

PROJECT # T-17-0012
SPLOST #4A ROADWAY REHABILITATION

APPENDIX C

AWARDED CONTRACTOR'S BID PROPOSAL

PROJECT # T-17-0012
SPLOST #4A ROADWAY REHABILITATION

APPENDIX D

**ADDITIONAL SPECIAL PROVISIONS, STANDARD
DRAWINGS & DETAILS**

Section 101—Definitions and Terms

Whenever in these Specifications or in other Contract Documents the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

101.01 Abbreviations

Wherever the following abbreviations are used in the Specifications or on the Plans, they are to be construed the same as the respective expressions represented.

Abbreviation	Term
AAN	American Association of Nurserymen
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMS	Aerospace Materials Specification
ANSI	American National Standards Institute
ARA	American Railway Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASTM	American Society of Testing and Materials
AWPA	American Wood Preservers' Association
AWWA	American Water Works Association
AWS	American Welding Society
CRSI	Concrete Reinforcing Steel Institute
DOT	Georgia Department of Transportation
EEO	Equal Employment Opportunity
FHWA	Federal Highway Administration
FSS	Federal Specifications and Standards, General Services Administration
GDT	Georgia Department of Transportation
IES	Illuminating Engineering Society

Section 101 — Definition and Terms

Abbreviation	Term
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
SAE	Society of Automotive Engineers
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structure Painting Council
UL	Underwriters Laboratories, Inc.

101.02 Acceptance Plans

A defined method of taking and evaluating measurements for the purpose of determining the acceptability of a lot of material or construction.

101.03 Advertisement

The public announcement as required by law, inviting bids for work to be performed or materials to be furnished.

101.04 Available Day

Any calendar day exclusive of Saturdays, Sundays, and Legal Holidays on which the Engineer determines that the Contractor is not prevented from accomplishing at least five hours of productive work on the controlling item or items of work which would normally be in progress at that time by causes beyond his control, and not due to his fault or negligence, including but not restricted to unsuitable weather and its aftermath, suspension order of the Engineer, acts of God, acts of public enemy, fire, flood, epidemic, quarantine, strikes, or freight embargo.

101.05 Award

The formal acceptance by the Department of a Bid.

101.06 Base Course

One or more layers of specified material of designed thickness placed on a subgrade or a subbase to support a surface course.

101.07 Bid

See Proposal.

101.08 Bid Item

A specifically described unit of work for which a price is requested in the proposal.

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101.09 Bidder

A qualified individual, firm or corporation, or combination thereof, submitting a written Proposal for the Work advertised.

101.10 Board

The State Transportation Board for Georgia Department of Transportation.

101.11 Bridge

A structure, including supports, erected over a depression or an obstruction, such as water, a highway or a railway, etc., and having a track or passageway for carrying traffic, water or other moving loads and having an opening measured along the center of the roadway of more than 20 ft. (6 m) between under copings of abutments or extreme ends of openings for multiple boxes.

A. Bridge Length

The overall length of a structure measured along the center of the roadway between backs of abutment backwalls or between ends of bridge floor.

B. Bridge Roadway Width

The clear width of a structure measured at right angles to the center of the roadway between the bottom of curbs or, if curbs are not used, between the inner faces of parapet or railing.

C. Bridge Complete

An entire bridge including its substructure and superstructure.

D. Completed Bridge Site

Unless otherwise shown on the Plans or indicated in the Proposal, a Completed Bridge Site is one in which all grading is completed to subgrade elevation (except for the stage construction providing a bench for the end bent). The minimum acceptable length of completed full-depth embankment shall equal the maximum width of fill between slope stakes at the particular end of bridge. This minimum length of full-depth embankment will be measured along the roadway centerline away from the end-of-bridge station.

In cut sections, a Completed Bridge Site shall be considered to be complete when the excavation is down to the subgrade elevation and extends 50 ft. (15 m) beyond the outer limits of the bridge in each direction.

In all cases, positive surface drainage shall be in place and functioning and all temporary erosion control measures shall be installed, functioning, and maintained.

101.12 Calendar Day

Every day shown on the calendar beginning at 12:00 midnight.

101.13 Chief Engineer

The Engineering Executive appointed by the State Transportation Board, or other authority as may be provided by law, and acting for the Department within the authority and scope of duties assigned.

101.14 Commissioner

The Commissioner of the Georgia Department of Transportation.

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101.15 Completion Date

The calendar date by which the Contract shall be completed when such date is shown in the Proposal in lieu of the stipulation of a number of available days or calendar days.

101.16 Contract

The written agreement between the Department and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the Work, the furnishing of labor and materials, and the basis of payment.

The Contract includes the Advertisement, Proposal, Contract Form and Contract Bond, Specifications, Supplemental Specifications, Special Provisions, general and detailed Plans, Notice to Proceed, and also any Supplemental Agreements that are required to complete the construction of the Work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument. No oral agreement or orders are to be considered as valid or as a part of the Contract.

101.17 Contract Bond (Performance and Payment Bond)

The approved form of security executed by the Contractor and his Surety or Sureties, which guarantees complete execution of the Contract and all Supplemental Agreements pertaining thereto, and the payment of all legal debts pertaining to the construction of the Project.

101.18 Contract Item (Pay Item)

A specifically described unit of work for which a price is provided in the contract.

101.19 Contract Time

The number of available days or calendar days allowed for the completion of the Contract, including authorized time extensions.

If a Completion Date is shown in the Proposal, the Contract Time then shall be the period between the issuance of the Notice to Proceed and the calendar date shown in the Proposal as the completion date.

101.20 Contractor

The individual, firm, corporation or combination thereof or governmental organization contracting with the Department for performance of prescribed work.

101.21 Culvert

Any structure under the roadway with a clear opening of 20 ft. (6m) or less measured along the center of the roadway.

101.22 Department

The Department of Transportation, State of Georgia.

101.23 Easement

A right, other than the acquisition of title, acquired to use or control property for a designated purpose.

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101.24 Engineer

The Chief Engineer of Georgia, acting directly or through a duly authorized representative.

101.25 Equipment

All machinery, apparatus, and tools necessary for the proper construction and acceptable completion of the work, plus the necessary repair parts, tools, and supplies for upkeep and maintenance.

101.26 Extension Agreement

A written agreement entered into by and between the Department and the Contractor extending The Work beyond its original boundaries and prescribing additional work to be done including the basis of payment and time allowed for completion.

101.27 Extra Work

An item of work not provided for in the Contract as awarded but found essential to the satisfactory completion of the Contract within its intended scope.

101.28 Force Account

A method of payment for Extra Work when a Supplemental Agreement is not arrived at between the Engineer and the Contractor.

101.29 General Terms

Whenever the following words or similar terms appear herein, they shall be understood to imply “by or to the Engineer,” unless the context clearly indicates a different meaning:

“acceptable,” “approved,” “authorized,” “called for,” “considered necessary,” “contemplated,” “deemed,” “designated,” “directed,” “established,” “given,” “indicated,” “ordered,” “permission,” “permitted,” “required,” “satisfactory,” “specified,” “sufficient,” “suitable,” “suspended,” “unacceptable,” “unsatisfactory,” “unsuitable.”

101.30 Highway—Road—Street

Each of these words is a general term denoting a public way for the purpose of vehicular travel including the entire area within the Rights of Way.

101.31 Holidays

In the State of Georgia, holidays occur on:

Date	Holiday
January 1	New Year's Day
3rd Monday in January	King's Birthday
January 19	State Holiday
3rd Monday in February	Washington's birthday
April 26	State Holiday
Last Monday in May	National Memorial Day

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Date	Holiday
July 4	Independence Day
1st Monday in September	Labor Day
2nd Monday in October	Columbus Day
November 11	Veterans' Day
4th Thursday in November	Thanksgiving Day
December 25	Christmas Day

If any of these Holidays fall on Sunday, the following Monday is considered to be the Holiday; if any of the Holidays fall on Saturday, the preceding Friday is considered to be the Holiday.

101.32 Inspector

The Engineer's authorized representative assigned to make a detailed inspection of Contract performance of any or all portions of The Work or materials thereof.

101.33 Invitation for Bids

See 101.03 Advertisement.

101.34 Laboratory

The testing laboratories of the Department or any other testing laboratory that may be designated by the Engineer.

101.35 Liquidated Damages

The fixed charges assessed against the successful Bidder or the Contractor for failure to execute the Contract or to complete the Contract within the Contract Time.

101.36 Materials

Any substances specified for use in the construction of the work.

101.37 Materials Allowance

Payment for materials on hand as defined in Subsection 109.07, not to be confused with Partial Payments for work completed.

101.38 Median

The portion of a divided highway separating the traveled ways for traffic moving in opposite directions.

101.39 Minor Structures

Any structure not defined as a bridge.

Section 101 — Definition and Terms

101.40 Notice to Contractors

A written Notice soliciting Proposals, mailed to Contractors, suppliers and others in the Construction Industry, which will indicate with reasonable accuracy the quantity and location of the Work to be done or the character and quantity of the material to be furnished and the time and place of the opening of Proposals.

101.41 Notice to Proceed

Written notice to the Contractor to proceed with the Contract Work.

101.42 Pavement Structure

The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute it to the roadbed.

101.43 Pay Item

See 101.18 Contract Item (Pay Item).

101.44 Performance and Payment Bond

See 101.17 Contract Bond (Performance and Payment Bond).

101.45 Plans

The approved plans, profiles, typical cross sections, working drawings and supplemental drawings or exact reproductions thereof, which show the location, character, dimensions, and details of The Work.

101.46 Prequalification

The procedure established and administered by the Department by virtue of which prospective Bidders are required to establish their responsibility and competence in advance of submission of Proposals.

101.47 Project

The specific section or sections of the transportation system together with all appurtenances and construction to be performed thereon under the Contract.

101.48 Proposal

The offer of a Bidder, on the prescribed form, to perform The Work and to furnish the labor and materials at the prices quoted.

101.49 Proposal Guaranty

Acceptable surety furnished by a bidder as a guaranty that he will enter into a contract and will furnish contract performance and payment bonds if a contract is awarded to him.

