

Request for Proposals
Bid Number: 21-03-2446LE

The Navajo Nation Office of the Controller - Purchasing Department, and Navajo Division of Transportation - Department of Roads, are accepting qualifications and sealed bids for route N5099-Aneth, UT: Approximately ~~42,240~~ **38,200** square yards of Scrub Seal & ~~43,240~~ of Cape Seal, with potholing repair, and permanent signage.

Contacts for a bid packet are L. Etsitty, Navajo Nation Purchasing Department, www.nnooc.org, (928) 871-6317; or, D. Jackson, Navajo DOT, Department of Roads, djackson@navajodot.org, (505)371-8364.

The closing date for this project is April 9, 2021 at 2:00pm, Window Rock, AZ, time. Any RFPs received after the closing date will be considered non-responsive and returned to the sender. No facsimile or emailed RFPs will be accepted.

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Section 1 - Overview

1. Request for Proposal (RFP) Packet – The Instructions on the proposal preparation, required documents, eligibility requirements, and evaluation criteria are provided herein.

The RFP package may be obtained by downloading from the Navajo Division of Transportation website and/or the Navajo Nation Purchasing Department’s website. **No printouts of the RFP will be given.** The websites to download the RFP are:

- Navajo DOT - <https://navajodot.org/rfp%2Frfrq>
- Purchasing Department’s website - <http://www.nnooc.org/RFPs-Advertisements.html>

Note: If a firm download’s from the websites given above or gets a copy of the RFP from another source other than from Mr. Jackson, please contact Mr. Jackson by email so that if an addendum(s) or questions are issued/answered, your firm will receive the information. Regardless of how a firm receives their copy of the RFP, email Don Jackson at, djackson@navajodot.org.

2. General Scope of Work (SOW) – This project is to conduct a routine road maintenance program/maintenance activity for N5099-Aneth, UT: Total project length is approximately 3.2 miles. The first approximately 2.7 miles shall be pothole repair; Scrub Seal & Cape Seal; and, permanent signage. The remaining 0.5 miles of work is pothole repair and permanent signage. Note: The Scrub Seal shall not exceed 38,200 square yards; and, the Cape Seal shall not exceed 39,200 square yards. Specifications for the project is located towards the end of this RFP. In addition to the specifications, the maintenance activities will be treated as per the typical cross-sections in the SOW. The Navajo Nation is the lead agency and is using Navajo Nation Road Funds for the project.

3. In addition to a Firm’s bid submission, this project is also qualifications based, per the ‘*Rating System and Evaluation Criteria*’ located on page 4 of the RFP.

4. Schedule of Activities: Note, all times Window Rock, AZ, time, 2021.

<u>Activities:</u>	<u>Due Date:</u>
i. Advertised Period	March 25- April 3, 2021.
ii. Deadline to Submit RFP Questions	April 5, by 12:00pm.
iii. Final Response to Written RFP Questions	April 6, by 5:00pm.
iv. RFP Submittal Deadline	April 9, by 2:00pm.
v. Evaluation of proposals	Week of April 12.
vi. Final Selection of Firm	April 16.

5. Inquiries – Questions regarding this RFP must be submitted by email to the Project Contact listed below. Written questions as to the intent or clarity of this RFP can be submitted to the Project Contact until 12:00pm (Window Rock, AZ time), April 5. Written responses to written questions and any RFP amendments will be distributed by email to all parties who obtained an RFP package and have notified L. Etsitty, NN Purchasing Department, or D. Jackson, Navajo DOT. No further questions, in any form, will be entertained after the April 5 deadline. Project Contact: D. Jackson, Engineer, Navajo Division of Transportation, Telephone: (505) 371-8364, and Email: djackson@navajodot.org.

6. Proposal Submittal Deadline – Proposals must be physically submitted to the following address by April 9, no later than 2:00 PM (local Window Rock, AZ time).

Navajo Division of Transportation
Attention: Don Jackson
Navajo Transportation Complex
#16 Old Coal Mine Road
Mentmore, NM 87319

Late, facsimiled or e-mailed proposals will not be accepted. These will be returned to the firm un-rated and firms responding in such fashion shall be considered non-responsive.

6. Addendum to the RFP – In the event it becomes necessary to revise any part of the RFP, Navajo DOT shall issue a written addendum on the specifics of the change and inform all concerned. **Addendums will also be made available for download from the Navajo DOT website (www.navajodot.org).** The firm shall acknowledge receipt and review of the addendum(s) under the Letter of Interest.

7. Rejections of Proposals – The Navajo DOT reserves the right to reject any or all proposals and to waive informalities in the proposals received whenever such a rejection or waiver is in the best interest of the Navajo nation.

8. Proprietary Information – Any restrictions on the use of data contained within any proposals must be clearly stated in the proposal. Each page that contains proprietary information must be stamped or imprinted “Proprietary”.

9. Ownership of Proposals – All materials submitted with the RFP accepted for rating shall become the property of Navajo DOT and not be returned to the firm. The Navajo DOT has the right to use any or all information presented in the RFP subject to limitations outlined in Paragraph 8, above. Disqualifications or non-selection of a firm or proposal does not eliminate this right.

10. Cost Incurred – The Navajo DOT is not liable for any cost incurred by the firm prior to issuance of a signed contract for services.

11. Contractual Obligation – The contents of the proposal may become part of contractual obligations of the contract award. Failure of the firm to accept these obligations may result in cancellation of the award for services.

12. Evaluation Criteria – Proposals accepted for rating shall be evaluated based on the criteria and point system set forth in Part 12(a) that follows on next page.

Part 12(a) – Rating System and Evaluation Criteria

Each proposal will be evaluated and rated as follows. Descriptions of the components are provided in Section 3 – Proposal Content and Evaluation Criteria

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| 1. Overall professionalism and conciseness of proposal. | 10 points |
| 2. Qualifications & Experience, of firm & project team. | 35 Points |
| 3. Approach to Scope of Work, including FP-14 Specifications, and to include Project Understanding & Project Scheduling. | 40 Points |
| 4. Listing of Equipment for SOW; and, Product Certifications as Stated in Specifications. | 15 Points |

Total Points	100 Points
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A Short List of qualified candidates will be determined from the 100 points. To get to the Short List, the firms must receive a minimum of 80 points.

Preference Points: If a Priority 1 firm makes the Short List, that firm will receive an additional ten (10) points added to their score ranking. If a Priority 2 firm makes the Short List, that firm will receive an additional five (5) points added to their score ranking. Non-priority firms do not receive additional points. This is a requirement from the Navajo Nation Business Opportunity Act. Firm must provide documentation per the Business Regulatory Department as prioritized under Section 204 (A) (1) and (2) of the revised Navajo Nation Business Opportunity Act, of its Priority 1 or 2 status.

It is intent of Navajo DOT to rank the firms according to the responses submitted. The Navajo DOT reserves the right to conduct detailed interviews in person, of qualified/responsive firms, if warranted.

13. Standard Contract – The Navajo Nation reserves the right to incorporate contract provisions which are based on applicable requirements, such as, Navajo Nation Laws, State, and local requirements, etc. into the contract documents. This includes provisions of the Navajo Business and Procurement Act, at 12 N. N. C. § 1501 et Seq., and the Navajo Business Opportunity Act, at 5 N. N. C. § 201 et Seq.

14. Taxes – All work performed and services provided within the territorial jurisdiction of the Navajo Nation is subject to the six percent (6 %) Navajo Sales Tax (24 N. N. C. § 601 et Seq.).

15. Insurance – The Navajo Nation will require the successful firm, at its sole expense, to procure and maintain adequate and sufficient insurance for all potential liability, such as, commercial general liability, automobile liability, worker’s compensation, performance & payment bonds, etc. The general contractor shall provide all bonds and insurance prior to the Notice to Proceed with Construction. For the Proposal, provide affidavit from surety indicating Contractor’s ability to provide said bonds. Failure to do so will result in a Firm’s proposal being Non-Responsive.

16. Bonding documentation required. The Navajo Nation’s Representative must receive written documentation of all required bonds prior to the issuance of a Notice to Proceed for the Project, and Contractor shall not commence any work or services under this Contract until such documentation is received by the Navajo Nation.

17. Disclaimer – The Navajo Nation’s acceptance or review of any proposal shall not guarantee the execution of any contract, and the proposed contract shall be reviewed by all appropriate departments through the 2 N. N. C. § 164 review process, including the Navajo Nation Department of Justice, for administrative and legal sufficiency, prior to execution by the Navajo Nation. The Navajo Nation reserves the right to reject any proposed contract prior to execution, for improprieties in the procurement process or applicable Navajo Nation or federal laws or regulations, or the failure to submit all requested documents or information.

Section 2 – Proposal Requirements and Selection

1. Proposal Submission

- A. Proposal must be submitted in a sealed envelope clearly marked:
 - a. “N5099-Aneth, UT: Approximately 42,240 38,200 square yards of Scrub Seal & 43,240 39,200 square yards of Cape Seal, with potholing repair, and permanent signage.”
 - b. The name of the firm submitting the proposal shall be legibly written and shown on the outside of the sealed envelope, to include the firms address.
- B. Proposal Standards: The firm shall submit one (1) original and three (3) identical copies of their RFP packet for the evaluation committee members. Appearance of the proposal is important and professionalism in proposal presentation should not be neglected. The proposal standards are as follows:
 - a. This RFP proposal may not exceed 15 single-sided pages (maximum 8 ½” x 11”) with a minimum of 10 pt. type.
 - b. Pages that have photos, charts, and graphs will be counted towards the maximum number of pages.
 - c. The following information is not included in the 15-page limit: proposal front and back cover; cover letter on company letterhead; divider and/or tabs, as long as there is nothing on them; and maximum 1-page resumes of each team member.
 - d. RFP submittals should be plastic or metal spiral-bound only. **Please do not submit RFP in loose-leaf 3-ring binders; these will be considered non-responsive and returned to the firm un-rated.**
 - e. Submissions exceeding the 15-page limit or any resumes exceeding the 1-page limit will be considered non-responsive and will be returned to the Applicant un-rated.
- C. In a separate sealed envelope clearly marked as “**BID PROPOSAL – N5099-Aneth, UT; Bid #21-03-2446LE**”, the firm shall provide its bid amount to complete the Scope of Work. The sealed envelope will not be opened by the Navajo DOT until after the RFP proposals have been reviewed and ranked.

- 2. Proposal Review Process & Receipt of Proposals will be verified on the due date specified. The Navajo DOT will screen and evaluate proposals received in accordance to the following criteria. Proposals which fail this check shall be considered non-responsive and returned to the firm un-rated.
 - a. Proposal is received by the required deadline date and time.
 - b. Proposal meets the proposal submission requirement set forth above, under Section 2, Part 1, (A), (B), & (C).

3. Proposal Evaluation
 - a. Proposal shall be evaluated and rated in accordance with the criteria outlined in Part 12(a) - Rating System on Evaluation Criteria.
 - b. The Navajo DOT will rate the proposal based on total points awarded and all firms with a minimum score of 80 of 100 points will be determined as responsive. The Navajo DOT reserves the right to interview these qualified firms.
4. Award of Contract
 - a. The Navajo DOT will issue a Notice to Proceed to the firm upon execution of the contract. No work shall be performed by the firm until such notice is given by Navajo DOT. The Navajo DOT is not liable for any cost incurred by the firm prior to issuance of a signed contract award, for “Approximately ~~42,240~~ 38,200 square yards of Scrub Seal & ~~43,240~~ 39,200 square yards of Cape Seal, with potholing repair, and permanent signage”.

Section 3 – Proposal Content and Evaluation Criteria

1. Qualifications and Experience of firm and project team. Proposals must specifically address and affirm the following:
 - a. Letter of Interest that indicates why your firm should be selected for project N5099-Aneth, UT. In addition, firm should acknowledge receipt and review of any addendum(s) issued. State that firm is capable to perform all or most aspects of the project.
 - b. Evidence of insurance and statement from bonding company that all bonds will be completed prior to Notice to Proceed with Construction.
 - c. Resume of personnel that will be involved in the task of completing projects, including professional qualifications and experiences of key personnel. Include personnel of sub-consultants which will be utilized by the prime consultant.
 - d. Provide key personnel’s availability for the proposed work, and, roles and responsibilities. Include their knowledge of the Navajo Nation, and Specifications noted within the RFP, with respect to - Approximately ~~42,240~~ 38,200 square yards of Scrub Seal & ~~43,240~~ 39,200 square yards of Cape Seal, with potholing repair, and permanent signage.
 - e. Organizational Chart outlining the inter-relationship and line of communication between the firm and sub-consultants.
 - f. Recent experiences in providing services comparable to the proposed SOW as listed in Section 4. Interested firms shall provide three (3) references from similar projects. List the reference’s contact person’s name, address, and phone number.
3. Approach to Scope of Work with respect to the Specifications.
 - a. Approach to Scope of Work - Describe your understanding of the project and approach to delivering the project SOW with respect to the Specifications, in addition to the work described in Section 4.
 - b. Include how your firm will schedule the work. Include a graphical illustration i.e. a Project Schedule such as a GANTT Chart.

4. List of Equipment for SOW and Product Certifications, as Stated in Specifications.
 - a. List equipment to complete the Scope of Work and list Product Certifications, including meeting requirements as stated in the Specifications.

Section 4 – SCOPE OF WORK for Project: N5099-Aneth, UT: Total project length is approximately 3.2 miles. The first approximately 2.7 miles shall be pothole repair; Scrub Seal & Cape Seal; and, permanent signage. The remaining 0.5 miles of work is pothole repair and permanent signage. Note: The Scrub Seal shall not exceed 38,200 square yards; and, the Cape Seal shall not exceed 39,200 square yards.

SCOPE 1.1. A scrub seal is the application of emulsified asphalt with a scrub broom followed immediately by an application of a single layer of cover aggregate. The treatment can be applied as a wearing surface or as an interlayer. 1.2. This standard specifies quality requirements for aggregate and emulsified asphalt for scrub seals.

A scrub seal is a roadway surface treatment that involves applying a spray-on emulsion with a higher viscosity followed by a broom trailer that forces the emulsion into the cracks. A light coverage of fine aggregate is applied to the emulsion to provide some surface skid resistance.

This treatment weather-proofs surfaces and adds a temporary skid resistance. It's primarily used as the first step in a cape seal treatment but can also be left as a final surface for low volume traffic conditions. If a scrub seal is used as a final surface treatment and aggregate larger than one-quarter inch is used, a fog seal is recommended to help lock down the aggregate.

A Cape Seal involves a single application of chip seal or scrub seal followed by a single application of slurry seal or micro surfacing treatment.

It's extremely cost effective and provides the benefits of both treatments – sealing moderate cracks, providing skid resistance, sealing pavement against moisture, protecting against oxidation and raveling, and restoring a uniform appearance.

Cape Seal treatments have been used for many years on projects with long life cycles.

There will be a non-mandatory, pre-bid, meeting at the project site on April 5, at 12:30pm M.S.T., at BOP#1, given below in part 1 a.

When construction begins, coordination with Navajo DOT shall be through the Construction Manager (CM), D. Jackson (505-371-8364), djackson@navajodot.org.

Additional Scope of Work requirements:

1. Project Location:
 - Potholing, Scrub Seal, Cape Seal, & Permanent Signage.
 - a. BOP#1-N5099: 37°25'12.49"N, 109°20'2.66"W
EOP#1-N5099: 37°24'28.23"N, 109°17'15.47"W
Potholing & Permanent Signage.
 - b. BOP#2-N5099: 37°23'19.71"N, 109°14'7.17"W
EOP#2-N5099: 37°23'30.47"N, 109°13'35.64"W

Scope of Work shall be denoted by 1 (a) & 1 (b), which are the Project Locations, latitudes & longitudes given in Paragraph 1, above.

2. **1 (a) & 1 (b):** It is the responsibility of the Firm/Contractor selected for this project to contact Navajo DOT – Project Management Department, immediately after the contract for this project is fully executed. Project Management oversees all environmental, biological, and

archeological compliances required by all government agencies. Contractor will request from Project Management all requirements needed to comply with all environmental & archeological conditions for this project. Written documentation shall be the required mode of communication regarding this requirement. The Construction Manager shall be notified within 24-hrs regarding communication between the Contractor, Project Management, and other compliance agencies; these communications shall be in written form.

3. **1 (a) & 1 (b):** Section 107 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC: Follow the requirements of FAR Clause 52.236-7 Permits and Responsibilities. Comply with applicable laws, ordinances, safety codes, regulations, orders, and decrees. Protect and indemnify the Government and its representatives against claim or liability arising from or based on the alleged violation of the same. Comply with permits and agreements obtained by the Government for performing the work that is included in the contract. Obtain additional permits or agreements and modifications to Government obtained permits or agreements that are required by the Contractor's methods of operation. Submit copies of permits and agreements. Provisional Notice to Proceed will be given to acquire permits prior to construction.
4. **1 (a) & 1 (b):** Contractor is encouraged to visit project site to, in general, determine type of equipment needed, and other project requirements.
5. **1 (a) & 1 (b):** Mobilization - Section 151: This work consists of moving personnel, equipment, material, and incidentals to the project and performing work necessary before beginning work at the project site. This work also includes obtaining permits, insurance, and bonds. Note: permits include 401 & 404 consultation letters & certifications, if warranted. In addition, water requirements and utility clearances for this project are considered a part of Mobilization.
6. **1 (a):** Section 153 - CONTRACTOR QUALITY CONTROL. Payment is in Bid Schedule as Bid Item #2. Contractor to collect geotechnical samples prior to and other requirements per Section 153.
7. **1 (a):** Section 154 - CONTRACTOR SAMPLING AND TESTING. Payment is in Bid Schedule as Bid Item #2.
 - a. This work consists of obtaining samples for testing and reporting required test results at least seven (7) calendar days before work begins. This includes all Section 204, 303, 311, and 407 work, to include geotechnical investigation prior to subgrade preparation, finished subgrade, prior to stabilization activities, and double course chip seal, and after completion of stabilized aggregate surface course and double course chip seal activities.
 - b. Supplement to Section 154: Allow the Construction Manager and/or Engineer staff the opportunity to witness all testing. Testing of trial samples may be required to demonstrate testing competence.
8. **1 (a) & 1 (b):** Section 155 - SCHEDULES FOR CONSTRUCTION CONTRACTS. Submit a Project Schedule with proposal. Contractor will submit schedule updates as needed, including 2-weeks prior to Notice to Proceed(s), for approval.
9. **1 (a) & 1 (b):** Section 156 – PUBLIC TRAFFIC. Controlling and protecting public traffic and dust abatement (for the work and public travel) is not a pay item.
10. **1 (a) & 1 (b):** Section 303. — ROAD RECONDITIONING. Road Conditioning shall be completed per FP-14 Section 303.03 & 303.04, Ditch & Shoulder Reconditioning, respectively – this is considered minor work. Firm is encouraged to attend the April 5, Non-Mandatory Pre-Bid Meeting at the project site.

