opportunity requirements set forth in the Required Contract Provisions.
- b) The contractor will work with the Tennessee Department of Transportation and the Federal Government in carrying out equal employment opportunity obligations and in their review of his/her activities under the contract.
- c) The contractor and all his/her subcontractors holding subcontracts not including material suppliers, exceeding \$10,000, will comply with the following minimum specific requirement activities of equal employment opportunity: (The equal employment opportunity requirements of Executive Order 11246, as set forth in Volume 6, Chapter 4, Section 1, Subsection 1 of the Federal-Aid Highway Program Manual, are applicable to material suppliers as well as contractors and subcontractors). The contractor will include these requirements in every subcontract exceeding \$10,000 with such modification of language as is necessary to make them binding on the subcontractor.

**Equal Employment Opportunity Policy**

The contractor will accept as his operating policy the following statement which is designed to further the provision of equal employment opportunity to all persons without regard to their age, race, color, religion, sex, national origin or disability and to promote the full realization of equal employment opportunity through a positive continuing program:

It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment opportunity officer (hereinafter referred to as the EEO Officer) who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of equal employment opportunity and who must be assigned adequate authority and responsibility to do so.

**Equal Employment Opportunity Officer**

The contractor will designate and make known to the Tennessee Department of Transportation contracting officers an equal employment opportunity officer (hereinafter referred to as the EEO Officer) who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of equal employment opportunity and who must be assigned adequate authority and responsibility to do so.

**Dissemination of Policy**

- (a) All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's equal employment opportunity policy and contractual responsibilities to provide equal employment opportunity in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
- (1) Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's equal employment opportunity policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.
  - (2) All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer or other knowledgeable company official covering all major aspects of the contractor's equal employment opportunity obligations within thirty days following their reporting for duty with the contractor.

- (3) All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer or appropriate company official in the contractor's procedures for locating and hiring minority group employees.
- (b) In order to make the contractor's equal employment opportunity policy known to all employees, prospective employees and potential sources of employees, i.e., schools, employment agencies, labor unions (where appropriate), college placement officers, etc., the contractor will take the following actions:
  - (1) Notices and posters setting forth the contractor's equal employment opportunity policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
  - (2) The contractor's equal employment opportunity policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

**Recruitment**

- (a) When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be published in newspapers or other publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
- (b) The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants, including, but not limited to, State employment agencies, schools, colleges and minority group organizations. To meet this requirement, the contractor will, through his EEO Officer, identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
- (c) In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with equal employment opportunity contract provisions. (The U.S. Department of Labor has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended).
- (d) The contractor will encourage his present employees to refer minority group applicants for employment by posting appropriate notices or bulletins in areas accessible to all such employees. In addition, information and procedures with regard to referring minority group applicants will be discussed with employees.

**Personnel Actions**

Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to age, race, color, religion, sex, national origin or disability. The following procedures shall be followed:

- (a) The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
- (b) The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
- (c) The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
- (d) The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

**Training and Promotion**

- (a) The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
- (b) Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event the Special Provision Regarding Training Program Requirements is provided under this contract, this subparagraph will be superseded as indicated therein.
- (c) The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.



- (d) The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

**Unions**

If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

- (a) The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
- (b) The contractor will use best efforts to incorporate an equal employment opportunity clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their age, race, color, religion, sex, national origin or disability .
- (c) The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the Tennessee Department of Transportation and shall set forth what efforts have been made to obtain such information.
- (d) In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to age, race, color, religion, sex, national origin or disability, making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The U.S. Department of Labor has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees). In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the Tennessee Department of Transportation.

**Subcontracting**

- (a) The contractor will use his best efforts to solicit bids from and to utilize minority group subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of minority-owned construction firms from the Tennessee Department of Transportation.

- (b) The contractor will use his best efforts to ensure subcontractor compliance with their equal employment opportunity obligations.

**Records and Reports**

- (a) The contractor will keep such records as are necessary to determine compliance with the contractor's equal employment opportunity obligations. The records kept by the contractor will be designed to indicate:
  - (1) The number of minority and non-minority group members and women employed in each work classification on the project.
  - (2) The progress and efforts being made in cooperation with unions to increase employment opportunities for minorities and women. (Applicable only to contractors who rely in whole or in part on unions as a source for their work force).
  - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees.
  - (4) The progress and efforts being made in securing the services of minority group subcontractors or subcontractors with meaningful minority and female representation among their employees.
- (b) All such records must be retained for a period of 3 years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the of the Tennessee Department of Transportation and the Federal Highway Administration.
- (c) Each contractor and subcontractor shall submit to the Tennessee Department of Transportation an annual report for every July during which work is performed indicating the number of minority, women and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form PR 1391 and is to be received by the Department not later than the 20th of the month following the reporting period.
- (d) The contractor and/or sub-contractor will be required to complete other reports as instructed by the Engineer.
- (e) Current estimates may be withheld by the Project Engineer when reports are not received within the above specified time limits.

**S T A T E**

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**T E N N E S S E E**

January 1, 2015 |

**SPECIAL PROVISION**

**REGARDING**

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY**

**CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)**

- 1) As used in these specifications:
  - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
  - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
  - c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941
  - d. "Minority" includes:
    - I. Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
    - II. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish or Portuguese Culture or origin, regardless of race);
    - III. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - IV. American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining indentifiable tribal affiliations through membership and participation or community identification).
- 2) Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation arid which is set forth in the solicitations from which this contract resulted.

- 3) If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals (including goals and time tables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
- 4) The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goal set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
- 5) Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specification, Executive Order 11246, or the regulations promulgated pursuant thereto.
- 6) In order for the nonworking training hours of apprentices and the trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
- 7) The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
  - (a) Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the

Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

- (b) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available and maintain a record of the organization's responses.
- (c) Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
- (d) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- (e) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources complied under 7b above.
- (f) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- (g) Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

- (h) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- (i) Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screenings procedures, and tests to be used in the selection process.
- (j) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
- (k) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- (l) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriation training, etc., such opportunities.
- (m) Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- (n) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- (o) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- (p) Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

- 8) Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
- 9) A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women, generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
- 10) The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of age, race, color, religion, sex, national origin or disability.
- 11) The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
- 12) The Contractor shall carry out such sanctions and penalties for violations of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
- 13) The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

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



**S T A T E**

**O F**

**T E N N E S S E E**

Revised 10-19-2012

January 1, 2015

**SPECIAL PROVISION**

**REGARDING**

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION**

**TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)**

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

<u>County</u>	<u>Goals for Female Participation in each Trade</u>
All Counties	6.9
<u>County</u>	<u>Goals for Minority Participation for each Trade</u>
Lincoln	11.2
Hamilton, Marion, Sequatchie	12.5
Bledsoe, Bradley, Grundy, McMinn, Meigs, Monroe, Polk, Rhea	8.6
Carter, Hawkins, Sullivan, Unicoi, Washington	2.6
Greene, Hancock, Johnson	3.2
Anderson, Blount, Knox, Union	6.6
Campbell, Claiborne, Cocke, Cumberland, Fentress, Grainger, Hamblen, Jefferson, Loudon, Morgan, Roane, Scott, Sevier	4.5

<u>County</u>	<u>Goals for Minority Participation for each Trade</u>
Montgomery	18.2
Davidson, Cheatham, Dickson, Robertson, Sumner, Williamson, Wilson, Rutherford	15.8
Bedford, Cannon, Clay, Coffee, Dekalb, Franklin, Giles, Hickman, Houston, Humphreys, Jackson, Lawrence, Lewis, Macon, Marshall, Maury, Moore, Overton, Perry, Pickett, Putnam, Smith, Stewart, Trousdale, Van Buren, Warren, Wayne, White	12.0
Shelby, Tipton	32.3
Benton, Carroll, Chester, Crockett, Decatur, Dyer, Fayette, Gibson, Hardeman, Hardin, Haywood, Henderson, Henry, Lake, Lauderdale, McNairy, Madison, Obion, Weakley	26.5

These goals are applicable to all the Contractor's construction work whether or not it is Federal or federally assisted.

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

3. The Contractor shall provide written notification to the Office of Federal Contract Compliance Programs at the following address within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation:

U.S. Department of Labor – Regional Office  
Office of Federal Contract Compliance Program  
61 Forsyth Street, Room 7B75  
Atlanta, GA 30303

The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

**STATE**

**OF**

**TENNESSEE**

(Rev. 03-23-09)  
(Rev. 05-11-09)

January 1, 2015 |

**SPECIAL PROVISION**

**REGARDING**

**TRAINING PROGRAM REQUIREMENTS**

Reference:

Federal-Aid Highway Program  
Transmittal 147, June 26, 1975  
Replaces FHWA Order Interim 7-2(2)

This Training Special Provision supersedes subparagraph 7b of the Special Provision Regarding Equal Employment Opportunity, and is in implementation of 23 U.S.C. 140(a).

As part of the contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The contractor shall provide on-the-job training aimed at developing full journeymen in the type of trade or job classification involved.

The number of training hours under this Special Provision will be indicated in the Proposal.

In the event that a contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, however, the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to pre-construction conference, the contractor shall submit to the Tennessee Department of Transportation OJT Program Coordinator for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the contractor shall make every effort

to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision.

This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Tennessee Department of Transportation and the Federal Highway Administration. The Tennessee Department of Transportation and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Employment and Training Administration, or with a State apprenticeship agency recognized by the Department of Labor and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Office of Apprenticeship, Employment and Training Administration, shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-Aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Federal Highway Administration division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by Change Order and the AAPO, reimbursement will be made for training persons in excess of the number specified herein.

This reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee, or pays the trainee's wages during the offsite training period.

No payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees be on board for the entire length of the contract. Failure of the contractor to employ a trainee in the classification he has requested by the time 15 percent of that type work has been performed will be just cause for withholding progress estimates unless the contractor has furnished the AAPO a satisfactory explanation in writing of his failure to do so. A contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Department of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision. However, in no case will the trainee be paid less than the minimum wage shown in the contract for the classification of laborer.

The contractor shall furnish the trainee a copy of the program he will follow in providing the training. The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

Payment is to be made under item 109-10.01, Trainee, at the unit price of \$0.80 per hour, for each hour of approved training provided. In any case the number of training hours for which payment is made will not exceed number of hours specified for the approved classification by the approved Training program.

The contractor shall not be permitted to commence construction without an approved training program. Failure of the contractor to provide an approved training program shall not be considered "As a condition not under the control of the contractor" in regards to Contract Time.

**STATE****OF****TENNESSEE**

(Rev. 06-01-03)

(Rev. 06-23-08)

(Rev. 11-10-08)

(Rev. 02-12-18)

(Rev. 08-20-18)

January 1, 2015

**SPECIAL PROVISION****REGARDING****DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION**

The disadvantaged business enterprise (DBE) requirements of 49 CFR Part 26 apply to this contract. Accordingly, Disadvantaged Business Enterprises (DBEs) as defined in 49 CFR Part 26 shall have the maximum appropriate opportunity to participate in the performance of this contract or in the performance of subcontracts to this contract. In this latter regard, the Contractor shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 to ensure that DBEs have the opportunity to compete for and perform subcontracts. The Contractor shall not discriminate on the basis of age, race, color, religion, national origin, sex, or disability in the award of subcontracts.

The Contractor shall submit to the Civil Rights Division Small Business Development Program (CRD-SBDP) copies of any subcontract agreements with DBEs upon execution. The Contractor shall identify all DBE subcontractors at the Preconstruction Conference and indicate the approximate date for each DBE subcontractor's appearance on the project. Before terminating and/or substituting a DBE subcontractor, the Contractor must give notice in writing to the DBE subcontractor, with a copy to TDOT's CRD-SBDP, of its intent to terminate and/or substitute including the reason for the request.

The Contractor shall provide notification to the Project Supervisor at least 24 hours prior to each DBE beginning work. The project supervisor or Inspector must complete a "Commercially Useful Function Checklist" to document the first date of work, work items, equipment, and forces of each DBE. The Contractor shall take full responsibility for the performance of a commercially useful function (CUF) by all DBE subcontractors, manufacturers, and materials suppliers who work on or provide materials for the project.

The Contractor shall enter monthly prompt payment certification to the Department through external access to AASHTOWare Project Civil Rights & Labor (CRL) The Contractor is responsible for ensuring all subcontractors, any tier, and material suppliers or haulers are registered for access with the Department. The Prompt Payment Certification shall be submitted monthly beginning no later than sixty (60) days after payment of the first estimate. Payments must abide by the conditions set in T.C.A. § 12-4-707.

Prior to receiving final payment, the Contractor shall provide to the project supervisor and CRD-SBDP certification of the dollars paid to each DBE firm, using Form CC3, "Certification of DBE Accomplishment." The certification shall be dated and signed by a responsible officer of the Contractor and by a responsible officer of the DBE. Falsification of this certification may

result in formal enforcement actions, including civil actions for false claims, suspension and debarment proceedings, or other administrative actions affecting bidder qualifications.

The Contractor and all subcontractors shall retain, for a period of not less than three (3) years after final acceptance of a project, copies of canceled checks or other documentation that substantiates payments to DBE firms. These records shall be available at reasonable times and places for inspection by authorized representatives of the Department and various Federal Agencies.

The Contractor is advised that failure to carry out the requirements as set forth above shall constitute a breach of contract, and after notification by the Department, may result in termination of the contract or other remedy deemed appropriate by the Department.



S T A T E

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T E N N E S S E E

July 17, 2020

**SPECIAL PROVISION**

**REGARDING**

**DBE CONTRACT GOAL(S)**

**FOR DESIGN-BUILD PROJECTS**

A. Disadvantaged Business Enterprise Policy ..... 1

B. Counting DBE Participation toward Meeting Goals ..... 2

C. Contract Bidding & Award Procedures For Proposals With Established Goals ..... 5

D. Post Award & Construction Requirements ..... 8

E. Post Construction Requirements ..... 12

F. Required Records ..... 12

G. Design-Builder Compliance..... 12

H. Appendix A (Form 1247A-DB) ..... 12

All Design-Builders shall pursue affirmative action requirements to encourage and increase participation of firms certified as a Disadvantaged Business Enterprise (DBE) as set forth in this special provision and in accordance with 49 Code of Federal Regulations (CFR) Part 26. The bidder shall arrange for the percentage of the work specified in Request for Proposal (RFP) Contract Book 2 to be performed by Tennessee Uniform Certification Program (TNUCP) DBEs or otherwise clearly demonstrate adequate good faith efforts as described herein. All payments must follow the conditions set by the most current Tennessee Code Annotated (T.C.A.) § 12-4-707.

The Design-Builder shall take full responsibility for ensuring the performance of a “commercially useful function” (CUF), as defined in 49 CFR Part 26, by all DBE subcontractors, manufacturers, and materials suppliers who work on the project or provide materials for the project.

**A. Disadvantaged Business Enterprise Policy**

The Design-Builder shall abide by the following provision and include in all subcontract agreements the following provision, which is designed to promote full participation of DBEs as suppliers and subcontractors through a continuous, positive result-oriented program on contracts let by the Department:

*The Design-Builder, sub-recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Design-Builder shall carry out applicable requirements of 49 CFR Part 26 in the award and*

*administration of U.S. Department of Transportation- assisted contracts. Failure by the Design-Builder to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Department deems appropriate.*

## **B. Counting DBE Participation toward Meeting Goals**

The Design-Builder shall count DBE participation toward goals in accordance with 49 CFR Part 26. If the DBE performs a CUF on the contract including those functions as a subcontractor, expenditures to a DBE contractor count toward DBE goals. A DBE performs a CUF when it is responsible for execution of some portion of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a CUF, the DBE must also be responsible, with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material, installing (where applicable), and paying for the material itself. The work performed by the DBE firm shall be necessary and useful to the completion of the contract, and consistent with normal highway construction industry practices in Tennessee. Work performed by a DBE firm in a particular transaction may be counted toward the goal only if the Department determines that it involves a CUF. The determination is verified by the "[Commercially Useful Function Checklist](#)" and the requirements of 49 CFR Part 26.

*Note: In accordance with 49 CFR 26.55(c), to determine whether a DBE is performing a CUF, the Department must evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and other relevant factors. A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation. In determining whether a DBE is such an extra participant, the Department must examine similar transactions, particularly those in which DBEs do not participate.*

*When a DBE is presumed not to be performing a commercially useful function, the DBE may present evidence to rebut this presumption. The Department may determine that the firm is performing a commercially useful function given the type of work involved and normal industry practices.*

The bidder may count the following DBE expenditures involving a CUF towards the DBE goal:

1. **Projects where the DBE is the Design-Builder** – The entire portion(s) of the contract to be completed by certified DBE firm's own forces will be counted toward meeting the goal. This will also include the cost of supplies and materials obtained by the DBE for the work of the contract, including supplies purchased or equipment leased by the DBE. Items of the contract subcontracted to non-DBE firms will not be counted toward the goal.

*Note: If a DBE does not perform or exercise responsibility for at least 30 percent of the total cost of its contract with its own work force, or the DBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involved, the Department must presume that it is not performing a commercially useful function.*

2. **Portions of a Bid from a Joint Venture** – When a DBE performs as a participant in a joint venture, only the total dollar value of the contract equal to the distinct, clearly defined portion of the work of the contract that the DBE performs with its own forces will count toward DBE goals. A bid from a joint venture between a DBE and a non-DBE Contractor shall include an explanation of DBE commitments on DBE Form 1247A-DB, which must be approved by the Civil Rights Division - Small Business Development Program (CRD-SBDP) prior to the letting. Only the DBE's portion will be counted toward the goal. Joint venture agreements must be approved separately from the bid documents, prior to the awarding of the contract.
3. **DBE Subcontractors** – The DBE subcontractor shall assume actual and contractual responsibility for provision of materials and supplies, subcontracted work, or other CUFs of the items of work subcontracted to them. When a DBE subcontracts part of the work of its contract to another firm, the value of the subcontracted work may be counted toward the DBE goal only if the DBE's subcontractor is also a DBE. Work that a DBE subcontracts to a non-DBE firm does not count toward the DBE goal. Cost of materials purchased from or the cost of equipment leased from the non-DBE Contractor will not count toward the project DBE commitment. Prior written approval must be obtained from the CRD-SBDP for any DBE use of the Design-Builder's personnel or equipment.
4. **DBE Manufacturers** – The Design-Builder may count toward the DBE goal 100% of its expenditures for materials and supplies required under a contract and obtained from a DBE manufacturer only if the DBE operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
5. **DBE Regular Dealers (Material Suppliers)** – The Design-Builder may count toward the DBE goal 60% of its expenditures for materials and supplies required under a contract and obtained from a DBE regular dealer. For purposes of this section, a regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A firm may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business where such products are bought, kept in

stock, and regularly sold to the public if the firm owns and operates the distribution equipment for the products. Any supplementing of the regular dealer's own distribution equipment shall be by a long-term lease and not on an ad hoc or contract-by-contract basis. Any lease containing the terms of the agreement shall be made available to and must be approved in writing by CRD-SBDP.

6. **Other DBE Suppliers** – With respect to materials or supplies purchased from a DBE that is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, toward DBE goals; provided, the Department finds the fees to be reasonable and not excessive as compared with fees customarily allowed for similar services. The cost of the materials and supplies themselves shall not count toward DBE goals.
7. **Transportation or Hauling of Materials** – The Design-Builder may count towards the DBE goal hauling in either DBE-owned trucks or in trucks leased to or by DBE firms. The verification of truck drivers employed by DBE firms will continue to be by submission of payrolls independent from any Davis-Bacon regulations. Use the following factors in determining whether a DBE trucking company is performing a CUF:
  - a. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting DBE goals.
  - b. The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
  - c. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
  - d. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services that the lessee DBE provides on the contract.
  - e. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE that leases trucks equipped with drivers from a non-DBE is entitled to credit for the total value of transportation services provided by non-DBE leased trucks equipped with drivers not to exceed the value of transportation services provided by DBE-owned trucks or leased trucks with DBE employee drivers. Additional participation by non-DBE owned trucks equipped with drivers receives credit only for the fee or commission it receives as a result of the lease arrangement. If the DBE chooses this approach, it must obtain written consent from the CRD-SBDP.
  - f. The DBE may lease trucks without drivers from a non-DBE truck leasing company. If the DBE leases trucks from a non-DBE truck leasing company and employs its own drivers, it is entitled to credit for the value of these hauling

services.

- g. For purposes of this paragraph, a lease must indicate that the DBE has exclusive use of and control over the truck. Leases cannot be Department contract-specific, must be long-term, and must be approved by CRD-SBDP. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.
  - h. Prior to hauling, the Design-Builder and DBE shall provide the project supervisor a complete list of trucks that will be used on the project for DBE goal participation. The Department will provide a form that shall be used by the Design-Builder and the DBE to identify the trucks. A revised list will be required any time the trucks used changes. The Design-Builder and DBE must be able to adequately document the actual amount of hauling eligible for DBE goal participation.
8. **Contracted Labor / Temporary Employment Agencies** – The Department will count the entire amount of fees or commissions charged by a DBE firm for providing a bona fide service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of the contract; provided, however, the Department must find the fee to be reasonable and not excessive as compared to the fees customarily allowed for similar services.

### **C. Contract Bidding & Award Procedures For Proposals With Established Goals**

The established DBE goal(s) will be shown in RFP Contract Book 2 as a percent of the total amount bid. Separate established DBE goals may be indicated for DBE design and construction subcontractors or a single combined project DBE goal may be indicated. If separate DBE design and construction subcontractor goals are indicated, each goal must be individually achieved. If a single combined project DBE goal is indicated, the goal may be achieved by the utilization of any combination of DBE design and/or construction subcontractors. If the total proposed DBE work submitted with the bid is less than the percentage participation goal(s) set by the Department, the bidder shall, within three (3) business days from the public proposal price opening, either propose sufficient additional DBE participation to meet the goal(s) or clearly demonstrate by documentation that good faith efforts were made to meet the goal.

#### **1. Bidder's Responsibility**

It is the bidder's responsibility to determine the level of professional competence and financial responsibility of any proposed DBE subcontractor. The bidder shall ascertain that the proposed DBE subcontractor has suitable experience and equipment to perform a commercially useful function for work that is common industry practice in the Tennessee highway construction industry.

For proposals with established project goals, the bidder shall develop and submit a DBE Diversity Plan within their technical proposal describing the methods to be employed for achieving the Department's DBE participation goals for the Agreement, including the bidder's exercise to solicit DBEs. The selected bidder's Diversity Plan is subject to Department review and comment as part of the Department's evaluation of the technical proposal. Each Diversity Plan must at a minimum include the following: specific categories of services and work anticipated for DBE participation on the project; schedule for submission of DBE commitment agreements based on the bidder's initial project schedule; good faith efforts performed to date; and good faith efforts that will be exercised by the bidder following execution of the Agreement to achieve the DBE participation goal for the project.

## **2. DBE's Responsibility**

Before bidding and subsequently entering into a contract (as a Design-Builder or subcontractor), the DBE should consider the scope and size of the project, as well as whether it is certified to receive credit for the type of work performed. As with any contract, this is a legally binding document and should be performed to the best of one's ability. However, should a DBE ever have to withdraw from a contract, it shall provide the CRD-SBDP and Design-Builder with written documentation. A DBE should only withdraw when there is no other option, as non-completion of its duties may result in temporary disqualification of a prequalified bidder or subcontractor by suspending the privilege of bidding on Department contracts or becoming an approved subcontractor, as outlined in Chapter 1680-05-03 of the Rules of the Department.

## **3. Apparent Low Bidder Procedures After Public Proposal Price Opening**

The Design-Builder shall develop and maintain records of negotiations with DBEs to reach agreeable prices, quotations and work schedules, including but not limited to a record of dates when the Design-Builder first contacted each DBE.

It is recommended that the anticipated DBE participation be submitted with the bid. If the anticipated DBE participation is not submitted with the bid, the apparent low bidder has three (3) business days after the public proposal price opening to attain the DBE goal amount and notify the CRD-SBDP which DBEs are anticipated to be used. This information should be submitted via email to [TDOT.DBE.Program@TN.gov](mailto:TDOT.DBE.Program@TN.gov) and the apparent low bidder will be required to complete DBE Form 1247A-DB. The bidder shall list the following information on DBE Form 1247A-DB:

- a. The names and addresses of all DBE firms being used or being considered for use under the contract as part of the bidder's DBE commitment;
- b. The work classification(s) and primary item code(s) for each DBE being used or being considered for use on the contract;
- c. The anticipated total amount that has been committed to each DBE firm being used or being considered for use on the contract;

- d. Written documentation of the bidder's commitment to use a DBE subcontractor whose anticipated participation it submits to meet a contract goal shall be provided as an attachment; and
- e. Written confirmation from each listed DBE firm that it is participating in the contract in the kind and anticipated amount of work provided in the Design-Builder's commitment shall be provided as an attachment.

The completed DBE Form 1247A-DB shall be submitted by the apparent low bidder within three (3) business days after the public proposal price opening. Failure to provide a completed form or documentation clearly evidencing a good faith effort, as detailed in Section C.4. below, within three (3) business days after the public proposal price opening may cause the bid to be rejected as irregular. Only certified DBE firms may be used. Design-Builder may access certification information by viewing the [TNUCP DBE Directory website](#).

When DBE goal projects are involved and the Design-Builder subcontracts to a non-DBE, and the non-DBE subcontractor in turn subcontracts to a DBE as a second tier subcontractor, the Design-Builder must affirm in writing his/her knowledge and approval of such an arrangement. Recognition of a second-tier arrangement with a DBE subcontractor for goal work must be forwarded to the CRD-SBDP Director for verification, in writing, prior to any work being performed by the DBE that is intended to be counted toward the goal.

#### **4. Bidder Selection and Good Faith Efforts**

- a. Bidders shall submit proposals that meet the DBE goal(s) or shall submit documentation clearly evidencing that they made a good faith effort to meet the DBE goal(s). Design-Builders who meet or exceed the contract goal(s) will be assumed to have made good faith efforts to utilize DBE firms. DBE firms who bid as Design-Builders will be considered to have met the goal(s).
- b. In making a fair and reasonable judgment as to whether the bidder has made adequate good faith efforts, the Department shall consider quality, quantity, and intensity of the different kinds of efforts that the bidder has made. The following list of factors is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases. In any event, the Department may consider whether the bidder:
  - 1) Selected portions of the work likely to attract DBE participation. The total dollar value of the portions selected should meet or exceed the contract DBE goal(s). If it is necessary, the bidder should break down subcontracts into economically feasible units in order to facilitate participation.
  - 2) Provided notice to a reasonable number of specific DBEs, including those not regularly used by the bidder, that their participation in the contract is being solicited in sufficient time to allow them to participate effectively.

- 3) Provided interested DBEs with adequate information about the plans, specifications and requirements of the contract.
  - 4) Advertised in trade association publications or minority-focused media concerning participation opportunities.
  - 5) Effectively used the services of available minority community organizations, minority contractors' groups, local, state, or federal minority business assistance offices, or other organizations that provide assistance in the recruitment and placement of DBEs.
  - 6) Negotiated in good faith with interested DBEs, including not rejecting DBEs as unqualified lacking sound reasons based on a thorough investigation of their capabilities.
  - 7) Made efforts to assist interested DBEs in obtaining bonding or insurance required by the bidder.
  - 8) Submitted all quotations received from DBEs, and for those quotations not accepted, an explanation of why the DBE was not accepted including price comparisons. Receipt of a lower quotation from a non-DBE will not in itself excuse a bidder's failure to meet the contract goal(s).
  - 9) Has adequate records of its contacts and negotiations with DBEs.
- c. If the Design-Builder has not submitted the required documentation in their proposal for meeting the DBE goal(s) as described in Section C.3. or submitted documentation clearly evidencing good faith efforts within three (3) business days after submittal of the proposal, the Design-Builder's bid will be considered non-responsive and may be cause for the forfeiture of the Proposal Guaranty which shall become the property of the Department, not as penalty, but as liquidated damages. The Department then may consider the next lowest responsive bid for award.

## **D. Post Award & Construction Requirements**

### **1. Joint Checking Allowance for DBE**

A DBE must receive pre-approval by the Department before using a joint check. Joint check requests shall be submitted by the DBE to CRD-SBDP prior to the subcontract agreement.

The following are some general conditions that must be met regarding joint check use:

- a. The second party (typically the Design-Builder) acts solely as a guarantor.
- b. The DBE must release the check to the supplier.
- c. The use of joint checks must be a commonly recognized business practice in the industry.
- d. The DBE remains responsible for all other elements of 49 CFR Part 26.55(c)(1)



- e. The DBE is not required to use a specific supplier nor the Design-Builder's negotiated unit price.
- f. The DBE shall submit receipt/copy of cancelled checks to CRD- SBDP.

## **2. DBE Subcontract Requirements for Design**

If RFP Contract Book 2 indicates a DBE design goal, or a combined DBE design and construction goal for which the Design-Builder will utilize DBE design services to achieve, the Design-Builder shall submit copies of binding subcontracts for DBE design services to the respective Project Supervisor and to CRD-SBDP before receiving the initial Notice to Proceed.

## **3. DBE Subcontract Requirements for Construction**

The Design-Builder shall identify all DBE construction subcontractors and indicate the approximate dates for their appearance on the project. The Department will review the contract information to verify the actual work to be performed by the DBE construction contractors and will review any lease agreements allowed as part of the DBE commitment.