101.50 Right-of-Way

A general term denoting land, property, or interest therein, usually, but not required to be, in a strip, acquired for or devoted to a highway and its appurtenant structures.

Section 101 — Definition and Terms

101.51 Roadbed

The graded portion of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulder.

101.52 Roadside Development

Those items necessary to the complete highway which provide for the preservation of landscape materials and features; the rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers; such suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the highway.

101.53 Roadway

The portion of a highway within the limits of construction.

101.54 Salvaged Material

Material having value that is to be removed, preserved, or stockpiled as directed for later use by the Department. Specific reference is made to Subsection 610.3.05.A.

101.55 Shall or Will, Should, May

As used in these Specifications, the following definitions apply:

SHALL or WILL—A mandatory condition. When certain requirements are described with the “shall” or “will” stipulation, it is mandatory that the requirements be met.

SHOULD—An advisory condition. Considered to be recommended but not mandatory.

MAY—A permissive condition. No requirement is intended.

101.56 Shoulder

The portion of the roadway contiguous with the traveled way for accommodations of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

101.57 Sidewalk

That portion of the roadway primarily constructed for the use of pedestrians.

101.58 Skew or Skew Angle

The acute angle between the centerline of the roadway and a line parallel to a pier, bent, or abutment of a bridge or parallel to the centerline of a culvert.

101.59 Special Provisions

A. Special Provision

Additions or revisions to the Standard or Supplemental Specifications, applicable to all projects.

B. Project Specific Special Provision

Additions or revisions to the Standard Specifications, Supplemental Specifications, or Special Provisions, applicable to a specific Project. A Project Specific Special Provision will be identified by the PI Number and County in the title block. This includes Special Provision 150.

101.60 Specifications

A general term applied to all directions, provisions and requirements pertaining to performance of the work.

101.61 Standard Specifications

A publication titled:

“DEPARTMENT OF TRANSPORTATION, STATE OF GEORGIA STANDARD SPECIFICATIONS, CONSTRUCTION OF TRANSPORTATION SYSTEMS.”

Transportation systems are defined as all modes of transportation, including but not limited to, highways, airports, rail and ports.

101.62 State Highway Engineer

See 101.13 Chief Engineer of the Georgia Department of Transportation.

101.63 State

The State of Georgia.

101.64 Station

When used as a term of measurement will be 100 linear ft. (1 km) measured horizontally.

101.65 Structures

Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, end walls, buildings, sewers, service pipes, underdrains, foundation drains, and other features that may be encountered in The Work and not otherwise classified herein.

101.66 Subbase

The layer or layers of specified or selected material of designed thickness placed on a subgrade to support a base course.

101.67 Subcontractor

Any individual, firm, corporation, or combination thereof to which the Contractor with the written consent of the Department sublets any part of the Contract.

Section 101 — Definition and Terms

101.68 Subgrade

The top surface of a roadbed upon which the pavement structure and shoulders are constructed— generally the top 12 in. (300 mm) within cuts and fills.

101.69 Subgrade Treatment

Modification of subgrade material by stabilization.

101.70 Stabilization

Modification of soils or aggregates by incorporating materials which will increase load bearing capacity, firmness, and resistance to weathering or displacement.

101.71 Substructure

All of that part of the bridge structure below the bearings of simple and continuous spans, skewbacks of arches and top of footings of rigid frames, including backwalls, wingwalls and wing protection railings.

101.72 Superintendent

The Contractor's authorized representative directly and solely responsible for the supervision and direction of the work.

101.73 Superstructure

The entire bridge structure except the substructure.

101.74 Supplemental Agreement

A written agreement entered into by and between the Department and the Contractor covering modifications or alterations to the original Contract, and establishing any necessary new Contract Items, any other basis of payment, and any time adjustments for The Work affected by the changes. This Agreement becomes a part of the Contract when properly executed and approved.

101.75 Supplemental Specifications

Approved additions to or revisions of the *Standard Specifications*.

101.76 Surety

The corporation, partnership or individual, other than the Contractor, executing a Bond furnished by the Contractor.

101.77 The Work

The Work shall mean the furnishing of all labor, materials, equipment, superintendence and other incidentals necessary or convenient to the successful completion of the Project and the carrying out of all the duties and obligations imposed by the Contract.

101.78 Titles (or Headings)

The titles or headings of the Sections and Subsections in these Specifications are intended for convenience of reference and shall not be considered as having any bearing on the interpretation of the Specifications.

Section 101 — Definition and Terms

101.79 Traveled Way

The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

101.80 Treasurer

The Treasurer of the Georgia Department of Transportation.

101.81 Working Drawings

Any supplementary drawings or similar data which the Contractor is required to submit to the Engineer for approval including but not limited to stress sheets, shop drawings, erection plans, falsework plans, framework plans, cofferdam plans, and bending diagrams for steel.

101.82 Related References

Listing of Specifications and documents contained in the Section are intended for convenience of reference and shall not be considered as having any bearing on the interpretation of the Specifications.

Section 106—Control of Materials

106.01 Source of Supply and Quantity of Materials

The materials used in the work shall meet all quality requirements of the Contract. Materials will not be considered as finally accepted until all tests, including any to be taken from the finished Work have been completed and evaluated. To expedite the inspection and testing of materials, the Contractor shall notify the Engineer in writing of his proposed sources of materials at least 2 weeks before delivery, or earlier if blend determinations or mix designs are required. When required, representative preliminary samples of the character and quality prescribed shall be submitted for examination and testing. The approval of preliminary samples does not obligate the Engineer to accept materials from the same source delivered later. If, after trial, it is found that sources of supply for previously approved materials do not produce uniform and satisfactory products, or if the product from any source proves unacceptable at any time, the Contractor shall furnish materials from other sources. The Engineer shall have the right to reject the entire output of any source from which he finds it is impractical to secure a continuous flow of uniformly satisfactory material.

Upon request by the Department, the Contractor shall furnish formal written invoices from the materials suppliers.

The invoice shall show the date shipped, the quantities, and the unit prices.

The Contractor shall purchase materials from suppliers who are willing for the Contractor to furnish the Department copies of invoices as noted herein upon request by the Department.

Materials used and operations performed under Section 400- Hot Mix Asphaltic Concrete Construction, shall be controlled and tested by the Contractor. This shall be done in such a manner as to produce a uniform product that meets Specification requirements. In the event the Contractor's quality control procedures do not achieve the desired objective, operations shall be suspended until satisfactory results are obtained.

The Contractor's quality control personnel shall be properly instructed and trained to perform all tests and make calculations and shall be competent to control all processes so that the requirements are met.

106.02 Unacceptable Material

All material not conforming to the requirements of the specifications will be considered as unacceptable. All unacceptable materials, whether in place or not, will be rejected and shall be removed immediately from the site of the work unless otherwise directed by the Engineer. In case of failure by the Contractor to comply promptly with any order by the Engineer to remove rejected materials, the Engineer shall have authority to have such rejected materials removed by other means and to deduct the expense of such removal from any monies due, or to become due, to the Contractor. No rejected materials, the defects of which have been corrected, shall be used until the Engineer has given approval.

106.03 Samples, Tests, Cited Specifications

All materials will be inspected, tested, and approved by the Engineer before incorporation into the work. Samples will be taken by a qualified representative of the Department. Unless otherwise designated, tests will be made by and at the expense of the Department and in accordance with methods of AASHTO, ASTM, or the published Specifications of any other designated organization that are current on the date of advertisements for bids. Copies of all tests will be furnished to the Contractor's representative at his request. Sampling and testing by the Department will be performed in accordance with the *Sampling, Testing and Inspection Manual*.

Section 106 — Control of Materials

For work performed under Section 400- Hot Mix Asphaltic Concrete Construction all materials shall be inspected and tested by the Contractor before incorporation into the work. The Contractor's Quality Control Technician shall sample and test all quality control samples. The Contractor's quality control tests may be used as acceptance tests at the discretion of the Engineer. Sampling and testing by the Contractor shall be performed according to the Sampling, Testing, and Inspection Manual. Copies of all tests performed by the Contractor shall be furnished to the Engineer and will become a part of the project records. The Department will be responsible only for determining the acceptability of the construction and materials incorporated therein. The Contractor shall be responsible for the quality of the construction and materials incorporated therein. The Department will monitor the Contractor's Quality Assurance Acceptance Program to verify test accuracy.

A. Testing and Acceptance Plans

1. **A Lot:** Work will be accepted on a Lot-to-Lot basis in accordance with the requirements specified in the Acceptance Plans specified in Section 400- Hot Mix Asphaltic Concrete Construction. Lot sizes will normally be specified. In the event, however, that operational conditions cause work to be interrupted, or only partially completed before the Lot size specified has been achieved, the Lot may be redefined by the Engineer as being either the amount of work accomplished within the day, or he may combine that work with the next Lot of work. A Lot is set forth in these specifications as a defined quantity of a specified material from a single source or a measured amount of specified construction assumed to be produced by the same process.
2. **Acceptance Plans:** The Acceptance Plan for a material, product, or an Item of construction, or completed work will be as specified hereinafter in Section 400 and Section 430 of these specifications. However, in addition to the following conditions, the Department reserves the right to test any additional material for work that appears defective and to require correction if necessary, prior to final acceptance of the project.
3. **Resampling of Lots:** It is the intent of these specifications that Lots of materials, products, Items of construction, or completed construction will meet specification requirements at the time of submission. Resampling of deficient Lots as a basis for check tests may be done by the Engineer at his option.
Non-conforming Lots, which can be corrected by reworking, will not be re-sampled before such corrective action is taken. Sampling and testing of reworked areas shall be at the expense of the Contractor.
4. **Acceptance or Rejection:** Nonconforming Lots, materials, products, or Items of construction that are not adaptable to correction by reworking shall be removed and replaced, accepted without payment, or accepted at an adjusted price as stated in the specifications, or if not stated, as directed by the Engineer.
5. Following the application of the acceptance plan, the decision of the Engineer shall be final as to the acceptance, rejection, or acceptance at an adjusted price of the Lots unless the Contractor elects to remove and replace any deficient materials or work at his expense.
6. **Adjusted Payment:**
 - a. **Single Deficiency:** A single deficiency is defined as a deficiency involving one characteristic of a material within a Lot. In the case of single-characteristic deficiency, it shall be used directly to determine an adjusted Contract Price.
 - b. **Multiple Deficiency:** A multiple deficiency is defined as deficiencies involving more than one characteristic of construction within a Lot. In the case of multiple deficiencies, the related adjusted percentage of contract price for each characteristic shall be determined and the greatest reduction in price shall be used to determine the Contract Unit Price to be paid. Should the total adjustment for any individual Lot be 50 percent or more, the Engineer will determine whether the deficient Lot should be removed and replaced or allowed to remain in place. No payment will be made for the original Lot or for its removal. Replacement of the Lot will be paid for in accordance with the provisions for the Item.

