

JOB SPECIAL PROVISIONS TABLE OF CONTENTS (ROADWAY)

(Job Special Provisions shall prevail over General Special Provisions whenever in conflict therewith.)

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Job No.: JKU0066

Route: 40

County: Jackson

 THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.	MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	GARVER 7509 NW Tiffany Springs Parkway STE 200 Kansas City, MO 64153 Certificate of Authority: 2008013090 Consultant Phone: 816-298-6465
	If a seal is present on this sheet, JSP's have been electronically sealed and dated.
	JOB NUMBER: JKU0066 JACKSON COUNTY, MO DATE PREPARED: 08/18/2026
	ADDENDUM DATE:
Only the following items of the Job Special Provisions (Roadway) are authenticated by this seal: All	

JOB
SPECIAL PROVISION

A. General - Federal JSP-09-02M

1.0 Description. The Federal Government is participating in the cost of construction of this project. All applicable Federal laws, and the regulations made pursuant to such laws, shall be observed by the contractor, and the work will be subject to the inspection of the appropriate Federal Agency in the same manner as provided in Sec 105.10 of the Missouri Standard Specifications for Highway Construction with all revisions applicable to this bid and contract.

1.1 This contract requires payment of the prevailing hourly rate of wages for each craft or type of work required to execute the contract as determined by the Missouri Department of Labor and Industrial Relations and requires adherence to a schedule of minimum wages as determined by the United States Department of Labor. For work performed anywhere on this project, the contractor and the contractor's subcontractors shall pay the higher of these two applicable wage rates. State Wage Rates, Information on the Required Federal Aid Provisions, and the current Federal Wage Rates are available on the Missouri Department of Transportation web page at www.modot.org under "Doing Business with MoDOT", "Contractor Resources". Effective Wage Rates will be posted 10 days prior to the applicable bid opening. These supplemental bidding documents have important legal consequences. It shall be conclusively presumed that they are in the bidder's possession, and they have been reviewed and used by the bidder in the preparation of any bid submitted on this project.

1.2 The following documents are available on the Missouri Department of Transportation web page at www.modot.org under "Doing Business with MoDOT"; "Standards and Specifications". The effective version shall be determined by the letting date of the project.

General Provisions & Supplemental Specifications

Supplemental Plans to July 2026 Missouri Standard Plans
For Highway Construction

These supplemental bidding documents contain all current revisions to the published versions and have important legal consequences. It shall be conclusively presumed that they are in the bidder's possession, and they have been reviewed and used by the bidder in the preparation of any bid submitted on this project.

B. Contract Liquidated Damages JSP- 13-01E

1.0 Description. Liquidated Damages for failure or delay in completing the work on time for this contract shall be in accordance with [Sec 108.8](#). The liquidated damages include separate amounts for road user costs and contract administrative costs incurred by the Commission.

2.0 Period of Performance. Prosecution of work is expected to begin on the date specified below in accordance with [Sec 108.2](#). Regardless of when the work is begun on this contract, all work on all projects shall be completed on or before the date specified below. Completion by this date shall be in accordance with the requirements of [Sec 108.7.1](#).

Notice to Proceed: November 23, 2026
Contract Completion Date: August 31, 2028

2.1 Calendar Days. Completion of the project is required as specified herein. The count of calendar days will begin on the date the contractor starts any construction operations on the project.

Project	Calendar Days	Daily Road User Cost
JKU0066	N/A	\$5,400

3.0 Liquidated Damages for Contract Administrative Costs. Should the contractor fail to complete the work on or before the contract completion date specified in Section 2.0, or within the number of calendar days specified in Section 2.1, whichever occurs first, the contractor will be charged contract administrative liquidated damages in accordance with [Sec 108.8](#) in the amount of **\$2,000** per calendar day for each calendar day, or partial day thereof, that the work is not fully completed. For projects in combination, these damages will be charged in full for failure to complete one or more projects within the specified contract completion date or calendar days.

4.0 Liquidated Damages for Road User Costs. Should the contractor fail to complete the work on or before the contract completion date specified in Section 2.0, or within the number of calendar days specified in Section 2.1, whichever occurs first, the contractor will be charged road user costs in accordance with [Sec 108.8](#) in the amount specified in Section 2.1 for each calendar day, or partial day thereof, that the work is not fully completed. These damages are in addition to the contract administrative damages and any other damages as specified elsewhere in this contract.

5.0 Liquidated Damages for Winter Months. Delete Sec 108.8.1.3 (a)

Liquidated damages for failure to complete the work on time shall not be waived from December 15 to March 15, both dates inclusive.

C. Work Zone Traffic Management JSP-02-06N

1.0 Description. Work zone traffic management shall be in accordance with applicable portions of Division 100 and Division 600 of the Standard Specifications, and specifically as follows.

1.1 Maintaining Work Zones and Work Zone Reviews. The Work Zone Specialist (WZS) shall maintain work zones in accordance with Sec 616.3.3 and as further stated herein. The WZS shall coordinate and implement any changes approved by the engineer. The WZS shall ensure all traffic control devices are maintained in accordance with Sec 616, the work zone is operated within the hours specified by the engineer, and will not deviate from the specified hours without prior approval of the engineer. The WZS is responsible to manage work zone delay in accordance with these project provisions. When requested by the engineer, the WZS shall submit a weekly report that includes a review of work zone operations for the week. The report shall identify any problems encountered and corrective actions taken. Work zones are subject to unannounced inspections by the engineer and other departmental staff to corroborate the validity of the WZS's review and may require immediate corrective measures and/or additional work zone monitoring.

1.2 Work Zone Deficiencies. Failure to make corrections on time may result in the engineer suspending work. The suspension will be non-excusable and non-compensable regardless if road user costs are being charged for closures.

2.0 Traffic Management Schedule.

2.1 Traffic management schedules shall be submitted to the engineer for review prior to the start of work and prior to any revisions to the traffic management schedule. The traffic management schedule shall include the proposed traffic control measures, the hours traffic control will be in place, and work hours.

2.2 The traffic management schedule shall conform to the limitations specified in Sec 616 regarding lane closures, traffic shifts, road closures and other width, height and weight restrictions.

2.3 The engineer shall be notified as soon as practical of any postponement due to weather, material or other circumstances.

2.4 In order to ensure minimal traffic interference, the contractor shall schedule lane closures for the absolute minimum amount of time required to complete the work. Lanes shall not be closed until material is available for continuous construction and the contractor is prepared to diligently pursue the work until the closed lane is opened to traffic.

2.5 Traffic Congestion. The contractor shall, upon approval of the engineer, take proactive measures to reduce traffic congestion in the work zone. The contractor shall immediately implement appropriate mitigation strategies whenever traffic congestion reaches an excess of 10 minutes to prevent congestion from escalating to 15 minute or above threshold. If disruption of the traffic flow occurs and traffic is backed up in queues of 15 minute delays or longer, then the contractor shall immediately review the construction operations which contributed directly to disruption of the traffic flow and make adjustments to the operations to prevent the queues from reoccurring. Traffic delays may be monitored by physical presence on site or by utilizing real-time travel data through the work zone that generate text and/or email notifications where available. The engineer monitoring the work zone may also notify the contractor of delays that require prompt mitigation. The contractor may work with the engineer to determine what other alternative solutions or time periods would be acceptable.

2.5.1 Traffic Safety.

2.5.1.1 Recurring Congestion. Where traffic queues routinely extend to within 1000 feet of the ROAD WORK AHEAD, or similar, sign on a divided highway or to within 500 feet of the ROAD WORK AHEAD, or similar, sign on an undivided highway, the contractor shall extend the advance warning area, as approved by the engineer.

2.5.1.2 Non-Recurring Congestion. When traffic queues extend to within 1000 feet of the ROAD WORK AHEAD, or similar, sign on a divided highway or to within 500 feet of the ROAD WORK AHEAD, or similar, sign on an undivided highway infrequently, the contractor shall deploy a means of providing advance warning of the traffic congestion, as approved by the engineer. The warning location shall be no less than 1000 feet and no more than 0.5 mile in advance of the end of the traffic queue on divided highways and no less than 500 feet and no more than 0.5 mile in advance of the end of the traffic queue on undivided highways.

2.6 Transportation Management Plan. The contractor Work Zone Specialist (WZS) shall review the Transportation Management Plan (TMP), found as an electronic deliverable on MoDOT's Online Plans Room and discuss the TMP with the engineer during the preconstruction

conference. Throughout the construction project, the WZS is responsible for updating any changes or modifications to the TMP and getting those changes approved by the engineer a minimum of two weeks in advance of implementation. The WZS shall participate in the post construction conference and provide recommendations on how future TMPs can be improved.

2.7 Traffic Management Center (TMC) Coordination. The Work Zone Specialist (WZS) or their designee shall contact by phone the MoDOT Traffic Management Center (KC Scout TMC at #816-347-2250) within five minutes of a lane or ramp closure beginning and within five minutes of a lane or ramp closure being removed. The WZS shall make this phone call 24 hours a day, 365 days of the year since the MoDOT Traffic Management Centers are always staffed.

3.0 Work Hour Restrictions.

3.1 Except for emergency work, as determined by the engineer, and long term lane closures required by project phasing, all lanes shall be scheduled to be open to traffic during the five major holiday periods shown below, from 12:00 noon on the last working day preceding the holiday until 6:00 a.m. on the first working day subsequent to the holiday unless otherwise approved by the engineer.

Memorial Day
Labor Day
Thanksgiving
Christmas
New Year's Day

3.1.1 Independence Day. The lane restrictions specified in Section 3.1 shall also apply to Independence Day, except that the restricted periods shall be as follows:

When Independence Day falls on:	The Holiday is Observed on:	Halt Lane Closures beginning at:	Allow Lane Closures to resume at:
Sunday	Monday	Noon on Friday	6:00 a.m. on Tuesday
Monday	Monday	Noon on Friday	6:00 a.m. on Tuesday
Tuesday	Tuesday	Noon on Monday	6:00 a.m. on Wednesday
Wednesday	Wednesday	Noon on Tuesday	6:00 a.m. on Thursday
Thursday	Thursday	Noon on Wednesday	6:00 a.m. on Friday
Friday	Friday	Noon on Thursday	6:00 a.m. on Monday
Saturday	Friday	Noon on Thursday	6:00 a.m. on Monday

3.1.2 Except for emergency work, as determined by the engineer, and long term lane closures required by project phasing, the contractor's working hours will be restricted for the Special Events as shown below. All lanes shall be scheduled to be open to traffic during these Special Events.

Cable Dahmer Arena – the contractor shall check for **major** traffic generating events and confirm a plan with the engineer.

3.2 The contractor shall not perform any construction operation on the roadway, roadbed or active lanes, including the hauling of material within the project limits, during restricted periods, holiday periods or other special events specified in the contract documents.

4.0 Detours and Lane Closures.

4.1 When a changeable message sign (CMS) is provided, the contractor shall use the CMS to notify motorists of future traffic disruption and possible traffic delays one week before traffic is shifted to a detour or prior to lane closures. The CMS shall be installed at a location as approved or directed by the engineer. If a CMS with Communication Interface is required, then the CMS shall be capable of communication prior to installation on right of way. All messages planned for use in the work zone shall be approved and authorized by the engineer or its designee prior to deployment. When permanent dynamic message signs (DMS) owned and operated by MoDOT are located near the project, they may also be used to provide warning and information for the work zone. Permanent DMS shall be operated by the TMC, and any messages planned for use on DMS shall be approved and authorized by the TMC at least 72 hours in advance of the work.

4.2 At least one lane of traffic in each direction shall be maintained at all times except for brief intervals of time required when the movement of the contractor's equipment will seriously hinder the safe movement of traffic. Periods during which the contractor will be allowed to interrupt traffic will be designated by the engineer.

5.0 Basis of Payment. No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, or time required to fulfill the above provisions, unless specified elsewhere in the contract document. All authorized changes in the traffic control plan shall be provided for as specified in Sec 616.

D. Emergency Provisions and Incident Management JSP-90-11A

1.0 The contractor shall have communication equipment on the construction site or immediate access to other communication systems to request assistance from law enforcement or other emergency agencies for incident management. In case of traffic accidents or the need for law enforcement to direct or restore traffic flow through the job site, the contractor shall notify law enforcement or other emergency agencies immediately as needed. The area engineer's office shall also be notified when the contractor requests emergency assistance.

2.0 In addition to the 911 emergency telephone number for ambulance, fire or law enforcement services, the following agencies may also be notified for accident or emergency situation within the project limits.

Missouri Highway Patrol (Troop A): 816-622-0800	
City of Independence	Jackson County
Fire: 816-325-7123	Fire (Central Jackson County): 816-229-2522
Police: 816-325-7300	Sheriff: 816-541-8017

2.1 This list is not all inclusive. Notification of the need for wrecker or tow truck services will remain the responsibility of the appropriate law enforcement agency.

2.2 The contractor shall notify law enforcement and emergency agencies before the start of construction to request their cooperation and to provide coordination of services when emergencies arise during the construction at the project site. When the contractor completes this notification with law enforcement and emergency agencies, a report shall be furnished to the engineer on the status of incident management.

3.0 No direct pay will be made to the contractor to recover the cost of the communication equipment, labor, materials or time required to fulfill the above provisions.

E. Project Contact for Contractor/Bidder Questions JSP-96-05A

1.0 All questions concerning this project during the bidding process shall be forwarded to the project contacts listed below.

Thankam Mathew, Project Contact
Kansas City District
600 NE Colbern Road
Lee's Summit, MO 64086

Telephone Number: (816) 607-2047

Email: Thankam.Mathew@modot.mo.gov

Vance Chambers, Project Contact
Kansas City District
600 NE Colbern Road
Lee's Summit, MO 64086

Email: Vance.Chambers@modot.mo.gov

Benjamin McCabe, Project Contact
Kansas City District
600 NE Colbern Road
Lee's Summit, MO 64086

Email: Benjamin.McCabe@modot.mo.gov

1.1 All questions concerning the bid document preparation can be directed to the Central Office – Design as listed below.

Telephone Number: (573) 751-2876

Email: BCS@modot.mo.gov

2.0 Upon award and execution of the contract, the successful bidder/contractor shall forward all questions and coordinate the work with the engineer listed below:

Russell Penner, Resident Engineer
Kansas City District
600 NE Colbern Road
Lee's Summit, MO 64086

Telephone Number: (816) 347-4143

Email: Russel.Penner@modot.mo.gov

F. Supplemental Revisions JSP-18-01KK

- Compliance with [2 CFR 200.216 – Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment](#).

The Missouri Highways and Transportation Commission shall not enter into a contract (or extend or renew a contract) using federal funds to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as substantial or as critical technology as part of any system where the video surveillance and telecommunications equipment was produced by Huawei Technologies Company, ZTE Corporation, Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

- Stormwater Compliance Requirements

1.0 Description. This provision requires the contractor to provide a Water Pollution Control Manager (WPCM) for any project that includes land disturbance on the project site and the total area of land disturbance, both on the project site, and all Off-site support areas, is one (1) acre or more. Regardless of the area of Off-site disturbance, if no land disturbance occurs on the project site, these provisions do not apply. When a WPCM is required, all sections within this provision shall be applicable, including assessment of specified Liquidated Damages for failure to correct Stormwater Deficiencies, as specified herein. This provision is in addition to any other stormwater, environmental, and land disturbance requirements specified elsewhere in the contract.

1.1 Definitions. The project site is defined as all areas designated on the plans, including temporary and permanent easements. The project site is equivalent to the “permitted site”, as defined in MoDOT’s State Operating Permit. An Off-site area is defined as any location off the project site the contractor utilizes for a dedicated project support function, such as, but not limited to, staging area, plant site, borrow area, or waste area.

1.2 Reporting of Off-Site Land Disturbance. If the project includes any planned land disturbance on the project site, prior to the start of work, the contractor shall submit a written report to the engineer that discloses all Off-site support areas where land disturbance is planned, the total acreage of anticipated land disturbance on those sites, and the land disturbance permit number(s). Upon request by the engineer, the contractor shall submit a copy of its land disturbance permit(s) for Off-site locations. Based on the total acreage of land disturbance, both on and Off-site, the engineer shall determine if these Stormwater Compliance Requirements shall apply. The contractor shall immediately report any changes to the planned area of Off-site land disturbance. The contractor is responsible for obtaining its own separate land disturbance permit for Off-site areas.

2.0 Water Pollution Control Manager (WPCM). The contractor shall designate a competent person to serve as the Water Pollution Control Manager (WPCM) for projects meeting the description in Section 1.0. The contractor shall ensure the WPCM completes all duties listed in Section 2.1.

2.1 Duties of the WPCM:

- (a) Be familiar with the stormwater requirements including the current MoDOT State Operating Permit for construction stormwater discharges/land disturbance activities;

MoDOT's statewide Stormwater Pollution Prevention Plan (SWPPP); the Corps of Engineers Section 404 Permit, when applicable; the project specific SWPPP, the Project's Erosion & Sediment Control Plan; all applicable special provisions, specifications, and standard drawings; and this provision;

- (b) Successfully complete the MoDOT Stormwater Training Course within the last 4 years. The MoDOT Stormwater Training is a free online course available at MoDOT.org;
- (c) Attend the Pre-Activity Meeting for Grading and Land Disturbance and all subsequent Weekly Meetings in which grading activities are discussed;
- (d) Oversee and ensure all work is performed in accordance with the Project-specific SWPPP and all updates thereto, or as designated by the engineer;
- (e) Review the project site for compliance with the Project SWPPP, as needed, from the start of any grading operations until final stabilization is achieved, and take necessary actions to correct any known deficiencies to prevent pollution of the waters of the state or adjacent property owners prior to the engineer's weekly inspections;
- (f) Review and acknowledge receipt of each MoDOT Inspection Report (Land Disturbance Inspection Record) for the Project within forty eight (48) hours of receiving the report and ensure that all Stormwater Deficiencies noted on the report are corrected as soon as possible, but no later than stated in Section 5.0.

3.0 Pre-Activity Meeting for Grading/Land Disturbance and Required Hold Point. A Pre-Activity meeting for grading/land disturbance shall be held prior to the start of any land disturbance operations. No land disturbance operations shall commence prior to the Pre-Activity meeting except work necessary to install perimeter controls and entrances. Discussion items at the pre-activity meeting shall include a review of the Project SWPPP, the planned order of grading operations, proposed areas of initial disturbance, identification of all necessary BMPs that shall be installed prior to commencement of grading operations, and any issues relating to compliance with the Stormwater requirements that could arise in the course of construction activity at the project.

3.1 Hold Point. Following the pre-activity meeting for grading/land disturbance and subsequent installation of the initial BMPs identified at the pre-activity meeting, a Hold Point shall occur prior to the start of any land disturbance operations to allow the engineer and WPCM the time needed to perform an on-site review of the installation of the BMPs to ensure compliance with the SWPPP is met. Land disturbance operations shall not begin until authorization is given by the engineer.

4.0 Inspection Reports. Weekly and post run-off inspections will be performed by the engineer and each Inspection Report (Land Disturbance Inspection Record) will be entered into a web-based Stormwater Compliance database. The WPCM will be granted access to this database and shall promptly review all reports, including any noted deficiencies, and shall acknowledge receipt of the report as required in Section 2.1 (f.).

5.0 Stormwater Deficiency Corrections. All stormwater deficiencies identified in the Inspection Report shall be corrected by the contractor within 7 days of the inspection date or any extended period granted by the engineer when weather or field conditions prohibit the corrective work. If the contractor does not initiate corrective measures within 5 calendar days of the inspection date or any extended period granted by the engineer, all work shall cease on the project except for

work to correct these deficiencies, unless otherwise allowed by the engineer. All impact costs related to this halting of work, including, but not limited to stand-by time for equipment, shall be borne by the contractor. Work shall not resume until the engineer approves the corrective work.

5.1 Liquidated Damages. If the contractor fails to complete the correction of all Stormwater Deficiencies listed on the MoDOT Inspection Report within the specified time limit, the Commission will be damaged in various ways, including but not limited to, potential liability, required mitigation, environmental clean-up, fines, and penalties. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$2,000 per day for failure to correct one or more of the Stormwater Deficiencies listed on the Inspection Report within the specified time limit. In addition to the stipulated damages, the stoppage of work shall remain in effect until all corrections are complete.

6.0 Basis of Payment. No direct payment will be made for compliance with this provision.

- **Delete Sec 106.9 in its entirety and substitute the following:**

106.9 Buy America Requirements.

Buy America Requirements are waived if the total amount of Federal financial assistance applied to the project, through awards or subawards, is below \$500,000.

106.9.1 Buy America Requirements for Iron or Steel Products.

The contractor's attention is directed to Title 23 CFR 635.410 *Buy America Requirements*. Where articles, materials or supplies that consist wholly or predominantly of iron or steel or a combination of both are to be permanently incorporated into the contract work, steel and iron material shall be manufactured, from the initial melting stage through the application of coatings, in the USA except for "minimal use" as described herein. Predominantly of iron or steel or a combination of both means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. Under a general waiver from FHWA the use of pig iron and processed, pelletized, and reduced iron ore manufactured outside of the USA will be permitted in the domestic manufacturing process for steel or iron material.

106.9.1.1 Any sources other than the USA as defined will be considered foreign. The required domestic manufacturing process shall include formation of ingots and any subsequent process. Coatings shall include any surface finish that protects or adds value to the product.

106.9.1.2 "Minimal use" of foreign steel, iron or coating processes will be permitted, provided the cost of such products does not exceed 1/10 of one percent (0.1 percent) of the total contract cost or \$2,500.00, whichever is greater. If foreign steel, iron, or coating processes are used, invoices to document the cost of the foreign portion, as delivered to the project, shall be provided and the engineer's written approval obtained prior to placing the material in any work.

106.9.1.3 Buy America requirements include a step certification for all fabrication processes of all steel or iron materials that are accepted per Sec 1000. The AASHTO Product Evaluation and Audit Solutions compliance program verifies that all steel and iron products fabrication processes conform to 23 CFR 635.410 Buy America Requirements and is an acceptable standard per 23 CFR 635.410(d). AASHTO Product Evaluation and Audit Solutions compliant suppliers will not be required to submit step certification documentation with the shipment for some selected steel and iron materials. The AASHTO Product Evaluation and Audit Solutions compliant supplier shall

maintain the step certification documentation on file and shall provide this documentation to the engineer upon request.

106.9.1.3.1 Items designated as Category 1 will consist of steel girders, piling, and reinforcing steel installed on site. Category 1 items require supporting documentation prior to incorporation into the project showing all steps of manufacturing, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410 Buy America Requirements. This includes the Mill Test Report from the original producing steel mill and certifications documenting the manufacturing process for all subsequent fabrication, including coatings. The certification shall include language that certifies all steel and iron materials permanently incorporated in this project was procured and processed domestically and all manufacturing processes, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410.

106.9.1.3.2 Items designated as Category 2 will include all other steel or iron products not in Category 1 and permanently incorporated in the project. Category 2 items shall consist of, but not be limited to items such as fencing, guardrail, signing, lighting and signal supports. The prime contractor is required to submit a material of origin form certification prior to incorporation into the project from the fabricator for each item that the product is domestic. The Certificate of Materials Origin form ([link to certificate form](#)) from the fabricator must show all steps of manufacturing, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410 Buy America Requirements and be signed by a fabricator representative. The engineer reserves the right to request additional information and documentation to verify that all Buy America requirements have been satisfied. These documents shall be submitted upon request by the engineer and retained for a period of 3 years after the last reimbursement of the material.

106.9.1.3.3 Any minor miscellaneous steel or iron items that are not included in the materials specifications shall be certified by the prime contractor as being procured domestically. Examples of these items would be bolts for sign posts, anchorage inserts, etc. The certification shall read "I certify that all steel and iron materials permanently incorporated in this project during all manufacturing processes, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410 Buy America Requirements procured and processed domestically in accordance with CFR Title 23 Section 635.410 Buy America Requirements. Any foreign steel used was submitted and accepted under minor usage". The certification shall be signed by an authorized representative of the prime contractor.

106.9.1.4 When permitted in the contract, alternate bids may be submitted for foreign steel and iron products. The award of the contract when alternate bids are permitted will be based on the lowest total bid of the contract based on furnishing domestic steel or iron products or 125 percent of the lowest total bid based on furnishing foreign steel or iron products. If foreign steel or iron products are awarded in the contract, domestic steel or iron products may be used; however, payment will be at the contract unit price for foreign steel or iron products.

106.9.2 Buy America Requirements for Construction Materials other than iron or steel products.

Construction materials mean articles, materials, or supplies that consist of only one of the items listed. Minor additions of articles, materials, supplies, or binding agents to a construction material do not change the categorization of the construction material. Upon request by the engineer, the contractor shall submit a domestic certification for all construction materials listed that are incorporated into the project.

- (a) Non-ferrous metals
- (b) Plastic and Polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables)
- (c) Glass (including optic glass)
- (d) Fiber optic cable (including drop cable)
- (e) Optical fiber
- (f) Lumber
- (g) Engineered wood
- (h) Drywall

106.9.3 Buy America Requirements for Manufactured Products.

Manufactured products mean articles, materials or supplies that have been processed into a specific form and shape, or combined with other articles, materials or supplies to create a product with different properties than the individual articles, materials or supplies. If an item is classified as an iron or steel product, an excluded material, or other product category as specified by law or in 2 CFR part 184, then it is not a manufactured product. However, an article, material or supply classified as a manufactured product may include components that are iron or steel products, excluded materials, or other product categories as specified by law or in 2 CFR part 184. Mixtures of excluded materials delivered to a work site without final form for incorporation into a project are not a manufactured product.

106.9.3.1 Produced in the United States, in the case of manufactured products, means:

- (A) For projects obligated on or after October 1, 2025, the product was manufactured in the United States; and
- (B) For projects obligated on or after October 1, 2026, the product was manufactured in the United States and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product.

106.9.3.2 (i) With respect to precast concrete products that are classified as manufactured products, components of precast concrete products that consist wholly or predominantly of iron or steel or a combination of both shall meet the requirements of paragraph (b) of this section. The cost of such components shall be included in the applicable calculation for purposes of determining whether the precast concrete product is produced in the United States.

(ii) With respect to intelligent transportation systems and other electronic hardware systems that are installed in the highway right of way or other real property and classified as manufactured products, the cabinets or other enclosures of such systems that consist wholly or predominantly of iron or steel or a combination of both shall meet the requirements of paragraph (b) of this section. The cost of cabinets or other enclosures shall be included in the applicable calculation for purposes of determining whether systems referred to in the preceding sentence are produced in the United States.

106.9.4 Waiver for De Minimis Costs for Manufactured and Construction Materials other than iron or steel products.

"The total value of the non-compliant products is no more than the lesser of \$1,000,000 or 5% of total applicable costs for the project." The contractor shall submit to the engineer any non-domestic materials and their total material cost to the engineer. The contractor and the engineer will both track these totals to assure that the minimal usage allowance is not exceeded.

- Third-Party Test Waiver for Concrete Aggregate

1.0 Description. Third party tests may be allowed for determining the durability factor for concrete pavement and concrete masonry aggregate.

2.0 Material. All aggregate for concrete shall be in accordance with Sec 1005.

2.1 MoDOT personnel shall be present at the time of sampling at the quarry. The aggregate sample shall be placed in an approved tamper-evident container (provided by the quarry) for shipment to the third-party testing facility.

2.2 AASHTO T 161 Method B Resistance of Concrete to Rapid Freezing and Thawing, shall be used to determine the aggregate durability factor. All concrete beams for testing shall be 3-inch wide by 4-inch deep by 16-inch long or 3.5-inch wide by 4.5-inch deep by 16-inch long. All beams for testing shall receive a 35-day wet cure fully immersed in saturated lime water prior to initiating the testing process.

2.3 Concrete test beams shall be made using a MoDOT approved concrete pavement mix design.

3.0 Testing Facility Requirements. All third-party test facilities shall meet the requirements outlined in this provision.

3.1 The testing facility shall be AASHTO accredited.

3.1.1 For tests ran after January 1, 2025, accreditation documentation shall be on file with the Construction and Materials Division prior to any tests being performed.

3.1.2 Construction and Materials Division may consider tests completed prior to January 1, 2025, to be acceptable if all sections of this provision are met, with the exception of 3.1.1. Accreditation documentation shall be provided with the test results for tests completed prior to January 1, 2025. No tests completed prior to September 1, 2024, will be accepted.