The Design-Builder shall submit copies of all binding subcontracts and purchase orders with DBE construction subcontractors to the respective Project Supervisor and to CRD-SBDP on or before the date of the Preconstruction Conference. Failure to provide binding subcontracts and purchase orders with DBE construction contractors will result in delay of payment to the Design-Builder. Information submitted shall match the Design-Builders Diversity Plan from the proposal and/or the documentation submitted as required in Section C.3.

The Design-Builder shall notify the Project Supervisor at least 24 hours prior to each DBE construction subcontractor beginning work. A Department Project Supervisor/Inspector must complete a CUF Checklist to document the first date of work, work items, equipment, and forces of each DBE.

## **4. Prompt Payment**

The Design-Builder shall enter monthly prompt payment certification to the Department through external access to AASHTOWare Project Civil Rights & Labor (CRL). The Design-Builder is responsible for ensuring that all subcontractors, any tier, and material suppliers or haulers are registered for access with the Department. In addition, the Design-Builder shall require subcontractors, material suppliers, and haulers to review payment information monthly and respond in CRL when discrepancies or disputes are present. Prompt payment data shall be submitted monthly beginning no later than sixty (60) days after payment of the first estimate for DBE services.

## **5. Department Right to Hold Estimate Payment**

The Department will hold estimate payment if previously listed information is not submitted. Reasons for non-payment to a DBE could include the following:

- a) Whether the DBE is performing satisfactorily;
- b) Whether the Design-Builder has reason to believe that the DBE is not performing a CUF, and if so, why and what steps the Design-Builder is taking to rectify the situation.

In the event that the Design-Builder reports questions in relation to prompt payment regarding whether a DBE is independent and performing a CUF and takes appropriate steps promptly to address the issue, then the Department will take this effort into account when considering Design-Builder compliance measures as described below. Payments must abide by the conditions set in TCA 12-4-707.

## **6. Brokering of Work**

Brokering of work by DBEs is not allowed and is a material breach of contract. A DBE firm involved in brokering of work may result in removal or suspension of DBE certification and/or formal enforcement actions, including civil actions for false claims, suspension and debarment proceedings, or other administrative actions affecting bidder qualifications. Any firm involved in brokering of work that engages in willful falsification distortion, or misrepresentation with respect to any facts related to the project shall be referred to the U. S. Department of Transportation's Office of the Inspector General for prosecution under Title 18, U.S. Code, Section 641. The Design-Builder shall place this provision in all subcontracts with DBEs.

## **7. Process for Removal of a DBE**

At no time shall a DBE be terminated or substituted without prior written consent from CRD-SBDP. This includes, but is not limited to, instances in which the Design-Builder seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. The Design-Builder shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the Design-Builder obtains the CRD-SBDP's written consent as provided herein. Absent such written consent, the Design-Builder shall not be entitled to any payment for work or material unless it is by the listed DBE. The CRD-SBDP may provide such written consent only if it agrees that the Design-Builder has good cause to terminate the DBE firm, as further described below.

Before terminating and/or substituting a DBE subcontractor on a project that includes SP1247DB in the RFP Contract Book 2, the Design-Builder must give notice in writing to the DBE subcontractor, with a copy to the CRD-SBDP, of its intent to request to terminate and/or substitute including the reason for the request.

The Design-Builder must then give the DBE five (5) days to respond to the Design-

Builder's notice. The DBE shall then advise the CRD-SBDP and the Design-Builder of the reasons, if any, why it objects to the proposed termination of its subcontract and why the CRD-SBDP should not approve the Design-Builder's action. If required in a particular case as a matter of public necessity (e.g., safety), the CRD-SBDP may provide a response period shorter than five (5) days.

If approval is granted for removal, CRD-SBDP will submit a letter to the Design-Builder and the DBE. Good faith efforts shall then be directed at finding another DBE to perform at least the same amount of work under the contract as the DBE that was terminated, to the extent needed to meet the contract goal(s) established. The good faith efforts shall be documented by the Design-Builder. If requested by the CRD-SBDP, the Design-Builder shall submit the documentation within seven (7) days, which may be extended for an additional seven (7) days if necessary at the request of the Design-Builder, and the CRD-SBDP shall provide a written determination to the Design-Builder stating whether or not good faith efforts have been demonstrated.

The Design-Builder has the responsibility to comply with 49 CFR Part 26.53(f) and all applicable policies and regulations.

Reasons for termination and/or substitution of a DBE subcontractor must meet the reasons for good cause as outlined in the current 49 CFR Part 26.53(f), which include, but are not limited to, circumstances in which the listed DBE subcontractor:

- a. Fails or refuses to execute a written contract;
- b. Fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Design-Builder;
- c. Fails or refuses to meet the Design-Builder's reasonable, nondiscriminatory bond requirements;
- d. Becomes bankrupt, insolvent, or exhibits credit unworthiness;
- e. Becomes ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1,200 or applicable state law;
- f. Is not a responsible contractor, as determined by the Department;
- g. Voluntarily withdraws from the project and provides written notice to the Design-Builder of its withdrawal;
- h. Is ineligible to receive DBE credit for the type of work required;
- i. Is unable to complete its work on the contract as a result of death or disability of an owner; and/or
- j. For other documented good cause, the Department may elect to compel the termination of the DBE subcontractor; provided that good cause does not exist if

the Design-Builder seeks to terminate a DBE it relied upon to obtain the contract so that the Design-Builder can self-perform the work for which the DBE was engaged, or so that the Design-Builder can substitute another DBE or non-DBE contractor after contract award.

### **E. Post Construction Requirements**

Prior to receiving final payment, the Design-Builder shall provide to the Project Engineer and CRD-SBDP certification of the dollars paid to each DBE firm, using [Form CC3, "Certification of DBE Accomplishment."](#) The certification shall be dated and signed by a responsible officer of the Design-Builder and by a responsible officer of the DBE. Falsification of this certification may result in removal or suspension of DBE certification and/or formal enforcement actions, including civil actions for false claims, suspension and debarment proceedings, or other administrative actions affecting bidder qualifications. The final estimate will not be paid to the Design-Builder until proper certifications including CC-3 have been made.

### **F. Required Records**

The Design-Builder and all subcontractors shall retain, for a period of not less than three (3) years after final acceptance of a project, copies of canceled checks or other documentation that substantiates payments to DBE firms. These records shall be available at reasonable times and places for inspection by authorized representatives of the Department and various Federal Agencies. Copies shall be provided to the Department if requested.

### **G. Design-Builder Compliance**

1. If the Design-Builder fails to comply with Special Provision 1247DB and/or 49 CFR Part 26, resulting in failure to obtain goal where a good faith effort was not accepted, the Department shall take one or a combination of the following steps:
  - 1) The Department may withhold from the Design-Builder the monetary value of the unattained goal percentage plus an additional 10% for engineering costs, not as penalty but as liquidated damages.
  - 2) Suspend the Design-Builder from participation in Department bid lettings pursuant to rules promulgated by the Department.
  - 3) For repeated failures to comply, debar the Design-Builder pursuant to rules promulgated by the Department.
  - 4) Invoke other remedies available by law and/or in the contract.
  - 5) Invoke any other lawful remedy agreed upon by the Commissioner and the Design-Builder in writing.

### **H. Appendix A (Form 1247A-DB)**

Appendix A includes a sample Form 1247A-DB.

**STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
CIVIL RIGHTS OFFICE**

**TDOT DBE Federal-aid Project Bid DBE Anticipated Commitment Form  
FORM 1247A-DB**

Small Business Development Program

Telephone No. 615 741-3681, Fax No. 615-741-3169

**YOUR FAILURE TO COMPLETE & RETURN THIS FORM BY EMAIL TO**

**[TDOT.DBE.Program@TN.gov](mailto:TDOT.DBE.Program@TN.gov)**

**MAY JEOPARDIZE THE AWARD OF THIS PROJECT**

Contract # :	
County :	
Bid Letting Date:	
Project No. :	
Design-Builder:	
Total Bid Amount :	
Contract DBE Goal:	
DBE Dollars Required:	
DBE Dollars Proposed:	
DBE Percentage Proposed:	

**DESIGN DBEs (SEE RFP - DBE DESIGN MAY NOT BE REQUIRED)**  
**(BINDING SUBCONTRACTS FOR DESIGN PARTICIPATION MUST BE SUBMITTED BEFORE INITIAL NOTICE TO PROCEED)**

NAMES OF & ADDRESSES OF DESIGN DBEs BEING USED OR BEING CONSIDERED FOR USE UNDER THIS CONTRACT	WORK CLASSIFICATION (Select via the drop-down list)	PRIMARY ITEM CODE(S) <small>List the first 3 digits of the TDOT Pay Item(s) associated with work classification</small>	ANTICIPATED PARTICIPATION	
			Sub/Supplier % <small>(100% for subs or 60% for suppliers)</small>	DBE Dollars

**Work Classifications**

Engineering	Cold Planing of Bituminous Plant Mix	Underdrains
Construction Stakes, Lines & Grades	Reinforcing Steel, Structures-Bridges	Concrete Median Barrier
Clearing & Grubbing	Concrete Structure, Retaining Walls	Traffic Control
Removal of Structures & Obstructions	Texture Coating, Painting	Traffic Control Flagging
Road & Drainage Excavation (Haul)	Pipe Culvert	Highway Signing
Erosion Control	Concrete Catch Basins, Endwalls, etc.	Pavement Markings
Hauling Roadway Materials	Bridge Deck Sealant	Signalization Work
Hauling Roadway Materials - Pea Gravel	Rein. Concrete Median/Parapet	Utilities - Water, Sewer, Electrical, etc.
Hauling Roadway Materials - Stone	Concrete Flat Work	Seed, Sod, Landscaping, etc.
Hauling Liquid Asphalt Material	Curb & Gutter	Supplying Materials @ 60%
Hauling Asphaltic Concrete Surface Hot Mix	Guardrail	Supplying Liquid Asphalt Materials @ 60%
Scoring Pavement	Rip-Rap	Supplying Electrical Parts @ 60%



## REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

### ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

### I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's

immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

### II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

**1. Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the

provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

**2. EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

**3. Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of

employees by means of meetings, employee handbooks, or other appropriate means.

**4. Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

**5. Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

**6. Training and Promotion:**



a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

**7. Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

**8. Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

**9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

**10. Assurance Required by 49 CFR 26.13(b):**

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

**11. Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should

represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

### III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

### IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

#### 1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for

determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

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

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

## 2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

## 3. Payrolls and basic records

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

the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

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

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed,

as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

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

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### 4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity

requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

**5. Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

**6. Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

**7. Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

**8. Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

**9. Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

**10. Certification of eligibility.**

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

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

**V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT**

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

**1. Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

**2. Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

**3. Withholding for unpaid wages and liquidated damages.** The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

**4. Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

## VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is

evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

## VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

## VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

#### **IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

#### **X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

##### **1. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this

covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

\* \* \* \* \*

## **2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

### **2. Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which

this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the



department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

\* \* \* \* \*

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

\* \* \* \* \*

**XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS**

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

**STATE**

**OF**

**TENNESSEE**

January 1, 2015

(Rev. 01-06-15)  
(Rev. 01-11-16)  
(Rev. 01-06-17)  
(Rev. 01-05-18)  
(Rev. 05-24-18)  
(Rev. 01-04-19)  
(Rev. 01-03-20)

**SPECIAL PROVISION**

**REGARDING**

**TENNESSEE DEPARTMENT OF TRANSPORTATION**

**2020 MINIMUM WAGE SCALES FOR FEDERAL-AID CONSTRUCTION**

**& 2019 MINIMUM WAGE SCALES FOR STATE FUNDED CONSTRUCTION**

This Contract contains "Tennessee Department of Transportation 2020 Minimum Wage Scales for State Funded Construction", Tennessee Department of Labor Decision No. T-40282, dated January 1, 2020 and Tennessee Department of Transportation 2020 Minimum Wage Scales for Federal-Aid Highway Construction, U. S. Department of Labor Decision No. TN190147 (dated January 3, 2020).

The Contractor is required to pay the greater of the two (2) rates for each classification.

Note: Minimum Wage Scales for Federal-Aid Heavy Construction are on file with the Department, and will be included in all applicable Contract Proposals

(Rev. 01/03/20)

STATE

OF

TENNESSEE

Sheet 1 of 6

**TENNESSEE DEPARTMENT OF TRANSPORTATION**

**MINIMUM WAGE SCALES FOR FEDERAL AID HIGHWAY CONSTRUCTION**

General Decision Number: TN20200147 01/03/2020

Superseded General Decision Number: TN20190147

State: Tennessee

Construction Type: Highway

Counties: Tennessee Statewide.

HIGHWAY CONSTRUCTION PROJECTS

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

Modification Number  
0

Publication Date  
01/03/2020

SUTN2016-001 07/13/2016

	Rates	Fringes
BRICKLAYER.....	\$ 14.26	
CARPENTER.....	\$ 17.52	
CEMENT MASON/CONCRETE FINISHER...\$	15.55	
ELECTRICIAN.....	\$ 24.08	
IRONWORKER		
Reinforcing.....	\$ 16.29	
Structural.....	\$ 16.89	
LABORER		
Common/Unskilled.....	\$ 13.11	
Skilled		
Air Tool Operator,		
Asphalt Raker, Chain Saw		
Operator, Concrete Mixer		
(less than 1 yd),		
Concrete Rubber, Edger,		
Fence Erector, Form		
Setter (steel), Guard		
Rail Erector, Mechanic's		
Tender (tire changer or		
oiler), Mortar Mixer,		
Nozzleman or Gun Operator		
(gunite), Pipelayer,		
Sign Erector.....	\$ 15.27	
PAINTER (INCLUDES SANDBLASTER)...\$	26.36	
POWER EQUIPMENT OPERATOR:		
GROUP 1		
Backhoe/Hydraulic		
Excavator (3/4 yd &		
over), Crane (less than		
20 Tons), End Loader (3		
yd & over), Motor Patrol		
(finish),Piledriver,		
Dragline.....	\$ 19.14	
GROUP 1A		
Drill Operator (Caisson)...\$	25.26	
Farm Tractor Operator		
(Power Broom).....	\$ 13.50	
GROUP 2		
Backhoe/Hydraulic		
Excavator (less than 3/4		
yd), Bulldozer or Push		
Dozer, End Loader (less		
than 3 yd), Motor Patrol		

(rough), Tractor  
(crawler/ utility), Truck  
Driver (Heavy Duty, Off  
Road) Scraper, Shovel, or  
Trenching Machine.....\$ 17.08

GROUP 3

Asphalt Paver, Concrete  
Finishing Machine,  
Concrete Paver, Scale,  
Spreader (self-  
propelled), Concrete  
Grinder, Asphalt Milling  
Machine, Boring Machine  
(horizontal).....\$ 17.75

GROUP 4

Bobcat, Central Mining  
Plant, Concrete Pump,  
Concrete Saw, Curb  
Machine (automatic or  
manual), Dozer or Loader  
(stockpile), Drill  
(piling), Mulcher or  
Seeder, Rock Drill (truck  
mounted), Roller  
(asphalt), Roller  
(compaction self-  
propelled), Soil  
Stabilization Machine,  
Tractor (boom and hoist),  
Bituminous Distributor  
Machine, pump, Track  
Drill, Striping Machine....\$ 16.48  
Heavy Duty Mechanic.....\$ 20.33  
Light Duty Mechanic.....\$ 19.53  
Sweeping Machine (Vacuum)  
Operator.....\$ 15.56

GROUP 5

Crane (over 20 Tons).....\$ 20.44

TRUCK DRIVER

2 axles.....\$ 15.36  
3-4 axles.....\$ 14.86  
5 or more axles.....\$ 16.27

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave  
for Federal Contractors applies to all contracts subject to the  
Davis-Bacon Act for which the contract is awarded (and any  
solicitation was issued) on or after January 1, 2017. If this

contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

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

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

#### Union Rate Identifiers

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

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

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

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

Union Average Rate Identifiers

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

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

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WAGE DETERMINATION APPEALS PROCESS

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

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

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the



Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

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

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

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

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

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

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

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

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

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END OF GENERAL DECISION

STATEOFTENNESSEETENNESSEE DEPARTMENT OF TRANSPORTATION2020 MINIMUM WAGE SCALES FOR STATE FUNDED CONSTRUCTION

January 1, 2020

Tenn. DOL Decision No. T-40282

CLASSIFICATION (ENGLISH)	CLASSIFICATION (SPANISH)	Basic Hourly Rates	Craft No.
Blaster	Proveedor do Explosivos	23.03	1
Bricklayer	Ladrillero	16.60	2
Carpenter / Leadsperson	Carpintero o Lider	20.40	3
Class "A" Operators	Operador Clase A	22.29	4
Class "B" Operators	Operador Clase B	19.88	5
Class "C" Operators	Operador Clase C	20.66	6
Class "D" Operators	Operador Clase D	19.18	7
Concrete Finisher	Terminador de Cemento	18.38	8
Drill Operator (Caisson)	Operador de Perfordora	34.55	9
Electrician	Electricista	32.85	10
Farm Tractor Operator (Power Broom)	Operador de Tractor de Rancho	15.72	11
Ironworkers (Reinforcing)	Herrero	18.96	12
Ironworkers (Structural)	Herrero de Estructura	19.67	13
Large Crane Operator	Operador de la Grua	23.80	14
Mechanic (Class I) Heavy Duty	Mecanico Clase 1	24.99	15
Mechanic (Class II) Light Duty	Mecanico Clase 2	22.14	16
Painter / Sandblaster	Pintor o Lajador	30.69	17
Skilled Laborer	Obrero Diestro	17.85	18
Survey Instrument Operator	Operador de Agrimensor	26.45	19
Sweeping Machine (Vacuum) Operator	Operador de Barredora	18.27	20
Truck Driver (2 axles)	Camionero (2 ejes)	17.88	21
Truck Driver (3/4 axles)	Camionero (3 o 4 ejes)	17.36	22
Truck Driver (5 or more axles)	Camionero (5 o más ejes)	19.57	23
Unskilled Laborer	Obrero no Diestro	15.33	24
Worksite Traffic Coordinator	Coordinar de Trafico en el Lugar de Trabajo	19.66	25

**CLASSIFICATION****CRAFT NO.****SKILLED LABORER:****17**

Air Tool Operator, Asphalt Raker, Chain Saw Operator, Concrete Mixer Operator (less than 1 yard), Concrete Rubber/Edger, Fence Erector, Form Setter (Steel Road), Guardrail Erector, Mechanic's Helper (Tire Changer or Oiler), Mortar Mixer, Nozzelman or Gun Operator (Gunitite), \*Pipelayer, Sign Erector

**CLASS "A" OPERATORS:****03**

Backhoe/Hydraulic Excavator (3/4 yard and over), Crane (less than 20 tons see Crane Operator below), End Loader (3 yards and over), Motor Patrol (Finish), Pile Driver, Dragline

**CLASS "B" OPERATORS:****04**

Backhoe/Hydraulic Excavator (less than 3/4 yard), Bull Dozer or Push Dozer, End Loader (less than 3 yards), Motor Patrol (Rough), Tractor (Crawler/Utility), Scraper, Shovel, Trenching Machine

**CLASS "C" OPERATORS:****05**

Asphalt Paver, Concrete Finishing Machine, Concrete Paver, Scale, Spreader (Self-Propelled), Concrete Grinder, Asphalt Milling Machine, Boring Machine Operator (Horizontal)

**CLASS "D" OPERATORS:****06**

Bobcat, Central Mixing Plant, Concrete Pump, Concrete Saw, Curb Machine (Automatic or Manual), Dozer or Loader (Stockpile), Drill (Piling), Mulcher or Seeder, Rock Drill (Truck Mounted), Roller (Asphalt), Roller (Compaction Self-Propelled), Soil Stabilization Machine, Tractor (Boom & Hoist), Bituminous Distributor Machine, Pump, Track Drill, Striping Machine Operator, Ditch Paving Machine

**CRANE OPERATOR:****25**

Means one who operates boom-type equipment equal to or greater than 20 tons to hoist and move materials, raise and lower heavy weights and perform other related operations; may oil, grease or otherwise service and make necessary adjustments to equipment as needed; and may perform other related duties. (Note: The equipment is used for such work as pouring concrete and setting steel. This work is subject to strict inspection and must conform closely to specifications. The equipment may also be used for other miscellaneous tasks for which crane or stick-type equipment is required which may include hoist operations and pile driving operations.)

**\*Skilled Laborer - Pipelayer Classification**

For any work where prevailing wage rates apply which is located five feet or more outside the actual building if building construction is involved:

**AND**

- (a) which consists of the building, rebuilding, locating, relocating or repairing any street, highway, bridges, water lines, sewer lines, gas lines, force mains or other related utilities

**OR**

- (b) which involves the construction or upgrading of industrial parks or sites and is located outside the five foot limitation.

The classification of pipelayer shall be applicable and the description of work under this classification shall be as follows:

Lays, connects, inspects and tests water lines, force mains, gas lines, sanitary or storm sewers and drains, underground telephone and electric ducts or other utilities manufactured from clay, concrete, steel, plastic, cast iron pipe or other similar materials.

May smooth bottom of trench to proper elevation by scooping with a shovel; receives pipe lowered from top of trench; inserts spigot end of pipe into bell end of last laid pipe; adjusts pipe to line and grades, caulks and seals joint with cement or other sealing compound; may connect threaded or flanged joint pipe; may assemble and place corrugated metal or plastic pipe and performs other related duties.

**Additional Information :**

Wage Rates : <http://www.tennessee.gov/labor-wfd/prevail.html>

Poster Page : <http://www.state.tn.us/labor-wfd/poster.htm>

Note: Adobe Acrobat Reader is required in order to download & print. If you do not have this software a link is provided at the bottom of the Poster Page for a free download.

Tenn.Dept. of Labor & Workforce Development (Labor Standards Division) : (615) 741-2858.

**APPRENTICESHIP REGULATIONS:**

Under T.C.A., §12-449, the Prevailing Wage Commission has promulgated Rule 0800-3-2-.04 which provides that: "Apprentices shall mean those persons registered individually under a bona fide apprenticeship program registered with the Bureau of Apprentiship and Training in the United States Department of Labor. The state agency contracting officer shall require the contractor or sub-contractor using the apprentice to submit evidence of his indenture and/or apprenticeship registration when the apprentice's name first appears on a submitting payroll."

**AUTHORITY:** T.C.A., §12-449. Administrative History: Original Rule filed June 4, 1976. Effective: July 14, 1976.

## **APPENDIX C**

### **CONTRACT BOOK 2 (DESIGN-BUILD CONTRACT) FORMS**

<b>FORM NAME</b>	<b>FORM DESIGNATION</b>
ATTESTATION RE PERSONNEL USED IN CONTRACT PERFORMANCE	FORM AT
CONFLICT OF INTEREST DISCLOSURE STATEMENT	FORM COI
CONTRACT PAYMENT AND PERFORMANCE BOND	FORM CP&PB
LOBBYING CERTIFICATE	FORM LC
TECHNICAL PROPOSAL SIGNATURE PAGE	FORM TPSP

**ATTESTATION RE PERSONNEL USED IN CONTRACT  
PERFORMANCE  
FORM AT**

<b>DESIGN-BUILD CONTRACT NUMBER:</b>	<b>DB2001</b>
<b>LEGAL ENTITY NAME:</b>	
<b>FEDERAL EMPLOYER IDENTIFICATION NUMBER: (or Social Security Number)</b>	

**The Entity, identified above, does hereby attest, certify, warrant, and assure that the Entity shall not knowingly utilize the services of an illegal immigrant in the performance of this Contract and shall not knowingly utilize the services of any subcontractor who will utilize the services of an illegal immigrant in the performance of this Contract.**

**SIGNATURE & DATE:**

---

NOTICE: This attestation **MUST** be signed by an individual empowered to contractually bind the Design-Builder. If said individual is not the chief executive or president, this document shall attach evidence showing the individual's authority to contractually bind the Design-Builder.

# CONFLICT OF INTEREST DISCLOSURE STATEMENT

## FORM COI

### DB2001

#### Background

The integrated nature of Design-Build creates the potential for conflicts of interest. Disclosure, evaluation, and management of these conflicts and of the appearance of conflicts, require attention to State and federal Laws in the contracting process. The Tennessee Department of Transportation (“TDOT”) has developed *Conflict of Interest Disclose Guidelines* (“COI Disclosure Guidelines”). The COI Disclosure Guidelines are intended to summarize the key governing standards of State and Federal Laws, include definitions of key terms, and describe the COI Disclosure Process.

#### Federal Standards

Pursuant to 23 USC 112(b)(3), the Federal Highway Administration (FHWA) has promulgated administrative rules that affect federally-funded Design-Build procurements and related procurements. These rules, which are in 23 Code of Federal Regulations (CFR) Parts 635 and 636, are used as the basis for TDOT’s guidelines on the subject. The main rule on organizational conflicts of interest in Design-Build transactions is 23 CFR § 636.116. This rule affects not only Design-Build procurements, but also “any contract for engineering services, inspection or technical support in the administration of the Design-Build contract.”

These rules specifically regulate both organizational and individual conflicts of interest. The federal rules define “organizational conflict of interest” as follows:

*“Organizational conflict of interest means that because of other activities or relationships with other persons, a person is unable or potentially unable to render impartial assistance or advice to the owner, or the person's objectivity in performing the contract work is or might be otherwise impaired, or a person has an unfair competitive advantage.”* (23 CFR § 636.103)

#### Organizational Conflict of Interest Policy

TDOT may disqualify the Design-Builder if any of its Major Participants belong to more than one Design-Builder organization. If any Major Participants of different Design-Builder organizations belong to the same parent company, each Design-Builder must describe how the participants have avoided conflicts of interest during the procurement phase of the Project.

The Design-Builder agrees that, if after award, an organizational conflict of interest is discovered, an immediate and full disclosure in writing must be made to TDOT that must include a description of the action that the Design-Builder has taken or proposes to take to avoid or mitigate such conflicts. If an organizational conflict of interest is determined to exist, TDOT may, at its discretion, cancel the Contract. If the Design-Builder was aware of an organizational conflict of interest prior to the award of the Contract and did not disclose the conflict to TDOT, TDOT may terminate the Contract for default.

**Disclosure Pursuant to Section 636.116(2)(v)**

In the space provided below, and on supplemental sheets as necessary, identify all relevant facts relating to past, present, or planned interest(s) of Design-Builder which may result, or could be viewed as, an organizational conflict of interest in connection with the RFP.

The Design-Builder shall disclose:

- a. any current contractual relationships with TDOT (by identifying TDOT contract number and project manager);
- b. present or planned contractual or employment relationships with any current TDOT employee;
- c. any current relationships between the Major Participants, Key Personnel, Design Professionals, or Subcontractors of the Design-Builder on other TDOT projects; and
- d. any other circumstances that might be considered to create a financial interest in the contract for the Project by any current TDOT employee if the Design-Builder is awarded the contract.

The foregoing is provided by way of example, and shall not constitute a limitation on the disclosure obligations.

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_
- 6. \_\_\_\_\_
- 7. \_\_\_\_\_



8. \_\_\_\_\_

**Explanation**

In the space provided below, and on supplemental sheets as necessary, identify steps that have been or will be taken to avoid, neutralize, or mitigate any organizational conflicts of interest described herein.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

**Certification**

The undersigned hereby certifies that, to the best of his or her knowledge and belief, no interest exists that is required to be disclosed in this Conflict of Interest Disclosure Statement, other than as disclosed above.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Company Name

**STATE OF TENNESSEE**  
**DEPARTMENT OF TRANSPORTATION**  
**CONTRACT PAYMENT AND PERFORMANCE BOND**  
**FORM CP&PB**

**DB2001**

Be it known that \_\_\_\_\_, as Design-Builder, and \_\_\_\_\_, as Surety(ies), all authorized to do business in the State of Tennessee, hereby bind themselves to the State of Tennessee, Department of Transportation, and other potential claimants, for all obligations incurred by the Design-Builder under its contract with the State of Tennessee, Department of Transportation, for the construction of the above identified contract; in the full contract amount of \_\_\_\_\_ (\$\_\_\_\_\_).

The obligations of the Design-Builder and Surety(ies) under these payment and performance bonds shall continue in full force and effect until all materials, equipment and labor have been provided AND all requirements contained in the Contract Documents, plans and specifications have been completed in a timely, thorough and workmanlike manner. The parties agree that these bonds are statutory in nature and are governed by the provisions contained in Title 12, chapter 4 and Title 54, chapter 5 of the Tennessee Code Annotated relating to bonds required of contractors and that those provisions constitute a part of this bond.

By this instrument, the Design-Builder and Surety(ies) specifically bind themselves, their heirs, successors, and assigns, *in solido*, under the following bonds:

**Payment Bond.** To the Tennessee Department of Transportation and all "Claimants," as contemplated by T.C.A. Title 54, chapter 5, in the full contract amount of

\_\_\_\_\_  
\_\_\_\_\_, in order to secure the payment in full of all timely claims under the Project.

**Performance Bond.** To the Tennessee Department of Transportation in the full contract amount of \_\_\_\_\_

\_\_\_\_\_,

in order to secure the full and faithful performance and timely completion of the project according to its scope, plans and specifications, inclusive of overpayments to the contractor and liquidated damages as assessed.

Upon receipt of notice that the Design-Builder is in default under the contract, the Surety(ies) shall undertake to complete performance, without regard to cost. If the Surety(ies) fail or refuse to complete performance of the contract, the Department may then proceed with the work in any lawful manner that it may elect until it is finally completed. When the work is thus finally completed, the total cost of the same will be computed. All costs and charges incurred by the Department in completing the work will be deducted from any monies due or which may become due to the Design-Builder. If the total costs of completion exceeds the sum which would have been payable under the Contract, then the Principal and the Surety(ies), *in solido*, shall be liable for and shall pay to the Department the amount of such excess.