Section 106 — Control of Materials

106.04 Plant Inspection

At the option of the Engineer, materials may be sampled and tested at the source of supply. In the event plant inspection is undertaken, the following conditions shall be met:

- A. The Engineer shall have the cooperation and assistance of the Contractor as well as the Contractor's material supplier.
- B. The Engineer shall have full entry at all times to such parts of the plant as may concern the manufacture or production of the materials being furnished.
- C. If specified in the proposal, the Contractor shall arrange for an approved building for the use of the inspector; such building to be located conveniently near the plant, independent of any building used by the material producer, and conforming to the requirements of Subsection 106.11 and Section 152.
- D. Adequate safety measures shall be provided and maintained. This shall include sampling valves on storage tanks for bituminous materials and safety stands for use in sampling from truck beds.
- E. It is understood that the Department reserves the right to retest all materials which, prior to incorporation into the work, have been tested and accepted at the source of supply and after the same have been delivered. The Department further reserves the right to reject all materials which, when retested, do not meet the requirements of the Contract Specifications.

106.05 Materials Certification

For certain products, assemblies, and materials, in lieu of normal sampling and testing procedures by the Contractor and the Department, the Engineer may accept from the Contractor the manufacturer's certification with respect to the product involved, under the conditions set forth in the following paragraphs:

- A. The certification shall state that the named product conforms to the Department's requirements and that representative samples thereof have been sampled and tested as specified.
 - B. The certification shall either:
 - 1. Be accompanied with a certified copy of the test results, or
 - 2. Certify that such test results are on file with the manufacturer and will be furnished to the Engineer upon demand. The certification shall give the name and address of the manufacturer and the testing agency and the date of tests and shall set forth the means of identification which will permit field determination of the product delivered to the project as being the product covered by the certification.
 - C. The certification shall be in duplicate with one copy to be sent with the shipment of the covered product to the Department's Project Engineer, and with one copy sent to Office of Materials and Research, 15 Kennedy Drive Forest Park, Georgia 30297.
 - D. No Certificate will be required for Portland Cement when furnished from a manufacturer approved by the Department.
 - E. The Department will not be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith.
 - F. The Department reserves the right to require samples and to test products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer. Any materials that fail to meet specification requirements will be rejected.
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Section 106 — Control of Materials

106.06 Agricultural Lime and Fertilizer

The sale and distribution of Fertilizers and Agricultural Lime are governed by Acts of the Georgia General Assembly and Rules and Regulations of the State Department of Agriculture.

Therefore, either of these materials may be sampled by authorized representatives of the State Commissioner of Agriculture. The Contractor may use these materials in The Work without sampling provided he notifies the Engineer 48 hours in advance of anticipated delivery to the job site. The Engineer reserves the right to request random sampling by a representative of the State Department of Agriculture.

The Contractor will not be expected to withhold application pending completion of tests but will not be relieved of the responsibility for the quality of the material furnished. In the event a sample fails to meet the requirements of the Georgia Law as evidenced by a report furnished by the Commissioner of Agriculture, the Engineer will deduct from monies due to the Contractor a sum equal to the penalty authorized by the above referenced Act.

106.07 Sample Holes

All holes dug or drilled for the purpose of taking samples or determining thickness any time before final acceptance of the project shall be repaired by the Contractor.

The material replaced shall be compacted and finished to the satisfaction of the Engineer. Costs of this work shall be included in the appropriate Bid Items.

106.08 Storage of Materials

For purposes of this Specification, flammable materials are defined as those materials capable of being easily ignited and of burning quickly. Combustible materials are those materials capable of producing a usually rapid chemical process that creates heat and usually light.

Portions of the right-of-way, approved by the Engineer, may be used for material storage purposes and for the placing of the Contractor's plant and equipment. Additional space required must be provided by the Contractor at no additional expense to the Department. Private property shall not be used for storage purposes without written permission of the owner or lessee, and if requested by the Engineer, copies of such written permission shall be furnished.

Materials shall be stored to assure the preservation of their quality and fitness for the work and shall be located so as to facilitate their prompt inspection. Stored materials, even though approved before storage, may again be inspected before their use in The Work.

All storage sites shall be restored to their original condition by the Contractor at no additional expense to the Department.

No flammable or combustible materials or harmful chemicals shall be stored within 200 ft (60 m) of a structure, to include but not limited to bridges nor within 200 ft. (60 m) of a roadway open to traffic. Such materials shall be stored in accordance with directions from the manufacturer and any applicable requirements of the Georgia Office of the Safety Fire Commissioner, Georgia Department of Community Affairs and current edition of the International Fire Code.

106.09 Handling Materials

All materials shall be handled in such a manner as to preserve their quality and fitness for the work. Aggregates, and mixtures of aggregates with other materials, shall be transported from the storage site to the work in tight vehicles so constructed as to prevent loss or segregation of materials after loading and measuring in order that there may be no inconsistency in the qualities of the materials intended for incorporation into the work as loaded and the qualities as actually received at the place of operation. The actual incorporation of the material in the work shall be such that the quality and fitness of the material is retained and no segregation results.

106.10 Local Material Sources

A. Sources Shown on the Plans

Possible sources of local materials and/or disposal areas may be designated on the plans. The quality of materials in such deposits will be acceptable in general but the Department does not warrant either the quality or the quantity of materials shown on the plans. The Contractor shall determine the amount of equipment and work required to produce a material meeting the specifications. Pit mixing, selective excavation, and other such operations shall be expected, and the Contractor shall determine the extent of these activities. It shall be understood that it is not feasible to ascertain from samples the limits for an entire deposit and that variations in quality and quantity shall be considered as usual and are to be expected.

1. When easements to secure local materials and/or disposal areas are obtained by the Department, the plans will show the locations of the pits or areas, the amount of royalties and other costs and conditions of acquisition of the material. In all cases where the Department has secured easements for material pits and/or disposal areas, these easements will be assigned to the Contractor who shall make prompt payment to the owners of such pits for all royalty and crop damage costs for materials and/or areas, and who shall further fulfill all of the terms of the Easement. The Department does not warrant the title or any interest of the property owner in such Easements.
2. If the Contractor elects to use only a portion of the materials or area estimated to be available in any pit or disposal area, or only clears or partially clears the pit or area, and does not remove or deposit any material, he shall make a minimum payment to the property owner of at least 33-1/3 percent of the estimated value of the pit or areas as shown in the Easement, plus any crop damage costs called for by the Easement.

The Contractor shall, before receiving final payment from the Department, submit to the Engineer a written statement signed by the owner stating that the owner has been paid in full and that all conditions agreed to have been fulfilled to the satisfaction of the owner. The Department will not take any separate payment to the Contractor for these material acquisition costs except that reclamation of the pit or area, if required, will be paid for in accordance with Section 160.

Should the Contractor fail to pay the property owner within 60 days after ceasing to use the pit or area, the Department may pay directly to the property owner any amounts due and deduct same from any funds due the Contractor. This provision does not affect the obligation of the Contractor under this Bond or the rights of the property owner or the Department under the Bond.

B. Substitution of Sources of Materials

1. If, after the Contract is awarded, the Contractor wishes to substitute other sources for sources designated on the plans, he may do so provided the material to be substituted conforms to the specifications. The Contractor shall make all necessary arrangements with the property owners for removal of the material from substituted pits. Payment will be made for clearing and grubbing, stripping excavation, pit reclamation, and ditch excavation only to the extent required for pits shown in the Plans. This does not relieve the Contractor from planting a satisfactory cover crop of the type called for on the plans or required by the specifications on all scarred areas created by the removal of materials.

In the event the Contractor substitutes a source for soil-cement, soil-bituminous, or other material to be stabilized, and the Engineer determines that the substitute source requires more stabilizing agent than the Plan pit, no payment will be made for the additional stabilizing agent required.

2. Substitution sources will not be allowed where the resulting scars will present an unsightly appearance from any State or Federal highway.

Section 106 — Control of Materials

C. Material Pits Furnished by the Contractor

When sources of any, or all, local materials are not shown on the plans, or when location maps of possible sources of materials are shown on the Plans for information but no Easements are obtained, the Contractor shall provide sources of material meeting Contract requirements and acceptable to the Engineer. The Contractor shall make arrangements with the property owner regarding rights to remove material from the pits but prior to final acceptance of the project by the State, the Contractor shall furnish the Engineer documentary proof of payment to the property owner for all materials as stated in Subsection 106.10.A.2 above. Under these circumstances, no separate payment will be made for clearing and grubbing, or reclamation of pits. Material sources shall not be excavated at locations where the resulting scars will present an unsightly appearance from any State or Federal highway. No payment will be made for material obtained in violation of this provision.

The Contractor shall provide a survey and sketch for all contractor-furnished material pits and haul road routes in accordance with the following:

The pit boundaries and haul road routes shall be selected and staked at 200 ft. (60 m) intervals or as required by the Engineer. Minimum work shall include measurement of pit boundaries and haul road routes using a chain or stadia and measurement of angles or bearings using a transit or a Brunton Compass. Pit boundaries and haul road routes shall be adequately marked and referenced to a centerline station number on the project.

D. Haul Roads

Unless specifically provided, no separate payment will be made to the Contractor for construction or maintenance of any roads constructed for hauling materials. The cost of constructing, maintaining, and revegetating, if necessary, these haul roads shall be included in the prices bid for the Pay Items pertaining to the part of the work in which the materials are used. Other designated Haul Roads will be paid for in accordance with Section 233.