3.2 The testing facility shall provide their testing process, list of equipment, equipment calibration documentation, and testing certifications or qualifications of technicians performing the AASHTO T 161 Procedure B tests. The testing facility shall provide details on their freezing and thawing apparatus including the time and temperature profile of their freeze-thaw chamber. The profile shall include the temperature set points throughout the entirety of the freeze-thaw cycle. The profile shall show the cycle time at which the apparatus drains/fills with water and the cycle time at which the apparatus begins cooling the specimens.

3.3 Results, no more than five years old, from the third-party test facility shall compare within ± 2.0 percent of an independent test from another AASHTO accredited test facility or with MoDOT test records, in order to be approved for use (e.g. test facility results in a durability factor of 79, MoDOT's recent durability test factor is 81; this compared within +2 percent). The independent testing facility shall be in accordance with this provision. The comparison test can be from a different sample of the same ledge combination.

3.4 When there is a dispute between the third party durability test results and MoDOT durability test results, the MoDOT durability test result shall govern.

3.5 Test results shall be submitted to MoDOT's Construction and Materials division electronically for final approval. Test results shall include raw data for all measurements of relative dynamic modulus of elasticity and percent length change for each individual concrete specimen. Raw data shall include initial measurements made at zero cycles and every subsequent measurement of concrete specimens. Raw data shall include the cycle count and date each measurement was taken. Test results shall also include properties of the concrete mixture as required by AASHTO T 161. This shall include the gradation of the coarse aggregate sample. If AASHTO T 152 is used to measure fresh air content, then the aggregate correction factor for the mix determined in accordance with AASHTO T 152 shall also be included.

4.0 Method of Measurement. There is no method of measurement for this provision. The testing requirements and number of specimens shall be in accordance with AASHTO T 161 Procedure B.

5.0 Basis of Payment. No direct payment will be made to the contractor or quarry to recover the cost of aggregate samples, sample shipments, testing equipment, labor to prepare samples or test samples, or developing the durability report.

- **Delete paragraph 15.0 of the General Provision Disadvantaged Business Enterprise (DBE) Program Requirements and substitute the following:**

15.0 Bidder's List Quote Summary. MoDOT is a recipient of federal funds and is required by 49 CFR 26.11 to provide data about its DBE program. All bidders who seek to work on federally assisted contracts must submit data about all DBE and non-DBEs in accordance with Sec 102.7.9. MoDOT will not compare the submitted Bidder's List Quote Summary to any other documents or submittals, pre or post award. All information will be used by MoDOT in accordance with 49 CFR 26.11 for reporting to USDOT and to aid in overall DBE goal setting.

- **Add Sec 102.7.9 to include the following:**

102.7.9 Bidder's List Quote Summary. Each bidder shall submit with each bid a summary of all subcontractors, material suppliers, and service providers (e.g. hauling) considered on federally funded projects pursuant to 49 CFR 26.11. The bidder will provide the firm's name, the corresponding North American Industry Classification System (NAICS) code(s) the firm(s) were considered for, and whether or not they were used in the bid. The information submitted should be the most complete information available at the time of bid. The information shall be disclosed on the Bidder's List Quote Summary form provided in the bidding documents and submitted in accordance with Sec 102.10. Failure to disclose this information may result in a bid being declared irregular.

G. Contractor Quality Control and Daily Reporting

1.0 The contractor shall perform Quality Control (QC) testing in accordance with the specifications and as specified herein. The contractor shall submit a Quality Control Plan (QC Plan) to the engineer for approval that includes all items listed in Section 2.0, prior to beginning work.

2.0 Quality Control Plan.

- (a) The name and contact information of the person in responsible charge of the QC testing.
- (b) A list of the QC technicians who will perform testing on the project, including the fields in which they are certified to perform testing.
- (c) A proposed independent third party testing firm for dispute resolution, including all contact information.
- (d) A list of Hold Points, when specified by the engineer.
- (e) The MoDOT Standard Inspection and Testing Plan (ITP). This shall be the version that is posted at the time of bid on the MoDOT website (www.modot.org/quality).

3.0 Quality Control Testing and Reporting. Testing shall be performed per the test method and frequency specified in the ITP. All personnel who perform sampling or testing shall be certified in the MoDOT Technician Certification Program for each test that they perform.

3.1 Reporting of Test Results. All QC test reports shall be submitted as soon as practical, but no later than the day following the test. Test data shall be immediately provided to the engineer upon request at any time, including prior to the submission of the test report. No payment will be made for the work performed until acceptable QC test results have been received by the engineer and confirmed by QA test results.

3.1.1 Test results shall be reported on electronic forms provided by MoDOT. Forms and Contractor Reporting Excel2Oracle Reports (CRE2O) can be found on the MoDOT website. All required forms, reports and material certifications shall be uploaded to a Microsoft SharePoint® site provided by MoDOT, and organized in the file structure established by MoDOT.

3.2 Non-Conformance Reporting. A Non-Conformance Report (NCR) shall be submitted by the contractor when the contractor proposes to incorporate material into the work that does not meet the testing requirements or for any work that does not comply with the contract terms or specifications.

3.2.1 Non-Conformance Reporting shall be submitted electronically on the Non-Conformance Report form provided on the MoDOT Website. The NCR shall be uploaded to the MoDOT SharePoint® site and an email notification sent to the engineer.

3.2.2 The contractor shall propose a resolution to the non-conforming material or work. Acceptance of a resolution by the engineer is required before closure of the non-conformance report.

3.3 Contractor Daily Work Reporting. The contractor shall submit to the engineer a Contractor Daily Work Report (CDWR) for each calendar day that work is performed. The CDWR shall include all information listed in 3.3.2.

3.3.1 The CDWR information may be provided on the MoDOT-provided form or an approved contractor form. Each CDWR shall be digitally signed by the contractor and uploaded to the MoDOT SharePoint® site no later than two (2) business days following the end of each week.

3.3.2 CDWR information:

- (a) Date and Contract Identification Number
- (b) Weather conditions, rainfall amounts, high/low ambient temperatures
- (c) List of subcontractors who performed work

- (d) Description of all work performed, including general location (ex. Sta, offset, log mile, etc.), and any testing performed.
- (e) Date range of days when no work was performed since the previous DWR
- (f) Pertinent traffic control information (changes, delays, accidents, etc.)
- (g) Statement: "All items installed meet or exceed contract requirements."

4.0 Work Planning and Scheduling.

4.1 Two-week Schedule. Each week, the contractor shall submit to the engineer a schedule that outlines the planned project activities for the following two-week period. The two-week schedule shall detail all work and traffic control events planned for that period and any Hold Points specified by the engineer.

4.2 Weekly Meeting. When work is active, the contractor shall hold a weekly project meeting with the engineer to review the planned activities for the following week and to resolve any outstanding issues. Attendees shall include the engineer, the contractor superintendent or project manager and any foreman leading major activities. This meeting may be waived when, in the opinion of the engineer, a meeting is not necessary. Attendees may join the meeting in person, by phone or video conference.

4.3 Pre-Activity Meeting. A pre-activity meeting is required in advance of the start of each new activity, except when waived by the engineer. The purpose of this meeting is to review construction details of the new activity. At a minimum, the discussion topics shall include: safety precautions, QC testing, traffic impacts, and any required Hold Points. Attendees shall include the engineer, the contractor superintendent and the foreman who will be leading the new activity. Pre-activity meetings may be held in conjunction with the weekly project meeting.

4.4 Hold Points. Hold Points are events that require approval by the engineer prior to continuation of work. Hold Points occur at definable stages of work when, in the opinion of the engineer, a review of the preceding work is necessary before continuation to the next stage.

4.4.1 A list of typical Hold Point events is available on the MoDOT website. Use of the Hold Point process will only be required for the project-specific list of Hold Points, if any, that the engineer submits to the contractor in advance of the work. The engineer may make changes to the Hold Point list at any time.

4.4.2 Prior to all Hold Point inspections, the contractor shall verify the work has been completed in accordance with the contract and specifications. If the engineer identifies any corrective actions needed during a Hold Point inspection, the corrections shall be completed prior to continuing work. The engineer may require a new Hold Point to be scheduled if the corrections require a follow-up inspection. Re-scheduling of Hold Points require a minimum 24-hour advance notification from the contractor unless otherwise allowed by the engineer.

5.0 Quality Assurance Testing and Inspection. MoDOT will perform quality assurance testing and inspection of the work, except as specified herein. The contractor shall utilize the inspection checklists provided in the ITP as a guide to minimize findings by MoDOT inspection staff. Submittal of completed checklists is not required, except as specified in 5.1.

5.1 Inspection and testing required in the production of concrete for the project shall be the responsibility of the contractor. Submittal of the 501 Concrete Plant Checklist is required.

6.0 Basis of Payment. No direct payment will be made for compliance with this provision.

H. Utilities JSP-93-26F

1.0 For informational purposes only, the following is a list of names, addresses, and telephone numbers of the known utility companies in the area of the construction work for this improvement:

<u>Utility Name</u>	<u>Known Required Adjustment</u>	<u>Type</u>
AT&T Mark Manion Phone: 816-214-2322 Email: mm256t@att.com	Yes Section 2.1	Communications
CHARTER COMMUNICATIONS (SPECTRUM) Jazmine Richardson Phone: 816-206-0524 Email: Jazmine.Richardson@charter.com	Yes Section 2.2	Communications
CITY OF INDEPENDENCE SEWER Brad Phelps Phone: 816-325-7614 Email: bphelps@indepmo.org	None	Sanitary Sewer
CITY OF INDEPENDENCE WATER Robert Bennetzen Email: rbennetzen@indepmo.org	Yes Section 2.3	Water
COMCAST Dallas Swofford Phone: 816-394-4600 Email: dallas_swofford@comcast.com	Yes Section 2.4	Communications
INDEPENDENCE POWER AND LIGHT Shaun Carter Phone: 816-325-6683 Email: smcarter@indepmo.org	Yes Section 2.5	Power
LITTLE BLUE VALLEY SEWER DISTRICT Bill Perkins Email: bperkins@lbvdsd.org	None	Sanitary Sewer
LUMEN Rick Redel Phone: 816-518-2804 Email: richard.redel@lumen.com Michael Lambert Email: mlambert2@olsson.com Sandra Munoz-Cabuya Email: smunozcabuya@olsson.com	Yes Section 2.6	Communications
MCI (VERIZON) Joseph Bullimore Email: joseph.bullimore@verizon.com	Yes Section 2.7	Communications

SEGRA Brian Short Email: brian.short@segrafiber.com fibermanagement@segrafiber.com	None	Communications
SPIRE Baylee Godat Phone: 816-334-8075 Email: baylee.godat@spireenergy.com	Yes Section 2.8	Gas

1.1 The existence and approximate location of utility facilities known to exist, as shown on the plans, are based upon the best information available to the Commission at this time. This information is provided by the Commission "as-is" and the Commission expressly disclaims any representation or warranty as to the completeness, accuracy, or suitability of the information for any use. Reliance upon this information is done at the risk and peril of the user, and the Commission shall not be liable for any damages that may arise from any error in the information. It is, therefore, the responsibility of the contractor to verify the above listed information indicating existence, location and status of any facility. Such verification includes direct contact with the listed utilities.

2.0 Project Specific Provisions:

2.1 AT&T

Proposed sidewalk on the southwest corner of the intersection of Route 40 and South Cliff Avenue will require the relocation of pull box, near station 498+02. The relocation shall be completed prior to the notice to proceed.

Proposed paving on eastbound Route 40 may require adjustment of communications manhole, near station 505+08, to match proposed pavement grade. The contractor shall coordinate with the AT&T representative in the field for proper adjustment details.

Proposed paving on eastbound Route 40 will require adjustment of communications manhole, near station 512+77, to match proposed pavement grade. The contractor shall coordinate with the AT&T representative in the field for proper adjustment details.

When installing proposed storm sewer on the north side of eastbound Route 40, near station 512+80, the contractor shall protect existing AT&T duct bank in place. The contractor shall coordinate with the AT&T representative in the field to ensure proper clearance and to avoid damage to structure.

Proposed paving on westbound Route 40 will require adjustment of communications manhole, near station 326+55, to match proposed pavement grade. The contractor shall coordinate with the AT&T representative in the field for proper adjustment details.

Proposed paving on westbound Route 40 may require adjustment of communications manhole, near station 332+02, to match proposed pavement grade. The contractor shall coordinate with the AT&T representative in the field for proper adjustment details.

Proposed paving on westbound Route 40 may require adjustment of communications manhole, near station 337+97, to match proposed pavement grade. The contractor shall coordinate with the AT&T representative in the field for proper adjustment details.

Proposed storm sewer installation on the south side of eastbound Route 40 may require the adjustment of buried fiber line, near station 530+71. The contractor shall coordinate with the AT&T representative in the field to ensure proper clearance and to avoid damage to the line.

Proposed storm sewer installation on the west side of Little Blue Parkway may require the relocation of buried communications line, from approximately station 13+30 to station 14+09. The relocation shall be completed prior to the notice to proceed.

Proposed road widening on the west side of Little Blue Parkway will require the relocation of pull box, near station 14+09. The relocation shall be completed prior to the notice to proceed.

Proposed road widening on the west side of Little Blue Parkway will require the relocation of pull box, near station 15+46. The relocation shall be completed prior to the notice to proceed.

2.2 CHARTER COMMUNICATIONS

Proposed lane addition, soil nail wall and storm sewer installation on the north side of westbound Route 40, under the Route 291 bridges will require the relocation of all buried communications lines, from approximately station 506+45 to approximately station 510+30. The relocation shall be completed prior to the notice to proceed.

2.3 CITY OF INDEPENDENCE WATER

Proposed paving on the west side of Little Blue Parkway may require adjustment of water valve, near station 16+42, to match proposed pavement grade. The contractor shall coordinate with the City of Independence representative in the field for proper adjustment details.

2.4 COMCAST

Proposed ditch grading on the south side of westbound Route 40 may require the adjustment of buried fiber line near station 335+45. The contractor shall coordinate with the Comcast representative in the field to ensure proper clearance and to avoid damage to the line.

Proposed storm sewer installation on the west side of Little Blue Parkway may require the adjustment of buried cable line, near station 13+28. The contractor shall coordinate with the Comcast representative in the field to ensure proper clearance and to avoid damage to the line.

Proposed grading on the west side of Little Blue Parkway will require the adjustment or relocation of cable pedestal, near station 15+66. The contractor shall coordinate with the Comcast representative in the field to ensure proper clearance and to avoid damage to the pedestal and buried lines.

2.5 INDEPENDENCE POWER AND LIGHT

Proposed grading and storm sewer installation on the south side of eastbound Route 40 may require the adjustment of buried power line, near station 511+73. The contractor shall coordinate with the IPL representative in the field to ensure proper clearance and to avoid damage to the line.

Proposed storm sewer installation on the south side of westbound Route 40 may require the adjustment of buried power line, near station 511+80. The contractor shall coordinate with the IPL representative in the field to ensure proper clearance and to avoid damage to the line.

Proposed road widening on the west side of Little Blue Parkway will require the relocation of street light pole, near station 12+40. The relocation shall be completed prior to the notice to proceed.

Proposed grading on the west side of Little Blue Parkway may require the adjustment of guy anchors, near station 15+71. IPL shall coordinate with the contractor in the field for proper adjustment details.

2.6 LUMEN

Per maps provided by Lumen, their fiber line appears to share AT&T manholes and duct bank at stations 495+89, 499+90 and 505+08. AT&T will be responsible for any adjustments to these manholes (see Section 2.1).

Proposed storm sewer installation on the north side of westbound Route 40 will require the relocation of fiber line, near station 506+58. The relocation shall be completed prior to the notice to proceed.

2.7 MCI

Proposed lane addition, soil nail wall and storm sewer installation on the north side of westbound Route 40, under the Route 291 bridges will require the relocation of all buried communications lines, from approximately station 506+45 to approximately station 510+30. The relocation shall be completed prior to the notice to proceed.

Proposed grading on the north side of westbound Route 40 will require the fiber pull box, near station 338+03 to be adjusted to match proposed grade. The contractor shall coordinate with the MCI representative in the field for proper adjustment details.

2.8 SPIRE

When installing proposed storm sewer on the north side of eastbound Route 40, near station 513+00, the contractor shall protect existing Spire gas line in place. The contractor shall coordinate with the Spire representative in the field to ensure proper clearance and to avoid damage to line.

Proposed storm sewer installation on the west side of Little Blue Parkway may require the adjustment of gas service line, near station 13+74. The contractor shall coordinate with the spire representative in the field to ensure proper clearance and to avoid damage to the line.

I. Truck Mounted Attenuator (TMA) for Stationary Activities JSP-23-04

1.0 Description. Provide and maintain Truck Mounted Attenuators (TMA) in accordance with Sec 612 and as specified herein.

2.0 Construction Requirements. Truck Mounted Attenuators (TMA) shall be used for the work activities indicated in the plans or specified herein.

2.1 Concrete Median Strip and Island Construction - any lane closure required for constructing the center median or any of the islands.

2.2 Traffic Signal Equipment Installation - any lane closure required for installing any traffic signal equipment within the project limits.

2.3 Pavement Marking – any lane closure required for installing pavement marking within the entire project limits.

2.4 Right Turn Lane Construction - any lane closure required for constructing the right turn lanes.

2.5 Mill/fill pavement operation - any lane closure required for mill/fill operations.

2.6 Construction in the median - any lane closure required for construction for median work that will not be protected by temporary concrete traffic barrier.

3.0 Method of Measurement. No measurement will be made for Truck Mounted Attenuators (TMA).

4.0 Basis of Payment. Delete Sec 612.5.1 and substitute with the following:

612.5.1 No payment will be made for truck mounted attenuators (TMAs) used in mobile operations or for any TMAs designated as optional.

612.5.1.1 Payment for TMAs required for stationary work activities will be paid for at the contract unit bid price for Item 612-30.01, Truck Mounted Attenuator (TMA), per lump sum. The lump sum payment includes all work activities that require a TMA, regardless of the number of deployments, relocations, or length of time utilized. No payment will be made for repair or replacement of damaged TMAs.

J. Balanced Mix Design Requirements for Sec 403 Asphalt JSP-24-01C

1.0 Description. Balanced Mix Design (BMD) and Paver-Mounted Thermal Profiles (PMTP), as specified herein, are required on this project for all Sec 403 asphaltic concrete pavement surface and base course mixes. BMD shall be in accordance with section 2.0. PMTP shall be in accordance with section 3.0. No additional payment will be made for compliance with these provisions.

1.1 Rapid Penetrating Emulsion. Should use of Rapid Penetrating Emulsion (RPE) be necessary for corrective action of longitudinal joint density, as specified elsewhere in section 2.0, RPE shall be in accordance with MoDOT JSP2303 Rapid Penetrating Emulsion (available at: https://epg.modot.org/index.php/Job_Special_Provisions), except that no payment will be made for use of RPE.

2.0 *Delete Sec 403 in its entirety and substitute the following:*

403 ASPHALTIC CONCRETE PAVEMENT with Balanced Mix Design

403.1 Description. This work shall consist of providing a bituminous mixture to be placed in one or more courses on a prepared base or underlying course as shown on the plans or as directed by the engineer. The contractor shall be responsible for QC of the bituminous mixture, including the design, and control of the quality of the material incorporated into the project. The engineer will be responsible for QA, including testing, to assure the quality of the material incorporated into the project.

403.1.1 Naming Convention. The nomenclature of Superpave bituminous mixture names, such as SP125CLP, will be as follows. When only the aggregate size is shown, such as SP125, the specifications shall apply to all variations of that size, such as SP125B, SP125C, SP125CLP, etc.

When "x" is indicated, such as SP125xLP, specifications shall apply to all variations of mixture designs. Stone Matrix Asphalt will be generally referred to as SMA and designated by SM or SMR.

Superpave Nomenclature	
SP	Superpave
048	4.75mm (No. 4) nominal aggregate size
095	9.5 mm (3/8 inch) nominal aggregate size
125	12.5 mm (1/2 inch) nominal aggregate size
190	19.0 mm (3/4 inch) nominal aggregate size
250	25.0 mm (1 inch) nominal aggregate size
x	Mixture design: B, C, E or F (as described below)
LP	Limestone porphyry (when designated)
SM	Stone Matrix Asphalt (when designated)
SMR	Stone Matrix Asphalt limestone/non-carbonate (when designated)

403.1.2 Design Levels. The following cumulative equivalent single axle loads (ESALs) shall be used for the specified mix design. The same size aggregate mix design at a higher design traffic may be substituted at the contractor's expense for the contract specified mixture design with the approval from the engineer. Substitutions shall be done uniformly and project mixing of various designs for the same work will not be permitted. For example, an SP125B mixture may be substituted for an SP125C mixture, or SP190C for SP190E, etc. Mixture design substitution will be limited to one design level higher than that specified in the contract.

Design Traffic (ESALs)	Design
< 300,000	F
300,000 to < 3,000,000	E
3,000,000 to < 30,000,000	C
≥ 30,000,000	B

403.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Aggregate	1002
Asphalt Binder, Performance Graded (PG)*	1015
Fiber Additive	1071
Anti-Strip Additive	1071

*The grade of asphalt binder will be specified in the contract.

403.2.1 Stone Matrix Asphalt. In addition to other requirements, material for SMA mixtures shall meet the following. Coarse aggregate shall consist of crushed limestone and either porphyry or steel slag in accordance with the quality requirements of [Sec 1002](#), except as follows. The Los Angeles (LA) abrasion, when tested in accordance with AASHTO T 96, shall not exceed 40 percent based on initial ledge approval and source approval. The percent absorption, when tested in accordance with AASHTO T 85, shall not exceed 3.5 percent based on the individual fractions. The amount of flat and elongated particles, measured on material retained on a No. 4 sieve, of the blended aggregate shall not exceed 20 percent based on a 3:1 ratio or 5 percent based on a 5:1 ratio.

403.2.2 Filler Restriction. Rigden void content determined in accordance with MoDOT Test Method TM-73 shall be no greater than 50 percent.

403.2.3 Fibers. A fiber additive shall be used as a stabilizer in SMA Mixtures. Fibers shall be uniformly distributed by the end of the plant mixing process. The dosage rate for fibers shall be no less than 0.3 percent by weight of the total mixture for cellulose and no less than 0.4 percent by weight for mineral fibers.

403.2.4 Reclaimed Asphalt. A maximum of 30 percent virgin effective binder replacement may be used in mixtures without changing the grade of binder. The asphalt binder content of recycled asphalt materials shall be determined in accordance with AASHTO T 164, ASTM D 2172 or other approved method of solvent extraction. A correction factor for use during production may be determined for binder ignition by burning a sample in accordance with AASHTO T 308 and subtracting from the binder content determined by extraction. The aggregate specific gravity shall be determined by performing AASHTO T 209 in accordance with [Sec 403.19.3.1.2](#) and calculating the G_{se} to which a 0.98 correction factor will be applied to obtain the G_{sb} as follows:

$$G_{se} = \frac{100 - P_b}{\frac{100}{G_{mm}} - \frac{P_b}{G_b}} \quad \text{RAP } G_{sb} = \text{RAP } G_{se} \times 0.98$$

403.2.5 Reclaimed Asphalt Pavement. Reclaimed Asphalt Pavement (RAP) may be used in any mixture, except SMA mixtures. Mixtures may be used with more than 30 percent virgin effective binder replacement provided testing according to AASHTO M 323 is included with the job mix formula that ensures the combined binder meets the grade specified in the contract. All RAP material, except as noted below, shall be tested in accordance with AASHTO T 327, *Method of Resistance of Coarse Aggregate Degradation by Abrasion in the Micro-Deval Apparatus*. Aggregate shall have the asphalt coating removed either by extraction or binder ignition during production. The material shall be tested in the Micro-Deval apparatus at a frequency of once per 1500 tons. The percent loss shall not exceed the Micro-Deval loss of the combined virgin material by more than five percent. Micro-Deval testing will be waived for RAP material obtained from MoDOT roadways. All RAP material shall be in accordance with [Sec 1002](#) for deleterious and other foreign material.

403.2.6 Reclaimed Asphalt Shingles. Reclaimed Asphalt Shingles (RAS) may be used in any mixture specified to use PG 64-22 in accordance with AASHTO PP 53 except as follows: When the ratio of virgin effective binder to total binder in the mixture is between 60 and 70 percent, the grade of the virgin binder shall be PG 52-28 or PG 58-28. Shingles shall be ground to 3/8-inch minus. Waste, manufacturer or new, shingles shall be essential free of deleterious materials. Post-consumer RAS shall not contain more than 1.5 percent wood by weight or more than 3.0 percent total deleterious by weight. Post-consumer RAS shall be certified to contain less than

the maximum allowable amount of asbestos as defined by national or local standards. The gradation of the aggregate may be determined by solvent extraction of the binder or using the following as a standard gradation:

Shingle Aggregate Gradation	
Sieve Size	Percent Passing by Weight
3/8 in.	100
No. 4	95
No. 8	85
No. 16	70
No. 30	50
No. 50	45
No. 100	35
No. 200	25

403.3 Composition of Mixtures.

403.3.1 Gradation. Prior to mixing with asphalt binder, the combined aggregate gradation, including filler if needed, shall meet the following gradation for the type of mixture specified in the contract. A job mix formula may be approved which permits the combined aggregate gradation during mixture production to be outside the limits of the master range when the full tolerances specified in [Sec 403.5](#) are applied.

Percent Passing by Weight							
Sieve Size	SP250	SP190	SP125	SP095	SP048	SP125xSM(R)	SP095xSM(R)
1 1/2 in.	100	---	---	---	---	---	---
1 in.	90 - 100	100	---	---	---	---	---
3/4 in.	90 max.	90 - 100	100	---	---	100	---
1/2 in.	---	90 max.	90 - 100	100	---	90-100	100
3/8 in.	---	---	90 max.	90-100	100	50-80	70-95
No. 4	---	---	---	90 max.	90-100	20 - 35	30-50
No. 8	19 - 45	23 - 49	28 - 58	32-67	---	16 - 24	20-30
No. 16	---	---	---	---	30-60	---	21 max.
No. 30	---	---	---	---	---	---	18 max.
No. 50	---	---	---	---	---	---	15 max.
No. 100	---	---	---	---	---	---	---
No. 200	1 - 7	2 - 8	2 - 10	2-10	7-12	8.0-11.0	8.0-12.0

403.3.2 Anti-Strip Agent. An anti-strip will be allowed by the engineer to improve resistance to stripping. Anti-strip agents and application rates shall be from a list approved in accordance with [Sec 1071](#).

403.3.3 Porphyry Mixtures. For LP and SMA mixtures, at least 50 percent by volume of the aggregate shall be crushed porphyry retained on the following sieves: No. 30 for SP048, No. 16 for SP095 and No. 8 for SP125. Depending on the actual gradation of porphyry aggregate furnished, the amount of crushed porphyry required may vary, however at least 40 percent by weight of crushed porphyry will be required. Steel slag may be substituted for porphyry in LP and SM mixtures, except at least 45 percent by weight of crushed porphyry and/or slag will be required. The engineer may approve the use of other hard, durable aggregate in addition to

porphyry and steel slag. When an SMR mixture is designated, the mixture shall contain aggregate blends with at least 30 percent non-carbonate material in accordance with [Sec 403.3.5](#).

403.3.4 Minimum Stone Matrix Asphalt Binder. The percent asphalt binder for SMA mixtures shall not be less than 6.0 percent unless otherwise allowed by the engineer.

403.3.5 Surface Mixtures. Design level B surface mixtures and SP048NC, except as described in [Sec 403.15.3](#), containing limestone coarse aggregate shall contain a minimum amount of non-carbonate aggregate. The LA abrasion values, AASHTO T 96, of the limestone will determine the type and amount of non-carbonate aggregate required as shown in the table below. The LA abrasion value will be determined from the most recent source approval sample. In lieu of the above requirements, the aggregate blend shall have an acid insoluble residue (AIR), MoDOT Test Method TM 76, meeting the plus No. 4 criteria of crushed non-carbonate material. Non-carbonate aggregate shall have an AIR of at least 85 percent insoluble residue.

Coarse Aggregate (+ No. 4)	Minimum Non-Carbonate by Volume
Limestone, LA $\leq$ 30	30% Plus No. 4
Limestone, LA > 30	20% Minus No. 4*
Dolomite	No Requirement

*Use for all SP095 and SP048NC containing limestone.