11. **1 (a):** Section 407. — CHIP SEAL. Specifications highlighted shall be followed by the Contractor.
- a. Attached is *Section 407* Specification for Scrub Seal maintenance activity.
 - b. Emulsified asphalt: See Supplemental Specifications.
 - c. Perform Geotech investigation to determine design mix and recommended quantities per Table 407-1, Type “1C” located in FP-14.
 - d. From FP14, Table 703-7, use Grading Designation “C”.
 - e. Payment will be made under Scrub Seal (square yard); and, no Pay Factor per Section 407.15.
12. **1 (a) & 1 (b):** Section 418— ASPHALT CONCRETE PAVEMENT PATCHING.
- a. The Firm is encouraged to attend the Non-Mandatory Pre-Bid Meeting on April 5, 12:30 M.S.T., at the project site, to determine its bid for this activity.
13. **1 (a) & 1 (b):** Section 633. — PERMANENT TRAFFIC CONTROL: For permanent traffic control provide the following signage quantities:
- a. All signs conform to latest version of MUTCD.
 - b. 1 BIA-DOT sign with “N5099” on panel.
 - c. 1-Stop Sign, Type R1-1, 30”x30”.
 - d. 2-35 mph, Type R2-1, 18”x24”.
 - e. Furnish hardware for all signs, per Section 633.02 of FP14.
 - f. All panels for signs per Section 633.02 of FP14.
 - g. All posts of galvanized type, per Section 633.02 of FP14.
 - h. Further miscellaneous materials for signage per Section 633.02 of FP14.
 - i. 4-delineators, Plastic, per 718.5 (d) and 718.08.
 - j. Two permanent special signs which notify graders to not blade within project area.
14. **1 (a):** Section 634. — PERMANENT PAVEMENT MARKINGS
- a. This work consists of applying a 4-inch Two-direction passing zone markings consisting of a normal broken yellow line where crossing the center line markings for passing with care is permitted for traffic traveling in either direction along the centerline of the 2.7-mile Scrub & Cape Seal.
 - b. Staking for centerline striping is incidental and is part of Section 634 Bid Item.
 - c. FP-14, use Type B – Waterborne traffic paint with Type 1 glass beads.
15. **1 (a) & 1 (b):** Section 635 - TEMPORARY TRAFFIC CONTROL: In addition to following Section 635, Contractor is to abide by the following.
- a. At least one lane will always remain opened and motorist will have access at all times. Full road width must be accessible during Contractor’s non-working hours and on weekends.
 - b. Traffic Control Plan (TCP) will be submitted to Contract Manager for approval 10-business days prior to any work on N7113. Any changes to TCP during construction will require Contractor to submit updated plan to CM 5-days minimum for approval.
16. **1 (a) & 1 (b):** Water: There will be no separate bid item for water and the water permit. The cost for providing water shall be included in the respective bid items for the work to be performed. Consult with Navajo Nation Water Code office for permit.
17. **1 (a) & 1 (b):** Submittals - In addition to submittals for Bid Items, other submittals required are the following: All submittals are considered incidental and not a pay item.
- a. Geotechnical results.
 - b. Certifications for materials, per FP-14 and Supplemental specifications.
 - c. Safety & Health Plan per FP-14 specifications.

- d. Contact list of any sub-contractors and key personnel.
 - e. SWPPP & BMPs, per FP-14 specifications.
18. **1 (a) & 1 (b):** The vendor will have to dispose of any rejected material at his own expense off the Government property in approved recycle facilities.
 19. **1 (a) & 1 (b):** Provide an estimated timeline bar chart schedule for this project.
 20. **1 (a) & 1 (b):** Explain approach for other activities required for acceptable Scope of Work and compliance with specifications.
 21. **1 (a) & 1 (b):** State how project communication is intended to keep all parties involved in the project.
 22. **1 (a) & 1 (b):** Materials Delivery Contractor(s) shall follow Contractor's approved Temporary Traffic Control and Safety Plan, as well as Navajo DOT's traffic control plan throughout the construction of the project.
 23. **1 (a) & 1 (b):** Staging area is a Mobilization item.
 24. **1 (a) & 1 (b):** A provisional Notice to Proceed will be given when a contract is fully executed between the General Contractor and the Navajo Nation. This will allow the Contractor to acquire permits and perform geotechnical investigation to facilitate a full Notice to Proceed with Maintenance Activities.
 25. **1 (a) & 1 (b):** If selected for this project, submit to Navajo DOT the following:
 - PROOF OF CERTIFICATE OF INSURANCE: Provide proof of Certificate of Insurance.
 - Taxpayer Identification: Form W-9.
 - Affidavit of Non-Collusion.
 - Suspension-Debarment.
 - Bonding.

Quality Assurance: 1 (a) & 1 (b):

Navajo DOT will provide quality assurance to ensure that work is being performed in accordance with the Scope of Work and project specifications.

Final inspection will include Navajo DOT for acceptance of scope of work.

CERTIFIED NAVAJO BUSINESS: 1 (a) & 1 (b).

If applicable, provide documentation that the business is currently certified by the Navajo Nation Business Regulatory Department and prioritized under Navajo Nation Council Resolution CAP-37-02 and, also, under the Section 204 (A) (1) and (2) of the revised Navajo Nation Business Opportunity Act.

Compliance: 1 (a) & 1 (b):

Comply with conditions stated in all compliance reports, cultural & biological. If cultural site is discovered, immediately notify NDOT Project Management & Roads Dept. Note: Navajo DOT will give copies of archeological & environmental reports to selected Contractor. Contractor will notify Navajo DOT – Project Management Department of its selection as the General Contractor. Contractor and his sub-contractors will stay in “footprint” of existing road. Written request by Contractor to Project Management to go out of existing “footprint” is required.

Supplemental Specifications for Scrub Seal.

Description

Construct an approximately 2.7-mile by 24-foot width, Scrub Seal on the existing chip seal course. surface treatment will consist of 1 or more applications of a single layer of asphalt emulsion that is scrubbed with a broom and covered with a single layer of aggregate.

Materials

Furnish materials of the type and grade shown on the plans in accordance with the following:

- Polymer modified emulsion CMS-2P, approved source: HollyFrontier Asphalt Company. See attached '*NMDOT Minimum Testing Requirements*'. Estimated quantity is 16,500 gallons.
- FP14, Table 703-7, use Grading Designation "C". Estimated quantity is 600 tons.

Weather

FP-14, Sections 407.07.

Surface Preparation

FP-14, Sections 406.04 & 407.06.

Equipment

Distributor. FP-14, Sections 407.05.

Calibration. FP-14, Sections 407.05, 406.03, & 407.09.

Aggregate Spreader. FP-14, Sections 407.05.

In addition:

- The chip spreader shall follow immediately behind the scrub broom

Rollers. FP-14, Sections 407.05.

In addition, Contractor shall

- A sufficient number of rollers are available that when placed in echelon can provide full lane coverage in each pass.
- Pneumatic type rollers shall: be offset; start at the centerline & work towards the shoulder; do 3 coverages; and, treat aggregate embedment activity like a conventional chip seal.

Scrub Broom. Furnish a scrub broom assembly of similar design to Exhibit A or B, as approved by the engineer, and having the following characteristics:

- Rigid frame construction,
- Attached to, and pulled by, the distributor,
- Of such weight that it does not squeegee the emulsion off the roadway surface,
- Leading and trailing broom heads angled at 10 to 15 degrees off the centerline of the supporting member,
- Stiff bristles with a minimum height of five inches, and
- Hinged wing assemblies or other means of adjusting the broom width.

The main body of the emulsion broom shall have a minimum frame size of 6.5 feet wide and 10 feet long. The maximum transverse rigid frame width at any point shall not exceed 6.75 feet. The nearest and furthest members, paralleling the back of the spreader truck, and diagonal members shall be equipped with street brooms. The leading member and the trailing member shall have brooms heads angled at 10 to 15 degrees off the centerline of the supporting member. The diagonal members shall have broom heads attached in line with the centerline of the supporting member. Each individual street broom attached to the emulsion broom assembly shall be 3.5 inches wide x 6.5 inches high x 16 inches long and have stiff nylon bristles. Bristle height is to be maintained at a minimum of five inches (5"). The emulsion broom shall be equipped with hinged wing assemblies attached to the main body not to exceed 4.5 feet per side, with diagonals and equipped with street brooms. The purpose of the maximum rigid frame width and the hinged wing extensions is not only for maximum width of 16 feet but to maintain the scrubbing process evenly as contours and cross-sections change across the existing road surface.

Provide a means of raising the broom from the road surface at desired points, and for towing the broom in elevated position when moving between shots.

Power Broom. FP-14, Sections 407.05 & Subsection 409.05(c); conform to all subsections of 409.05(c) - (1), (2), and (3). Furnish a rotary, self-propelled broom for initial sweeping and final surface sweeping

Emulsion Storage and Handling Equipment. When the plans or the Engineer allows storage tanks, furnish a thermometer in each tank to indicate the emulsion temperature continuously. Keep equipment clean and free of leaks. Keep emulsion free of contamination.

Aggregate Haul Trucks. Unless otherwise authorized, use trucks of uniform capacity to deliver the aggregate. Provide documentation showing measurements and calculation in Tons.

Material Application

The emulsion broom shall be pulled behind the emulsion distributor immediately after the application of the emulsion. All cracks in the pavement shall be filled by emulsion by the movement of the weighted emulsion broom through the emulsion.

The aggregate shall be dry during spreading. The aggregate shall be evenly spread over the scrubbed emulsion.

The seal should be rolled immediately after the aggregate is applied. There shall be at least three passes made with a pneumatic roller.

The scrub seal system shall be stiff enough to allow sweeping up excess aggregate without damage to the pavement surface. The excess aggregate shall be removed with the vacuum broom within two hours of rolling or as directed by the Engineer or CM.

The roadway shall not be opened to traffic until at least two hours after the completion of the placement of the emulsion and aggregate. The Engineer or CM may require a second power sweeping to remove any loose aggregate. Excess aggregate shall be removed from the project unless otherwise approved by the Engineer or CM.

For inner layer applications the scrub seal shall be sufficiently cured a minimum of 72 hours prior to placing a bituminous overlay, micro-surfacing, or other asphalt surface treatments. The work shall be staged such that any seal coat inner-layer placed shall be covered by the succeeding surface treatment as soon as possible following the minimum curing time. The status of being cured shall

be determined by the ability to sweep all loose aggregate from the surface without removing any aggregate adhered to the bituminous emulsion.

Longitudinal joints shall not overlap. The longitudinal construction joint shall coincide with the painted lane line or at the outside edge of shoulder.

Acceptance

The Contractor shall be responsible for the maintenance of the surface treatment until the work is accepted by the Engineer. Damage or loss of aggregate in the surface exceeding 2 % of the surface area in any 500-foot-long section shall be repaired by use of additional emulsion and aggregate. All bleeding (excess asphalt) surfaces shall be covered with additional concrete sand in such a manner that the asphaltic material will not adhere to or be picked up by the wheels of vehicles.

If in the Engineer's or CM's judgment, defective areas warrant removal, the Contractor shall remove and replace those areas at the Contractor's expense with materials meeting specification requirements.

CAPE SEAL SPECIFICATIONS

MATERIALS:

Polymer Pre-Modified Base Emulsion: Polymer Modified Cationic Rapid Set emulsion (CRS-2P) shall be an emulsified blend of polymer modified asphalt, water, and emulsifiers. The emulsion shall contain a minimum of three percent (3.0%) styrene-butadiene (SB) or styrenebutadiene-styrene (SBS) polymer by weight of asphalt cement. The asphalt cement shall be polymer modified prior to emulsification using a block SB or SBS co-polymer. The emulsion standing undisturbed for a minimum of 24 hours shall show no white, milky separation but shall be smooth and homogeneous throughout. The emulsion shall be pumpable and suitable for application through a distributor.

Tests on CRS-2P Emulsion	Minimum	Maximum	Test Method
Viscosity, Saybolt Furol, 50oC, sec, (a)	50	450	ASTM D 244
Storage Stability, 24-hr, % (a)		1.0	ASTM D 6930
Demulsibility, 35 ml, 0.8% Dioctyl Sodium Sulfosuccinate, %	40		ASTM D 6936
Particle Charge	Positive		ASTM D 244
Sieve, % (a)		0.1	ASTMD 6933
Distillation: (b)			AASHTO T 59
Oil Distillate by Volume of Emulsion, %		3.0	AASHTO T 59
Residue, %	65		AASHTO T 59
Tests on Residue (b)			
Penetration, 25 °C, 100g, 5s, dmm	70	150	ASTM D 5
Solubility in Trichloroethylene, % (c)	97.5		ASTM D 2042
Toughness, in-lb	70		ASTM D 5801
Tenacity, in-lb	45		ASTMD 5801

The specification for CRS-2P is in accordance with the material properties and test methods as specified by ASTM, AASHTO, and CDOT.

- (a) This test requirement on representative samples is waived if successful application of the material has been achieved in the field.
- (b) Residue by evaporation is intended to provide rapid determination of the percent residue and to provide material for tests on residue. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test specified by AASHTO T 59. For polymer modified emulsions, the distillation and evaporation tests will be modified to include 400F maximum temperature to be held for 15 minutes.

CAPE SEAL SPECIFICATIONS

- (c) If the solubility of the residue is less than 97.5%, the base asphalt binder for the emulsion shall be tested. The solubility of the base asphalt binder shall be greater than 99 percent.

Cationic Quick Setting Emulsified Asphalt (Slurry Seal): CQS-1hL shall be an emulsified mixture of *straight-run vacuum tower bottoms asphalt*, synthetic SBR polymer dispersion, emulsifiers and water. The emulsion shall contain a minimum of one percent (1.0%) styrene butadiene rubber (SBR) solids by weight of asphalt cement. The SBR polymer dispersion shall be co-milled during the emulsification process such that a bicontinuous polymer-asphalt network is formed upon curing of the finished emulsion. The emulsion shall be pumpable and suitable for use in a Slurry Seal machine. The emulsified asphalt shall conform to the following requirements:

Test on Emulsion	Minimum	Maximum	Test Method
Viscosity, Say bolt Furol, 77 F, s	20	100	ASTM D 244
Storage Stability Test, 24-h, % (a)		1	ASTM D 6930
Particle Charge Test	Positive		ASTM D 244
Sieve Test, % (a)		0.1	ADTM D 6933
Distillation: (b)			
Residue, %	60		ASTM D 6997
Polymer:			
Polymer content, % polymer solids based on asphalt solids	1.0	3.0	Supplier Cert.
Polymer Type:	SBR Latex		Supplier Cert.
Test on Residue from 325 F hot plate evaporation test (Colorado DOT CP L2212*) b			
Penetration, 77 F, 100g, 5s	40	90	ASTM D 5
Ductility, 77 F, 5 cm/min, cm	40		ASTM D 113
Solubility in Trichloroethylene, %	97.5		ASTM D 2042
Elastic Recover, 77 F, 10cm,1h, %	40		ASTM D 5976

- A) This test requirement on representative samples is waived if successful application of the material has been achieved in the field.
- B) Distillation to 260°C (T-59 §11 to 15) shall be the reference method for percent residue. Residue by hot plate evaporation at 163°C (CP-L2212 modified to a maximum temperature of 325°F) shall be the reference method to obtain material for tests on residue. Residue from distillation shall not be used for tests on residue due to polymer degradation at 260°C.

CAPE SEAL SPECIFICATIONS

Colorado DOT Procedure CP-L 2212* modified to a 163°C maximum temperature may be used for acceptance testing of percent residue.

- C) If the solubility of the residue is less than 97.5 percent, the base asphalt binder for the emulsion shall be tested. The solubility of the base asphalt binder shall be greater than 99 percent.

* CP-L 2210, CP-L 2211, and CP-L 2212 are Colorado DOT test procedures.

Cover Coat Material: The chip or cover coat and slurry aggregate shall be washed, hard, durable, clean rock and free from coatings or deleterious material. All of the aggregate shall be crushed gray granite with 100 percent fractured faces. The aggregate shall have maximum loss of 20 percent when tested with the LA Abrasion procedure as defined by AASHTO T96 using grade C or D.