106.11 Field Laboratory

The Contractor may be required to provide a field laboratory on or near the project consisting of a suitable building in which to house and use the equipment necessary to perform the required tests. The building, if required, will meet the requirements of and be paid for in accordance with Section 152.

At all permanent plants producing asphaltic concrete, Portland cement concrete or cement stabilized base course materials, a fully equipped plant laboratory shall be furnished at no expense to the Department.

106.12 Inspection for Non-Domestic Materials

A. Materials Manufactured Outside the United States

Materials which are manufactured outside the United States shall be delivered to a distribution point in the United States, where the materials shall be retained for a sufficient period of time to permit inspection, sampling, and testing. The Contractor, at no cost to the Department, shall furnish facilities and arrange for all testing as required by the Engineer to ensure that the materials comply with the specifications. All such tests shall be made in the presence of the Engineer or his representative, and if the tests are performed outside of the boundaries of the State of Georgia and its contiguous area, the Contractor shall reimburse the Department for the expenses actually incurred by the Engineer or his representative in attending the tests.

B. Certified Mill Test Reports

Certified mill test reports shall be furnished for all materials obtained from foreign manufacturers. Such reports shall be printed in English and shall be clearly identifiable to the lot of material tested.

C. Materials from Foreign Manufacturers

Materials shall be furnished only from those foreign manufacturers who have previously established, to the satisfaction of the Engineer, the sufficiency of their in-plant quality control which will give satisfactory assurance of the manufacturer's ability to furnish material uniformly and consistently in compliance with the Specifications. Such sufficiency shall be established by detailed written evidence to the Engineer's satisfaction, or, if deemed necessary, through in-plant inspection by the Engineer or his representative; the cost of such inspection to be reimbursed by the Contractor.

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D. Structural Steel Fabricated Outside the State of Georgia

In the event the Contractor elects to have items of structural steel fabricated outside the boundaries of the State of Georgia and its contiguous area, the Contractor shall reimburse the Department for the actual cost of the shop inspection of such fabrication in excess of the average inspection cost for shop inspection of fabrication within the State of Georgia and its contiguous area. Such actual costs of shop inspection may include the actual expenses incurred by the Engineer or his representative in making an in-plant inspection, arranging for an approved inspection agency to make the shop inspection, and the cost of the shop inspection by the approved inspection agency.

E. Department Reimbursement

In the event the Contractor fails to reimburse the Department promptly for any of the costs established by this provision, the Contractor agrees that the amount of such costs may be deducted from amounts of money owing to the Contractor on monthly estimates or final estimate.

F. Definitions

The following definitions shall apply to Subsection 106.12.

United States: The geographical area of the United States of America excluding its territories and possessions.

State of Georgia and Contiguous Area: The geographical area within the State of Georgia and those states which share a common border with the State of Georgia.

Average Inspection Cost: The average of the actual expenses incurred in making an inspection within the area designated as determined by the Engineer.

Foreign Manufacturer: A manufacturer of materials where the materials are manufactured outside the geographical area of the United States.

106.13 Out of State Materials Payment

Materials payments to Contractors who elect to have materials fabricated and stored outside the boundaries of the State of Georgia shall be made under the following guidelines.

The Contractor shall submit a written request to the Engineer for an inspection of out-of-state materials. This request shall state that the Contractor agrees to reimburse the Department for the actual cost of travel, subsistence, and extra expense incurred by the Department in the execution of this inspection and any subsequent inspection that may be necessary. This request shall be signed by a person legally responsible to bind the company and shall be notarized.

In the event the Contractor fails to reimburse the Department promptly for any of the costs established by this provision, the Contractor agrees that the amount of such costs may be deducted from amounts of money owing to the Contractor on monthly estimates or final estimate.

The above requirements are not applicable to the fabrication and materials payment for structural steel, prestress beams, precast bridge units, and piling for bridge construction within the states which share a common border with the State of Georgia.

**DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA**

SUPPLEMENTAL SPECIFICATION

Section 108—Prosecution and Progress

Replace Section 108 with the following:

108.01 Subletting of Contract

The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or Contracts, or any portion thereof, or of his/her right, title, or interest therein, without written consent of the Engineer. For Subcontracts, consent of the Engineer will not be considered until after award of the Contract.

In case such consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform, with his/her own organization, work amounting to not less than thirty percent (30%) of the total Contract cost, including materials, equipment, and labor.

As further exception, any items designated as Specialty Items may be performed by Subcontract and the cost of any such Specialty Items so performed by Subcontract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his/her own organization.

Purchase of materials by the Prime Contractor for use by a Subcontractor will not be allowed when computing the 30% requirement.

No Subcontracts, or transfer of Contract, shall in any case release the Prime Contractor of his/her liability under the Contract and Bonds. No Subcontractor shall commence work in advance of the written approval of the Subcontract by the Department. Except for certain items exempted by the State Transportation Board, each Subcontractor shall be prequalified or registered with the Department. Each Subcontract for a Registered Subcontractor shall not exceed \$2,000,000.00 and Subcontracts for Prequalified Contractors shall not exceed their current capacity. Prequalified or Registered Subcontractors shall be qualified or registered with the Department in accordance with Chapter 672-5 of the Rules and Regulations Governing the Prequalification of Prospective Bidders adopted by the State Transportation Board.

In the event any portion of a Subcontract is further sublet, all of the provisions governing subletting, including registration and written approval by the Engineer, shall apply.

This Sub-Section shall not apply to Contracts between the Department and counties, municipalities, or other State agencies.

All subcontract agreements between the Prime Contractor and subcontractor shall be in writing and shall contain all of the Federal-Aid requirements and pertinent provisions of the Prime Contract. The Prime Contractor shall, upon request by the Engineer, furnish copies of any subcontract agreement to the Department within ten (10) days of such request. This provision applies to all subcontracts, including second or multi-tier subcontracts.

According to the provisions stated above, the following items are designated Specialty Items for general transportation system construction and building construction whenever they appear in the Contract:

General Transportation System Contracts

- Grassing items

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- Fencing items
- Highway lighting items
- Sign items
- Guardrail items (except bridge handrail)
- Utility items
- Comfort and convenience items in rest areas
- Landscaping items
- Pressure grouting, slab removal and replacement
- Permanent traffic markings
- Signal systems
- Railroad track work above sub-ballast

General Transportation System Contracts (continued)

- Drilled caisson foundations
- Construction layout
- Asphaltic concrete leveling and asphalt concrete patching (when used on surface treatment and slurry seal resurfacing contracts)

Building Contracts

- Structural Steel
- Plumbing
- Heating, ventilation, and air conditioning (HVAC)
- Electrical
- Telephone service
- Masonry
- Glass work
- Drywall
- Ceiling installation
- Roofing
- Carpentry
- Floor covering
- Raised flooring
- Landscaping
- Security system
- Fire protection
- Gutters
- Painting
- Insulation
- Doors
- Elevators
- Construction layout

The Contractor's cost for Construction Layout shall be fully documented prior to deduction from the original Contract amount.

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108.02 Notice to Proceed

The delivery to the Contractor of a notice, stating that construction is authorized, constitutes Notice to Proceed. The Contractor shall do no work under the Contract until receipt of the Notice to Proceed, and the Department will not be obligated to pay for work done prior to receipt of the Notice to Proceed.

Within 10 calendar days after the Notice to Proceed has been issued, the Contractor shall begin The Work. Contract Time charges for Available Day and Calendar Day projects will begin on the date the Contractor starts to work, or 10 days after the Notice to Proceed, whichever occurs first. For completion date projects contract time charges shall begin on the day after the Notice to Proceed.

Where the Contractor's access to part of the right-of-way is restricted, either the special provisions in the Contract or the conditional Notice to Proceed will indicate such restrictions. The Department may, at its option, issue a conditional Notice to Proceed if, in the opinion of the Engineer, a sufficient portion of the right-of-way is available to the Contractor to allow construction to proceed.

108.03 Prosecution and Progress

The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the Project in accordance with the Plans and Specifications within the time set forth in the Proposal. Unless otherwise required by the Engineer, each operation shall begin as soon after the Contract is awarded as conditions will permit. Each class of work will be expected to continue from the date it is begun until it is completed.

The Contractor shall furnish the Engineer, for approval, a progress schedule immediately following the receipt of the Notice to Proceed. Unless otherwise specified, the schedule shall be prepared on forms furnished by the Department or an acceptable critical path schedule will be used as the basis for establishing the controlling items of work and as a check on the progress of The Work. This schedule will not be required on resurfacing projects.

Approval of the progress schedule shall not be construed to imply approval of any particular method or sequence of construction or to relieve the Contractor of providing sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans, specifications, and special provisions within the time set forth in the proposal. Contract time as shown in the proposal is the allowable time. The Contractor's proposed progress schedule may indicate a completion date in advance of the Contract specified completion date; however, the Department will not be liable in any way for the Contractor's failure to complete the project prior to the Contract specified completion date.

At least 48 hours before commencing the work, the Contractor shall notify the Engineer of his intention to begin so that proper inspection may be provided. Should the prosecution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

If the Contractor's operations are materially affected by changes in the plans or in the amount of work, or if he has failed to comply with the approved schedule, the Contractor shall submit a revised progress schedule, if requested by the Engineer, which schedule shall show how he proposes to prosecute the balance of the work. The Contractor shall submit the revised progress schedule within 10 days after the date of the request. The Contractor shall incorporate into every progress schedule submitted, any contract requirements regarding the order of performance of portions of the work.

No payments will be made to the Contractor while he is delinquent in the submission of a progress schedule or a revised progress schedule.

108.04 Limitation of Operations

The Contractor shall conduct the work at all times in such a manner and in such sequence as will assure the least interference with traffic and shall provide for smooth and safe traffic flow. It shall be the decision of the Engineer as to what will assure the least interference with traffic and smooth, safe traffic flow. Also, the Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional sections if the opening of such section is essential to public convenience.

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108.05 Character of Workers, Methods and Equipment

The Contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by these Specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person employed by the Contractor or by any Subcontractor who the Engineer determines does not perform work in a proper and skilled manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer.

Should the Contractor fail to remove such person or persons as required above or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until such orders are complied with.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet the requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be such that no injury to the roadway, adjacent property, or other highways will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the Contract, the Contractor is free to use any methods or equipment that he demonstrates to the satisfaction of the Engineer will accomplish the work in conformity with the requirements of the Contract.