In witness whereof we have signed this instrument as dated.

Design-Builder (1)

\_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_

Printed Name and Title

Design-Builder (2)\*

\_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_

Printed Name and Title

Surety 1 \_\_\_\_\_

Surety 2\* \_\_\_\_\_

By: \_\_\_\_\_

Attorney-in-Fact

By: \_\_\_\_\_

Attorney-in-Fact

\_\_\_\_\_

Printed Name and Title

\_\_\_\_\_

Printed Name and Title

\_\_\_\_\_

Agency Name

\_\_\_\_\_

Agency Name

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
City/State/Zip

\_\_\_\_\_  
City/State/Zip

(Seal)

(Seal)

Subsequent correspondence/communication from TDOT with respect to monthly progress reports and/or the contract bonds should be directed to:

Surety 1 \_\_\_\_\_

Surety 2\* \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Attorney-in-Fact

Attorney-in-Fact

\_\_\_\_\_  
Printed Name and Title

\_\_\_\_\_  
Printed Name and Title

\_\_\_\_\_  
Agency Name

\_\_\_\_\_  
Agency Name

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
City/State/Zip

\_\_\_\_\_  
City/State/Zip

\*NOTE: The signature and information for Design-Builder (2) and Surety (2) is to be provided when there is a joint venture.

# LOBBYING CERTIFICATE FORM LC

## PROJECT

**DESCRIPTION:** Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee

### DB2001

The undersigned certifies, to the best of his or her knowledge and belief, that **CHECK ONE:**

- No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned,** to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of **ANY** Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.
- If any funds other than Federal appropriated funds have been paid or will be paid** to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with **THIS** Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions [as amended by "Government-wide Guidance for New Restrictions on Lobbying," 61 Federal Regulations 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, et seq.)].

The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

[Note: Pursuant to 31 U.S.C. §1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each expenditure or failure.]

The Design-Builder, \_\_\_\_\_, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Design-Builder understands and agrees that the provisions of 31 U.S.C. §3801, et seq., apply to this certification and disclosure, if any.

Date

Company Name

Signature

Name and Title

NOTE: DESIGN-BUILDER IS REQUIRED PURSUANT TO FEDERAL LAW TO INCLUDE THE ABOVE LANGUAGE IN SUBCONTRACTS OVER \$100,000 AND TO OBTAIN THIS LOBBYING CERTIFICATE FROM EACH SUBCONTRACTOR BEING PAID \$100,000 OR MORE UNDER THIS CONTRACT.

**TECHNICAL PROPOSAL SIGNATURE PAGE**  
**FORM TPSP**

DESIGN-BUILDER: \_\_\_\_\_ TELEPHONE No. (\_\_\_\_) \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CONTRACTOR'S LICENSE No. \_\_\_\_\_

LICENSE CLASSIFICATION \_\_\_\_\_

PROJECT: Interstate 65 Interchange at Buckner Road, Williamson County, Tennessee (the "Project")

DB CONTRACT No.: DB2001

TO THE TENNESSEE DEPARTMENT OF TRANSPORTATION:

FIRM OFFER; SCOPE OF FIRM OFFER. The Design-Builder hereby submits this its Firm Offer in response to that Request for Proposals (RFP) issued \_\_\_\_\_, \_\_\_\_20\_\_\_\_, as amended by Addenda

Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____

to execute the Contract, consisting of the Contract Documents, as those terms are defined in the **DB Standard Guidance**, within the time period stipulated in the Contract Documents if awarded the Contract, and upon Contract execution to perform the Contract in accordance with its terms. Such Firm Offer shall remain open for a minimum of 180 Calendar Days from the original Proposal Due Date, or for such longer period to which the Design-Builder may consent. Notwithstanding the foregoing, the Design-Builder's execution of the Contract shall constitute evidence that its Firm Offer was held open to date of Contract execution.

The following portions of the Design-Builder's Technical Proposal and Price Proposal (collectively, its "Proposal") are included in this Firm Offer in accordance with the criteria established in the Design-Build Contract and all associated Contract Documents:

**Technical Proposal:** Those portions of the Proposal that meet or exceed TDOT's minimum Contract requirements, as determined by TDOT in its sole discretion, shall be incorporated into the resulting Contract as if fully set forth therein, and shall constitute additional minimum Contract requirements. Upon incorporation, such portions of the Proposal shall amend the minimum Contract requirements they exceed. Those portions of the Technical Proposal that do not meet or exceed the minimum Contract requirements established by TDOT shall **not** be

incorporated into the Contract.

**Price Proposal:** The total of prices proposed in the Price Proposal “Schedule of Items” (the “Proposal Price”), shall be incorporated into the resulting Contract as if fully set forth therein.

**EQUAL OPPORTUNITY CLAUSE.** The Design-Builder, hereby certifies that **(CHECK ONE)** it has  has not , participated in a previous contract or subcontract subject to the equal opportunity clause, as required by Executive Orders 11246, 10925 and 11114 as amended, and that **(CHECK ONE)** it has  has not , filed with the Office of Federal Contract Compliance Program all reports due under the applicable filing requirements.

**PROPOSAL SECURITY.** By submitting this Proposal, the undersigned Design-Builder hereby agrees to be bound by the award of the Contract and, if awarded the Contract on this Proposal, to execute the required Contract and the required Contract Payment and Performance Bond within ten (10) days after receipt of notice of the award. The undersigned Design-Builder submits herewith the required Proposal guaranty in an amount of not less than five (5%) percent of the total amount of the Price Proposal drawn to the order of the Tennessee Department of Transportation offered and agrees and consents that the Proposal guaranty shall immediately be at the disposal of the Department, not as a penalty, but as an agreed liquidated damage if the required Contract and Contract Payment and Performance Bond are not executed within ten (10) days from receipt of the notice of award.

**DBE PROJECT UTILIZATION GOAL** is 14.0%.

**GOOD FAITH EFFORTS.** The Design-Builder will either meet the DBE utilization goals identified herein or will make good-faith efforts to meet such goals. **(CHECK ONE)** YES  NO  or N/A .

**DESIGN-BUILDER DBE STATUS.** The Design-Builder affirms that the Design-Builder is certified as a DBE under Tennessee Law: **(CHECK ONE)** YES  NO  or N/A . The Design-Builder affirms that one or more joint-venture partners of the Design-Builder is certified as a DBE under Tennessee Law: **(CHECK ONE)** YES  NO  or N/A .

If the Design-Builder or a joint-venture partner of the Design-Builder is a DBE, answer the following:

Indicate both type of work to be performed by the DBE Design-Builder and **percent** of total Proposal Price represented by such work

---

Identify by name each joint venture partner certified as a DBE under Tennessee Law and include both type of work to be performed by each such joint venture partner and **percent** of total Proposal Price represented by such work

---

#### **DESIGN-BUILDER AFFIRMATIONS.**

The undersigned Design-Builder, its authorized representative, acknowledges, represents, attests,



warrants and certifies that:

- (1) By submitting this Proposal, the Design-Builder represents that it has carefully examined the Contract, which includes **Contract Book 1 (ITBD - Instruction to Design-Builders)**, **Contract Book 2 (Design-Build Contract)**, **Contract Book 3 (Project Specific Information)** and all referenced documents, the **DB Standard Guidance**, ;has carefully examined any Plans provided by the Department, the Standard Specifications for Road and Bridge Construction (January 1, 2015) adopted by the State of Tennessee, Department of Transportation, with subsequent revisions which are acknowledged to be a part of this Proposal, the Special Provisions, the Standard Drawings, the Proposal Form, the Form of Contract, All Contract Documents and Addenda; and thoroughly understands their stipulations, requirements, and provisions. The Design-Builder, acting through its authorized representatives, has read and understands, and agrees to be bound by and comply with all RFP instructions, terms and conditions, together with all Addenda, if any, issued.
- (2) The Design-Builder, acting through its authorized representatives, has made a proper examination of the Project Site work described herein and all work locations and has become familiar with local conditions and the character and extent of the work.
- (3) The Design-Builder, acting through its authorized representatives, has read and understands, and agrees to be bound by and comply with the terms of the Contract identified, included, or incorporated by reference into the RFP before submitting its Proposal.
- (4) The Design-Builder has determined the quality and quantity of materials required; has investigated the location and determined the sources of supply of the materials required; has investigated labor conditions; and, has arranged for the continuous prosecution of the work herein described.
- (5) By submitting this Proposal, the Design-Builder agrees to provide all necessary equipment, tools, labor, incidentals, and other means of construction, to do all the work, and furnish all the materials of the specified requirements which are necessary to complete the work in accordance with the Plans, the Specifications and all Contract Documents, and agrees to accept as payment in full therefor described in the Contract that are set forth in this Proposal. Compensation for "Extra Work" which may be required by the Department in connection with the construction and completion of the work but which was not reflected in the Proposal scope at the time of bidding, will be made in the following manner: work will be compensated in accordance with the applicable Contract Documents.
- (6) The Proposal was prepared independently from all other Design-Builders, and without collusion, fraud, or other dishonesty.
- (7) Neither the Design-Builder nor anyone representing the Design-Builder offered or gave any advantage, gratuity, bonus, discount, bribe or loan of any sort to TDOT or its agents, employees, or anyone representing TDOT, or engaged in any other type of anti-competitive conduct at any time during this procurement.
- (8) If awarded the Contract, the Design-Builder shall utilize in performance of the Contract all resources indicated in its Proposal, including Major Participants, Key Personnel, and Design Professionals, to the extent within the Design-Builder's control and through

application of the Design-Builder's best efforts.

- (9) If awarded the Contract, the Design-Builder shall make all Personnel, including Design Professionals, identified in its Proposal available at all times and places required under the terms of the Contract, and shall ensure that such Personnel devote all efforts necessary for all periods of time necessary or required under the terms of the Contract, to timely fulfill all Contract obligations.
- (10) The Design-Builder has the power and authority to enter into and perform the Contract to be awarded, and the Contract, when executed and delivered, shall be a valid and binding obligation enforceable according to its terms.
- (11) If the Design-Builder is a joint venture or partnership, each joint venturor or partner has signed this Technical Proposal Signature Page on behalf of both itself and the Design-Builder, and each joint venturor or partner and the Design-Builder shall be jointly and severally liable for performing all of the duties and meeting all of the obligations of the Design-Builder under the terms of the RFP, Proposal and Contract to be entered into.
- (12) The Design-Builder acknowledges that TDOT has the right to modify the Contract prior to execution to (a) correct typographical errors, (b) reconcile inconsistencies within and among the Contract Documents, (c) conform terminology used throughout the Contract, (d) include omitted terms clearly contemplated by the language in the Contract, (e) add terms required under State or federal law, and (f) incorporate those portions of the Technical Proposal and Price Proposal, as set forth under, if so, as may be authorized under applicable statutes and rules.
- (13) The Design-Builder intends its Proposal Price to constitute full compensation for performance of all Contract obligations, including those additional minimum Contract requirements proposed in the Technical Proposal and incorporated in the Design-Build Contract.
- (14) The Design-Builder agrees to be bound by and will comply in all respects with the terms of the resulting Contract upon award.
- (15) TDOT will not be liable for any expenses incurred by the Design-Builder in preparing and submitting its Proposal or in participating in the Proposal evaluation/selection process.
- (16) In the event the Design-Builder has engaged in unlawful anti-competitive conduct or behavior prohibited under the terms of the RFP during this procurement or lacks power or authority or fails for any reason to execute the Contract if awarded to it within the time period specified in the RFP or agreed to by the Parties, the Design-Builder shall forfeit its Proposal Security and be disqualified from further consideration for Contract award and eligibility for receipt of a Proposal stipend.
- (17) The Design-Builder certifies that it is not under the control of any person, firm, partnership, or corporation, which has or exercises any control of any other person, firm, partnership, or corporation, which is submitting a Proposal on this Contract.

**BEFORE ME APPEARING THE UNDERSIGNED AND BEING BY ME DULY SWORN, UPON HIS/HER OATH INDIVIDUALLY AND IN HIS/HER REPRESENTATIVE CAPACITY ON BEHALF OF THE DESIGN-BUILDER, DEPOSES AND STATES:**

I, the undersigned, am a duly-authorized representative of the Design-Builder and have been authorized by the Design-Builder (a) to make in the name of and on behalf of the Design-Builder all acknowledgments, representations, attestations, warranties, and certifications contained herein and elsewhere in the Proposal, (b) to execute this Technical Proposal Signature Page and (c) by my signatures to bind the Design-Builder to the terms of its Proposal.

And further, that (a) the acknowledgments, representations, attestations, warranties, and certifications contained herein and elsewhere in the Proposal are true and correct, and (b) all copies of the Technical Proposal and Price Proposal submitted with the originals are true and correct copies of the originals. This is an official document that is required or authorized by law to be made under oath and is presented in an official proceeding. A person who makes a false statement in this certification is subject to the penalties of perjury.

\_\_\_\_\_ Sworn to and subscribed before me  
Design-Builder (1) this \_\_\_\_\_ day of \_\_\_\_\_,

By: \_\_\_\_\_

\_\_\_\_\_ Notary Public  
Printed Name and Title My commission expires \_\_\_\_\_

(Seal)

-----  
\_\_\_\_\_ Sworn to and subscribed before me  
Design-Builder (2)\* this \_\_\_\_\_ day of \_\_\_\_\_,

By: \_\_\_\_\_

\_\_\_\_\_ Notary Public  
Printed Name and Title My commission expires \_\_\_\_\_

(Seal)

\*NOTE: The signature and information for Design-Builder (2) is to be provided when there is a joint venture.

**\*\*THIS TECHNICAL PROPOSAL SIGNATURE PAGE MUST BE SIGNED IN BLUE INK. ANY ALTERATIONS, INTERLINEATIONS, OR ERASURES TO THE PROPOSAL MUST BE INITIALED ON THE ORIGINAL COPY IN INK BY THE SIGNATORY TO THIS TECHNICAL PROPOSAL COVER SHEET AND SIGNATURE PAGE.**

**DESIGN-BUILD  
RFP CONTRACT BOOK 3  
PROJECT SPECIFIC INFORMATION**

**TENNESSEE DEPARTMENT OF TRANSPORTATION**

**INTERSTATE 65 INTERCHANGE AT BUCKNER ROAD IN  
SPRING HILL, TN  
WILLIAMSON COUNTY- TENNESSEE**

**CONTRACT NUMBER: DB2001**



**July 17, 2020**

- Addendum #1 August 21, 2020
- Addendum #2 September 11, 2020
- Addendum #3 September 29, 2020
- Addendum #4 October 12, 2020
- Addendum #5 November 9, 2020
- Addendum #6 November 19, 2020

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*Interstate 65 Interchange at Buckner Road, Williamson County*

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APPENDIX A: ENGINEERING ANALYSIS PAVEMENT DESIGN

## 1.0 GENERAL

This **Contract Book 3 (Project-Specific Information)** contains the requirements and conditions by which the Design-Builder shall design and construct the Project, except for any portions of the work that may be stipulated within this **Contract Book 3 (Project-Specific Information)** to be performed by the Tennessee Department of Transportation (TDOT, or “the Department”).

The order of precedence of **Contract Book 3 (Project-Specific Information)** with the other contract documents is described in **Contract Book 2 (Design-Build Contract)**. TDOT will utilize electronic contracts for this project.

The Definition of Terms corresponding with this **Contract Book 3 (Project-Specific Information)** can be found in the *Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction (January 1, 2015 edition)* and/or *Design-Build (DB) Standard Guidance: [https://www.tn.gov/content/dam/tn/tdot/construction/design-build\\_projects/Design-Build\\_Guidance\\_01-31-17.pdf](https://www.tn.gov/content/dam/tn/tdot/construction/design-build_projects/Design-Build_Guidance_01-31-17.pdf)*.

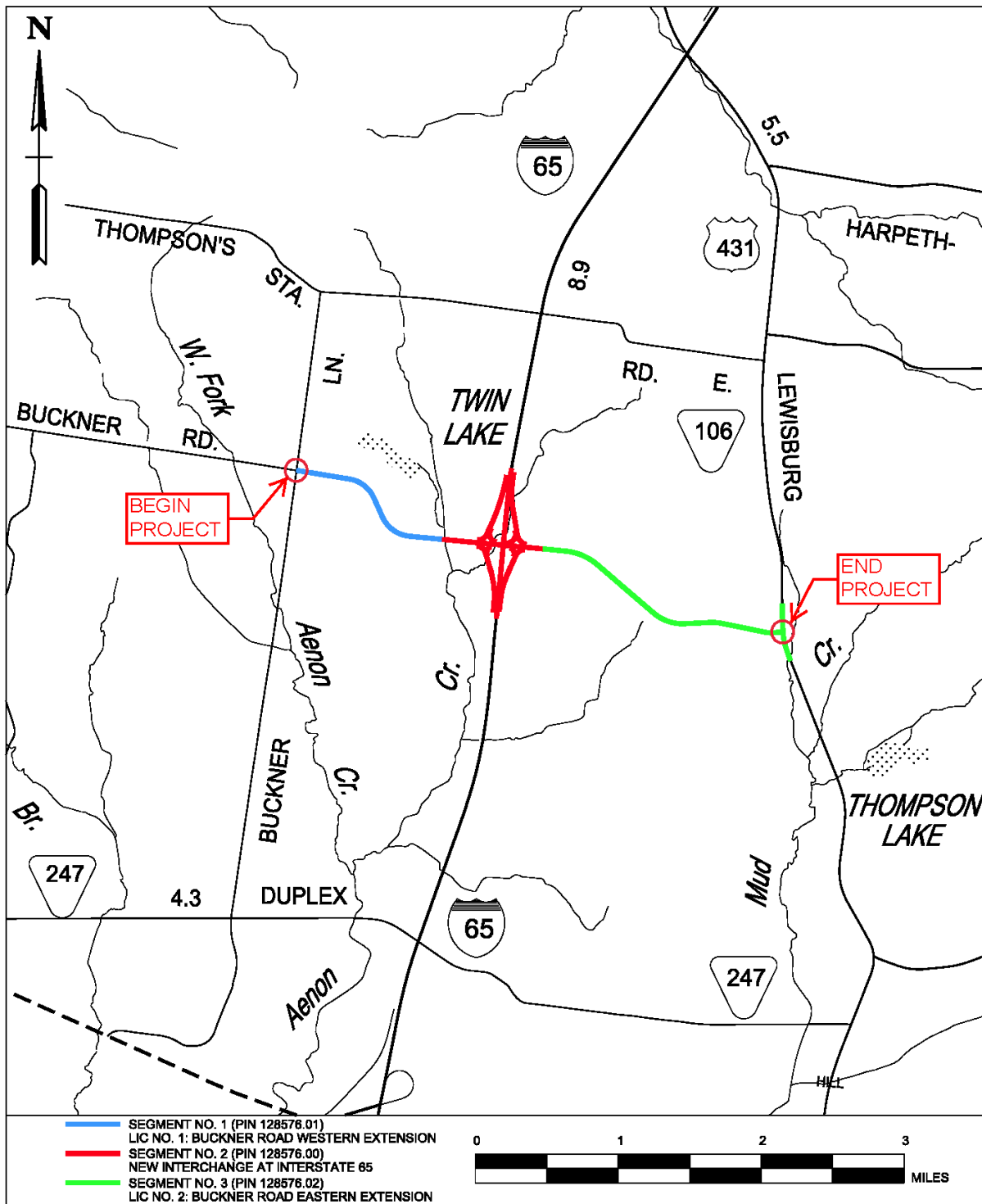
### 1.1 PROJECT DESCRIPTION

The proposed project shall include the design and construction of a new diverging diamond interchange on Interstate 65 at L.M. 2.62 in Spring Hill, Williamson County, TN and roadway (Buckner Road) extensions to near the existing intersection with Buckner Road at Buckner Lane to the west and Lewisburg Pike (US-431/SR-106) to the east (See Figure 1 – Location Map). The project shall include:

- Construction of Buckner Road Extensions to existing Buckner Road and Lewisburg Pike (US-431/SR-106) from Interstate 65;
- Construction of a new diverging diamond interchange and associated on- and off-ramps to Interstate 65 including a new bridge over Interstate 65;
- Mill and overlay of Interstate 65 as described in Section 3.2 and Appendix A;
- Construct grass strips to accommodate future sidewalk and shared-use path along Buckner Road;
- Replacing all substandard guardrail and terminals within the project limits;
- Construction of all required drainage structures, bridges, box bridges, and/or channel relocations;
- New signals at Lewisburg Pike and at the diverging diamond interchange;
- Construct new access control fencing as described in Section 3.2;
- Right-of-way (ROW) acquisition;
- Preparing all documents necessary to obtain all permits required;
- All erosion prevention and sediment control designs and implementation;
- Traffic maintenance and management during all phases of construction;
- Pavement markings and signage;
- Maintenance as described in Section 12 and in the *DB Standard Guidance*;
- Complete interchange lighting;
- Other structures (retaining walls, overhead sign structures, etc.) as needed to complete the project; and
- Project and Quality management.
- Construct an access road as described in Section 3.11



FIGURE 1 - LOCATION MAP



## **1.2 PROJECT GOALS**

The following goals have been established for the Project (**not listed in any specific order**):

- Minimize inconvenience to the public during construction.
- Provide a management system or approach that ensures the requirements of the Project will be met or exceeded.
- Provide a high-quality project that minimizes future maintenance.
- Provide a solution consistent with the Department's Roadway and Structures Design Standards.
- Adhere to local, state, and federal environmental regulations and/or permits that are required in executing and/or completing the Project.
- Incorporate Best Management Practices (BMPs) to control sediment, storm water runoff/discharge, or other environmental parameters that are established for the Project.
- Implement innovative solutions to maximize the return on taxpayer investment by reducing costs or improving quality of the transportation system.
- Complete construction no later than September 30, 2023.
- Incorporate safety and positive drainage into all aspects of design and construction with the ultimate goal of zero incidents and accidents.
- Provide a visually pleasing finished product.
- Meet or exceed the DBE goal as described in Section 1.4.

## **1.3 DEPARTMENT PROVIDED MATERIALS**

Plans and/or the Department supplied material are available for download on the Department's project website:

<https://www.tn.gov/tdot/tdot-construction-division/transportation-construction-alternative-contracting/i-65-interchange-at-buckner-rd>

The following materials are provided by the Department:

- Supplemental Safety and Health Plan requirements as amendment to Section 2.5.5. of the Design-Build Standard Guidance;
- Survey Data File in Microstation (for information only);
- The National Environmental Policy Act (NEPA) documentation was processed as a D List Categorical Exclusion (CE) under 23 CFR 771.117(d) and was approved by FHWA on February 12, 2020;
- NEPA Environmental Commitments – Green Sheet dated February 12, 2020;
- Interchange Access Request (IAR) for Interstate 65 at Buckner Road Extension was conceptually approved by FHWA on February 14, 2018 and an IAR Modification was approved by FHWA on February 15, 2019;
- Roadway Functional Plans (for information only);
- Signing and Striping Exhibit;
- Bridge Functional Plans (for information only);

- TDOT Structural Design Memorandums SMO-05 dated July 28, 2016, SMO-31 dated October 31, 2014, and SMO-55 dated November 24, 2014;
- TDOT Bridge Plans Notes dated March 11, 2020;
- Buckner Road Traffic Data developed by the Department's Project Planning Division, dated November 14, 2019;
- Interstate 65 at Buckner Road Interchange Traffic Data, dated January 8, 2020.
- Preliminary Report of Geotechnical Exploration, dated December 4, 2019 (for information only);
- Pavement design (see Appendix A), dated September 2, 2020;
- TDOT 2017 *Procedures for Providing Offsite Waste and Borrow on Construction Projects* (May 15, 2017 edition);
- Lighting Specifications;
- Bridge Aesthetics Renderings;
- Typical Structural Repair Details;
- Single Slope Bike & Pedestrian Median Barrier Wall Details;
- Median Island Details;
- City of Spring Hill Resolution 20-47;
- Pavement Evaluation Report;
- Culvert Inspection Reports;
- City of Spring Hill Traffic Systems Specifications; and
- Generic Bridge Load rating assignment letter (for information only).

The Design-Builder shall verify existing survey and provide all updated surveys, mapping, plans, verification of existing utilities, investigation, survey data file, and analysis required for completion of the work.

By submitting a response to this RFP, the Design-Builder acknowledges and agrees that TDOT does not make any warranties or representations as to the accuracy or completeness of the provided survey and geotechnical data. The Design-Builder shall bear the risk for any changes in its design or construction resulting from its failure to verify the survey and geotechnical data provided by the Department.

The Design-Builder shall adhere to all commitments stated in the NEPA document. The Design-Builder shall acknowledge that materials furnished by the Department are preliminary and provided solely to assist the Design-Builder in the development of the project design. The Design-Builder shall be fully and totally responsible for the accuracy and completeness of all work performed under this contract and shall hold the Department harmless and shall be fully liable for any additional costs and all claims against the Department which may arise due to errors, omissions and negligence of the Design-Builder in performing the work required by this contract.

#### **1.4 DBE GOAL**

The assigned DBE goal for this Project is 14.0%.

The Design-Builder shall exercise all necessary and reasonable steps to ensure that DBEs participate in at least the percent of the total project cost as set forth above as the goal. The Design-Builder shall make good faith efforts in achieving this goal and shall comply with all requirements of 49 CFR part 26.

#### **1.5 ON-THE-JOB/APPRENTICESHIP TRAINING**

On-the-Job/Apprentice Training is required on this Project and shall be included in the bid document and special provision. See for further information §7.2.11 of the *DB Standard Guidance*.

#### **1.6 LIQUIDATED DAMAGES**

The Design-Builder shall complete the Project within the time limitations set forth in **Contract Book 2 (Design-Build Contract)** and Special Provision 108B.

#### **1.7 TDOT STANDARD SPECIFICATIONS**

All work shall be completed in accordance with the *Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction (January 1, 2015 edition)*, unless specifically stated otherwise herein.

#### **1.8 CONSTRUCTION ENGINEERING INSPECTION**

The Department will be responsible for Construction Engineering Inspection (CEI) work and Quality Acceptance Testing.

#### **1.9 CONTRACTOR RESPONSIBILITIES**

Nothing in the Contract shall relieve the Design-Builder from their responsibilities toward the safety and convenience of the general public and the residents along the proposed construction area.

## **2.0 PROJECT MANAGEMENT**

The Design-Builder shall prepare and administer a Project Management Plan (PMP) containing the Design-Builder's approach to managing the design and construction activities of the Project in accordance with the *DB Standard Guidance* and the specific requirements defined herein.

The PMP shall contain, at a minimum, the following component parts:

- Organizational Structure and Staffing Plan
- Critical Path Method (CPM) Schedule
- Quality Management Plan
- Environmental Compliance Plan
- Safety and Health Plan (see Supplemental Requirements in Department provided materials)
- Public Relations and Public Information Plan
- Records Management Plan

The Design-Builder shall use the Project Understanding and Approach, and the Project Management and Approach submitted with the Proposal as a foundation to prepare the PMP component plans. The Design-Builder shall implement all elements of the PMP.

The successful Design-Builder shall be required to utilize PlanGrid software to transmit all submittals and RFIs for the project. The Design-Builder shall contact PlanGrid directly to obtain usage license and service information. Information about PlanGrid and contact information for purchasing licenses at TDOT's special rate can be found at the following link:

<https://www.tn.gov/tdot/tdot-construction-division/transportation-construction-division-resources/plangrid.html>

### **2.1 ORGANIZATIONAL STRUCTURE AND STAFFING PLAN**

The Design-Builder shall prepare an Organization Structure and Staffing Plan for the purpose of ensuring that appropriate qualified staff are employed by the Design-Builder to perform the Work and are able to carry out the Work in a manageable and safe manner.

The plan shall identify the Key Personnel and key management staff including the Key Personnel level 1 and level 2 identified in the Statement of Qualifications (SOQ) and on the Response Category 2 form.

The Design-Builder shall provide an organizational chart that graphically represents the hierarchy and functional interaction of the Key Personnel and indicates the functional responsibilities of each. The organizational chart shall be part of the PMP.

The organization shall be monitored, and the chart updated and provided to the Department when changes to the Design-Builder's organizational chart occur.

### **Staffing Requirements**

The Design-Builder shall provide to the Department, within 15 calendar days after the initial Notice to Proceed (NTP), a list of the contacts (and contact details) of Key Personnel on site and Key Personnel on call who are available 24 hours per day during the executions of the Work.

The Design-Builder shall include a procedure for a structured and managed replacement of Key Personnel on the project team of the Design-Builder.

Any licenses or certifications that are required to meet the requirements of the Request for Qualifications (RFQ) and RFP shall be in place by the time the first NTP is issued.

### **2.2 CRITICAL PATH METHOD (CPM) SCHEDULE**

The Design-Builder shall prepare a cost-loaded Critical Path Method (CPM) Schedule, in accordance with Chapter 3 of the *DB Standard Guidance* and the requirements herein, for review at the Post-Award Meeting.

The Design-Builder shall use the preliminary CPM Schedule submitted with the Proposal as a foundation to prepare a Project CPM Schedule and shall submit it to the Department for Review and Acceptance. Acceptance of the initial Project CPM Schedule by the Department shall be a condition of starting any Work. The Design-Builder shall submit an updated Project CPM Schedule on a monthly basis for the Department's Review and Acceptance. Failure to submit an updated Project CPM Schedule may result in the withholding of progress payments.

