Job No.: JSL0018
Route: Huster Rd.
County: St. Charles

JOB SPECIAL PROVISIONS TABLE OF CONTENTS (ROADWAY)

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

12/12/2023 11:24:50 AM
ALVIN NIEVES-ROSARIO - CIVIL
MO-PE-2017026124

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 W. CAPITOL AVE.
JEFFERSON CITY, MO 65102
Phone 1-888-275-6636

If a seal is present on this sheet, JSP's have been electronically sealed and dated.

JOB NUMBER: JSL0018
ST. CHARLES COUNTY, MO
DATE PREPARED: 12/12/2023

ADDENDUM DATE:

Only the following items of the Job Special Provisions (Roadway) are authenticated by this seal: All

Job No.: JSL0018
Route: Huster Rd.
County: St. Charles

JOB
SPECIAL PROVISION

A. General - State JSP-09-03J

1.0 Description. The Federal Government is not participating in the cost of construction of this project.

1.1 This contract requires payment of the prevailing hourly rate of wages for each craft or type of worker required to execute the contract as determined by the Missouri Department of Labor and Industrial Relations. The current State Wage Rates can be found on the Missouri Department of Transportation web page at www.modot.org under "Doing Business with MoDOT", "Contractor Resources" for the applicable bid opening. This supplemental bidding document has 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.

State Wage Rates

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 2023 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-13-01C

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 (job numbers) shall be completed on or before the Contract Completion date specified below. Completion by this date shall be in accordance with the requirements of Sec 108.7.1.

Notice to Proceed: March 11, 2024
Completion Date: November 1, 2024

2.1 Calendar Days. The count of calendar days will begin on the date the contractor starts any construction operations on the project.

Job Number	Calendar Days	Daily Road User Cost
JSL0018	N/A	$1,800

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 **$250** 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 above 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.

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 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 or Gateway Guide TMC at #314-275-1513) 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

3.2 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.

3.3 The contractor shall be aware that traffic volume data indicates construction operations on the roadbed outisde the following hours will likely result in traffic queues greater than 15 minutes. Based on this, the contractor's operations will be restricted to the work hours below. It shall be the responsibility of the engineer to determine if the below work hours may be modified. Working hours for weekends and holidays will be determined by the engineer.

Huster Rd.:
Monday – Friday: No restrictions

4.0 Detours and Lane Closures.

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.

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 (636) 300-2800		
City of St. Charles	Missouri Highway Patrol	MoDOT TMC
Fire: (636) 344-7600	(636) 300-2800	Operating Hours 24/7/365
Police: (636) 949-3000		Dispatch: (314) 275-1500

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-96-05

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

Alvin Nieves-Rosario, P.E.
Transportation Project Manager
Missouri Department of Transportation
St. Louis District
1590 Woodlake Drive
Chesterfield, MO 63014

Office Number: (314) 453-1839
Cell number: (314) 370-3791
Email: Alvin.Nieves-Rosario@modot.mo.gov

All questions concerning the bid document preparation can be directed to the Central Office – Design at (573) 751-2876.

F. Supplemental Revisions JSP-18-01AA

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.

Anti-Discrimination Against Israel Certification

By signing this contract, the Company certifies it is not currently engaged in and shall not, for the duration of the contract, engage in a boycott of goods or services from the State of Israel, companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel, or persons or entities doing business in the State of Israel as defined by Section 34.600 RSMo. This certification shall not apply to contracts with a total potential value of less than One Hundred Thousand Dollars ($100,000) or to contractors with fewer than ten (10) employees.

Ground Tire Rubber (GTR) Dry Process Modification of Bituminous Pavement Material

1.0 Description. This work shall consist of the dry process of adding ground tire rubber (GTR) to modify bituminous material to be used in highway construction. Existing GTR requirements in Section 1015 pertain to the wet process method of GTR modification that blends GTR with the asphalt binder (terminal blending or blending at HMA plant). The following requirements shall govern for dry process GTR modification. The dry process method adds GTR as a fine aggregate or mineral filler during mix production. All GTR modified asphalt mixtures shall be in accordance with Secs 401, 402, or 403 as specified in the contract; except as revised by this specification.

2.0 Materials. The contractor shall furnish a manufacturer's certification to the engineer for each shipment of GTR furnished stating the name of the manufacturer, the chemical composition, workability additives, and certifying that the GTR supplied is in accordance with this specification.

2.1 Product Approval. The GTR product shall contain a Trans-Polyoctenamer (TOR) added at 4.5 % of the weight of the crumb rubber or an engineered crumb rubber (ECR) workability additive that has proven performance in Missouri. Other GTR additives shall be demonstrated and proven prior to use such as a five-year field performance history in other states or performance on a federal or state-sanctioned accelerated loading facility.

2.2 General. GTR shall be produced from processing automobile or truck tires by ambient or cryogenic grinding methods. Heavy equipment tires, uncured or de-vulcanized rubber will not be permitted. GTR shall also meet the following material requirements:

Table 1 – GTR Material Properties		
Property	**Test Method**	**Criteria**
Specific Gravity	ASTM D1817	1.02 to 1.20
Metal Contaminates	ASTM D5603	≤ 0.01%
Fiber Content	ASTM D5603	≤ 0.5%
Moisture Content	ASTM D1509	≤ 1.0%*
Mineral Filler	AASHTO M17	≤ 4.0%

*Moisture content of the GTR shall not cause foaming when combined with asphalt binder and aggregate during mix production

2.3 Gradation. The GTR material prior to TOR or ECR workability additives shall meet the following gradation and shall be tested in accordance with ASTM D5603 and ASTM D5644.