When the Contract specifies that the construction be performed by the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than those specified in the Contract, he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing construction work in conformity with Contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet Contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining construction with the specified methods and equipment. The Contractor shall remove the deficient work and replace it with work of specified quality or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the construction items involved nor in Contract Time as a result of authorizing a change in methods or equipment under these provisions.

108.06 Temporary Suspension of Work

The Engineer has the authority to suspend the work wholly or in part, for as long as he may deem necessary, because of unsuitable weather, or other conditions considered unfavorable for continuing the work, or for as long as he may deem necessary by reason of failure of the Contractor to carry out orders given, or to comply with any provisions of the Contract. No additional compensation will be paid the Contractor because of suspension. If it becomes necessary to stop the work for an indefinite period, the Contractor shall store all materials in such a way that they will not impede the traveling public unnecessarily or become damaged in any way, and he shall take every precaution to prevent damage or deterioration of the work done; provide suitable drainage of the roadway, and erect temporary structures where necessary. The work shall be resumed when conditions are favorable or when corrective measures satisfactory to the Engineer have been applied; when, and as ordered by the Engineer in writing. The Contractor shall not stop the work without authority.

If the work is stopped by any temporary or permanent injunction, court restraining order, process or judgment of any kind, directed to either of the parties hereto, then such period or delay will not be charged against the Contract Time nor shall the Department be liable to the Contractor on account of such delay or termination of work

108.07 Determination of Contract Time

The definition of Contract time and when Contract time officially begins is stated in Subsection 101.19. After the Contract has been signed by all parties, Contract time becomes the specified period of time, agreed upon by the Contractor, the Surety, and the Department, during which all Items and quantities of work set forth in the Proposal and included in the original Contract will be completed.

A. Available Day Contracts

An available day is defined in Subsection 101.04. The Engineer will furnish the Contractor a written monthly statement showing the total number of available days charged through the preceding month. The Contractor will be allowed one week in which to file a written protest setting forth in what respect said statement is incorrect, otherwise the statement shall be deemed to have been accepted by the Contractor as correct.

B. Calendar Day Contracts

When the Contract time is on a calendar day basis it shall consist of the number of calendar days stated in the Contract counting from the date Contract time starts as defined in Subsection 108.02, including all Sundays, holidays, and non-work days.

C. Completion Day Contracts

When the Contract completion time is a fixed date, it shall be the date on which all work on the project shall be completed.

D. Settlement Periods

Settlement periods shall be computed in calendar days unless otherwise stated in the contract documents.

E. Extension of Contract Time

If satisfactory fulfillment of the Contract requires performance of work in greater quantities than those set forth in the Proposal, the Contract time allowed for performance shall be extended on a basis commensurate with the amount and difficulty of the added work as determined by the Engineer, whose decision shall be final and conclusive.

If the estimated time for the consolidation of embankments at bridge ends is extended, the Contract time will be extended as provided in Subsection 208.3.05.B.3.

If the normal progress of the work is delayed for reasons beyond his control, the Contractor shall, within 15 days after the start of such delay, file a written request to the Engineer for an extension of time setting forth therein the reasons and providing complete documentation for the delay which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may extend the time for completion in such amount as the conditions justify.

Any authorized extension of the Contract Time will be in full force and effect the same as though it was the original Contract time.

F. Suspension of Time Charges

If the Engineer suspends the work by reason of failure of the Contractor to carry out written orders given, or to comply with any provision of the Contract, time charges will continue through the period of such suspension.

If the Contractor is declared in default, time charges will continue.

Except on completion date Contracts, time charges will not be made against the Contract when the only remaining controlling items of work are shut down by the Engineer because of seasonal limitations or temperature controls.

G. When Time Charges Cease

Time charges will cease when all work on Contract Items have been completed to the satisfaction of the Engineer. The only exceptions to this requirement are that a satisfactory growth of vegetative cover, application(s) of nitrogen

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and Final Documentation will not be required when time charges are stopped. Final documentation includes final DBE Report, Reflectivity testing Report, and NPDES Notice of Termination. Filling of all washes and repairs to planted areas have to be accomplished as a prerequisite of vegetative cover and nitrogen condition. Maintenance of planted areas in order to produce a satisfactory growth after time charges have stopped will be performed without assessment of liquidated damages provided this work is diligently prosecuted. If, during this waiting period, maintenance of any part of the project is inadequate, the Engineer may resume time charges 10 days after written notification to the Contractor and will continue time charges until the unsatisfactory conditions are corrected. If final documentation associated with the project is not received within fifty (50) days of the final inspection, the Engineer may resume time charges 10 days after written notification to the Contractor and will continue time charges until necessary documentation is received.

108.08 Failure or Delay in Completing Work on Time

Time is an essential element of the Contract, and any delay in the prosecution of the work may inconvenience the public, obstruct traffic, or interfere with business. In addition to the aforementioned inconveniences, any delay in completion of the work will always increase the cost of engineering. For this reason, it is important that the work be pressed vigorously to completion. Should the Contractor or, in case of default, the Surety fail to complete the work within the time stipulated in the Contract or within such extra time that may be allowed, charges shall be assessed against any money due or that may become due the Contractor in accordance with the following schedule:

Schedule of Deductions for Each Day of Overrun in Contract Time			
Original Contract Amount		Daily Charges	
From More Than	To and Including	Available Day	Calendar Day or Completion Date
\$0	\$2,000,000	\$298	\$213
\$2,000,000	\$4,000,000	\$893	\$638
\$4,000,000	\$7,000,000	\$1,636	\$1,169
\$7,000,000	\$12,000,000	\$2,826	\$2,019
\$12,000,000	\$20,000,000	\$4,759	\$3,399
\$20,000,000	\$30,000,000	\$7,436	\$5,311
\$30,000,000	\$40,000,000	\$8,328	\$5,949
\$40,000,000	\$50,000,000	\$10,707	\$7,648
\$50,000,000		\$11,897	\$8,498

When the Contract time is on either the calendar day or completion date basis, the schedule for calendar days shall be used. When the Contract time is based on an available day basis, the schedule for available days shall be used.

For each calendar day or available day, as specified, that any work shall remain uncompleted after the contract time specified for the completion of the work required by the Contract, the sum specified in the Contract will be deducted from any money due the Contractor, not as a penalty, but as liquidated damages; provided however, that due account shall be taken of any adjustment of the contract time for completion of the work granted under the provisions of Subsection 108.07.E.

The Department may waive such portions of the liquidated damages as may accrue after the work is in condition for safe and convenient use by the traveling public.

A. Liquidated Damages

The amount of such charges is hereby agreed upon as fixed liquidated damages due the Department after the expiration of the time for completion specified in the Contract. The Contractor and his Surety shall be liable for liquidated damages in excess of the amount due the Contractor on the final payment.

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These fixed liquidated damages are not established as a penalty but are calculated and agreed upon in advance by the Department and the Contractor due the uncertainty and impossibility of making a determination as to the actual and consequential damages which are incurred by the Department, the State, and the general public as a result of the failure on the part of the Contractor to complete the work on time.

- 1. Deduction from Partial Payments:** Liquidated damages, as they accrue, will be deducted from periodic partial payments.
- 2. Deduction from Final Payment:** The full amount of liquidated damages will be deducted from final payment to the Contractor and/or its Surety.
- 3. No Liquidated Damages Charged for Delay by the Department:** In case of default of the Contract and the subsequent completion of the work by the Department as hereinafter provided, the Contractor and his Surety shall be liable for the liquidated damages under the Contract, but no liquidated damages shall be chargeable for any delay in the final completion of the work by the Department due to any unreasonable action, negligence, omission, or delay of the Department. In any suit for the collection of or involving the assessment of liquidated damages, the reasonableness of the amount shall be presumed. The liquidated damages referred to herein are intended to be and are cumulative and shall be in addition to every other remedy now or hereafter enforceable at law, in equity, by statute, or under the Contract.

B. No Waiver of Department's Rights

Permitting the Contractor to continue and finish The Work or any part of it after the expiration of the time allowed for completion or after any extension of time, shall not operate as a waiver of the rights of the Department under the Contract.

108.09 Default of Contract

If the Contractor fails to begin the work within the time specified, or fails to perform the work with sufficient workers, equipment, or materials to ensure its prompt completion, or performs the work unsuitably, or neglects or refuses to remove materials or perform anew such work as shall be rejected as defective and unsuitable, or discontinues the prosecution of the work, or from any other cause whatsoever does not carry on the work in an acceptable manner, or becomes insolvent or is adjudicated a bankrupt, or commits any act of bankruptcy or insolvency, or allows any final judgement to stand against him unsatisfied for a period of 10 days, or makes an assignment for the benefit of creditors, or fails to comply with the contract requirements regarding wage payments or EEO requirements, or fails to sign the standard release form as stipulated in Subsection 109.08 *Final Payment*, the Engineer may give notice in writing by registered or certified mail to the Contractor and the Surety, stating the nature of the deficiencies and directing that The Work including its progress be remedied and made satisfactory.

If, within 10 days after such notice, the Contractor or its Surety does not proceed in satisfactory way to remedy the faults specified in said notice, the Engineer will notify the Contractor and its Surety by registered or certified mail that the Contractor is in default and, by the same message, direct the Surety to take over the work including all of the obligations pertaining to the Contract. If the Surety takes over the work in a satisfactory way within 10 days after such notice of default, the Department will thenceforth pay to the Surety the amounts due and to become due under the Contract, less all deductions provided herein including liquidated damages. The Department shall not be liable for any sums not due under the Contract and shall not be made a party to any dispute between the Contractor and the Surety.

If the Contractor is declared in default and the work and other Contract obligations are taken over by the Surety as required by its Bond, and when all parts of the work have been completed and found to be satisfactory by the Engineer, as provided for in Subsection 105.16 *Final Inspection and Acceptance*, the said Surety is hereby constituted the attorney in fact of the Contractor for the purpose of executing such final releases as may be required by the Department or to do any other act or thing, including the execution of any documents, necessary to the completion of the Contract and a final settlement of same, including but not limited to those documents required by the provisions regarding final payment and release as set forth in Subsection 109.08.