403.4 Job Mix Formula. At least 30 days prior to placing any mixture on the project, the contractor shall submit a mix design for approval to Construction and Materials. The mixture shall be designed in accordance with AASHTO R 35 or R 46 and shall be tested in accordance with AASHTO T 312 except as noted herein. A detailed description of the mix design process shall be included with the job mix formula (JMF). Representative samples of each ingredient for the mixture shall be submitted with the mix design.

403.4.1 Proficiency Sample Program. Laboratories that participate in and achieve a score of three or greater in the AASHTO proficiency sample program for T 11, T 27, T 84, T 85, T 166, T 176, T 209, T 304 (ASTM C 1252), T 308 and T 312 will have the mixture verification process waived. The mix design shall be submitted to Construction and Materials for approval at least seven days prior to mixture production.

403.4.2 Required Information. The mix design shall include raw data from the design process and contain the following information:

- (a) All possible sources intended for use, and grade and specific gravity of asphalt binder.
- (b) Source, type (formation, etc.), ledge number if applicable, gradation, and deleterious content of each aggregate fraction.
- (c) Bulk and apparent specific gravities and absorption of each aggregate fraction in accordance with AASHTO T 85 for coarse aggregate and AASHTO T 84 for fine aggregate including all raw data.
- (d) Specific gravity of hydrated lime, mineral filler or baghouse fines, if used, in accordance with AASHTO T 100.
- (e) Percentage of each aggregate component.

- (f) Combined gradation of the job mix.
- (g) Percent asphalt binder, by weight, based on the total mixture and percent asphalt binder contributed by reclaimed asphalt materials.
- (h) Bulk specific gravity (G_{mb}) by AASHTO T 166 Method A of a laboratory compacted mixture compacted at N_{design} gyrations.
- (i) Percent air voids (V_a) of the laboratory compacted specimen compacted to N_{design} gyrations.
- (j) Voids in the mineral aggregate (VMA) and volume of Effective Asphalt (V_{be}) at N_{design} gyrations.
- (k) Theoretical maximum specific gravity (G_{mm}) as determined by AASHTO T 209, in accordance with [Sec 403.19.3](#), after the sample has been short term aged in accordance with AASHTO R 30.
- (l) The tensile strength ratio as determined by AASHTO T 283 including all raw data.
- (m) The gyratory sample weight to produce a 115 mm minimum height specimen.
- (n) Mixing temperature and gyratory molding temperature.
- (o) Number of gyrations at N_{design} .
- (p) Dust proportion ratio ($-200/P_{be}$).
- (q) Bulk specific gravity (G_{sb}) of the combined aggregate.
- (r) Percent chert contained in each aggregate fraction.
- (s) Percent of G_{mm} at $N_{initial}$ and $N_{maximum}$.
- (t) Voids in coarse aggregate (VCA) for both the mixture and dry-rodded condition for SMA mixtures.
- (u) Draindown for SMA mixtures.
- (v) Performance testing results for Cracking Tolerance Index (CT_{Index}), Long-Term aged Cracking Tolerance Index ($CT_{Index, Long-Term Aged}$), Hamburg Wheel Tracking Test (HWTT), and Rutting Tolerance Index (RT_{Index}).
- (w) Baghouse fines added for design.
 - (i) Batch and continuous mix plants – Indicate which aggregate fraction to add baghouse percentage during production.
 - (ii) Drum mix plants – Provide cold feed settings with and without baghouse percentage.

403.4.3 Approval. No mixture will be accepted for use until the JMF for the project is approved by Construction and Materials.

403.4.4 Mix Formula Modification. The JMF approved for each mixture shall be in effect until modified in writing by the engineer. When unsatisfactory results occur or should a source of material be changed, a new JMF may be required.

403.4.4.1 Asphalt Binder Source Change. When an asphalt binder source change includes a binder grading that differs from the original grade on the JMF, new performance testing values (CT_{Index} and RT_{Index}) shall be provided prior to use.

403.4.4.2 Additive Source Change. When rejuvenators, warm mix additives, anti-strip additive, or other additives sources change; new performance testing values (CT_{Index} and RT_{Index}) shall be provided.

403.4.5 Design Gyration. The minimum number (N) of gyrations required for gyratory compaction shall be as follows:

Design	N_{design}^a
F	35
E	50
C	60
B	65

^a SMA mixtures shall have N_{design} equal to 100.

403.4.6 Mixture Characteristics. When compacted in accordance with AASHTO T 312, the mixture shall meet the following criteria.

403.4.6.1 Air Voids (V_a). Design air voids for SuperPave mixtures at all traffic levels shall be between 3.0 and 5.0 percent. SMA mixtures shall have a design air void of 4.0 percent.

403.4.6.2 Voids in the Mineral Aggregate (VMA). SuperPave mixtures shall have a minimum volume of effective asphalt, equal to the VMA minus the air voids, as shown in the chart below, with design air voids between 3.0 to 5.0 percent for SuperPave and shall be 4.0 percent for SMA. The minimum VMA shall be equal to the minimum volume of effective binder (V_{be}) plus design air voids.

Mixture	V_{be} Minimum (percent)
SP250	9.0
SP190	10.0
SP125 (except for SMA)	11.0
SP095 (except for SMA)	12.0
SP048	13.0
SMA	13.0

403.4.7 Dust to Binder Ratio. For all mixtures except SMA and SP048, the ratio of minus No. 200 material to effective asphalt binder (P_{be}) shall be between 0.8 and 1.6. For SP048, the ratio of minus No. 200 material to effective asphalt binder (P_{be}) shall be between 0.9 and 2.0.

403.4.8 Moisture Susceptibility. For all mixtures except SMA, the mixture shall have a tensile strength ratio (TSR) greater than 85 percent (80 percent if an approved anti-strip agent is used)

when compacted to 3.7 inches with 7 ± 0.5 percent air voids and tested in accordance with AASHTO T 283. SMA mixtures shall have a TSR greater than 85 (80 percent if an approved anti-strip agent is used) percent when compacted to 3.7 inches with 6 ± 0.5 percent air voids and tested in accordance with AASHTO T 283.

403.4.8.1 Minimum Tensile Strength. All mixtures shall have a minimum allowable conditioned tensile strength of 60 psi.

403.4.8.2 Liquid Anti-Strip Dosage. The liquid anti-strip dosage shall be in the range recommended by the manufacturer and provided on the JMF.

403.4.9 Draindown. AASHTO T 305, Draindown Test, shall be performed on all SMA mixtures prior to job mix approval. The mixture shall be stabilized in such a way that the draindown of the asphalt binder shall not exceed 0.3 percent by weight of mixture.

403.4.10 Voids in Coarse Aggregate. The percent VCA_{MIX} of SMA mixtures shall be less than or equal to the VCA_{DRC} as determined using AASHTO T 19. This may be calculated using the following equations:

$$VCA_{DRC} = 100 \times (G_{CA}\gamma_w - \gamma_s) / G_{CA}\gamma_w$$

$$VCA_{MIX} = 100 - (P_{bp} \times G_{mb} / G_{CA})$$

$$P_{bp} = P_s \times PA_{bp}$$

Where:

G_{CA}	=	bulk specific gravity of the combined coarse aggregate (AASHTO T 85),
γ_s	=	unit weight of coarse aggregate in the dry-rodded condition (DRC) (lb/ft ³) (AASHTO T 19),
γ_w	=	unit weight of water (62.34 lb/ft ³) ,
P_{bp}	=	percent aggregate by total mixture weight retained on No. 4 sieve and
PA_{bp}	=	percent aggregate by total aggregate weight retained on No. 4 sieve*.

*Use No. 8 sieve for SP095xSM

403.4.11 Mix Design Performance Testing. Acceptable test results meeting the criteria for the following performance tests shall be submitted with the mix design for approval. Test specimens shall be compacted to an air void content of 7.0 ± 0.5 percent or 6.0 ± 0.5 percent for SMA mixtures.

403.4.11.1 Cracking Tolerance Index (CT_{Index}) Testing. The CT_{Index} testing shall be completed in accordance with ASTM D8225 and at a test temperature of 25 ± 0.5 C.

Mix Type	Minimum CT_{Index}	$CT_{Index, (Long-Term Aged)}$ *
Non-SMA	50	Informational Only
SMA	135	Informational Only

*Long-Term Aged defined as loose mix aging for 20 hours at 115 C.

403.4.11.2 Rutting Tolerance Index (RT_{Index}) Testing. The RT_{Index} testing shall be completed in accordance with ASTM D8360 and at a test temperature of 50 ± 1 C.

PG Grade High Temperature*	Minimum RT _{Index}
58-28H / 64-22	50
64-22H / 70-22	65
64-22V / 76-22	80

*Determined by the binder grade specified in the contract.

403.4.11.3 Hamburg Wheel Track (HWT). HWT testing will be completed in accordance with AASHTO T324 at test temperature of 50 ± 1 C and 2.44 inch specimen height.

PG Grade High Temperature *	Minimum Wheel Passes	Maximum Rut Depth (in.)
58-28H / 64-22	7,500	0.38
64-22H / 70-22	15,000	0.38
64-22V / 76-22	20,000	0.38

*Determined by the binder grade specified in the contract.

403.5 Mixture Production Specification Limits.

403.5.1 Gradation and Deleterious Content Control. The gradation of the aggregate shall be determined from samples taken from the hot bins on batch-type or continuous mixing plants or from the composite cold feed belt on drum mix plants. The gradation may also be obtained by sampling the mixture and testing the residual aggregate. The deleterious content of the aggregate shall be determined from samples taken from the composite cold feed belt. Aggregate samples shall be taken in accordance with AASHTO R 90. The RAP shall be sampled from the RAP feeding system on the asphalt plant. Gradation and deleterious shall be taken when directed by the engineer.

403.5.1.1 Stone Matrix Asphalt Tolerances. In producing mixtures for the project, the plant shall be operated such that no intentional deviations from the job mix formula are made. The maximum deviation from the approved job mix formula shall be as follows for SMA mixtures:

Sieve	Max. Tolerance	
	SP095	SP125
3/4 in.	---	---
1/2 in.	---	±4
3/8 in.	±4	±4
No. 4	±3	±3
No. 8	±3	±3
No. 200	±2	±2

403.5.1.2 Mixture Tolerance. For all other SP mixtures, the percent passing the first sieve size smaller than the nominal maximum size shall not exceed 92.0 percent, a tolerance not to exceed 2.0 percent on the No. 8 sieve from the table in [Sec 403.3.1](#), and within the range listed in [Sec 403.3.1](#) for the No. 200 sieve. The deleterious content of the material retained on the No. 4 sieve shall not exceed the limits specified in [Sec 1002.2](#).

403.5.2 Density. The final, in-place density of the mixture shall be 92.5 to 98.0 percent of the theoretical maximum specific gravity for all mixtures except SMA. SMA mixtures shall have a minimum density of 94.0 percent of the theoretical maximum specific gravity. The theoretical maximum specific gravity shall be determined from a sample representing the material being tested. Tests shall be taken not later than the day following placement of the mixture. The engineer will randomly determine test locations.

403.5.2.1 Shoulder Density. Density on non-integral shoulders shall be in accordance with [Sec 403.15.3](#).

403.5.2.2 Integral Shoulder. When shoulders are placed integrally with the traveled way, tests shall be taken on the traveled way.

403.5.2.3 Longitudinal Joint Density. Density along longitudinal joints shall be in accordance with [Sec 403.16.1](#). Pay shall be in accordance with [Sec 403.23.4.1](#).

403.5.3 Asphalt Content. The asphalt content (AC) shall be within ± 0.3 percent of the approved mix design.

403.5.4 Air Voids. Air voids shall be within ± 1.0 percent of the approved mix design at N_{des} gyrations.

403.5.5 Cracking Tolerance Index. Minimum CT_{Index} shall be 50 for all mixtures except SMA. SMA mixtures shall have a minimum CT_{Index} of 135.

403.5.6 Rutting Tolerance Index. Minimum RT_{Index} shall be based upon the high temperature asphalt binder grade in the contract in accordance with the following:

PG Grade High Temperature*	Minimum $RT_{Index}^{(a)}$
58-28H / 64-22	50
64-22H / 70-22	65
64-22V / 76-22	80

*Determined by the binder grade specified in the contract.

^(a)Mixtures not meeting the minimum RT_{Index} shall be tested by the Hamburg Wheel Track Test and meet a minimum of $\frac{1}{2}$ " rutting at the number of wheel passes required by the contract grade of the mixture.

403.5.7 Tensile Strength Ratio (TSR). The TSR shall be greater than or equal to 75 percent as determined from loose mixture taken from the plant and tested in accordance with AASHTO T 283. The minimum allowable conditioned tensile strength of the mixture shall be 60 psi. The liquid anti-strip dosage during production shall match the dosage listed on the JMF.

403.5.8 Fibers. The fiber proportioning and delivery system for SMA mixtures shall have an accuracy of 10 percent by weight of the material actually being measured in any given period of time.

403.5.9 Moisture Content. The asphaltic concrete mixture, when sampled and tested in accordance with AASHTO T 329, shall not contain more than 0.5 percent moisture by weight of the mixture.

403.5.10 Contamination. The asphaltic concrete mixture shall not be contaminated with deleterious agents such as unburned fuel, objectionable fuel residue or any other material not inherent to the job mix formula.

403.6 Field Laboratory. The contractor shall provide a Type 3 field laboratory in accordance with [Sec 601](#). The contractor shall furnish the bituminous mixture equipment to perform all required test methods for QC and QA work. The gyratory compactor shall be evaluated in accordance with AASHTO PP 35. An approved list will be maintained by Construction and Materials. All other equipment shall be capable of performing tests in accordance with the approved test methods.

403.7 Bituminous Mixing Plants. Bituminous mixing plants and preparation of material and mixtures shall be in accordance with [Sec 404](#).

403.8 Hauling Equipment. Trucks used for hauling bituminous mixtures shall be in accordance with [Sec 404](#).

403.9 Pavers. Bituminous pavers shall be self-contained units, provided with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing asphaltic concrete in lane widths applicable to the specified typical sections and thicknesses shown on the plans.

403.10 Construction Requirements.

403.10.1 Weather Limitations. No mixture shall be placed on any wet or frozen surface. No mixture shall be placed when either the air temperature or the temperature of the surface on which the mixture is to be placed is below 40 F. Temperatures shall be obtained in accordance with MoDOT Test Method TM 20.

403.10.2 Substitutions. With approval from the engineer, the contractor may substitute a smaller nominal maximum size mixture for a larger sized mixture. Specifications governing the substitute mixture shall apply. Except for a single surface layer, the total pavement thickness shall be maintained when the substitute mixture layer is reduced as allowed in [Sec 403.13](#) by increasing the thickness of other layers or courses. The contract unit price for the original mixture shall be used.

403.11 Field Adjustments of Job Mix Formulas. When test results indicate the mixture produced does not meet the specification requirements, the contractor may field adjust the job mix formula as noted herein. Field adjustments may consist of changing the percent binder as listed on the original approved job mix by no more than 0.3 percent. Additional fractions of material or new material will not be permitted as field adjustments. The engineer shall be notified immediately when any change is made in the cold feed settings, the hot bin settings or the binder content. A new G_{sb} shall be calculated using the new aggregate percentages. The gradation of the adjusted mixture shall meet the requirements of the mixture type specified in the contract. When the binder content is adjusted more than 0.3 percent, the mixture will be considered out of specification, and a new mix design shall be established.

403.11.1 Field Mix Redesign. When a new mix design will be required, the contractor will be permitted to establish the new mix design in the field. The mixture shall be designed in accordance with AASHTO R 35 or AASHTO R 46 and shall meet the mix design requirements, including performance testing and TSR requirements. A representative sample of the mixture

shall be submitted with the new mix design to the Central Laboratory for mixture verification. The amount of mixture submitted for verification shall weigh at least 50 pounds.

403.11.1.1 Approval. New mix designs established in the field shall be submitted for approval to Construction and Materials. Upon approval, Construction and Materials will assign a new mix number to the mixture.

403.11.1.2 Resume Production. No mixture shall be placed on the project until the new field mix design is approved.

403.12 Application of Prime or Tack. The prime coat, if specified, shall be applied in accordance with [Sec 408](#). A tack coat is required on all existing pavement and shoulder surfaces that will be overlaid with a bituminous mixture. A tack coat is also required between all lifts of bituminous pavements placed within the driving and turn lanes, unless otherwise specified in the contract. All construction requirements of a tacked surface shall be in accordance with [Sec 407](#), and specified herein. The tack coat shall be applied uniformly and shall completely cover the surface upon which the bituminous mixture is to be placed. Placement of a bituminous mixture shall not be placed upon a tacked surface that is not uniformly covered or surfaces that have experienced excessive loss of tack due to tracking. Re-application of tack due to excess tracking or non-uniform coverage shall be at the contractor's expense.

403.13 Spreading and Finishing. The base course, primed or tacked surface, or preceding course or layer shall be cleaned of all dirt, packed soil or any other foreign material prior to spreading the asphaltic mixture. If lumps are present or a crust of mixture has formed, the entire load will be rejected. The thickness and width of each course shall conform to the typical section in the contract. The contractor may elect to construct each course in multiple layers. The minimum compacted thickness shall be 0.75 inches for SP048, 1.25 inches for SP095, 1.75 inches for SP125, 2 inches for SP190, and 3 inches for SP250.

403.13.1 Paving Widths. The following shall apply for roadways constructed under traffic. For pavements having a width of 16 to 24 feet, inclusive, the asphaltic concrete pavement shall be laid in lanes approximately one half the full width of the completed pavement, and the full width shall be completed as soon as practical. Unless otherwise permitted, a single lane of any course shall not be constructed to a length that cannot be completed to full width of the pavement the succeeding operating day. For pavements greater than 24 feet wide, single lane width construction shall be limited to one day's production and completion to full width shall be accomplished as soon as practical. Uneven pavement shall be left in place for no more than seven days, unless approved by the engineer. Removal of pavement to be in accordance with this specification shall be at the contractor's expense.

403.13.2 Segregation. No thermal or physical mix segregation will be permitted in handling the mixture at the plant, from the truck or during spreading operations on the roadbed.

Paver Mounted Thermal Profiling (PMTF) shall be conducted in accordance with Sec 406.

All layers shall be feathered out, by hand raking, if necessary, in transitioning the depth of the surface to meet present grades at bridges or ends of projects, to provide a uniform, smooth riding surface free of irregularities. Where only the top layer of the surfacing continues across a bridge, the bottom layers shall be feathered out.

Any visual/physical segregation shall be tested in accordance with MoDOT Test Method TM 75. Mixture production shall immediately cease if either criteria of MoDOT Test Method TM 75 fail. Segregated mixture shall be removed and replaced to the limits determined by the engineer.

403.13.3 Release to Traffic. If the asphaltic concrete construction consists of more than a single layer, each layer shall be compacted as specified and allowed to cool to the ambient temperature before the next layer is placed. The contractor shall keep traffic off the asphaltic concrete until the surface of the asphaltic concrete is 140 F or below and the asphaltic concrete has cooled sufficiently to prevent flushing of the asphalt binder to the surface, marking or distorting the surface or breaking down the edges.

403.13.4 Draindown. Evidence of asphalt binder separation or draindown at delivery will be cause for rejection.

403.13.5 Shoulder Substitution. When a [Sec 403](#) mixture is specified for traffic lanes, the same mixture may be used for the adjacent shoulder, subject to the density requirements in [Sec 403.5.2](#).

403.14 Spot Wedging and Leveling Course. The engineer will specify the locations and thickness of spot wedging and the thickness of leveling course to obtain the smoothest possible riding surface. This procedure may result in spot wedging operations over small areas with feather-edging at high points and ends of wedge areas. Rigid control of the placement thickness of the leveling course shall be required. Leveling course, consisting of a layer of asphaltic concrete of variable thickness used to superelevate curves and eliminate irregularities in the existing base, shall be spread uniformly to the specified profile grade and cross section. The mixture shall be uniformly spread and compacted, with only minor segregation as accepted by the engineer. Type SP125 or finer mixtures, as applicable, shall be used for the spot wedging and for the leveling course. Mixtures used as spot wedging and leveling courses shall be accepted in accordance with [Sec 403.23.8.3](#).

403.15 Compaction. After the asphaltic mixture has been spread, struck off and surface irregularities adjusted, the asphaltic mixture shall be compacted thoroughly and uniformly by rolling to obtain the required compaction while the mixture is in a workable condition. Excessive rolling, to the extent of aggregate degradation, will not be permitted. Rollers shall not be used in the vibratory mode when the mixture temperature is below 225 F. When warm mix technology is used, as approved by the engineer, rollers shall not be used in the vibratory mode when the mixture temperature is below 200 F.

403.15.1 Rolling. Any displacement occurring as a result of starting, stopping or changing direction of a roller, or from other causes, shall be avoided. Excess liquid, to prevent adhesion of the mixture to the rollers, will not be permitted. Diesel fuel, fuel oil or other detrimental products shall not be used as wetting agents. Along forms, curbs, headers, walls, and other places not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers.

403.15.2 Defective Mixture. Any mixture that becomes loose and broken, mixed with dirt or is in any way defective shall be removed and replaced with fresh, hot mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of asphalt binder shall be removed and replaced.

403.15.3 Non-Traffic Areas. [Sec 403](#) mixtures used for surfacing medians and similar areas, shoulders adjacent to rigid or flexible pavement and shoulders adjacent to resurfaced pavement

shall be compacted to the specified densities for the mixture. Once an established rolling pattern has been demonstrated to provide the required density for shoulders, at the engineer's discretion, the pattern may be used in lieu of density tests provided no changes in the material, typical location or temperatures are made. Regardless of the method, density will still be required and subject to testing as deemed necessary by the engineer. In lieu of roller and density requirements, temporary bypasses to be maintained at the expense of the contractor shall be thoroughly compacted. The rolling shall be performed at proper time intervals and shall be continued until there is no visible evidence of further consolidation.

403.15.4 Density Measurement. Measurements for determining the in-place density of the mixture shall be taken no later than the day following placement. Measurements not obtained within the prescribed time limits shall be subject to the requirements of [Sec 403.22](#).

403.15.4.1 Density Cores. If a core is taken, material from underlying layers that remain adhered to the core shall be removed in a manner that does not harm the integrity of the specimen. If the contractor elects to place a lift of mixture greater than six times the nominal maximum aggregate size, cores shall be cut in half and the density of each half determined separately.

403.15.4.2 Nuclear/Alternative Methods. In-place asphalt density may be obtained by nuclear or alternative methods in accordance with MoDOT TM-41. The nuclear/alternative calibration locations shall be conducted within a trial section in accordance with Sec 405.4.8.

403.15.5 Intelligent Compaction. Intelligent Compaction requirements in accordance with Section 405 shall not apply unless required by job special provision. Intelligent compaction shall be conducted on the traveled way to monitor the optimum roller passes at a mean temperature above 180 F in accordance with Sec 405. Passing Segments shall have a minimum of 85 percent coverage at or above the optimum number of passes. Segments with between 85 percent and 70 percent coverage will be called moderate segments. Any segment with less than 70 percent coverage at the optimum number of passes shall be a Deficient Segment. If 70 percent of the target IC-MV is not obtained, the segment shall be flagged accordingly in the Veta project file. All segments with a mean temperature of less than 180 F at the optimum pass shall be considered deficient.

403.15.6 Surface Smoothness. The finish of the pavement surface shall be substantially free from waves or irregularities and shall be true to the established crown and grade. The pavement surface shall be thoroughly tested for smoothness by profiling or straight edging in accordance with [Sec 610](#).

403.16 Joints. Transverse joints shall be formed by any method that will produce a dense, vertical section for use when laying is resumed. When a transverse vertical edge is to be left and opened to traffic, a temporary depth transition shall be built as approved by the engineer. The joint formed when the fresh mixture is placed shall be dense, well sealed, and the grade, line and surface texture of the succeeding surface shall conform to that of the joined surface. If directed by the engineer, the transverse joint shall be painted with a light coating of liquid asphalt. Hand manipulation of the mixture shall be minimized to avoid unsightly surface texture.

403.16.1 Joint Composition. Longitudinal joints shall be formed by the use of an edging plate fixed on both sides of the finishing machine. Care shall be taken to obtain a well bonded and sealed longitudinal joint by placing the hot mixture in a manner ensuring maximum compaction at this point. If directed by the engineer for properly sealing the longitudinal joint, a light coating of

bituminous material shall be applied to the exposed edge before the joint is made. Each side of the joint shall be flush and along true lines.

403.16.2 Joint Offset. The longitudinal joint in any layer shall offset that in the layer immediately below by a minimum of 6 inches; except, the joints in the completed surfacing shall be at the lane lines of the traveled way or other required placement width outside the travel lane. The placement width shall be adjusted such that pavement marking shall not fall on a longitudinal joint.

403.17 Quality Control.

403.17.1 Quality Control Operations. The contractor shall maintain equipment and qualified personnel to perform all QC field inspection, sampling and testing as required by this specification. All contractor personnel included in the QC operation shall be qualified by the MoDOT Technician Certification Program. Under no circumstances will unqualified personnel be allowed to perform QC sampling or testing. Personnel will be disqualified if acceptable methods and procedures are not followed.

403.17.1.1 Asphalt Test Results. The contractor shall record all test results and furnish a copy, including all raw data, to the engineer no later than the beginning of the day following the test. The contractor shall maintain all test results in an organized format and shall be available to the QA inspector at all times. Scale readings and other measurements not directly recorded by electronic media shall be recorded in an organized format. Printouts from gyratory compactors and asphalt content devices shall be retained as part of the testing records.

403.17.2 Bituminous Quality Control Plan. Prior to approval of the trial mix design by the engineer, the contractor shall submit a QC Plan to Construction and Materials for approval. The QC Plan shall include:

- (a) The contractor representative in charge of QC and the project level representative if different from the contractor representative. Contact information should be recorded for these individuals.
- (b) Lot and subplot sizes and how they will be designated.
- (c) Performance testing, volumetrics, and asphalt content sampling, fabrication, and testing plan.
- (d) The test method for determining asphalt content and density determination. If cores are to be cut, the number of cores shall be specified.
- (e) Intelligent Compaction (if included in contract) and Paver Mounted Thermal Profiler base station and cellular reception plan.
- (f) A proposed independent third party name, contact, address, and phone number for dispute resolution.

403.17.2.1 Third Party. The third party shall be independent of the contractor, MoDOT consultants and all project subcontractors or suppliers on each specific project. All testing of material for dispute resolution shall be performed by an approved laboratory. Approved laboratories shall be AASHTO Accreditation Program certified in the areas of the material being tested.

403.17.2.2 Plant Calibration. Plant calibration shall be performed by the contractor in accordance with [Sec 404](#), and records shall be made available to the engineer.

403.17.2.3 Retained Samples. All samples taken by the contractor, including but not limited to tested aggregate, volumetric and density samples, shall be retained for the engineer until the contractor's and engineer's tests are complete and accepted unless otherwise instructed. This includes CT_{Index} and RT_{Index} results. These samples shall be maintained in clean covered containers, without contamination, readily accessible to the engineer. The retained sample's identification shall consist of, but is not limited to:

- (a) Time and date sampled.
- (b) Product specification number.
- (c) Type of sample, i.e. belt, bin, stockpile.
- (d) Lot and subplot designation.
- (e) Sampler/Tester.
- (f) Project Job Number.

403.17.2.3.1 Retained Loose Mix Material. All loose mix samples for determination of volumetrics, performance tests, asphalt binder content and TSR shall be taken from the plant at random as designated by the engineer. Loose mix material shall be taken, identified, and retained for the engineer.

403.17.2.4 Performance Test Specimens and Loose Mix Sample. All loose mix samples for determination of performance tests, volumetrics, asphalt binder content and TSR shall be taken at the plant at random intervals as designated by the engineer. All QC/QA loose mix samples shall be taken by the contractor. Non-TSR performance test specimens shall be fabricated by the contractor. The engineer shall be present when taking loose mix samples and fabricating specimens for QA testing. Companion samples shall be identified and retained for the engineer.