Table 2 – GTR Gradation	
Sieve	**Percent Passing by Weight**
No. 20	100
No. 30	98-100
No. 40	50-70
No. 100	5-15

3.0 Delivery, Storage, and Handling. The GTR shall be supplied in moisture-proof packaging or other appropriate bulk containers. GTR shall be stored in a dry location protected from rain before use. Each bag or container shall be properly labeled with the manufacturer's designation for the GTR and specific type, mesh size, weight and manufacturer's batch or Lot designation.

4.0 Feeder System. Dry Process GTR shall be controlled with a feeder system using a proportioning device that is accurate to within ± 3 percent of the amount required. The system shall automatically adjust the feed rate to always maintain the material within this tolerance and shall have a convenient and accurate means of calibration. The system shall provide in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds per minute, to verify feed rate. The supply system shall report the feed in 1-pound increments using load cells that will enable the user to monitor the depletion of the GTR. Monitoring the system volumetrically will not be allowed. The feeder shall interlock with the aggregate weight system and asphalt binder pump to maintain correct mixture proportions at all production rates.

Flow indicators or sensing devices for the system shall be interlocked with the plant controls to interrupt mixture production if GTR introduction rate is not within ± 3 percent. This interlock will immediately notify the operator if GTR introduction rate exceeds introduction tolerances. All plant production will cease if the introduction rate is not brought back within tolerance after 30 seconds. When the interlock system interrupts production and the plant has to be restarted, upon restarting operations; the modifier system shall run until a uniform feed can be observed on the output display. All mix produced prior to obtaining a uniform feed shall be rejected.

4.1 Batch Plants. GTR shall be added to aggregate in the weigh hopper. Mixing times shall be increased per GTR manufacturer recommendations.

4.2 Drum Plants. The feeder system shall add GTR to aggregate and liquid binder during mixing and provide sufficient mixing time to produce a uniform mixture. The feeder system shall ensure GTR does not become entrained in the exhaust system of the drier or plant and is not exposed to the drier flame at any point after introduction.

5.0 Testing During Mixture Production. Testing of asphalt mixes containing GTR shall not begin until at least 30 minutes after production or per additive supplier's recommendation.

6.0 Construction Requirements. Mixes containing GTR shall have a target mixing temperature of 325 F or as directed by the GTR additive supplier. The additive supplier's recommendations shall be followed to allow for GTR binder absorption/reaction. This may include holding mix in the silo to allow time for binder to absorb into the GTR. Rolling operations may need to be modified.

7.0 Mix Design Test Method Modification. A formal mixing procedure from the additive supplier shall be provided to the contractor and engineer that details the proper sample preparation, including blending GTR with the binder or other additives. Samples shall be prepared and fabricated in accordance with this procedure by the engineer and contractor throughout the duration of the project.

8.0 Mix design Volumetrics. Mix design volumetric equations shall be modified as follows:

8.1 Additional virgin binder added to offset GTR absorption of binder shall be counted as part of the mix virgin binder

8.2 GTR shall be included as part of the aggregate when calculating VMA of the mix.

8.2.1 GTR SPG shall be 1.15

8.3 Mix G_{sb} used to determine VMA shall be calculated as follows:

$$G_{sb\,(JMF)} = \frac{(100 - P_{bmv})}{\left(\frac{P_s}{G_{sb}} + \frac{P_{GTR}}{G_{GTR}}\right)}$$

$$where:$$

$G_{sb\,(JMF)} = bulk\ specific\ gravity\ of\ the\ combined\ aggregate\ including\ GTR$
$P_{bmv} = percent\ virgin\ binder\ by\ total\ mixture\ weight$
$P_s = percent\ aggregate\ by\ total\ mixture\ weight\ (not\ including\ GTR)$
$P_{GTR} = percent\ GTR\ by\ total\ mixture\ weight$
$G_{sb} = bulk\ specific\ gravity\ of\ the\ combined\ aggregate\ (not\ including\ GTR)$
$G_{GTR} = GTR\ specific\ gravity$

8.4 G_{se} shall be calculated as follows:

$$G_{se} = \frac{(100 - P_b - P_{GTR})}{\left(\frac{100}{G_{mm}} - \frac{P_b}{G_b} - \frac{P_{GTR}}{G_{GTR}}\right)}$$

8.5 P_{be} shall be calculated as follows:

$$P_{be} = P_b - \frac{P_{ba}}{100} * (P_s + P_{GTR})$$

9.0 Minimum GTR Amount. The minimum dosage rate for GTR shall be 5 % by weight of total binder for an acceptable one bump grade or 10 % by weight of total binder for an acceptable two bump grade as detailed in the following table. Varying percentage blends of GTR and approved additives may be used as approved by the engineer with proven performance and meeting the specified requirements of the contract grade.

Contract Binder Grade	Percent Effective Virgin Binder Replacement Limits	Required Virgin Binder Grade	Minimum GTR Dosage Rate
PG 76-22	0 - 20	PG 70-22	5 %
		PG 64-22	10 %
PG 70-22	0 - 30	PG 64-22	5 %
		PG 58-28	10 %
PG 64-22	0 – 40*	PG 58-28	5 %
		PG 52-34	10 %
PG 58-28	0 – 40*	PG 52-34	5 %
		PG 46-34	10 %

* Reclaimed Asphalt Shingles (RAS) may be used when the contract grade is PG 64-22 or PG 58-28. RAS replacement shall follow the 2 x RAS criteria when calculating percent effective binder replacement in accordance Sec 401.