For all purposes, as herein set out and defined, including the execution of documents necessary to the final completion and settlement of the Contract, the Surety, under such circumstances, is hereby authorized and directed by the Contractor to perform such acts and execute such documents as fully and completely as though the same were performed or executed by such contractor, and to be lawfully binding upon such Contractor as though such acts had been performed or such documents executed by him in person.

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If the Surety does not take over The Work in a satisfactory way within 10 days after the notice of default, or does not proceed to finish The Work according to the Contract, the Department shall have full power and authority, without impairing the obligation of the Contract or the Contract Bond, to take over the completion of The Work; to appropriate or use any or all material and equipment on the ground that may be suitable, to enter into agreements with others for the completion of the Contract according to the terms and provisions thereof; or to use such other methods as may be required for the completion of the Contract. In so assuming the obligations of the Contractor, the Department does so as the agent of the Contractor. Assumption of these duties and obligations by the Department will not act as a release of the Contractor or its Surety from any of the provisions of this Contract. The Contractor and its Surety shall be liable for all costs incurred by the Department in completing the work and also for all liquidated damages in conformity with the terms of the Contract. If the sum of such liquidated damages and the expense so incurred by the Department is less than the sum which would have been payable under this Contract if it had been completed by the Contractor or its Surety, the Contractor, or its Surety, shall be entitled to receive the difference; and if the sum of such expense and such liquidated damages exceeds the sum that would have been payable under the Contract, the Contractor and its Surety shall be liable and shall pay to the Department the amount of such excess. Notice to the Contractor shall be deemed to have been served when delivered to the person in charge of any office used by the Contractor, its representative at or near the work or by registered or certified mail addressed to the Contractor at the last known place of business.

Time charges shall continue through a period of a default in compliance with the provisions of Subsection 108.07.F.

108.10 Termination of Contractor's Responsibility

Except as specified in the Contract Bond and in Subsection 107.20, the Contractor's responsibility for the work shall terminate upon final acceptance of the work by the Department.

DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA

SPECIAL PROVISION

Section 150—Traffic Control

150.1 General Description

This section, as supplemented by the Plans, Specifications, and Manual on Uniform Traffic Control Devices (MUTCD) shall be considered the Temporary Traffic Control (TTC) Plan in accordance with Work Zone Safety and Mobility Policy. Activities shall consist of furnishing, installing, maintaining, and removing necessary traffic signs, pedestrian signs, barricades, lights, signals, cones, pavement markings and other traffic control devices and shall include flagging and other means for guidance and protection of vehicular and pedestrian traffic through the Work Zone. This Work shall include both maintaining existing devices and installing additional devices as necessary in construction work zones.

The Contractor shall be responsible for the maintenance of traffic signals and Advanced Traffic Management System (ATMs) devices from the time that the system is modified until final acceptance. The maintenance of traffic signals and ATMs devices that are not a part of the Work and that are not in conflict with any portion of the Work shall not be the responsibility of the Contractor. However, the Contractor is still responsible for damages to all devices that he or his subcontractors cause, in accordance with Section 107 and other Specifications.

When any provisions of this Specification or the Plans do not meet the minimum requirements of the MUTCD, the MUTCD shall control. The 2009 Edition of the MUTCD including revisions shall be in effect for the duration of the project.

All traffic control devices used during the construction of the project shall meet the standards utilized in the MUTCD, and shall comply with the requirements of these Specifications, Georgia Construction Standards and Details, Project Plans, Design Manuals, and Special Provisions.

The needs and control of all road users (motorists, bicyclists and pedestrians within the highway right-of-way and easements, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a Temporary Traffic Control (TTC) zone shall be an essential part of highway construction, utility work, maintenance operations and management of traffic incidents.

Utilities included in the Contract are bound by Special Provision 150 and shall follow its requirements. For utilities not included in the Contract but working within the project limits, they shall, at a minimum follow the MUTCD. Moreover, in accordance with Utility Accommodation Policy and Standards Manual dated 2016, the Engineer reserves the right to require additional certified flaggers, signs, warning lights, channelization devices, and other safety devices as may be necessary to properly protect, warn, and safeguard the traveling public. In addition, the Department reserves the right to place time restrictions or moratoriums on all utility work covered under a permit when, in the opinion of the Department, the continuance of the Work would seriously hinder traffic flow, be needlessly disruptive, or would unnecessarily inconvenience the traveling public. In case of emergencies, Utilities shall be provided access in accordance with Utility Accommodation Policy and Standards Manual.

150.1.01 Definitions

For Special Provision 150, the definitions for “shall”, “ should”, and “may” will be in accordance with MUTCD (1A.13).

Shall (Standard) - a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device.

Should (Guidance) - a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate.

May (Option) - a statement of practice that is a permissive condition and carries no requirement or recommendation.

150.1.02 Content

150.1 General Description

150.1.01 Definitions

150.1.02 Content

150.1.03 Related References

A. Standard Specification

B. Reference Documents

150.1.04 Submittals/Preconstruction

A. Worksite Traffic Control Supervisor

B. Sequence of Operations

C. Pedestrian Considerations

1. Pedestrian Signage

2. Temporary Pedestrian Facilities

150.2 Materials and Traffic Control Devices

150.2.01 Traffic Control Devices

A. NCHRP 350 and MASH

B. Approval

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2. Difference of Two Inches ($\leq 2''$) or Less Between Adjacent Travel Lane and Paved Shoulder
3. Difference of Greater Than Two Inches ($>2''$) is Permitted for Continuous Operations
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B. Changeable Message Sign, Portable

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2. Remove and Reset Existing Special Guide Signs, Ground Mount or Overhead
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K. Temporary Walkways with Detectable Edging

L. Traffic Signal Installation - Temporary

M. Work Zone Law Enforcement

150.5 Reserved

150.6 Special Conditions

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150.7.01 Enforcement and Adjustments

150.1.03 Related References

A. Standard Specifications

Section 104 - Scope of Work

Section 105 - -Control of Work-Legal Regulations and Responsibility to the Public

Section 107 - Legal Regulations and Responsibility to the Public

Section 108 - Prosecution and Progress

Section 209 - Subgrade Construction

Section 400 - Hot Mix Asphaltic Concrete Construction

Section 441 - Miscellaneous Concrete

Section 429 - Rumble Strips

Section 620 - Temporary Barrier

Section 632 - Portable Changeable Message Signs

Section 641 - Guardrail

Section 647 - Traffic Signal Installation

Section 648 - Traffic Impact Attenuator

Section 652 - Painting Traffic Stripe

Section 653 - Thermoplastic Traffic Stripe

Section 654 - Raised Pavement Markers

Section 656 - Removal of Pavement Markings

Section 657 - Preformed Plastic Pavement Markings

Section 658 - Polyurea Traffic Strip

Section 659 - Hot Applied Preformed Plastic Pavement Markings

Section 911 - Sign Posts

Section 912 - Sign Blanks and Panels

Section 913 - Reflectorizing Materials

B. Referenced Documents

ASTM D4956-13 (Retro-reflectivity)

American Traffic Safety Services Association (ATSSA)

Construction Detail A-3 Curb Cut (Wheelchair) Ramps Concrete Sidewalk Details

Construction Detail A-4 Detectable Warning Surface Truncated Dome Size, Spacing and Alignment Requirements

Construction Detail T-3A (Type 7, 8, and 9 Square Tube Post Installation Detail)

GDOT Signing and Marking Design Guidelines

Georgia Standard 4000W "Lengths of Advancement, Clear Zone Distances, Fill Height Embankment"

Georgia Standard 4960 "Temporary Barrier (End Treatment Options)"

Georgia Standard 9102 "Traffic Control Detail for Lane Closure on Two-Lane Highway"

Georgia Standard 9106 "Traffic Control Detail for Lane Closure on Multi-Lane Divided Highway"

Georgia Standard 9107 "Traffic Control Detail for Lane Closure on Multi-Lane Undivided Highway"

Georgia Standard 9121 "Tapers, Signs, and Markings for Passing Lanes"

Manual for Assessing Safety Hardware (MASH)

Manual on Uniform Traffic Control Devices (MUTCD)

National Cooperative Highway Research Program (NCHRP) 350

National Safety Council

Qualified Product List #29 (QPL-29) Reflective Sheeting

Qualified Product List #34 (QPL-34) Work Zone Traffic Control Devices (Drums, Type III Barricades, Vertical Panels, and Portable Sign Systems)

Qualified Product List #35 (QPL-35) Drive Type Galvanized Steel Sign Posts

Qualified Product List #46 (QPL-46) Traffic Pavement Markings

Qualified Product List #64 (QPL-64) Attenuator Units (Compression Crash Cushion) and Guardrail End Treatments

Qualified Product List #76 (QPL-76) Raised Pavement Markers and Channel Markers

Qualified Product List #79 (QPL-79) Portable Arrow Boards

Qualified Product List #82 (QPL-82) "Portable Changeable Message Signs"

Utility Accommodation Policy and Standards Manual

Work Zone Safety and Mobility Policy

150.1.04 Submittals/Preconstruction

A. Worksite Traffic Control Supervisor

The Contractor shall designate a qualified individual as the Worksite Traffic Control Supervisor (WTCS). The WTCS shall be responsible for selecting, installing and maintaining all traffic control devices in accordance with the Plans, Specifications, Special Provisions and the MUTCD. The WTCS shall be currently certified by the American Traffic Safety Services Association (ATSSA) Work Site Traffic Supervisor Certification program or the National Safety Council Certification program. On-line classes will not be accepted.

The WTCS shall be available on a twenty-four (24) hour basis to perform his duties. If the Work requires traffic control activities to be performed during the daylight and nighttime hours, it may be necessary for the Contractor to designate an alternate WTCS. An alternate WTCS must meet the same requirements and qualifications as the primary WTCS and be accepted by the Engineer prior to beginning any traffic control duties. The Worksite Traffic Control Supervisor's traffic control responsibilities shall have priority over all other assigned duties.