The maximum amount of flat and elongated aggregate with a ratio of 3:1 shall not exceed 12% as determined by ASTM D4791. Only one source of aggregate shall be used and shall conform to the following gradations:

Gradation Table - Cover Coat Aggregate (percent passing)

Sieve Size	3/8" Chip	1/4" Chip
1/2"	100	100
3/8"	95-100	100
1/4"	0-35	95-100
No. 8	0-3	0-3
No. 200	0-1.5	0-1.5

Gradation Table - Slurry Aggregate (percent passing)

Sieve Size	Type II % Passing	Type III % Passing	Stockpile Tolerance
3/8	100	100	+ or - 5%
No. 4	90-100	70-90	+ or - 5%
No. 8	65-90	45-70	+ or - 5%
No. 16	45-70	28-50	+ or - 5%
No. 30	30-50	19-34	+ or - 5%
No. 60	18-36	12-25	+ or - 4%
No. 100	10-24	7-18	+ or - 3%
No. 200	5-15	5-15	+ or - 2%

CAPE SEAL SPECIFICATIONS

CONSTRUCTION REQUIREMENTS:

Equipment: The size and condition of all equipment shall be approved prior to construction. Should equipment be unsatisfactory for whatever cause, the Contractor shall remove and replace the equipment without delay or cost. The equipment shall conform to the following minimum requirements.

Bituminous Distributor: One distributor shall be used on this project. The distributor shall be self-powered and capable of providing a uniform application rate of emulsion varying from .05-1.00 gallons per square yard over a variable width up to 20 feet in a single pass. The uniformity of the distributor shall not vary by more than two-hundredths gallons per square yard. The distributor shall be equipped with a variable power unit for the pump and full circulation spray bars, which are adjustable laterally and vertically. The nozzle angle and bar height shall be set to provide one hundred percent of double coverage in a single pass. Where multiple passes will be required to complete the full width, the four inches adjacent to the second pass may be left with 50 percent coverage so that the next pass will complete the full application rate specified. Distributor shall be self-powered and include a computerized application controls, a tachometer, pressure gauges, accurate volume devices, calibrated tank, and a thermometer for measuring temperatures of the emulsion in the tank.

Aggregate Spreader: The aggregate spreader shall be self-propelled and supported by at least four tires on two axles capable of providing a uniform application rate of aggregate from five to fifty pounds per square yard over a variable width up to 20 feet in a single pass. The uniformity of this machine shall not vary by more than one pound per square yard. The aggregate spreader shall be equipped with the means of applying the cover coat material to the surface with computerized application controls so that the required amount of material will be deposited uniformly over the full width of the bituminous material. A computer rate controlled aggregate spreader shall be required.

Rollers: A minimum of two self-propelled pneumatic tired rollers shall be used on the project unless otherwise requested by the Project Manager. The rubber-tired rollers shall have a gross load adjustable to apply 200 – 250 pounds per inch of rolling width. Tire pressure shall be specified for the pneumatic tire rollers and shall not vary more than plus or minus 5.0 psi. The smooth drum roller shall be a single drum roller with a loaded rate of five tons. Depending on the speed of the Chip Seal operation and the width of coverage, additional rollers may be required. At no time shall the rollers travel more than 10 miles per hour.

Mixing Slurry Machine: The Slurry course shall be mixed in a self-propelled mixing machine equipped with a continuous flow pug mill capable of accurately delivering and automatically proportioning the aggregate, emulsified asphalt, water and admixtures to a double shafted, multi-blade pugmill mixer capable of minimum speeds of 200 revolutions per minute.

A minimum of two mixing machines, of 10 cubic yards or larger shall be utilized on the project. The Slurry course retention time in the pugmill shall be less than three seconds. The mixing machine shall have sufficient storage capacity of aggregate, emulsified asphalt, and water to maintain an adequate supply to the proportioning controls.

CAPE SEAL SPECIFICATIONS

The mixing machine shall be equipped with hydraulic controls for proportioning the material by volume to the mix. Each material control device shall be calibrated, properly marked, preset. The mixing machine shall be equipped with water pressure system and nozzle type spray bars to provide water spray immediately ahead of the spreader box.

The mixing machine shall be equipped with an approved fines feeder that provides a uniform, positive, accurately metered, pre-determined amount of a mineral filler at the same time and location that the aggregate is fed.

The Slurry mixture shall be uniformly spread by means of a controlled spreader box capable of spreading a traffic lane width and shall have strips of flexible rubber belting or similar material on each side of the box. The rear flexible strike-off blade shall make close contact with the pavement and shall be capable of being adjusted to the various crown shapes so as to apply a uniform layer of material. Slurry mixture, to be spread in areas inaccessible to the controlled spreader box, may be spread by other approved methods.

Each mixing unit to be used in performance of the Slurry work shall be calibrated prior to construction at a minimum of once per year. Calibration documentation covering the exact materials to be used may be acceptable, provided they were made during the calendar year. The documentation shall include an individual calibration of each material at various setting, which can be related to the machine's metering devices. No machine will be allowed to work on the project until the calibration has been completed and accepted.

Sweepers: One mechanical pick up broom and one side cast broom. Any areas adjacent to the project where a side cast broom cannot access, shall be removed by the use of a blow pack.

MATERIAL APPLICATION RATES:

Material	3/8" Cape Seal	1/4" Cape Seal
CRS-2P Chip Seal	.26-.42 Gal/SY	.20-.32 Gal/SY
Cover Coat		
Aggregate	20 lbs/SY Minimum	28 lbs/SY Minimum
Slurry Mix	22 lbs/SY Minimum	18 lbs/SY Minimum

The specific size of aggregate used shall be determined using factors such as surface temperature, traffic volume, existing road condition, and time of year. The Contractor may alter the application rate at any time during the course of the construction upon approval by the Project Manager.

Manholes, Valves and Inlets: Manholes, valve boxes, and inlets shall be covered and or protected with an approved material during the operation and shall be removed immediately after the street has been Cape Sealed. The Contractor is responsible for locating all exposed manholes, valve boxes and prior to construction.

Weather Limitations: The Chip Seal shall not be applied when the pavement is moist, or when the weather is or may be detrimental. Detrimental weather is defined as rain showers, cool temperatures, moist pavements, threat of rain showers, or other environmental factors which could

CAPE SEAL SPECIFICATIONS

affect the performance of the Chip Seal construction. If either the pavement or air temperature is below 55°F (10°C) and falling but may be applied when both pavement and air temperatures are above 50°F (7°C) and rising.

The Slurry Seal shall not be applied if either the pavement or air temperature is below 50°F (10°C) and falling but may be applied when both pavement and air temperatures are above 45°F (7°C) and rising. No Slurry Seal shall be applied when air temperatures will be below freezing within 24 hours. The mixture shall not be applied when weather conditions prolong opening to traffic beyond a reasonable time.

Water: All water used in making the Slurry shall be potable. The effect of moisture content on the specific weight of the aggregate, and the moisture content of the aggregate being used, shall be taken into account in calibrating the machine to deliver asphalt in the correct proportion.

Mix Design: Before work begins the Contractor shall submit a mix design for the Slurry Seal, covering the specified materials to be used on this project. This design shall be prepared by the emulsion supplier with a laboratory qualified in Slurry Seal mix design and testing. Once the materials are selected, no substitution will be permitted unless first tested and approved by the laboratory preparing the mix design.

EXECUTION OF THEWORK

Surface Preparation: The Contractor shall be responsible for all measures required providing a thoroughly clean and dry pavement surface including vegetation removal and sweeping prior to the Chip Seal application. The Contractor shall observe the condition of the pavement prior to bidding to determine the work necessary to provide a clean, dry pavement for construction and shall include the work necessary in the bid.

Application of Bituminous Material (Chip Seal): The application of the emulsion shall be performed by means of a pressure distributor in a manner to achieve a uniform and continuous spread over the asphalt surface. The temperature of the emulsion shall be a minimum of 160 F. The quantity of emulsion per square yard shall be as specified herein and agreed upon with the project manager. The distributor shall be moving forward at proper application speed at the time the spray bar is opened. If at any time a nozzle becomes clogged or not spraying a proper pattern, the operation shall be immediately halted until repairs are made. Repairs shall be made immediately after deficiencies are noted and prior to the aggregate spreader at all times during construction. The width of the spread shall be no greater than the width of the aggregate spreader except where additional passes are required the emulsion shall be four inches beyond the aggregate spread at fifty percent application rate. At no time shall the emulsion be allowed to break, chill, setup, harden, or otherwise impair the aggregate retention before the aggregate has been properly applied and rolled

Application of Cover Coat Aggregate (Chip Seal): The aggregate shall be applied immediately following the emulsion application by the approved aggregate spreader. The quantity of cover coat aggregate per square yard shall be specified herein and agreed upon with the Project Manager. The Contractor, prior to start of work, shall calibrate the aggregate spreader to achieve the design

CAPE SEAL SPECIFICATIONS

application rate of the cover coat aggregate. Spreading shall be accomplished in such a manner that the tires of the trucks and aggregate spreader never contact the newly applied bituminous material. The width of the aggregate spreader shall be equal to the width of the emulsion spread, except where additional passes are required. Areas, which are deficient in aggregate, shall be covered immediately with additional material.

Rolling (Chip Seal): Initial rolling shall begin immediately after the application of cover coat aggregate. Rollers shall work in tandem and complete a minimum of three passes with a sufficient overlap. Should the rolling operation be delayed, the aggregate and emulsion spreading shall be halted until the operation regains proper sequencing and timing. The maximum speed of the rolling operations shall be ten miles per hour.

Sweeping (Chip Seal): Within 24 hours of the Chip Seal application, excess aggregate shall be swept and removed from the roadway and adjacent areas with the specified sweepers.

Application of Material (Slurry): Within 48 hours of the Chip Seal application the Slurry course will be applied. The surface shall be fogged with water directly preceding the spreader. The Slurry mixtures shall be of the desired consistency, based on the submitted mix design, as it leaves the mixer with additional approved additive if required. A sufficient amount of Slurry shall be carried in all parts of the spreader at all times so that complete coverage is obtained.

No lumping, balling, or unmixed aggregates shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted. No excessive breaking of the emulsion will be allowed in the spreader box. Rippling of the finished pavement is undesirable and shall be minimized.

No excessive build-up or unsightly appearance shall be permitted on longitudinal or transverse joints. The use of burlap drags or other type drags shall be used so that joints will be straight and have a neat appearance. Squeegees shall be used to spread Slurry in areas not accessible to the Slurry mixer. Care shall be exercised as the leave a good appearance. Care shall be taken to insure straight lines along curbs, shoulders and joints. Lines at intersections will be kept straight to provide a good appearance.

Slurry treated areas shall be allowed to cure until such time as traffic will not damage the finished product. Contractor will be responsible for monitoring roadways treated to insure sufficient cure time is allowed before allowing traffic over the treated areas.

N5099-Aneth, UT; Bid #21-03-2446LE

March 25, 2021

BID SCHEDULE

BID ITEM NO.	FP-14 ITEM NO.	Item Description	Estimated Quantity	Unit	Unit Price	Total
1	151	Mobilization	All Required	LS		
2	154	Contractor Sampling and Testing	All Required	LS		
3	303	Road Reconditioning, minor.	3.2	Mile		
4	N/A	Scrub Seal	38,200	SY		
5	N/A	Cape Seal	39,200	SY		
6	418	Asphaltic Concrete Pavement Patching - Pothole Repair.	All Required	LS		
7	633	Permanent Signage: Furnish all materials, equipment, and labor to complete roadway signage, per plans and specifications complete.	1	LS		
8	634	Permanent Pavement Markings	14,256	LF		
9	635	Temporary Traffic Control Plan.	All Required	LS		
		SUBTOTAL				
		Navajo Nation Tribal Tax - 6%.				
		Contingency.				\$5,000.00
		TOTAL PROJECT COST.				

Note: Payment will be made per FP-14, Section 109.05, and will be made for the actual quantities of work performed and accepted or material furnished according to the contract. No payment will be made for work performed in excess of that staked, ordered, or otherwise authorized.

FP-14 can be downloaded from the following FHWA website:

<https://flh.fhwa.dot.gov/resources/specs/fp-14/fp14.pdf>

Section 153. — CONTRACTOR QUALITY CONTROL

Description

153.01 This work consists of planning and implementing a construction quality process to ensure work conforms to the contract. This work also includes quality control inspection and documentation, and process control sampling and testing. See FAR Clause 52.246-12 Inspection of Construction.

Construction Requirements

153.02 Qualifications. Submit the following for approval with the Quality Control Plan:

(a) Quality control manager (QCM). Provide a QCM according to (1) or (2) below. If neither is specified, conform to (1).

(1) Full-time, on-site QCM. Provide a QCM with no responsibilities for performing testing and inspection, managing the project, or performing operations other than managing quality control and the following:

(a) One year experience managing quality control on construction projects of similar type and scope, and

(b) One of the following:

(1) Two years' experience as a construction project manager or superintendent on construction projects of similar type and scope;

(2) Three years' experience as a project engineer, resident engineer, foreman, construction inspector, or equivalent on construction projects of similar type and scope; or

(3) National Institute for Certification in Engineering Technologies (NICET) Level III certification or equivalent in highway construction or highway material.

(2) Part-time, on-site QCM. Furnish a QCM who has at least 2 years' experience in highway construction, inspection, quality control, and material testing.

(b) Inspectors. Provide inspectors with at least 2 years' experience inspecting projects of similar complexity and with training related to the work to be inspected.

(c) Testers. Provide testers with at least one year experience in the type of sampling and testing required, and with one of the following for the type of sampling and testing performed:

(1) NICET Level II certification in highway material or equivalent state or industry certification;

(2) Certification by a regional certification program (such as Western Alliance for Quality Transportation Construction (WAQTC), Northeast Transportation Technician Certification Program (NETTCP), Southeast Task Force for Technician Training and Qualification (STFTTQ), or Multi Regional Training and Certification (M-TRAC)); or

(3) At least one year employment by an AASHTO accredited laboratory performing equivalent sampling and testing.

153.03 Quality Control Plan (QCP). Develop a QCP addressing all contract work categories. A category consists of related work items performed in one operation (such as excavation, drainage, and paving). Include the work of subcontractors, major material suppliers, and structural and geotechnical services suppliers.

For each category, include the following:

(a) Quality control personnel. Furnish the name, authority, responsibilities, and qualifications of the quality control manager and other personnel directly involved in inspection and testing. Conform to Subsection 153.02.

(b) Quality control procedures. Describe the inspection, testing, and other activities to be performed for each phase of work in Subsection 153.04. Include methods, schedules, equipment, and laboratory facilities. Conform to Subsections 153.04 and 153.05.

List the material to be tested by:

- (1) Pay item;
- (2) Applicable requirements of the Sampling, Testing, and Acceptance Requirements tables;
- (3) Persons responsible for performing the sampling and testing;
- (4) Laboratory testing facilities to be used for process control and project testing; and
- (5) Proposed reporting formats.

As a minimum perform process control testing according to the Sampling, Testing, and Acceptance Requirements tables included at the end of each Section where applicable.

(c) Records. Describe the reporting format for inspection, testing, certification, and daily reports. Conform to Subsections 153.06 and 153.07.

At least 14 days before the start of work, submit the QCP for approval. Do not perform work on a work category unless the quality control for that category is accepted. Approval does not imply that the QCP will result in contract compliance.

Revise the QCP when contract quality requirements are not achieved and when changes occur in the contract, work progress, or personnel.

153.04 Prosecution of Work. Complete the following:

(a) Preparatory phase.

(1) Before starting each work category, hold a preparatory phase meeting. Include the project superintendent, work foreman, CO, QCM, and appropriate subcontractors. Be prepared to discuss the following:

- (a) Contract requirements for the work, including acceptance procedures, schedule, and control strip;
- (b) Process and equipment for constructing the work; and

(c) Plan for inspection, process control, testing, measuring, and reporting the work.

- (2) Review and coordinate certifications, submittals, plans, drawings, and permits.
- (3) Verify the capabilities of equipment, material, and personnel. Provide training as necessary.
- (4) Establish a detailed testing schedule based on the production schedule.
- (5) Ensure preparatory testing and inspection is accomplished.
- (6) Review accuracy of the surveying and staking.

(b) Start-up phase.

(1) Hold a start-up meeting to review the contract, the construction processes, and the inspection, testing, and reporting requirements with the personnel performing the work. Include the project superintendent, inspectors, testers, CO, and QCM. Explain procedures that will be followed if defective work is identified.

(2) Inspect, test, and report start-up work according to the QCP and ensure the work conforms to the contract.

(c) Production phase.

(1) Inspect, test, and report according to the QCP and evaluate the acceptability of the work produced.

(2) Identify and correct deficiencies.

(3) Request Government inspection and acceptance.

153.05 Sampling and Testing. Inspect commercial laboratory equipment within 45 days of project use.

Have mobile laboratory equipment inspected and calibrated after the laboratory is moved to the project and every time it is moved thereafter. Keep laboratory facilities clean and maintain equipment in proper working condition. Certify that equipment conforms to testing requirements and submit evidence of current calibrations.

Allow the CO unrestricted access to the laboratory for inspection and review. When requested by the CO, provide additional inspections and tests to demonstrate sampling and testing proficiency. Submit proficiency sample test results within 48 hours of sample receipt.

Perform quality control sampling and testing according to the QCP and the sampling, testing, and acceptance requirements table in applicable sections.

When no sampling frequencies are specified, submit the proposed sampling and testing frequencies.

153.06 Certifications. Obtain, review, and verify certifications for work. Submit certifications when required.

153.07 Records and Control Charts. Maintain records and control charts by pay item.

(a) Quality control and construction operations reports. Submit written quality control and construction operations reports daily according to the QCP. Document meetings, work locations, labor and equipment used including actual hours worked, testing and measurement activities, inspection results, deficiencies observed, corrective actions taken, and process changes. Use FHWA Form 1413, *Inspector's Daily Record of Construction Operations* or approved alternate forms. Include the following certification signed by the QCM on all reports:

"I certify that the information contained in this record is accurate and that work documented herein complies with the contract. Exceptions to this certification are documented as a part of this record."