Delete Sec 403.19.2 and substitute the following:

403.19.2 Lots. The lot size shall be designated in the contractor's QC Plan. Each lot shall contain no less than four sublots and the maximum sublot size shall be 1,000 tons. The maximum lot size shall be 4,000 tons for determination of pay factors. 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 403.23.7.4.1. A new lot shall begin when the asphalt content of a mixture is adjusted in accordance with Sec 403.11.

Delete Sec 106.9 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 and Steel.
On all federal-aid projects, the contractor's attention is directed to Title 23 CFR 635.410 *Buy America Requirements*. Where steel or iron products 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. Furthermore, any coating process of the steel or iron shall be performed in the USA. 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.

106.9.2 Buy America Requirements for Iron and Steel for Manufactured items.
A manufactured item will be considered iron and steel if it is “predominantly” iron or steel. Predominantly iron or steel means that the cost of iron or steel content of a product is more than 50 percent of the total cost of all its components.

106.9.2 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.

106.9.3 “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.

106.9.4 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.

106.9.4.1 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 the following. That 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.

106.9.4.2 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.

106.9.4.3 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.

106.9.5 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 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.

106.9.6 Buy America Requirements for Construction Materials other than iron and steel materials. Construction materials means 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

106.9.6.1 Minimal Use allowance for Construction Materials other than iron or steel.
"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.

106.9.7 Buy America Requirements for Manufactured Products.
Manufactured products means:

(a) Articles, materials, or supplies that have been:
    (i) Processed into a specific form and shape; or
    (ii) Combined with other articles, materials, or supplies to create a product with different properties than the individual articles, materials, or supplies.

(b) If an item is classified as an iron or steel product, a construction material, or a section 70917(c) material under § 184.4(e) and the definitions set forth in this section, then it is not a manufactured product. However, an article, material, or supply classified as a manufactured product under § 184.4(e) and paragraph (1) of this definition may include components that are construction materials, iron or steel products, or section 70917(c) materials.

106.9.7.1 Manufactured products are exempt from Buy America requirements. To qualify as a manufactured product, items that consist of two or more of the listed construction materials that have been combined together through a manufacturing process, and items that include at least one of the listed materials combined with a material that is not listed through a manufacturing process, should be treated as manufactured products, rather than as construction materials.

106.9.7.2 Manufactured items are covered under a general waiver to exclude them from Buy America Requirements. To qualify for the exemption the components must comprise of 55% of the value of materials in the item. The final assembly must also be performed domestically.

G. NTCIP Compliant Changeable Message Sign (Contractor Furnished and Retained)

1.0 Description. All solar powered changeable message signs, hereinafter referred to as a CMS, shall be in accordance with these specifications.

2.0 Material. Each CMS shall consist of an all LED (light emitting diode) matrix message board, solar/battery power supply and a user-operated interface, as specified, all mounted on a heavy duty, towable trailer.

2.1 Each CMS shall be either Full Matrix or Character Matrix, and have the following minimum characteristics:

(a) Full Matrix - Each CMS shall be the Full Matrix type with the capability of providing one, two, and three lines of individual changeable characters with minimum heights of 52 (1300), 28 (700), and 18 (450) inches (mm), respectively. Full Matrix signs shall be capable of both static and dynamic graphics, and full display sized messages.

(b) Character Matrix (Three Line) – Each CMS shall consist of a minimum of three lines containing eight individual changeable characters per line. Each character shall be a minimum of 12 inches wide and 18 inches (450 mm) high.

(c) Sign firmware shall comply with the current FHWA and DOT (Department of Transportation) NTCIP standards and support all NTCIP mandatory objects.

(d) The sign controller shall be remotely accessible by the MoDOT St Louis District Transportation Management Center (TMC) through the Commission's ATMS (Advanced Traffic Management System) software, currently TransSuite provided by TransCore. The contractor will be responsible for ensuring the CMS is added to the ATMS software.

(e) The CMS shall have a cellular data modem compatible with the district's current cellular IP (packet data) service provider and be capable of allowing the MoDOT St Louis District TMC

ATMS software to have full control of the NTCIP compliant CMS controller remotely. Modem shall be capable of being programmed with a static IP.

(f) The sign shall have a GPS unit that can assist in locating the sign's position when polled by the TMC. The GPS unit must be remotely accessible by the TMC and be part of or work with the provided communication modem.

(g) Physical access to the on-board computer shall be protected by a padlock or other locking handle mechanism. Electronic access to the on-board computer shall be protected by a username and password.

2.2 Full matrix CMS and character matrix CMS shall meet the following:

(a) The overall sign dimensions shall not be less than 72 inches (1800 mm) high x 126 inches (3150 mm) wide.

(b) The CMS shall be legible up to a distance of 650 feet (200 m) for both day and night operations and shall be visible for ½-mile (800 m) with 18 inch (450 mm) characters.

(c) When fully raised in the display position, the bottom of the CMS board shall be at least a height of 7 feet (2100 mm) from the ground and shall be able to rotate a complete 360 degrees atop the lift mechanism. A sight tube, used to aim the CMS board to oncoming traffic, shall be installed on the CMS board or mast. The CMS shall have an electrical-hydraulic lifting mechanism that includes a manual lifting and lowering relief mechanism as a backup. It also must be able to be locked into various viewing angles as determined best for the motorists by the CMS operator.