As the representative of the Contractor, the WTCS shall have full authority to act on behalf of the Contractor in administering the TTC Plan. The WTCS shall have appropriate training in safe traffic control practices in accordance with Part 6 of the MUTCD. In addition to the WTCS, all other individuals making decisions regarding traffic control shall meet the training requirements of the Part 6 of the MUTCD.

The Worksite Traffic Control Supervisor (WTCS) shall have a copy of Part 6 of the MUTCD and the Contract on the job site. Copies of the current MUTCD may be obtained from the FHWA web page at <http://mutcd.fhwa.dot.gov>.

The WTCS shall supervise the initial installation of traffic control devices. The Engineer, prior to the beginning of construction, will review the initial installation. Modifications to traffic control devices as required by sequence of operations or staged construction shall be reviewed by the WTCS.

Any work performed on the interstate or limited access highway right-of-way that requires traffic control shall be supervised by a submitted/approved certified Worksite Traffic Control Supervisor. No work requiring traffic control shall be performed unless the certified WTCS is on the worksite. Failure to maintain a Certified Worksite Traffic Control Supervisor on the Work will be considered as non-performance under Subsection 150.7.01.

The WTCS or alternate WTCS shall be available on a full-time basis to maintain traffic control devices with access to all personnel, materials, and equipment necessary to respond effectively to an emergency situation within forty-five (45) minutes of notification of the emergency.

The WTCS shall perform inspections, at a minimum once a month, to ensure that traffic control is maintained. For all interstate and limited access highways, the WTCS shall perform, as a minimum, weekly traffic control inspections. The inspections will start with the installation of the advance warning signs and will stop when a maintenance acceptance is issued or when the corrective list is completed.

An inspection shall include both daytime and nighttime reviews. The inspection shall be reported to the Engineer on a Traffic Control Inspection Report, (TC-1). Unless modified by the special conditions or by the Engineer, routine deficiencies shall be corrected within a twenty-four (24) hour period. Failure to comply with these provisions shall be grounds for dismissal from the duties of WTCS and/or removal of the WTCS from the project. Failure of the WTCS to execute his duties shall be considered as non-performance under Subsection 150.7.01.

TRAFFIC CONTROL INSPECTION REPORT (TC-1)

Project No.: _____ County: _____

Contractor: _____ Date: _____ Daytime: _____

Nighttime: _____

PURPOSE: To provide adequate warning, delineation, and channelization to assist in guiding road users in advance of and through the work zone by utilizing proper pavement markings, signs, and other MUTCD compliant devices.

RESPONSIBILITY: The Worksite Traffic Control Supervisor (WTCS) has the duty of ensuring that all traffic control devices are installed and maintained according to the requirements of the Traffic Control Plan.

DEFICIENCIES: Items noted below require corrective measures be performed within the next _____ hours/days.

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>ACTION REQUIRED</u>

(use additional sheets if needed)

Signature: _____ WTCS or DOT performing inspection

DOT inspection presented to WTCS Date: _____ Time: _____

TO BE COMPLETED BY THE WTCS

The attached deficiencies were corrected by Date: _____ Time: _____

Signature _____ Return TC-1 to DOT inspector.

The WTCS certifies that all traffic control devices in use on the project are MASH/NCHRP 350 crashworthy compliant.

Traffic Control Checklist

Satisfactory Unsatisfactory Non-applicable

Signs

S

U

N

- Are the signs correctly installed?
- Signs are in place according to TTC Plans. Signs are plumb and level. Signs are at the proper height.
- Are the signs visible and readable to the public both daytime and nighttime?
- Is retroreflectivity good?
- Are signs not in use including PCMS properly stored?

TTC Devices

S

U

N

- Are they MASH/NHCRP 350 approved? Do they meet MUTCD and Special Provision 150 requirements?
- Are they installed according to manufacture recommendation?
- Are they in acceptable/marginal condition? Are they stable? Is the retroreflectivity good?

Clear Zone

S

U

N

- Are all material and equipment stored beyond the clear zone?
- If stored in clear zone, are they protected by positive barrier?
- Are drop-offs marked and healed according to Special Provision 150?

Positive Barriers

S

U

N

- Are the barriers in acceptable/marginal condition and FHWA approved?
- Are the barrier reflectors proper and in good condition?
- Do the barriers extend to the proper advancement length? Are the tapers according to GA Standards?

Attenuators and Guardrails

S

U

N

- Are the proper attenuator assemblies in use?
- Gating - Is the recovery area free of debris and provide the necessary recovery area?
- Is the assembly in accordance with manufacture's recommendation?
- Are the guardrails properly anchored and/or attached to the barrier?
- Are shoes and transition sections in accordance with Standards?

Pavement Markings

S

U

N

- Are the pavement markings visible and legible?
- Can they be seen during the daytime and nighttime?
- Are there no conflicting pavement markings?
- Are the pavement markings including RPM installed and maintained according to section 150?

The Engineer will periodically review the Work for compliance with the requirements of the TTC plan.

On projects where traffic control duties will not require full time WTCS supervision, the Engineer may allow the Contractor's Project superintendent, foreman, subcontractor, or other designated personnel to serve as the WTCS as long as satisfactory results are obtained. Nevertheless, the individual shall meet the requirements and perform the duties of a WTCS.

B. Sequence of Operations

Any Sequence of Operations provided in this Contract in conjunction with any staging details which may be shown in the Plans, is a suggested sequence for performing the Work. It is intended as a general staging plan for the orderly execution of the Work while minimizing the impact on pedestrian facilities, mainline, cross-streets and side streets. The Contractor shall develop detailed staging and temporary traffic control plans for performing specific areas of the Work including but not limited to all traffic shifts, detours, bridge widenings, paces, or other activities that disrupt traffic or pedestrian flow. The Engineer may require detailed staging and TTC Plans for lane closures or disruption to pedestrian facilities. These Plans shall be submitted for approval at least two (2) weeks prior to the scheduled date of the activity. Activities that have not been approved at least seven (7) days prior to the scheduled date shall be rescheduled.

Where traffic is permitted through the work area under stage construction, the Contractor may choose to construct, at no additional expense to the Department, temporary on-site bypasses or detours in order to expedite the Work. Plans for such temporary bypasses or detours shall be submitted to the Engineer for review and approval thirty (30) calendar days prior to the proposed construction. Such bypasses or detours shall be removed promptly when in the opinion of the Engineer; they are no longer necessary for the satisfactory progress of the Work. Bypasses and detours shall meet the minimum requirements of Subsection 150.3.01.E.

As an option to the Sequence of Operations in the Contract, the Contractor may submit an alternative Sequence of Operations for review and approval. Alternate Sequence of Operations for pedestrian facilities shall be in compliance with the MUTCD and ADA. Pedestrian needs identified in the preconstruction phase shall be included in the proposed alternate plan.

The Department will not pay, or in any way, reimburse the Contractor for claims arising from the Contractor's inability to perform the Work in accordance with the Sequence of Operations provided in the Contract or from an approved Contractor alternate.

The Contractor shall secure the Engineer's approval of the Contractor's proposed plan of operation, sequence of work and methods of providing for the safe passage of vehicular and pedestrian traffic before it is placed in operation. The proposed plan of operation shall supplement the approved traffic control plan. Any major changes to the approved TTC plan, proposed by the Contractor, shall be submitted to the Department for approval.

Some additional traffic control details will be required prior to any major shifts or changes in traffic. The traffic control details shall include, but not be limited to, the following:

1. A detailed drawing showing traffic locations and lanes for each step of the change.
2. The location, size, and message of all signs required by the MUTCD, Plan, Special Provisions, and other signs as required to fit conditions. Any portable changeable message signs used shall be included in the details.
3. The method to be used in, and the limits of, the obliteration of conflicting lines and markings.
4. Type, location, and extent of new lines and markings.
5. Horizontal and vertical alignment and superelevation rates for detours, including cross-section and profile grades along each edge of existing pavement.
6. Drainage details for temporary and permanent alignments.
7. Location, length, and/or spacing of channelization and protective devices (temporary barrier, guardrail, barricades, etc.)

8. Starting time, duration and date of planned change.
9. For each traffic shift, a paving plan, erection plan, or work site plan, as appropriate, detailing workforce, materials, and equipment necessary to accomplish the proposed Work. This will be the minimum resource allocation required in order to start the Work.

The above details shall be submitted to the Engineer for approval at least fourteen (14) days prior to the anticipated traffic shift. Submission should be made electronically in a portable document format (pdf). The Contractor shall have traffic control details for a traffic shift which has been approved by the Engineer prior to commencement of the physical shift. All preparatory work relative to the traffic shift, which does not interfere with traffic, shall be accomplished prior to the designated starting time. The Engineer and the Contractor's representative will verify that all conditions have been met prior to the Contractor obtaining materials for the actual traffic shift.

C. Pedestrian Considerations

All existing pedestrian facilities, including access to transit stops, shall be maintained. Where pedestrian routes are closed, alternate routes shall be provided. Closures of existing, interim and final pedestrian facilities shall have the prior written approval of the Engineer. When existing pedestrian facilities are disrupted, closed or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility. Pedestrian facilities are considered improvements and provisions made to accommodate or encourage walking. Whenever a sidewalk is to be closed, the Engineer shall notify the maintaining agency two (2) weeks prior to the closure. Prior to closure, detectable barriers (that are detectable by a person with a visual disability traveling with the aid of a long cane), as described by the MUTCD, shall be placed across the full width of the closed sidewalk. Barriers and channelizing devices used along a temporary pedestrian route shall be in compliance with the MUTCD.

Temporary Traffic Control devices used to delineate a Temporary Traffic Control Zone Pedestrian Walkway shall be in compliance with Subsection 150.3.01.A. Appropriate signs as described in the MUTCD shall be maintained to allow safe passage of pedestrian traffic or to advise pedestrians of walkway closures (Refer to MUTCD Figures TA-28 and TA-29 for guidance). Advance closure signing should be placed at intersections rather than midblock locations so that pedestrians are not confronted with midblock work sites that will induce them to attempt skirting the work site or making a midblock crossing. Temporary Traffic Control devices and construction material shall not intrude into the usable width of the pedestrian walkway. Signs and other devices shall be placed such that they do not narrow or restrict any pedestrian passage to less than forty-eight inches ($\geq 48"$).