403.17.3 Quality Control Laboratory. All QC mixture testing shall be performed in an approved laboratory.

403.17.3.1 Calibration Schedule. The contractor shall calibrate or verify all significant test equipment associated with tests covered in this specification. Intervals as set by the contractor shall not exceed the following limits:

Equipment - Test Method (AASHTO)	Requirement	Interval (Month)
Performance Testing Load Frames – R 18	Calibrate	12
Hamburg Wheel Track Test - R 18	Calibrate	12
Gyratory Compactor - T 312	Calibrate – $1.16 \pm .02^\circ$ internal angle	12 ^a
Gyratory Compactor - T 312	Verify	1 ^c
Gyratory Molds - T 312	Check Critical Dimensions	12
Thermometers - T 209, T 166, T 312	Calibrate	12
Vacuum System - T 209	Check Pressure	12

Pycnometer (Flask) - T 209	Calibrate	Daily
Binder Ignition Oven - T 308	Verify	12 ^b
Nuclear Content Gauge – T 287 or MoDOT TM 54	Drift & Stability – Manuf. Recommendation	1
Mechanical Shakers - T 27	Check Sieving Thoroughness	12
Sieves	Check Physical Condition	6
Weighted Foot Assembly - T 176	Check Weight	12
Mechanical Shaker - T 176	Check Rate & Length of Throw	12
Liquid Limit Device - T 89	Check Wear & Critical Dimensions	12
Grooving Tool - T 89	Check Critical Dimensions	12
Ovens	Verify Temp. Settings	12
Balances	Verify	12 ^b
Timers	Check Accuracy	12

^aCalibrate and/or verify after each move.

^bVerify after each move.

^cIncludes ram pressure, LVDT, frequency of gyration, and external angle.

403.17.3.1.1 Inventory. An inventory of all major sampling, testing, calibration, and verification equipment, including the serial number or other identifying number shall be maintained.

403.17.3.1.2 Calibration Records. Calibration and verification records shall include but are not limited to:

- (a) Detailed results of the work performed (dimensions, mass, force, temperature, etc.)
- (b) Description of the equipment calibrated including identifying number.
- (c) Date the work was performed.
- (d) Identification of the individual performing the work.
- (e) Identification of the calibration or verification procedure used.
- (f) The previous calibration or verification date and next due date.
- (g) Identification of any in-house calibration or verification device used (including identification to establish traceability of items such as standard masses, proving rings, standard thermometers, balances, etc.).

403.17.3.2 Record Retention. Test records shall be maintained to permit verification of any test report. Records pertaining to testing, equipment calibration and verification, test reports, internal quality systems review, proficiency sample testing, test technician training and evaluation and personnel shall be retained in a secure location for a minimum of three years.

403.17.3.3 Test Method Availability. A current copy of all test methods and procedures shall be maintained in the QC laboratory at all times for reference by the technicians. Examples of report formats and procedures may be found in AASHTO R 18.

403.18 Quality Assurance. All QA field inspection, sampling and testing will be performed by a qualified MoDOT technician. The QA inspector shall have free access to any and all testing equipment used by the mixture producer and any workbooks, records or control charts maintained

by the mixture producer for the QC process. The QA inspector shall also have sufficient access to the plant grounds to assure compliance with the approved QC Plan.

403.18.1 Assurance Testing. The engineer will independently test the specimens and/or mixture from the roadway or plant at the frequency listed in Sec 403.19.3. The independent samples shall be of sufficient size to retain half for possible disputes. Further testing of this sample will be under the direction of the engineer. The retained portion of the QC samples for mixture properties, gradation, and deleterious content will be tested as directed by the engineer. The engineer's test results, including all raw data, will be made available to the contractor when completed and no later than the next working day.

403.18.2 Chain of Custody. QA density cores shall be sealed in approved tamper-evident containers immediately after extraction in the presence of the engineer. At the plant, the contractor shall provide loose mix material and test specimens at the frequency listed in Sec 403.19.3 for all QA testing at the provided random tonnage in the presence of the engineer.

403.18.3 Aggregate Comparison. Comparison for aggregate will be considered favorable when the contractor's QC results and engineer's QA test results of a retained sample compare within the following limits.

403.18.3.1 Gradation.

Sieve Size	Percentage Points
¾ inch and larger	5.0
½ inch	5.0
3/8 inch	4.0
No. 4	4.0
No. 8	3.0
No. 10	3.0
No. 16	3.0
No. 20	3.0
No. 30	3.0
No. 40	2.0
No. 50	2.0
No. 100	2.0
No. 200	1.0

403.18.3.2 Deleterious. The total and individual deleterious content shall not exceed the specification limits.

403.18.4 Federal Highway Administration Requirements. Performance and acceptance of QC/QA testing under these specifications shall not eliminate any FHWA requirements for acceptance of the material.

403.19 Acceptance of Material. Acceptance of bituminous mixture will be based on lots. With the exception of density, asphalt material will be sampled at the asphalt plant in lots or sublots on a random basis through the use of a random number system and evaluated using a Quality Level Analysis (QLA). A QLA will determine payment based on a combination of the total PWL (PWL_t) determined for each pay factor item for each lot of material produced.

403.19.1 Random Numbers. The engineer will generate random numbers. Random numbers will be based upon tonnage.

403.19.2 A lot shall consist of a maximum of 6,000 tons. The maximum subplot size shall be 1500 tons and each lot shall contain no less than 4 sublots. Sublots from incomplete lots shall be combined with the previous complete lot for determination of pay factors. When no previous lot exists, the mixture shall be treated in accordance with Sec 403.23.8.1. A new lot shall begin when the asphalt content of a mixture is adjusted in accordance with Sec 403.11 or if there is an asphalt binder grade change or an additive source change.

403.19.3 Test and Pay Factor Items. As a minimum, the contractor and engineer shall test in accordance with the following table. The number of random tests per subplot may be increased per the contractor's QC plan. The QC plan shall state the test and testing frequency. All random tests shall be used in the pay factor determination. Where multiple test methods are allowed, the contractor shall designate the test method to be used in the QC Plan. Final payment will be based on the indicated pay factor items.

Tested Property	Test Method	Contractor Frequency	Engineer Frequency
Pay Factors			
Mat Density (% of theoretical maximum density) ^(a)	MoDOT TM 41, AASHTO T 166 or AASHTO T 331	1 Sample / Sublot	1 Sample / Lot
Asphalt content	AASHTO T 164, or MoDOT Test Method TM-54, or AASHTO T 287, or AASHTO T 308	1 / Sublot	1 / Lot
V _a , N _{des}	AASHTO T 312 and R 35	1 / Sublot	1 / Lot
CT _{Index}	ASTM D 8225	1 / 3000 tons	1 / 12000 tons
Pay Factor Adjustments			
Unconfined Longitudinal Joint Density ^(a)	MoDOT TM 41, AASHTO T 166 or AASHTO T 331	1 Sample / Sublot	1 Sample / Lot
Intelligent Compaction	Sec 405	Continuous	10% of travelway of one roller
RT _{Index}	ASTM D 8360	1 / 3000 tons	1 / 12000 tons
Tensile Strength and TSR	AASHTO T 283	1 / 12000 tons (maximum)	1 / Project
Other Testing			
Cold feed or hot bin gradation and deleterious content	AASHTO T 27 and AASHTO T 11	As Needed	As Needed
Mix Temperature at Plant	----	1 / Sublot	1 / Day
Temperature of Base and Air	----	As Needed	As Needed

(a) Core samples shall consist of one core. Up to two additional cores, as stated in the QC Plan, may be obtained at the same offset within one foot of the randomly selected location. If more than one core is obtained, all cores shall be combined into one sample.

403.19.3.1 Test Method Modification.

403.19.3.1.1 Binder Ignition Modification. Asphalt content determination in accordance with AASHTO T 308, Section 6.9.1 shall be modified by adding the following: If the calibration factor exceeds 1.0 percent, lower the test temperature to 800 ± 8 F and repeat test. Use the calibration factor obtained at 800 F even if it exceeds 1.0 percent. If RAP is used, the binder ignition oven shall be calibrated in accordance with MoDOT Test Method TM 77. At the engineer's discretion, testing may be waived when production does not exceed 200 tons per day. The contractor shall certify the proper proportions of a previously proven mixture were used.

403.19.3.1.2 Rice Test. When the water absorption of any aggregate fraction is greater than 2.0 percent, the test method for determining theoretical maximum specific gravity, AASHTO T 209, shall be modified as follows: After completing the procedure in accordance with Section 9.5.1 or 9.5.2, drain water from the sample. To prevent loss of fine particles, decant the water through a paper towel held over the top of the container. Spread the sample before an electric fan to remove surface moisture. Weigh at 15-minute intervals, and when the loss in mass is less than 0.05 percent for this interval, the sample may be considered to be surface dry. This procedure requires about 2 hours and shall be accompanied by intermittent stirring of the sample. Break conglomerations of mixture by hand. Take care to prevent loss of particles of mixture. Calculate the specific gravity of the sample by substituting the final surface-dry mass for A in denominator of Equations 2 or 3.

403.19.3.1.3 Mixture Bulk Specific Gravity. Determining bulk specific gravity using paraffin-coated specimens, AASHTO T 275, shall not be used when required by AASHTO T 166. Alternate methods are AASHTO T 331 and ASTM D1188. The surface of specimens prepared for testing by these methods may have the surface texture removed by sawing a minimal amount. Specimens shall be securely held in a jig or other clamping device to eliminate distortion and retain a face parallel to the original surface. Measurements for lift thickness shall be made prior to sawing.

403.19.3.1.4 QC and QA Mix Sampling and Preparation. All loose mix shall be sampled at the plant by the contractor during production in accordance with AASHTO R 97 and split to the appropriate size in accordance with AASHTO R 47. After QC has been notified of the random sample, the first truck shall be sampled as directed by the engineer. If the random number for multiple tests overlap, the contractor shall complete the first testing requirements and then immediately proceed with the second testing requirements. The contractor shall wait 30 minutes after sampling loose mix before fabricating specimens for CT_{Index} and RT_{Index} testing. Loose mix temperatures shall not drop below the molding temperature. The 30 minutes shall start when all the material for the loose mix sample has been obtained and the time this occurs shall be recorded. All specimens shall be fabricated as soon as possible after the 30-minute delay. QC and QA samples shall be taken and fabricated by the contractor at separate random times.

The following table details the minimum number of specimens required for QC or QA testing:

Test Method	Minimum Number of Specimens	Molded Specimen Height (mm)
Required Fabrication for CT_{Index} and RT_{Index} QC Frequency: 1 Set per 3000 tons QA Frequency 1 Set per 12000 tons		
Cracking Tolerance Index (CT _{Index})	5 Compacted Specimens	62 (±1mm) ^(b)
Rutting Tolerance Index (RT _{Index})	3 Compacted Specimens	62 (±1mm) ^(b)
Retained Loose Mix ^(a) (QA sample only)	125 lbs	N/A
Required Fabrication for Volumetrics and % Asphalt Content QC Frequency: 1 Set per subplot QA Frequency 1 Set per Lot		
% Asphalt Content	1 Sample	N/A
Theo. Max SG of mixture, Gmm	1 Sample	N/A
% Air Voids	2 Compacted Specimens	N _{Design}
Retained Loose Mix ^(c)	30 lbs	N/A
Required Sampling for TSR QC Frequency: 1 Sample per 12,000 tons QA Frequency: 1 Sample per Project		
Tensile Strength Ratio (TSR)	250 lbs	N/A

(a) Retained loose mix for Hamburg verification of mixture not meeting minimum RT_{Index} thresholds

(b) 95 mm specimen height for SP250 mixes

(c) Retain at least 30 pounds of loose mix material for dispute resolution.

The CT_{Index} test shall be based upon five compacted specimens tested, discard the single highest and lowest values, and average the three remaining values.

The RT_{Index} test shall be based upon the average of three compacted specimens.

Volumetric testing shall be based upon the average of two compacted specimens.

403.19.3.1.5 Molding Performance Samples. The specimens shall be compacted to an air void content of 7.0 ± 0.5 percent or 6.0 ± 0.5 percent for SMA mixtures. The compacted test specimens shall be allowed to cool to 77 ± 5 F prior to determining the air void content.

403.19.3.1.6 Records. Compaction temperature, times in and out of the oven, gyratory specimen weights and times, and sample identification shall be recorded.

403.20 Miscellaneous Applications.

403.20.1 Small Quantities. Small quantities are less than 6000 tons for the pay item quantities of each separate mixture and the following shall apply:

(a) A field laboratory will not be required for monitoring mixtures. All required QC and QA testing shall be performed in an approved laboratory.

(b) No Performance Testing is required and acceptance shall be in accordance with Sec 403.23.8.1. Density, % AC, and % Air Voids shall be performed at a frequency of no less than one per day if production does not exceed 1000 tons and at a frequency of no less than two per day if production exceeds 1000 tons. Independent or retained sample QA tests shall be performed at least once per project, as indicated.

403.20.2 Base Widening and Entrances. For base widening mixture and entrance work, the following will apply:

(a) All base widening shall be constructed in accordance with [Sec 401.7](#) and subsections.

(b) The minimum density of these mixtures shall be attained as specified herein, except, compaction may be performed in accordance with [Sec 403.15.3](#).

403.20.3 Dispute Resolution. When there are significant discrepancies between the engineer's and the contractor's test results, dispute resolution procedures will be used.

403.20.3.1 Cease Work. The contractor's operations may be required to cease until the dispute is resolved if the test results indicate the mixture is subject to failure.

403.20.3.2 Third Party Resolution. The first step in dispute resolution will be to identify differences in procedures and correcting inappropriate procedures before moving to third party resolution. If that does not resolve the dispute, either the contractor or the engineer may request the approved QC Plan third party involvement. The recommendations of the approved third party shall be binding on both the engineer and contractor.

403.20.3.3 Third Party Payment. The contractor shall be responsible for the cost associated with the third party testing and resolution if the final result indicates the engineer's test results were correct. Likewise the Commission will be responsible for the cost associated with the third party testing and resolution when the final result indicates the contractor's results were correct.

403.20.3.4 Other Adjustments. The contractor shall not be entitled to any additional payment for costs incurred due to use of the dispute resolution procedures such as, but not limited to, those for delay, cessation of operations, costs to subcontractors, etc. The engineer may give consideration to adjustment of working days if warranted.

403.20.3.5 Dispute with CT_{Index} and RT_{Index} Results. If QA and QC results for CT_{Index} or RT_{Index} do not compare favorably, the first step will be to identify differences in procedures, including specimen aging. If that does not resolve the dispute, the QA CT_{Index} result shall be averaged with the QC CT_{Index} result to determine pay. If RT_{Index} results are in dispute, QC shall fabricate specimens for Hamburg testing in the presence of the Engineer using the retained loose mix material. Retained loose mix material from the QC sample shall be used to fabricate specimens unless otherwise directed by the Engineer. Specimens shall be sent to the Engineer for Hamburg testing to determine specification compliance.

403.21 General Requirements.

403.21.1 Sequence of Operations. To reduce inconvenience to the traveling public during widening or surfacing, the contractor will not be permitted to place any final surface course until the base widening, the leveling course and the binder course have been completed throughout the entire combination of sections, unless otherwise authorized by the engineer. The proper condition of the base widening, the leveling course, and the binder course, at the time of placing the surface course, shall be the contractor's responsibility.

403.21.2 Pavement Marking. If the contractor's work has obliterated the existing pavement marking on resurfacing projects open to through traffic, the pavement marking shall be replaced in accordance with [Sec 620](#).

403.21.3 Surfaced Approaches. At locations designated in the contract or as specified by the engineer, approaches shall be primed in accordance with [Sec 408](#) and surfaced with Type SP125 asphaltic concrete. The asphaltic concrete surface shall be placed in accordance with the details shown on the plans or as specified by the engineer. Approaches shall not be surfaced until after the surface course adjacent to the entrance is completed. Any work required to condition and prepare the subgrade on the approaches will be at the contractor's expense.

403.21.4 Filling Drain Basins. If shown on the plans, existing drain basins shall be filled to the top of the lip with plant mix bituminous base course or asphaltic concrete from the pavement edge to the edge of the shoulder. Any difficulty or delay created by this requirement will be at the contractor's expense.

403.21.5 Pavement Repairs (Blow-Ups). A blow-up will be considered that area where excessive expansion has resulted in distress to the existing pavement. Blow-ups occurring prior to the application of the tack coat on the existing surface will normally be repaired by the Commission. Blow-ups occurring after the application of the tack coat shall be repaired by the contractor by removing the distressed concrete and replacing the pavement in accordance with [Sec 613](#).

403.22 Method of Measurement.

403.22.1 Weight Determination. The weight of the mixture will be determined from the batch weights if a batch-type plant is used, and will be determined by weighing each truck load on scales in accordance with [Sec 310](#) if other types of plants are used. Measurement will be made to the nearest 0.1 ton for the total tonnage of material accepted.

403.22.2 Full Depth.

403.22.2.1 The final driving surface area, for the full depth of the pavement, will be used as the area for all underlying bituminous lifts and will not include the additional quantity needed to construct the 1:1 slope.

403.22.2.2 Final measurement of the completed pavement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Where required, measurement of the pavement complete in place will be made to the nearest 0.1 square yard. The revision or correction will be computed and added to or deducted from the contract quantity.

403.22.3 Alternate Overlay.

403.22.3.1 Field Established Quantity. When bid as an alternate to a Portland cement concrete overlay, the contractor shall establish the existing roadway profile and set the final overlay profile. The engineer may adjust the final profile as needed. The tons of hot mix asphalt required will be determined by the engineer from the set or adjusted profile. This quantity will be the field established plan quantity.

403.22.3.2 Overlay Measurement. Final measurement of the completed pavement will be based on the field established plan quantity except for authorized changes during construction. The revision or correction will be computed and added to or deducted from the contract quantity. Measurement of the pavement complete in place will be made to the nearest 0.1 ton.

403.22.4 Pavement Testing. The finished courses shall have the nominal thickness shown on the plans. Tests will be conducted to ensure that each course is being constructed to proper thickness, composition, and density. The contractor shall cut samples from any layer of the compacted mixture at locations designated by the engineer. QA samples shall be cut and delivered to the engineer no later than the end of the next day following the laydown operation. If the samples are not cut and delivered as stated, the asphaltic laydown operation may be suspended and a deduction of 5 percent per day of the contract unit price of the representative material may be applied, until samples are cut and delivered to the engineer. Samples may be obtained by either sawing or drilling 4-inch minimum diameter cores. Each sawed sample shall consist of a single piece of the pavement of the size designated by the engineer, but no larger than 12 inches square.

403.22.4.1 Pavement Thickness. Lift thickness may be determined by the average thickness of cores taken for density measurements for each lot. Total thickness samples for new full depth asphalt pavements shall be obtained after all bituminous construction is completed on the project and shall be taken at locations specified by the engineer. For the purpose of determining the constructed thickness of full depth pavement, cores shall be taken at random intervals in each traffic lane at the rate of one core per 1000 feet or increment thereof, or at any other locations as may be determined by the engineer and measured in accordance with AASHTO T 148. Sections of any asphaltic concrete determined to be 0.5 inches or more, less than the thickness shown on the plans, shall be corrected by the contractor. No payment will be made for any costs incurred by the contractor in correcting pavement deficient in thickness. Each core is representative of the pavement thickness for a distance extending one-half the distance to the next core, measured along centerline, or in the case of a beginning or ending core, the distance will extend to the end of the pavement.

403.22.4.2 Surface Restoration. The surface from which samples have been taken, including those for density measurements, shall be restored by the contractor with the mixture then being produced no later than the next day of plant operation, if construction is still active. If bituminous construction has been completed, the surface from which samples have been taken shall be restored within 48 hours with an approved commercial mixture or with cold patch mixtures acceptable to the engineer.

403.23 Basis of Payment.

403.23.1 Percent Within Limits. PWL will be based on the mean, standard deviation and quality index of each lot's test results. The upper PWL (PWL_u) and lower PWL (PWL_l) is determined from the table in [Sec 502.15.8](#). For Upper or Lower Quality Index values less than zero, the value

in the Table shall be subtracted from 100. Total percent within limits, PWL_t , is: $PWL_t = (PWL_u + PWL_l) - 100$. For Density of SMA mixes the PWL_u shall be 100.

The mean is: $\bar{x}_a = (\sum x_i)/n$

Where: $\bar{x}_a$ = Average of the individual values being considered

$\sum x_i$ = The summation of all the individual values being considered

n = The number of individual values under consideration

The Standard Deviation is: $s = (\sum (x_i - \bar{x}_a)^2 / (n - 1))^{1/2}$

The Upper Quality Index is: $Q_u = (USL - \bar{x}_a)/s$

The Lower Quality Index is: $Q_l = (\bar{x}_a - LSL)/s$

Where: Q_u = Upper Quality Index

Q_l = Lower Quality Index

USL = Pay Factor Item Upper Spec Limit

LSL = Pay Factor Item Lower Spec Limit

403.23.1.1 Quality Level Analysis. The engineer will make the QLA no more than 24 hours after receipt of the contractor's test results, by determining the PWL_t for each designated pay factor item.

403.23.1.1.1 Acceptance. The contractor's test results will be used when applicable to determine the PWL , provided the contractor's QC tests and the engineer's QA tests compare favorably, and provided the engineer's inspection and monitoring activities indicate the contractor is following the approved QC Plan.

403.23.1.1.2 Comparison. Favorable comparison will be obtained when the engineer's QA test results on a production sample are within two standard deviations or the comparison limit, whichever is greater, of the mean of the contractor's test results for that particular lot. Comparison limits for QC average results are as follows: air voids within ± 0.5 percent, asphalt content within ± 0.2 percent, and density within ± 1.3 percent. QA CT_{Index} results shall be within ± 30 of the QC testing that falls nearest result for SuperPave and ± 60 for SMA. For the CT_{Index} test, if all QC and QA are greater than 80 for SuperPave mixes and greater than 190 for SMA mixes, then results are considered comparable. QA RT_{Index} results shall be within ± 15 percent of the QC testing that falls nearest. Further comparisons may be made by using F & t testing at a significance level of 1 percent as directed by the engineer.

403.23.1.1.3 Outliers. No test result shall be discarded, except individual test results on a lot basis may be checked for an outlier in accordance with the statistic T in ASTM E 178, at a significance level of 5 percent. If an outlier is found, material from the retained QA sample may be tested, in the presence of the engineer, to determine a replacement test value. The replacement test value shall be used in the PWL determination.

403.23.1.1.4 Roadway/Shoulder Lots. For the purpose of QLA, mixture placed on the traveled way and placed on the traveled way and shoulders integrally, shall be accounted for in a regular lot/sublot routine. Mixture placed on shoulders only shall be accounted for in a shoulder lot/sublot routine.

403.23.1.1.5 Random Sampling. For the purpose of QLA, all mixture produced at the plant and placed on the roadway shall be subject to random testing. Mainline density measurements at the

roadway shall not be taken within 6 inches of an unconfined longitudinal joint. Random samples taken in the same day may be separated by 200 tons.

403.23.2 Pay Factors. The total pay factor (PF_T) for each lot will be equal to the weighted sum of the pay factors (PF) for each pay factor item for each lot, and is determined as follows:

$$PF_T = + (0.5) PF_{\text{Density}} + (0.25) PF_{Va} + (0.25) PF_{AC}$$

The PF_T for each lot, on the shoulder or otherwise when the density pay factor is not directly included, will be equal to the weighted sum of the PF for each pay factor item for each lot, and will be determined as follows:

$$PF_T = (0.5) PF_{Va} + (0.5) PF_{AC}$$

The PF for each pay factor item for each lot will be based on the PWL_t of each pay factor item of each lot and will be determined as follows:

When PWL_t is greater than or equal to 90: $PF = 0.3 PWL_t + 73$;

When PWL_t is greater than or equal to 70 and PWL_t is less than 90: $PF = 0.5 PWL_t + 55$;

When PWL_t is less than 70: $PF = 2 PWL_t - 50$;

403.23.2.1 Density Pay Factor. The theoretical maximum specific gravity of the mixture, as determined for each subplot and the bulk specific gravity of no less than one core from each subplot, will be used to perform the QLA for the percent of theoretical maximum density. Thick cores required to be cut in half in accordance with [Sec 403.15.4](#) shall effectively double the number of sublots for cores. When density is not used as a pay factor, additional adjustment of the contract unit price will be based on the table in [Sec 403.23.8.1](#).

403.23.2.2 Asphalt Content Pay Factor. The QLA will be performed using the asphalt content test results from each lot.

403.23.2.3 Air Voids Pay Factor. Two gyratory specimens shall be compacted for each subplot and the average of the two specimens will be used to calculate the volumetrics of the subplot. The air voids shall be determined from the gyratory compacted specimens. The air voids for the QLA shall be those calculated using the average bulk specific gravity of the gyratory compacted specimens and the theoretical maximum specific gravity of the mixture determined for the subplot of material.

403.23.2.4 CT_{Index} and TSR Pay Factor. The contract unit price for each 3,000 tons or fraction thereof for all mixtures shall be adjusted based on the average CT_{Index} results for the tonnage according to the following table provided that acceptable RT_{Index} or Hamburg and TSR results are obtained. The lower adjusted contract unit price from the CT_{Index} and TSR results shall apply.

SuperPave Mixtures		
Cracking Tolerance Index (CT _{Index})	Tensile Strength Ratio (TSR) ^(a)	Percent of Contract Price
40 – 49	70 – 74 %	97%
50 – 99	75 – 84 %	100%
100 or Greater	85 % or Greater	103%
SMA Mixtures		
Cracking Tolerance Index (CT _{Index})	Tensile Strength Ratio (TSR) ^(a)	Percent of Contract Price
80 – 134	70 – 74 %	97%
135 – 239	75 – 84 %	100%
240 or Greater	85 % or Greater	103%

(a) If an approved liquid anti-strip is used, the TSR limit to receive full incentive is 80 percent.

The QLA shall be performed using each Density, % Air Void, and % Asphalt Content result within the lot.

403.23.3 Removal of Material. All lots of material with a PF_T less than 50.0 shall be removed and replaced with acceptable material by the contractor.

Any subplot of material with a percent of theoretical maximum density of less than 90.5 percent or greater than 98.5 percent shall be removed and replaced with acceptable material by the contractor. For SMA mixtures, any subplot of material with a percent of theoretical maximum density of less than 92.0 percent shall be removed and replaced with acceptable material by the contractor.

Any material with a CT_{Index} less than 40 shall be considered unacceptable material. For SMA mixtures, any material with a CT_{Index} less than 80 shall be considered unacceptable material.

Any subplot of material with air voids in the compacted specimens less than 1.5 percent or tonnage of material not meeting the minimum RT_{Index} shall be evaluated with Hamburg testing and removed and replaced with acceptable material by the contractor if the rut depth is greater than 1/2 inch at the designated number of wheel passes.

Any material with TSR results below 70 percent or minimum conditioned tensile strength below 60 psi are considered unacceptable and will be subject to removal, production shall cease, the mixture reverified, and other payfactors incentives shall not be applied.

No additional payment will be made for such removal and replacement. The replaced material will be tested at the frequencies listed in [Sec 403.19](#). Pay for the material will be determined in accordance with the applicable portions of [Sec 403.23](#) based on the replacement material.

403.23.4 Pay Factor Adjustments. Pay factor adjustments are as follows:

403.23.4.1 Unconfined Longitudinal Joint Density Adjustment. The minimum density of all traveled way pavement within 6 inches of a longitudinal joint, including the pavement on the traveled way side of the shoulder joint, shall not be less than 90.5 percent of the theoretical maximum specific gravity for SuperPave mixtures and above 92.0 percent of the theoretical maximum specific gravity for SMA mixtures. The density of the longitudinal joint when confined

will be included in the evaluation of the remainder of the mat. Pay adjustments will be in accordance with the following table and will be applied to the corresponding tonnage represented by the core(s).

Pay adjustments due to longitudinal joint density will apply to the full width of the lane paved. The average of joint cores from each subplot will determine specification compliance. If payment reductions are necessary, the lowest PF_{Total} shall apply. Adjustments due to joint density will apply to the subplot from which the cores are obtained.

Longitudinal Joint Density	
Field Density (Percent of Laboratory Max. Theoretical Specific Gravity)	Percent of Contract Unit Price
SuperPave Mixtures	
≥ 90.5	PF_{Total} not changed by longitudinal joint density
89.5 – 90.4	Maximum $PF_{Total} = 100\%$; Correction Required ^(a)
< 89.5	Remove and Replace
SMA Mixtures	
≥ 92.0	PF_{Total} not changed by longitudinal joint density
90.0 – 91.9	Maximum $PF_{Total} = 100\%$; Correction Required ^(a)
< 90.0	Remove and Replace

- (a) Correction requires spraying rapid penetrating emulsion on deficient density areas in accordance with JSP2303. All costs associated with correction shall be at the contractor's expense with no additional payment.