(d) All LED displays and control circuitry shall be operational from -20 F (-29 C) to 120 F (50 C). The LED's shall have a rated life of 100,000 hours. The LED's shall be ITE amber in color on a flat black background.

(e) The CMS face shall be constructed that if an individual panel or pixel fails the rest of the face shall continue to display the message.

(f) All costs and coordination needed for testing to verify modem communication, sign NTCIP compliance, remote GPS status polling, ability to control the sign via the St Louis District's ATMS software provided by TransCore shall be the sole responsibility of the Contractor. Full integration into TransCore's ATMS shall be completed at least 5 business days prior to use of the CMS in the project. TransCore contact information will be provided to the contractor by contacting MoDOT's Gateway Guide staff at 314-275-1526 or via email at ggtech@modot.mo.gov with details of the request. No other support shall be provided by MoDOT other than TransCore contact information. Information provided shall include, at a minimum, CMS make and model, IP address, and proposed locations and messages.

(g) The Contractor shall be responsible for all monthly cellular service fees for the duration of the project.

(h) The unit shall be able to withstand a 65-mph (105-kmph) maximum road wind speed. The trailer shall be able to support the fully extended CMS board in an 80-mph (130-kmph) wind load.

(i) Solar charging system shall allow for total autonomy of 24/7/365 continuous operation.

(j) All exterior surfaces except the sign face shall be cleaned, primed, and finished with two coats of Highway Safety Orange and the sign interior itself shall be cleaned and finished with one coat of corrosion inhibiting primer and two coats of flat black. The sign face shall be covered with a rigid translucent material to prevent damage to the sign face caused by the environment.

3.0 Construction Requirements. Prior to placing a CMS on a project, the engineer shall verify proposed CMS location is void of conflict with another DMS or CMS locations presently established. If a conflict is present, the engineer shall contact the Traffic Management Center (TMC) at 314-275-1526 to mitigate. If no conflict is present, engineer shall provide Traffic Management Center (TMC) with the Job Number, Route, County, specific CMS location, and a CMS identification number that is permanently affixed to the CMS. The engineer and contractor shall verify the message displayed on board is compliant with CMS messaging policies. The contractor shall place the CMS 6 feet [2 meters] off of the right edge of shoulder at the location shown on the plans or as directed by the engineer. The CMS shall be placed so that the right side of the unit is advanced approximately 3 degrees ahead with the direction of traffic. CMS shall not be located in medians. CMS shall be delineated with a minimum of five non-metallic channelizing devices. Installation, including location and placement, shall be approved by the engineer. If needed, the contractor shall relocate the CMS as directed by the engineer.

3.1 When not in use, the CMS shall be stored no closer than 30 feet [10 meters] to the edge of pavement carrying traffic, unless it is in a properly protected area or an off-site storage area or as otherwise directed by the engineer.

4.0 Basis of Payment. All expenses incurred by the contractor in integrating, maintaining, relocating, operating and protecting the changeable message signs as outlined above shall be paid for at the contract unit price for Item 616-99.02 Changeable Message Sign, Contractor Furnished and Retained, per Each.

4.1 Cost for channelizers shall be included in the contract unit price for CMS.

4.2 Cost for cellular phone hookup and monthly usage fee for the duration of the project shall be included in the contract unit price for CMS.

Item No.	Type	Description
616-99.02	Each	NTCIP Compliant Changeable Message Sign (Contractor Furnished and Retained)

H. Contractor Quality Control NJSP-15-42

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.

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.

I. Utiliities

1.0 The Contractor shall be aware there are numerous utilities present along the routes in this contract. Utility locates were not performed during the design phase of the project; therefore, the extent of conflicts with utilities are unknown. It is the inherent risk of the work under this contract that the contractor may encounter these utilities above and/or below the ground or in the vicinity of any given work item which may interfere with their operations. The contractor expressly acknowledges and assumes this risk even though the nature and extent are unknown to both the contractor and the Commission at the time of bidding and award of the contract. It is, therefore, the responsibility of the contractor to comply with Missouri CSR 319 to get utilities marked and verify the existence, location and status of any marked utility prior to any excavations. Such verification may require direct contact with the listed utilities.

2.0 If utility facilities are discovered the contractor shall contact the MoDOT Area Utility Coordinator, Steve Belcher at (314) 624-7382. The engineer will determine whether relocation of the utility is necessary to accommodate construction or if the work can be installed in accordance with Missouri Standard Plans for Highway Construction for the item of work specified.

3.0 Basis of Payment: No direct payment shall be made for compliance with this provision.

J. Full Depth Reclamation with Cementitious Materials NJSP-22-01A

1.0 Description. This work shall consist of reclaiming (pulverizing) the in-place material to the depth and width shown on the plans. A binder agent, water, and other additives, if required, shall be incorporated into the reclaimed material. The combined material shall be spread and compacted in accordance with the plans and specifications and as directed by the Engineer. This process will herein be referred to as Full Depth Reclamation (FDR).

2.0 Material. All material shall be approved by the Construction and Materials Division or in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Emulsified Asphalt	1015
Water	1070
Cement	1019

2.1 Cement Material. The type and amount of cement material to be used shall be determined by the mixture design. Portland cement is referenced in this specification.

2.2 Reclaimed Asphalt Pavement (RAP) and Underlying Material. RAP and underlying material shall consist of the existing asphalt material, existing base course material, and/or subgrade material. The underlying materials shall be free of roots, sod, topsoil, weeds, wood, or any material deleterious to its reaction with the cementitious stabilizing agent. The gradation of the processed (pulverized) material shall meet the requirements in Section 6.1 of this provision.