(b) Control charts. Maintain linear control charts that identify the test number, test parameter, upper and lower specification limit applicable to each test parameter, and test results for applicable material. Use the control charts to document variability of the process, to identify production and equipment problems, and to identify actions to improve processes or quality.

Update and post control charts daily in a location accessible to the CO. Cease production and correct the process when problems are evident.

153.08 Acceptance. The Contractor's quality control system will be evaluated under Subsection 106.02 based on its demonstrated effectiveness to ensure work conforms to the contract.

Measurement and Payment

153.09 Do not measure Contractor quality control for payment. See Subsection 109.05.

Section 154. — CONTRACTOR SAMPLING AND TESTING

Description

154.01 This work consists of obtaining samples for testing.

When there is a pay item for Contractor testing included in the bid schedule, this work also includes sampling, testing and reporting the required test results. It excludes Contractor quality control testing required under Section 153.

Construction Requirements

154.02 General. Include the work required under this Section in the Section 153 quality control plan.

Sample and test material according to the Sampling, Testing, and Acceptance Requirements tables included at the end of each Section. Perform additional sampling and testing as directed when material does not meet requirements.

Provide the CO the opportunity to witness sampling, splitting, and testing of material.

Where process control sampling and testing frequencies are identical to the sampling and testing frequencies for acceptance, the process control samples may be used for acceptance for the applicable work.

154.03 Sampling. Sample and split samples according to AASHTO or other acceptable procedures. The location of statistical acceptance sampling will be provided using a random number system. Perform splits when required and deliver the Government's portion of the sample or split sample in an acceptable container suitable for shipment. Label samples with the following:

- (a) Project number and name;
- (b) Pay item number and description;
- (c) Source of material;
- (d) Sample number;
- (e) Date sampled;
- (f) Time sampled;
- (g) Location sample taken;
- (h) Name of person sampling;
- (i) Name of person witnessing sampling; and
- (j) Type of test required on sample.

154.04 Testing. Perform tests when there is a pay item for Contractor testing included in the bid schedule. Demonstration of testing competence may be required.

154.05 Records. When tests are on material being incorporated in the work, report test results within 24 hours unless specified otherwise in the Sampling, Testing, and Acceptance Requirements tables. Report test results on forms containing sample information required by Subsection 154.03. Label interim measurements used to determine the results. Attach work sheets used to determine test values to the test result forms. Payment for work may be delayed or the work stopped until test results are submitted.

154.06 Acceptance. Contractor sampling and testing will be evaluated under Subsections 106.02 and 106.04 based on Government verification testing.

Measurement

154.07 Measure the Section 154 pay items listed in the bid schedule according to Subsection 109.02.

Payment

154.08 The accepted quantities will be paid at the contract price per unit of measurement for the Section 154 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Progress payments for Contractor testing lump sum will be paid as follows:

- (a) 25 percent of the pay item amount, not to exceed 0.5 percent of the original contract amount, will be paid after the testing facilities are in place, qualified sampling and testing personnel are identified, and the work being tested has started.
- (b) Payment for the remaining portion of the pay item amount will be prorated based on the total work completed in Section 154.

Payment may be retained if Government verification testing does not validate the Contractor testing or if it is determined that documentation of sampling and testing does not meet requirements.

Section 303. — ROAD RECONDITIONING

Description

303.01 This work consists of reconditioning ditches, shoulders, roadbeds, aggregate surfaces, or the entire road.

Material

303.02 Conform to the following Subsection:

Water	725.01(c)
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Construction Requirements

303.03 Ditch Reconditioning. Remove slide material, sediment, vegetation, and other debris from existing ditches and culvert inlets/outlets. Reshape ditches and culvert inlets/outlets to achieve positive drainage and uniform ditch width, depth, and grade. Dispose of waste at designated sites or according to Subsection 204.14.

303.04 Shoulder Reconditioning. Remove slide material, vegetation, and other debris from existing shoulders including shoulders in parking areas, turnouts, and other widened areas. Repair soft and unstable areas according to Subsection 204.07. Reshape shoulders to the widths and slopes shown in the plans. Dispose of waste at designated sites or according to Subsection 204.14.

303.05 Roadbed Reconditioning. Remove organic, deleterious, and material larger than 6 inches (150 millimeters) from the top 6 inches (150 millimeters) of subgrade. Dispose of waste according to Subsection 204.14. Repair soft and unstable areas according to Subsection 204.07. Scarify surface to a 6-inch (150-millimeter) depth. Remove irregularities and shape to a uniform surface. Finish earth surfaces to within 0.05 feet (15 millimeters) and rock surfaces to within 0.10 feet (30 millimeters) of required line, grade, and cross-section. Compact according to Subsection 204.11.

303.06 Aggregate Surface Reconditioning. Repair soft and unstable areas to the full aggregate surface depth and according to Subsection 204.07. Scarify the thickness of aggregate surfacing material or to 6 inches (150 millimeters), whichever is less. Remove irregularities and shape to a uniform surface. Finish and compact the surface according to Subsection 302.05.

303.07 Roadway Reconditioning. Perform applicable work described in Subsections 303.03 through 303.06. Maintain existing cross slope and crown or as shown in the plans.

303.08 Acceptance. See Table 303-1 for sampling, testing, and acceptance requirements.

Road reconditioning work will be evaluated under Subsections 106.02 and 106.04.

Measurement

303.09 Measure the Section 303 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

Measure waste under Section 204.

Payment

303.10 The accepted quantities will be paid at the contract price per unit of measurement for the Section 303 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

**Table 303-1
Sampling, Testing, and Acceptance Requirements**

Material or Product (Subsection)	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time	Remarks
Production									
Existing roadbed material or aggregate surfacing	Measured and tested for conformance (106.04)	Classification	-	AASHTO M 145	1 per soil type	Roadbed	Yes	Before using in work	-
		Moisture-density	-	AASHTO T 180, Method D ⁽¹⁾ or AASHTO T 99, Method C ⁽¹⁾	1 per mixture or change in material	Processed material	No	"	-
		Density	-	AASHTO T 310 or other approved procedures	1 per 2000 yd ² (1700 m ²)	In-place after compaction	"	End of shift	For Subsection 204.11(c) cases only
	Process control (153.03)	Moisture content (in-place)	-	"	"	"	"	"	-
Finished Product									
Aggregate surface reconditioning (303.06)	Measured and tested for conformance (106.04)	Surface tolerance & grade	-	Subsection 301.06	Determine by the CO	Surface of final course	No	Before placement of next layer or as requested	-

(1) Minimum of 5 points per proctor.

Section 406. — FOG SEAL

Description

406.01 This work consists of applying an emulsified asphalt fog seal.

Emulsified asphalt is designated according to AASHTO M 140 or AASHTO M 208.

Material

406.02 Conform to the following Subsections:

Blotter	703.12
Emulsified asphalt	702.02
Water	725.01(c)

Construction Requirements

406.03 Equipment. Furnish an asphalt distributor with the following:

- (a) Heater for uniformly heating the asphalt;
- (b) Full circulation spray bar adjustable to 15-foot (4.5-meter) width;
- (c) Positive controls including tachometer, pressure gauge, volume measuring device, or calibrated tank to uniformly deposit asphalt over the full width within 0.02 gallons per square yard (0.09 liters per square meter) of the required rate; and
- (d) Thermometer for measuring asphalt temperature in the tank.

406.04 Surface Preparation.

- (a) Clean the existing surface of loose material, dirt, and other deleterious material before placing the fog seal. Remove or protect raised pavement markers, pavement markings, reflectorized tape, and other material that interferes with the work. Protect service entrances (such as manholes, valve boxes, and drop inlets). Protect concrete work, rock walls, and other objects adjacent to the work.
- (b) Dry the surface before placing the fog seal.

406.05 Weather Limitations. Apply fog seals only when the following apply:

- (a) Ambient air temperature is above 50 °F (10 °C);
- (b) Surface temperature is above 50 °F (10 °C);
- (c) Weather is not foggy or rainy;
- (d) Rain or temperatures below 40 °F (4 °C) are not anticipated for at least 24 hours after application;

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- (e) Sustained winds are less than or equal to 10 miles (16 kilometers) per hour; and
- (f) Application is completed at least 2 hours before sunset.

406.06 Asphalt Application. Dilute the emulsion one part water to one part emulsified asphalt.

Apply the emulsion according to Subsection 407.09 at a rate of 0.10 to 0.15 gallons per square yard (0.4 to 0.7 liters per square meter) as approved by the CO.

At locations where the fog seal cannot be applied with an asphalt distributor spray bar, apply the fog seal uniformly using a hand spray attachment or by another approved method.

Allow the fog seal to cure undisturbed for at least 2 hours or until the emulsified asphalt breaks and is substantially tack free.

Cover unabsorbed asphalt with blotter to protect traffic or minimize rain damage. Remove excess blotter after the asphalt is absorbed. Dispose of material according to Subsection 203.05(a) and (d).

406.07 Acceptance. See Table 406-1 for sampling, testing, and acceptance requirements.

Emulsified asphalt will be evaluated under Subsections 106.02 and 106.03. Furnish a production certification with each load of emulsified asphalt.

Blotter will be evaluated under Subsection 106.03.

Construction of fog seals will be evaluated under Subsections 106.02 and 106.04.

Measurement

406.08 Measure the Section 406 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

Measure fog seal including water added for dilution. Show a breakdown of total emulsion and water added on the load invoices supplied to the CO for payment.

Payment

406.09 The accepted quantities will be paid at the contract price per unit of measurement for the Section 406 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

**Table 406-1
Sampling, Testing, and Acceptance Requirements**

Material or Product (Subsection)	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time	Remarks
Production									
Emulsified asphalt (702.02)	Process control (153.03)	Placement temperature	-	-	Minimum 1 per distributor truck	Distributor truck	No	Before incorporating into work	-

Section 407. — CHIP SEAL. Note: for this project, a Scrub Seal is a form of chip seal.

Description

407.01 This work consists of applying a Scrub Seal ~~single or double course chip seal.~~

Chip seal types are designated according to Tables 407-1 and 407-2.

~~Refer to Supplemental Specifications for use of emulsified asphalt on this project. Asphalt binder is designated according to AASHTO M 320 and emulsified asphalt is designated according to AASHTO M 140 or AASHTO M 208.~~

Material

407.02 Conform to the following Section and Subsections:

Asphalt binder	702.01
Blotter	703.12
Chip seal aggregate	703.09
Emulsified asphalt	702.02
Fog seal	406

Construction Requirements

407.03 Qualifications. Provide a superintendent and foreman with experience in placing chip seals. Submit the following for approval at least 14 days before starting chip seal work:

- (a) Names of personnel; and
- (b) A résumé for each individual describing their experience on at least five chip seal projects of similar complexity.

407.04 Composition. Submit the following for approval at least 14 days before placement:

- (a) **Aggregate samples.** 80 pounds (35 kilograms) from the material produced for the project, the gradation range represented, and the proposed target value for each sieve size;
- (b) **Asphalt sample.** 1-gallon (4-liter) sample with a production certification conforming to Subsection 106.03(a);
- (c) **Spread rates.** The proposed spread rate for the asphalt and aggregate; and
- (d) **Density.** The density of the aggregate according to AASHTO T 19, shoveling procedure.

407.05 Equipment.

- (a) **Asphalt distributor.** See Subsection 406.03. Maintain two-way radio communication with the aggregate spreader.

(b) Sweeper. Furnish two sweepers conforming to Subsection 409.05(c).

(c) Pneumatic-tire rollers.

(1) Three rollers each with a minimum compacting width of 5 feet (1.5 meters), or two rollers each with a minimum compacting width of 6.5 feet (2.0 meters); and

(2) Gross mass adjustable within the range of 200 to 360 pounds per inch (3.6 to 6.4 kilograms per millimeter) of compaction width.

(d) Aggregate spreader. Controls to uniformly deposit aggregate over the full asphalt width.

407.06 Surface Preparation. See Subsection 406.04(a). Prepare the surface as follows:

(a) Newly asphalt patched areas. Fog seal according to Section 406.

(b) Existing asphalt surfaces including recycled asphalt pavements. Dry the surface.

(c) Aggregate base course surfaces.

(1) When using an emulsified asphalt, make the surface damp; or

(2) When using an asphalt binder, dry the surface.

407.07 Weather Limitations. Apply chip seals only when the following apply:

(a) Ambient air temperature is above 65 °F (18 °C);

(b) Surface temperature in the shade is above 60 °F (16 °C);

(c) Surface temperature in the sun is below 150 °F (66 °C);

(d) Weather is not foggy or rainy;

(e) Rain or temperatures below 40 °F (4 °C) are not anticipated for at least 24 hours after application;

(f) Sustained winds are less than or equal to 10 miles (16 kilometers) per hour; and

(g) Application is completed at least 2 hours before sunset.

407.08 Production Start-Up Procedures. Conduct a pre-chip seal preparatory phase meeting according to Subsection 153.04(a).

On the first day of each chip seal layer placement, construct up to three 200- to 500-foot (60- to 150-meter) control strips that are one-lane wide according to Subsections 407.09 and 407.10. Coordinate the control strip locations with the CO. Start the first control strip at the proposed application rates. Vary the asphalt material or surface aggregate application rate for each control strip. Construct the control strip using the material, lay-down procedures, and compaction procedures intended for the entire project.

Repeat the control strip process until an acceptable control strip is produced. Cease production until the material and the control strip are evaluated and accepted. The CO will indicate which strip will serve as

the approved project control strip.

Acceptable control strips may remain in place and will be accepted as a part of the completed project. Correct unacceptable control strips.

Use these start-up procedures when changing construction procedures, when resuming production after a termination of production due to unsatisfactory quality according to Subsection 106.04, or the beginning of a new construction season.

407.09 Asphalt Application. Calibrate asphalt distributors before the start of project and when directed by the CO. Calibrate the spray bar height, check nozzle angle, and verify longitudinal and transverse application rates according to ASTM D2995.

Spread building paper on the pavement surface at the beginning and end of each asphalt application so distributor flow is started and stopped on the paper.

Apply asphalt uniformly at the optimum application rate determined from the control strip. Do not apply more asphalt than can immediately be covered with aggregate. Correct skipped areas or deficiencies.

At the end of each day's production, provide the CO with documentation of calibrations and application rates.

Remove and dispose of material spills and associated debris at the end of each shift according to Subsection 203.05(a) and (d).

407.10 Aggregate Application. When emulsified asphalt is used, verify the aggregate stockpile moisture daily and use moist surfaced aggregate.

When asphalt binder is used, dry the aggregate. Precoat the aggregate uniformly with 2 to 3 percent of residual asphalt by mass of aggregate. Maintain the flow qualities of the precoated aggregate to allow uniform spreading with the aggregate spreader.

Calibrate aggregate spreaders before the start of project and as directed by the CO. Calibrate the longitudinal and transverse spread rates.

Apply aggregate uniformly at the optimum application rate determined from the approved control strip. Apply the aggregate immediately after the asphalt material is applied. Operate the aggregate spreader so asphalt is covered with the aggregate before wheels pass over it. For part-width construction, leave an uncovered 6-inch (150-millimeter) wide asphalt strip to permit an overlap of asphalt material.

Cover excess asphalt with blotter to protect traffic.

Correct excesses and deficiencies by adding or removing aggregate to achieve a uniform texture before the asphalt cures.

Operate rollers at a maximum speed of 5 miles (8 kilometers) per hour. Do not allow the aggregate to be displaced by pickup or sticking of material to the tire surface. Roll the surface to uniformly and thoroughly bond the aggregate over the full width. Complete rolling within 1 hour after asphalt is applied to the surface. Perform three passes with the rollers. Do not allow traffic to travel over aggregate until rolling is completed.

At the end of each day's production, provide the CO with documentation for calibrations and application rates.

Use a pilot car according to Section 635 to limit traffic speeds to 10 miles (15 kilometers) per hour during the first 45 minutes after rolling and to 20 miles (30 kilometers) per hour for the next 24 hours.

Sweep the surface when the air temperature is below 90 °F (32 °C). Do not displace embedded material. Complete vacuum sweeping by the morning after construction. Dispose of material according to Subsection 203.05(a) and (d).

407.11 Placing and Finishing. Apply the asphalt and aggregate according to Subsections 407.09 and 407.10 and Table 407-1. The application rates in these tables are for estimating purposes only. Determine the exact rates based on approved control strips.

Table 407-1
Approximate Quantities of Material for Single Course Chip Seal

Type	Nominal Maximum Size of Aggregate	Aggregate Gradation ⁽¹⁾	Estimated Quantity of Aggregate ⁽²⁾ pounds/yd ² (kilograms/m ²)	Estimated Quantity of Asphalt Binder gallons/yd ² (liters/m ²)	Estimated Quantity of Emulsified Asphalt gallons/yd ² (liters/m ²)
1A	¾ inch (19 mm)	A	44 – 53 (24 – 29)	0.31 – 0.42 (1.41 – 1.91)	0.48 – 0.65 (2.17 – 2.94)
1B	½ inch (12.5 mm)	B	29 – 33 (16 – 18)	0.25 – 0.34 (1.15 – 1.56)	0.39 – 0.53 (1.77 – 2.40)
1C	⅜ inch (9.5 mm)	C	24 – 28 (13 – 15)	0.18 – 0.28 (0.79 – 1.27)	0.27 – 0.43 (1.22 – 1.95)
1D	No. 4 (4.75 mm)	D	18 – 24 (10 – 13)	0.14 – 0.19 (0.65 – 0.85)	0.27 – 0.43 (1.22 – 1.95)

(1) See Table 703-7 for aggregate gradations.

(2) Aggregate masses are for aggregates having a bulk specific gravity of 2.65, as determined by AASHTO T 84 and AASHTO T 85. Make proportionate corrections when the aggregate furnished has a bulk specific gravity above 2.75 or below 2.55.