403.23.4.2 Smoothness Adjustment. The contract unit price for all mixes, except wedge or level course, will be adjusted in accordance with [Sec 610.5](#). The contract unit prices for asphaltic concrete pavement will be considered full compensation for all materials entering into the construction of the pavement and for the cost of the smoothness testing and correction.

403.23.4.3 Paver Mounted Thermal Profiler. The contract unit price for all mixes, except wedge or level course, will be adjusted in accordance with Sec 406. The contract unit prices for asphaltic concrete pavement will be considered full compensation for all materials entering into the construction of the pavement and for the cost of the PMTP testing and correction.

403.23.4.4 Intelligent Compaction. If Intelligent compaction is not included as a pay item in the contract, then all specification requirements and pay adjustments pertaining to Intelligent Compaction will not apply. If pay items for Intelligent Compaction are included in the contract, then all specification requirements and pay adjustments pertaining to Intelligent Compaction shall apply.

403.23.5 Aggregate Variation. Due to possible variations in the specific gravity of the aggregates, the tonnage of mixture used may vary from the proposal quantities. No adjustment in contract unit price will be made because of such variation.

403.23.6 Compacted Samples. Payment for obtaining and delivering samples of compacted mixture from the pavement and replacing the surface will be made per sample at the fixed price specified in [Sec 109](#). No direct payment will be made for samples taken for QC and QA testing.

403.23.7 Payment for Pavement Repairs (Blow-ups). Payment for repairing blow-ups will be made in accordance with [Sec 104](#).

403.23.8 Miscellaneous Applications.

403.23.8.1 Small Quantities. Small quantities are defined in [Sec 403.20.1](#). Unless the contractor has elected to use the normal evaluation in the Bituminous QC Plan for small quantities, the following shall apply for each separate mixture qualifying as a small quantity

(a) QLA and PWL shall not apply.

(b) Mixtures shall be within the specified limits for % Air Voids, % AC, and density. In addition to any adjustments in pay due to profile, the contract unit price for the mixture represented by each set of cores will be adjusted based on actual field density above or below the specified density using the following schedule:

Field Density (Percent of Laboratory Max. Theoretical Density)	Pay Factor (Percent of Contract Unit Price)
For all SP mixtures other than SMA:	
92.5 to 98.0 inclusive	100
90.5 to 92.4 inclusive	Correction ^(a)
Above 98.0 or Below 90.5	Remove and Replace
For SMA mixtures:	
>94.0	100
92.0 to 93.9 inclusive	Correction ^(a)
Above 98.0 or Below 92.0	Remove and Replace

(a) Correction requires spraying rapid penetrating emulsion on deficient density areas in accordance with JSP2303. All costs associated with correction shall be at the contractor's expense with no additional payment.

403.23.8.2 Base Widening and Entrances. For base widening mixtures and entrance work, QLA and PWL will not be required. Payment for these mixtures will be made at 100 percent of contract unit price for material that otherwise meets the specifications.

403.23.8.3 Single Lift on Unmilled Surface or Leveling Course Work. For resurfacing projects specifying a single lift on an unmilled surface, surface mixture of 3,000 tons or more, or for leveling course work, the following shall apply to the traveled way mixture. All bituminous mixture QC/QA requirements shall apply, except the density pay factor designated in [Sec 403.23.2](#) will not be directly included in the total pay factor. In lieu of that, one density sample shall be taken per subplot and the pay adjustment for density will be made using the table in [Sec 403.23.8.1](#).

3.0 Insert Sec 406 Paver-Mounted Thermal Profiles:

406 Paver-Mounted Thermal Profiles

406.1 Description. This work shall consist of continuous thermal profiling of the asphalt mat temperature behind the trailing edge of the paver screed plate during placement operations using a Paver-Mounted Thermal Profile System (PMTPS). This work shall be completed in accordance

with the general principles set forth in AASHTO R 110 "Standard Practice for Continuous Thermal Profile of Asphalt Mixture Construction", and specifically as stated in the following sections.

406.2 Required Measurements. PMTPS measurements are required on the full width of paving of each asphalt lift. Collection of data shall include shoulder pavement when placed simultaneously with the mainline. The shoulder paving data will be filtered out using Veta during data processing. PMTPS data collection is not required in the following exceptions:

- (1) PMTPS measurements are not required on auxiliary lane tapers, ramps, shoulders (not paved simultaneously with mainline), cross-overs, non-continuous turn lanes, loops, bypass lanes, acceleration/deceleration lanes, intersecting streets, roundabouts, and partial lane width widenings.
- (2) PMTPS measurements are not required for a total net paving length less than 2 lane miles.
- (3) PMTPS measurements are not required on asphalt lift thicknesses less than 1 inch.

406.3 Equipment Requirements. The PMTPS shall consist of the following components listed.

- (1) Temperature sensor to continuously monitor surface temperature of mat.
 - a. Longitudinal and lateral surface temperature readings shall be collected at 12-inch or less intervals at all paving speeds with an X-Y accuracy of plus or minus 1 inch.
 - b. Surface temperatures shall be collected for the full width paved in one pass (including any shoulders paved simultaneously with mainline).
 - c. Surface temperature sensors(s) shall have a temperature range of at least 140 F to 480 F. Sensory accuracy shall be plus or minus 3.6 F, or plus or minus 2.0 percent of sensor reading, whichever is greater.
- (2) Global Navigation Satellite System (GNSS) receiver to capture coordinates of the surface temperature readings. GNSS accuracy shall be plus or minus 2 inches or less in X and Y directions when intelligent compaction is being used. A base station shall be required at any locations having poor cellular reception to obtain required accuracy. When intelligent compaction is not being used GNSS accuracy shall be plus or minus 4 feet or less in the X and Y directions and ground distance sensor shall be within plus or minus 1/1000 feet.
- (3) Onboard data acquisition with a minimum of the following capabilities:
 - a. Displays (in real-time) map of the surface temperature readings.
 - b. Displays total distance, paver speed and location.
 - c. Reports surface temperature readings and GNSS status.
 - d. Provides real-time statistical summaries of surface temperature readings.
 - e. Allows operator to define data lot currently being placed per AASHTO PP 114.

- f. Stores data internally until data transfer.
- g. Automatically transfers data to cloud storage or other approved methods.

406.3.1 System Setup on Pavers. Pavers shall be instrumented with the PMTP system for the full paving width and shall collect measurements no less than 3 feet and no greater than 12 feet from the trailing edge of the screed plate. Other objects shall not obstruct surface temperature measurements and GNSS accuracy.

406.4 Construction Requirements.

406.4.1 Temperature Verification. Temperature verification shall follow AASHTO R110-22, Section 6 Calibration. A record of each verification shall be submitted to the SharePoint prior to the start of the project.

406.4.2 Data Management. PMTP data files shall be compatible with the Veta software. The contractor shall supply the engineer with the manufacturer's PMTPS Computer Software 14 days prior to beginning work and until ninety days after completion of all work. If Cloud Storage or Cloud Computing is used, the engineer shall be supplied one user ID with full access for the same time-period specified. If cloud storage is not used Raw PMTP data files shall be downloaded once per day and uploaded to the appropriate MoDOT IC-PMTP SharePoint site before the start of the next day's production. The following data management requirements shall apply:

- (1) The PMTP data files should be directly transferred from cloud storage to Veta. Other methods shall be approved by the engineer.
- (2) The PMTP Veta files shall be appropriately formatted and filtered in accordance with MoDOT IC-PMTP protocol.
- (3) Date and time stamp of PMTP shall be checked and verified to reflect the local time zone for both mapped and exported data.

406.4.3 Quality Control. The following shall apply to the Contractor's Quality Control for PMTP.

- (1) The contractor shall have a properly trained person listed in the QC Plan that has completed a Veta training course within the last 2 years to perform the PMTP data collection and file management for the project.
- (2) The PMTP system shall have a documented annual calibration before beginning construction.
- (3) For each run, the thermal profile shall be divided into 150-foot sublots at the full paving width and partial data sublots as follows:
 - (a) Combine partial data sublots less than 75 feet with the previous data subplot.
 - (b) Treat partial sublots greater than 75 feet as one data subplot.
 - (c) Sublots shall not extend over multiple days, different lifts, or paving directions.
- (4) Veta files shall be completed and uploaded with the appropriate naming convention in accordance with MoDOT IC-PMTPS Protocol. Appropriate naming convention can be

found in the IC-PMTP Document Helper. The completed Veta files shall have the appropriate filters applied with the summary data transferred to the Summary Report. An up-to-date Summary Report shall be provided to the engineer two days prior to the 1st and 15th of each month.

- (5) **PMTP Quality Control Plan.** A pre-activity meeting shall be required prior to mainline paving. The PMTP Quality Control Plan shall be submitted to the engineer at least 2 weeks prior to the mainline paving pre-activity meeting. The plan at minimum shall include the following:

- (a) A list of personnel previously trained
- (b) Detailed daily verification procedure for checking the RTK-GNSS of PMTP
- (c) Procedure for downloading PMTP data from the instrument
- (c) The procedure for training operators or other project staff
- (e) Detailed daily verification procedure for checking the temperature sensor on the PMTP
- (f) The name of the designated PMTP Quality Control Technician
- (g) Procedure for submitting data
- (h) Contact information for technical support staff
- (i) Anticipated cellular service and GNSS coverage throughout entire project
- (j) A list of the control points with either UTM or State Plane Coordinates established by the contractor if a base station is required.

406.4.4 Quality Assurance (QA) Testing. The Engineer will use a Forward Looking InfraRed (FLIR) camera to verify the contractor's PMTP system. QA tests shall be taken at random locations twice per day. The contractor shall assist the engineer with the placement of the event marker.

The QA tests using the FLIR data QA tool shall compare favorably, according to the instructions found in the IC-PMTP Document Helper. If results do not compare favorably, the contractor's PMTPS shall be verified by the manufacturer. In the case that the PMTPS is required to be sent off to the manufacturer and the contractor is not able to provide a replacement, the contractor will be allowed to continue paving with the verification by the engineer using a FLIR camera for acceptance only.

406.4.5 Thermal Segregation. Thermal segregation will be calculated by using the Differential Range Statistics (DRS) under the parameters of AASHTO R110 in each 150-foot subplot.

The Veta analysis with the appropriate filters applied shall exclude the following surface temperature readings from each subplot:

- (1) Surface temperature readings less than 180 F.
- (2) Surface temperature readings within 2 feet. prior to and 8 feet. after paver stops that are greater than 1 minute in length.

The thermal segregation categories are based on the Differential Range Statistics (DRS), as shown in the table below.

Differential Range Statistics (DRS)	Thermal Segregation Category
$DRS \leq 25.0^{\circ}F$	Low
$25^{\circ}F < DRS \leq 35^{\circ}F$	Moderate
$35^{\circ}F < DRS \leq 50^{\circ}F$	Moderate-High
$DRS \geq 50^{\circ}F$	Severe

406.4.6.1 Incentive/Disincentive. Incentive/disincentive adjustments shall be made for each subplot in accordance with the following:

Thermal Segregation Category	Adjustment per 150 ft. Sublot
Low	\$40 Incentive
Moderate	\$40 to \$0 Incentive (Linear)
Moderate-High	\$0 to -\$40 Disincentive (Linear)
Severe	-\$40 Disincentive and Reviewed by Engineer

406.5 Loss of Data. If data collection ceases as a result of circumstances reasonably beyond the control of the contractor, the contractor will be allowed to continue the days paving, but the paved sublots will not be eligible for 406 PMTP Incentive. The engineer shall be notified immediately of the issue and shall determine if the contractor has made a reasonable effort to resolve the issue. A meeting with the engineer shall be held to determine how to proceed if the issue is expected to extend into the next day's paving. Failure to notify the engineer of the issue at hand will result in the paved sublots to receive a minus \$40 deduct.

406.5.1 GNSS Obstructions. Isolated areas of GNSS obstruction may be filtered out of Veta at the contractor's choice. These areas shall be identified in Veta and brought to the attention of the Engineer. Areas excluded from GPS obstruction shall not exceed approximately 5 percent of the total day's production. It is at the discretion of the engineer to determine if the area exceeds an approximate 5 percent.

406.6 Basis of Payment. No direct payment will be made for compliance with this provision.

K. Non-Tracking Tack JSP-24-02A

1.0 Description. This work requires application of tack in accordance with Sec 407 and prevention of tack loss from the surface as specified herein. Tack loss prevention shall be accomplished with successful usage of a MoDOT-approved non-tracking tack, or other acceptable non-tracking means, as approved by the engineer.

2.0 MoDOT-Approved Non-Tracking Tack. A list of MoDOT-approved non-tracking tack products is available at MoDOT.org under the Materials Qualified List. Upon request from the contractor, the MoDOT Division of Construction & Materials will consider allowance of other non-tracking products. To be approved, the contractor must successfully demonstrate that the proposed product meets the non-tracking requirements specified in section 3.0. The location of a contractor demonstration will only be allowed in areas approved by the engineer. The engineer will make final determination of product acceptance based on observation of the results of the contractor's demonstration.

2.1 Products on the Qualified List have demonstrated successful non-tracking performance on previous projects; however, the Commission does not endorse nor guarantee success of any of the listed products. Success is dependent on the contractor choosing a product that can achieve the desired results while also taking into consideration all factors, including, but not limited to, cure time, weather conditions, surface prep, surface type, material properties, and adherence to manufacturer's instructions. The contractor is responsible for monitoring adherence of the tack to the pavement surface and shall cease operations when tack first begins to show signs of not meeting the requirements of Section 3.0. Corrective action shall be made prior to resuming tacking operations.

3.0 Non-Tracking Requirements. Non-tracking tack shall remain adhered to the pavement surface when exposed to any wheeled or tracked vehicles. The tack shall not track off the surface within 30 minutes of being applied, and shall not stick to the tires, tracks or other parts of paving equipment or vehicles such that the underlying surface becomes visible or void of tack prior to the placement of the hot mix asphalt. The tack shall not track onto any adjacent lanes, pavement markings, driveways, sideroads, etc.

3.1 The contractor shall be responsible for cleaning all tracked tack from adjacent lanes, driveways, sideroads, etc., and shall replace all pavement markings that become coated with tracked tack. This cleaning and replacement requirement applies to both approved and proposed non-tracking products.

4.0 Basis of Payment. Measurement and payment shall be in accordance with Sec 407. The accepted quantity of non-tracking tack coat will be paid for per gallon at the contract unit price for 407-10.07 Tack Coat – Non-Tracking, per gallon. No additional payment will be made for the cost to demonstrate proposed products, for cleaning surfaces due to tracking of tack, or for replacement of pavement marking damaged by tracked tack.

L. Lump Sum Temporary Traffic Control JSP-22-01B

1.0 Delete Sec 616.11 and insert the following:

616.11 Method of Measurement. Measurement for relocation of post-mounted signs will be made to the nearest square foot of sign area only for the signs designated for payment on the plans. All other sign relocations shall be incidental. Measurement for construction signs will be made to the nearest square foot of sign area. Measurement will be made per each for each of the temporary traffic control items provided in the contract.

616.11.1 Lump Sum Temporary Traffic Control. No measurement will be made for temporary traffic control items grouped and designated to be paid per lump sum. The list of lump sum items provided in the plans or contract is considered an approximation and may be subject to change based on field conditions. This is not a complete list and may exclude quantities for duplicate work zone packages used in simultaneous operations. The contractor shall provide all traffic control devices required to execute the provided traffic control plans for each applicable operation, stage, or phase. No measurement will be made for any additional signs or devices needed except for changes in the traffic control plan directed by the engineer.

2.0 Delete Sec 616.12 and insert the following:

616.12 Basis of Payment. All temporary traffic control devices authorized for installation by the engineer will be paid for at the contract unit price for each of the pay items included in the contract. Whether the devices are paid individually, or per lump sum, no direct payment will be made for the following:

- (a) Incidental items necessary to complete the work, unless specifically provided as a pay item in the contract.
- (b) Installing, operating, maintaining, cleaning, repairing, removing, or replacing traffic control devices.
- (c) Covering and uncovering existing signs and other traffic control devices.
- (d) Relocating temporary traffic control devices, including permanent traffic control devices temporarily relocated, unless specifically included as a pay item in the contract.
- (e) Worker apparel.
- (f) Flaggers, AFADs, PFDs, pilot vehicles, and appurtenances at flagging stations.
- (g) Furnishing, installing, operating, maintaining, and removing construction-related vehicle and equipment lighting.
- (h) Construction and removal of temporary equipment crossovers, including restoring pre-existing crossovers.
- (i) Provide and maintaining work zone lighting and work area lighting.

616.12.1 Lump Sum Temporary Traffic Control. Traffic control items grouped together in the contract or plans for lump sum payment shall be paid incrementally per Sec 616.12.1.1. Alternately, upon request from the contractor, the engineer will consider a modified payment schedule that more accurately reflects completion of traffic control work. No payment will be made for any additional signs or devices needed except for changes in the traffic control plan directed by the engineer. Additional items directed by the engineer will be paid for in accordance with Sec 109.4. No adjustment to the price will be made for overruns or underruns of other work or for added work that is completed within existing work zones.

616.12.1.1 Partial payments. For purposes of determining partial payments, the original contract amount will be the total dollar value of all original contract line items less the price for Lump Sum Temporary Traffic Control (LSTTC). If the contract includes multiple projects, this determination will be made for each project. Partial payments will be made as follows:

- (a) The first payment will be made when five percent of the original contract amount is earned. The payment will be 50 percent of the price for LSTTC, or five percent of the original contract amount, whichever is less.
- (b) The second payment will be made when 50 percent of the original contract amount is earned. The payment will be 25 percent of the price for LSTTC, or 2.5 percent of the original contract amount, whichever is less.

(c) The third payment will be made when 75 percent of the original contract amount is earned. The payment will be 20 percent of the price for LSTTC, or two percent of the original contract amount, whichever is less.

(d) Payment for the remaining balance due for LSTTC will be made when the contract has been accepted for maintenance or earlier as approved by the engineer.

616.12.1.2 Temporary traffic control will be paid for at the contract lump sum price for Item:

Item No.	Description	Unit
616-99.01	Misc. Lump Sum Temporary Traffic Control	Lump Sum

M. ADA Compliance and Final Acceptance of Constructed Facilities JSP-10-01C

1.0 Description. The contractor shall comply with all laws pertaining to the Americans with Disabilities Act (ADA) during construction of pedestrian facilities on public rights of way for this project. An ADA Checklist is provided herein to be utilized by the contractor for verifying compliance with the ADA law. The contractor is expected to familiarize himself with the plans involving pedestrian facilities and the ADA Post Construction Checklist prior to performing the work.

2.0 ADA Checklist. The contractor can locate the ADA Checklist form on the Missouri Department of Transportation website:

<https://www.modot.org/forms-contractor-use>

2.1 The ADA Checklist is not to be considered all-inclusive, nor does it supersede any other contract requirements. The ADA checklist is a required guide for the contractor to use during the construction of the pedestrian facilities and a basis for the commission's acceptance of work. Prior to work being performed, the contractor shall bring to the engineer's attention any planned work that is in conflict with the design or with the requirement shown in the checklist. This notification shall be made in writing. Situations may arise where the checklist may not fully address all requirements needed to construct a facility to the full requirements of current ADA law. In those situations, the contractor shall propose a solution to the engineer that is compliant with current ADA law using the following hierarchy of resources: 2010 ADA Standards for Accessible Design, Draft Public Rights of Way Accessibility Guidelines (PROWAG) dated November 23, 2005, MoDOT's Engineering Policy Guidelines (EPG), or a solution approved by the U.S. Access Board.

2.2 It is encouraged that the contractor monitor the completed sections of the newly constructed pedestrian facilities in attempts to minimize negative impacts that his equipment, subcontractors or general public may have on the work. Completed facilities must comply with the requirements of ADA and the ADA Checklist or have documented reasons for the non-compliant items to remain.

3.0 Coordination of Construction.

3.1 Prior to construction and/or closure on an existing pedestrian path of travel, the contractor shall submit a schedule of work to be constructed, which includes location of work performed, the duration of time the contractor expects to impact the facility and an accessible signed pedestrian

detour compliant with MUTCD Section 6D that will be used during each stage of construction. This plan shall be submitted to the engineer for review and approval at or prior to the pre-construction conference. Accessible signed detours shall be in place prior to any work being performed that has the effect of closing an existing pedestrian travel way.

3.2 When consultant survey is included in the contract, the contractor shall use their survey crews to verify that the intended design can be constructed to the full requirements as established in the 2010 ADA Standards. When 2010 ADA Standards do not give sufficient information to construct the contract work, the contractor shall refer to the PROWAG.

3.3 When consultant survey is not included in the contract, the contractor shall coordinate with the engineer, prior to construction, to determine if additional survey will be required to confirm the designs constructability.

4.0 Final Acceptance of Work. The contractor shall provide the completed ADA Checklist to the engineer at the semi-final inspection. ADA improvements require final inspection and compliance with the ADA requirements and the ADA Checklist. Each item listed in the checklist must receive either a "YES" or an "N/A" score. Any item receiving a "NO" will be deemed non-compliant and shall be corrected at the contractor's expense unless deemed otherwise by the engineer. Documentation must be provided about the location of any non-compliant items that are allowed to remain at the end of the construction project. Specific details of the non-compliant items, the ADA requirement that the work was not able to comply with, and the specific reasons that justify the exception are to be included with the completed ADA Checklist provided to the engineer.

4.1 Slope and grade measurements shall be made using a properly calibrated, 2 foot long, electronic digital level approved by the engineer.

5.0 Basis of Payment. The contractor will receive full pay of the contract unit cost for all sidewalk, ramp, curb ramp, median, island, approach work, cross walk striping, APS buttons, pedestrian heads, detectible warning systems and temporary traffic control measures that are completed during the current estimate period as approved by the engineer. Based upon completion of the ADA Checklist, the contractor shall complete any necessary adjustments to items deemed non-compliant as directed by the engineer.

5.1 No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, or time required to fulfill the above provisions, unless specified elsewhere in the contract documents.

N. ADA Material Testing Frequency Modifications JSP-23-01A

1.0 Description. This provision revises the Inspection and Testing Plan (ITP) for the construction of ADA compliant features to better match the nature of the work. The minimum Quality Control (QC) testing frequencies shall be as stated in these provisions.

2.0 Compaction Test on Base Rock Under Sidewalk, Curb Ramps and Paved Approaches. (Revises ITP Sec 304.3.4) The required test frequency shall be one per 600 tons.

3.0 Gradation Test on Base Rock Under Sidewalk, Curb Ramps and Paved Approaches. (Revises ITP Sec 304.4.1) The required frequency shall be one per 500 tons.

4.0 Concrete Plant Checklists. (Revises ITP Sec 501) Submittal of the 501 Concrete Plant Checklist shall be once per week when the contractor is only pouring curb, sidewalk, paved approaches, and curb ramps.

5.0 Concrete Median, Median Strip, Sidewalk, Curb Ramps, Steps and Paved Approaches. The required frequency shall remain as stated in ITP Sec 608 and further detailed in Sec 608.3.7.

6.0 Concrete Curb. (Revises ITP Sec 609 only for Concrete Curb) For concrete curb, the required frequency shall be equivalent to ITP Sec 608 (concrete median, median strip, sidewalk, curb ramps, steps, and paved approaches), and Sec 608.3.7.

O. ADA Compliant Moveable Barricade

1.0 Description. The work shall consist of providing moveable barricades to satisfy the requirements of the pedestrian traffic control plans as shown in the bidding documents. The contractor will be responsible for moving the pedestrian barricades to coincide with their planned order of work.

2.0 Construction Requirements. The contractor shall use a moveable barricade that meets the requirements as established by the ADA. The pedestrian barricades shall be of self-supporting type having a minimum length of 6 feet per unit. The face of the barricade shall not extend into adjacent sidewalk considered open for pedestrian use. The contractor will be responsible for setting and maintaining the pedestrian barricades until all the proposed improvements have been constructed.

3.0 Method of Measurement. Measurement for ADA Compliant Moveable Barricade will be made per each for each 6 feet (min.) unit provided.

4.0 Basis of Payment. Payment for all work necessary to fulfill the requirements noted above will be considered completely covered in the contract unit price for Pay Item No. 616-99.02 ADA Compliant Moveable Barricade, per each. No direct payment will be made for any necessary relocation of the ADA Compliant Moveable Barricade.

P. Linear Grading for ADA Facilities

1.0 Description. This work shall consist of altering the existing roadside features to the required grade and cross sections shown on the plans (if applicable), or to comply with typical sections, running slopes, drop-off and side-slope standards, consistent with the guidelines set forth in the Americans with Disabilities Act (ADA). This work shall be in accordance with Sections 202 and 207 and accompanying provisions except as modified herein.

2.0 Construction Requirements. The roadside shall be brought to the required grade and cross section as established in Section 1.0 of this provision, to a uniform appearance, free of sharp breaks or humps. Minor deviations will be allowed, to take advantage of favorable topography, as approved by the engineer.

2.1 The contractor shall remove all existing roadside improvements necessary to facilitate the new sidewalk and curb ramp construction, along with any other roadside removal items at, or

adjacent to the pedestrian pathway, as noted in the plans or as approved by the engineer. This shall include the removal and/or saw cutting at existing raised islands or median strips to construct the pedestrian pathway. The contractor shall pay special care to existing utility facilities to be used in place or relocated by others.

2.2 The contractor shall be responsible for all excavation and embankment work necessary to facilitate construction of new ADA compliant facilities; normally consisting of subgrade and subsequent finished grading for sidewalks, curbs, curb ramps; and may include miscellaneous grading work for items such as ditches, entrances, paved approaches, driveways and pipes, at or adjacent to proposed new sidewalk facilities.

2.3 By this provision, it may be necessary to excavate, stockpile, and haul some material within the project limits. Due to staging and/or Right-of-Way constraints, it may be necessary to waste unusable material off Right-of-Way, and/or haul a replacement volume of material back to achieve the desired grades.

2.4 All removals of Portland or Asphaltic Concrete performed under this provision will require saw-cutting a neat/clean edge along the removal lines at no direct pay, unless otherwise provided for in the contract.

3.0 Method of Measurement. Measurement of Linear Grading for ADA Facilities will be made along the length of the new sidewalk and/or curb ramp installed, along each side of the roadway where sidewalk work is to be performed, and along the centerline length of each driveway, entrance, or paved approach as shown on the plans. Measurement will be made to the nearest 1-foot for each sidewalk work area, totaled, and paid to the nearest 1-foot for final pay. Final field measurement will not be required except where appreciable errors are found, or authorized changes have been made.

4.0 Basis of Payment. The accepted quantities of Linear Grading for ADA Facilities will be paid for at the contract unit price for item 207-99.03, Linear Grading for ADA Facilities, Linear Foot, and will be considered as full compensation for all labor, equipment, material, waste fees, disposal agreements, material acquisition, or other construction costs involved to complete the described work.

4.1 No direct payment will be made for "REMOVAL OF IMPROVEMENTS" associated with the removal and disposal of sidewalks, curbs, curb ramps, entrances, and other incidentals required for construction of the new sidewalk and/or curb ramps.

Q. Curb Ramps and Sidewalk

1.0 Description. Construction of concrete curbs, aprons, curb ramps, transition areas, sidewalk and landings shall be in accordance with applicable portions of Sections 608 & 609 of the Standard Specification and Standard Plans for Highway Construction 608.10, as shown on the plans, and meet ADA requirements.

2.0 Construction Requirements. This work shall include, but is not limited to, sidewalk construction including landings, joint construction, aggregate base, compaction, apron modifications, transition area, curb ramp construction, Type S Curb or Type A Curb installation (as required), tie bars or dowel bars (as required), clean-up, etc. for each location shown on the plans.