The Design-Builder shall provide a narrative with each CPM Schedule submittal, which shall include:

- A detailed description of the status of the Project and changes to the CPM;
- Identification of strategies for mitigation of Project risks or issues impacting the CPM Schedule describing constraints and discussing contingencies;
- How the proposed project phasing and sequence of work and allocation of resources enables the Design-Builder to progress the work to achieve the contractual completion dates;
- How the phasing ensures timely deliveries of materials to achieve the CPM Schedule milestones;
- Identification of categories of work performed by Design-Builder's own direct labor force and those performed by Subcontractors; and
- Pay Item activities and all work included in the Pay Item activities corresponding to totals as reflected on the Schedule of Items.
- Cost Loaded CPM: Cost loading activities shall be distributed appropriately. Individual activities shall be cost loaded. Level of effort cost loading shall not be used unless approved by the Department. Cost loading shall be provided for the individual segments described in Section 3.1.

The Design-Builder shall include all Design Reviews submittals and any resubmittals in the CPM Schedule in order for the Department to appropriately allocate resources for performing the reviews and to track and document any possible schedule impacts.

### **TDOT and FHWA Review Time**

The Design-Builder shall allocate ten (10) Business Days (excluding State holidays) in the CPM Schedule for activities requiring the Department's Review and Acceptance, or Review and Comment. Submittals requiring review and approval/acceptance from FHWA shall be allocated fifteen (15) Business Days

(excluding Federal holidays) in the CPM Schedule for FHWA review. Department and FHWA review periods can be assumed to occur concurrently.

Monthly progress payment requests and CPM updates are due five (5) business days prior to estimate cutoff date.

Number of Plan Review submittals shall be limited to two (2) at any given time.

### **Schedule and Cost Control**

The Design-Builder shall develop procedures for schedule and cost control on the Project, including the cost control and schedule management system to be used to control and coordinate the cost and schedule of the work.

The cost-control approach shall include a description of the proposed approach for calculating progress performance for preparing the monthly payment requests using the Pay Item activities, Schedule of Items and CPM Schedule.

The Design-Builder shall include a procedure for re-scheduling of its work to achieve schedule recovery objectives and how these objectives shall be enforced with its work force and subcontractors.

### **Liquidated Damages for Failure to Meet Completion Deadline**

The Design-Builder shall complete the Project within the time limitations set forth in **Contract Book 2 (Design-Build Contract)** and Special Provision 108B.

The Time Value (B) used for calculation of selection is **\$15,000** with a minimum value of **750** Calendar Days applied.

## **2.3 QUALITY MANAGEMENT PLAN**

The Design-Builder shall prepare a Quality Management Plan (QMP) in accordance with Section 2.5 of the *DB Standard Guidance* and the requirements herein. The QMP shall consist of a:

- Design Quality Management Plan
- Construction Quality Management Plan

### **Design Quality Management Plan**

The Design Quality Management Plan (DQMP) shall describe the quality roles and responsibilities of the Design-Builder's design quality management team and procedures for implementing the design work in accordance with Chapter 5 of the *DB Standard Guidance*. The DQMP shall be submitted for the Department's Review and Acceptance prior to starting any design work. The DQMP shall describe the design development, submittal and design review process for preparation of final signed and sealed construction plans used to construct the proposed improvements. The processes and procedures in the DQMP shall be developed in accordance with TDOT's *Design Guidelines* and Chapter 5 of the *DB Standard Guidance* for the Department's Review and Acceptance prior to starting any design work.

The DQMP shall include quality control and quality assurance procedures for ensuring the quality of the design work and conformance with the requirements in the *DB Standard Guidance*, including design-quality checks and certifications, and independent Design Reviews prior to submittal for the Department's Review and Acceptance.

The Design-Builder shall provide all Design Documents and perform Design Reviews in accordance with the Design Review schedule established in the Critical Path Method (CPM) Schedule, and in accordance with Contract requirements.

The Design-Builder shall be responsible for design QC and ensuring that the design submittals and design reviews are performed in accordance with the DQMP and the Contract Documents. The Design-Builder shall provide a Design Quality Manager (DQM) to perform quality assurance activities and audits of the QC activities and QC program. The DQM shall be independent of the production work and shall certify to the Design-Builder and the Department that the design Work Product conforms to the requirements of the Contract Documents.

The Design-Builder's DQMP shall outline the ROW Acquisition Management procedures to be followed based on the requirements of the Department *ROW Manual* and the *DB Standard Guidance*. The plan shall show the Design-Builder's approach to control, monitor, report on, and assure the quality of the delivery of the ROW acquisition services.

### **Construction Quality Management Plan**

The Construction Quality Management Plan (CQMP) shall describe the quality roles and responsibilities of the Design-Builder's construction quality management team and procedures for implementing the construction work in accordance with Chapter 7 of the *DB Standard Guidance*. The CQMP shall be submitted for the Department's Review and Acceptance prior to starting any construction work.

Although the Department will provide Construction Engineering and Inspection (CEI) and Quality Acceptance Testing, the Design-Builder is responsible for ensuring the quality of the work and shall prepare procedures in the CQMP for quality control of materials and how the Design-Builder plans to inspect the project to ensure compliance with the Contract Documents.

The Design-Builder shall be responsible for QC during construction and ensuring that QC testing and inspections are performed in accordance with the CQMP and the Contract Documents. The Design-Builder shall provide a Construction Quality Manager to oversee, manage, certify and perform construction quality assurance and audit activities. The CQM shall independently review the submittals for the Department, and upon completion shall certify to the Department that the information is accurate and complete. The CQM shall certify that all Work Product has been checked and/or inspected by the CQM's quality staff, and that all work complies with the Contract Documents. The CQM shall also certify to the Department that the CQMP and all measures, protocols, and procedures provided therein, are functioning properly and are being followed.

The Design-Builder shall guarantee and provide full cooperation in relation to CEI, audits, reviews, requests for information etc.

## **2.4 ENVIRONMENTAL COMPLIANCE PLAN**

The Design-Builder shall prepare an Environmental Compliance Plan (ECP) in accordance with Section 2.5.4 of the *DB Standard Guidance*.

## **2.5 SAFETY AND HEALTH PLAN**

The Design-Builder shall prepare a Safety Plan in accordance with the *DB Standard Guidance* with attention to Section 2.5.5 as amended and provided as an additional resource in the Department provided



materials (see project website). Note, the Design-Builder's Safety and Health Plan must be reviewed and accepted by the TDOT Occupational Health and Safety Division prior to commencing work.

## **2.6 PUBLIC RELATIONS AND PUBLIC INFORMATION PLAN**

The Design-Builder shall comply with Section 7.2.8 of the *DB Standard Guidance* and address the following the project-specific requirements:

### **Internal and External Communications**

The Design-Builder shall describe the internal and external communication process between the Design-Builder, the Department's staff, City of Spring Hill staff, external stakeholders, third parties, and the public affected by the work.

The Design-Builder shall provide all information required for communication purposes. The communication activities are mainly intended for the Department, Department staff, and City of Spring Hill staff (internal stakeholders) but shall also focus on neighboring public and communities, companies and organizations, emergency services, Williamson County, Town of Thompson Station, environmental agencies and other external services.

The focus on the construction communication shall support the following goals:

- Ensure that the entire project is executed in the least disruptive and positive manner possible for the Department.
- Maintain the best possible long-term relations with all relevant external stakeholders.
- Ensure that the work is performed in the most effective and efficient way

### **Project Website**

The Design-Builder shall coordinate with the Department and provide Project-related information to the Department for Review and Acceptance including:

- Contact information;
- Project maps;
- Current Project activities and progress;
- Timing of road closures and openings;
- Recommended route alternatives during closures, with maps;
- Newsletters and meeting materials; and
- Calendar of, and announcements for, meetings and special events.

### **Liaison with the Media**

Unless otherwise specifically authorized in writing by the Department, the Design-Builder shall provide no news release, press release, or any other statement to a member of the news media regarding this Project without the Department's prior written authorization. The Design-Builder shall require this clause within all Subcontractors agreements.

## **2.7 RECORDS MANAGEMENT PLAN**

The Design-Builder shall describe procedures for managing and maintaining Project record documents in accordance with Sections 5.2.11 and Chapter 7 of the *DB Standard Guidance* and the project-specific requirements herein.

The Department will perform a combination of Audits, Reviews, Inspections etc. to assess whether the Design-Builder's integrated project management is functioning properly and determine whether its records and information are reliable and up to date.

Upon completion of the Project, the Design-Builder shall provide the State Innovative Delivery Office a transmittal letter, an electronic copy (CAD and signed PDF's) of the As-Built drawings, and final foundation type, including footing elevations and lengths of individual piles, prior to final payment of funds to the Design-Builder. In addition, the Design-Builder shall provide TDOT Structures Division a final as-built set of plans for all structures (bridges, walls, foundations, etc.). The plans shall be delivered on USB flash drive (each sheet an individual PDF file).

The Tennessee licensed Professional Engineer in charge of the development of the Project plans shall place their seal, including signature and date, on the right side of the title sheet. All plans sheets shall contain the seal, including signature and date, of the Professional Engineer in charge of its development. Certified digital signatures shall be required for all plan submittals (refer to Section 4 of the TDOT Design Guidelines).

The As-Built Plans and the Design-Builder Specifications following construction completion shall incorporate any changes to the Readiness-for-Construction Design Review Plans and Specifications, changes made during construction as well as all utility locations within ROW as described in the *DB Standard Guidance*.

## **2.8 ESTIMATED QUANTITIES**

The Design-Builder shall provide the Department estimated quantities using the Department's Roadway Items Lists with each Readiness-for-Construction (RFC) Plans package (ie. LIC No. 1, Interchange, or LIC No. 2) to assist the Department in determining the number(s) and type(s) of material tests required as well as scheduling appropriate testing personnel as required by Chapter 5 of the *DB Standard Guidance*. The current items list can be downloaded at the following web page:

<https://www.tn.gov/tdot/roadway-design/design-standards/roadway-item-lists.html>

## **2.9 PROJECT PHOTOGRAPHY AND VIDEOGRAPHY**

The Design-Builder shall assist the Department in promoting the project progress to the public by providing high quality visual materials at the request of the Department, such as but not limited to time lapse video, drone video (minimum of one flight per month during construction), and before and after photos, as project milestones and visually compelling activities occur.

The Design-Builder shall comply with all federal, state, and local laws and shall acquire all necessary permits or certifications related to the use of any unmanned aerial vehicle (UAV) used to complete project photography and videography.

The Design-Builder shall provide and use high-resolution camera equipment resulting in still photos and a time-lapse video of the interchange construction from start to finish subject to the following:

- The location of the camera placement must be approved by TDOT. The Design-Builder shall submit a camera placement plan of the project site with notation of the vantage point(s) marked for location and direction along with the elevation.
- The Design-Builder shall provide TDOT unlimited access to and ability to download from an online photo album including still photos and high-quality time-lapse videos in order to view what is happening at any time during the construction as well as to review what's already happened. The Design-Builder shall submit for approval the proposed frequency for taking the images. Still photos shall include the date and time within the file name. Time-lapse videos shall include the date range within the file name.
- All images and time-lapse footage shall be the property of TDOT and their Assigns.
- All original digital still images shall be provided without alteration, manipulation, editing, watermarks, or modifications using image-editing software.
- At the conclusion of the construction, the Design-Builder shall submit a professionally produced high-definition time-lapse movie of the project. Editing shall include image stabilization, color correction, and removal of images outside the desired daily time range to be determined by TDOT.
- Final video should be a minimum of (3840 x 2160 pixels) with minimal compression at 30 frames per second. Photos should be a minimum of (6000x4000 pixels) with minimal compression.

### **3.0 ROADWAY SCOPE OF WORK**

The roadway shall be designed to adhere to the latest editions of all applicable TDOT Roadway Standard Drawings, TDOT *Roadway Design Guidelines* and Instructional Bulletins, TDOT *Drainage Manual*, TDOT *Traffic Design Manual*, TDOT *Design CADD Standards*, TDOT *Survey Manual* and the Department accepted American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets*, and *Manual on Uniform Traffic Control Devices* (MUTCD). Diverging Diamond Interchange design shall be based on the 2018 American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets* and FHWA *Diverging Diamond Interchange Informational Guide*.

The Design-Builder shall ensure that all applicable “General and Special Notes” found in Section VI of the current edition of the State of Tennessee Department of Transportation Design Division Roadway Design Guidelines are incorporated into the plans.

The Design-Builder shall be responsible for preparation of final signed and sealed definitive design and construction plans used to construct the proposed improvements.

The Design-Builder shall provide separate Definitive Design and Construction plans sets for each segment identified in Section 3.1 (ie. LIC No. 1, Interchange, and LIC No. 2).

Microstation and Geopak shall be used in the preparation of CADD and design files.

#### **3.1 GENERAL**

The Project shall consist of the following segments:

##### **Segment No. 1 (LIC No. 1): Buckner Road Western Extension (PIN 128576.01)**

This segment consists of the construction of the Buckner Road Western Extension beginning 250’ east of the intersection of existing Buckner Road and Buckner Lane and extending east approximately 3,650’ just west of Aenon Creek on new alignment to the western limit of the C.A. ROW for Segment 2. Buckner Road in this segment varies from four to six lanes (two or three in each direction). The City of Spring Hill is undergoing two separate projects to widen Buckner Lane as follows:

- Project No. 1 will widen Buckner Lane to the north between existing Buckner Road and Thompson Station Road. This project will include improvements to the intersection at Buckner Road and Buckner Lane. The Design-Builder shall tie its construction to the eastern end of the seven-lane section constructed as part of this project which will extend 250’ east along the proposed Buckner Road centerline from the intersection with the existing Buckner Lane centerline. The Design-Builder shall ensure that the turn lanes along Buckner Road described in Section 3.2 are provided.
- Project No. 2 will widen Buckner Lane to the south between existing Buckner Road and Duplex Road.

The Design-Builder shall be required to coordinate its design and construction efforts with the City and the designers and contractors of the two projects described above.

##### **Segment No. 2: New Interchange at Interstate 65 (PIN 128576.00)**

This segment consists of the construction of a new fully access controlled diverging diamond interchange on Interstate 65 at L.M. 2.62. The western terminus for Segment No. 2 is measured approximately 1,000

feet along the Buckner Road alignment to the west from the intersection of the crossover tangents on the western side of Interstate 65. The eastern terminus for Segment No. 2 is measured approximately 850 feet along the Buckner Road alignment to the east from the intersection of the crossover tangents on the eastern side of Interstate 65.

**Segment No. 3 (LIC No. 2): Buckner Road Eastern Extension (PIN 128576.02)**

This segment consists of the construction of the Buckner Road Eastern Extension beginning at the eastern limit of the C.A. ROW for Segment 2 and extending east approximately 5,650' on new alignment where it intersects with Lewisburg Pike (US-431/SR-106) south of the Brienz Valley subdivision. Buckner Road in this segment consists of four travel lanes (two in each direction). The Design-Builder shall construct the approach to Lewisburg Pike as the five-lane section described in Section 3.2. The approach shall be striped to provide one right turn lane and one left turn lane onto Lewisburg Pike. Lewisburg Pike shall be widened to provide southbound right and northbound left turn lanes onto Buckner Road as described in Section 3.2.

**3.2 DESIGN REQUIREMENTS**

**Horizontal and Vertical Alignments**

The proposed horizontal and vertical alignments shall be designed to meet or exceed the following:

- Buckner Road
  - Functional Classification: Rural Arterial
  - Terrain Classification: Rolling
  - Termini:
    - The western terminus of the project shall tie to the proposed improvements described in Section 3.1. The proposed eastbound lane of Buckner Road (right lane looking ahead on survey) shall be positioned to align with the existing eastbound lane of Buckner Road west of Buckner Lane.
    - The eastern terminus of the project shall tie to Lewisburg Pike south of the Brienz Valley subdivision.
  - Maximum Grade: 4%
  - Maximum SE rate: 0.04 ft/ft
  - Design Speed: 45mph
  - Posted Speed: 40mph
- Lewisburg Pike (US-431/SR-106)
  - Functional Classification: Principal Arterial, Rural
  - Maximum Grade: match existing
  - Design Speed: 55mph
- Diverging Diamond Interchange
  - Maximum Grades:
    - Buckner Road Approaches: 4%
    - Ramps: 5%
    - Interstate 65: 3%
  - Design Speeds:
    - Ramp Proper: 60mph
    - Ramp Entrance: 60mph
    - Ramp Exit Terminals: 20mph
    - Interstate 65: 70mph
  - Crossover Design:
    - Design speed: 25mph minimum, 35mph maximum

- Crossover Angle: 40 – 50 degrees
- Lane widths: 15'
- Tangent length through crossover: 50' minimum
- Design Vehicle: WB-67
- Vertical Clearance: 17'-0" minimum over the ultimate number of lanes and shoulders of Interstate 65 described in Section 3.2 for the bridge over Interstate 65.
- Low points on sag curves shall not be located on bridges or pavement at bridge ends.

**Typical Section Requirements for Buckner Road**

The typical section for Buckner Road shall be designed for an Urban Arterial using Std. Dwg. RD11-TS-6A and modified using Std. Dwg. MM-TS-2 and MM-TS-3. The typical section consists of two 12' lanes in each direction except as noted below:

- Beginning 1,440' west of the intersection of the crossover tangents on the western side of Interstate 65 and extending east to the crossovers, the typical section shall consist of three 12' lanes in each direction.
- Within and between the crossovers, the lanes shall be 15' wide. The eastbound crossover shall carry three lanes through the western crossover and across the bridge over Interstate 65 after which it will split to carry two lanes on Buckner Road and two lanes to Ramp CC. The westbound crossover shall carry three lanes through the western crossover, two of which must be carried across the bridge over Interstate 65, after which it will split to carry two lanes on Buckner Road and two lanes to Ramp DD.

Grass strips (15' on the left and 11' on the right looking forward on survey) shall be provided. Grass strips and side slopes shall be permanently stabilized by seeding with mulch or sodding in accordance with Part 8 of the Standard Specifications.

Concrete barriers (see provided details on project website) shall be constructed to allow for a center 12' shared-use path on the bridge over Interstate 65.

The typical section shall include Type 6-33 curb and gutter on each side. A 14' raised grass median with 2' inside shoulders shall be constructed along Buckner Road beginning as close as possible to the end of the taper for the WB Buckner Road to SB Buckner Lane left turn lanes and extending to the crossover on the western side of Interstate 65. The raised median and 2' inside shoulders shall begin again at the crossover on the eastern side of Interstate 65 and extend to Lewisburg Pike. Grass median shall be permanently stabilized by sodding.

A median opening shall be provided at STA. 134+30 within Segment No. 1. Within Segment No. 3, median openings shall be provided at a uniform spacing within a range of 880 feet and 1,760 feet.

Buckner Road shall be constructed to accommodate the turn lanes described in the table below. The intersection at EB Buckner Road and Lewisburg Pike will be constructed for three total lanes, but only one turn lane in each direction will be striped.

LOCATION	NUMBER OF TURN LANES	STORAGE LENGTH (FT)
WB Buckner Road to NB Buckner Lane	1	150
WB Buckner Road to	2	750

SB Buckner Lane		
EB Buckner Road to SB Lewisburg Pike	1	170

In cut sections, the Design-Builder shall size a ditch such that drainage does not convey across the sidewalk or shared-use path.

Buckner Road shall be constructed to include an additional 12' lane for added storage at the locations described in the table below.

LOCATION	STORAGE LENGTH (FT)
EB Buckner Road to Ramp B	550
WB Buckner Road to Ramp C	250

**Typical Section Requirements for Interstate 65 and Ramps**

The typical sections for ramps shall be designed per Std. Dwg. RD11-TS-4. Shoulders shall be 12' outside (10' paved) and 6' inside (4' paved). The number of lanes shall be as follows:

- Ramp A – varies from two to three 12' lanes
- Ramp AA – one 16' lane
- Ramp B – varies from one 16' lane to two 12' lanes
- Ramp BB – one 16' lane
- Ramp C – varies from one 16' lane to three 12' lanes
- Ramp CC – varies from two 12' lanes to two 15' lanes
- Ramp D – varies from one 16' lane to three 12' lanes
- Ramp DD – varies from two 12' lanes to two 15' lanes

The typical sections for auxiliary lanes for Interstate 65 shall be designed per Std. Dwg. RD11-TS-5. Lengths of auxiliary lanes shall be as required by the AASHTO *Policy on Geometric Design of Highways and Streets*, TDOT *Design Guidelines*, and TDOT Standard Drawings.

The cross slope of the shoulders for concrete ramps with asphalt shoulders shall conform to note M of standard drawing RD11-TS-4 for asphalt ramps.

The ultimate typical section of Interstate 65, on which the bridge length is to be based, consists of the following:

- Four 12' lanes in each direction
- 12' inside shoulders on each side of I65
- 12' outside shoulders on each side of I65

**Typical Section Requirements for Lewisburg Pike**

The typical sections for Lewisburg Pike shall be designed per Std. Dwg. RD11-TS-3. South of the intersection with Buckner Road, the Design-Builder shall construct a 150' long left turn lane and all

required tapers and transitions. The typical section will vary from three 12' lanes with two 8' shoulders (6' paved) to two 12' lanes with 3' shoulders (1' paved). North of the intersection with Buckner Road, the Design-Builder shall construct a 180' long right turn lane and all required tapers and transitions. The typical section will vary from four 12' lanes with two 8' shoulders (6' paved) to two 12' lanes with 3' shoulders (1' paved).

### **Additional Design Requirements**

The Design-Builder shall construct six-foot tall chain link CA fence at the following locations:

- Western Approach: Beginning at the western terminus of Segment 2 and extending east along Buckner Road and Ramps A and B to tie in with the existing controlled access fence on Interstate 65.
- Eastern Approach: Beginning at the eastern terminus of Segment 2 and extending west along Buckner Road and Ramps C and D to tie in with the existing controlled access fence on Interstate 65.

The CA fence and proposed ROW shall be offset from the toe of slope along the ramps a distance of 20' (see Note 4 on Standard Drawing RD11-TS-5 for freeways).

The Design-Builder will be responsible for the design and construction of all proposed overhead structures within the Project limits. The Design-Builder shall ensure minimum vertical clearance is provided throughout the duration of construction and upon completion of the project as defined in the TDOT Roadway Design Guidelines. The Design-Builder shall submit plans as outlined in the TDOT Roadway Design Guidelines to the TDOT Structures Division for Grade Approval.

The Design-Builder shall ensure that all proposed overhead sign structures are of sufficient height so as to not adversely affect the sight distance for crossover signals.

The Design-Builder shall identify the need for any special roadway design details (i.e. any special drainage structures, rock embankment, retaining walls, concrete barrier designs, etc.) and shall provide special design drawings to the Department for Review and Acceptance.

The geometric configurations of all roadway components shall be designed to provide adequate drainage and prevent hydroplaning (during construction and when complete). Cross slopes shall be as shown on the applicable RD11 Standard Drawing for each route. The Design-Builder shall provide hydraulic calculations (including spread calculations) to the Department for review and acceptance.

The Design-Builder shall mill and overlay existing Interstate 65 as described in the Pavement Design Report (Appendix A). The mill and overlay limits shall be determined as follows:

- The southern log mile for the beginning of the mill and overlay section for both NB and SB Interstate 65 shall be the southernmost log mile for the beginning of the auxiliary lane taper for either Ramp B or Ramp D (whichever is furthest south)
- The northern log mile for the end of the mill and overlay section for both NB and SB Interstate 65 shall be the northernmost log mile for the end of the auxiliary lane taper for either Ramp A or Ramp C (whichever is furthest north)

Transitions from asphalt to concrete pavement along ramps shall occur at the end of the gore area with the joint placed radial to the ramp baseline.

The Design-Builder's Definitive Design Plan submittal(s) shall include traffic control plans.



Design of intersections must provide for future construction of cross walks and meet ADA requirements for future sidewalk and shared multi-use path. The Design-Builder's plans shall indicate the locations of future ramps, cross walks, pedestrian push-buttons, and sidewalks/multi-use paths within the crossover limits for the Department's concurrence. These areas shall be marked "By Others" in the Design-Builder's plans. The conduit and pull boxes (see Section 5.0) to be installed shall also be identified in the Design-Builder's plans.

If temporary construction activities disturb the existing pavement or pavement markings beyond the limits defined in Section 3.1, the Design-Builder shall extend the mill and overlay and restriping limits to include those areas.

The Design-Builder shall use 3:1 slopes or flatter with necessary recovery area to limit the amount of guardrail installed along Buckner Road. The use of 2:1 slopes along Buckner Road should be used based on Case II slopes as applicable within the interchange access control and only by approved Alternate Technical Concept along Buckner Road.

Where overhead sign supports fall on the side slopes outside the ROW, the Design-Builder's design shall accommodate a notch in the proposed ROW to provide a ten (10) foot perimeter around the overhead sign support foundation.

The Owner of Tract 15 is installing steel casings to accommodate future water and sewer lines for future development. These casings will extend between the toes of slopes shown in the Functional Plans. They will be located at STA 112+02 and 112+32 of Buckner Road with a top of casing elevation of 778.50 and skewed 90 degrees with the Buckner Road centerline. The Design-Builder's vertical profile shall be sufficient to provide a minimum of two feet of cover between the casing and the pavement base stone.

The Design-Builder shall plan and schedule all work, submittals, and reviews necessary to obtain the Department's written acceptance of sealed Definitive Design Plans for the portion of the project affected by the relocation of the AT&T line and private easement no later than May 1, 2021. The Design-Builder shall allow for 18 months after Definitive Design acceptance in their CPM schedule for the relocation process of the AT&T line.

A construction easement shall be acquired for all driveways and field entrances. This easement shall be offset approximately 10' from toe of slope of the driveway or field entrance.

### **3.3 DEVIATIONS AND EXCEPTIONS**

All proposed modifications require an Alternative Technical Concept (ATC) subject to Department approval. The Design-Builder shall not request more than eight ATCs.

Deviations from the Functional Plans horizontal alignment (greater than 10.0 feet) for Buckner Road, Interstate 65, all ramps, or Lewisburg Pike will require an ATC with Department approval. The Design-Builder is responsible for any impacts resulting from deviations from the Functional Plans. ATCs shall identify the limits of Segment Nos. 1, 2, and 3 identified in Section 3.1 for approval by the Department.

The Design-Builder shall identify and label any adjustments made to the taper locations and/or typical sections identified in Section 3.2 or the Functional Plans in their ATC submittal for approval by the Department.

No ATC will be considered that:

- Changes the interchange configuration from a diverging diamond;
- Changes the pavement design from that shown in Appendix A;
- Requires earthmoving or other ground disturbing activities including staging of heavy equipment, excavation of borrow materials, and vegetation removal below the natural ground surface in the areas designated as “Approximate Sensitive Environmental Area” identified in the Functional Plans;
- Places the eastern crossover in such a manner that access to any Tract is lost; or
- Proposes the elimination of or reduction in width of the grass strips.

No design exceptions shall be allowed.

### **3.4 GUARDRAIL AND BARRIERS**

The proposed guardrail, including any anchor system, shall be installed prior to opening traffic. Existing guardrail within the construction limits shall be upgraded to current standards. Guardrail shall be removed and replaced in accordance with the TDOT Standard Drawings and the January 2015 edition of TDOT *Standard Specifications*.

All permanent and temporary safety appurtenances (sign supports, guardrail, barrier rail, impact attenuators, etc.) shall meet current TDOT standards and shall have all required Department certification documents.

All existing and new guardrail, guardrail attachments to bridge ends and/or concrete barriers, and end terminals within the project limits shall be MASH-compliant TL-3 and be on the Department’s Qualified Products List.

The Design-Builder shall construct a median refuge as shown on Standard Drawing MM-CR-4 at the crossover locations to allow for future pedestrian facilities along Buckner Road. The pedestrian barrier on the bridge over Interstate 65 shall be constructed as per the details provided on the project website. The end of the vertical taper shall be placed such that the 14'-0" clear zone to the adjacent lane is provided. The pedestrian barriers on the left and right of centerline shall terminate at the same location. 6" raised concrete median shall be constructed between the shared-use path and the shoulder within the crossovers. The Design-Builder shall construct concrete barrier walls in accordance with the S-SSMB series of TDOT Standard Drawings.

Required guardrail and concrete barrier locations shall conform to the Design Guidelines, TDOT Standard Drawings, and/or the AASHTO *Roadside Design Guide*. All proposed guardrail along Buckner Road shall be placed at the location required to accommodate the future sidewalk and multi-use path (see Standard Drawing S-PL-6). Right-of-way shall be notched such that proposed guardrail and terminals are within the proposed right-of-way.

### **3.5 DRAINAGE**

The Design-Builder shall be responsible for design and construction of the entire stormwater management system within the Project limits and shall adhere to the latest edition of the TDOT *Drainage Manual*. The Design-Builder shall utilize a 10-yr frequency for the stormwater system design, a 50-yr frequency for crossings where Q50 is less than 500 cfs and 100-yr for crossings and encroachments for which Q50 is greater than 500 cfs. The design storm is the storm at which the flood elevation equals the roadway overtopping elevation. If design storm is greater than 100 year then 100-yr event should be reported. The Design-Builder shall utilize a 50-yr frequency for stormwater system design along Interstate 65.

All stormwater runoff that flows through the Project, whether originating within or outside of the Project, must be accounted for in the design of the Drainage System. The project drainage shall function independently of adjacent projects. Inlets and ditches shall not drain onto or through existing or future roads or drainage systems excluding the culverts along Interstate 65.