2.3 Corrective Aggregate. Corrective aggregate may be required to supplement the existing material gradation and meet the performance requirements of the mix. Corrective aggregate may consist of limestone screenings, crush rock, RAP, crushed concrete, or other approved crushed materials.

2.4 Other Additives. If necessary, other additives such as set retarders, lime, or pozzolans may be used to produce a mixture in accordance with Section 3.0. The type and percentage used shall be described in the submitted design recommendation.

2.5 Water. Water shall be added to achieve the desired moisture content. Water added shall be free from deleterious concentrations of oils, alkalis, salts, sugars, vegetation, as well as other organic, chemical, or deleterious substances. The water shall not cause an adverse effect on either the cementitious stabilizing agent or the reclaimed mixture. If the water is of questionable quality, it shall be tested in accordance with AASHTO T 26 or ASTM C 1602.

3.0 Mixture Design. The contractor, using material obtained directly from the project site, shall submit a mix design tested in accordance with Appendix 1. Significant changes in the type of bituminous or underlying materials encountered during sampling shall warrant a separate mix design. The FDR mix design submitted by the contractor shall meet the following criteria.

FDR MIX DESIGN	
Property	**Criteria**
Compressive strength, AASHTO T 22, 7-day, psi	200 (Min.)
Compaction effort for strength samples, AASHTO T 99, Method C	96 % of MOD (min)

MIX DESIGN GRADATION REQUIREMENTS*	
Percent Passing 3/4" Sieve*	100
Percent Passing No. 4 Sieve	45 (min)
Percent Passing No. 200 Sieve	5 (min)

* Maximum size for laboratory mix design, field pulverized material shall meet the gradation requirements listed in Section 6.1.

In addition to meeting the above criteria, the contractor shall report the results of their mix design on the form provided in Appendix 2.

4.0 Equipment.

4.1 Reclaimer. The reclaimer shall be self-propelled and capable of fully reclaiming the existing road to the depth required, incorporate the cement material and water, and mix the materials to produce a homogeneous material. The minimum power of the reclaimer shall be 400 horsepower unless waived by the engineer. The machine shall be capable of reclaiming no less than 8 feet (2.4 m) wide and up to 12 inches deep in each pass. A machine with a width less than 8 feet (2.4 m) may be approved by the engineer upon demonstration of sufficient mixing capabilities. The reclaimer shall have an integrated water injection system for adding water or slurry with a full width spray bar consisting of a positive displacement pump interlocked to the machine speed so that the amount of water or slurry being added is automatically adjusted with changes in machine speed. Individual valves on the spray bar shall be capable of being turned off as necessary to minimize cement material overlap on subsequent passes.

4.2 Motor Grader. A motor grader for pre-shaping, aerating, spreading and final shaping of the material is necessary. The motor grader shall have a cross slope indicator.

4.3 Rollers. Compacting of the reclaimed mix shall be completed using self-propelled rollers, complete with properly operating scrapers and water spray systems. The number, weight and types of rollers shall be as necessary to obtain the required compaction throughout the entire FDR thickness. A pneumatic roller of adequate size, a vibratory padfoot roller with an 84-inch wide drum equipped with knockdown blade, and a single or double drum vibratory steel roller with a 10 ton minimum weight may be used in any combination to achieve density.

5.0 Construction Methods.

5.1 Weather Limitations. FDR operations shall be completed when the atmospheric temperature, measured in accordance with MoDOT Test Method TM-20, is 50 F (10 C) and rising. All equipment shall be off the road 30 minutes before sunset when constructed under traffic. The weather shall not be foggy or rainy and shall not call for freezing temperatures within seven days after placement of any portion of the project.

5.2 Vegetation Removal. Grass and other vegetation shall be removed from the edge of the roadway to be reclaimed to prevent contamination of the material during the reclaiming operation.

5.3 Pulverization. Prior to the addition of cementitious material, the roadway shall be pulverized to the depth and width shown on the plans using a self-propelled reclaimer meeting the requirements of Section 4. The roadway shall be pulverized to form a homogeneous mixture and be brought to the desired moisture content by means of an integrated water injection system.

5.3.1 Pre-milling. Coldmilling, if required, shall be performed to the depth and width shown on the plans prior to pulverization.

5.3.2 Corrective Aggregate. Corrective aggregate, if required, may be placed either prior to or following pulverization but before the addition of any cementitious material. If applied following pulverization, the granular material shall then be blended with the reclaimed material by means of additional full depth mixing to form a homogeneous mixture prior to the application of cementitious material.

5.4 Cement Material Spreading. Cement material shall be applied to the pulverized surface with a spreading device capable of uniformly spreading the amount required. The spreading device shall be capable of spreading the cement material both laterally and longitudinally in an even and accurate manner. Spreading with a motor grader or pneumatic blower shall not be allowed. Additives shall be introduced by a calibrated device through wet or dry methods. The FDR operation shall be suspended when winds create an excessive amount of blowing dust or blowing cement material.