The following requirements shall be applicable to construction of this project:

- Existing curb, curb and gutter, sidewalk, shoulders, etc. that are adjacent to a designated curb ramp and/or sidewalk improvement area that is damaged during construction shall be replaced/repared to match existing materials and condition.
- Variable height curb along the roadside may be constructed monolithic or separate depending on construction operations. Integral curb shall be doweled to the existing gutter or pavement. - Integral or Type S-curb shall be used along the existing right-of-way when constructing curb ramps as shown on the plans. The cost of the curb is included in pay limits of the curb ramp.
- The transition area shall be 8" thick and tied to the existing roadway pavement and existing paved approach or sidewalk it is matching.
- Curing compound for all concrete construction shall be a clear or translucent color. The white pigmented option or other colored compound will not be allowed.
- Adjacent grass areas, landscaping, irrigation systems (lines, sprinkler heads, control boxes), pavement, etc. disturbed by curb ramp or sidewalk construction shall be repaired or replaced to match or exceed existing conditions.
- Sod quantities are included for adjacent areas. More or less sod may be required depending on actual field conditions.

3.0 Method of Measurement. Curb ramps and concrete sidewalk will be measured to the nearest 1/10 square yard. Measurement of incidental items required to complete all aspects of construction for the above noted items at each new curb ramp and sidewalk location will not be made individually unless specified elsewhere in the contract.

4.0 Basis of Payment. All costs incurred by the contractor by reason of compliance to satisfy the above requirements will be considered incidental to and completely covered by the contract unit price for each of the pay items within the contract.

R. Optional Pavements JSP 06-06H

1.0 Description. This work shall consist of a pavement composed of either Portland cement concrete or asphaltic concrete constructed on a prepared subgrade. This work shall be performed in accordance with the standard specifications and as shown on the plans or established by the engineer.

2.0 The quantities shown reflect the total square yards of pavement surface designated for each pavement type as computed and shown on the plans.

2.1 No additional payment will be made for asphaltic concrete mix quantities to construct the required 1:1 slope along the edge of the pavement, or for tack applied between lifts of asphalt.

2.2 No additional payment will be made for aggregate base quantities outside the limits of the final surface area as computed and shown on the plans. When A2 shoulders are specified, payment for aggregate base will be as shown on the plans.

2.3 The grading shown on the plans was designed for the thicker pavement option. For projects with grading in the contract, there will be no adjustment of the earthwork quantities due to adjusting the roadway subgrade for optional pavements.

2.4 The contractor shall comply with Sections 401 through 403 for the asphalt option and Sections 501 and 502 for the concrete option.

2.5 Pavement options composed of Portland cement concrete shall have contrast pavement marking for intermittent markings (skips), dotted lines, and solid intersection lane lines. The pavement markings shall be in accordance with Section 620. No additional payment will be made for the contrast pavement markings.

3.0 Method of Measurement. The quantities of concrete pavement will be measured in accordance with Section 502.14. The quantities of asphaltic concrete pavement will be measured in accordance with Section 403.22.

4.0 Basis of Payment. The accepted quantity of the chosen option will be paid for at the contract unit bid price for Item 401-99.05, Optional Pavement, per square yard.

4.1 For projects with previously graded roadbeds, any additional quantities required to bring the roadway subgrade to the proper elevation will be considered completely covered by the pay item for Subgrading and Shouldering.

4.2 Price Adjustment for Fuel. If the contractor accepts the option for fuel adjustment in the bid proposal, a fuel adjustment will be applied in accordance with Sec 109.14 for the type of pavement constructed.

S. Removal and Delivery of Existing Signs JSP-12-01C

1.0 Description. All Commission-owned signs removed from the project shall be disassembled, stored, transported, and disposed of as specified herein. Sign supports, structures and hardware removed from the project shall become the property of the contractor.

2.0 Disassembly and Delivery.

2.1 All Commission-owned signs, (excluding abandoned billboard signs), designated for removal in the plans, or any other signs designated by the Engineer, shall be removed from the sign supports and structures, disassembled, stored, transported, and delivered by the contractor to the recycling center for destruction.

2.2 The contractor shall coordinate and make arrangements with the recycling center for delivery of the signs. Sign panels shall be disassembled and/or cut into sizes as required by the recycling center.

2.3 The contractor shall provide the Engineer with a "Sign Delivery Certification" attesting to completion of delivery of all existing sign material from the project to the recycler. In addition, the contractor shall provide to the Engineer a final "Sign Certification of Destruction" from the recycler that documents the total pounds of scrap sign material received from the project and attests that all such material will not be re-purposed and will be destroyed in a recycling process. The

contractor can locate the required certification statements from the Missouri Department of Transportation website:

<https://www.modot.org/forms-contractor-use>

2.4 Funds received from the disposal of the signs from the recycling center shall be retained by the Contractor.

3.0 Basis of Payment. All costs associated with removing, disassembling and/or cutting, storing, transporting, and disposing of signs shall be considered as completely covered by the contract unit price for Item No. 202-20.10, "Removal of Improvements", per lump sum.

T. Disposition of Existing Signal/Lighting and Network Equipment JSP-15-05A

1.0 Description. All controllers, cabinets, cabinet equipment, network equipment, DMS equipment, antennas, radios, modems, and other equipment noted in the plans shall be removed by the contractor and delivered to the following location:

Alejandro Martinez
600 NE Colbern Rd.
Lee's Summit, MO 64086
Phone number: 816-835-5607

2.0 Signal Equipment. All equipment other than network communication devices noted in 3.0 are to be transported to the address listed above. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling the phone number listed above and ask for the field traffic supervisor.

3.0 Network Communication Devices. Devices such as CCTV cameras and domes, video encoders, device servers, Ethernet switches, media converters, and radio assemblies are to be transported to the address listed below. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling phone number listed below and providing details for the delivery.

Alejandro Martinez
600 NE Colbern Rd.
Lee's Summit, MO 64086
Phone number: 816-835-5607

4.0 The contractor shall exercise reasonable care in the handling of the equipment during the removal and transportation. Should any of the equipment be damaged by the contractor's negligence, it shall be replaced at the contractor's expense. The contractor shall dispose of any other equipment. Delivery shall be within 2 working days of removal. All items returned shall be tagged with the date removed, project number and location/intersection.

5.0 Basis of Payment. Payment for removal, handling and transportation of all equipment specified shall be considered completely covered by the contract unit price for 202-20.10, Removal of Improvements, per lump sum.

U. Tree Clearing Restriction JSP-07-05C

1.0 Description. The project is within the known range of the federally endangered Indiana bat, northern long-eared bat, and proposed endangered tricolored bat. These bats are known to roost in trees with suitable habitat characteristics during summer months.

1.1 MoDOT has determined that suitable trees for one or more of these bat species exist within the project area.

1.2 To avoid negative impacts to these bat species, removal of any trees/limbs greater than three (3) inches in diameter shall only occur between October 16 and March 31.

2.0 Basis of Payment. No direct pay shall be provided for any labor, equipment, time, or materials necessary to complete this work.

V. KC District Video Detection System

1.0 Description. The Contractor shall furnish and install all equipment, materials, software and other miscellaneous items that are required to provide a fully functional Video Detection System for the control of bicycle and vehicular traffic signals.

2.0 Material. The video detection system shall consist of power supply, hard-wired video cameras, all necessary video and power cabling with end connectors, mounting brackets, surge protection as recommended by the manufacturer, video detection processors/extension modules capable of processing the number of camera and phase combination video sources shown on the project plans. The video detection system will be defined as the complete assembly of all required equipment and components for detection of vehicles. Each video detection system shall consist of the video camera(s), lightning arrester for video cabling, processor unit(s), control device (mouse or keypad;), software and license for system control via a computer or USB (if applicable), communication components, and a color monitor. All camera views shall be obtainable without requiring the disconnection and reconnection of cables within the system. The video detection systems in the list below are the only systems that are tested, fully functional, and approved for use in the Kansas City District:

1. **Autoscope Vision**
2. **Autoscope OptiVu**
3. **Iteris Vantage Vector**

3.0 Installation Requirements. The video detection system shall be installed per the manufacturer's recommendations. The installer shall be certified by the video detection system's manufacturer to install the system. All coaxial and ethernet cable runs (if used) shall be continuous without a splice from the cabinet to the camera. If requested by the engineer, a factory certified representative from the supplier shall be available for on-site assistance for a minimum of one day during installation.

A separate grounded 120 VAC service outlet shall be provided in the controller cabinet for supplying power to the parts of the video detection system requiring AC power. Use of the grounded service outlet located on the cabinet door will not be permitted.

3.1 Detection Zones. The detection zones shall be created by drawing the detection zones on the video image (minimum 2 zones). A graphical user interface shall be built into the video detection system and displayed on a video monitor or computer. It shall be possible to edit previously defined detector configurations to fine-tune detection zone placement. When a vehicle is detected by crossing a detection zone, there shall be a visual change on the video display, such as a flashing symbol or a change in color or intensity to verify proper operation of the video detection system.

The video detection system shall have a method to send and receive communications from the system to a central location. It should be able to obtain a live video image and configured detection zones. The user should have the ability to change detection zones and detection settings in real time from the central location. The system shall be able to have re-addressable IP addresses.

3.2 Performance. Overall performance of the video detection system shall be comparable to inductive loops. Using camera optics and in the absence of occlusion, the video detection system shall be able to detect vehicle presence with 98% accuracy under normal day and night conditions with only slight deterioration in performance under adverse weather conditions, including fog, snow and rain. When visibility exceeds the capabilities of the camera, the video detection system shall default to placing a call on all detectors. Supportive documentation is required to meet this specification and shall be provided to the Engineer before installation.

3.3 Vehicle Data. In addition to presence detection, the video detection system shall be capable of performing at a minimum the following calculations in real time and store all values for each camera view for any visible lane without the addition of another device:

- a) Speed
- b) Volume
- c) Lane Occupancy
- d) Vehicle Classification
- e) Other available performance measures

For speed calculations thru movements are required. Turning movement measurements are desired but not required. For volume measurements/calculations both mainline thru and all turning movements are required. All values are to be assigned to detector channels within the controller. If this requirement cannot be met, all values shall be exported thru an excel spreadsheet. Other performance measures must be clearly defined. In all cases, all performances measures must be ultimately available in an easily usable, exportable format (USB, Ethernet, or built Wi-fi Computer). The contractor shall provide documentation to the Engineer to confirm the volumes are configured and operational through the video detection system.

3.4 Monitor. The monitor shall be an LCD active matrix with a minimum 7" diagonal screen color monitor, an NTSC-M system, HDMI, VGA, and BNC video in-out connections built into the housing. The unit shall be compact and lightweight, with a stand on the cabinet shelving, have low power consumption, constructed to operate under extreme temperature conditions, and run on AC power. AC adaptor shall be included. The monitor shall be installed to automatically power on when the cabinet door is opened and automatically power off when the cabinet door is closed. A manual on/off switch shall be provided.

3.5 Video Camera and Housing. The camera shall produce a high definition (HD) color video image of vehicles during daylight hours, with an optional production of black and white images

during nighttime hours. The camera shall be able to detect a minimum of 500 ft in advance of the signal. Detection shall work properly during night hours without the need of additional luminaire lighting at the signal. The video shall produce a clear image for scenes. The camera shall include an electronic shutter or auto iris control based on average scene luminance and shall be equipped with an auto iris lens, as well as sun shield that prevents sunlight from directly entering the lens. The sun shield shall include a provision for water diversion to prevent water from flowing in the camera field of view and shall be able to slide forward and back. The total weight of the enclosure, camera, lens, housing, sun shield and mounting bracket shall be less than 10 pounds.

3.6 Video Detection System Connections. The system shall be able to connect through computer or mouse/video for configuring the detection zones. The equipment shall be provided with a NEMA TS2 interface as shown on the plans.

At a minimum, each lane of traffic shall be able to have its own output. A minimum of 32 detector outputs is required for the system but should be capable of expanding to 64 outputs if required based on the geometry of the intersection.

The contractor shall be responsible for any changes or additions to either an existing or new cabinet in order to provide a properly functional video detection system and monitor display. This may include, but is not limited to, additional SDLC connectors, shelf relocation and component reorganization. No direct pay for any changes or additions. All required connections will be considered part of the video detection system installation.

3.7 Warranty of Video Detection System. The video detection system including cameras shall be warranted to be free of defects in material and workmanship for a minimum of 3 years. During the warranty period, technical support from factory certified personnel or factory certified installers shall be available from the supplier. Ongoing software support by the supplier shall include updates for the processor unit and computer software and shall be provided at no cost during the warranty period. The update of the processor unit software to be NTCIP compliant shall be included.

4.0 Construction Requirements. Construction requirements shall conform to Sec 902.

5.0 Documentation and Testing. The contractor shall provide one bound copy for the signal cabinet and one pdf version of the user's manual.

6.0 Method of Measurement. Method of measurement shall conform to Sec 902.

7.0 Training. MoDOT may require training on the maintenance and operation of the detection system. Maintenance and operation personnel shall be trained on troubleshooting, maintenance and repair of cameras and all serviceable equipment. Training shall include field level troubleshooting and bench repair. This training shall be for a minimum of sixteen hours over two days. Training shall be conducted at a time and location mutually agreeable by the contractor and the signal shop traffic supervisor or as directed by MoDOT.

7.1 Basis of Payment. Measurement and payment for work covered by this specification shall include all equipment, tools, labor, programming and materials necessary and shall be paid at the contract unit price as follows:

Item No.	Description	Unit
902-99.02	KC District Video Detection System	EA

W. NEMA TS2/EV Cabinet Assembly (Without Controller)

1.0 Description. The cabinet assembly shall meet, as a minimum, all applicable sections of the latest revisions as found in the NEMA TS2 Standard Publication and sections 902 and 1092 of the Missouri Standard Specifications for Highway Construction Manual. Where differences occur, this specification shall govern.

2.0 Materials.

2.1 EV Cabinet. The cabinet shall be constructed from aluminum with a minimum thickness of 0.125 inches. The cabinet shall be designed and manufactured with materials that will allow rigid mounting, whether intended for pole, base or pedestal mounting. All mounting points where the cabinet is bolted to the foundation shall be reinforced at the factory by welding in an additional layer of material equal to the thickness of the material that the cabinet is constructed from. Triangular gussets are also required when the base plate and cabinet walls are welded together vs. continuous rolled material. A rain channel shall be incorporated into the design of the main door opening to prevent liquids from entering the enclosure. All external hardware shall be stainless steel. The cabinet exterior shall be supplied with a natural aluminum finish. Unless otherwise specified, the interior of the cabinet shall be white. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be free from weld flash. Welds shall be smooth, neatly formed, free from cracks, blowholes and other irregularities. All sharp edges shall be ground smooth. The cabinet shall be equipped with (2) lifting brackets for installation and removal purposes.

2.2 Cabinet Doors. The cabinet shall include a front door of NEMA type 3R construction with rain tight gaskets. A stiffener plate shall be welded across the inside of the main door to prevent flexing. Doors shall include a mechanism capable of holding the door open at approximately 90 and 165 degrees under windy conditions. Manual placement of the mechanism shall not be required by field personnel. Only the main door shall have ventilation louvers. A plaque designation "Traffic Control" shall be affix to each main cabinet door.

2.3 Door Alarm. The front and rear doors shall be equipped with switches wired to the traffic signal controller alarm with 1 input for logging and reporting of a door open condition.

2.4 Shelves. No less than (2) shelves shall be provided and each shall have the ability to be independently removed, relocated, and adjusted. The front edge of each shelf shall have holes predrilled at a spacing of no greater than 8 inches to accommodate tie-wrapping to secure cables/harnesses.

2.5 Mounting Rails. A minimum of one set of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The channels shall accommodate spring mounted nuts or studs. All mounting rails shall extend to within 7 inches of the top and bottom of the cabinet.

2.6 Pull-out Drawer. The cabinet shall be equipped with a pull-out drawer/shelf assembly. A 1½ inch deep drawer shall be provided in the cabinet, mounted directly beneath the controller support shelf. The drawer shall have a hinged top cover and shall be capable of accommodating one complete set of cabinet prints and manuals. This drawer shall support 50 pounds in weight when fully extended. The drawer shall open and close smoothly. The drawer dimensions shall make

maximum use of available depth offered by the controller shelf and be a minimum of 18 inches wide.

2.7 Police Door. The police door shall contain only (1) switch used for flash/auto operations. The ability to turn field indications off from the police panel will not be permitted.

2.8 Lighting. The cabinet shall include no less than (3) field replaceable LED light assemblies along the top and sides of the cabinet. The LED panels shall be controlled by a manually activated toggle switch on the tech panel.

2.9 Fans/Ventilation. The components of the system as well as the CFM requirements shall be in compliance with the MoDOT 902 & 1092 specifications. A minimum of 2 fans shall be required.

2.10 Heater. The cabinet shall be supplied with a 200-Watt fan heater with thermostat control that is designed to protect electronics from the effects of low temperatures such as corrosion, freezing or condensation, which can damage critical components within a control enclosure. Housing shall be constructed of aluminum. Overall dimensions including mounting areas shall be approximately: 4-inch depth, 4 inch width, 5.50 inch height.

2.11 Switch Guards. All switches shall include switch guards. All switches shall be clearly labeled.

2.12 Receptacles and power strip(s). One 8-outlet IP addressable industrial surge protected power strip shall be provided. The installation of the power strip shall be included in the cost of the cabinet assembly. The main door tech panel shall contain a 15-amp duplex GFI receptacle. A separate grounded service outlet shall be provided in the controller cabinet for supplying power to the video detection monitor. The monitor shall be installed to automatically power on when the cabinet door is opened and automatically power off when the cabinet door is closed. The use of the grounded service outlet located on the cabinet door will not be permitted for this function. A manual on/off switch shall also be provided and mounted to the main door tech panel.

2.13 16-Position Back Panel Wiring. All new signal cabinets shall have a 16-position load switch back panel and conform to the following specifications. Regardless of the number of phases specified on the plans, all load switch positions shall be completely wired for use. The load switch back panel shall be configured for NEMA Configurations designated on the signal plans. All wiring of FYA should be wired in mode G. The MMU2 should also be configured in mode G. Vehicle phases (1 thru 8), pedestrian phases (position 9-12) and overlaps (position 12–16) (including FYA configurations), shall be wired such that it shall work with an MMU2. The MMU2 shall come with an ethernet port. The cabinet shall include both a DT panel and a CTB (SDLC) panel with 6 harnesses.

2.14 Intersections with Video Detection. For intersections with video detection, the cabinet shall be wired to automatically power on the video monitor when the cabinet door is open.

2.15 Load Switch. The front of the load switch shall be provided with (3) indicators to show the input signal from the controller to the load switch and (3) indicators to show the output to the field devices. The full complement of load switches shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

2.16 SDLC. All connection points shall be protected by a BIU 15 pin surge suppressor used for the protection of any devices on Port 1 Synchronous Data Link Control (SDLC). Each cabinet

shall be provided with a SDLC hub assembly and (6) SDLC cables unless otherwise noted on the order form. All mechanical connections shall be soldered.

2.17 Surge Protection. Surge protection shall be a modular plug-in type product as listed in the MoDOT Traffic APL.

2.18 AC line filter. The AC line filter shall protect equipment from malfunctions due to conducted interference coming into the equipment from line, especially line to ground (common mode) noise and transients. Overall dimensions including mounting areas shall be approximately: 4.17inch width and 3.53inch height.

2.19 Signal Buss Relay. The relay shall be a direct “drop-in” replacement for existing mercury displacement relays. The relay shall be a single pole solid state or hybrid relay. Overall dimensions including mounting areas shall be approximately: 2.5-inch depth, 2-inch width, 5-inch height.

2.20 Field Wiring termination. All field wires shall be attached to the back panel terminal strips via a mechanical copper lug, which can accommodate wire sizes from 14AWG - 6AWG. Lugs shall be provided for all field outputs to maximize the cabinet design.

2.21 Flash Transfer Relays. The full complement of relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

2.22 Cabinet Wiring. Paper cabinet prints as well as electronic media shall be provided with each cabinet. (4) paper copies shall be provided (22” X 34”) and (1) electronic copy in pdf and dgn format. All flash program wiring configurations shall be represented on the cabinet print (Red, Amber, No Flash, FYA, Ped, FYA & Ped). Wiring configuration shall be a red-red flash, unless otherwise specified by plans or Traffic Engineer.

2.23 Generator Attachment. A generator plug shall be installed on each cabinet unless otherwise noted. The access door shall be hinged, lockable and watertight. The plug shall conform to the (NEMA L5-30 configuration). An automatic transfer switch shall be provided which will switch power to/from “line”, “UPS” or “generator” when power from one of the sources has been lost or gained. The unit shall be rated for 30 amps and shall contain either a LCD display or indicator lights that validate the following: Line in, Line out, UPS in, UPS out and “from” generator. The unit shall contain a main breaker (on/off switch), a UPS bypass breaker (switch) and a Generator breaker (switch). To minimize the impact of the presence of the auto transfer switch, the dimensions shall be no greater than 12” wide X 6” deep X 4” high. The unit shall be constructed of either aluminum or stainless steel.

3.0 Signal/New Cabinet Turn ON.

3.1 Turn on Date. Traffic engineer shall be given a minimum of two weeks’ notice for signal turn on or new cabinet turn on date. Signal turn on or new cabinet turn on date shall not occur on any Friday, unless previously approved by traffic engineer.

3.2 Traffic Control. Contractor shall provide a minimum of two Changeable Message Signs (CMS) in advance of new signal location for mainline traffic, unless determined that all legs of intersection require advance notice. The CMS boards shall be in place a minimum of two week prior to signal turn-on date and left in place a minimum of one week after signal turn on. Messages will be provided by traffic engineer for the CMS boards.

3.3 Time. Signal shall not be turned on during morning or evening rush hour times. This varies by location and shall be preapproved by traffic engineer and the lead construction inspector.

4.0 Testing.

4.1 Each controller and cabinet assembly shall be tested as a complete entity under signal load in accordance with Missouri Standard Specifications Section 902 for a minimum of 30 days after installation. The traffic engineer is to determine if the 30 days has been accomplished with no functionality issues.

4.2 Each assembly shall be delivered with a signed document detailing the cabinet final tests performed.

The cabinet shall be assembled and tested by the controller manufacturer or authorized local distributor to ensure proper component integration and operation.

5.0 Warranty and Training.

5.1 The Malfunction Management Unit shall be warranted by the manufacturer against mechanical and electrical defects for a period of 2 years from date of shipment. The manufacturer's warranty shall be supplied in writing with each cabinet. Second party extended warranties are not acceptable.

5.2 The cabinet assembly and all other components shall be warranted for a period of one year from date of shipment. Any defects shall be corrected by the manufacturer or supplier at no cost to the owner.

5.3 MoDOT may require training on the maintenance and operation of NEMA TS2 cabinet assemblies. Maintenance and operation personnel shall be trained on troubleshooting, maintenance and repair of cabinets and all serviceable equipment. Training shall include field level troubleshooting and bench repair. This training shall be for a minimum of sixteen hours over two days. Training shall be conducted at a time and location mutually agreeable by the contractor and the signal shop traffic supervisor or as directed by MoDOT.

6.0 Method of Measurement. Method of measurement shall conform to Sections 902 and 1092 of the Standard Specifications.

7.0 Basis of Payment. Payment included with cost of pay item 902-99.02 (NEMA TS2/EV Cabinet Assembly (Without Controller)) paid per each. Payment will be considered full compensation for all labor, equipment and material to complete the described work as shown on the plans. No additional payment will be made to provide conformance.

X. CCTV Camera System

1.0 Description. This work shall consist of providing and installing a fully functioning CCTV Camera System with a top-mount style assembly and riser pole as shown in the plans.

2.0 Construction Requirements. The CCTV system with riser pole shall be mounted on the traffic signal pole, as shown in the plans. All equipment shall be installed per the manufacturer's recommendations.

2.1 The mounting location of each camera and relocation of existing wireless radio equipment shall be coordinated with the engineer and KC traffic staff. The contractor shall contact Alejandro Martinez (Alejandro.Martinez@modot.mo.gov; 816-607-2038) at MoDOT and Ray Webb (rwebb@marc.org; 816-701-8358) at OGL at least two (2) weeks prior to equipment installation for on-site verification of camera location and to verify establishment of camera communication with OGL.

3.0 Material. The equipment shall consist of a camera with IP addressable remotely controlled pan-tilt-zoom (PTZ), mounting brackets, camera controller, power over ethernet (POE) cable, camera cabinet interface, surge protection and riser pole. The cable shall be recommended by the camera assembly manufacturer and shall provide a clear signal from the camera to the cabinet. The Contractor shall mount the camera controller and POE surge device on a DIN rail inside the new or existing traffic signal cabinet. The aluminum riser pole shall be 4.5 inches in diameter and shall be mounted to the existing signal pole with brackets recommended by the riser pole manufacturer.

3.1 New CCTV cameras shall meet the following requirements: operate with a continuous 360-degree rotation in both axes, be IP addressable with power over Ethernet cable included, include power over Ethernet surge protection and a camera controller inside the existing traffic signal cabinet, include a hydrophilic glass window on the camera unit, operate with a 36X optical zoom, and include built-in electronic image stabilization. The camera shall have a minimum 3-year manufacturer's warranty; the warranty shall begin at final acceptance of the system and shall be fully transferrable to the owner. The contractor shall, at their expense (approx.. \$350) provide a Genetec security desk license and annual support for each new CCTV camera. The Genetec security desk license shall be provided to ETI or installed on the OGL Genetec system and turned over to OGL at the time of CCTV installation prior to project completion.

4.0 Method of Measurement and Basis of Payment. All costs associated with this bid item shall include coordination, materials, installation, testing, and communication of the CCTV Camera System shall be paid for at the contract unit price for the following pay item:

Item No.	Description	Unit
902-99.02	Misc. CCTV Camera System	EA

Y. Accessible Pedestrian Pushbutton Connectivity

1.0 Description. Connectivity to all accessible pedestrian pushbuttons shall be required for all signalized pedestrian crosswalks at all intersections as shown in the plans.

2.0 Construction Requirements. In addition to Sec 902, all accessible pedestrian pushbutton systems shall have a Bluetooth interface or other hands-free capability and be password protected. Programming of the APS buttons shall be accessible through a field service application available on both iOS and Android platforms.

3.0 Equipment requirements. The accessible pedestrian pushbutton system and its components, in form and functionality, shall meet or exceed the requirements of the following documents and standards:

- 2009 MUTCD, Section 4E.09 – 4E.13

- NEMA 250 – 4X
- NEMA TS2

4.0 Documentation and Support. The contractor shall provide two (2) copies of the operation and maintenance manuals for each installed system.

5.0 Method of Measurement. No measurement providing connectivity will be made.

6.0 Basis of Payment. No direct payment for providing connectivity will be made. Payment for all work necessary to fulfill the requirements above will be considered completely covered in and paid for at the contract unit price for the following pay item:

Item No.	Description	Unit
902-49.21	Accessible Pedestrian Signal	EA

Z. Coordination with MoDOT and MARC OGL

1.0 Description. Any work that will impact the existing traffic signal monitoring and communications network shall be coordinated with the Mid-American Regional Council Operation Green Light (OGL) staff. This includes but not limited to removal and replacement of any existing communications equipment, adding new devices and changes to power sources or disconnects.

1.1 MoDOT is a member of MO-One-Call System. Prior to any excavation or work within MoDOT Right-Of-way, the contractor shall contact MO-One Call at 1-800-DIG-RITE and request for Utility Locates within noted project limits. If the scope of work contains modification, addition and/or expansion of existing underground MoDOT lighting, or signal facilities, the contractor shall notify the MoDOT Utilities Locate staff prior to any work, in order for MoDOT to update MoDOT utility location records with Missouri One Call.

2.0 Contact. Initial contact shall be made at least seven calendar days before work that may impact the existing communications network commences. Contact Ray Webb with OGL via email at rwebb@marc.org or 816-701-8300.

3.0 The signal and communication devices located within the project limits are a crucial part of the traffic operation system for this area. It is imperative that the downtime be kept to a minimum when adding, removing, or modifying any existing signal and communication devices, a target of less than 72 hours of disruption is desired. The network communication is critical to the ability to send signal timing plans to the controllers that support special event timing plans for ingress traffic up to two hours prior to a Cable Dahmer Arena event and also upon egress of an event. This may require the contractor to perform work that will affect existing network devices during nighttime and/or weekend hours, at the discretion of the Engineer. Allowable timeframes for this work will be subject to the need for communication devices in the area to be used to manage other traffic impacting workzones. Cable Dahmer Arena events can be found on their event website, <https://www.cabledahmerarena.com/events>

4.0 Basis of Payment. No direct payment will be made for compliance with this provision.

AA. Lowering Scout ITS Conduits

1.0 Description. This work shall consist of lowering existing Scout ITS conduits to avoid new ditch grading along the southbound I-470 Off-Ramp.