The analysis, design, and construction of all components of the stormwater management system shall address the interim conditions during construction of the Project and the final design. Where not otherwise instructed by the TDOT Design Guidelines, TDOT Drainage Manual, TDOT Standard Drawings, TDOT Design Procedures for Hydraulic Structures 2012, or Permit requirements, the Design-Builder shall design interim open channels to collect and convey without damage, and to confine within any temporary roadside ditches or swales, stormwater flow using a 2-year design frequency. Interim design shall be based on the interim land cover and corresponding Manning coefficients.

The drainage system shall have adequate capacity to convey all stormwater through the project without any adverse impacts to upstream and/or downstream adjacent properties.

The Design-Builder shall embed culverts for aquatic organism passage for all streams in accordance with the requirements of FHWA Hydraulic Engineering Circular 26, "Culvert Design for Aquatic Organism Passage".

All new culverts and pipes for closed drainage system shall have a slope of not less than 0.5%.

The Design-Builder shall slip line the existing 66" CMP culvert beneath Interstate 65 (just south of the Functional Plans interchange location) in accordance with Special Provision 607G without reducing hydraulic capacity.

The Design-Builder shall replace the existing 60" CMP culvert beneath Lewisburg Pike (south of the intersection of Buckner Road with Lewisburg Pike). The replacement structure shall be sized in accordance with the TDOT *Drainage Manual*.

The Design-Builder shall inspect the existing culverts within the project limits that are to remain to ensure that they are clean, operable, and structurally adequate. Any concrete spall or crack repairs or scour repairs shall be performed by the Design-Builder. Any debris in the culverts or near the culvert inlet/outlet shall be removed by the Design-Builder. All repairs shall be completed per Department guidelines and meet the full approval of the Engineer.

The Design-Builder shall provide aggregate pipe underdrains as specified in the pavement design (Appendix A) and shall provide appropriate outlets for the underdrains as specified by the TDOT Standard Drawings.

The Design Builder shall adhere to all permits, FEMA, and hydraulic design criteria when designing channel relocations, bridges, culverts and culvert extensions. The Design Builder shall use the *TDOT Drainage Manual* found on the TDOT Design Division website, and *Design Procedures for Hydraulic Structures 2012* found on TDOT Structures Division's website. Design Builder shall use FHWA scour publication HEC-18, and FHWA's Hydraulic Engineering Circular 21 "Design of Bridge Deck Drainage" and Hydraulic Engineering Circular 22, "Urban Drainage Design Manual". Hydraulic designs for structures and channel relocations with a 50-year flow rate higher than 500 cubic feet per second (cfs) shall include a HEC-RAS model of the 'no-bridge', existing structure and proposed structure conditions for flood events up to the 500-year flood. The Design-Builder shall submit a hydraulic design and all HEC-RAS files to the Department for approval; this design shall be sealed by a Professional Engineer licensed in Tennessee. If a stream is found to be in a FEMA AE Zone, the bridge hydraulic design shall

meet the FEMA “No-rise” requirement (i.e., the proposed 100-year flood elevation is equal to or less than the existing). Otherwise, the Design-Builder shall meet the backwater criteria of not exceeding 1 ft of rise compared to the natural (no-bridge) conditions and not increasing flooding to any existing structures.

The Design-Builder's drainage design shall take into account the impervious surface of the future sidewalk and multi-use path.

### **3.6 PAVEMENT MARKINGS**

The Design-Builder shall prepare pavement marking plans for the Department’s review and concurrence. The signing and striping in the Functional Plans and roll plot shall be used. High contrast markings shall be utilized on all concrete surface in accordance with the special provisions and TDOT Design Guidelines. See **Contract Book 1 (Instructions to Design-Builders)** for additional information regarding striping items with specific attention to pay items 716-99.50 and 716-99.51. The design and installation of permanent pavement markings shall be in strict accordance with the current edition of the Manual on Uniform Traffic Control Devices (MUTCD), TDOT Roadway Design Guidelines, TDOT Standard Drawings, TDOT Standard Traffic Operations Drawings, TDOT Traffic Design Manual, and the current edition of the TDOT Standard Specifications. All pavement marking removal on final surfaces shall be accomplished by water blasting or another non-marring method. Any damage to the pavement surface caused by the selected method shall be removed and replaced at the contractor’s expense.

Permanent pavement line markings shall be thermoplastic installed to permanent standards at the end of each day’s work. Short unmarked sections shall not be allowed. Temporary pavement markings to be utilized for seven (7) calendar days or more shall be paint or tape. On the final surface, the Design-Builder shall have the option of using temporary pavement markings installed to permanent standards at the end of each day’s work and then installing the permanent markings after the paving operation is completed. All pavement markings beyond the immediate work area that are affected by the Work shall be reapplied to permanent standards.

### **3.7 SIGNING**

The Design-Builder shall prepare signage plans for the Department’s concurrence/review prior to ordering. Signs shall be constructed as shown in the Signing and Marking Roll Plots. The design and installation of permanent roadway signs shall be in strict accordance with the current edition of the MUTCD, TDOT Roadway Design Guidelines and TDOT Standard Drawings, the current edition of the Standard Highway Signs, the TDOT Supplemental to the Standard Highway Signs, the current edition of the TDOT Standard Specifications, and TDOT Traffic Design Manual.

After the permanent sign locations have been staked, but prior to ordering any material for supports, there shall be a Field Review and Acceptance by the Department.

The Design-Builder shall verify all support lengths at the site prior to erection.

All overhead sign structures shall be truss span structures. Overhead cantilever signs will not be allowed. All overhead sign structures shall be designed per LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (current edition) and reviewed and concurred with by TDOT Structures Division prior to construction. The Design-Builder shall design the structure to support signs across the entire length of the travel way as described in Chapter 14 of the TDOT Traffic Design Manual.

All permanent signing plans; Signing Layouts, Sign Schedules, Overhead Structures Drawings & Miscellaneous Detail Sheets shall be reviewed by the Department prior to ordering and construction/installation.

All overhead support structures placed within the clear zone shall be protected as required by the TDOT Design Guidelines or Standard Drawings.

For the overhead sign structures immediately before and after the bridge over Interstate 65 (approximately STA 150+20 and STA 153+40 in the Functional Plans), the Design-Builder has the option of spanning the entire roadway or constructing a median support as shown on Std. Dwg. S-SSMB-8. If the Design-Builder elects to construct the S-SSMB-8 median support, it shall provide a minimum of one foot from the toe of the support to the adjacent travel lane. The S-SSMB-8 median support may encroach a maximum of one foot into the shared use path. The horizontal and vertical tapers between the S-SSMB-8 barrier and the pedestrian barrier shall be 20:1 and 6:1, respectively.

### **3.8 GROUND SURVEY**

The ground survey including survey control will be provided by the Department.

The Design-Builder shall verify the ground survey and survey control before utilizing in the design of the project (see Section 1.3). In addition, the Design-Builder shall be responsible for field surveys and support activities, such as, but not limited to geotechnical investigations, ROW stakeout, construction stakeout, etc.

If the Design-Builder's design footprint extends beyond the limits of the survey provided by the Department, the Design-Builder shall be responsible for securing the necessary additional survey.

All field survey activities shall be performed in accordance with the latest version of the TDOT Survey manual and any other applicable design standards previously referenced

### **3.9 PAVEMENT DESIGN**

The Pavement Design Report for this Project has been developed by the Department and is located in Appendix A.

Prime Coat and Tack Coat are required and shall be applied as part of the Project.

### **3.10 PAYMENT FOR SELECT QUANTITY OVERRUNS**

The following table is provided to cover select quantities that are above those anticipated in the scope. When the Design-Builder utilizes any item in the table below, he must provide the Department with an invoice detailing the location, purpose, and quantity used, for tracking purposes. Failure to provide invoices throughout the progress of the project may result in nonpayment for overrun quantities.

ITEM	TYPE	UNIT	UNIT PRICE	QUANTITY
Temporary Traffic Control	Changeable Message Sign Unit	EACH	\$6,500	Signs exceeding 6

### **3.11 DESIGN REQUIREMENTS FOR ACCESS ROAD**

The Design-Builder shall construct an access road to allow for access to Tracts 17 and 32.

The typical section for the access road to Tracts 17 and 32 shall be designed per Std. Dwg. RD11-TS-1 using a design speed of 20mph. The typical section shall consist of two 10' lanes with no shoulders.

A median opening along Buckner Road shall be provided at the intersection with the access road. The intersection of the access road shall fall outside of the controlled access fence.

The pavement design for the access road shall be Mix Type IV as described in Table 3-3 of the TDOT Design Guidelines.

The pavement markings for the access road shall be provided according to Section 4 of the TDOT Design Guidelines and TDOT Standard Drawings.

The access road shall end with a cul-de-sac with a ninety-six foot minimum outside diameter.

A private driveway to Tract 17 and a field entrance to Tract 32 shall be provided.

The Design-Builder shall be responsible for preparing any additional environmental technical studies and completion of the NEPA document re-evaluation(s) if the design and/or construction activities extend beyond the environmental technical study area (ETSA) boundary that was studied in the approved NEPA document. If the access road is designed exclusively within the ETSA, no further technical studies would be warranted; however, a re-evaluation shall be required. See Book 3 Section 9.0 for additional information.

The Design-Builder shall be responsible for preparing and obtaining required permits.

The Design-Builder's access road design shall be submitted with the Initial Right-Of-Way Exhibit Submittal and in the Technical Proposal with Response Category IV (TECHNICAL SOLUTIONS) information with TDOT comments to the initial submittal addressed. See Contract Book 1 (Instructions to Design-Builders). This submittal shall include the horizontal alignment, vertical alignment, and proposed ROW acquisition areas.

The access road shall intersect Buckner Road at a ninety (90) degree angle.

The alignment of the access road shall be parallel and adjacent to the CA fence and located beyond the CA fence but within the proposed ROW. The northern boundary for the proposed ROW for the access road shall be the CA fence. The southern boundary shall be determined as described on Standard Drawing RD11-TS-1. The Design-Builder shall provide access to Tracts 17 and 32, but minimize the amount of acquisition of Tract 33.

## **4.0 STRUCTURES SCOPE OF WORK**

The Design-Builder shall be responsible for the design and construction of all structures within the Project limits including the bridge over Interstate 65, interstate ramp bridge(s), retaining walls, and box/slab bridges, as further described below.

### **4.1 BRIDGE DESIGN REQUIREMENTS**

New bridges shall be designed and detailed using the AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, current edition, the AASHTO Guide Specifications for LRFD Seismic Bridge Design, Second Edition (2011) with all interims, and the TDOT Structures Division Structural Memorandums.

Proposed Accelerated Bridge Construction (ABC) methods shall be submitted to the Department through an ATC for approval by the Department.

Precast, prestressed Girders shall be continuous for live loads. The final concrete beam strength shall be between 5,000 psi and 10,000 psi. If structural steel girders are used, they shall be designed continuous for all loads. Structural steel shall be A709 Grade 50W. Concrete for the bridge deck shall be Class "DS" ( $f'c = 4000$  psi) and meet the requirements of the Standard Specifications. The minimum slab thickness shall be 8" and all slab steel shall be epoxy coated. Concrete for substructures shall be Class "A" ( $f'c = 3000$  psi) and meet the requirements of the Standard Specifications. Other types of concrete required by the design from the Design-Builder shall meet the minimum design strength requirements and also the requirements of the Standard Specifications or any applicable Supplemental Specification or Special Provision.

All bridges shall be designed for HL-93 live loading. The bridge design shall include 35 pounds per square foot (psf) for a future wearing surface.

Bridge deck surface finish shall be in accordance with Method 3 of Article 604 of the Standard Specifications.

Pavement at bridge ends (See Standard Drawing STD-1-5) is required at all bridges.

End of bridge drains will not be allowed in the Pavement at Bridge Ends.

Abutments shall be of integral construction to eliminate joints at bridge ends.

The Design-Builder shall perform a hydraulic analysis for bridge deck drainage and shall meet the criteria in the TDOT *Design Procedures for Hydraulic Structures*.

The Design-Builder shall submit shop drawings in accordance with the requirements set forth in the Standard Specifications for Road and Bridge Construction for bridge components, erection plans and calculations for concurrence by the Department. The shop drawings and erection plans shall be submitted in a timely manner allowing ten (10) business days for the Department's review.

Should the Design-Builder elect to use drilled shafts, they shall be constructed according to Special Provision 625 Drilled Shaft Specifications.

The new structure over Interstate 65 shall be wide enough to incorporate the full roadway width as presented in Section 3.2 (five 15-foot lanes, 2' outside shoulders, 1' inside shoulders, 12' future shared-use path, two STD-1-1SS parapets, and two pedestrian barriers). See project website for pedestrian

barrier details. The new structure shall provide a minimum of 17'-0" of vertical clearance as described in Section 3.2.

New ramp bridge(s) shall be wide enough to incorporate the full roadway width as presented in Section 3.2 and two STD-1-1SS parapets.

Deck drains (if needed) shall be as shown on STD-1-2SS and follow the requirements of the TDOT *Design Procedures for Hydraulic Structures 2012*. Deck drains shall not discharge onto current or future lanes or shoulders of Interstate 65. If used, a closed drainage system shall not be placed outside of the exterior bridge girders. For the bridge over Interstate 65, the calculated spread may encroach into the outermost travel lane so long as at least twelve feet of the outermost lane remains. For all other bridges, the spread shall be limited to the shoulder.

All guardrail (including guardrail terminal, anchor and hardware) shall be MASH TL-3 compliant.

Should the Design-Builder elect to construct bridges on Buckner Road in lieu of the box bridges shown in the Functional Plans, they shall be of sufficient width to accommodate the future sidewalk and multi-use path. The area denoted as "grass strip" in Section 3.2 shall be constructed as a sidewalk with STD-11-1 parapets.

All exposed concrete surfaces shall receive an applied texture coated finish of Mountain Grey (AMS STD-595 color No. 36440), except that the top and side of the bridge rail facing traffic shall receive a white finish (AMS STD-595 color No. 37886).

The Design-Builder shall conduct and submit a load rating analysis report for each of the new bridges that are constructed. The load ratings are to be completed using AASHTOWare Bridge Rating (BrR) or CSi Bridge software and submitted with the Bridge Construction Plans for review. The load rating analysis report and load rating modeling file shall be updated for the as-built conditions with the final as-built plans. For a listing of the specific vehicles to be load rated as well as a description of the report format, see the reference material on the project website.

#### **4.2 BUCKNER ROAD OVER INTERSTATE 65 BRIDGE AESTHETICS**

If a bent is required for the Design-Builder's design for the bridge over Interstate 65, the cap shall have a hammerhead appearance similar to that shown in the Functional Plans. The end faces of the bent cap shall include a 3'-0" Tri-Star emblem as shown on the TDOT Standard Drawing STD-8-6. The columns of the bridge bent shall be a minimum width of 6'-0" (measured along interstate 65) with a minimum dry-stack stone finish width of 5'-0" on each column. The areas receiving the dry-stack stone finish shall be stained as described below.

Each abutment wingwall shall receive a dry-stack stone finish that shall be stained as described below. A 2'-0" Tri-Star emblem as shown on TDOT Standard Drawing STD-8-6 shall be included on each wingwall.

The vertical faces of the pedestrian barriers adjacent to the shared-use path, excluding the top 6", shall receive a dry-stack stone finish that shall be stained as described below. The vertical face of the pedestrian barriers not receiving a dry-stack stone finish shall receive a Mountain Grey finish (AMS STD-595 color No. 36440). All other faces of the pedestrian barriers shall receive a white finish (AMS STD-595 color No. 37886).



The exposed face of the retaining walls at the bridge over Interstate 65 shall receive a dry-stack stone finish that shall be stained as described below.

The handrail shown on the Single Slope Bike & Pedestrian Median Barrier Wall (see project website) shall be painted black.

The dry-stack stone form liner used by the Design-Builder shall be approved by the Department and the City of Spring Hill. The maximum relief shall be between 1.5" and 2". The minimum relief shall be 1.25".

The dry-stack stone finish staining shall conform to the following:

- Coloring material of all surfaces shall be accomplished by using a weather-resistant, water-based acrylic stain. The following are known stain products that are acceptable (provided for information only). There may be similar products from other manufacturer's that will meet the project requirements:
  - Sherwin Williams H & C
  - Gemite Industries Rainshield
  - Euclid Chemical Tammscoat
  - BASF MasterProtect
- Individual stones shall be stained in a random pattern using a minimum of four different colors.
- Concrete shall be a minimum of 28 calendar days old prior to applying stain.
- All concrete shall be clean, dry, and free of oil, paint, sealers, form release agents, curing compounds (must not contain parafins), salt, efflorescence, etc. Vertical concrete surfaces shall be cleaned in accordance with stain manufacturer's recommendations. Concrete surface shall dry for a minimum of 24 hours before applying stain.
- Stain shall be applied per manufacturer's recommendations.
- A minimum of two coats applied at a minimum of 250 square feet per gallon is required.
- Apply under dry conditions only. If it has rained before application, the surface shall be allowed to dry a minimum of 24 hours before staining. Do not apply stain if rain is expected within 12 hours following application. When applying stain, air and surface temperature should be between 50 degrees Fahrenheit and 90 degrees Fahrenheit. Air and surface temperature should be a minimum of 50 degrees Fahrenheit and rising. Application is to stop two hours before sunset.

The Design-Builder shall construct a 4'-0" x 4'-0" mock-up demonstrating the dry-stack stone form liner and staining appearance for concurrence by the Department and the City of Spring Hill prior to beginning bridge or retaining wall construction.

### **4.3 RETAINING WALLS**

Retaining walls shall be built in accordance with Special Provision 624, Retaining Walls. The exposed face of all retaining walls (excluding the retaining walls at the Interstate 65 bridge) shall receive an ashlar stone finish approved by the Department. The final locations, lengths, heights, and the beginning and end stations of all walls shall be determined by the Design-Builder.

For cast-in-place concrete retaining walls (excluding the retaining walls at the Interstate 65 bridge), all exposed concrete surfaces shall receive an applied texture coated finish of Mountain Grey (AMS STD-595 color No. 36440).

#### **4.4 BOX/SLAB BRIDGES**

All box and slab bridges constructed on the project should be constructed in accordance with the notes and details shown on the TDOT Standard Drawings for LRFD Box Culverts (STD-17 series) unless approved by the Department. Special designs for box curbs will be allowed up to a height of 3'-0" to reduce culvert lengths. The Design-Builder shall provide details of special designs for heights beyond those depicted in the Standard Drawings for review. Slab bridges may only be constructed on bedrock or a foundation designed to be stable at 100- and 500-year scour elevations.

## **5.0 TRAFFIC SIGNALS AND LIGHTING SCOPE OF WORK**

The Design-Builder shall install a minimum of three 2” conduits in the parapets on each side of the bridge over Interstate 65. Two of these conduits on each side are spares for future use by the City and shall not be used by the Design-Builder. The two spare 2” conduits shall run for the full length of project along each side of Buckner Road. The conduit on one side of Buckner Road will carry future electrical wiring and fiber for signals with the conduit on the other side carrying future telecommunications fiber. These conduits shall run underneath the future sidewalk and shared-use path with the pull boxes installed such that the top of the pull box is at the surface of the future sidewalk or shared-use path. Each pair of conduit shall terminate at each end of the project at a pull box installed by the Design-Builder.

All materials required for installation of lighting and signals, including but not limited to wire, conduit, pull boxes, etc., shall meet or exceed the requirements of the Middle Tennessee Electric Membership Corporation (MTEMC) standards.

The Design-Builder shall coordinate with the City and/or MTEMC to determine electric feed points.

### **5.1 TRAFFIC SIGNALS**

The Design-Builder shall construct the proposed traffic signals (including but not limited to cabinet, controller, traffic signal heads, wiring, detection equipment, conduit and pull boxes, traffic signal poles and associated traffic signal timing and all other materials and methods required to provide a fully functional and operational traffic signal) at the following locations:

- Intersection of Buckner Road and Lewisburg Pike
- Interchange crossovers

To allow for full synchronization capabilities within the existing and future traffic signal system serving the City of Spring Hill, the Design-Builder shall use the following:

- Eight Phase Omni ATC EX2 NEMA Controllers with ABC harness manufactured by McCain
- MMU or Signal Monitor EDI SSM-16LE(ip) Enhanced NEMA MMU
- Preemption – Sonem Model #2000
- Load Switches – Power Distribution & Control, Inc. (PDC SSS86I/O)
- Wavetronix Radar Detection Units

The Design-Builder shall design the signal system servicing the DDI using NCHRP 03-113 *Guidance for Traffic Signals at Diverging Diamond Interchanges and Adjacent Intersections* and the FHWA *Diverging Diamond Interchange Informational Guide*.

The Design-Builder’s signal design shall include supplemental advanced signals for the following locations:

- Eastbound Buckner Road through the western crossover
- Westbound Buckner Road through the eastern crossover
- Southbound Interstate 65 off-ramps to Buckner Road (Ramp A and Ramp AA)
- Northbound Interstate 65 off-ramps to Buckner Road (Ramp D and Ramp DD)

Supplemental advanced signal heads shall be mounted to the pole for the main signal mast arms where possible.

The Design-Builder shall be responsible for active management of signals and operations until final acceptance of the Project. During this time, the final signal timing will be implemented and modified to provide optimal traffic signal operations.

Traffic signals shall be designed and constructed in accordance with Supplemental Specification 700SS (See **Contract Book 2 (Design-Build Contract)**), Special Provision 700SIG, City of Spring Hill Traffic Systems Specifications, and the TDOT *Traffic Design Manual*.

The Design-Builder shall provide final signal timing settings to the City of Spring Hill at the completion of the Project.

The Design-Builder shall coordinate the signals at the interchange using a fiber optic connection.

All signal poles and mast arms, including the poles and mast arms supporting the signs with flashers along Lewisburg Pike, shall be powder coated black.

The control cabinet for the signal at Lewisburg Pike shall be placed on the southwest quadrant of the intersection within the proposed ROW.

## **5.2 LIGHTING**

The Design-Builder shall construct Complete Interchange Lighting (CIL) in accordance with the TDOT *Traffic Design Manual*. The installation shall provide relatively uniform lighting for the interchange through the installation of high mast, standard lighting, and underpass lighting fixtures in the area of the interchange. The area of the interchange is defined as follows:

- Interstate 65 northbound and southbound lanes from northern ramp junctions to the southern ramp junctions.
- All four ramps of the interchange
- Buckner Road from the Interstate 65 southbound terminal intersection to the Interstate 65 northbound terminal intersection

Transition lighting is required beyond the limits described above in accordance with Section 15.2.2 of the TDOT Traffic Design Manual. Along Buckner Road, lighting shall extend for a distance of 1,000' measured in each direction from the crossover intersections.

All lighting shall be 4000k LED lighting. The Design-Builder shall prepare lighting designs/plans in accordance with TDOT Standard Specifications for Road and Bridge Construction, TDOT Standard Drawings, TDOT Standard Traffic Operations Drawings, TDOT *Traffic Design Manual*, Chapter 15, and the latest edition to the National Electric Code, National Fire Protection Association (NFPA) 70.

The Design-Builder shall submit a preliminary lighting design with the Initial Design and Right-Of-Way Exhibit Submittal and in the Technical Proposal with Response Category IV (TECHNICAL SOLUTIONS) information with TDOT comments to the initial submittal addressed. See **Contract Book 1 (Instructions to Design-Builders)**. The design package shall include electronic design files using AGi32 software, layout sheets which illustrate the photometrics, and high mast foundation information.

The Design-Builder shall not allow light pollution/light hindrance into residential areas during construction. In residential areas, the Design-Builder shall shield or consider less glare values ("0 to 3" out of 5) to avoid light trespass.

Allowable high mast and wall pack lighting is provided on the project website in the City of Spring Hill Proprietary Item List. Other items listed in this letter shall not be used. Offset lighting on ramps and Interstate 65 shall be per TDOT standards. The mounting height for high mast and offset lighting should be governed by the photometric analysis. However, the minimum requirements are 100' for high mast and 40' for offset poles. In case of a difference between TDOT Standards and Specifications and MTEMC standards, TDOT standards and specifications shall control.

The Design-Builder shall obtain all permits required for installation of interchange lighting.

No high-mast lighting poles shall be placed outside the interchange quadrants.

The maximum distance between offset or mast arm light poles shall not exceed 250 feet.

The distance between light poles and bridges must be a minimum of 50 feet.

All wiring shall be concealed underground in 2-inch schedule 40 PVC rigid conduit. The conduit shall be installed a minimum depth of 26 inches as measured from finished subgrade.

The ground wire shall be run inside conduit within structures, shall be colored green and have THW insulation.

All proposed roadway light standards shall be designed in accordance with the requirements of the latest edition of the LRFD Standard Specifications for Structural Support for Highway Signs, Luminaires and Traffic Signals published by the American Association of State Highway and Transportation Officials. High-mast foundation calculations (signed and sealed by a Professional Engineer licensed in the State of Tennessee) shall be submitted to the Department.

Underpass connections and bridge lighting connections, if needed for the bridge over Interstate 65, shall be embedded in the bridge structure.

All lighting designs shall use the illuminance method. The average maintained horizontal illuminance for R3 pavement classification for Interstate 65 is 0.9 (+/- 0.1). Refer to Chapter 15 of the Traffic Design Manual.

Photometric values (minimum, average/minimum, and maximum/minimum) for the interstate system shall be 0.2, 3:1, and 6:1, respectively.

The recommended values of the manufacturer shall be used for the total LLF. However, the total LLF cannot be less than 0.85 for LED.

Proposed lighting design or files shall have "beginning of light" and "end of light" labels.

Lighting shall not be placed in the medians along Buckner Road.

## **6.0 GEOTECHNICAL ENGINEERING SCOPE OF WORK**

The geotechnical exploration investigations shall be performed in accordance with the current TDOT *Geotechnical Manual* located on the Geotechnical Engineering Sections webpage on the Department's website:

<https://www.tn.gov/content/dam/tn/tdot/hq-materials-tests/geotech/2016-10-15-TDOTGeotechManual.pdf>

The Design-Builder shall determine the amount and level of the geotechnical investigations to cover geological risks, including karst terrain and features, associated with this Project.

The Design-Builder shall perform a slope analysis for all proposed slopes.

The Design-Builder shall be responsible for obtaining the borings for all structural support and foundation locations where subsurface information is not sufficient or is warranted by variability in the geology. All borings shall be deep enough to show a complete soil and rock profile to the depth of the foundation-supporting layer. Refer to Section 1: Geotechnical Projects with Structural Components, of the current TDOT *Geotechnical Manual*.

The Design-Builder shall collect appropriate field data and samples for geotechnical evaluation of embankments, subgrade, soil and rock cuts, culverts, bridge and retaining wall structures, storm water management structures and ponds, minor structures, including drainage pipes, and any other earth supported structures or elements of highway design and construction relevant to the Project. Refer to Section 2: Geotechnical Projects with Roadway Design Components, of the current TDOT *Geotechnical Manual*.

The Design-Builder shall perform all subsurface investigation and laboratory testing in accordance with the current TDOT *Geotechnical Manual*.

### **6.1 NOTIFICATION REQUIREMENTS**

Any required lane or shoulder closures to perform geotechnical investigations must be approved a minimum of seven (7) calendar days in advance by the Department. Lane or shoulder closures on City streets shall be coordinated with the City of Spring Hill.

The Design-Builder shall notify the Department, City of Spring Hill, and all adjoining property owners one week prior to commencing any activity on private property. A letter shall be mailed to all property owners where entry is needed. Property owner's names and addresses shall be obtained using the latest records available from the county Tax Assessor's office. To promote good relationships, a diligent effort shall be made to contact each property owner or tenant prior to entering the property. However, personal contact is preferable in order to explain that entry is required, the purpose of the activity, the activities involved and to determine facts pertinent to the activity.

The Department or the City of Spring Hill may limit when drilling activities or other geotechnical work including lane closures may occur within the Department or City's ROW.

The Department or City of Spring Hill may require the Design-Builder to immediately halt drilling activities or other geotechnical work underway, if in their judgement the Design-Builder's work causes a potential threat to the public safety or welfare.

The Design-Builder shall be required to provide traffic control for all drilling activities occurring within the Department or City's ROW including but not limited to lane closures and shoulder closures.

## **6.2 GEOTECHNICAL REPORTS**

The Design-Builder shall provide geotechnical reports, design and construction summaries that contain pertinent subsurface investigations, tests, and engineering evaluations.

Prior to any geotechnical design submittal, as outlined in the TDOT *Geotechnical Manual*, the foundation design recommendation reports shall be sealed and signed by a Professional Engineer registered in the State of Tennessee who has completed a minimum of three geotechnical design projects of scope and complexity similar to that anticipated for this Project using the LRFD method and in accordance with the latest edition of the AASHTO LRFD *Bridge Design Specifications*.

## **7.0 RIGHT-OF-WAY (ROW) SCOPE OF WORK**

The Department has secured NEPA approval. If the Design-Builder deems additional ROW, Permanent Easements, or Temporary Easements are needed outside of the limits shown in the NEPA document, the Design-Builder shall also be responsible for preparing the additional environmental technical studies and completion of the NEPA document reevaluation(s).

### **7.1 ACQUISITION SERVICES REQUIREMENTS**

The Design-Builder, acting as an agent on behalf of the Department, shall provide ROW acquisition services for the Project.

ROW acquisition services shall include certified title reports, appraisal, appraisal review, negotiations, relocation assistance services, property management services, parcel closings and all related activities.

All appraiser/s, appraisal reviewer/s and acquisition/relocation firms shall be selected from the Department's ROW Office's pre-qualified list.