5.5 Reclaiming and Compaction. Operations shall be scheduled so that the elapsed time between the initial mixing of the cement material and the completion of padfoot rolling does not exceed 30 minutes. If using dry stabilizer, water application shall only be done through the reclaimer's integrated water injection system during mixing. If the 30 minutes is exceeded on an uncompacted lift, the uncompacted material will be retreated as directed by the Engineer. Proposals may be submitted to the Engineer including the use of alternate methods, alternate equipment or set retarding additives, if suitable laydown and compaction is not achieved. **Final rolling pass shall be completed within one hour of the initial mixing.**

5.6 Initial Compaction. The breakdown roller, padfoot or pneumatic, shall not be behind the reclaimer by more than 500 feet (150 m). The padfoot roller, applying high amplitude and low frequency, or the pneumatic roller shall perform initial compaction at enough passes until the roller walks out of the material. Walking out for the padfoot roller shall be when light is clearly evident between all of the pads at the material-padfoot drum interface. Walking out for the pneumatic roller shall be when no significant wheel impressions are left on the surface.

5.7 Shaping. After the completion of padfoot rolling, any remaining padfoot marks shall be removed and the material spread using a motor grader to cut no deeper than the depth of the padfoot marks. The desired slope and shape shall be achieved. After the first day of cement material addition, the reclaimed base shall not be shaped to prevent chunking.

5.8 Intermediate and Final Compaction. The vibratory double-drum steel roller and pneumatic roller shall compact the bladed material. The best combination of number of passes and order of rollers shall be used to meet compaction requirements. The finish roll shall not be Hi vibratory mode.

5.9 Curing. Within two hours after adding the cement material and water, a diluted CSS-1 emulsified asphalt material meeting the requirements of Sec 1015, shall be applied in accordance with Sec 413.40. The CSS-1 emulsified asphalt shall be diluted with 50% water or as directed by the engineer. The NanoTac® emulsion additive, shall be mixed into the diluted emulsion at 0.35% by weight of the emulsion or as directed by the NanoTac® representative. Contact information regarding the NanoTac® is provided as follows:

Rick Bird
Email: rbird@asmg.com
Phone: (775) 690-8513

The final emulsified asphalt mixture shall be applied in two passes with each pass having an application rate of 0.1 gallons per square (gal/sy) to produce a total application rate of 0.2 gal/sy. The reclaimed surface shall be wetted with a light water spray prior to placement of the first pass of emulsified asphalt. Blotter sand may be required if traffic experiences pick up of the emulsion.

5.10 Smoothness. The completed surface shall not vary more than 0.25 inch (6 mm) from the lower edge of a 10-foot (3 m) straight edge placed on the surface parallel and transversely to the centerline. The contractor shall correct humps exceeding this tolerance by trimming, milling or abrasive grinding. Feathering shall not be permitted for repair of low areas. Depressions exceeding the specified depth tolerance shall have a tack coat applied and filled with asphalt concrete just prior to placement of the final surfacing.

5.11 Traffic. Completed portions of FDR stabilized base can be opened immediately to low speed local car traffic, provided the curing material is not impaired. Construction equipment and heavy truck traffic shall not be allowed on the completed FDR stabilized base until a proof roll is conducted to verify the stability of the FDR layer. Proof rolling shall be performed by driving a tandem dual wheel loaded dump truck or equivalent piece of equipment over the FDR finished product. The contractor shall order his work to provide for prompt placement of the bottom lift of the asphalt course to minimize raveling of the base from traffic exposure. The maximum period of traffic exposure on any given section of FDR stabilized base shall not exceed 14 calendar days as measured from, and counting the day that the stabilized base is first opened to traffic, to the day that the first lift is placed unless otherwise approved by the engineer.

5.12 Repairing. Areas in the recycled roadway that develop cracking and/or settlement after the full depth reclamation process shall be repaired. These repairs shall be by deep patching and completed prior to placement subsequent layers. The existing asphalt surfacing material, base and subgrade soil as required shall be removed and replaced with the type of asphaltic concrete being produced on the project at that time and properly compacted to produce a stable repair.

5.13 Equipment Innovation. Other methods and equipment as approved by the engineer will be allowed.

6.0 Quality Control. The contractor shall be responsible for quality control (QC) of all material and the reclaiming process. The form in Appendix 3 shall be used to document QC test results. Sampling and testing frequency shall meet the minimum requirements described herein or defined in the contractor's QC plan.

6.1 Material Sizing. Samples of the reclaimed material shall be obtained before beginning initial compaction. The processed (pulverized) material shall meet the following gradation requirements. A sieve analysis shall be conducted at a minimum of two tests per day. The resulting gradation shall be compared to the mix design gradations to determine any necessary changes to the cementitious or corrective aggregate material content. Sampling procedures shall be in accordance with AASHTO T 168.

Sieve Size	Minimum % Passing by Weight
2.0 in. (50mm)	100
3/4" in. (19 mm)	70
No. 4 (4.75mm)	40
No. 200 (0.075mm)	5

6.2 Cement Material Content. The amount of cement material used shall be as recommended from the mix design. Any changes to the cement material content will need to be approved by the engineer prior to altering the content. The percentage of cement material added shall be checked by determining the amount used by meter readings or truck weight (mass) tickets and by estimating the quantity of road reclaimed – depth, width, length, and estimated in-place density by Proctor density, mix design or field check, or by nuclear density. On the first day of FDR operations, the cement material content shall be determined at a minimum on the first cement material transport. Adjustments in equipment calibration shall be made if necessary. If adjustments are made, the cement material content shall be checked again. Thereafter, the cement material content shall be determined at a sampling frequency of a minimum of one test per day.