407.12 Double Course Chip Seal. Apply each asphalt and aggregate layer according to Subsections 407.09 and 407.10 and Table 407-2. Table 407-2 application rates are for estimating purposes only. Determine the exact rates based on approved control strips.

When using emulsified asphalt, wait at least 24 hours between applications. When using asphalt binder, no wait is required between applications. Lightly vacuum sweep the first layer to remove loose material.

Table 407-2
Approximate Quantities of Material for Double Course Chip Seal

Type (Thickness)	Nominal Maximum Size of Aggregate	Aggregate Gradation ⁽¹⁾	Estimated Quantity of Aggregate ⁽²⁾ pounds/yd ² (kilograms/m ²)	Estimated Quantity of Asphalt Binder gallons/yd ² (liters/m ²)	Estimated Quantity of Emulsified Asphalt gallons/yd ² (liters/m ²)
2A (7/8 inch (22 mm))					
1 st Application	3/4 inch (19 mm)	A	44 – 53 (24 – 29)	0.29 – 0.41 (1.31 – 1.86)	0.43 – 0.60 (1.95 – 2.72)
2 nd Application	3/8 inch (9.5 mm)	C	24 – 29 (13 – 16)	0.41 – 0.46 (1.86 – 2.08)	0.60 – 0.70 (2.72 – 3.17)
2B (3/4 inch (19 mm))					
1 st Application	1/2 inch (12.5 mm)	B	33 – 44 (18 – 24)	0.27 – 0.31 (1.22 – 1.40)	0.39 – 0.48 (1.77 – 2.17)
2 nd Application	3/8 inch (9.5 mm)	C	22 – 26 (12 – 14)	0.29 – 0.38 (1.31 – 1.72)	0.45 – 0.58 (2.04 – 2.63)
2C (1/2 inch (12.5 mm))					
1 st Application	3/8 inch (9.5 mm)	C	29 – 39 (16 – 21)	0.17 – 0.27 (0.77 – 1.22)	0.27 – 0.39 (1.22 – 1.77)
2 nd Application	No. 4 (4.75 mm)	D	13 – 18 (7 – 10)	0.27 – 0.31 (1.22 – 1.40)	0.39 – 0.48 (1.77 – 2.17)

(1) See Table 703-7 for aggregate gradations.

(2) Aggregate masses are for aggregates having a bulk specific gravity of 2.65, as determined by AASHTO T 84 and AASHTO T 85. Make proportionate corrections when the aggregate furnished has a bulk specific gravity above 2.75 or below 2.55.

407.13 Acceptance. See Table 407-3 for sampling, testing, and acceptance requirements.

Emulsified asphalt and asphalt binder will be evaluated under Subsections 106.03 and 106.04. Furnish a production certification with each load of emulsified asphalt or asphalt binder.

Chip seal aggregate gradation will be evaluated under Subsection 106.05.

The upper and lower specification limits are equal to the calculated mean of all test results plus or minus the allowable deviations shown in Table 703-7, except as follows:

- (a) If the calculated mean value for a tested sieve exceeds the maximum gradation value shown in Table 703-7, the upper specification is equal to the maximum gradation value plus the allowable deviation, and the lower specification is equal to the maximum gradation value minus the allowable deviation.

(b) If the calculated mean value for a tested sieve is less than the minimum gradation value shown in Table 703-7, the upper specification is equal to the minimum gradation value plus the allowable deviation, and the lower specification is equal to the minimum gradation value minus the allowable deviation.

Construction of asphalt chip seals will be evaluated under Subsections 106.02 and 106.04.

Measurement

407.14 Measure the Section 407 pay items listed in the bid schedule according to Subsection 109.02.

Payment **Payment is by the square yard (SY).**

407.15 The accepted quantities will be paid at the contract price per unit of measurement for the Section 407 pay items listed in the bid schedule, except the chip seal contract price will be adjusted according to Subsection 106.05. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Payment for the chip seal will be made at a price determined by multiplying the contract price by the material pay factor. The material pay factor is the lowest single pay factor determined for each specified sieve of the aggregate gradation for each aggregate gradation furnished.

~~When two gradations are furnished for a double chip seal the material pay factor is weighted for the quantity of each aggregate gradation spread as a percent of the total. The material pay factor is calculated as follows:~~

$$PF_{\text{Material}} = PF_{1st} [SR_{1st} / (SR_{1st} + SR_{2nd})] + PF_{2nd} [SR_{2nd} / (SR_{1st} + SR_{2nd})]$$

where:

~~PF_{Material} = Material pay factor.~~

~~PF_{1st} = Pay factor for first aggregate gradation. PF_{1st} is the lowest single pay factor determined for each specified sieve.~~

~~PF_{2nd} = Pay factor for second aggregate gradation. PF_{2nd} is the lowest single pay factor determined for each specified sieve.~~

~~SR_{1st} = Spread rate for the first aggregate per square yard (square meter).~~

~~SR_{2nd} = Spread rate for the second aggregate per square yard (square meter).~~

Table 407-3
Sampling, Testing, and Acceptance Requirements

Material or Product (Subsection)	Type of Acceptance (Subsection) ⁽³⁾	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time	Remarks
Source									
Chip seal aggregate ⁽¹⁾	Measured and tested for conformance (106.04 & 105)	Quality	-	Subsection 703.09	1 per material type	Source of material	Yes	Before producing	-
	Process control (153.03)	Gradation	-	AASHTO T 27 & T 11	2 per day per stockpile	Crusher belt (during production)	No	24 hours	Not required when using a pre-crushed commercial source
Blotter	"	"	-	Subsection 703.12	"	"	"	"	-
Asphalt binder ⁽²⁾ or emulsified asphalt ⁽²⁾	Measured and tested for conformance (106.04)	Quality	-	Section 702	1 per material type	Point of shipment or delivery	Yes ⁽⁵⁾	Before incorporating into work	-

Table 407-3 (continued)
Sampling, Testing, and Acceptance Requirements

Material or Product (Subsection)	Type of Acceptance (Subsection) ⁽³⁾	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time	Remarks
Production									
Chip seal aggregate ⁽¹⁾	Statistical ⁽³⁾ (106.05)	Gradation (See Table 703-7 for applicable sieves)	I	AASHTO T 27 & T 11	See Note (3)	Production belt or spreader discharge ⁽⁴⁾	Yes	24 hours	–
	Process control (153.03)	Moisture on surface of aggregates	–	Visual inspection (409.10)	Contractor determine	Stockpile or spreader discharge	No	Before incorporating into work	–
Asphalt binder ⁽²⁾ or emulsified asphalt ⁽²⁾	Measured and tested for conformance (106.04)	Quality	–	Section 702	1 per tanker truck including trailer	Tanker or Distributor	Yes ⁽⁵⁾	–	Tested by Government
	Process control (153.03)	Placement temperature	–	–	Minimum 1 per distributor truck	Distributor truck	No	Before incorporating into work	–

(1) Applies to each aggregate grade furnished.

(2) Applies to each asphalt material furnished.

(3) For plan quantities less than 40,000 square yards (33,000 square meters), material will be accepted according to Subsection 106.03. For plan quantities greater than 40,000 square yards (33,000 square meters), material will be accepted according to Subsection 106.05. For plan quantities between 40,000 and 240,000 square yards (33,000 and 200,000 square meters), the sampling frequency will be determined by dividing the plan quantity by eight. If plan quantity exceeds 240,000 square yards (200,000 square meters), the sampling frequency will be one every 30,000 square yards (25,000 square meters).

(4) Select one point of sampling that must remain throughout project or lot.

(5) Two 1-quart (1-liter) samples for asphalt binder. One 1-gallon (4-liter) sample for emulsified asphalt.

Section 409. — MICRO SURFACING

Description

409.01 This work consists of applying a polymer-modified micro surfacing mix on an existing pavement surface.

Material

409.02 Conform to the following Subsections:

Micro surfacing aggregate	703.10(b)
Mineral filler	725.05
Polymer-modified emulsified asphalt for micro-surfacing	702.02(b)
Water	725.01(c)

Construction Requirements

409.03 Qualifications. See Subsection 407.03.

409.04 Composition of Mix (JMF). Submit a written JMF for micro surfacing which conforms to ISSA A143, *Recommended Performance Guideline for Micro Surfacing* for approval at least 14 days before production. Include the following:

- (a) Aggregate gradation values.** Percent passing for each sieve size for the aggregate blend;
- (b) Emulsified asphalt content.** Residual asphalt content, as a percent by mass of dry aggregate;
- (c) Polymer-modifier.** Type and quantity of polymer-modifier solids based on the residual asphalt content;
- (d) Aggregate samples.** 80-pound (35-kilogram) sample of each aggregate;
- (e) Polymer-modified emulsified asphalt sample.** 1-gallon (4-liter) sample with a production certification conforming to Subsection 106.03(a); and
- (f) Mineral filler samples.** 10-pound (5 kilogram) sample of each proposed mineral filler.

409.05 Equipment.

- (a) Mixing equipment.** Conform to ISSA A143.
- (b) Spreading equipment.** Conform to ISSA A143 with the exception that augers within the spreader box are not required.

(c) Sweeper.

- (1) Self-propelled;
- (2) Vertical broom pressure control; and
- (3) Vacuum capability.

(d) Pneumatic-tire rollers.

- (1) Self-propelled;
- (2) 10-ton (9-metric ton) gross mass with a tire pressure of 50 pounds per square inch (350 kilopascals); and
- (3) Water-spray system.

(e) Auxiliary equipment. Furnish hand squeegees, shovels, and other equipment necessary to perform the work. Provide power brooms, air compressors, water flushing equipment, and hand brooms to clean the pavement surface.

Other equipment of proven performance may be used in addition to or instead of this equipment when approved by the CO.

409.06 Surface Preparation. See Subsection 406.04(a).

409.07 Weather Limitations. Apply only when the following apply:

- (a) Ambient air temperature is above 45 °F (7 °C);
- (b) Surface temperature in the shade is above 45 °F (7 °C);
- (c) Weather is not foggy, rainy, or overcast;
- (d) Rain or temperatures below 32 °F (0 °C) are not anticipated for at least 24 hours after application.

409.08 Calibration. Calibrate mixing equipment according to ISSA A143.

409.09 Production Start-Up Procedures. Conduct a pre-surfacing preparatory phase meeting according to Subsection 153.04(a).

On the first day of placement, construct one 300-foot (100-meter) long control strip, one lane wide. Coordinate location of the control strip with the CO. Construct the control strip using material, lay-down, and rolling procedures intended for the entire project.

Cease production after construction of the control strip until the material and the control strip are evaluated and accepted by the CO. Repeat the control strip process until an acceptable control strip is produced.

Acceptable control strips may remain in place and will be accepted as a part of the completed surface treatment. Correct unacceptable control strips.

Section 418. — ASPHALT CONCRETE PAVEMENT PATCHING

Description

418.01 This work consists of repairing distressed areas of asphalt concrete pavement by removing and patching the pavement and underlying material as required.

Separation and stabilization geotextile is designated according to Table 714-1.

Material

418.02 Conform to the following Sections and Subsections:

Asphalt concrete	403
Asphalt tack coat	412
Crushed aggregate	703.06
Separation and stabilization geotextile and geotextile filter	714.01(a)
Stabilization geogrid	714.03

Construction Requirements

418.03 Asphalt Pavement, Base, and Subgrade Full Depth Patch, Type 1 (FDP-1).

(a) Patch areas. Extend the repair area 12 inches (300 millimeters) beyond the distressed area. If patch limits are within 24 inches (600 millimeters) of the pavement edge, extend the patch limit to the pavement edge. Make the minimum transverse dimension of the patch half of the travel lane width and the minimum longitudinal dimension of the patch 36 inches (900 millimeters).

(b) Pavement removal. Mill completely through the pavement or saw cut and remove the pavement. When saw cutting, cut through the existing pavement and around the perimeter of the patch area. Make saw cuts perpendicular to the roadway surface and at right angles to each other. Remove the pavement, base and subgrade to the depth shown in the plans.

(c) Patching. When required, place geogrid or geotextile according to Section 207. Place and compact crushed aggregate base according to Subsections 302.04 and 302.05. Asphalt millings may be used for crushed aggregate base material. Apply a tack coat to the edges of the patch area according to Section 412. Place and compact asphalt concrete pavement to ensure the patched surface matches the same grade as the adjacent surface.

418.04 Asphalt Pavement Full Depth Patch, Type 2 (FDP-2).

(a) Patch areas. Extend the repair area 12 inches (300 millimeters) beyond the distressed area. If patch limits are within 24 inches (600 millimeters) of the pavement edge, extend the patch limit to the pavement edge. Make the minimum length and width of the patch 36 inches (900 millimeters).

(b) Pavement removal. See Subsection 418.03(b), except remove the pavement to expose subbase or subgrade as shown in the plans.

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(c) **Patching.** Apply a tack coat to the edges of the patch area according to Section 412. Place and compact asphalt concrete pavement so the patched surface matches the same grade as the adjacent surface.

418.05 Asphalt Pavement Partial Depth Patch, Type 3.

(a) **Patch areas.** Patch areas will be designated by the CO.

(b) **Pavement removal.** Clean the patch area by sweeping or other acceptable methods.

(c) **Patching.** Apply a tack coat to asphalt concrete surfaces within the patch area according to Section 412. Place the asphalt material either by hand, with a blade, or other approved method. Compact the asphalt concrete pavement patch to match the grade of the adjacent surface.

418.06 Disposing of Waste. Dispose of debris and unsuitable and excess material according to Subsection 203.05(a) and (d).

418.07 Acceptance. Construction of asphalt concrete pavement patching will be evaluated under Subsections 106.02 and 106.04.

Separation and stabilization geotextiles and geogrid will be evaluated under Subsections 106.02 and 106.03.

Asphalt concrete will be evaluated under Section 403.

Crushed aggregate will be evaluated under Section 302.

Asphalt tack coat will be evaluated under Section 412.

Measurement

418.08 Measure the Section 418 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

Do not measure asphalt tack coat.

Payment

418.09 The accepted quantities will be paid at the contract unit price per unit of measurement for the Section 418 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 633. — PERMANENT TRAFFIC CONTROL

Description

633.01 This work consists of installing and removing and resetting permanent traffic control devices.

Sign panels are designated as plywood, steel, aluminum, plastic, fiberglass reinforced plastic, or extruded aluminum.

Sign posts are designated as wood, aluminum, galvanized steel, or corrosion resistant steel.

Material

633.02 Conform to the MUTCD and the following Section and Subsections:

Delineator and object marker retroreflectors	718.08
Hardware	718.06
Legends and borders	718.07
Minor concrete	601
Object marker and delineator posts	718.05
Panels	718.03
Retroreflective sheeting	718.01
Sign posts	718.04

Construction Requirements

633.03 General. Furnish and install permanent traffic control devices according to the MUTCD and permanent traffic control plans. Provide traffic control devices that are crashworthy.

Sign locations may be changed to fit field conditions as approved by the CO. Determine sign support lengths at time of staking.

633.04 Sign Posts. Install sign posts plumb and according to the manufacturer's recommendations.

Drive sign posts with a suitable driving head or set posts in drilled or punched holes.

Excavate, construct, and backfill concrete footings according to Section 601.

633.05 Sign Panels.

(a) Fabrication.

(1) Panels. Cut panels to dimension shown and place holes before applying retroreflective material. Do not field drill holes in panels.

Clean and degrease the face of the metal panels using methods recommended by the retroreflective sheeting manufacturer before applying retroreflective sheeting.

Wipe plastic panels clean with a slightly dampened cloth before applying retroreflective sheeting.

Abrade, clean, and degrease the face of the plywood panels using methods recommended by the retroreflective sheeting manufacturer before applying reflective sheeting. Treat plywood panel edges with sealant.

Join extruded aluminum panel sections with panel nuts, bolts, and washers to achieve the desired sign size. Use 6- and 12-inch (150- and 300-millimeter) plate heights to achieve the sign panel vertical dimensions in increments of 6 inches (150 millimeters). Do not include more than one 6-inch (150-millimeter) plate per sign.

Use retroreflective sheeting as specified and according to ASTM D4956. For roadside signs, use Type III, IV, VIII, IX, or XI prismatic retroreflective sheeting. Use fluorescent yellow sheeting for warning signs. Use fluorescent yellow-green sheeting for pedestrian, bicycle, and school crossing signs.

For multilane or overhead guide signs, use Type III or Type IV prismatic retroreflective sheeting for the background and Type IX or Type XI retroreflective sheeting for the legend.

For parking lot and non-roadway signs, Types I and Type II retroreflective sheeting may be used.

(2) Legends and borders. Form letters, numerals, and other units to provide a continuous stroke width with smooth edges. Make the surface flat and free of warp, blisters, wrinkles, burrs, and splinters. Do not fabricate letters, numerals, arrows, symbols, or borders using a red screen ink process.

Conform to one of the following techniques:

(a) Type L-1 (screen process). Apply letters, numerals, arrows, symbols, borders, and other features on the sign background by direct or reverse screen process. Apply messages and borders of a color darker than the sign background by the direct process. Apply messages and borders of a color lighter than the sign background by the reverse screen process.

Apply screen inks recommended by the ink manufacturer for use on the various types of retroreflective sheeting. Apply ink that has the same durability and color as specified for that type of retroreflective sheeting. Apply black screen ink until opaque on retroreflective sheeting.

Perform the screening in a manner to ensure a uniform color and tone, with sharply defined edges of legends and borders. Do not allow running, streaking, or sagging.

Air dry or bake the signs after screening according to manufacturer's recommendations to provide a smooth hard finish.

(b) Type L-2 (transparent films). Apply letters, numerals, arrows, symbols, borders, and other features on the sign background with colored transparent films. Select durable, electronically cuttable films coated with a transparent pressure-sensitive adhesive protected by a removable liner. Use transparent films recommended by the manufacturer within the color requirements specified for the retroreflective sheeting.