The Department will retain authority for approving just compensation, relocation benefits and claims administrative settlements, court settlements and court awards.

The Department must issue a NTP with ROW Acquisition to the Design-Builder prior to any offers being made to acquire the property. This represents a hold point in the Design- Builder's Baseline Schedule.

The Department must also issue a NTP with Construction to the Design-Builder once the property has been acquired prior to commencing construction on the property. This also represents a hold point in the Design-Builder's Baseline Schedule.

The Department will be responsible for the actual purchase price paid to a landowner for ROW, including fee simple, for any and all easements, and for any relocation assistance payments.

The Department will be responsible for actual payments to property owners and certain expenses related to the acquisitions and associated legal costs as well as any additional monies paid the landowners to reach an administrative settlement or pay for court settlements and awards.

The Design-Builder shall be responsible for all costs associated with the services provided by the appraiser(s), review appraiser(s), acquisition/relocation firm, title company, engineering and legal services related to the acquisition of ROW, the costs of any public hearings that may be required, and any other cost associated with the services related to the purchase of ROW. The Design-Builder shall provide the Department a breakdown of these costs separately for each project segment described in Section 3.1.

### **7.2 TITLE REPORTS AND CLOSINGS**

The Design-Builder shall provide a current title report (no older than one hundred and eighty (180) calendar days) for each parcel at the time of the initial offer to landowner. Each title examination report shall be prepared by a Department's approved title company (each of the Department's Regional ROW Offices has a list of approved title firms). The Design-Builder shall furnish an original and three legible copies of a title report, including summary of 5 years sale history, on a form to be provided by the Department, designated as ROW Form-49, with copies of all recorded deeds, liens, seloffs, easements, subdivision plats, divorce decrees, wills, judgments, and other pertinent documents attached, for each numbered tract on the ROW plan. The Design-Builder shall furnish one updating of the title report; the process of updating the title report shall be performed as part of the closing.



In accordance with TCA 54-5-110 the Design-Builder shall cause the Right of Way Plans to be filed and recorded in the office of the Register of Deeds in Williamson County.

The following terms and conditions shall also apply:

- Preliminary reports of title are required on all tracts for which a taking or an acquisition is shown on the acquisition table.
- Title insurance is not required.
- An original and three (3) legible copies of the "Preliminary Report of Title" (Form 49) are to be submitted. All attachments must accompany the original and all three (3) copies.
- Reports must include information on all contiguous parcels of land which form a single tract under the same ownership.
- In addition to the information to be provided on the ROW Form 49, each preliminary report of title shall contain the tax map, and parcel number for the particular tract as well as the civil district in which the tract is located. In addition, include documentation of all Environmental Liens if they apply.
- The Design-Builder shall furnish the correct mailing address of the property owner for each tract number. If the ROW plan is revised so to add additional tracts from which there will be an acquisition as shown by the acquisition table, all services covered by this agreement are to be provided for those additional tracts.
- Facsimile of title report shall not be accepted.
- Completion and filing of Form 1099 published by the Internal Revenue Service, is required in connection with closing of ROW acquisition.
- Copies of Tax Maps showing all tracts are to be included. These maps are to be complete, full size sheets whenever possible.
- Copies of subdivision plots are to be included when the only deed description of an individual parcel consists of a lot number in the mentioned subdivision.
- Number the pages of each "Preliminary Report of Title".
- If any instrument is not legible on the provided copy, (attachments) then a typed legible instrument must accompany illegible copies.

The Design-Builder shall close all negotiated tracts on the Project. This service shall include:

- updating the title report to the time of closing;
- the preparation of the warranty deed and any releases;
- the preparation of a closing statement (ROW Form-24 provided by the Department); and
- the preparation of the deed transmittal statement (ROW Form-29 provided by the Department).
- the preparation of the Tax Proration Form
- the preparation of the closing tract map
- the preparation of the W-9 form

- the preparation of the closing log form (ROW Form 17A provided by the Department)

The Design-Builder is responsible for the arrangement of and making of such disbursements as may be necessary to cause the removal of property taxes, judgments and instruments constituting liens for money owed, and the recording of the warranty deed.

The Department will be responsible for the reimbursement to the Design-Builder for the recording of releases and/or partial releases and the recording of any other required releases for liens or encumbrances and all cost associated with obtaining any releases and any other such documents.

The Design-Builder agrees to discuss time and location for each proposed closing with the prospective grantor(s) and within reason to accomplish same in accordance with the grantor(s)' advice. Normal closings are expected to take place within 45 calendar days after the seller's acknowledgement of sale price and conditions (ROW form 30-A) is executed. Extenuating circumstances requiring more than 45 calendar days shall be reported by letter (or by FAX) no later than the 45th day from the date of the executed agreement of sale with a request for an extension. Requests for extensions beyond the normal accepted time will be considered on a case by case basis. Within 24 hours after closing, the Design-Builder shall notify the Regional Transportation Manager 2 of this fact. All closings are to be done by personal contact, at a time and place that is convenient to the landowner. Where a closing by mail is requested, the written consent of the Department is required, except when the closing involves Out-of-State property owners.

### **7.3 APPRAISALS AND APPRAISAL REVIEWS**

The Design-Builder shall prepare appraisals in accordance with TDOT's *Guidelines for Appraisers*, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (the "Uniform Act"), the Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally-Assisted Programs (Part 24 of title 49 CFR), and the Uniform Standards for Professional Appraisal Practice (USPAP). Appraisal and Related Service shall include all or parts of the following: real estate appraisal, real estate appraisal review, real estate consultation, pre-trial conference, deposition, and court testimony, as further defined.

The Design-Builder shall complete all appraisal services and work product to the standards set forth herein. Failure on the part of the Design-Builder to complete each assignment according to said standards by the agreed upon due date shall be considered a material breach of this Contract.

The Design-Builder shall complete all appraisal services in accordance with the Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally-Assisted Programs (Part 24 of title 49 CFR), the Uniform Standards of Professional Appraisal Practice [USPAP (Appraisal Foundation)], Guidelines For Appraisers ([https://www.tn.gov/content/dam/tn/tdot/right-of-way-division/TDOT\\_Guidelines\\_for\\_Appraisers\\_06-30-15.pdf](https://www.tn.gov/content/dam/tn/tdot/right-of-way-division/TDOT_Guidelines_for_Appraisers_06-30-15.pdf)) and Federal, State and local laws, rules, and regulations.

The Design-Builder shall furnish an original and two (2) copies of each Market Data Brochure and each Appraisal Report. The Design-Builder shall also furnish one additional copy of each appraisal report together with all exhibits and comparable data write-ups. This copy shall be clearly identified as the landowner's copy. Unless specifically directed otherwise in writing, all appraisal services products are to be delivered to the regional office.

In addition to the standard photos of the subject property and exterior photos of the acquired improvements, the Design-Builder shall provide a typical interior photo of acquired/ affected structures

having substantial contributory value (i.e. residences, commercial structures, large barns, etc.). Legible digital images are acceptable.

The Design-Builder shall update the appraisal report(s) on any tract(s) involved in condemnation covered under Work Orders issued hereunder to "date of possession" when requested to do so by the Department. Appraisal updates shall be completed within sixty (60) calendar days after the request is made in writing by the Department. All such updates shall be in compliance with standards set forth above except that the standards in force as of the date of employment to conduct the updated appraisal service shall apply. The "update" appraisal request may require the Design-Builder to consider and include minor plan revisions and changes in market conditions.

Upon request by the Department, the Design-Builder shall testify in any judicial or arbitration proceeding involving the determination of the value of the property, in support of the opinion of value of any and all of the property included in its appraisal report. Further, the Design-Builder agrees to attend, as requested by the Department, any pre-trial conferences, meetings, depositions, etc. related to such proceedings. The Design-Builder shall be compensated for these litigation-related services in accordance with the Expert Valuation Witness Rates in effect at the time the service is rendered. The Expert Valuation Witness Rate Schedule may be adjusted periodically.

The Design-Builder shall execute disclaimers of any past, present or contemplated future personal interest in any of the properties included in the proposed agreement, as required by the Department, or if applicable, FHWA.

The Design-Builder shall maintain throughout the term of this Contract Errors and Omissions insurance in the amount of not less than one million dollars (\$1,000,000.00), and proof of which shall be made available to the State upon demand.

The Design-Builder shall provide appraisal reviews complying with technical review guidelines found in the Department's Guidelines for Appraisers, the Uniform Act, and (USPAP), and the Department's ROW Procedures Manual and make a recommendation of just compensation. Design-Builder's ROW staff that performs acquisition and relocation/property management services shall be from the Department's pre-qualified consultant list for acquisition and relocation assistance and related services and the Design-Builder shall include a Department's pre-qualified Fee Appraiser from Department's prequalified appraiser list. The review appraiser shall be approved by the Department and shall also be on the Department's prequalified fee appraiser list. The Department shall have final approval of all the Design-Builder's ROW staff.

#### **7.4 ACQUISITION, RELOCATION ASSISTANCE, AND PROPERTY MANAGEMENT**

The Design-Builder shall acquire property in accordance with all Federal and State laws and regulations, including but not limited to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (the "Uniform Act") the Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally-Assisted Programs and (Part 24 of title 49 CFR). The acquisition of property shall follow the guidelines as established by the Department's ROW Procedures Manual. The Design-Builder shall execute a certification in its proposal that it has received the Department's ROW Procedures Manual and will comply with the procedures.

The Department has an Appeals Advisory Board to hear any Relocation Assistance appeals. The Department agrees to assist with any out of state relocation by persons displaced within the rights of way by arranging with such other state(s) for verification of the relocation assistance claim.

The Design-Builder shall establish an acquisition/relocation office at a location that is accessible to the property owners and displacees on or near the project. The purpose of maintaining this office is to ensure effective and responsive service to meet the property owners' and displacees' needs. The office must be operational by the time acquisitions begin. The Design-Builder shall supply relocation and negotiation personnel with substantial experience in highway ROW acquisition, or similar work, in numbers sufficient to accomplish the required work in a timely manner. Design-Builder's ROW staff that performs acquisition and relocation/property management services shall be from the Department's pre-qualified consultant list for acquisition and relocation assistance and related services. All relocation and negotiation personnel are to be approved by the Department for each project hereunder. After the Department has approved the personnel for a project, changes may only be made with the written approval of the Department. This office shall be staffed by persons knowledgeable of the Uniform Act and the Department's ROW Procedures Manual. This office shall be open during normal business hours and after hours by appointment.

The Design-Builder shall submit procedures for handling ROW acquisitions and relocations to the Department for concurrence prior to commencing ROW activities. This represents a hold point in the Design-Builder's Baseline Schedule. These procedures are to show the Design-Builder's methods, including the appropriate steps and workflow required for certified title reports, appraisals, appraisal review, negotiations, acquisition, relocations and parcel closings and all related activities. These procedures shall include the Department's review and concurrence of just compensation, administrative settlements, relocation benefits and claims.

A Department's Representative will be available to make timely decisions concerning establishing review and concurrence of just compensation, concurrence of administrative settlements, concurrence of relocation benefits and claims, on behalf of the Department. The Department's Representative is committed to issuing decisions on approval requests within sixty (60) calendar days. The commitment is based on the plan providing a reasonable and orderly workflow and the work being provided to the Department's Representative as completed.

The Design-Builder shall maintain accurate parcel files and, at the termination of the work on the project, turn over to the Department all relocation and negotiation files, appraisal and appraisal review files, and any other pertinent acquisition files, records or reports. All files shall be documented in accordance with the applicable State and Federal requirements. During the work on the project, the Design-Builder shall make all such files available, upon demand, for inspection by the Department and/or by the FHWA, when applicable.

The Design-Builder shall submit a project specific Conceptual Stage Relocation Plan and an Acquisition Stage Relocation Plan for the Department's Review and Acceptance. The plan shall identify a prioritized schedule of ROW activities including but not limited to appraisal, appraisal review, the specific parcels to be acquired and all relocations. The plan shall allow for the orderly relocation of displaced persons based on time frames not less than those provided by the Uniform Act and/or the Department's ROW Procedures Manual. This plan shall be updated as necessary during the life of the Project.

The Design-Builder shall make the necessary relocation survey and promptly prepare and submit all required relocation documents in accordance with State and Federal regulations. The Design-Builder shall perform all relocations in accordance with the Uniform Act and the Department's ROW Procedures Manual as applicable.

The Design-Builder shall submit monthly status reports to the Department's ROW Division to manage and track the acquisition process. The status report must include but not be limited to the appraisal,

appraisal review, and acquisition and relocation assistance status of all parcels. The Department's standard appraisal, appraisal review, acquisition and relocation assistance and property management forms and documents shall be used as applicable.

The Design-Builder shall provide necessary property management services during the period of the Design-Builder's work. Those property management services include but are not limited to: private property owner utility adjustment cost estimates, salvage appraisals on improvements being acquired, moving cost determination, including the moving of on-premise signs and outdoor advertising devices, and determination and collection of rent after the "90 day" notice to vacate has expired.

The Design-Builder shall coordinate all work through the State's Regional ROW Transportation Manager 2 or his/her designated representative.

The Design-Builder shall recommend tracts for condemnation. When the Design-Builder recommends a tract for condemnation, the request for condemnation must have the necessary supporting documentation attached to properly completed forms as indicated by the Regional ROW Office. The Regional ROW Office will check these forms and process this information to obtain a voucher. In general, all voucher requests for any payment will be handled in this manner.

The Design-Builder shall conduct any public meetings as requested by the Department and as required by the Department's ROW procedures and practices.

The Design-Builder shall meet and coordinate with public officials of governmental agencies and civic groups as required or as requested by the State.

The Department will be responsible for the costs associated with the payment to property owners for negotiated settlements, administrative settlements, and relocation benefits. The Department is also responsible for the costs associated with the payment to be deposited with the court in condemnation cases. In addition, any payments agreed to by the property owner and the Attorney General's Office during the condemnation process either by settlement or through the courts including court costs and any mediation expenses is the responsibility of the Department. The Design-Builder shall be responsible for disbursement of these payments and providing indefeasible title to the Department. All payments shall be made in accordance with the policies and procedures established in the Department's ROW Procedures Manual.

The Design-Builder shall prepare, obtain execution of, and record documents conveying title to such properties to the Department and deliver all executed and recorded general warranty deeds to the Department. For all property purchased in conjunction with the Project, title shall be acquired in fee simple (except for the acquisition of slope, construction or permanent drainage easements, in lieu of fee simple title, with respect to any portion of the ROW, which must be concurred with by the Department's Design Division) and shall be conveyed to the Department, Grantee, by a Department-approved general warranty deed, free and clear of all liens and encumbrances except encumbrances expressly permitted by the Department in writing in advance. All easements shall be acquired in the name of the Department.

Because these acquisitions are being made on behalf of the Department, the Department shall make the ultimate determination in each case as to whether settlement is appropriate or whether the filing of a condemnation action is necessary, taking into consideration the recommendations of the Design-Builder. When the Department authorizes the filing of condemnation, the Design-Builder shall prepare all required documents necessary to file and forwarded to the appropriate Department Regional ROW Office.

The Design-Builder shall provide the necessary staff and resources as directed by the Department to work with the Department and the Attorney General's Office throughout the entire condemnation process until the property is acquired by settlement, by deed, or by Final Consent Judgment executed by the Department and the appropriate court. The Design-Builder shall provide updated appraisals (i.e., appraisal reports effective as of the date of possession) and expert testimony supporting condemnation proceedings upon request by the Department and/or the Attorney General's Office.

The Design-Builder shall be responsible for all contacts with landowners for ROW and construction items and shall be responsible for properly setting all ROW monuments associated with the Project.

The Design-Builder shall maintain adequate access to all occupied properties to ensure emergency and personal vehicle access. Utility service must be available to all occupied properties at all times prior to and until relocation is complete.

During the acquisition process and for a period of three (3) years after final payment is made to the Design-Builder for any phase of the work, and until the Department has indefeasible title to the property, all Project documents and records not previously delivered to the Department, including but not limited to design and engineering costs, construction costs, costs of acquisition of ROW, and all documents and records necessary to determine compliance with the laws relating to the acquisition of ROW and the costs of relocation of utilities, shall be maintained and made available to the Department for inspection or audit. Throughout the design, acquisition and construction phases of the Project, copies of all documents/correspondence shall be submitted to both the Department Headquarters Office and the respective Department's Regional Office.

The Design-Builder shall ensure no open burning will occur within 1,000 feet of an occupied dwelling.

The Design-Builder shall maintain a sufficient buffer or hold off zone around parcels which have not been acquired and/or occupied properties to ensure compliance with ROW procedures prior to starting construction activities in these affected areas. There should be no construction-related activities within the hold off zone until the property is acquired and/or vacated. The Department will provide written notification before the contractor can enter the hold off zone.

### **Fidelity Bond**

Fidelity Bond: The Design-Builder shall furnish a fidelity bond in the amount of \$250,000.00 with the State being made the insured for the period of time from the first offer to the owners until all tracts have a recorded deed or vouchers submitted for condemnation, in such form as approved by the State. The bond shall indicate the State's ROW project number (both Federal and State numbers, if applicable).

### **Condemnations**

Property acquisition requiring condemnation shall be handled by the State Attorney General's Office. TDOT has no control over the timeframe for the condemnation proceedings. The Design-Builder shall anticipate time for condemnation proceedings. The Design-Builder is solely at-risk for any delays for right-of-entry associated with condemnation proceedings.

## **8.0 UTILITY SCOPE OF WORK**

The project's utility coordination will be performed by TDOT, inclusive of submitting plans, receiving, reviewing, and approving responses, reimbursement agreements, easement agreements, and authorization to proceed with utility relocation.

Immediately after submittal of the accepted final Definitive Design Plans to TDOT, TDOT will begin the utility coordination according to the statute (TCA 54-5-854) which requires the utility to respond within 120 -165 Calendar Days. The Design Builder will include the TDOT coordination in their CPM for Utility Investigation.

The Design-Builder shall be responsible for all additional costs associated with utility relocations due to revisions to the definitive plans after submittal to the utilities for coordination. These revisions include but are not limited to changes to haul roads and/or any other temporary conditions resulting from the Design-Builder's methods of operation or sequence of work.

Some adjustment of utility facilities will be required due to the Design-Builder design. Exact locations shall be determined in the field by contacting the utility companies involved. Notification by calling the Tennessee One Call System, Inc., at 1-800-351-1111 as required by TCA 65-31-106 will be required.

Prior to submitting the proposal, the Design-Builder shall be solely responsible for contacting owners of all affected utilities in order to determine the extent to which utility relocations and/or adjustments will have upon the schedule of work for the Project. While some work may be required 'around' utility facilities that will remain in place, other utility facilities may need to be adjusted concurrently with the Design-Builder's operations. Advance clear cutting may be required by the Department at any location where clearing is called for in the specifications and clear cutting is necessary for a utility relocation.

If the Design-Builder elects to make arrangements with a utility company to incorporate a new utility installation as part of the highway construction, the utility work done by the Design-Builder and the associated costs for the work shall be negotiated and agreed upon between the Design-Builder and the utility company with the costs and work being outside of the state contract.

In the event the Design-Builder performs any utility work outside of the state contract, it is their responsibility to obtain any and all applicable permits.

The Design-Builder shall be familiar with 1680-6-1 Rules and Regulations for Accommodating Utilities within Highway Rights-of-Way, Tennessee Code Annotated (TCA) Part 8 Relocation of Utilities 54-5-801 through 54-5-856, 23 CFR Part 645 "Utilities", and TDOT Policy 240-7 (Chapter 86). Adherence to the above referenced regulations and procedures are mandatory.

The Design-Builder shall notify each individual utility owner of their plan of operation in the area of the utilities. Prior to commencing construction, the Design-Builder shall contact the utility owners and request them to properly locate their respective utility on the ground. This notification shall be given at least three (3) business days prior to commencement of operations around the utility in accordance with TCA 65-31-106.

The Design-Builder shall provide all necessary protective measures to safeguard existing utilities from damage during construction of this Project. The cost of protecting utilities from damage and furnishing special equipment will be included in the price bid for other items of construction.

The Design-Builder shall accommodate utility adjustments, reconstruction, new installation and routine maintenance work by others that may be underway or take place during the progress of the contract.

No additional compensation or time shall be granted for any delays, inconveniences, or damage sustained by the Design Builder or its subcontractors due to interference from utilities or the operation of relocating utilities.

The Design Builder shall make all reasonable efforts to design the Project to avoid conflicts with utilities and minimize impacts where conflicts cannot be avoided.



## **9.0 ENVIRONMENTAL SCOPE OF WORK**

### **9.1 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DOCUMENT**

The NEPA document has been approved by FHWA. The Design-Builder shall review and adhere to the approved NEPA document and technical reports; specifically, any environmental commitments listed on the "Green Sheet" of the approved NEPA document. These commitments are to be adhered to throughout the design and construction process. The NEPA document, including the "Green Sheet" environmental commitments, are provided on the Project website. All commitments listed with respect to their technical area are to be fulfilled prior to construction and/or in-stream work (as applicable).

Should any environmental features within the NEPA study area, not addressed in the approved NEPA document, be uncovered during construction activities, all construction activities shall stop immediately in that area and the Design-Builder shall contact the TDOT Environmental Analysis Office and Region 3 ETO for consultation. All technical study activities must be completed in accordance with Department practices; the Design-Builder shall be responsible for obtaining any necessary Documentation Standards from the TDOT Environmental Analysis Office.

Should any changes to the design of the project occur, the Design-Builder shall provide the Environmental Division Office and the Region 3 ETO with a notification and copy of the revised plans. The Design-Builder is responsible for any and all required re-evaluation(s) of the approved NEPA document to address project changes such as, but not limited to, any additional ROW and/or easements or changes to the project design that were not covered under the approved NEPA document. The Design-Builder is also responsible for all technical studies needed for re-evaluations. The re-evaluation(s) may take place at any time during the development of the Project. Depending on the magnitude of the design changes required, the re-evaluation may require review and approval by FHWA; however, any minor changes may be documented, reviewed and concurred with by the Department's Environmental Division.

No additional time will be allotted to the Project schedule for the Design-Builder's preparation of a NEPA document re-evaluation, TDOT Environmental Division staff's review and concurrence of the NEPA document re-evaluation, agency coordination, and potential subsequent FHWA approval of the NEPA document re-evaluation.

### **9.2 ENVIRONMENTAL BOUNDARIES**

The Design-Builder shall make certain all features from the Environmental Boundaries Report (EBR) are field verified by a Tennessee Qualified Hydrologic Professional (TN-QHP) and an updated EBR is prepared as necessary. The Design-Builder may refer to the following web page for information and minimum qualifications concerning TN-QHP: <https://tnhdt.org/page.asp?Title=Info>

The Design-Builder shall install high-visibility fence around areas designated as "Approximate Sensitive Environmental Area" identified in the Functional Plans within the proposed right-of-way or any easements that are not to be disturbed.

The Design-Builder shall obtain an approved PJD or AJD from the COE prior to application. Design-Builder shall have all impacted jurisdictional water features assessed and verified by TDEC prior to application. Design-Builder shall submit these documents to the Region 3 ETO for review prior to submittal to agencies.

For impacts to any streams, springs, wetlands, sinkholes or other water resource features identified during construction, and not previously documented in the original EBR, it shall be the responsibility of the

Design-Builder to provide the data sheets and forms listed below to the Department's Region 3 ETO for review prior to submittal to the regulatory agencies:

### **Streams**

- Hydrologic Determination Field Data Sheet (Version 1.4)
- Ecology Water Resources Field Data Sheet
- A location map, plan sheets with resources clearly marked and labeled, and a U.S. Geological Survey (USGS) Quad map showing the proposed stream(s) using Department-provided map templates
- Photo summary of each feature including photo views of the location of the proposed alteration, upstream, downstream, and along the centerline of the Project.

### **Wetlands**

- U.S. Army Corps of Engineers (USACE): Wetland Determination Data Form – Eastern Mountain and Piedmont Region: Version 2.0
- Tennessee Division of Water Resources: Tennessee Rapid Assessment Methodology (TRAM) documentation for wetlands including: TRAM Decision Key, TRAM Outstanding Natural Resource Water or Exceptional Tennessee Water Decision Table, appropriate HGM field data forms (if applicable) or Non-HGM field data forms (if applicable) for the wetland type being assessed, and TRAM Quantitative Summary Table.
- A location map, plan sheets with resources clearly marked and labeled, and a USGS Quad map showing the proposed wetland(s) using Department-provided map templates.
- Photo summary of each feature including photo views of the location of the proposed alteration and wetland boundaries.

If an updated EBR is required, it shall be completed in accordance with Department practices. The Design-Builder shall be responsible for obtaining any necessary Documentation Standards from the TDOT Environmental Division.

Water resource determinations shall be completed by a Tennessee Qualified Hydrologic Professional (TN-QHP). The certification for the TN-QHP must be submitted along with the Hydrologic Determination Field Data Sheet for the individual preparing the data sheets and forms. All additional environmental field studies are to be performed by the Design-Builder's personnel with the required qualifications.

### **9.3 STATE OR FEDERAL ENDANGERED / THREATENED SPECIES**

Due to concerns for project impacts to federally and state listed species, and in coordination with the USFWS and TWRA, TDOT has agreed to implement the following project commitments:

Immediately prior to performing any instream work in Aeon Creek and the associated riverine wetland habitat, the Design-Builder shall coordinate with TWRA for fish species sweeps of the State-Deemed-In-Need-of-Management species Redband Darter (*Etheostoma luteovinctum*). The Design-Builder shall hire a biologist with the proper TWRA collection permit and ability to identify all fish species collected during sweeps. The Region 3 Environmental Tech Group shall be notified at least ten (10) business days prior to each fish sweep.

The Design-Builder's coordination with resource agencies shall, at a minimum, include the following information: a clear description of the project changes and methodologies to be reviewed, timing and schedule for implementation of the changes, maps showing location of changes (if applicable), plans documenting the changes, description of the habitat(s) affected by the changes, description of how the changes maintain compliance with existing project commitments, and previous coordination responses from the resource agencies.

If the Design-Builder makes changes to the plans that will cause construction activity to extend outside the Environmental Study Area, impact streams or wetlands not identified in the Environmental Boundaries Report (EBR), or impact federal or state-listed species in a manner not previously addressed within the attached correspondence from U.S. Fish and Wildlife Service (USFWS), Tennessee Wildlife Resources Agency (TWRA), and the Tennessee Department of Environment and Conservation (TDEC) Division of Natural Areas, re-coordination with the agencies listed above may be necessary. The Design-Builder shall contact the Department's Region 3 Environmental Tech Office prior to any coordination so that TDOT Ecologists can determine whether re-coordination is required. If re-coordination is deemed necessary, it will be completed by TDOT ecologists and will provide those agencies the opportunity to review the proposed changes and provide feedback. If TWRA or USFWS require any species surveys, sweeps, or transplants, the Department will require the Design-Builder to perform the work. That includes any additional commitments required as a result of re-coordination. The Design-Builder must provide the following to the Department's Region 3 Environmental Tech Office before starting coordination with the USFWS, TDEC Division of Natural Areas, and TWRA.

- Surveys shall be conducted as appropriate, depending on the species. The Design-Builder's biologist shall prepare a sampling plan as recommended by the USFWS, TWRA, and/or TDEC Division of Natural Areas. The plan shall include (at a minimum) the techniques, equipment, analytical techniques or metrics (e.g., IBI, TMI), time frame, staff qualifications, and the appropriate collection permits including identification numbers (if applicable).
- A sweep is generally associated with fish, mussels, or crayfish; and is typically conducted immediately prior to commencement of construction work in the water. The sweep is performed the same day as installation of the coffer dams or when the work is being done in the water. A plan describing the methods for conducting the sweep shall be required. All sweep methods and procedures must be coordinated with USFWS and TWRA prior to the sweep.
- A translocation plan, if applicable, shall be submitted to the USFWS (for Federal-listed plants) and the TDEC Division of Natural Areas (for State-listed plants) for approval. This shall include, at a minimum, a description of the translocation site including the ownership of the parcel, the technique for moving the plants, the proposed relocation site, the time frame for the move, long term protection strategies at the translocation site, and the qualifications of the staff involved.

The Design-Builder shall be responsible for any additional project commitments required by the resource agencies as a result of the additional agency review and coordination. These commitments may include but are not limited to: preparation of species reports or biological assessments, any species surveys, species sweeps and relocations, additional prohibitions on work during designated time periods, and any required species monitoring.

The Design-Builder shall (in consultation with the Department) allow time in the CPM Schedule for the review and coordination of project changes with TWRA, USFWS, and the TDEC Division of Natural Areas, if required.

The Design-Builder shall perform all construction work in observance of the Migratory Bird Treaty Act (MBTA) of 1918 (last amended in 1998) wherein all migratory birds, with the exception of pigeons and starlings, are protected.

If migratory birds' nest or roosts are observed the Design-Builder's biologist should use best professional judgment regarding the nesting behaviors and social tendencies of the species in question (i.e., solitary vs. colonial, etc.) to determine what constitutes a significant concentration of nesting birds. Some examples of nesting populations include heron rookeries, turkey vulture roosts, and cliff swallow nests on bridges. The definition of significant concentration will vary depending on the species. For example, a single robin or bluebird nest would not be significant, but a single bald eagle nest or twenty cliff swallow nests may be.