6.3 Moisture Content. Moisture content shall be checked by microwave oven in accordance with ASTM D 4643 or equivalent methods, such as a nuclear gauge, direct heating or infrared. Minimum sample size shall be 700 grams for the microwave procedure after the material has been screened through a %-inch (19.0 mm) sieve. If the average moisture content is not **within one percent of the optimum moisture content (corrected for oversized particles),** then the moisture content shall be adjusted by moisture addition with a water truck or by aeration. If the moisture content has been manipulated, the moisture content shall be re-checked. The moisture content sample shall be to the depth of reclamation and taken by any suitable method. The sides of the sample hole shall be perpendicular to the road surface. Samples shall be kept sealed until the samples are ready for testing. The moisture content shall be checked, at minimum, of every 1000 feet on the first day of FDR. After the first day, moisture content sampling frequency shall be at a minimum of three tests per day or as directed by the Engineer.

6.4 Depth Control. The reclaiming depth during all operations shall be monitored regularly to determine compliance with the plans. The depth shall be determined on each side of the reclaimer pass and shall be adjusted immediately as necessary. Depth control shall be verified once per day. The contractor shall take precautions so as not to damage any existing drainage or pipes. Any pipes damaged by the contractor shall be repaired or replaced at the contractor's expense as directed by the engineer.

6.5 Reclaimed Material Compacted Density. Density shall be a **minimum of 96%** of the maximum dry density (MDD) corrected for oversized particles and determined in accordance with AASHTO T 99, Method C. Adjustments to the MDD for oversized particles shall be determined in accordance with ANNEX A1 of AASHTO T 99. Density shall be determined according to MoDOT Test Method TM-41. A minimum of two test strips shall be completed to determine the optimum rolling pattern to obtain the required density. Test strips failing to meet the required density shall be reprocessed. Test strips meeting density requirements shall remain as part of the finished work. Care shall be taken not to over-roll the mat based on visual observations of check cracking or shoving. A new rolling pattern may need to be established if conditions change or it found the required density is not achieved. After acceptance of the test strips, the minimum testing frequency shall be every 1000 feet.

7.0 Quality Assurance. Samples will be taken daily to determine the density and moisture content are in compliance with this specification.

8.0 Method of Measurement. Work as described for FDR will be measured to the nearest 0.1 square yard of the completed sections for the depth specified. Final measurement will not be made except for changes authorized by the engineer

9.0 Basis of Payment. The accepted quantities of FDR shall be paid at the contract unit bid price for item number 405-50.10, Full Depth Reclamation, per square yard. Portland cement will be included in the unit bid price for Full Depth Reclamation. For estimating purposes, 6.0% Portland cement for FDR by weight (mass) of the reclaimed material was used for the plan quantity. No separate payment will be made for other cementitious materials, water, and/or other additives needed for compliance with this specification.

9.1 Adjustment to Plan Quantity. Adjustments to the total percent of cement used in the mix design may be allowed to optimize the performance of the FDR layer.

9.1.1 In the event the percentage of cement material required to meet Section 3.0 of this provision increases by more than +2% (total of greater than 8.0% cement material) of the total planned mix design quantity shown in the Laboratory FDR Mix Design Reporting Form, the following unit price for the additional cement material (above 8.0%) shall be applied via change order.

405-99.10 Misc. Full Depth Reclamation Cement Material at $190 per ton

9.1.2 Payment for adjusted quantities of cement will be measured to the 0.1 tons for accepted quantity of material as approved by the engineer.

APPENDIX 1 - Mix Design Procedures

10.0 Sampling. A field sampling plan using auger borings (ASTM D 1452), cores, and/or other determinations should be established to determine if more than one design shall be performed. The sampling plan should be established using a pattern that results in a representative sample of the asphalt pavement and underlying material. If pre-milling is required, the sampling depth will need to take into account the thickness of the pre-milling. Samples of the asphalt pavement and underlying material should be kept separate during the sampling process. Sections of the roadway with significant changes in the type of asphalt pavement or underlying material should be delineated and treated as separate sampling units. A separate mix design shall be performed for each delineated sampling unit. In addition, sections where the FDR process will encounter more than a 2-inch (50 mm) difference in the average bituminous thickness shall have separate designs performed. A minimum sample size of 350 pounds (160 kg) (asphalt pavement + underlying material) will be required for each mix design.

10.0.1 Processing. Once the roadway samples have been examined and the number of mix designs determined, the asphalt material shall then be crushed to produce RAP. A ledge stone aggregate crusher or similar laboratory equipment should be used to generate a RAP gradation that will be similar to that produced by the FDR process (i.e. 100% passing a 2" sieve). To facilitate crushing of the asphalt material, the material may be placed in a 0° F freezer for 24 hours prior to processing. The generated RAP should then be mixed with the underlying material at the percentages to be encountered in the field. Percentage should be based on dry weight of RAP and underlying material and the depth of FDR shown on the plans. Attention must be given to any

pre-mill depth and its effects on what the remaining thickness of HMA will be for the FDR process. A sieve analysis of the blended material shall be conducted as stated in Section 10.2. This sieve analysis shall be considered the initial gradation. Although the initial gradation should be similar to that produced by the FDR process, specimens prepared for mix designs shall only use the portion that passes the 0.75 in. (19.0 mm) sieve. A moisture-density relationship of the blended material, without stabilizing agent, shall then be determined. After determining the moisture-density relationship of the untreated blended material, the blended material shall then be treated with a cementitious stabilizing agent at various rates and compacted and tested in accordance with this provision.