2.0 Construction Requirements. The existing Scout trench consists of one 2" HDPE conduit containing a 48 count fiber and a second 2" conduit containing the tracer wire. These conduits shall be lowered in place 36" below the new final ditch grade by utilizing existing fiber slack and new split duct conduit.

2.1 Throughout the relocation area, a new blue jacketed #14 tracer wire shall be installed from existing pull box to existing pull box with a minimum of 10' of tracer wire coiled up at each pull box. During the relocation work, the Contractor shall take care not to damage or leave exposed the existing live fiber optic cable. Schedule 80 split duct conduit repair systems shall be used to lower and reconnect the existing 2" SDR11 HDPE fiberoptic conduit, but the Contractor has the option to utilize matching 2" SDR11 HDPE conduit and HDPE conduit couplers for the lowering of the tracer wire conduit. A PVC to HDPE adhesive shall be used when making final connections between the split duct conduit and the existing HDPE conduit.

3.0 Method of Measurement and Basis of Payment. Measurement of conduit lowered will be recorded by linear feet for the length that the two Scout conduits are lowered together in the same trench in order to achieve a depth at least 36" below the new ditch grade. No additional pay will be providing and installing the new tracer wire as that work is incidental to the conduit lowering.

Item No.	Description	Unit
910-99.03	Misc. Lowering Scout ITS Conduits	LF

BB. ITS Conduits

1.0 General. These plans depict conduit routing in schematic form only. The contractor shall determine final routing based on actual field conditions prior to construction at each site, including utility locator service markings, to assure no conflicts with existing utilities, including State owned underground lighting, ITS, traffic signal, or cathodic protection facilities. The contractor shall field review necessary routing of conduit and location of pull boxes and splice vaults prior to submittal of bid to determine the types and extent of incidental removal, relocation and replacement items to include in the price of conduit, pull boxes, and splice vaults. Section 902.16 shall apply except as modified herein.

Before preparing a bid, the contractor shall visit the site of the work and make his own determination of the amount of rock, unclassified, or other materials that might be encountered in his trenching or pushing operations. No additional pay will be made for differences in material encountered.

1.1 Material. All material shall conform specifically as follows:

Item	Section
Electrical Conduit	1060
Junction Boxes	1062

All non-metallic conduits shall be color-coded yellow for electrical cables, and powder blue for fiber optic cable. Any conduit on structure shall be galvanized rigid metallic conduit.

All HDPE conduit and materials shall have a minimum SDR of 11 and be compliant with ASTM D3035.

All conduit splices shall be made with conduit couplers in accordance with conduit manufacturer recommendations. Coupler materials to be used for conduit splices shall be submitted to the engineer for review and approval along with the manufacturer's recommendations and installation procedures. All conduit couplers are incidental to the linear feet of conduit being installed.

HDPE SDR11 conduit shall be required for all trenched or bored conduits.

Trenching and Pushing depths and installation shall be constructed with the following minimum covers:

Conduit under Paved areas including Roadway, Shoulders, Paved Medians and Sidewalks:

Pushed Conduit - minimum 42 inches below top of paved areas.

Conduit under Non-Paved Areas:

Conduit in Trench - minimum 30 inches of cover

Conduit shall slope to a pull box at a minimum rate of 0.5 percent, unless otherwise shown on plans. A change in direction of conduit shall be accomplished by bending the conduit uniformly to a radius that will fit the location or by the use of standard bends. The minimum bending radius of all conduits shall be the greater of the following: 20 times the diameter of the fiber optic cable or six times the internal diameter of the conduit.

Open ends of conduit placed for future use shall be capped or plugged with water tight mechanical terminations. Pull ropes shall be placed in all empty conduits. Pull ropes shall be polypropylene with a minimum tensile strength of 1,250 lbs.

All conduit ends shall be deburred before installing any cabling, including fiber optic cable and power cable.

If approved by the engineer, conduit may be installed by trenching, plowing, pushing or directional boring; however, payment will be made by the method specified in the contract for that conduit.

1.2 Conduit in Trench. Trenches shall be excavated to the width and depth necessary for conduit installation. Material which might cause mechanical damage to the conduit shall not be used for backfilling below an elevation 6 inches above the conduit. The bottom of the trench shall be free of such material before the conduit is placed. No conduit shall be placed without approval of the trench by the engineer. All trenches shall be backfilled as soon as practicable after installation of conduit. Backfill material shall be deposited in the trench in layers not exceeding 6 inches deep.

1.2.1 In lieu of trenching, conduits may be installed by plowing. When installation is accomplished by plowing, it shall be done with a vibratory type plow which will place conduits at the minimum depths shown above and recompact the soil over the installation approximately to original in-place density. The contractor shall not plow conduit in areas of rock.

1.2.2 Orange burial tape imprinted with "CAUTION-BURIED FIBER OPTIC CABLE BELOW" shall be installed at approximately 1/3 to 1/2 of the depth of cover over any trenched conduits. The orange burial tape shall be color durable, and chemically resistant. Where excavation is made across parkways or driveways, sod, topsoil and crushed stone or gravel shall be replaced as soon as practicable to its former condition. Concrete or bituminous surfaces and stabilized bases shall be restored to their former condition. The entire area involved shall be left in a neat, presentable condition.

1.3 Pushed Conduit. If pushed conduit is specified or shown on the plans, the conduit shall be installed without disturbing the existing surface. Pushed conduit may be placed by jacking, pushing, boring or other approved means.

1.4 Power Service Conduit. Conduit between the contractor installed power supply pedestal and the utility service point shall meet the requirements of the specific electric utility company. This utility conduit must be installed by the contractor according to the utility company's requirements and the cost of this conduit is incidental to the cost of the Type 2 power supply.

2.0 Method of Measurement. Measurement of conduit in trench and pushed conduit will be made to the nearest linear foot as shown on the plans. Contract quantities will be adjusted using the documented fiber cable sheath readings along all conduit runs. If the contractor decides to bore conduit runs instead of trenching, then those additional boring lengths will only be measured and paid as trenched conduit.

No additional pay will be made for trenching or pushing operations in rock, unclassified, or other materials.

No additional pay will be made for conduit couplers or conduit splicing. Couplers used for conduit splicing are incidental to the linear feet of conduit installed.

Contractor shall not damage paved drainage ditches or unmarked pavement underdrains. Contractor has the option to bore under or trench around concrete drainage ditches or underdrains. No additional pay will be made for routing around paved drainage ditches or underdrains. Any damage to paved drainage ditches or underdrains due to contractor's operations shall be replaced at contractor's expense.

3.0 Basis of Payment. The accepted conduit system will be paid for at the unit price for each of the pay items included in the contract. No direct payment will be made for any incidental items necessary to complete the work unless specifically provided as a pay item in the contract.

Conduit shall only be paid as Pushed Conduit for only the length that is specified in the plans. Conduit couplers that are utilized to connect pushed conduit to trenched conduit shall be incidental to the linear feet of conduit installed.

Item No.	Description	Unit
910-52.01	Conduit, 3 in. Rigid, in Trench	LF
910-72.01	Conduit, 3 in. Rigid, Pushed	LF

CC. ITS Pull Boxes

1.0 Description. All ITS pull boxes that contain fiber optic cable (splice vaults) in this contract shall be circular, constructed, and installed as detailed on the plans or as directed by the engineer. These circular pull boxes shall be constructed of one piece polymer concrete and shall be referred to as splice vaults. The splice vault shall have a minimum depth of 48" and come with a minimum of four stainless steel hooks to be used for hanging the fiber optic cable. The installation of all pull boxes shall conform to the locations, lines, grades, and details shown on the plans. All pull boxes shall be surrounded by a concrete pad and shall withstand a wheel load of 9,000 kg. Each pull box shall be equipped with a bolt down cover of the same material. All fiber and power pull boxes shall include a protective concrete pad around each pull box according to the details provided in the plans. Concrete for the pad shall be Class B, or a commercial mixture meeting the requirements of Sec 501. The top surface edges of all pull boxes and splice vaults shall be flush with surfaced areas and earth or sodded areas.

Covers on pull boxes that contain 480-volt circuits shall be embossed with "CAUTION-HIGH VOLTAGE". Covers on all other pull boxes or splice vaults shall be embossed with "MODOT FIBER" unless otherwise directed by the engineer.

1.1 Conduit Openings. Conduit shall enter the splice vault through the side of the box. If it is necessary to increase the excavation depth and extend the pull box or splice vault, no direct payment will be made. The holes shall be round and no more than 1/2 inch larger than the conduit and shall be made as recommended by the manufacturer. All conduit entrances into pull boxes shall be sealed with an expandable foam sealer around the conduits to prevent the entering of foreign material into the pull boxes.

1.2 Excavation and Backfilling. The excavated opening outside pull boxes or splice vaults shall be wide enough to allow compaction of the backfill material. Cinders, broken concrete, broken rock or other hard or undesirable material shall not be used for backfilling. The backfill material shall be placed in layers not to exceed 6 inches deep and each layer shall be thoroughly compacted before the next layer is placed. All disturbed areas shall be seeded and mulched in accordance with Sec 802 and 805. No direct pay will be made for seeding and mulching disturbed areas.

Removed concrete and soil shall become the property of the contractor and shall be disposed of off the right of way. No direct pay will be made for removal of paved surfaces or the disposition of excess material off the right of way.

1.3 Drains. All ITS pull boxes will be constructed with a stone drain that is 2' deeper than the bottom of the pull box. No direct pay will be made for stone drains.

2.0 Method of Measurement. All pull boxes shall be measured per each. All concrete pads, special covers, and grounding requirements for splice locations shall be included in the unit price for the Pull Box.

No additional pay will be made for installation of pull box or splice vault in rock.

3.0 Basis of Payment. The pay items for Pull Boxes and Splice Vaults are:

Item No.	Description	Unit
910-88.16	Pull Box, Preformed Class 5	EA

DD. Fiber Optic Cable, Installation, and Hardware

1.0 General. All fiber optic (F/O) cable required for this project shall be all dielectric, gel filled, duct type, with loose buffer tubes and shall conform to these special provisions. The fiber optic cables shall connect the ITS field equipment such as Closed Circuit Television (CCTV) Cameras and Dynamic Message Signs (DMS) to the aggregators and bandwidth managers via the communications backbone cable. The Single Mode Fiber Optic (SMFO) fibers shall contain single mode (SM) dual-window (1310 nm and 1550 nm) fibers.

The optical fibers shall be contained within loose buffer tubes. The loose buffer tubes shall be stranded around an all dielectric central member. Aramid yarn and/or fiberglass shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

Fiber optic cables shall be provided and installed as shown in the plans and specifications. The fiber optic cable shall be installed with a minimum number of splices. No additional splice vault locations will be permitted. The contractor shall utilize the maximum cable lengths possible, and avoid additional splices in the backbone 24 count cable.

All fiber optic cable on this project shall be from the same manufacturer, who is regularly engaged in the production of this material. If availability and delivery schedule does not allow fiber optic cable to be from the same manufacturer, multiple manufacturers may be used if approved by the engineer.

The fiber optic cable shall be qualified as compliant with Chapter XVII, Title 7, Part 1755.900 of the Code of Federal Regulations, "REA specification for filled fiber optic cables".

Each buffer tube shall be terminated in its own splice tray and each tray shall contain a maximum of 12 splices. Pictures must be taken of each fiber splice enclosure when all work has been completed and that documentation must be submitted to the engineer along with OTDR traces. The first splice location must be inspected and approved by the engineer and MoDOT ITS technical staff before the contractor continues with fiber optic cable splicing.

1.1 Material. Each optical fiber shall be made of glass that is manufactured by Corning or licensed by Corning and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube shall be usable fibers, and shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of these specifications.

The individual fiber coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically or chemically strippable without damaging the fiber.

The cable shall comply with the optical and mechanical requirements over an operating temperature range of -40° F. to +158° F. The cable shall be tested in accordance with EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The attenuation shall be measured at 1310 nm and 1550 nm.

Fibers within the finished cable shall meet the requirements in the following table:

Fiber Characteristics Table

Parameters	Value
Mode	Single
Type	Step Index
Core diameter	8.3 μm (nominal)
Cladding diameter	125 $\mu\text{m} \pm 1.0 \mu\text{m}$
Core to Cladding Offset	$\leq 0.6 \mu\text{m}$
Coating Diameter	245 $\mu\text{m} \pm 10 \mu\text{m}$
Cladding Non-circularity defined as: $[1 - (\text{min. cladding dia} \div \text{max. cladding dia.})] \times 100$	$\leq 1.0\%$
Proof/Tensile Test	100 kpsi, min.
Attenuation @ 1,310 nm	$\leq 0.40 \text{ dB/km}$
Attenuation @ 1,550 nm	$\leq 0.35 \text{ dB/km}$
Attenuation at the Water Peak	$\leq 2.1 \text{ dB/km @ } 1383 \pm 3 \text{ nm}$
Chromatic Dispersion:	
Zero Dispersion Wavelength	1301.5 to 1321.5 nm
Zero Dispersion Slope at zero dispersion wavelength	$\leq 0.092 \text{ ps}/(\text{nm}^2 \cdot \text{km})$
Maximum Dispersion:	3.3 $\text{ps}/(\text{nm} \cdot \text{km})$ for 1285 - 1330 nm <18 $\text{ps}/(\text{nm} \cdot \text{km})$ for 1550 nm
Cut-Off Wavelength	<1260 nm
Mode Field Diameter (Petermann II)	9.3 $\pm 0.5 \mu\text{m}$ at 1310 nm 10.5 $\pm 1.0 \mu\text{m}$ at 1550 nm

1.2 Color Coding. Optical fibers shall be distinguishable from others in the same buffer tube by means of color coding according to the following:

1. Blue (BL)	5. Slate (SL)	9. Yellow (YL)
2. Orange (OR)	6. White (WT)	10. Violet (VL)
3. Green (GR)	7. Red (RD)	11. Rose (RS)
4. Brown (BR)	8. Black (BK)	12. Aqua (AQ)

The colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598A "Color Coding of Fiber Optic Cables." The color formulation shall be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

1.3 Cable Construction. The fiber optic cable shall consist of, but not be limited to, the following components:

- A. Buffer tubes
- B. Central member
- C. Filler rods if needed
- D. Stranding
- E. Core and cable flooding
- F. Tensile strength member
- G. Ripcord

- H. Outer jacket
- I. Glass fibers as described above

1.3.1 Buffer Tubes. Loose buffer tubes shall provide clearance between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes and shall not adhere to the inside of the tube.

The loose buffer tubes shall be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material shall be tough and abrasion resistant to provide mechanical and environmental protection of the fibers, yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tube filling compound shall be a homogenous hydrocarbon-based gel with anti-oxidant additives. It shall prevent water intrusion and migration. The filling compound shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hydroscopic and electrically non-conductive. The filling compound shall be free from dirt and foreign matter and shall be readily removable with conventional nontoxic solvents.

Buffer tubes shall be stranded around a central member by a method, such as the reverse oscillation stranding process that will prevent stress on the fibers when the cable jacket is placed under strain.

Each buffer tube shall be distinguishable from other buffer tubes in the cable by using the same color coding as specified above for fibers.

1.3.2 Central Member. The central member, which functions as an anti-buckling element, shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. To provide the proper spacing between buffer tubes during stranding, a symmetrical linear overcoat of polyethylene may be applied to the central member to achieve the optimum diameter.

1.3.3 Filler rods. Fillers may be included in the cable cross-section. Filler rods shall be solid medium or high-density polyethylene. The diameter of filler rods shall be the same as the outer diameter of the buffer tubes.

1.3.4 Stranding. Completed buffer tubes shall be stranded around the overcoated central member using stranding methods, lay lengths and positioning such that the cable shall meet mechanical, environmental and performance specifications. A polyester binding shall be applied over the stranded buffer tubes to hold them in place. Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hydroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

1.3.5 Core and Cable Flooding. The cable core interstices shall be filled with a polyolefin based compound to prevent water ingress and migration. The flooding compound shall be homogeneous, non-hydroscopic, electrically non-conductive, and non-nutritive to fungus. The compound shall also be nontoxic, dermatologically safe and compatible with all other cable components.

1.3.6 Tensile Strength Member. Tensile strength shall be provided by high tensile strength

aramid yarns and/or fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

1.3.7 Ripcord. The cable shall contain at least one ripcord under the jacket for easy sheath removal.

1.3.8 Outer jacket. The jacket shall be free of holes, splits, and blisters and shall be medium or high density polyethylene (PE), or medium density cross-linked polyethylene with minimum nominal jacket thickness of 37 mils. Jacketing material shall be applied directly over the tensile strength members and flooding compound and shall not adhere to the aramid yarn strength material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus. The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable" or "Fiber Optic Cable", the number of fibers, "SM" or "Single Mode", year of manufacture, and sequential measurement markings every 3 feet. The actual length of the cable shall be within 1 percent of the length marking. The marking shall be in a contrasting color to the cable jacket (Yellow or White are preferred). The height of the marking shall be approximately 2.5 mm (.098 inch).

1.4 General Cable Performance Specifications. The fiber optic cable shall withstand water penetration when tested with a one-meter static head or equivalent continuous pressure applied at one end of a one-meter length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with EIA-455-82A (FOTP-82), "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable."

A representative sample of cable shall be tested in accordance with EIA-455-81B (FOTP-81), "Compound Flow (Drip) Test for Filled Fiber Optic Cable". No preconditioning period shall be conducted. The cable shall exhibit no flow (drip or leak) at 176° F as defined in the test method.

Crush resistance of the finished fiber optic cables shall be 220 N/cm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with EIA-455-41A (FOTP-41), "Compressive Loading Resistance of Fiber Optic Cables". The average increase in attenuation for the fibers shall be ≤ 0.10 dB/km at 1550 nm for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after removal of load. Testing shall be in accordance with EIA-455-41A (FOTP-41), except that the load shall be applied at the rate of 3 mm to 20 mm per minute and maintained for 10 minutes.

The cable shall withstand 25 cycles of mechanical flexing at a rate of 30 ± 1 cycles/minute. The average increase in attenuation for the fibers shall be ≤ 0.20 dB/km at 1550 nm at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. The test shall be conducted in accordance with EIA-455-104A (FOTP-104), "Fiber Optic Cable Cyclic Flexing Test," with the sheave diameter a maximum of 20 times the outside diameter of the cable. The cable shall be tested in accordance with Test Conditions I and II of (FOTP-104). Impact testing shall be conducted in accordance with EIA-455-25B (FOTP-25) "Impact Testing of Fiber Optic Cables and Cable Assemblies." The cable shall withstand 20 impact cycles. The average increase in attenuation for the fibers shall be ≤ 0.20 dB/km at 1550 nm. The cable jacket shall not exhibit evidence of cracking or splitting.

The finished cable shall withstand a tensile load of 2669 N (600 lbs.) without exhibiting an average increase in attenuation of greater than 0.20 dB. The test shall be conducted in accordance with EIA-455-33A (FOTP-33), "Fiber Optic Cable Tensile Loading and Bending Test." The load shall be applied for one-half hour in Test Condition II of the EIA-455-33A (FOTP-33) procedure.

1.5 Packaging and Shipping Requirements. Documentation of compliance to the required specifications shall be provided to the engineer prior to ordering the material.

Attention is directed to "Fiber Optic Testing," in Section 3.5 of these special provisions.

The completed cable shall be packaged for shipment on reels. The cable shall be wrapped in weather and temperature resistant covering. Both ends of the cable shall be sealed to prevent the ingress of moisture.

Each end of the cable shall be securely fastened to the reel to prevent the cable from coming loose during transit. Six feet of cable length on each end of the cable shall be accessible for testing. The complete outer jacket marking shall be visible on this six feet of cable length.

Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable on the reel, the contractor's name, the contract number, and the reel number. A shipping record shall also be included in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information.

The minimum hub diameter of the reel shall be at least thirty times the diameter of the cable. The F/O cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Installation procedures and technical support information shall be furnished at the time of delivery.

2.0 Cable Installation. The contractor shall submit for review the planned procedures for pulling and or blowing the fiber optic cable to the engineer for review and approval at least 20 working days prior to installing cables. Mechanical aids may be used to assist cable installation.

If cable is pulled a tension measuring device or break away swivel shall be incorporated into the pulling line and attached to the cable, to ensure that the tension does not exceed 2669N (600lb). The cable grips for installing fiber optic cable shall have a ball bearing swivel attached to prevent the cable from twisting during installation. Pulling of fiber optic cable shall be with even tension. F/O cable ends shall be properly sealed during installation.

The breakaway tension limiting device shall be set to release at or below the manufacturer's maximum recommended pulling tension. One break away tension limiting device is required for each cable being pulled.

During cable installation, the bend radius shall be maintained at a minimum of twenty times the outside diameter of the cable. The cable shall not be stressed beyond the minimum bend radius at any time during installation and handling.

Fiber optic cable shall be installed using a cable pulling lubricant recommended by the fiber optic cable manufacturer and/or the inner duct or conduit manufacturer and a non-abrasive pull tape conforming to the provisions described under "Conduit" elsewhere in these special provisions. When lubricant is used, lubricant shall cover the fiber optic cable for entire pull.

Fiber optic cable shall be installed without splices except where specifically allowed on the plans or described in these special provisions. The fiber optic cables shall be spliced only at splice vault/handholes associated with bandwidth managers, aggregators, CCTV camera sites, DMS sites, radar detector sites or other VDS sites, unless shown otherwise in the plans. The engineer may allow additional splices between these specified locations. The slack shall be divided equally on each side of the splice enclosure.

Six feet of slack fiber optic cable shall be provided in all splice vaults/handholes that do not contain splices unless noted otherwise on the plans. At splice vaults/handholes that contain splices 50 feet of slack fiber shall be provided on each side of the splice enclosure. At cabinet assemblies, 50 feet of slack fiber shall be stored in the adjacent splice vaults/handholes and 10 feet stored within the cabinet and fiber distribution unit.

The contractor shall record sequential markings at all splice vault/handholes. The contractor shall after pulling, cut off and discard the first 10 feet of the fiber optic cable. This 10 feet has not been included in the conduit and cable routing tables on the plan sheets and shall be considered incidental to other items of work. The contractor shall account for this length. The remaining cable length in the splice vault/handhole must meet the slack cable length requirements.

Following installation of the cable in conduit, all conduit entrances in cabinet assemblies, pull boxes and splice vault/handholes shall be sealed with duct plugs and sealing compound to prevent the ingress of moisture, foreign materials and rodents. No residual tension should remain on the cable after installation, except the weight of the cable.

2.1 Splicing. The contractor shall submit a splicing plan for the engineer's review and approval. Approval of the splicing plan shall occur prior to any installation of fiber optic cable. The contractor's splicing plan shall include all information shown in the splicing diagrams, included in the plans, and be in a similar format.

The contractor shall cut only the fibers to be terminated/spliced at a location according to the design plans. Unused fibers or fibers that are continuous through a splice location are to be coiled, labeled and left loose in the tray.

Optical fibers shall be spliced using the fusion type method. Alignment shall be via fiber cores and not via fiber diameters. Mechanical splices shall not be permitted.

Splice losses shall average less than or equal to 0.05 dB/splice between any two optical ports and shall not exceed 0.10 dB for any splice.

The completed splices shall be placed in a splice tray. The splice tray shall then be placed in the splice enclosure.

Termination splices shall join the fibers in the fiber optic cable span to the fibers in pigtails. The termination splices shall be placed in a splice tray and the splice tray(s) shall then be placed in the fiber distribution unit (FDU). The individual fibers shall be looped a minimum of one full turn within the splice tray to avoid micro bending. A 51 mm (2 inches) minimum bend radius shall be maintained during installation and after placing in the optical fiber splice tray. Each fiber shall be individually restrained in a splice tray. The optical fibers in buffer tubes and the placement of the optical fibers in the splice tray shall be such that there is no discernable tensile force on the optical fiber.

All splices shall be protected with a thermal shrink sleeve.

All fiber cables shall be labeled in the cabinet assemblies and splice vault/handholes with permanent vinyl markers. Labels shall identify the destination cabinet assembly number or splice vault/handhole number of the fiber. Pigtail ends shall also be labeled to identify the destination cabinet assembly number or splice vault/handhole number of the fiber.

3.0 Passive Cable Assemblies and Components. The fiber optic cable assemblies and components shall be compatible components, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. All components or assemblies shall be best quality, non-corroding, with a design life of at least 20 years. All components or assemblies of the same type shall be from the same manufacturer.

3.1 General. Fiber optic cable terminations shall include pigtails and jumpers. Breakout cables shall comply with the specifications for pigtails.

All components shall be the size and type required for the specified fiber.

All fiber optic cable on this project shall be from the same manufacturer, who is regularly engaged in the production of this material.

3.2 Fiber Optic Splice Enclosures. The fiber optic splice enclosure (also referred to as simply "closures") shall consist of an outer enclosure, an inner enclosure and splice trays, and shall conform to the following special provisions.

The fiber optic splice enclosure shall be designed for a temperature range of -40° F. to +158° F. The fiber optic splice enclosure shall be designed for splice vault/handhole applications. The splice enclosure shall have enough room for up to 144 splices and shall have a minimum length of 28 inches and a minimum diameter of 6.6 inches. The enclosures shall be designed for cable entrance into the end of the enclosure.

All materials in the enclosures shall be non-reactive and shall not support galvanic cell action. The outer enclosure shall be compatible with the other enclosure components, the inner enclosure, splice trays, and cables.

The outer enclosure shall protect the splices from mechanical damage, shall provide strain relief for the cable, and shall be resistant to salt corrosion. The outer enclosure shall be waterproof, and re-enterable, corrosion resistant, rodent proof, and air tight. The outer enclosure shall be flash-tested at 103 kPa. (15 psi.). The inner enclosure shall be of metallic construction.

The inner enclosure shall be compatible with the outer enclosure and the splice trays and shall allow access to and removal of individual splice trays.

The splice trays shall be constructed of rigid plastic or metal.

Adequate splice trays shall be provided to splice all fibers entering the enclosure, plus 12 additional fibers.

The contractor shall install the fiber optic splice enclosure in the splice vault/handholes where splicing is required. The fiber optic splice enclosures shall be securely fastened to the splice

vault/handhole using standard hardware. The contractor shall provide all mounting hardware required to securely mount the enclosures to the splice vault/handhole.

The fiber optic splice enclosure shall be mounted in a manner that allows the cables to enter at the end of the enclosure without exceeding the minimum bending radius specification for any of the cables contained within the splice vault/handhole. A vertical mounting bracket made for the splice enclosure shall be installed and the splice enclosure shall be securely strapped to that mounting bracket.

Upon completion of the splices, the splice trays shall be secured to the inner enclosure. The enclosure shall be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices.

Care shall be taken at the cable entry points to ensure a tight waterproof seal is made which will not leak upon aging. It is acceptable to have multiple pigtail-fibers enter the fiber optic splice enclosure through one hole as long as all spaces between the cables are adequately sealed.

3.3 Fiber Optic Cable Assemblies. Cable assemblies (jumpers and pigtails) shall be products of the same manufacturer. The cable used for cable assemblies shall be made of fiber meeting the performance requirements of these special provisions for the fiber optic cable being connected, except that the operating temperature shall be modified to -4° F. to +158° F. Manufacturer's attenuation test results shall be provided for all cable assemblies.

3.3.1 Pigtails. Pigtails shall be of simplex (one fiber) construction, in 900 micrometer tight buffer form, surrounded by aramid yarn for strength, with a connector on one end. The outer jacket shall be yellow PVC with a nominal diameter of 3 mm (.118 inch), marked with the manufacturer's identification information. All pigtails shall be at least one meter in length. Pigtails installed in conduit shall follow the installation procedures outlined for fiber optic cables, except that the pulling tension shall not exceed 890 N (200 lb.). Pigtail connectors shall be factory terminated. Field terminations shall not be permitted.

3.3.2 Jumpers. Jumpers may be of simplex or duplex design. Duplex jumpers shall be of duplex round cable construction and shall not have zip cord (Siamese) construction. All jumpers shall be at least 2 meters (6.5 feet) in length, sufficient to avoid stress and allow orderly routing. Jumpers shall have connectors on both ends.