#### **9.4 OTHER NATURAL RESOURCES**

The Design-Builder shall ensure identification, survey and monitoring of other natural resources such as sinkholes, caves or specialized habitats. The Design-Builder shall coordinate with the Department's Region 3 ETO for coordination with regulatory agencies (i.e. TDEC) when necessary and obtain any necessary permits for modifications to the natural resources (i.e. TDEC Underground Injection Control (UIC) Permit, etc.).

#### **9.5 GPS / GIS DATA COLLECTION**

The Design-Builder's data collection for streams, wetlands, springs, sinkholes or other jurisdictional features shall be with mapping grade accuracy (defined as sub meter).

#### **9.6 MITIGATION OF STREAMS AND WETLANDS**

The Design-Builder shall be responsible for any and all compensatory mitigation of impacts to environmental features (streams and/or wetlands) for the Project as documented in the initial EBR, or additional features identified prior to and during construction.

The Design-Builder shall be responsible for all costs associated with obtaining mitigation. This may include (but is not limited to):

- Planning;
- NEPA Technical Studies and required NEPA Re-evaluations;
- Right-of-Way or Real Property Protection (see Appendix F of the 2019 TDEC Stream Mitigation Guidelines (<https://www.tn.gov/content/dam/tn/environment/water/policy-and-guidance/dwr-nr-g-01-stream-mitigation-guidelines-052019.pdf>));
- Design;
- As-Built Drawings for permittee-responsible mitigation plans;
- Permitting;
- Construction of on-site/off-site mitigation for stream and/or wetlands impacts;
- Post-construction monitoring and maintenance of the mitigation sites or stream relocations for the first year; and/or
- Purchasing stream and/or wetland mitigation credits from an approved bank/organization

Construction of linear transportation and utility projects requiring State and federal permits have the potential to impact and degrade streams. These impacts often result in loss of aquatic resource values, including stream length, hydrology, available habitat, and other beneficial ecological and physical characteristics. If the proposed design impacts a stream that results in a loss of aquatic resource value, the Design-Builder shall use the most current mitigation guidelines in the State of Tennessee to assess mitigation needs. Currently, state and federal agencies approve the use of the Tennessee Stream Quantification Tool (SQT) and Tennessee Debit Tool (TDT) to determine the existing condition for each impacted reach and the amount of mitigation needed. It is essential that the Design-Builder retain a consultant with experience collecting this type of data to prevent revisions resulting in delays in obtaining permits. The Design-Builder shall provide all documentation as outlined in the SQT and TDT to the Department's Region 3 Environmental Tech Office for review before submittal to the Tennessee Department of Environment & Conservation or U.S. Army Corps of Engineers. For guidance on data collection, worksheets needed, etc., see the Tennessee Department of Environment & Conservation web page for Compensatory Mitigation for Streams and Wetlands.

<https://www.tn.gov/environment/permit-permits/water-permits1/aquatic-resource-alteration-permit--arap-/permit-water-arap-compensatory-mitigation.html>

If required, constructed mitigation sites and stream relocations shall be constructed within the first six months once construction activities have started. Mitigation sites and stream relocations shall be completed in time to allow for the Design-Builder to complete at minimum one year of monitoring. This monitoring shall be conducted in full prior to completion of construction activities. Monitoring does not start until all components of the mitigation plan(s) have been installed /constructed. As stated above, the Design-Builder is responsible for all maintenance and monitoring of the mitigation site / stream relocation. The Department will monitor these sites after the project completion date for the remainder of the monitoring period outlined in the permits. During the remainder of the monitoring period, outlined in the permit, if TDOT, USACE or TDEC identifies any deficient or failing mitigation measures, it shall be the responsibility of the Design-Builder to perform corrective actions.

The Design-Builder shall provide mitigation for any impacts to environmental features (streams, wetlands, etc.) in accordance with state and federal regulations, such as the 2008 Federal Mitigation Rule (40 CFR Part 230, Compensatory Mitigation for Losses of Aquatic Resources).

All stream and wetland mitigation shall follow the current requirements outlined in the most current Stream Mitigation Guidelines for the State of Tennessee (available at <https://www.tn.gov/environment/permit-permits/water-permits1/aquatic-resource-alteration-permit--arap-/permit-water-arap-compensatory-mitigation.html>), prepared by the TDEC, Division of Water Resources Permits Section and federal mitigation requirements of the Department of the Army, Corps of Engineers 33 CFR Parts 325 and 332. All proposed stream and wetland mitigation shall be submitted to and coordinated with the Department's Region 3 ETO and the Headquarters Environmental Mitigation Office for coordination with regulatory agencies prior to the submittal of the permit application. It shall be the responsibility of the Design-Builder to make any and all adjustments deemed necessary by the regulatory agencies to the proposed mitigation plan.

The Design-Builder shall be responsible for all on-site/off-site mitigation requirements listed in the permits and all costs associated with mitigation requirements.

## **9.7 PERMITTING**

The Department has not procured, nor will it procure, permits for the Design-Builder. The Design-Builder shall determine all permits required in order to perform the work.

The Design-Builder shall be solely responsible for and obtain any necessary state and federal environmental permits or approvals resulting from their design and construction. If environmental permits are necessary, prior to completion of the Definitive Design Plans, the Design-Builder shall contact the Department Alternative Contracting Office immediately for guidance. The Department's Region 3 Environmental Tech Office (ETO) and TDOT HQ Permitting Office shall be included in all correspondence and/or negotiations with agencies. The Region 3 ETO will be the lead Department contact concerning Water Quality Permitting.

The Design-Builder shall be solely responsible for complying with and obtaining any necessary building, demolition, grading, and environmental permits or approvals, including but not limited to archaeology, ecology, historical, hazardous materials, air and noise, TVA 26a, TDEC ARAP/401, USACE Section 404, and TDEC National Pollution Discharge Elimination System (NPDES) permits, from federal, state and/or local agencies regarding any material and staging areas and the operation of any project-dedicated asphalt and/or concrete plants, and any waste or borrow areas that will be used. Any such permits shall be supplied to the Department's Region 3 ETO prior to the commencement of activities in the permitted area(s).

The Design-Builder shall be responsible, under the laws and regulations listed above, to avoid and minimize, to the maximum extent practicable, impacts to Waters of the State and/or Waters of the U.S. when designing and constructing the project. Avoidance and minimization of impacts to Waters of the State and/or Waters of the U.S. are beneficial to the Design-Builder because such actions avoid or reduce the amount of compensatory mitigation that may be required to obtain water quality permits prior to construction.

The Design-Builder shall obtain and pay for all regulatory permits as required by applicable laws, the plans, or contract specifications. This includes stormwater discharges associated with construction support activities including, but not limited to: equipment staging yards, material storage areas, excess excavated materials disposal, demolition disposal (waste) areas, and borrow areas. These areas are to be addressed in accordance with the TDOT *Procedures for Providing Offsite Waste and Borrow on Construction Projects* (current version). The Design-Builder shall be cognizant of and adhere to the requirements of the various permits that will be necessary for construction and operation of the Project.

#### **Applying for and Obtaining Permits**

The Design-Builder shall be responsible for preparing all documents (permit application package) and attending all public meetings necessary to obtain the environmental permits required for the construction of this Project. TDOT application templates will be provided to the Design-Builder and shall be used in the permit application package.

The Design-Builder shall acquire information and prepare permit drawings/sketches that reflect the impacts and minimization efforts resulting from the Design-Builder's design of this Project. If water quality permits are required, there shall be scheduled reviews of permissible plans, application, and permit conditions by the Department's Region 3 ETO and upon request, Headquarters Environmental Division Permitting Section to ensure regulatory practices are consistent. TDOT will review the Design-Builder's permits, permit applications, and permit documents within ten (10) business days.

The Design-Builder shall schedule a pre-application meeting with the permitting agencies to discuss the project and impacts to water quality features before submittal of the water quality application. The Department's Region 3 ETO and HQ Permits Office shall be included on any correspondence or meetings with the permitting agencies.

The Design-Builder shall be responsible for developing the permit application for all jurisdictional water resource impacts. The Design-Builder shall be responsible for all public notice requirements such as documentation to be placed in the local paper and in the field and answering of public notice comments. The Design-Builder shall employ all personnel that it deems necessary in order to provide permit compliance.

The Design-Builder shall submit the permit application in its own name and ensure the permit is issued in its name. If under the applicable laws and regulations, the permit application cannot be submitted in the Design-Builder's name, the Design-Builder shall submit the permit application as an Authorized Agent of the Department and ensure the permits are issued with the Department as the Permittee. The Design-Builder shall attend a final review meeting with the Department to review all permit applications prior to submitting the application to the permitting agencies.

Environmental permits may also be required when activities such as core sampling, seismic exploratory operations, geotechnical investigations, ROW fence replacement, utility relocations, and historic resources surveys are within Waters of the State or Waters of the U.S. These permits may also be required for placement and operations of scientific measurement devices.

The Department's Region 3 ETO and Headquarters Environmental Division Permitting Section shall be invited to any meeting between the Design-Builder and the respective regulatory agency to discuss issues related to the application for (or refusal of) a permit. The Design-Builder shall inform the Department a minimum of ten (10) business days in advance of the time and location such a meeting is to take place and provide a meeting agenda five (5) business days in advance of the meeting.

The Design-Builder shall represent the Department in any proceedings relating to reservations, objections, appeals and/or applications for preliminary injunctions initiated by others against the permit application or by itself against the permit decision. In such proceedings, the Design-Builder shall do everything in its power to defend the submitted application.

If any regulatory agency rejects or denies the permit application, it is the Design-Builder's responsibility to make the necessary revisions to ensure the permit is approved. If revisions are required to obtain permits, there should be scheduled reviews of the revisions by the Department's Regional ETO and upon request, the Headquarters Environmental Division Permitting Section to ensure regulatory practices are consistent. The Design-Builder shall be responsible for preparing designs and proposing construction methods that are permissible. All permits required for a particular construction activity shall be acquired prior to commencing the particular construction activity. All costs and delays associated with incomplete permit packages, agency rejection, agency denials, agency processing time, or any permit violations shall be the responsibility of the Design-Builder and will not be considered sufficient reason for time extension.

The Design-Builder shall provide the Department with a copy of the draft permit decision and a copy of the final permit immediately upon receipt.

The Design-Builder shall plan, implement, monitor and maintain all applicable Erosion Prevention and Sediment Control (EPSC) measures and Best Management Practices (BMPs) in accordance with all TDOT standards during construction. The Design-Builder shall bear all cost and risks associated with applying for, obtaining and complying with permits.

**Permit Application Package Contents**

The permit application package (applicable for USACE §404, TVA Section 26a, and TDEC ARAPs) shall include, but not be limited to, the following information:

- TDOT Application Templates or an Approved Equal which meets all required Sections of the Agencies Applications forms (ie. TDEC CN-1091, USACE ENG 4345, NPDES NOC, etc.);
- A signed application cover letter to the TDEC Division of Water Resources, Water Permits Section and the USACE. The application cover letter shall include alternatives for each impact to environmental features, proposed methods utilized by the Design-Builder to minimize impacts to each environmental feature, and proposed mitigation for impacts to environmental features (if required);
- Copy of signed TDEC ARAP CN-1091 form (the originally-signed CN1091 form shall be submitted to TDEC);
- Copy of Signed USACE ENG Form 4345 (if applicable). The originally signed form shall be submitted to the USACE. Feature impact tables (including summary table if the application includes any site with mitigation);
- Signed DA/TVA form or DA form (if applicable);
- Signed TVA Applicant Disclosure Form (if applicable);
- TN Debit Tool (utilizing the data collected by SQT Method) datasheets showing project related impacts. Separate tables may be required if TDEC and USACE impacts differ. Refer to TDEC's website listed above on TN SQT (if needed for mitigation);
- Labeled USGS color quadrangle map;
- Permit sketches for each impact. If the project has an USACE Individual Section 404 Permit, the names and addresses of all property owners adjacent to all impacts must be provided on a separate permit sketch. Permit sketches shall be prepared in accordance with the TDOT *Design Guidelines*;
- Compensatory Mitigation and Monitoring Plan for all streams and wetlands (if applicable). This includes in-lieu-fee and bank credit reservations letters, Permittee Responsible Mitigation design and narrative (known as a 12-step) and wetland debit sheet;
- A copy of the Environmental Boundaries Report as well as any revisions or additions. The EBR needs to be completed and all agency coordination and comments have been finalized. The final EBR shall include all the documentation indicated in Section 9.2 as well as TN-SQT data. An approved PJD or AJD along with TDEC verification is also required;
- A copy of approved NEPA Environmental Document including all Section 106 clearances;
- Provide a Federal Emergency Management Agency (FEMA) flood insurance rate map (FIRM) for the subject project with construction limits labeled if not included in the NEPA Environmental Document. Include with the application any FEMA No-Rise Certification letter, Conditional Letter of Map Revision (CLOMR), and/or Letter of Map Revision (LOMR), if applicable; and
- Include a half-size set of roadway plans and bridge layouts showing all environmental features. The plans shall be highlighted to distinguish between existing and new work. Environmental Division Permits Section uses the following guidelines:
  - New culvert construction (extensions included) including endwalls and rip-rap shall be highlighted in orange on the proposed layout.
  - Existing culverts shall be highlighted in blue on the present layout (blue on the proposed layout if sections are remaining).
  - Stream inlet and outlet protection measures and channel transitions shall also be dimensioned, labeled on the plans, and recorded in the impact table.
  - Streams/springs shall be highlighted in blue on the present and proposed layout.
  - Wetlands shall be highlighted on present layout (green for permanent impacts and yellow for temporary impacts). Be sure to label plans accordingly.



- Bank stabilization, outfall structures, and sinkholes shall be highlighted in pink on proposed layout.
- General Notes, Special Notes, Project Commitments sheet, and EPSC plans with the roadway plans shall also be included.

Any temporary construction measures, including de-watering, construction access, haul roads, EPSC measures, temporary crossings, stream diversions, etc. shall be addressed in the permit application. The Design-Builder shall clearly indicate the location of and impacts from haul roads on jurisdictional areas. The Design-Builder shall identify all proposed borrow and waste sites and provide all clearance documentation per the TDOT *Procedures for Providing Offsite Waste and Borrow on Construction Projects* (current version):

[https://www.tn.gov/content/dam/tn/tdot/construction/old\\_web\\_page/WasteBorrowManual.pdf](https://www.tn.gov/content/dam/tn/tdot/construction/old_web_page/WasteBorrowManual.pdf)

These details shall be included in the permit application data. Further, the Design-Builder shall describe the methods of construction of all structures.

### **NPDES Permit Specific Requirements**

A TDEC National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) for construction stormwater runoff is required for this Project. It shall be the responsibility of the Design-Builder to develop final EPSC sheets, a Storm Water Pollution Prevention Plan (SWPPP) and obtain the NPDES CGP for the Project.

The Design-Builder shall schedule a pre-application meeting with TDEC to discuss construction phasing of the project and estimated time frames for submittals. The Department's Region 3 ETO and TDOT HQ Permitting Office shall be included in all correspondence and/or negotiations with agencies. The Region 3 ETO is the lead and will be the Department's contact for stormwater permitting.

The Design-Builder shall prepare a SWPPP, Documentation and Permits Binder and a Notice of Intent (NOI) using the Department's most current format template to be approved by the Department prior to submittal of the NPDES CGP to TDEC. A copy of the SWPPP template used by the Department to develop SWPPPs and the Documentation and Permits Binder can be obtained from the Region 3 ETO.

<https://www.tn.gov/tdot/environmental-home/environmental-ecology-and-permits-office/environmental-ecology-and-permits-environmental-permit.html>

The SWPPP template and Manual shall be used as a guide in preparation of the SWPPP and the Design-Builder is responsible for complying with all requirements of the CGP.

The SWPPP shall include the EPSC plans for application of coverage under the CGP. The SWPPP and Notice of Intent (NOI) shall be submitted at least forty-five (45) business days prior to beginning construction activities. Once a Notice of Coverage (NOC) is received by the Design-Builder, the EPSC plans and SWPPP shall be kept current for all stages of construction. Any changes in scope subsequent to submitting the SWPPP for coverage under the CGP shall be submitted to both TDEC and the Department for their records.

If at any time, the Design-Builder is not in compliance with any applicable permit regulations, all non-compliance items must be addressed by the Design-Builder within 24 hours of such identification. The Department has the authority to suspend work until such time as the deficiencies have been corrected. The Design-Builder shall not be granted any cost or time compensation for any work suspensions associated with non-compliance. Any monetary fees and/or fines associated with any violations shall be the sole responsibility of the Design-Builder. In the event that a Notice of Violation (NOV) is issued by a regulatory

agency, the response to the NOV shall be written by the Design-Builder and approved by the Department's Region 3 ETO prior to submittal to the agency.

The Design-Builder shall prepare EPSC plans detailing BMPs to prevent erosion, control sedimentation, and prevent the discharge of any pollutants from leaving the Department's ROW/easements or entering jurisdictional features, or stormwater conveyances and be transported to receiving waters during the construction of the Project. The Design-Builder shall identify all outfall locations on the EPSC plans with an appropriate numbering or lettering system. The Design-Builder shall revise the SWPPP and the EPSC plans as necessary based on actual construction activities throughout the duration of the Project. All SWPPP and EPSC revisions shall be documented. The Design-Builder shall certify that the individual who prepared and reviewed the EPSC plans and SWPPP is currently certified according to the CGP. The Design-Builder shall also certify that the BMPs are designed so that if properly implemented, installed, and maintained, they will manage erosion and prevent sedimentation to waters of the state and on adjacent property owners, as well as comply with the terms of the TDEC NPDES Construction General Permit.

The Design-Builder shall follow all of the Department's Design Standards/Guidelines when developing the EPSC plans and SWPPP for the subject project.

### **Inspections**

The Design-Builder shall complete project site inspections of the erosion control measures, disturbed areas, areas used for storage of material, construction entrance/exit, and all outfalls. The Design-Builder shall be accompanied by a TDOT representative during these site inspections. Following the inspection, a report shall be prepared and maintained with the SWPPP. The CGP requires the inspections to be performed at least twice a week, 72 hours or more apart. The inspector must document the findings of the inspection fully in the report, and provide a copy to the site operator and the contractor, document that the rain gage has been read and rainfall recorded on a daily basis or that a reference site has been used to document rainfall. The inspector shall also document that all records are being completed and maintained per the TN CGP.

The inspector shall use photo documentation to clearly convey recommendations to the site operator and contractor. All photos shall be saved to document site conditions over time to support the inspection report findings when the site is audited by TDEC or other regulators.

The Design-Builder shall maintain a rain gauge on-site that measures up to 6-inches of rainfall. The rain gauge shall be located along the project site in an open area such that measurements will not be influenced by outside factors. Rainfall monitoring shall be initiated prior to clearing, grubbing, excavation, grading, cutting or filling. The rain gauge shall be read and emptied after every rainfall event occurring on the project site (at approximately the same time of day). The rainfall records shall be recorded and maintained with the SWPPP. Record data should include date of rain event, amount of rainfall and the approximate duration.

Inspectors performing the required twice weekly inspections must have one of the following: a valid certification from the "Fundamentals of Erosion Prevention and Sediment Control Level I" course, licensure as a professional engineer or landscape architect, Certified Professional in Erosion and Sediment Control (CPESC) certification, or successful completion of the "Level II Principles for Erosion Prevention and Sediment Control for Construction Sites" course. A copy of each inspector's certificate, license, or training record should be kept on site.

As outlined in the NPDES CGP, the Department will perform the monthly Environmental Quality Assurance Project Compliance Assessments (QA Inspections) on this Project, which will include any waste and borrow areas. Should the project have repeat non-conformances on QA Inspections, Water Quality violations or a NOV, the Department may increase the frequency of QA inspections to two per month. The extra QA inspection will occur until the project has been brought back into compliance for two consecutive QA inspections. The Design-Builder will be required to compensate the Department for these additional QA inspections.

### **Water Quality Permits Specific Requirements**

The Design-Builder assumes all responsibility as the Authorized Agent of the Department (Permittee) as indicated in the permit that relates to protection of the “Waters of the United States” and/or “Waters of the State of Tennessee” pursuant to the following:

- Sections 401 and 404 of the Federal Clean Water Act (33 U.S.C. §1344), and all implementing regulations, including without limitation, regulations of the U.S. Army Corps of Engineers governing permits for discharges of dredged or fill material into waters of the United States in 33 CFR Part 323;
- The Tennessee Water Quality Control Act (T.C.A. §69-3-101, et. seq.) and all implementing regulations, including without limitation the Rules of TDEC governing National Pollutant Discharge Elimination System (NPDES) permits in Chapter 1200-4-10, and Aquatic Resource Alteration Permits in Chapter 1200-4-7; Class V Injection Well Permits for work in or near sinkholes;
- Section 26a of the Tennessee Valley Authority (TVA) Act of 1933 as amended (49 Stat 1079, 16 U. S. C. sec. 831y1.) and all implementing regulations, including without limitation the regulations of the Tennessee Valley Authority governing construction in the Tennessee River System in 18 C.F.R., Part 1304.

### **Permit Register**

The Design-Builder shall administer a permit register and provide an updated permit register in every progress report. The permit register shall include an overview of all permits required of the Project. The permit register requires each permit to be indicated as follows:

- Name and address of the granting authority;
- Purpose of the permit;
- Reference to the document in which the permit conditions are defined;
- Status of permit;
- Date by which the authorization of the specific permit is anticipated;
- Permit conditions relevant for the Work;
- Date by which the permit is required (milestone);
- How the Design-Builder ensures that he shall comply with the permit requirements and conditions; and
- Validity and the expiry date (if any) of the permit.

## **9.8 DISPOSAL OF MATERIALS**

All disposal activities shall be in accordance with the TDOT *Procedures for Providing Offsite Waste and Borrow on Construction Projects* (current version) located at:

[https://www.tn.gov/content/dam/tn/tdot/construction/old\\_web\\_page/WasteBorrowManual.pdf](https://www.tn.gov/content/dam/tn/tdot/construction/old_web_page/WasteBorrowManual.pdf)

Borrow and waste disposal areas shall be located in non-wetland areas and above the 100-year, Federal Emergency Management Agency floodplain. Borrow and waste disposal areas shall not affect any Waters of the State/U.S. unless these areas are specifically covered by an ARAP, §404, and/or NPDES permit, obtained solely by the Design-Builder.

### **9.9 EROSION PREVENTION AND SEDIMENT CONTROL (EPSC)**

All EPSC designs and implementation shall be the responsibility of the Design-Builder.

Grass strips and side slopes shall be permanently stabilized by seeding with mulch or sodding in accordance with Part 8 of the Standard Specifications to prevent damage to adjacent facilities and property due to erosion on all newly graded cut and fill slopes that have permanently ceased.

- Pre-construction vegetative ground cover shall not be destroyed, removed or disturbed (i.e. clearing and grubbing initiated) more than 14 calendar days prior to grading or earth moving activities unless the area is mulched, seeded with mulch or other temporary cover is applied.
- Clearing, grubbing, and other disturbances to riparian vegetation shall be limited to the minimum necessary for slope construction and equipment operations. Existing vegetation, including stream and wetland buffers (unless permitted), should be preserved to the maximum extent possible. Unnecessary vegetation removal is prohibited.

Temporary stabilization shall be initiated within 14 calendar days when construction activities on a portion of the site are temporarily ceased and earth disturbing activities shall not resume until after 14 calendar days. Permanent stabilization measures in disturbed areas shall be initiated within 14 calendar days after final grading of any phase of construction.

Steep slopes shall be temporarily stabilized not later than 7 calendar days after construction activity on the slope has temporarily or permanently ceased. For this project, steep slopes shall be defined as natural or created slopes of greater than 3H:1V, regardless of height.

Permanent stabilization shall replace temporary measures as soon as practicable. Priority shall be given to finishing operations and permanent EPSC measures over temporary EPSC measures.

Inspection, repair, and maintenance of EPSC structures shall be performed on a regular basis and sediment shall be removed from sediment control structures when the design capacity has been reduced by fifty percent (50%). During sediment removal, the Design-Builder shall take care to ensure that structural components of EPSC structures are not damaged and thus made ineffective. If damage does occur, the Design-Builder shall repair the structures at their own expense.

EPSC controls shall be inspected according to permit requirements to verify measures have been installed and maintained in accordance with TDOT standard drawings, specifications, and good engineering practices. EPSC inspections shall be documented on the TDOT EPSC inspection report and a copy of each inspection report shall be provided to the Department.

Sediment removed from sediment control structures shall be placed and be treated in a manner so that the sediment is contained within the Project limits and does not migrate onto adjacent properties and into Waters of the State/United States.

The Design-Builder shall establish and maintain a comprehensive and proactive method to inspect and prevent the off-site migration or deposit of sediment off the Project limits (e.g. ROW, easements, etc.), into Waters of the State/United States, or onto roadways used by the general public. If sediment escapes the construction site, off-site accumulations of sediment that have not reached a stream must be removed at a frequency sufficient to minimize off-site impacts (e.g., fugitive sediment that has escaped the construction site and has collected in a street must be removed so that it is not subsequently washed into storm sewers and streams by the next rain and/or so that it does not pose a safety hazard to users of public streets). Arrangements concerning removal of sediment on adjoining property must be settled with the adjoining property owner before removal of sediment.

Upon conclusion of the inspections, EPSC measures found to be ineffective shall be repaired, replaced, or modified before the next rain event, if possible, but in no case more than 24 hours after the inspection or when the condition is identified. If the repair, replacement or modification is not practical within the 24-hour timeframe, written documentation must be provided in the field diary and EPSC inspection report. An estimated repair, replacement or modification schedule shall be documented within 24-hours of identification. All costs associated with modifications made to these measures shall be the responsibility of the Design-Builder and all modifications shall be concurred with by the Department.

Temporary EPSC measures may be removed at the beginning of the workday but must be replaced at the end of the workday or before/during a precipitation event.

Delaying planting of cover vegetation until winter months or dry months shall be avoided.

Offsite vehicle tracking of sediments and the generation of dust shall be minimized. A stabilized construction access (a point of entrance/exit to the construction project) shall be provided to reduce the tracking of mud and dirt onto public roads by construction vehicles.

The Design-Builder shall have a plan in place for dust control. The dust control plan shall be developed prior to the start of any construction activities and shall be submitted to the Department for approval.

The EPSC plan shall be updated by the Design-Builder whenever EPSC inspections indicate, or where State or Federal officials determine EPSC measures are proving ineffective in eliminating or significantly minimizing pollutant sources or are otherwise not achieving the general objectives of controlling pollutants in storm water discharges associated with the construction activity.

The accepted EPSC plan shall require that EPSC measures be in place before clearing, grubbing, excavation, grading, culvert or bridge construction, cutting, filling or any other earthwork occurs, except as such work may be necessary to install EPSC measures.

EPSC measures shall be installed and functional prior to any earth moving operations and shall be maintained throughout the construction period except as such work may be necessary to install EPSC measures.

The Design-Builder shall establish and maintain a proactive method to prevent litter and construction wastes from entering Waters of the State/United States. These materials shall be removed from stormwater exposure prior to anticipated storm events or before being carried offsite by wind, or otherwise prevented from becoming a pollutant source for stormwater discharges. After use, materials used for EPSC shall be removed from the site by the Design-Builder.

### **9.10 STREAM RELOCATION**

The Design-Builder shall be responsible for performing any stream relocations required for construction of the roadway project. If the proposed project ROW is not sufficient to allow for this stream relocation, and the requisite vegetative buffer, then the Design-Builder shall acquire ROW sufficient to do so. All permitting, design, and construction of the relocated stream channel will be performed by the Design-Builder. In the event that any portion of the relocated stream does not meet performance standards, as set forth in the associated regulatory permits, then the Design-Builder shall be responsible for any required corrective action.

### **9.11 DEPARTMENT INSPECTIONS**

The Department will review and monitor the Project, including all waste and borrow areas, to ensure compliance with all applicable environmental regulations and stormwater management activities throughout the duration of the Project.

If at any time, the Design-Builder is not in compliance with any applicable permit regulations, all non-compliance items must be addressed by the Design-Builder within 24 hours of such identification. The Department has the authority to suspend work until such time as the deficiencies have been corrected.

The Design-Builder shall not be granted any cost or time compensation for any work suspensions associated with non-compliance. Any monetary fees and/or fines associated with any violations, assessed by regulatory agencies, shall be the responsibility of the Design-Builder.

The Design-Builder shall monitor any constructed mitigation sites for the required monitoring period post construction as defined in the permits and shall be responsible for the correction of any deficient or failing mitigation measures during this time. The cost for any repairs during the required monitoring period shall be included in the Design Builder's bid.

Should the project have repeat non-conformances on QA Inspections, Water Quality violations or a NOV, the Department may increase the frequency of QA inspections to two per month. The extra QA inspection will occur until the project has been brought back into compliance for two consecutive QA inspections. The Design-Builder will be required to compensate the Department for these additional QA inspections.

## **10.0 CONSTRUCTION SCOPE OF WORK**

The Design-Builder shall meet the requirements of the Department's Standard Specifications for Road and Bridge Construction (January 1, 2015 edition), contractual Special Provisions, the Manual on Uniform Traffic Control Devices (MUTCD), and the Tennessee Occupational Safety and Health Administration (TOSHA).

The Design-Builder shall ensure that all applicable "General and Special Notes" found in Section VI of the current edition of the TDOT *Roadway Design Guidelines* and *TDOT Instructional Bulletins (IBs)* applicable on the date the RFP is issued are adhered to during construction.

Reference Special Provision 108 B Project Completion Time and Liquidated Damages as included in **Contract Book 2 (Design-Build Contract)**.

### **Construction Services**

The Design-Builder shall supervise and administer all construction activities in accordance with Contract requirements.