10.1 Material Evaluation. The plasticity characteristics of underlying fine-grained soils shall be determined in accordance with ASTM D 4318 or AASHTO T 90 and T 89. A sieve analysis of the blended material (RAP + underlying material) shall be conducted in accordance with ASTM C 136 or AASHTO T 27. A moisture-density relationship of the blended material, without stabilizing agent, shall be determined in accordance with AASHTO T 99, Method C. A moisture-density relationship of a treated blended material is not necessary. Experience with previous projects has shown that the differences between the OMC and MOD for a treated and untreated sample are typically negligible. The results of the material tests shall be documented and reported on the FDR Mix Design Reporting Form in Appendix 2.

10.2 Number of Specimens/Mixing. A minimum of three cement material contents that bracket the design cement material content shall be chosen, typically 4, 6, and 8 percent for Portland cement by dry weight of blended material.

10.2.1 Three specimens for each of the three cement material contents shall be produced for strength testing.

10.2.2 A mechanical mixer shall be used that has a bowl of 10-12 inches (250-300 mm) in diameter. The mixer shall rotate on the mixer's axis at 50 to 75 revolutions per minute. A mixing paddle which makes contact with the bottom and side of the bowl shall rotate on the mixing paddle axis at twice the bowl rotation rate and in the opposite rotation direction as the bowl. Other mixers providing complete and uniform mixing may be used.

10.4 Compaction. Each strength specimen shall be compacted at the optimum moisture content (OMC) determined from Section 10.2. Compaction shall be performed in accordance with AASHTO T 99, Method C, or ASTM 0558, Method B. A separate and new representative sample of the blended material should be used for each specimen; compacted material shall not be reused. Extrude the sample from the mold and record the weight of the compacted sample for density determination. The moisture content of each sample shall be determined by obtained left over, uncompacted, material from each specimen.

10.5 Curing Before Testing. After extruding and weighing the compacted specimens, the specimens shall be sealed to prevent loss of moisture and moist-cured for a period of 7 days at 75° F.

10.6 Strength Test. Test the cured specimens in accordance with AASHTO T 22, except the length – diameter correction will not be applied.

10.7 Optimum Cement Material Content. Determine the optimum cement material content by plotting the average compressive strength versus the cement material content. As a factor of safety,

the optimum cement material content selected from the mix design shall produce an average compressive strength of at least 50 psi above the minimum requirement of Section 3.0.

APPENDIX 2 – Laboratory FDR Mix Design Reporting Form. At least 30 days prior to performing any reclaiming activity on the project, the contractor shall submit the following FDR mix design information to Central Office – Construction and Materials, Field Office for approval.

Laboratory FDR Mix Design Reporting Form

Contractor:	**Date:**
Project No.:	**Location:**
FDR MIX DESIGN REPORTING FORM Results of Laboratory Testing	
Laboratory Test *	**Laboratory Results**
Sieve Analysis (for Moisture-Density Relationship) AASHTO T 27 (crushed HMA & corrective aggregate, if required)	
3/4" Sieve (% Passing) (100% Required)	
No. 4 Sieve (% Passing) (Min 45% Required)	
No. 200 Sieve (% Passing) (Min 5% Required)	
Moisture-Density Relationship AASHTO T 99 – Method C (without cementitious material)	
Optimum Moisture Content (OMC)	
Maximum Wet Density (MWD) at OMC	
Maximum Dry Density (MDD) at OMC	
% Corrective Aggregate (if required)	
FDR Mixture Compressive Strength, ASTM D1633, Method A	
Compressive Strength, Min. Required @ 7 days, 200 psi	
Target Moisture Content of Specimen	
Material Information	**Target Material Content**
% Cement (by weight of MDD)	
% Other Additives (if needed): • • •	
Target Field Moisture Content	

Target Field Moisture Content: (%) (Moisture content of lab specimen at optimum compressive strength. Field moisture shall be within 1 percent of this value.)	

*Submit attached to this form supporting Laboratory Reports with applicable graphs.

Reviewed by: Date: ○ Approved

○ Rejected

MoDOT Construction & Materials

APPENDIX 3 – FDR Quality Control Data Sheets

Date:	Project / location:
QC personnel:	Phone:
Temperature at start of day:	Temperature at end of day:
Climate conditions:	

Results of mix design

Optimum moisture content (OMC)	
Maximum Dry Density at OMC.	
Wet Density at OMC.	
Recommended field moisture range:	Recommended cementitious material content:

Corrective Aggregate

Station / location						
Type and source						
Length, ft						
Width, ft						
Weight, lb						
Rate, lb/SY						

Test strip for sand cone or nuclear density

Location	Station	Wet density, cf	Moisture, %	Corrected Moisture,	Dry density, pcf	Notes
Average						
Operator	Gauge model	Gauge Serial #				
	Final roller pattern:					

Density measurements not required. Final roller pattern:

Material Tests

Station / location						
Max. size – 2"						
Sieve Size – 1.75"						
% Passing No. 4						
Moisture content, %						
Cementitious material content, %						
Wet Density, pcf						
Dry density, pcf						
Proctor dry density, pcf						
Percent of reference density						

Reported by:_____

K. Required Combination of Calls

The following calls are in required combination of calls and bids shall be submitted for all calls. The bidder will be declared irregular if bids are not submitted for all calls listed below in accordance to Section 102.8 of the Missouri Standard Specifications for Highway Construction.

Call	Job Number
240119_F7A	J6S3487 J6S3607
240119_F7B	JSL0018

The combination of the total prices of the bids for all calls listed above will be used to determine the low bid. The first sentence of the Missouri Standard Specifications for Highway Construction Section 102.12.3 is deleted for this contract. However, this does not affect the applicability of the remainder of that section to the work under the required combination of calls. A separate contract will be executed for each call listed above.