(c) Type L-3 (direct applied characters). Cut letters, numerals, arrows, symbols, borders, and other features from black opaque or retroreflective sheeting of the color specified. Apply characters to the sign background according to the retroreflective sheeting manufacturer's instructions. Use the same sheeting manufacturer for both the sign legend, border, and background.

Package sign panels in protective material and transport in a vertical position.

(b) Installation. Mount sign panels with the legend horizontal.

Use oversized bolt heads and neoprene or nylon washers for fastening plastic sign panels. Use antitheft fasteners where possible. Paint bolt heads, screw heads, and washers that are exposed on the sign face. Match the color of the paint to the color of the sheeting at the point where the fitting is exposed.

Turn sign panels 3 degrees away from the road in the direction of travel to reduce specular glare (mirror reflection).

Cover the sign face with an opaque material if a sign message is not applicable. Maintain the covering in good condition until the message becomes applicable. Do not use adhesive tape on the sign face.

633.06 Delineators and Object Markers. Attach delineators and object markers to posts according to the manufacturer's recommendation or as specified.

633.07 Removing and Resetting Permanent Traffic Control Devices. Remove and store existing traffic control devices to be reset as necessary. Replace traffic control devices damaged during removal, storage, and resetting.

633.08 Acceptance. Material for permanent traffic control devices will be evaluated under Subsections 106.02 and 106.03.

Installation of permanent traffic control devices will be evaluated under Subsections 106.02 and 106.04.

Excavation and backfill will be evaluated under Section 209.

Minor concrete will be evaluated under Section 601.

Measurement

633.09 Measure the Section 633 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When measuring sign panels by the square foot (square meter), measure front face. Measure each sign panel in a multiple configuration.

When measuring sign systems by the square foot (square meter), measure front face of each sign panel.

When measuring sign systems by the each, measure each system as one regardless of the number of sign panels.

A sign system includes the supports.

When measuring removing and resetting permanent traffic control device, measures after they are reset. Measure removing and resetting of sign systems as described above.

Payment

633.10 The accepted quantities will be paid at the contract price per unit of measurement for the Section 633 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 634. — PERMANENT PAVEMENT MARKINGS

Description

634.01 This work consists of applying paint, markings, and markers on finished pavement.

Pavement markings are designated as follows:

Type A – Solventborne traffic paint with Type 1 glass beads;

Type B – Waterborne traffic paint with Type 1 glass beads;

Type C – High-build waterborne traffic paint with Type 1 and Type 3 glass beads;

Type D – Epoxy markings with Type 1 glass beads;

Type E – Epoxy markings with Type 1 and Type 3 glass beads;

Type H – Thermoplastic markings with Type 1 glass beads;

Type I – Thermoplastic markings with Type 1 and Type 3 glass beads;

Type J – Preformed pavement marking tape; or

Type K – Nonreflectorized markings.

Material

634.02 Conform to the MUTCD and the following Subsections:

Epoxy markings	718.11
Epoxy resin adhesives	718.17
Glass beads	718.14
Pavement markers	718.15
Preformed pavement marking tape	718.13
Solventborne traffic paint	718.09
Thermoplastic markings	718.12
Waterborne traffic paint	718.10

Construction Requirements

634.03 General. Where existing and final pavement marking locations are identical, stake the limits of existing pavement markings before beginning pavement work.

Submit manufacturer's MSDS and product data sheets at least 7 days before applying pavement markings. A field demonstration may be required to verify the adequacy of the material.

Ship marking material in suitable containers plainly marked with the following information as appropriate for the material being furnished:

(a) Manufacturer's name and address;

(b) Name of product;

- (c) Lot and batch numbers;
- (d) Color;
- (e) Net mass and volume of contents;
- (f) Date of manufacture;
- (g) Date of expiration;
- (h) Statement of contents (if mixing of components is required);
- (i) Mixing proportions and instructions; and
- (j) Safety information.

Establish marking patterns or locations according to the MUTCD, plans, or state requirements. In curve widening areas, establish the edge line markings at the limits of the traveled way and the centerline markings equal distance between the edge lines.

Remove loose particles, dirt, tar, grease, and other deleterious material from the surface to be marked. Where markings are placed on rigid pavement less than 1-year old, clean the pavement of laitance and curing compounds.

Remove temporary pavement markings the same day permanent pavement markings are applied. Remove temporary and conflicting pavement markings according to Subsection 635.13 before applying permanent pavement markings.

Obtain approval before applying markings. Apply markings to a clean, dry surface, and according to the manufacturer's recommendations. Produce markings that are clean-cut and uniform in appearance by day and night.

Current state approved pavement marking material may be used, when approved by the CO. Submit proof of compliance with state specifications.

Apply glass beads immediately following paint or markings application to ensure adhesion.

Protect markings from traffic until dried to a no-tracking condition. Remove tracking marks, spilled marking material, markings in unauthorized areas, and defective markings.

634.04 Solventborne Traffic Paint (Type A). Apply paint when pavement and air temperatures are at 35 °F (2 °C) and rising. Do not heat the paint above 120 °F (49 °C). Spray paint at a 15 mil (0.38 millimeters) minimum wet film thickness or at a rate of 107 square feet per gallon (2.6 square meters per liter).

Apply Type 1 glass beads on the paint at a rate of 6 to 8 pounds per gallon (0.72 to 0.96 kilograms per liter) of paint.

On new asphalt pavements or new asphalt surface treatments, apply two applications of paint and glass beads. Apply second application after first application is track free.

634.05 Waterborne Traffic Paint (Type B and Type C). Apply paint when pavement and air temperatures are 50 °F (10 °C) and rising.

(a) **Type B.** Do not heat the paint above 120 °F (49 °C). Spray paint at a 15 mil (0.38 millimeters) minimum wet film thickness or at a rate of 107 square feet per gallon (2.6 square meters per liter).

Apply Type 1 glass beads on the paint at a rate of 6 to 8 pounds per gallon (0.72 to 0.96 kilograms per liter) of paint.

On new asphalt pavements or new asphalt surface treatments, apply two coats.

(b) **Type C.** Spray paint at 25 mil (0.63 millimeters) minimum wet film thickness or at a rate of 71 square feet per gallon (1.7 square meters per liter).

Use two bead dispensers. Apply Type 3 glass beads on the paint at a rate of 6 to 8 pounds per gallon (0.72 to 0.96 kilograms per liter) followed by Type 1 glass beads on the paint at a rate of 6 to 8 pounds per gallon (0.72 to 0.96 kilograms per liter) of paint.

634.06 Epoxy Markings (Types D and Type E). Apply epoxy when pavement and air temperatures are 35 °F (2 °C) and rising. Heat components as specified by the manufacturer. Apply at a 25 mil (0.63 millimeters) minimum dry film thickness or at a rate of 71 square feet per gallon (1.7 square meters per liter).

(a) **Type D.** Apply Type 1 glass beads on the epoxy at a rate of 6 to 8 pounds per gallon (0.72 to 0.96 kilograms per liter) of epoxy.

(b) **Type E.** Use two bead dispensers. Apply Type 3 glass beads on the epoxy at a rate of 6 to 8 pounds per gallon (0.72 to 0.96 kilograms per liter) of epoxy followed by Type 1 glass beads on the epoxy at a rate of 6 to 8 pounds per gallon (0.72 to 0.96 kilograms per liter) of epoxy.

634.07 Thermoplastic Markings (Type H and Type I). Apply thermoplastic when pavement and air temperatures are 50 °F (10 °C) and rising. Heat thermoplastic as specified by the manufacturer.

Apply an epoxy resin primer/sealer according to the thermoplastic manufacturer's recommendations when placing markings on rigid pavements or asphalt pavements more than 2-years old, oxidized, or having exposed aggregates.

Allow the primer/sealer to dry.

For edge lines, apply thermoplastic at 60 mil (1.5 millimeters) dry film thickness. For other lines, apply thermoplastic at 90 mil (2.3 millimeters) dry film thickness.

(a) **Type H.** Apply Type 1 glass beads on the thermoplastic at a rate recommended by the manufacturer.

(b) **Type I.** Use two bead dispensers. Apply Type 3 glass beads on the thermoplastic followed by Type 1 glass beads on the thermoplastic at rates recommended by the manufacturer.

634.08 Preformed Pavement Marking Tape (Type J). Install to form a durable, weather resistant bond to the pavement. Apply preformed markings according to the manufacturer's recommendations. Use preformed marking tape containing retroreflective beads.

634.09 Nonreflectorized Markings (Type K). Apply solvent borne or waterborne traffic paint without glass beads.

634.10 Pavement Markers. Install raised or recessed pavement markers when the pavement and air temperatures are 50 °F (10 °C) and rising. Apply pavement markers with an epoxy resin adhesive as recommended by the manufacturer when the pavement is dry. Space the markers according to the MUTCD and plans.

634.11 Acceptance. Material for permanent pavement markings will be evaluated under Subsections 106.02 and 106.03.

Placing of permanent pavement markings will be evaluated under Subsections 106.02 and 106.04.

Measurement

634.12 Measure the Section 634 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When pavement markings are measured by the linear foot (meter), measure the length of line applied along the centerline of each line applied regardless of color. Measure broken or dotted pavement lines from end to end of the line including gaps. Measure solid pavement lines from end to end of each continuous line. Measure line quantities based on a 4-inch (100-millimeter) wide line. For line widths greater than 4 inches (100 millimeters), adjust the measured length of line in the ratio of the required width to 4 inches (100 millimeters).

When pavement markings are measured by the square foot (square meter), measure the number of square feet (square meter) of line, symbol or letter marking based on the marking area shown in the plans. If not shown, measure the area of each marking in place to the nearest square foot (square meter).

Payment

634.13 The accepted quantities will be paid at the contract price per unit of measurement for the Section 634 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 635. — TEMPORARY TRAFFIC CONTROL

Description

635.01 This work consists of furnishing, installing, maintaining, relocating, and removing temporary traffic control devices and services as ordered for the control and protection of public traffic through the project.

Advance warning arrow board, barricade, and warning light types are designated in the MUTCD.

Material

635.02 Conform to the MUTCD and the following Sections and Subsections:

Concrete barrier (temporary)	618
Delineator and object marker retroreflectors	718.08(b)
Guardrail (temporary)	617
Retroreflective sheeting	718.01
Sign panels	633.05
Sign posts	633.04
Temporary plastic fence	710.11
Temporary pavement markings	718.16

Construction Requirements

635.03 Qualifications. Provide flaggers certified by ATSSA, the National Safety Council, a state department of transportation, or other acceptable organization. Use pilot car operators conforming to the qualifications of a flagger.

635.04 General. Furnish, install, and maintain temporary traffic control devices adjacent to and within the project as required by the MUTCD, traffic control plan, and Section 156. Install and maintain traffic control devices as follows:

- (a) Furnish and install traffic control devices before the start of construction operations;
- (b) Install only those traffic control devices needed for each stage or phase;
- (c) Relocate temporary traffic control devices as necessary;
- (d) Remove devices that no longer apply to the existing conditions;
- (e) Immediately replace devices that are lost, stolen, destroyed, or inoperative;
- (f) Keep temporary traffic control devices clean;
- (g) Furnish and maintain traffic control devices that meet the "acceptable" standard described in ATSSA, *Quality Standards for Work Zone Traffic Control Devices*. Amend the ATSSA standards as follows:
 - (1) Repair or remove and replace "marginal" devices within 48 hours; and

- (2) Repair or remove and replace "*unacceptable*" devices immediately;
- (h) Remove temporary traffic control devices upon contract completion or when approved; and
- (i) Furnish crashworthy temporary traffic control devices.

635.05 Barricades. Use barricades of the type and size specified or according to the MUTCD. Use Type III, IV, IX, or XI retroreflective sheeting.

635.06 Cones and Tubular Markers. Use cones or tubular markers of the height specified or according to the MUTCD. Use Type III or Type VI retroreflective sheeting.

635.07 Construction Signs. Use Type III, IV, VIII, IX, or XI prismatic retroreflective sheeting. Use fluorescent sheeting for orange signs. For roll-up signs, use fluorescent Type VI retroreflective sheeting.

Install posts according to Section 633. Portable sign supports may be used instead of sign posts when approved by the CO.

Remove or completely cover unnecessary signs. Use metal, plywood, or other acceptable material to cover signs. Do not use adhesives, glues, tapes, or mechanical fasteners that mar the face of the panel of the sign to be covered.

635.08 Drums. Use plastic drums that are at least 36 inches (900 millimeters) high and at least 18 inches (450 millimeters) in diameter. Use Type III or Type VI retroreflective sheeting.

635.09 Flaggers. Use flaggers certified according to Subsection 635.03. Use Type III, IV, VIII, IX, or XI retroreflective sheeting on flagger paddles. Do not use flags.

635.10 Pilot Cars. Use pilot car operators certified according to Subsection 635.03. Mount a "*PILOT CAR FOLLOW ME*" sign on the rear and a high-intensity, rotating, flashing, oscillating, or strobe light on the roof of the pilot car.

635.11 Temporary Barriers. Use temporary barriers that are crashworthy and are new or used provided they are not badly damaged. Lifting holes no larger than 4 inches (100 millimeters) or lifting loops are permitted.

Mount white or yellow retroreflectors as applicable, to the top or side of the barrier on 25-foot (8-meter) centers. Mount the retroreflectors at a uniform height at least 24 inches (600 millimeters) above the road surface. Flexible barrier delineators or barrier delineation tape may be used instead of retroreflectors when approved by the CO.

635.12 Temporary Guardrail. Construct temporary guardrail according to Section 617.

Mount white or yellow retroreflectors as applicable, to the top or side of the guardrail on 25-foot (8-meter) centers. Mount the retroreflectors at a uniform height at least 24 inches (600 millimeters) above the road surface.

635.13 Temporary Pavement Markings and Delineation. Before opening a pavement surface to traffic, remove conflicting pavement markings by sandblasting or other methods that do not damage the surface or texture of the pavement. Make the removal pattern uneven to not perpetuate the outline of the removed pavement markings. Lightly coat sandblasted or removal areas on asphalt surfaces with emulsified asphalt.

Place and maintain temporary pavement markings that are neat, crack free, true, straight, and unbroken.

If temporary signs and pavement markers are substituted for temporary pavement markings, install temporary signs and pavement markers according to the MUTCD and plans.

For temporary pavement markings, use preformed retroreflective tape, traffic paint, or pavement markers as follows:

(a) Preformed retroreflective tape. Apply according to the manufacturer's instructions. Remove loose preformed retroreflective tape before placing additional pavement layers.

(b) Pavement markers. Do not use pavement markers during seasonal suspensions. When chip seals, slurry seals, or tack coats are used after marker placement, protect the markers with an approved protective cover, and remove it after the asphalt material is sprayed.

(c) Traffic paint. Do not apply traffic paint to the final surface. Apply traffic paint as the temporary pavement marking if no work will be performed on the project for at least 30 consecutive days. Apply traffic paint at a 15 mil (0.38-millimeter) minimum wet film thickness or at a rate of 107 square feet per gallon (2.6 square meters per liter). Immediately apply Type 1 glass beads on the paint at a minimum rate of 6 pounds per gallon (0.7 kilograms per liter) of paint.

Remove temporary pavement markers before placing additional pavement layers or permanent pavement markings. Remove temporary markings after 14 days and apply permanent pavement markings unless approved by the CO.

635.14 Vertical Panels. Use vertical panels that are at least 24 inches (600 millimeters) in height and 8 to 12 inches (200 to 300 millimeters) wide. Use Type III, IV, VIII, IX, or XI retroreflective sheeting.

635.15 Warning Lights. Use warning lights of the types shown in the plans or according to the MUTCD. Install warning lights with a minimum mounting height of 30 inches (750 millimeter) to the bottom of the lens. Secure lights to the top of the traffic control device they are supplementing. Use batteries recommended by the light manufacturer. Mount large batteries below windshield height and preferably on the ground. Replace batteries when they no longer provide satisfactory performance.

Use Type C steady-burn warning lights for delineation on barricades or drums. Use Type A low-intensity flashing warning lights on the first 2 barricades or drums in the merging or shifting taper series. Use Type B high-intensity flashing warning lights on the first two advance warning signs. Type A and Type C warning lights are intended to warn road users during nighttime hours, while Type B warning lights are intended to warn road users during both daylight and nighttime hours.

635.16 Shadow Vehicle. Use a 19,800 pound (9000-kilogram) \pm 990 pound (\pm 450 kilogram) shadow vehicle equipped with a truck-mounted attenuator (crash cushion) attached to the rear of the vehicle, exterior flashing yellow dome light, and an arrow board.

Use the shadow vehicle to provide physical protection to workers from traffic approaching from the rear during moving operations.

Use the following procedures to close a lane of traffic:

- (a) Move the shadow vehicle to a point approximately 200 feet (60 meters) from the first advance warning sign for the lane closure and stop on the shoulder;
- (b) Activate the flashing lights and flashing arrow board. Begin the arrow board in the caution mode and after approximately 2 minutes display the correct flashing pass arrow;
- (c) Move the shadow vehicle (now acting as a protection vehicle) along the shoulder to the first sign location, stopping approximately 100 feet (30 meters) before the sign location in a blocking position;
- (d) Place the first sign then proceed to the next advance sign location. Repeat step (c) for the second sign and install that sign. Repeat this procedure until advance warning signs are installed;
- (e) After installing the advanced warning signs for the lane closure, move the shadow vehicle into the lane that is to be closed to a position 100 feet (30 meters) before the closing taper location. Install the channelizing devices for the taper in the shielded lane; then
- (f) Move the shadow vehicle off the roadway and past the taper on the shoulder and remain in position until the flashing arrow board for the closure (if one is to be provided) is placed and operating. Move the shadow vehicle with the workers as they proceed to set up the remaining devices as additional protection.