The Design-Builder shall perform all other construction work required to complete the Project in conformance with all Contract requirements, including Legal Requirements.

The Design-Builder shall keep the work location and its vicinity free from accumulation of waste materials and rubbish caused by the Design-Builder's operations.

The Design-Builder shall be required to furnish any special equipment needed to accomplish all aspects of the work.

Construction work is permitted within the City of Spring Hill as set forth in City of Spring Hill Resolution 20-47 (see reference material on project website).

Any area that is disturbed outside limits of construction during the life of this Project shall be repaired by the Design-Builder at their expense. All repaired areas shall be inspected and be deemed satisfactory by the Department.

The Design-Builder shall coordinate its work with that of other contractors working on or near the Project. The Design-Builder shall consider the schedule of other contractors when developing its schedule to maintain continuity of work and compliance with the Project schedule.

### **Acceptance of Material**

All materials utilized in this project shall meet the requirements set forth in the contract, plans and specifications. Materials incorporated into the project must have certifications, test reports and/or acceptance testing as specified in the Department's Quality Assurance Program for the Sampling and Testing of Materials and Products (SOP 1-1) (<https://www.tn.gov/tdot/materials-and-tests/standard-operating-procedures.html>). The Design-Builder shall communicate what materials will be utilized in the project along with estimated quantities in sufficient time that adequate samples and/or acceptance testing can be performed by TDOT representatives.

### **Method of Construction**

The Design-Builder is responsible for obtaining all permits necessary for its proposed method of construction including haul roads. The Design-Builder is responsible for determining all means and

methods of construction for the project. However, this does not relieve them of the responsibility to protect the public, environment and private property.



## **11.0 TRAFFIC CONTROL / PAVEMENT MARKING SCOPE OF WORK**

### **11.1 GENERAL REQUIREMENTS**

The Design-Builder shall:

- Develop a Transportation Management Plan including a Traffic Control System that addresses major aspects of the work for individual construction areas, phases and stages including temporary traffic control, transportation and information strategies. The Transportation Management Plan shall be in accordance with TDOT *Standard Specifications for Road and Bridge Construction, January 2015 edition*, TDOT Standard Drawings, TDOT Standard Traffic Operations Drawings, TDOT *Traffic Design Manual*, TDOT *Design Guidelines*, TDOT *Work Zone Safety and Mobility Manual*, ATSSA *Quality Guidelines for Temporary Traffic Control Devices and Features* (Current Edition), and the latest edition of the *Manual of Uniform Traffic Control Devices*.
- Use Traffic Control materials from the Department's Qualified Products List (QPL) <https://www.tn.gov/tdot/materials-and-tests/research---product-evaluation-and-qualified-products-list.html>
- The Design-Builder shall ensure drainage spread does not exceed allowable spread. Design-Builder shall provide drainage/spread calculations for all phases of traffic control phasing. The Design-Builder shall verify temporary traffic control conditions and shall provide positive drainage through temporary barrier and construction phasing.
- The Transportation Management Plan shall describe in detail all accommodations for traffic access and flow during all stages of construction for the life of the Project. The plan shall include the following:
  - Detailed proposed sequencing plan that includes each step of the project including all major traffic shifts or changes, minor shifts or changes, closures, alternate traffic patterns.
  - Overall goals of the sequencing plan and how the plan aligns with the Project Critical Path.
  - Plans for providing Queue Protection during operations requiring temporary lane closures, temporary road closures, rolling roadblocks, traffic pacing, and setting up or removing long-term lane shifts.
  - Conceptual construction staging diagrams (scale: 1 inch = 200 feet) including lane configuration and traffic management of the Interstate, State Routes, and local streets during the different stages of construction. Staging areas within the project limits shall be approved by the Department.
  - Narrative description of how Design-Builder shall schedule and sequence the construction to minimize impacts on the environment, communities and traveling public while still providing acceptable construction performance.
  - Brief description of the laydown, recycling, staging, disposal areas, waste and borrow pits, and maintenance locations to be used during construction.
  - Description of how the ROW and adjacent roads and properties will be maintained and protected, including the intended measures to be used to mitigate and minimize noise, vibration, light, dust, erosion/run-off and local road damage.

## **11.2 TEMPORARY LANE / ROAD CLOSURES**

The Design-Builder shall maintain the existing number of lanes on Interstate 65 throughout construction except for Department-approved night or weekend lane closures. Minimum lane widths shall be eleven (11) feet. Minimum inside and outside shoulder widths shall be two (2) feet. The Design-Builder shall include a request for state troopers when submitting its requests for lane closures.

No full closures on Interstate 65 will be allowed.

Rolling road blocks for operations specified in the SP108B other than blasting will only be allowed beginning at 9:00 PM and must be completed by 6:00 AM with a maximum duration of thirty (30) minutes.

If blasting is needed, it shall occur no earlier than 9:00 AM and shall be completed before 3:00 PM. Blasting shall only occur on weekdays.

All temporary lane closures and road closures on Interstates and State Routes must meet requirements of SP108B and be approved by the Department in advance. Requests for approval must be sent to the Department at least seven (7) calendar days in advance.

For local street lane closures involving Buckner Lane/Buckner Road intersection and associated local streets, requests for approval must be sent to the City of Spring Hill at least seven (7) calendar days in advance. The City of Spring Hill has specific requirements for local street lane closures including the placement of message boards and detour signs a minimum of seven (7) calendar days in advance of closure. A detour plan for short-term and extended lane closures shall be submitted in advance with the request to the City of Spring Hill. Flaggers may also be required by the City to ensure safe movement of vehicular traffic during the street lane closure.

For local street lane closures near the Lewisburg Pike intersection, requests for approval must be sent to the Department and the Williamson County Highway Department at least seven (7) calendar days in advance.

There will be periods when the Design-Builder will not be allowed to have any type of closures due to holidays as specified in subsection 104.04 of the Standard Specifications. The Department may deny any request for lane closures.

The Design-Builder is responsible for obtaining any State Transportation Permits required for beam transport.

## **11.3 TEMPORARY MARKINGS**

Temporary markings shall adhere to guidance outlined in Section IV of current edition of the Department's *Design Division Roadway Design Guidelines* for pavement markings.

## **11.4 TEMPORARY SIGNAGE**

All temporary signage shall be in accordance with TDOT *Standard Specifications for Road and Bridge Construction (January 2015 edition)*, TDOT Standard Drawings, TDOT Standard Traffic Operations Drawings, TDOT *Traffic Design Manual*, TDOT *Design Guidelines*, TDOT *Work Zone Safety and Mobility Manual*, and the latest edition of the *Manual of Uniform Traffic Control Devices*.

### **Changeable Message Signs**

Changeable Message Signs shall be used in advance of changed roadway conditions such as lane closures, road closures, lane shifts, or detour routes. The locations of these Changeable Message signs shall be reviewed by the Department prior to implementation. Portable changeable message signs should be used as a supplement to and not as a substitute for conventional signs and pavement markings. Portable changeable message sign trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users.

### **Queue Protection Devices**

Queue Protection Devices shall be used in strict accordance with the special provisions outlined in the contract documents.

### **Digital Speed Limit Sign Assembly**

Digital Speed Limit Sign Assemblies shall be used in strict accordance with the special provisions outlined in the contract documents. The locations of the Digital Speed Limit Sign Assembly shall be reviewed and concurred with by the Department prior to implementation.

### **Detour and Construction Signage**

All detour and construction signing shall be in strict accordance with the current edition of the MUTCD.

## **11.5 CONSTRUCTION WORK ZONE**

Traffic control devices shall not be displayed or erected unless related conditions are present necessitating warning.

### **Pavement Edge Drop-off Traffic Control**

Differences in elevation between adjacent traffic lanes or between the traffic lane and shoulder where the traffic lane is being used by traffic, which is caused by base, paving or resurfacing, shall be handled as follows:

- Differences in elevation between adjacent roadway elements greater than 0.75 inch and not exceeding 2.0 inches:
  - Warning signs, uneven lanes (W8-11) and/or shoulder drop-off with plaque (W8-17 and W8-17P), shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be two thousand (2,000) feet with a minimum of two (2) signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.
  - Differences in elevation between adjacent traffic lanes being utilized by traffic caused by added pavement shall be eliminated within three (3) business days.
  - Differences in elevation between adjacent traffic lanes being utilized by traffic caused by cold planing shall be eliminated within three (3) business days.
  - When the difference in elevation is between the traffic lane being utilized by traffic and shoulder the difference in elevation shall be eliminated within seven (7) business days after the condition is created.
- Differences in elevation between adjacent roadway elements greater than 2.0 inches and not exceeding six (6) inches: (Traffic is not to be allowed to traverse this difference in elevation):

- Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:
  - Where posted speeds are fifty (50) mph or greater, spacing of the protective devices shall not exceed one hundred (100) feet.
  - Where posted speeds are less than fifty (50) mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour.
- If the difference in elevation is eliminated or decreased to two (2) inches or less by the end of each workday, cones may be used during daylight hours in lieu of drums, barricades or other approved protective devices mentioned in the first list item, provided warning signs are erected. Warning signs (uneven lanes and/or shoulder drop-off) shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be two thousand (2,000) feet with a minimum of two (2) signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.
- When the difference in elevation is between the through traffic lane and the shoulder and the elevation difference is less than three (3) inches, the Design-Builder may use only warning signs and/or protective devices as applicable and approved by the Regional Traffic Engineer. See paragraph regarding use of drums, barricades or other approved protective devices. Warning signs (uneven lanes and/or shoulder drop-off) shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be two thousand (2,000) feet with a minimum of two (2) signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.

In these situations, the Design-Builder shall limit his operations to one (1) work zone not exceeding two (2) miles in length unless otherwise noted on the plans or concurred with by the Department. Once the Design-Builder begins work in a work zone, a continuous operation shall be maintained until the difference in elevation is eliminated. Simultaneous work on separate roadways of divided highways will be considered independently in regard to restriction of work zone activity.

- Differences in elevation between adjacent roadway elements greater than six (6) inches but not exceeding eighteen (18) inches:
  - The Design-Builder shall accomplish separation by drums, barricades or other approved devices in accordance with the following:
    - Where posted speeds are fifty (50) mph or greater, spacing of the protective devices shall not exceed one hundred (100) feet.
    - Where posted speeds are less than fifty (50) mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour.

In order to use this method, the Design-Builder must reduce the difference in elevation to six (6) inches or less by the end of the workday that the condition is created.

- The Design-Builder shall provide drums, barricades or other approved separation devices as specified in the first list item, and construct a stone wedge with a 4:1 slope, or flatter, to eliminate the vertical offset if the lower elevation is at or below subgrade at the end of each workday.
- The Design-Builder shall provide drums, barricades or other approved separation devices as specified in the first list item and if the lower elevation is base stone or asphalt pavement,

placement of subsequent layers of pavement must begin the next workday and progress continuously until the difference in elevation is eliminated or reduced to six (6) inches or less.

- The Design-Builder shall provide separation by portable barrier rail.

For the preceding three list items, the Design-Builder shall use the shoulder drop-off warning sign with plaque (W8-17 and W8-17P). It shall be placed in advance of and throughout the exposed area. Maximum spacing between the signs shall be two thousand (2,000) feet with a minimum of two (2) signs per exposed area. In these situations, the Design-Builder shall limit his operations to one (1) work zone not exceeding one (1) mile in length unless otherwise noted on the plans or concurred with by the Department. Once the Design-Builder begins work in a work zone, a continuous operation shall be maintained until the difference is eliminated. Simultaneous work on separate roadways of divided highways will be considered independently in regard to restriction of work zone activity.

- Differences in elevation between adjacent roadway elements greater than eighteen (18) inches, separation shall be provided by use of portable barrier rail.

In this situation the Design-Builder shall limit his operations to one work zone not exceeding one (1) mile in length unless otherwise noted on the plans or concurred with by the Department. Once the Design-Builder begins work in a work zone, a continuous operation shall be maintained until the difference in elevation is eliminated. Simultaneous work on separate roadways of divided highways will be considered independently in regard to restriction of work zone activity.

Difference in elevation is within thirty (30) feet of the nearest traffic lane being used by traffic caused by grading, excavation for utilities, drainage structures, undercutting, etc., differing situations shall be handled as follows:

- Difference in elevation is within eight (8) feet of the nearest traffic lane with difference in elevation greater than 0.75 inch and not exceeding two (2) inches;
- Warning signs (uneven lanes and/or shoulder drop-off) shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be two thousand (2,000) feet with a minimum of two (2) signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.
- Difference in elevation is within eight (8) feet of the nearest traffic lane with difference in elevation greater than two (2) inches and not exceeding six (6) inches:
  - Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:
    - Where posted speeds are fifty (50) mph or greater, spacing of the protective devices shall not exceed one hundred (100) feet; or
    - Where posted speeds are less than fifty (50) mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour.
- Difference in elevation is within eight (8) feet of the nearest traffic lane with difference in elevation greater than six (6) inches:
  - Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:
    - Where posted speeds are fifty (50) mph or greater, spacing of the protective devices shall not exceed one hundred (100) feet; or

- Where posted speeds are less than fifty (50) mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour.
- Eliminate vertical offset by constructing a stone wedge or grading to a 4:1 slope, or flatter, or use portable barrier rail.

The Design-Builder shall schedule the work so as to minimize the time traffic is exposed to an elevation difference. Once the Design-Builder begins an activity that creates an elevation difference within eight (8) feet of a traffic lane, the activity shall be pursued as a continuous operation until the elevation difference is eliminated.

- Difference in elevation is farther than eight (8) feet from the nearest traffic lane but not more than thirty (30) feet from the nearest traffic lane:
  - Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:
    - Where posted speeds are fifty (50) mph or greater, spacing of the protective devices shall not exceed one hundred (100) feet; or
    - Where posted speeds are less than fifty (50) mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour.
  - Eliminate vertical offset by constructing a stone wedge or grading to a 4:1 slope, or flatter, or use portable barrier rail.

The Design-Builder shall schedule the work so as to minimize the time traffic is exposed to an elevation difference. Once the Design-Builder begins an activity that creates an elevation difference, the activity shall be pursued as a continuous operation until the elevation difference is eliminated.

## **12.0 PROJECT MAINTENANCE**

The Design-Builder shall prepare a maintenance plan for Department Review and Acceptance that meets the requirements herein.

The Design-Builder is responsible for the maintenance of the Project in accordance with the approved maintenance plan until Project completion and acceptance by the Department.

The Design-Builder shall maintain the Project from the date of the Design-Builder's first NTP for Construction until Project completion and acceptance by the Department, in a manner that provides a safe and reliable transportation system.

The maintenance limits for the project are defined as 500 feet beyond the project limits measured along Interstate 65, Buckner Road, Buckner Lane, and Lewisburg Pike for the width of the proposed and/or existing State or City ROW.

The Design-Builder shall be fully responsible for maintenance as required by the Department's *Standard Specification for Road and Bridge Construction, January 2015 edition, Section 104.05 Maintenance During Construction*. The Design-Builder shall be responsible for all components of the transportation system within construction limits until final acceptance of the Project by the Department.

Upon Acceptance of the Project, the Department will assume responsibility for the operation and maintenance of the entire Project. Nothing contained herein shall otherwise limit any warranty obligations of the Design-Builder with respect to any Defect or non-conforming Work.

The Design-Builder shall deliver a ROW Mowing & Litter Removal service to provide a consistent vegetation height and a clean non-littered appearance from the date of the Design-Builder's first NTP for construction with the Department until Project completion and acceptance by the Department.

See Special Provision 806 regarding contract mowing and Special Provision 719A regarding removal and disposal of litter.

Annually there will be a minimum of three (3) mowing and six (6) litter cycles. The final two months prior to opening to traffic, there shall be one mowing cycle per month. The Design-Builder shall submit a mowing and litter plan for concurrence by the Department.

The Design-Builder shall mitigate potholes greater than or equal to 1 square foot and 1.25 inches deep or an equivalent volume of size, shape and location that presents a hazard to the traveling public within 24 hours of discovery or notification within the maintenance limits.

The Design-Builder shall delineate any guardrail that has been damaged within the maintenance limits within 24 hours of discovery or notification and shall repair or replace within ten (10) calendar days of discovery or notification.

Hydroblasting shall be used for striping removal on existing roadway surfaces to remain.

The Design-Builder shall coordinate as needed with any adjacent projects in the performance of mowing and litter collection activities.

The Design-Builder shall provide its approach to roadway incident response within the work zone in its maintenance plan.

## APPENDIX A: ENGINEERING ANALYSIS PAVEMENT DESIGN



**STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION**

**DESIGN DIVISION**  
SUITE 1200, JAMES K. POLK BUILDING  
505 DEADERICK STREET  
NASHVILLE, TENNESSEE 37243-1402  
(615) 741-0835

CLAY BRIGHT  
COMMISSIONER

BILL LEE  
GOVERNOR

September 2, 2020

Justin Eckel, PE  
Volkert Inc.  
302 Innovation Drive, Suite 100  
Franklin, TN 37067

SUBJECT: Pavement Design, **revised**  
Project No. 94002-3198-44  
Pin No. 128576.00  
I-65  
Interchange at Buckner Road in Spring Hill (Design Build)  
Williamson County

Dear Mr. Eckel,

The following are the recommended pavement designs for the subject project.

1. Full depth design for I-65 widening
2. Full depth design for Buckner Rd
3. Full depth design for SR-106
4. Design for ramps

See the attached pavement design sheets for details. **Aggregate underdrains was added to Buckner Rd and SR-106. CS leveling mix was added to I-65. This pavement design is valid until 1/08/2023. Proceeding this date an updated traffic data should be requested and a revised pavement design issued.** Please direct any questions you might have concerning this design to the pavement design office.

Sincerely,

*Darell Bridges*

Darell Bridges  
Trans. Proj. Spec. Spv. 1

*Sampson Udeh*

Sampson Udeh  
Pavement Design Coordinator

SUU:db  
File copy



**RFP Contract Book 3 (Project-Specific Information)**  
**Interstate 65 Interchange at Buckner Road, Williamson County**

DATE: 09/02/20 FULL DEPTH DESIGN FOR I-65  
 COUNTY: WILLIAMSON PROJ NO: 94002-3198-44 FED PROJ#: NH-I-65-2(113)  
 DESCRIPTION: I-65 INTERCHANGE AT BUCKNER ROAD IN SPRING HILL

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CBR          9.00                                DESIGN PERIOD (YR)    20.00
ADL          4783.00      SN REQ'D      5.91      REGION III
=====
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ROADWAY DESIGN

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=====
DESCRIPTION                                COEFFICIENT          THICKNESS          SN
=====
411-03.23      ACS MIX (PG76-22) OGFC          0.30          1.25          0.38
307-03.10      AC (PG76-22) GR "CS"          0.40          0.50          0.20
307-03.08      AC MIX(PG76-22) GR "B-M2"      0.40          2.25          0.90
307-03.01      AC MIX(PG76-22) GR "A"        0.40          6.00          2.40
307-01.22      AC MIX(PG76-22)GR"A-S"        0.30          3.00          0.90
303-01         MINERAL AGG BASE GRADING "D"  0.14          10.00         1.40
=====
TOTALS                                23.00          6.18
=====
```

SHOULDER DESIGN

```
=====
DESCRIPTION                                COEFFICIENT          THICKNESS          SN
=====
411-03.23      ACS MIX (PG76-22) OGFC          0.30          1.25          0.38
307-03.10      AC (PG76-22) GR "CS"          0.40          0.50          0.20
307-03.08      AC MIX(PG76-22) GR "B-M2"      0.40          2.25          0.90
303-01         MINERAL AGG BASE GRA "D"      0.14          19.00         2.66
=====
TOTALS                                23.00          4.14
=====
```

- REMARKS: 1) 6" OF "A-MIX" TO BE APPLIED AT TWO EQUAL LIFTS  
 2) SUBSURFACE DRAINAGE - AGGREGATE UNDERDRAIN W/PIPE  
 3) FOR THE EXISTING PAVEMENT MILL 1.25" AND OVERLAY USING 1.25" OF OGFC AND 0.5" OF CS LEVELING MIX  
 4) FOR UNDIVIDED MEDIAN ELIMINATE SHOULDER DESIGN AND PAVE FULL DEPTH

**RFP Contract Book 3 (Project-Specific Information)**  
**Interstate 65 Interchange at Buckner Road, Williamson County**

---

DATE: 09/02/20 FULL DEPTH DESIGN FOR I-65  
 COUNTY: WILLIAMSON PROJ NO: 94002-3198-44 FED PROJ#: NH-I-65-2(113)  
 DESCRIPTION: I-65 INTERCHANGE AT BUCKNER ROAD IN SPRING HILL

```

=====
ROADWAY DESIGN                                REGION III
=====
DESCRIPTION                                THICKNESS
=====
411-03.23  ACS MIX (PG76-22) OGFC                1.25
307-03.10  AC (PG76-22) GR "CS"                0.50
307-03.08  AC MIX(PG76-22) GR "B-M2"          2.25
307-03.01  AC MIX(PG76-22) GR "A"            6.00
307-01.22  AC MIX(PG76-22)GR"A-S"           3.00
303-01     MINERAL AGG BASE GRADING "D"      10.00
=====
TOTALS                                         23.00
=====
  
```

```

=====
SHOULDER DESIGN
=====
DESCRIPTION                                THICKNESS
=====
411-03.23  ACS MIX (PG76-22) OGFC                1.25
307-03.10  AC (PG76-22) GR "CS"                0.50
307-03.08  AC MIX(PG76-22) GR "B-M2"          2.25
303-01     MINERAL AGG BASE GRA "D"           19.00
=====
TOTALS                                         23.00
=====
  
```

- REMARKS: 1) 6" OF "A-MIX" TO BE APPLIED AT TWO EQUAL LIFTS  
 2) SUBSURFACE DRAINAGE - AGGREGATE UNDERDRAIN W/PIPE  
 3) FOR THE EXISTING PAVEMENT MILL 1.25" AND OVERLAY USING 1.25" OF OGFC AND 0.5" OF CS LEVELING MIX  
 4) FOR UNDIVIDED MEDIAN ELIMINATE SHOULDER DESIGN AND PAVE FULL DEPTH

**RFP Contract Book 3 (Project-Specific Information)**  
**Interstate 65 Interchange at Buckner Road, Williamson County**

---

DATE: 09/02/20 FULL DEPTH DESIGN FOR BUCKNER ROAD  
 COUNTY: WILLIAMSON PROJ NO: 94002-3198-44 FED PROJ#: NH-I-65-2(113)  
 DESCRIPTION: I-65 INTERCHANGE AT BUCKNER ROAD IN SPRING HILL

```
=====
CBR          9.00                                DESIGN PERIOD (YR)    20.00
ADL          347.00          SN REQ'D          3.81          REGION: III
=====
```

ROADWAY DESIGN

```
=====
DESCRIPTION                                COEFFICIENT          THICKNESS          SN
=====
411-02.10          ACS (PG70-22) GR "D"          0.40          1.25          0.50
307-02.08          AC MIX (PG70-22) GR "B-M2"    0.40          2.00          0.80
307-02.01          AC MIX (PG70-22) GR "A"       0.40          3.00          1.20
307-01.21          AC MIX (PG70-22)GR "A-S"     0.30          3.00          0.90
303-01            MINERAL AGG BASE GRADING "D"  0.14          10.00         1.40
=====
TOTALS                                19.25          4.80
=====
```

REMARKS: 1) CURB AND GUTTER SECTION ONLY  
 2) SUBSURFACE DRAINAGE: AGGREGATE UNDERDRAIN W/PIPE

**RFP Contract Book 3 (Project-Specific Information)**  
**Interstate 65 Interchange at Buckner Road, Williamson County**

---

DATE: 09/02/20 FULL DEPTH DESIGN FOR BUCKNER ROAD  
 COUNTY: WILLIAMSON PROJ NO: 94002-3198-44 FED PROJ#: NH-I-65-2(113)  
 DESCRIPTION: I-65 INTERCHANGE AT BUCKNER ROAD IN SPRING HILL

```

=====
ROADWAY DESIGN                                REGION: III
=====
DESCRIPTION                                THICKNESS
=====
411-02.10  ACS (PG70-22) GR "D"                1.25
307-02.08  AC MIX (PG70-22) GR "B-M2"         2.00
307-02.01  AC MIX (PG70-22) GR "A"           3.00
307-01.21  AC MIX (PG70-22)GR "A-S"          3.00
303-01     MINERAL AGG BASE GRADING "D"      10.00
=====
TOTALS                                19.25
=====
  
```

REMARKS: 1) CURB AND GUTTER SECTION ONLY  
 2) SUBSURFACE DRAINAGE: AGGREGATE UNDERDRAIN W/PIPE

**RFP Contract Book 3 (Project-Specific Information)**  
**Interstate 65 Interchange at Buckner Road, Williamson County**

---

DATE: 09/02/20 FULL DEPTH DESIGN FOR SR-106  
 COUNTY: WILLIAMSON PROJ NO: 94002-3198-44 FED PROJ#: NH-I-65-2(113)  
 DESCRIPTION: I-65 INTERCHANGE AT BUCKNER ROAD IN SPRING HILL

```
=====
CBR          9.00                                DESIGN PERIOD (YR)    20.00
ADL          247.00    SN REQ'D    3.61    REGION: III
=====
```

ROADWAY DESIGN

```
=====
DESCRIPTION                                COEFFICIENT    THICKNESS    SN
=====
411-02.10    ACS (PG70-22) GR "D"                0.40            1.25    0.50
307-02.08    AC MIX (PG70-22) GR "B-M2"          0.40            2.00    0.80
307-02.01    AC MIX (PG70-22) GR "A"             0.40            3.00    1.20
307-01.21    AC MIX (PG70-22)GR "A-S"           0.30            3.00    0.90
303-01       MINERAL AGG BASE GRADING "D"        0.14            8.00    1.12
=====
TOTALS                                           17.25    4.52
=====
```

SHOULDER DESIGN

```
=====
DESCRIPTION                                COEFFICIENT    THICKNESS    SN
=====
411-01.07    ACS (PG64-22) GR "E"                0.40            1.50    0.60
303-01       MINERAL AGG BASE GRADING "D"        0.14            15.75    2.21
=====
TOTALS                                           17.25    2.81
=====
```

REMARKS: 1) SUBSURFACE DRAINAGE: AGGREGATE UNDERDRAIN W/PIPE  
 2) FOR EXISTING PAVEMENT MILL 1.25" AND OVERLAY USING 1.25" OF D-MIX

**RFP Contract Book 3 (Project-Specific Information)**  
**Interstate 65 Interchange at Buckner Road, Williamson County**

---

DATE: 09/02/20 FULL DEPTH DESIGN FOR SR-106  
 COUNTY: WILLIAMSON PROJ NO: 94002-3198-44 FED PROJ#: NH-I-65-2(113)  
 DESCRIPTION: I-65 INTERCHANGE AT BUCKNER ROAD IN SPRING HILL

=====

ROADWAY DESIGN REGION: III

=====

	DESCRIPTION	THICKNESS
411-02.10	ACS (PG70-22) GR "D"	1.25
307-02.08	AC MIX (PG70-22) GR "B-M2"	2.00
307-02.01	AC MIX (PG70-22) GR "A"	3.00
307-01.21	AC MIX (PG70-22)GR "A-S"	3.00
303-01	MINERAL AGG BASE GRADING "D"	8.00
TOTALS		17.25

=====

SHOULDER DESIGN

=====

	DESCRIPTION	THICKNESS
411-01.07	ACS (PG64-22) GR "E"	1.50
303-01	MINERAL AGG BASE GRADING "D"	15.75
TOTALS		17.25

=====

REMARKS: 1) SUBSURFACE DRAINAGE: AGGREGATE UNDERDRAIN W/PIPE  
 2) FOR EXISTING PAVEMENT MILL 1.25" AND OVERLAY USING 1.25" OF D-MIX

**RFP Contract Book 3 (Project-Specific Information)**  
**Interstate 65 Interchange at Buckner Road, Williamson County**

---

DATE: 09/02/20                      DESIGN FOR RAMPS  
 COUNTY: WILLIAMSON              PROJ NO: 94002-3198-44              FED PROJ#: NH-I-65-2(113)  
 DESCRIPTION:                      I-65 INTERCHANGE AT BUCKNER ROAD IN SPRING HILL

```
=====
MOD. SUBGRADE REACTION (COMPOSITE)  803.00                      DESIGN PERIOD (YR)      20.00
ADL                      349.00                      REGION III
=====
```

ROADWAY DESIGN

```
=====
DESCRIPTION                                              THICKNESS
=====
501-01                      PORTLAND CEM CONC (PLAIN)                      10.00
313-03                      TREATED PERMEABLE BASE                      4.00
303-01                      MINERAL AGG BASE GRADING "D"                      4.00
=====
TOTALS                                              18.00
=====
```

SHOULDER DESIGN

```
=====
DESCRIPTION                                              COEFFICIENT                      THICKNESS                      SN
=====
411-01.07                      ACS (PG64-22) GR "E"                      0.40                      1.25                      0.50
307-01.08                      AC MIX(PG64-22)GR "B-M2"                      0.40                      2.00                      0.80
303-01                      MINERAL AGG BASE GRADING "D"                      0.14                      14.75                      2.07
=====
TOTALS                                                                   18.00                      3.37
=====
```

REMARKS: 1) SUBSURFACE DRAINAGE - AGGREGATE UNDERDRAIN W/PIPE  
 2) ELIMINATE SHOULDER DESIGN FOR CURB AND GUTTER SECTION