The outer jacket of duplex jumpers shall be yellow. The two inner simplex jackets shall be contrasting colors to provide easy visual identification for polarity. Jumper connectors shall be factory terminated. Field terminations shall not be permitted.

3.3.3 Connectors. Connectors shall be of the type shown on the plans. No index-matching fluids, gels or anti-reflection coating shall be applied to the end of the fiber. The connector operating temperature range shall be -4°F to +158°F. Insertion loss shall not exceed 0.4 dB and the return reflection loss shall be at least 35 dB. Connection durability shall be less than a 0.2 dB change per 500 mating cycles per EIA-455-21A (FOTP-21). All terminations shall provide a minimum 222 N (50 lb.) pull out strength. The installed connector loss shall be less than 0.9 dB. Connectors shall have a yellow color body or boot.

All connectors installed on pigtails and jumpers shall be factory-installed and tested. Factory test results shall be documented and submitted to the engineer prior to installing any connectors. There shall be no installation of connectors in the field.

All unmated connectors shall have protective caps installed.

3.4 Fiber Distribution Unit (FDU). The fiber distribution unit (FDU), also referred to as patch panels, shall be used to terminate fibers in the field termination cabinet assemblies including the CCTV camera and DMS cabinets. The terminations shall be SC-bulkhead connectors which match the fiber optic jumper cables used for connection to the optical termination equipment in the cabinet assembly. The units shall be rack mountable in an EIA 19-inch (482.6mm) rack and utilize 3U of rack space. The 3U fiber distribution units shall consist of a closet connector housing (CCH) and shall include two CCH panels at each FDU location. The FDU shall meet the requirements of ANSI/TIA/EIA-568-B and ANSI/TIA/EIA-606-A. The contractor shall leave enough fiber slack so the FDU can be removed and placed on a work table if needed. At all FDU locations, the contractor shall terminate all 12 fibers inside the fiber distribution unit located inside each ITS cabinet.

3.5 Fiber Optic Testing. The contractor shall test and document any fibers that are spliced and terminated at both ends. The contractor shall complete power meter and OTDR traces in both directions and document that those results meet the loss requirements listed above. The contractor shall complete a summary worksheet for each test and also provide the actual fiber trace for each test. The fiber trace shall be formatted and scaled so losses can be recognized when visually reviewing the fiber trace report. The contractor shall submit a proposed testing summary worksheet to the Engineer for review before any fiber splicing work begins on the project.

4.0 Method of Measurement. Measurement of fiber optic cable will be made to the nearest linear foot as shown on the plans. Contract quantities will be verified using the documented fiber sheath readings in and out of every fiber pull box and splice enclosure. Fiber optic splicing, testing and documentation will be measured as a lump sum pay item.

5.0 Basis of Payment. Accepted fiber optic cable will be paid for at the unit price for each of the pay items included in the contract. No direct payment will be made for pigtails, jumpers, or connectors, fiber optic splice closure, fiber optic distribution units, fiber distribution frames or any other incidental items necessary to complete the fiber splicing work unless specifically provided as a pay item in the contract. The contractor shall include all incidental items, fiber enclosures, mounting brackets, fiber installation, fiber splicing, fiber testing and documentation in the lump sum price for fiber splicing, testing, and documentation.

Item No.	Description	Unit
910-83.50	Fiber Optic Cable, 6-Strand, Single Mode	LF
910-83.52	Fiber Optic Cable, 24-Strand, Single Mode	LF
910-99.01	Misc. Fiber Optic Splicing, Testing and Documentation	LS

EE. Fiber Distribution Unit (FDU)

1.0 Description. Fiber distribution unit (FDU) shall be contractor furnished and contractor installed at the locations shown on the Plans.

The section includes material and installation for FDU.

2.0 Special Specification. The FDU shall act as the demarcation point between the fiber optic cable via the fiber pigtail from the splice closure and the terminal equipment via the fiber optic

patch cords. The Contractor shall furnish and install 6 port ST connector panels and pre-terminated pigtails to be spliced to the backbone fiber. The approved type of optical connectors on the one end of each of the pigtails shall be ST and screw into a sleeve securely mounted to a patch panel within the FDU enclosure. The maximum optical loss across the connection shall not exceed 0.4 dB.

The FDU housings shall be supplied by the contractor and shall be mounted in the 19-inch rack, as shown on the plans. The FDU shall accept a minimum of forty-eight (48) fiber terminations. The cabinet shall have fiber optic cable entrances with cable sheath strain relief, leading to the FDU.

3.0 Basis for Payment. Payment for the above items shall include all costs necessary to complete the work including furnishing, installation, incidentals, and testing of a fully functional system.

Item No.	Description	Unit
910-99.02	Misc. Fiber Optic Patch Panel	EA

FF. Ethernet Switch

1.0 Description. The proposed locations for Ethernet Switch installation are as follows and as shown on the plans.

Route 40			Ethernet Switch		
Intersection			New	Relocate	Existing
Rte. 40	@	Cliff Ave	1		
Rte. 40	@	I-470 SB Ramp	1		
Rte. 40	@	I-470 NB Ramp	1		
Rte. 40	@	Valley View Pkwy	1		
Rte. 40	@	Little Blue Pkwy	1		

2.0 Ethernet Switch The Ethernet Switches and power supplies will be MoDOT-Furnished and configured. The contractor shall work together with MoDOT to install the switches and power supplies. The contractor shall furnish and install CAT6 cable and fiber optic jumpers to complete connections to fiber patch panel and installed hardware.

The Ethernet switches and power supplies shall be rack mounted on the inside wall of the ITS cabinet, as directed by the engineer.

3.0 CAT6 Cable. The contractor shall furnish and install CAT6 cable in ITS Cabinets and complete connections between the Ethernet Switch in the ITS cabinet and traffic signal controller and Battery Backup System in the signal cabinet. All other devices shall be installed in the ITS cabinet and connected with CAT6 pigtails from that equipment, such as POE injector, video detection system encoder, or other equipment in the ITS cabinet to the switch as shown on the plans.

4.0 Method of Measurement. This item will be measured as each Ethernet Switch installed complete in place.

5.0 Basis of Payment. The contract unit price for installing the MoDOT-Furnished Ethernet Switch in ITS cabinet shall include full compensation for installing MoDOT-Furnished Ethernet Switch, and for furnishing all labor, materials, appropriate connectors, fiber optic jumpers, tools, equipment and incidentals, and for doing all the work involved in installing Ethernet Switch, complete in place, as shown on the plans and specified in the Standard Specifications and these Special Provisions, and directed by the Engineer. No additional compensation will be made.

Item No.	Description	Unit
910-99.02	Misc. Network Switch (Install Only)	EA

GG. Cabinet Modification and Load Switch

1.0 Description. This work shall consist of modifying the existing cabinet and installing a new load switch in the existing controller assembly.

2.0 Construction Requirements.

2.1 Modify Existing Cabinet. The existing signal cabinet at Little Blue Parkway and Route 40 shall be modified to allow for proper operation of the existing Flashing Yellow Arrow indications and proposed pedestrian signal indications as shown on the plans. The contractor shall determine and complete all appropriate wiring and programming associated with this work as recommended by the cabinet manufacturer. The contractor shall provide electronic documentation including, but not limited to:

- Updated signal cabinet prints indicating all modified back panel wiring
- Load switch wiring
- Controller programming
- Signal monitor programming
- Revised plan sheets
- Other documentation as requested by the engineer

2.2 Load Switch. The existing cabinet, as noted on the plans as to be modified and used in place, may require the installation of a new load switch for the addition of pedestrian signal heads. Existing load switch assignments are shown on the signal 'D' sheets within the plans. Modification shall be based upon notes included on those sheets and as specified in Sec 1092.4.1.

2.0 Basis of Payment. Payment for the cabinet modification, based upon the number of cabinets to be modified, shall be made per each and shall be considered full compensation for all contractor-provided equipment, connection cables, signal monitor programming, labor and material needed to complete the described work.

Installation of a new load switch will be made per each and shall be considered full compensation for all contractor provided equipment, connection cables, labor, removals and material needed to complete the described work. Payment will be made as follows:

Item No.	Description	Unit
902-99.02	Misc. Cabinet Modification	EA
902-99.02	Misc. Install New Load Switch in Existing Controller Assembly	EA

HH. Special Grooved Pavement Marking Requirements

1.0 Description. This specification covers multi-component liquid materials suitable for use as retroreflective pavement markings on portland cement concrete or asphalt pavements. Glass beads or other reflective elements are dropped at a specified rate on the surface of the liquid material immediately after it is applied to the pavement surface. Upon curing, it produces an adherent retroreflective marking of specified thickness and width, capable of resisting deformation by traffic. All pavement marking shall be grooved over the existing stripe except for bridge decks.

1.1 Drop on Glass Beads: Glass beads shall be applied into all the pavement markings included by means of a low pressure, gravity drop bead applicator in accordance with the following:

1.2 Gradation:

U.S. Mesh	Microns	% Passing
16	1180	90-100
18	1000	65-80
20	850	
30	600	30-50
40	425	
50	300	0-5
80	180	

1.3 Roundness: All beads shall meet a minimum of 80 percent true spheres in accordance with AASHTO R98-20.

1.4 Color / Clarity: Beads shall be colorless, clear, and free of carbon residues.

1.5 Refractive Index: Minimum 1.51 by oil immersion method.

1.6 Air Inclusions: Less than 5 percent by visual count.

1.7 Chemical Resistance: Beads shall be resistant to hydrochloric acid, water, calcium chloride, and sodium sulfide as tested per methods outlined in sections 4.3.6 to 4.3.9 of the TT-B Federal Spec.1325D.

1.8 Glass beads used for any type of pavement marking shall not contain more than 75 parts per million (ppm) arsenic, 75 ppm antimony and 100 ppm lead, as tested in accordance with EPA methods 3052 and 6010C, or other approved testing method or AASHTO T392.

1.9 Application Rate of Drop on Glass Beads: See specific pavement marking materials for application rates.

2.0 Retroreflectivity

2.1 Pavement marking applications associated with this JSP will be evaluated and accepted following the same MoDOT procedures found in the Missouri Standard Specifications for Highway

Construction Section 620 with the minimum retroreflectivity requirements, using the blended bead listed above, being defined as:

White	Yellow	% Payment
≥ 450	≥ 350	100%
400-449	300-349	100%
300-399	225-299	80% ^a

^a Contractor has the option to accept this deduction or to correct and improve payment.

3.0 Pavement Marking Recessed Grooving. The following specifications shall be used for recessed pavement markings.

3.1 Description: This work shall consist of grooving the pavement surface with the depth of the groove being specified per the material type. **There will be no pavement grooving on bridge decks.**

3.2 Equipment: The grooving equipment shall have a free-floating cutting or grinding heads. The heads shall be of uniform wear and shall produce a smooth textured surface. Any ridges in the groove shall have a maximum height of 15 mils.

3.3. General: Prior to the operation, the Contractor shall supply the Engineer with a copy of the pavement marking material manufacturer's recommendations for constructing a groove for the installation of the durable ramp marking.

3.4 Pavement Grooving Methods: The grooves for recessed pavement markings shall be constructed using the following methods:

(a) **Wet Cutting Head Operation:** When water is required or used to cool the cutting head, the groove shall be flushed with high pressure water immediately following the cut to avoid build up and hardening of slurry in the groove. The pavement surface shall be allowed to dry for a minimum of 24 hours prior to the final cleaning of the groove and application of the pavement marking material.

(b) **Dry Cutting Head Operation:** The groove shall be thoroughly cleaned to remove all loose aggregate, debris, and dust generated during the cutting operation. Cleaning requires blasting with a high velocity high pressure compressed air blower with a minimum 185 cfm airflow and 120 psi at the air nozzle. Other cleaning options may be allowed as approved by the engineer.

3.5 Pavement Grooving: Grooving shall not cause ravels, aggregate fractures, spalling or disturbance of the joints to the underlying surface of the pavement. Grooves shall be cut into the pavement prior to the application of the pavement marking material. Grooves shall be cut such that the width is 1 in. greater than the width of the pavement marking line as specified on the plans. The length of the groove shall be cut such that the pavement marking material can be applied meeting the installation requirements for the entire length of the marking material. Grooving between skip dashes will not be allowed. The position of the edge of the grooves shall be a minimum of 4 in. from the edge of all longitudinal joints unless otherwise approved by the engineer. The cutting head shall be operated at the appropriate speed to prevent undulation of the cutting head and grooving at an inconsistent depth. The depth of the groove shall be as specified.

3.6 Final Cleaning: Immediately prior to the application of the pavement marking material the groove shall be cleaned with high-pressure air blasts.

4.0 Multi-Component Liquid Pavement Marking (to be used on all surfaces):

Grooved in Multi-Component Liquid Pavement Marking shall be one of the pre-qualified materials listed. The material shall be installed in accordance with manufacturer's installation recommendations with the following exceptions:

4.1 Application: Multi-Component Liquid Pavement Marking shall be applied at an application thickness of 20-25 mils in accordance with the manufacturer's installation procedures.

4.2 Application Temperatures: Multi-Component Liquid Pavement Marking shall only be applied if the air and surfaced temperatures are within the manufacturer's specification limits.

4.3 Surface Preparation: Multi-Component Liquid Pavement Marking shall be placed in a recessed groove cut 40 mil ($\pm$ 10 mil) deep per the grooving specifications specified.

4.4 Drop on Glass Beads: Glass beads shall meet the specifications and applied at a rate of 30 lbs. per 100 square feet.

4.5 MoDOT's requirement to provide contrast markings with white pavement marking on concrete pavements does not apply to these applications.

List of Prequalified Multi-Component Liquid Pavement Marking Materials

Manufacturer	Product
Ennis-Flint	HPS-4 (White and Yellow)
Epoplex	LS-65 (White and Yellow)
Swarco Colorado Paint	MFUA-10 (White and Yellow)
Olin Epoxy – Poly Carb	Mark 55.9 (White and Yellow)

5.0 Method of Measurement.

5.1 Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

5.2 Where required, measurement of 6 inch or 12-inch pavement marking will be made to nearest linear foot. Where intermittent lines are specified, deductions will be made for the gaps in pavement marking.

6.0 Basis of Payment. The accepted quantity of pavement markings including all labor, equipment, and material necessary to groove the existing pavement and place the marking will be paid at the contract unit price for Item Numbers:

Item No.	Description	Unit
620-99.03	Misc. Multi-Component Liquid Pavement Marking, 6 in. Solid White	LF
620-99.03	Misc. Multi-Component Liquid Pavement Marking, 12 in. Solid White	LF

620-99.03	Misc. Multi-Component Liquid Pavement Marking, 24 in. Solid White	LF
620-99.03	Misc. Multi-Component Liquid Pavement Marking, 6 in. Solid Yellow	LF
620-99.03	Misc. Multi-Component Liquid Pavement Marking, 24 in. Solid Yellow	LF

II. Overhead Sign Trusses

1.0 Description. This work shall consist of furnishing and installing overhead sign trusses as shown on the plans. All materials and construction procedures shall meet MoDOT specifications and specifically the applicable requirements listed in Section 903.

2.0 Basis of Payment. All costs associated with furnishing and installing the Overhead Sign Trusses shall include any additional materials, equipment, and labor, shall be considered completely covered by the contract unit price for the following items:

Item No.	Description	Unit
903-99.01	Misc. Sign No. 12, Type S Tubular Two Tube, 74 Ft.	Lump Sum
903-99.01	Misc. Sign No. 19, Type S Tubular Two Tube, 87 Ft.	Lump Sum
903-99.01	Misc. Sign No. 20, Type S Tubular Two Tube, 70 Ft. – 3 In.	Lump Sum
903-99.01	Misc. Sign No. 26, Type S Tubular One Tube, 71 Ft.	Lump Sum
903-99.01	Misc. Sign No. 31, Type S Tubular Two Tube, 85 Ft.- 9 In.	Lump Sum

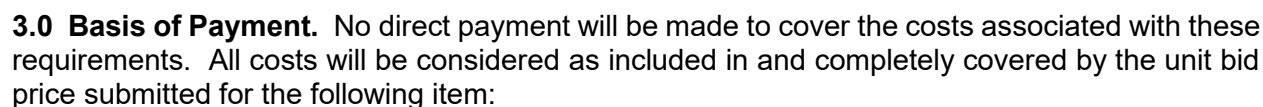
JJ. APWA Curb and Gutter Standard Detail

1.0 In addition to the Missouri Standard Plans for Highway Construction, the following shall apply:

1.1 Description. Part of this project has improvements on Little Blue Parkway and will use the American Public Works Association (APWA) Type CG-1 curb and gutter standard found on Standard Drawing C-1 of the APWA standard drawings. The contractor shall be responsible for incorporating the following this drawing when constructing the curb and gutter along Little Blue Parkway as shown on the plans.

2.0 Construction Requirements. In addition to the APWA's requirements, the contractor shall comply with the provisions outlined in the Missouri Standard Specifications for Highway Construction and any instructions given by the engineer. The contractor can find the APWA's design standards on the APWA Kansas City Metro Chapter website at the link below.

https://kcmetro.apwa.org/wp-content/uploads/sites/23/2023/12/Specifications_APWAStdDwgs_Revised-April2019-1.pdf



Item No.	Description	Unit
609-99.03	Misc. Curb and Gutter (APWA Standard CG-1)	LF

KK. Existing Irrigation Lines

1.0 Description. The contractor shall be made aware that existing businesses within the project limits may have irrigation systems, which may extend into existing MoDOT or City Right of Way.

2.0 Construction Requirements. The contractor may contact businesses to have the existing irrigation lines located in the field as they are not part of the Missouri One Call System, however, they may be unresponsive.

2.1 The contractor shall exercise reasonable care when working near these areas. Irrigation systems that are discovered on MoDOT or City Right of Way that are damaged shall be capped by the contractor at the Right of Way Line. If this occurs, the contractor shall notify the property owner to inform them the irrigation system will need to be repaired at the property owner's expense and kept off MoDOT or City Right of Way.

3.0 Basis of Payment. No direct payment will be made to the contractor for all costs incurred with compliance of this provision.

LL. Truck Apron (Pigmenting and Texturing Concrete)

1.0 Description. This work shall consist of constructing, pigmenting, texturing, and sealing the concrete pavement for truck aprons to give the appearance of brick pavers for the low-profile truck apron at the I-470 northbound off-ramp for the off-tracking area for right-turning vehicles.

2.0 Construction Requirements. The textured, pigmented and sealed truck apron shall be constructed in accordance with Sec 502 and Sec 608 and specifically as follows. The thickness of the truck apron shall be 8" with the top 3" above the driving surface to form a low-profile island. The designated truck apron shall have a red textured Ashlar Stone brick pattern as approved by the engineer.

2.1 The pigment shall be red in color and shall be free from oil, grease, dirt and nonferrous particles and shall cause no adverse effects on the strength and overall integrity of the concrete. The material used for pigmenting shall be mixed into the concrete mixture prior to being placed for the truck apron. The contractor shall not be allowed to use surface only pigmenting material on the surface of the concrete. The coloring shall be one of the following approved coloring systems, or an equivalent as approved by the engineer.

- a.) Stampcrete Integral Color, SC-21 Brick Red
- b.) Solomon Colors SGS Integral Colors, 417 Brick Red
- c.) Davis Colors Integral Color, 160 Brick Red

2.2 A minimum of 10 working days prior to the placement of the colored truck apron, the contractor shall submit a sample of the colored and textured concrete section to the engineer. The sample shall be constructed using the identical process for coloring the truck apron. If, in the opinion of the engineer, changes need to be made to the color or the stamped pattern, a new sample shall be submitted before final approval will be given. The minimum size sample shall be 2 ft. by 2 ft. No direct pay will be made for providing this sample, regardless of the number of samples required by the engineer to achieve the desired surface and color.

3.0 Texturing. After surface irregularities have been removed, the concrete shall be given a uniform surface finish to give the appearance of brick pavers. The method by which the surface is textured is left to the discretion of the Contractor. A stamp or roller device is preferred to maintain consistency. Hand texturing will be permitted in irregular areas where, in the opinion of the Engineer, a stamp or roller device would no longer be beneficial or would not give a satisfactory appearance to the surface of the concrete. Prior to placing the concrete, the Contractor and Engineer shall review all perceived areas where hand texturing may be necessary. The Engineer shall make all efforts to minimize the amount of area to be hand textured. The material used for tinting shall be mixed into the concrete prior to being placed. The contractor shall not be allowed to just place the tinting material on the surface. Tar paper shall be required around the border of the form so that the surrounding pavement will not be marred or stained.

4.0 Method of Measurement. Concrete areas shall be computed to the nearest 1/10 square yard.

5.0 Basis of Payment. Payment for the above-described work including all materials, equipment, labor and any other incidental work necessary to complete the item shall be considered as completely covered in pay items:

Item No.	Description	Unit
502-99.05	Misc. Truck Apron (Pigmented & Textured)	SY

MM. Steel Plate

1.0 Description. This work shall consist of installing a steel plate as shown on the plans.

2.0 Construction Requirements. The contractor shall refer to the construction plans detailing the locations of the steel plates. The contractor shall pay special attention during construction to ensure proper drainage is achieved where the steel plates are to be installed.

2.1 The one half ($\frac{1}{2}$) inch steel slip-resistant plate shall be installed flush with the top of the Modified Type A Gutter or sidewalk and secured to the top of the angle iron. The steel slip-resistant plate shall have a minimum static coefficient of friction of 0.6 and be ADA compliant.

3.0 Method of Measurement. Measurement will be made to the nearest square foot.

4.0 Basis of Payment. All labor, equipment and materials required to install the steel plate as shown on the plans and by this specification will be considered completely covered by Pay Item No. 604-99.04, Steel Plate, square foot. No direct payment will be made for other incidental items required for installation of the steel plates.

NN. Modified Paved Approach

1.0 Description. This work shall consist of constructing modified paved approaches as shown on the plans in accordance with Sec 608

2.0 Construction Requirements. The modified paved approaches shall be constructed as shown on the plans in accordance with Sec 608.

3.0 Method of Measurement. The modified paved approaches will be measured in accordance with Sec 608.

4.0 Basis of Payment. All costs incurred for constructing modified paved approaches as shown on the plans, complete in place, will be paid for at the contract unit price for the following pay item:

Item No.	Description	Unit
608-99.05	Misc. Modified Paved Approach, 8 in	Square Yard

OO. Modified Type B Gutter

1.0 Description. This work shall consist of constructing a Modified Type B Gutter as shown on the plans and in accordance with Section 609.

2.0 Construction Requirements. The Modified Type B Gutter shall be constructed as shown on the plans in accordance with Sec 609.

3.0 Method of Measurement. Measurement will be made to the nearest linear foot along the center of the curb.

4.0 Basis of Payment. All costs incurred for constructing modified paved approaches as shown on the plans, complete in place, will be paid for at the contract unit price for the following pay item:

Item No.	Description	Unit
609-99.03	Misc. Modified Type B Gutter	LF

PP. Wall Pack Lighting

1.0 Description. This work shall consist of furnishing and installing LED wall packs at the I-470 and MO-40 interchange for the eastbound to northbound left-turning movement as shown on the plans.

2.0 Material Requirements. The wall packs, conduit, and wiring shall conform Sec 901.

2.1 Wall pack lighting shall be Holophane W4GLED Wallpack IV Glass LED, with the following specifications:

- 20C1000
- 40K (4000K color temperature)
- T3M (Type III Medium distribution)
- Multi-Volt (120-277V) with Surge Protection
- P7 NEMA Twistlock 7-Pin Receptacle-Control
- Single Fusing
- Gray Super Durable Paint
- Shorting Cap

3.0 Construction Requirements. The wall pack lighting shall be installed in accordance with the manufacturer's instructions, Sec 901, and the National Electrical Code (NEC). Conduit shall be securely fastened and routed to minimize exposure to potential damage. Electrical cables shall be properly terminated and connected. Surge protection devices shall be installed per manufacturer recommendations.

4.0 Method of Measurement. Measurement will be made per each wall pack light.

5.0 Basis of Payment. All costs incurred for furnishing and installing the 150-watt high pressure sodium wall packs including all materials, wiring, conduit, junction boxes, fittings, elbows, equipment, tools, labor, and other incidental work shall be considered completely covered by the contract unit price for the following pay item:

Item No.	Description	Unit
901-99.02	Misc. Wallpack 150W HPS EQ. LED Fixture	EA

QQ. Relocating and Mounting Existing Signs on New Posts

1.0 Description. This work shall consist of relocating and mounting existing signs of various sizes to new PSST, Pipe, or structural posts at locations as shown on the signing plans.

2.0 Construction Requirements. The contractor shall remove, store, and reinstall the signs with new posts and footings as shown on the plans. All work shall be in accordance with the construction requirements of Section 903.

2.1 The contractor shall exercise reasonable care during removal and handling of signs. All signs designated to be removed and relocated that are damaged due to contractor negligence shall be replaced at the contractor's expense.

2.2 The contractor shall remove any existing sign footings to 6-inches below the adjacent ground if not covered by embankment. All work shall be in accordance with the construction requirements of Section 202.

3.0 Method of Measurement. Measurement for relocating and mounting existing signs to new posts will be per each. Measurement for posts and concrete footings will be made in accordance with Section 903.

4.0 Basis of Payment. All costs incurred for relocating and mounting existing signs to new posts at the locations shown on the plans, complete in place, will be paid for at the contract unit price for Pay Item No. 903-99.02, Relocate and Remount Existing Sign to New Post, per each. All costs associated with the removal of the existing posts will be considered completely covered by the contract unit price for Pay Item No. 202-20.10, Removal of Improvements, per lump sum. All costs associated with the providing and installing new posts and concrete footings will be considered completely covered by other pay items provided in the contract.

RR. NEMA 4X Rated Junction Box

1.0 Description. This work shall consist of furnishing and installing a NEMA 4X-rated junction boxes at locations shown on the plans or as directed by the engineer. Work shall be performed in accordance with the plans and manufacturer's recommendations.

2.0 Materials.

2.1 Junction Box Requirements. The dimensions of the box shall be of nominal size and based on Sec 1062.4. The box shall be suitable for outdoor and corrosive environments, offering protection against water, dust, and corrosion.

2.2. Material. The box shall be constructed of 304 or 316 stainless steel with brushed finish. The cover shall be hinged or screw-on with weatherproof gasket to maintain the NEMA 4X rating. All enclosures shall include an internal grounding stud or bar. Knockouts or holes shall not be factory pre-punched unless shown on the plans. All penetrations shall maintain the NEMA 4X rating with proper strain reliefs or fittings.

2.3 Mounting Hardware. Mounting brackets or backplates shall be stainless steel or corrosion-resistant alloy. All fasteners, hinges, latches, and exterior hardware shall be corrosion-resistant, stainless steel, or approved equivalent.

2.4 Conduit Fittings. All conduit entries shall use watertight hubs (e.g., Myers hubs or equivalent). Conduit shall enter the box in a manner that maintains the NEMA 4X enclosure rating.

3.0 Construction Requirements.

3.1 Installation. The Junction boxes shall be securely mounted to the structure (e.g., wall, pole, or cabinet) as shown on the plans at a height and orientation that provides safe and convenient access for maintenance. The box shall be level, plumb, and all conduit connections shall be watertight and properly aligned.

3.2 Grounding. All wire entries shall be sealed and strain-relieved as necessary. Any unused knockouts or holes shall be sealed with plugs rated for NEMA 4X use. All wiring within the box shall be neat and labeled as per MoDOT specifications. A ground conductor shall be connected to the internal ground lug or bar in accordance with the National Electrical Code (NEC) and MoDOT electrical standards.

3.2 Inspection and Testing. All boxes shall be inspected after installation for water-tightness, secure mounting, correct labeling, and overall workmanship. The engineer may require a visual inspection of interior terminations and connections.

3.3 Submittals. The contractor shall submit manufacturer datasheets, installation instructions, and cut sheets for all junction boxes and fittings to the engineer for approval prior to installation.

4.0 Method of Measurement. Measurement will be made per each NEMA 4X Junction Box installed and accepted.

5.0 Basis of Payment. All costs incurred for furnishing and installing the NEMA 4X Junction Box including all materials, equipment, tools, labor, and other incidental work shall be considered completely covered by the contract unit price for the following pay item.

Item No.	Description	Unit
901-99.02	Misc. NEMA 4X Rated Junction Box	EA