Alternate lane closure procedures may be used if approved by the CO.

635.17 Pavement Patch. Use an asphalt mix according to Section 403 or commercial available cold asphalt mix to repair potholes and rough spots in the traveled way before reopening travel lanes to traffic. If cold asphalt mix is used, remove and replace with hot asphalt mix before placing succeeding hot asphalt lifts.

635.18 Temporary Crash Cushions. Use a crashworthy temporary crash cushion according to manufacturer's recommendations.

635.19 Temporary Signal System. Use a temporary signal system according to MUTCD Parts 4 and 6.

Provide the names and telephone numbers of at least two emergency contacts who can be reached 24 hours a day, and who are available to arrive on site within 4 hours of notification to repair or replace malfunctioning temporary signal equipment. In addition, provide for emergency flaggers who can be reached 24 hours a day, and who are available to perform traffic control operations within the timeframes specified below until the temporary signal system is operable.

If the traffic signal malfunctions during construction operations, immediately begin traffic control operations using flaggers until the system is returned to normal signal operation. Complete traffic signal repairs within 6 hours of the malfunction.

If the traffic signal malfunctions during a period when no construction activity is taking place, begin traffic control operations using flaggers as soon as possible, but no later than 2 hours after the initial notification. Continue temporary flagging operations until the system is returned to normal signal operation. Complete traffic signal repairs within 12 hours of notification.

No payment will be made for the use of flaggers in place of a malfunctioning or inoperable temporary signal system.

635.20 Temporary Fence. Use temporary fence according to Section 619.

635.21 Temporary Rumble Strip. Use transverse or longitudinal rumble strips according to the MUTCD Part 6 to alert drivers of an approaching flagger station or work area.

635.22 Steel Plates. Use 1-inch (25-millimeter) or thicker steel plates capable of safely carrying traffic. Secure the plates to the pavement to prevent movement.

635.23 Acceptance. Material for temporary traffic control devices will be evaluated under Subsections 106.02 and 106.03.

Vehicles for pilot cars and shadow vehicles will be evaluated under Subsections 106.02 and 106.04.

Placement of temporary traffic control devices will be evaluated under Subsections 106.02 and 106.04.

Temporary traffic control services will be evaluated under Subsections 106.02 and 106.04.

Measurement

635.24 Measure the Section 635 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable when ordered by the CO and installed.

When measuring temporary traffic control pay items, measure only one time even if relocated or replaced, except for pay items paid by the hour.

Measure barricades by the linear foot (meter) of width.

When measuring construction signs by the square foot (square meter), measure front face sign panel. Do not measure posts and temporary supports.

When there is a pay item for moving temporary barriers, do not measure movement of temporary barriers for work access or the convenience of the Contractor.

When measuring temporary pavement markings, measure only one application of pavement markings per lift. When temporary pavement markings are measured by the linear foot or mile (meter or kilometer), measure the number of linear feet or miles (meters or kilometers) of lines applied along the centerline of each 4-inch (100-millimeter) wide line applied regardless of color. Measure solid lines from end to end of each continuous line. Measure broken lines from end to end including gaps. For line widths greater than 4 inches (100 millimeters), adjust the measured length of line in the ratio of the required width to 4 inches (100 millimeters). When temporary pavement markings are measured by the square foot (square meter), measure the number of square feet (square meters) of symbols or letter markings based on the marking area shown in the plans or, if not shown, the area of each marking measured in place to the nearest square foot (square meter).

When measuring temporary pavement markers, measure only one application of pavement markings per lift, even if replaced. Measure temporary pavement markers used at the option of the Contractor instead of temporary pavement markings as equivalent temporary pavement markings and not as temporary pavement markers.

When measuring pavement marking removal, measure the actual line removed. Do not measure gaps.

When measuring temporary crash cushions, measure each entire crash cushion configuration.

When there is a pay item for moving temporary crash cushion, do not measure movement of temporary crash cushion for work access or the convenience of the Contractor.

Measure replacement barrels or cartridges for crash cushions for the barrels or cartridges damaged by public traffic.

Payment

635.25 The accepted quantities will be paid at the contract price per unit of measurement for the Section 635 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Progress payments for temporary traffic control devices will be paid as follows:

- (a) 50 percent of the pay item amount will be paid upon installation.
- (b) An additional 25 percent of the pay item amount will be paid following completion of 50 percent of the contract amount.
- (c) Payment of the remaining portion of the pay item amount will be paid when the temporary traffic control devices are removed from the project.

Progress payments for pay items paid for by the hour will be paid at 100 percent of the pay item amount when ordered by the CO and furnished.

**DIVISION 700
MATERIAL**

Section 702. — ASPHALT MATERIAL

702.01 Asphalt Binder. Conform to AASHTO M 226 or AASHTO M 320.

~~**702.02 Emulsified Asphalt.** Conform to AASHTO M 140 or AASHTO M 208.~~

See Supplemental Specification.

~~(a) **Polymer modified cationic emulsified asphalt for chip seals.** Use a solid or latex polymer added either to the asphalt binder or during the emulsification process. Conform to AASHTO M 316, except as follows:~~

- | | |
|---|-----------|
| (1) Force ratio, f_2/f_1 , 39.2 °F (4 °C), 5 cm/min, AASHTO T 300 | 0.3 min. |
| (2) Elastic recovery, 77 °F (25 °C), 5 cm/min, AASHTO T 301 | 50 % min. |
| (3) CRS-2P, penetration, 77 °F (25 °C), 100 g, 5 sec, AASHTO T 49 | 90 to 150 |
| (4) CRS-2hP, penetration, 77 °F (25 °C), 100 g, 5 sec, AASHTO T 49 | 50 to 90 |

~~(b) **Polymer-modified emulsified asphalt for micro-surfacing.** Conform to ISSA A143, except use Section 6, *Emulsified Asphalt Residue by Evaporation* of AASHTO T 59 to determine percent residue.~~

~~(c) **Penetrating emulsified asphalt for prime coat.** Conform AASHTO T 59, except as modified by Table 702-1.~~

**Table 702-1
Penetrating Emulsion for Prime Coat**

	Minimum	Maximum
Requirements for Emulsion		
Viscosity, Saybolt Furol at 122 °F (50 °C), sec	15	150
Settlement, 24-hours, %	—	1
Residue by evaporation, %	62	—
Requirements for Residue		
Penetration, 77 °F (25 °C), 100 g, 5 sec, AASHTO T 49	40	200
Solubility in trichloroethylene, %, AASHTO T 44	97.5	—

702.03 Material for Dampproofing and Waterproofing Concrete and Masonry Surfaces.

(a) **Primer.** Conform to ASTM D41 for asphalt membranes. Furnish a neoprene-based primer for use with rubberized asphalt membrane. Furnish a resin- or solvent-based primer for use with the modified bitumen membrane.

If preformed membrane sheets are used, furnish primers of a type recommended by the manufacturer.

(b) **Asphalt.** For mop coat, conform to ASTM D449, Type I or Type II.

(c) **Waterproofing fabric.** Furnish asphalt saturated fabric conforming to ASTM D173.

If preformed membrane sheet is used, furnish either the rubberized asphalt type or the modified bitumen type. The rubberized asphalt type consists of a rubberized asphalt sheet reinforced with a polyethylene film or mesh. The modified bitumen sheet type consists of a polymer modified bitumen sheet reinforced with a stitch-bonded polyester fabric or fiberglass mesh. Conform to Table 702-2 or 702-3.

**Table 702-2
Preformed Membrane Sheet for Surfaces Other Than Bridge Decks**

Property	Test	Value	
		Rubberized Asphalt Type	Modified Bitumen Type
Tensile strength in machine direction	ASTM D882	20 lb/in (3.5 kN/m)	20 lb/in (3.5 kN/m)
Elongation at break in machine direction	ASTM D882	150% at 73.4 °F (23 °C)	25% at 73.4 °F (23 °C)
Pliability	ASTM D146 ⁽¹⁾	No cracks	No cracks
Thickness, minimum	—	60 mil (1.52 mm)	60 mil (1.52 mm)
Softening point, minimum	ASTM D36 ⁽¹⁾	165 °F (74 °C)	210 °F (99 °C)

(1) Base ASTM D146 on a 180-degree bend over a 4.0-inch (100-mm) mandrel at 10 °F (-12 °C).

**Table 702-3
Preformed Membrane Sheet for Bridge Decks**

Property	Test	Value	
		Rubberized Asphalt Type	Modified Bitumen Type
Tensile strength in machine direction	ASTM D882	50 lb/in (8.75 kN/m)	40 lb/in (7.0 kN/m)
Elongation at break in machine direction	ASTM D882	15% at 73.4 °F (23 °C)	10% at 73.4 °F (23 °C)
Pliability	ASTM D146 ⁽¹⁾	No cracks	No cracks
Thickness, minimum	—	65 mils (1.65 mm)	70 mils (1.65 mm)
Softening point, minimum	ASTM D36 ⁽¹⁾	165 °F (74 °C)	210 °F (99 °C)

(1) Base ASTM D146 on a 180-degree bend over a 4.0-inch (100-mm) mandrel at 10 °F (-12 °C).

(d) Mastic. Furnish mastic consisting of a rubberized asphalt cold-applied joint sealant for use with preformed rubberized sheets. Furnish mastic consisting of a blend of bituminous and synthetic resins for use with modified bitumen sheet.

(e) Asphalt roll roofing. Conform to ASTM D6380, Class M, Type II.

702.04 Asphalt Mastic. Conform to AASHTO M 243.

702.05 Antistrip Additive. Conform to the following:

(a) **Type 1.** Furnish commercially produced, heat stable liquid products that when added to an asphalt have the chemical and physical properties to prevent separation of the asphalt from aggregates.

(b) **Type 2.** Furnish cement conforming to Subsection 701.01 or fly ash conforming to Subsection 725.04(a).

(c) **Type 3.** Furnish lime conforming to AASHTO M 303.

702.06 Mineral Fiber. Conform to the following:

(a) Fiber length ¼-in (6-mm) max. mean test value

The fiber length is determined according to the Bauer McNett fractionation.

(b) Fiber thickness 0.0002-in (5-µm) max. mean test value

The fiber diameter is determined by measuring at least 200 fibers in a phase contrast microscope.

(c) Shot content Table 702-4

Table 702-4
Mineral Fiber Shot Content⁽¹⁾

Sieve Size	Nominal Maximum Size Percent Passing
No. 60 (250 µm)	90±5
No. 230 (63 µm)	70±10

(1) Shot content is a measure of non-fibrous material. The shot content is determined on vibrating sieves. See ASTM C612 for additional information.

Section 703. — AGGREGATE

703.01 Fine Aggregate for Concrete. Furnish sand conforming to AASHTO M 6, Class B, except as amended or supplemented by the following:

- | | |
|--|---|
| (a) Material passing No. 200 (75- μ m) sieve, AASHTO T 11 | 3.0 percent max. |
| (b) Alkali-silica reactivity. Test the aggregate for alkali silica reaction and conform to one of the following (1) through (5): | |
| (1) Alkali-silica reactivity, ASTM C1260 | ≤ 0.10 percent at 16 days after casting |
| (2) Alkali-silica reactivity, ASTM C1260 | 0.11 percent to 0.20 percent at 16 days after casting |
| And one of the following examinations: | |
| (a) Petrographic examination of aggregates, ASTM C295, performed within 1 year from time of submittal | Favorable report for use |
| (b) Petrographic examination of hardened concrete, ASTM C856, performed on ASTM C1260 specimens after test | Favorable report for use |
| (3) Alkali-silica reactivity with cementitious material, ASTM C1567, performed on approved mix design mass percent combinations. Do not use lithium compounds as mitigation measures | ≤ 0.10 percent at 16 days after casting |
| (4) Alkali silica reaction, ASTM C1293 | < 0.04 percent at 12 months |
| (5) Alkali-silica reaction with cementitious material, ASTM C1293, performed on approved mix design mass percent combinations | < 0.04 percent at 24 months |

For lightweight fine aggregate, conform to AASHTO M 195.

703.02 Coarse Aggregate for Concrete. Conform to AASHTO M 80, Class A, except as amended or supplemented by the following:

- | | |
|---------------------------------------|--|
| (a) Los Angeles abrasion, AASHTO T 96 | 40 percent max. |
| (b) Grading, AASHTO M 43 | All sizes, except Size Numbers 8, 89, 9, or 10 |
| (c) Alkali-silica reactivity | See Subsection 703.01(b) |

For bridge decks or surface courses, do not use aggregates known to polish or carbonate aggregates containing less than 25 percent by mass of insoluble residue as determined by ASTM D3042.

For lightweight coarse aggregate, conform to AASHTO M 195.

703.03 Granular Backfill. Furnish aggregate for the following installations.

(a) Underdrain pipe with geotextile. Furnish granular backfill conforming to AASHTO M 80, Class E and AASHTO M 43, Size Number 3, 4, 5, 57, 67, or 7.

(b) Underdrain pipe without geotextile. Furnish granular backfill conforming to AASHTO M 6, except the soundness test is not required.

703.04 Reserved.

703.05 Subbase, Base, and Surface Course Aggregate.

(a) General. Furnish hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel conforming the following:

- | | |
|--|----------------------|
| (1) Los Angeles abrasion, AASHTO T 96 | 50 percent max. |
| (2) Soundness of aggregate using sodium sulfate, AASHTO T 104 (5 cycles) | 12 percent loss max. |
| (3) Durability index (coarse), AASHTO T 210 | 35 min. |
| (4) Durability index (fine), AASHTO T 210 | 35 min. |
| (5) Fractured faces, ASTM D5821 | 50 percent min. |
| (6) Without organic matter and lumps or balls of clay. | |

(b) Subbase or base aggregate. In addition to Subsection 703.05(a), conform to the following:

- | | |
|-------------------------------|-------------|
| (1) Gradation | Table 703-2 |
| (2) Liquid limit, AASHTO T 89 | 25 max. |

**Table 703-2
Target Value Ranges for Subbase and Base Gradation**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 and T 11)				
	Grading Designation				
	A (Subbase)	B (Subbase)	C (Base)	D (Base)	E (Base)
2½ inch (63 mm)	100 ⁽¹⁾				
2 inch (50 mm)	97 – 100 ⁽¹⁾	100 ⁽¹⁾	100 ⁽¹⁾		
1½ inch (37.5 mm)		97 – 100 ⁽¹⁾			
1 inch (25 mm)	65 – 79 (6)		80 – 100 (6)	100 ⁽¹⁾	
¾ inch (19 mm)			64 – 94 (6)	86 – 100 (6)	100 ⁽¹⁾
½ inch (12.5 mm)	45 – 59 (7)				
⅜ inch (9.5 mm)			40 – 69 (6)	51 – 82 (6)	62 – 90 (6)
No. 4 (4.75 mm)	28 – 42 (6)	40 – 60 (8)	31 – 54 (6)	36 – 64 (6)	36 – 74 (6)
No. 40 (425 µm)	9 – 17 (4)			12 – 26 (4)	12 – 26 (4)
No. 200 (75 µm)	4.0 – 8.0 (3)	4.0 – 12.0 (4)	4.0 – 7.0 (3)	4.0 – 7.0 (3)	4.0 – 7.0 (3)

(1) Statistical procedures do not apply.

() The value in the parentheses is the allowable deviation (±) from the target values.

(c) Surface course aggregate. In addition to Subsection 703.05(a), conform to the following:

- | | |
|---|-------------|
| (1) Gradation | Table 703-3 |
| (2) Liquid limit, AASHTO T 89, Method A | 35 max. |
| (3) Plasticity index, AASHTO T 90 | 10±3 |

Do not furnish material that contains asbestos fibers.

**Table 703-3
Target Value Ranges for Surface Course Gradations**

Sieve Size	Percent by Mass Passing Designate Sieve (AASHTO T 27 & AASHTO T 11)
1 inch (25 mm)	100 ⁽¹⁾
½ inch (12.5 mm)	70 – 80 (5)
No. 4 (4.75 mm)	40 – 50 (7)
No. 10 (2.0 mm)	25 – 40 (6)
No. 40 (425 µm)	15 – 25 (5)
No. 200 (75 µm)	8.0 – 14.0 (4)

(1) Statistical procedures do not apply.

() The value in the parentheses is the allowable deviation (±) from the target values.

703.06 Crushed Aggregate. Furnish hard, durable particles or fragments of crushed stone or gravel conforming to the size and quality requirements for crushed aggregate material normally used locally in the construction and maintenance of highways by Federal or state agencies. Furnish crushed aggregate with a maximum size of 1 inch (25 millimeters) as determined by AASHTO T 27 and AASHTO T 11. Furnish crushed aggregate uniformly graded from coarse to fine and free of organic matter, lumps or balls of clay, and other deleterious material.

703.07 Asphalt Concrete Aggregate. Furnish hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel conforming to the following:

- | | |
|--|----------------------|
| (a) Los Angeles abrasion, AASHTO T 96 | 35 percent max. |
| (b) Soundness of aggregate using sodium sulfate, AASHTO T 104 (5 cycles): | |
| (1) Coarse aggregate | 12 percent loss max. |
| (2) Fine aggregate | 12 percent loss max. |
| (c) Fractured faces, ASTM D5821 | 90 percent min. |
| (d) Fine aggregate angularity, AASHTO T 304, Method A | 40.0 percent min. |
| (e) Flat and elongated particles, ASTM D4791 (1:5 ratio, plus 3/8-inch (9.5-mm) sieve, calculated by mass, weighted average) | 10 percent max. |
| (f) Sand equivalent, AASHTO T 176, Alternative Method No. 2, Reference Method | 45 min. |
| (g) Gradation. Size, grade and combine the aggregate fractions in mix proportions that result in a composite blend conforming to the specified gradation. Nominal maximum size is one sieve size greater than the first sieve to retain more than 10 percent of the combined aggregate. Test according to AASHTO T 27 and AASHTO T 11. Volumetric asphalt concrete aggregate gradation. See Table 703-4. | |

For the surface course, do not use aggregates known to polish or carbonate aggregates containing less than 25 percent by mass of insoluble residue when tested according to ASTM D3042.

**Table 703-4
Asphalt Concrete Aggregate Gradation**

Sieve Size	Nominal Maximum Aggregate Size – Percent Passing									
	Grading Designation									
	1 inch (25 mm)		¾ inch (19 mm)		½ inch (12.5 mm)		¾ inch (9.5 mm)		No. 4 (4.75 mm)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
2 inch (50 mm)										
1½ inch (37.5 mm)	100									
1 inch (25 mm)	90	100	100							
¾ inch (19 mm)	*	90	90	100	100					
½ inch (12.5 mm)	*	*	*	90	90	100	100			
¾ inch (9.5 mm)	*	*	*	*	*	90	90	100	100	
No. 4 (4.75 mm)	*	*	*	*	*	*	*	90	95	100
No. 8 (2.36 mm)	19	45	23	49	28	58	32	67	70	80
No. 16 (1.18 mm)	*	*	*	*	*	*	*	*	*	*
No. 30 (600 µm)	*	*	*	*	*	*	*	*	*	*
No. 50 (300 µm)	*	*	*	*	*	*	*	*	*	*
No. 200 (75 µm)	1.0	7.0	2.0	8.0	2.0	10.0	2.0	10.0	4.0	10.0

* Contractor specified target values. See Table 703-5 for allowable deviations.

**Table 703-5
Allowable Deviation Based on Target Value**

Percent by Mass Passing		Allowable Deviation
Minimum	Maximum	
70.1	89.9	4
60.1	70.0	5
55.1	60.0	6
45.1	55.0	7
40.1	45.0	6
30.1	40.0	5
21.1	30.0	4
8.1	21.0	3
0	8.0	2

703.08 Open-Graded Asphalt Friction Course Aggregate. Furnish hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel conforming to the following:

- | | |
|--|----------------------|
| (a) Los Angeles abrasion, AASHTO T 96 | 35 percent max. |
| (b) Soundness of aggregate using sodium sulfate, AASHTO T 104 (5 cycles), coarse aggregate | 12 percent loss max. |
| (c) Fractured faces, ASTM D5821 (two or more) | 75 percent min. |
| (d) Gradation | Table 703-6 |

**Table 703-6
Target Value Ranges for
Open Graded Friction Course Aggregate Gradation**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & T 11)	
	Grading Designation	
	A	B
½ inch (12.5 mm)	–	100
⅜ inch (9.5 mm)	100	95 – 100
No. 4 (4.75 mm)*	30 – 45	50 – 70
No. 8 (2.36 mm)*	5 – 15	5 – 15
No. 200 (75 µm)*	2.0 – 5.0	2.0 – 5.0

* Contractor specified target values. See Table 703-5 for allowable deviations.

703.09 Chip Seal Aggregate. Furnish hard durable particles or fragments of crushed gravel, crushed stone, crushed slag, or lightweight aggregates. Use only one type of aggregate on the surface treatment. Conform to the following:

- (a) Gradation Table 703-7
- (b) Clay lumps and friable particles, AASHTO T 112 1.0 percent max.
- (c) Flat and elongated particles, ASTM D4791 (1:3 ratio, plus 3/8-inch (9.5-mm) sieve, calculated by mass, weighted average) 10 percent max.
- (d) Fractured faces, ASTM D5821 90 percent min.
- (e) Los Angeles abrasion, AASHTO T 96 40 percent max.
- (f) Soundness of aggregate using sodium sulfate, AASHTO T 104 (5 cycles) 12 percent loss max.

**Table 703-7
Target Value Ranges for
Single and Double Course Chip Seal Aggregate Gradation**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & AASHTO T 11)			
	Grading Designation			
	A	B	C	D
1 1/2 inch (37.5 mm)				
1 inch (25 mm)	100 ⁽¹⁾			
3/4 inch (19 mm)	90 – 100 (3)	100 ⁽¹⁾		
1/2 inch (12.5 mm)	0 – 35 (5)	90 – 100 (3)	100 ⁽¹⁾	
3/8 inch (9.5 mm)	0 – 12 (3)	0 – 35 (5)	85 – 100 (3)	100 ⁽¹⁾
No. 4 (4.75 mm)	–	0 – 12 (3)	0 – 35 (5)	85 – 100 (3)
No. 8 (2.36 mm)	–	–	0 – 8 (3)	0 – 23 (4)
No. 200 (75 µm)	0.0 – 1.0 (0.5)	0.0 – 1.0 (0.5)	0.0 – 1.0 (0.5)	0.0 – 1.0 (0.5)

(1) Statistical procedures do not apply.

() The value in the parentheses is the allowable deviation (±) from the target values.

703.10 Slurry Seal and Micro Surfacing Aggregate. Furnish hard durable particles or fragments of crushed gravel or crushed stone.

(a) **Slurry seal aggregate.** Conform to ISSA A105 and the following:

- (1) Gradation Table 703-8
- (2) Los Angeles abrasion, AASHTO T 96, Grading D 35 percent max.

- (3) Sand equivalent, AASHTO T 176, Alternate Method No. 2, Reference Method 45 min.
- (4) Soundness of aggregate using sodium sulfate, AASHTO T 104 (5 cycles) 15 percent loss max.

(b) **Micro surfacing aggregate.** Conform to ISSA A143 and the following:

- (1) Gradation Table 703-8
- (2) Los Angeles abrasion, AASHTO T 96, Grading D 30 percent max.
- (3) Sand equivalent AASHTO T 176, Alternate Method No. 2, Reference Method 65 min.
- (4) Soundness of aggregate using sodium sulfate, AASHTO T 104 (5 cycles) 15 percent loss max.

Table 703-8
Micro Surfacing and Slurry Seal Aggregate
Gradation

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & AASHTO T 11)		
	Grading Designation		
	I	II	III
3/8 inch (9.5 mm)	–	100	100
No. 4 (4.75 mm)	100	90 – 100	70 – 90
No. 8 (2.36 mm)	90 – 100	65 – 90	45 – 70
No. 16 (1.18 mm)	65 – 90	45 – 70	28 – 50
No. 30 (600 µm)	40 – 65	30 – 50	19 – 34
No. 50 (300 µm)	25 – 42	18 – 30	12 – 25
No. 100 (150 µm)	15 – 30	10 – 21	7 – 18
No. 200 (75 µm)	10.0 – 20.0	5.0 – 15.0	5.0 – 15.0

703.11 Reserved.

703.12 Blotter. Furnish sound durable particles of gravel or crushed stone conforming to the following:

- (a) Material passing 3/8-inch (9.5-mm) sieve, AASHTO T 27 100 percent
- (b) Liquid limit, AASHTO T 89, Method A 25 max.
- (c) Without organic matter and clay balls.

703.13 Aggregate for Aggregate-Topsoil Course. Conform to AASHTO M 80, Class E and AASHTO M 43, Size Number 57.

703.14 Sand. Furnish clean material conforming to the following:

- (a) Gradation AASHTO M 6
- (b) Deleterious material AASHTO M 6, Class B

703.15 Aggregate for Lean Concrete Backfill. Furnish hard, clean, durable, nonplastic, nonorganic, nonreactive aggregate to meet the designated gradation in Table 703-10.

**Table 703-10
Aggregate for Lean Concrete Backfill**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & T 11)
1 inch (25 mm)	100
No. 200 (75 μm)	0.0 – 10.0

703.16 Shotcrete Aggregate. Combine fine and coarse aggregates to meet the designated gradation in Table 703-11.

**Table 703-11
Shotcrete Gradation Limits for Combined Aggregates**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & AASHTO T 11)	
	Grading Designation	
	A	B
½ inch (12.5 mm)	—	100
¾ inch (9.5 mm)	100	90 – 100
No. 4 (4.75 mm)	95 – 100	70 – 85
No. 8 (2.36 mm)	80 – 98	50 – 70
No. 16 (1.18 mm)	50 – 85	35 – 55
No. 30 (600 μm)	25 – 60	20 – 35
No. 50 (300 μm)	10 – 30	8 – 20
No. 100 (150 μm)	2.0 – 10.0	2.0 – 10.0

(a) **Fine aggregate.** Conform to AASHTO M 6, Class B, except as amended or supplemented by the following:

- (1) Material passing No. 200 (75-μm) sieve, AASHTO T 11 3.0 percent max.
- (2) Sand equivalent value, AASHTO T 176, Alternate Method No. 2, Reference Method 75 min.
- (3) Alkali-silica reactivity See Subsection 703.01(b)

(b) **Coarse aggregate.** Conform to AASHTO M 80, Class A, except as amended or supplemented by the following:

- (1) Los Angeles abrasion, AASHTO T 96 40 percent max.

(2) Alkali-silica reactivity

See Subsection 703.01(b)

703.17 Granular Rock Backdrain. Furnish hard, durable rock conforming to the following:

- | | |
|---|------------------|
| (a) Los Angeles abrasion, AASHTO T 96 | 50 percent max. |
| (b) Apparent specific gravity, AASHTO T 85 | 2.50 min. |
| (c) Absorption, AASHTO T 85 | 4.0 percent max. |
| (d) Durability index (course), AASHTO T 210 | 50 min. |
| (e) Gradation | Table 703-12 |

**Table 703-12
Granular Rock Backdrain Gradation**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & AASHTO T 11)
6 inch (150 mm)	100
4 inch (100 mm)	0 – 25
No. 200 (75µm)	0.0 – 5.0

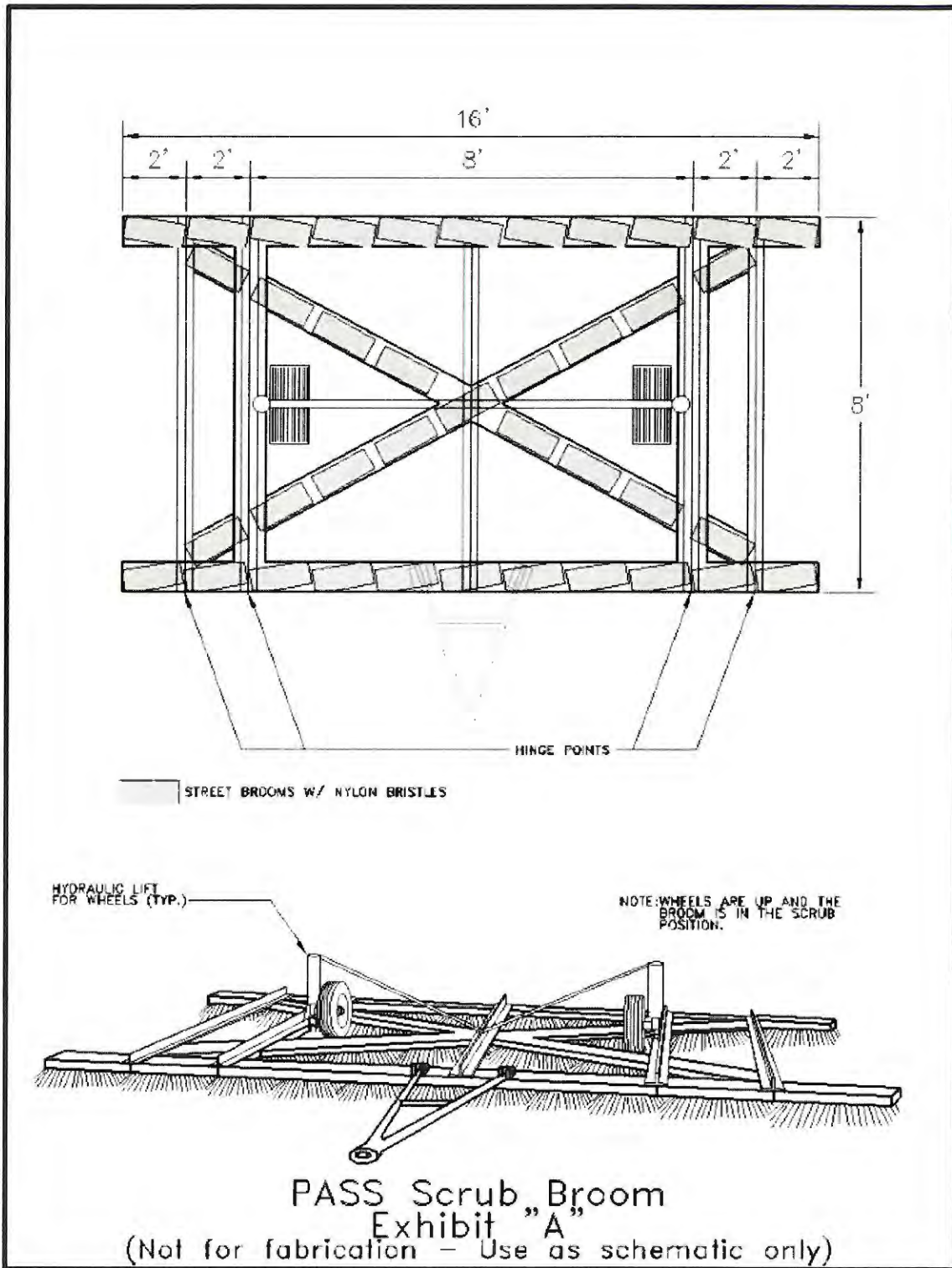
CMS-2P

New Mexico Department of Transportation Minimum Testing Requirements

Non QLA HOT MIX ASPHALT (HMA)/Warm Mix Asphalt (WMA)

ITEM	Test Required	Sampling/Testing Location	Agency Testing	Contractor Testing	Independent Assurance		State Materials Bureau
					Project Approach	System Approach	
Asphalt Emulsion (Section 402)	The manufactures certificate of compliance will suffice for testing credits	N/A	N/A	N/A	N/A	N/A	Material shall be provided by approved suppliers, in accordance with SMB procedures for Certification of Asphalt Suppliers.
Hydrated Lime or Anhydrite Base Material (Section 402)	The manufactures certificate of compliance will suffice for testing credits	N/A	N/A	N/A	N/A	N/A	N/A

Exhibit A



Truck Mounted Scrub Broom

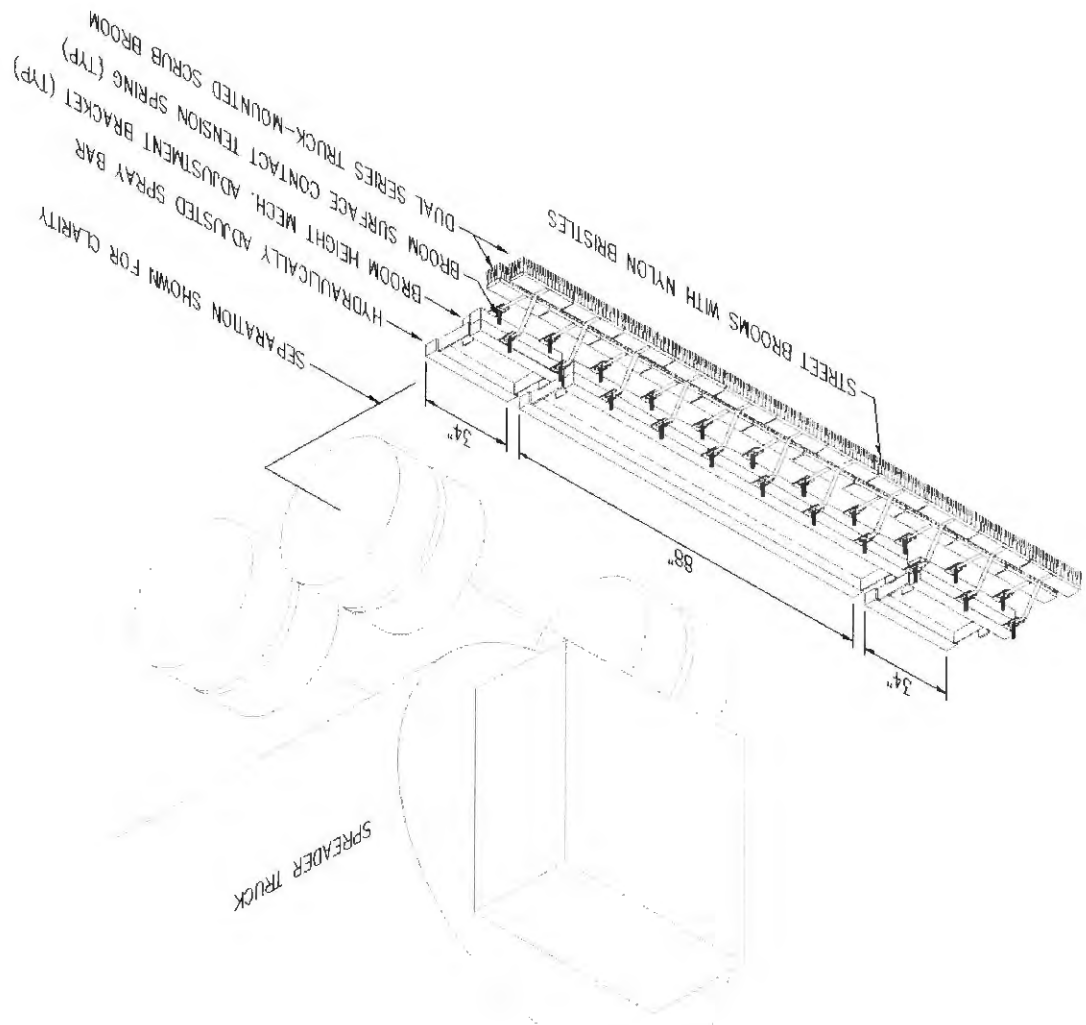


Exhibit B