1. Pedestrian Signage

A pedestrian walkway shall not be severed or relocated for non-construction activities, such as parking for construction vehicles and equipment. Movement by construction vehicles and equipment across designated pedestrian walkways should be minimized. When necessary, construction activities shall be controlled by flaggers. Pedestrian walkways shall be kept free of mud, loose gravel or other debris.

When temporary covered walkways are used, they shall be lighted during nighttime hours. When temporary traffic barrier is used to separate pedestrian and vehicular traffic, the temporary barrier shall meet NCHRP-350 Test Level Three. The barrier ends shall be protected in accordance with Georgia Standard 4960. Curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are required. Tape, rope or plastic chain strung between temporary traffic control devices are not considered as detectable and shall not be used as a control for pedestrian movements.

The WTCS shall inspect the activity area daily to ensure that effective pedestrian TTC is being maintained. The inspection of TTC for pedestrian traffic shall be included as part of the TC-1 report.

2. Temporary Pedestrian Facilities

Temporary pedestrian facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. The geometry, alignment and construction of the facility should meet the applicable requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)".

a. Temporary Walkways with Detectable Edging

A smooth, continuous hard surface (firm, stable and slip resistant) shall be provided throughout the entire length of the temporary pedestrian facility. Compacted soils, sand, crushed stone or asphaltic pavement millings shall not be used as a surface course for walkways.

Temporary walkways shall include detectable edging as defined in the MUTCD. When temporary traffic barrier is included as a pay item in the Contract and where locations identified on the Plans for positive protection will also allow them to serve as pedestrian detectable edging, payment will be made for the temporary traffic barrier in accordance with Section 620. No payment will be made for temporary walkways with Detectable Edging where existing pavements or existing edging (that meets the requirements of MUTCD) are utilized as temporary walkways. Payment for temporary detectable edging, including approved barriers and channelizing devices, installed on existing pavements shall be included in Traffic Control-Lump Sum.

Regardless of the materials used, temporary walkways shall be constructed with sufficient thickness and durability to withstand the intended use for the duration of the construction project. If concrete or asphalt is used as the surface course for the walkway, it shall be a minimum of one and one-half inches ($\geq 1\text{-}1/2''$) thick. Temporary walkways constructed across unimproved streets and drives shall be a minimum thickness of four inches ($\geq 4''$) for concrete and three inches ($\geq 3''$) for asphalt. Joints formed in concrete sidewalks shall be in accordance with Section 441. Concrete surfaces shall have a broom finish.

If plywood is used as a walkway, it must be a minimum of three quarters of an inch ($\geq 3/4''$) thick, pressure treated and supported with pressure treated longitudinal joists spaced a maximum of sixteen inches ($\leq 16''$) on center. The plywood shall be secured to the joist with galvanized nails or galvanized deck screws. Nails and screws shall be countersunk to prevent snagging or tripping the pedestrians. A slip resistant friction course shall be applied to any plywood surface that is used as a walkway. Any slip resistant material used shall have the prior written approval of the Engineer.

The Contractor may propose alternate types of Temporary Walkways provided that the Contractor can document that the proposed walkway meets the requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)". Alternate types of Temporary Walkways shall have the prior written approval of the Engineer.

Temporary walkways shall be constructed and maintained so there are no abrupt changes in grade or terrain that could cause a tripping hazard or could be a barrier to wheelchair use. The Contractor shall construct and maintain the walkway to ensure that joints in the walkway have a vertical difference in elevation of no more than one quarter ($\leq 1/4''$) of an inch and that the horizontal joints have gaps no greater than one half ($\leq 1/2''$) of an inch. The grade of the temporary walkway should parallel the grade of the existing walkway or roadway and the cross slope should be no greater than two percent ($\leq 2\%$). A width of sixty inches (60"), if practical, should be provided throughout the entire length of any temporary walkway. The temporary walkway shall be a minimum width of forty eight inches (48"). When it is not possible to maintain a minimum width of sixty inches (60") throughout the entire length of temporary walkway, a sixty inch (60") by sixty inch (60") passing space should be provided at least every two hundred feet (200 ft.), to allow individuals in wheelchairs to pass.

Temporary walkways shall be constructed on firm subgrade. Compact the subgrade according to Section 209. Furnish and install any needed temporary pipes prior to constructing any walkway to ensure positive drainage away from or beneath the temporary walkway. Once the walkway is no longer required, remove any temporary materials and restore the area to the original conditions or as shown in the Plans.

b. Temporary Curb Cut Wheelchair Ramps

Temporary curb cut wheelchair ramps shall be constructed in accordance with Section 441 and Construction Detail A-3 Curb Cut (Wheelchair) Ramps Concrete Sidewalk Details. Ramps shall also include a detectable warning surface in accordance with Construction Detail A-4 Detectable Warning Surface Truncated Dome Size, Spacing and Alignment Requirements. Other types of material for the construction

of the temporary curb cut wheelchair ramps, including the detectable warning surface, may be used provided the Contractor can provide documentation that the material to be used meets the requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)". When a wheelchair ramp is no longer required, remove the temporary materials and restore the area to existing conditions or as shown in the Plans. For the items required to restore the area to original conditions or as shown in the Plans, measures for payment shall be covered by Contract pay items. If pay items are not included in the Contract, then payment for these items shall be included in Traffic Control-Lump Sum.

c. Temporary Audible Information Device

Temporary audible information devices, when shown in the Plans, shall be installed in compliance with the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)". The devices shall be installed in accordance with the manufacturer's recommendations. Prior to installation, the Contractor shall provide the Engineer with a set of manufacturer's drawings detailing the proper installation procedures for each device. When no longer required, the devices shall remain the property of the Contractor.

150.2 Materials and Traffic Control Devices

150.2.01 Traffic Control Devices

A. NCHRP 350 and MASH

All devices shall be certified in accordance with the Manual for Assessing Safety Hardware (MASH) Test Level 3 and/or the National Cooperative Highway Research Program (NCHRP) 350 Test Level 3 as applicable unless modified by this Special Provision. In addition, temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested under 2016 edition of MASH requirements. Such devices manufactured on or before this date, and successfully tested under either NCHRP Report 350 or the 2009 edition of MASH, may continue to be used throughout their normal service lives.

B. Approval

All traffic control devices with applicable Qualified Products List (QPL) categories shall come from the appropriate QPL list. Products not on the QPL may be used with an approval letter from the Georgia Department of Transportation Office of Materials and Testing. If there is no applicable QPL, the Contractor shall provide proof of MASH/NCHRP 350 certification. The proof may be a letter or written statement from the manufacturer that the product is MASH/NCHRP 350 approved. Decal certifications are not proof of certification and are not required.

C. Quality Guidelines for All Temporary Traffic Devices

All traffic control devices found to be unacceptable in accordance with the current ATSSA, "Quality Guidelines for Temporary Traffic Devices and Features" regardless of total numbers shall be replaced within twenty-four (24) hours unless stated otherwise in the Specifications, in the Contract, or as directed by the Engineer.

150.2.02 Retroreflectivity Requirements

A. Signs

Reflective sheeting shall meet the requirements of Section 913 and QPL-29

All construction warning signs (black on fluorescent orange) shall meet the minimum reflectivity and color requirements of ASTM D4956 Type XI regardless of the mounting height. All other signs reflectorization shall be in accordance with the Plans, Contract, and "GDOT Signing and Marking Design Guidelines".

B. Channelization Devices

Reflective sheeting shall meet the requirements of Section 913 and QPL-29

All channelization devices (white/ fluorescent orange and white/red) shall meet the minimum retroreflectivity requirements of ASTM D4956 Type VI.

150.2.03 Arrow Panels

Arrow panels shall meet the requirements for MUTCD (6F.61) and QPL-79.

Portable sequential arrow, sequential chevron, or flashing arrow panels shall be a minimum size of forty-eight inches (48") high by ninety-six inches (96") wide with not less than fifteen (15) lamps used for the arrow. The arrow shall occupy virtually the entire size of the arrow panel and shall have a minimum legibility distance of one (1) mile. The minimum legibility distance is the distance at which the arrow panel can be comprehended by an observer on a sunny day, or clear night. Arrow panels shall be equipped with automatic dimming features for use during hours of darkness. The arrow panels shall also meet the requirements for a Type C panel as shown in the MUTCD (6F.61). The sequential or flashing arrow panels shall not be used for lane closure on two-lane, two-way highways when traffic is restricted to one-lane operations in which case, appropriate signing, flaggers and when required, pilot vehicles will be deemed sufficient.

The arrow panels shall be placed on the shoulder at or near the point where the lane closing transition begins. The panels shall be mounted on a vehicle, trailer, or other suitable support. Vehicle mounted panels shall be provided with remote controls. Minimum mounting height shall be seven feet (7') above the roadway to the bottom of the panel, except on vehicle mounted panels which should be as high as practical.

For emergency situations, arrow display panels that meet the MUTCD requirements for Type A or Type B panels may be used until Type C panels can be located and placed at the site. The use of Type A and Type B panels shall be held to the minimum length of time possible before having the Type C panel(s) in operation. The Engineer shall determine when conditions and circumstances are considered to be emergencies. The Contractor shall notify the Engineer, in writing, when any non-specification arrow display panel(s) is being used in the Work.

150.2.04 Channelization Devices

A. General

Channelization shall clearly delineate the travel way through the work zone and alert drivers and pedestrians to conditions created by work activities in or near the travel way. Channelization shall be in accordance with the Plans, Specifications, MUTCD, QPL-34, and the following requirements.

B. Drums

1. Design

Drums shall meet the minimum requirement of the MUTCD (6F.67). Drums shall have six inch (6") wide stripes – white/fluorescent orange.

2. Application

Drums shall be used as the required channelizing device to delineate the full length of a lane closure, shift, or encroachment, except as modified by this Subsection.

3. Longitudinal Channelization

Drums shall be spaced as listed below for various roadside work conditions except as modified by Subsection 150.3.11. Spacing shall be used for situations meeting any of the conditions listed as follows:

a. FORTY FOOT (40') SPACING MAXIMUM

- For difference in elevation exceeding two inches ($> 2''$).
- For healed sections no steeper than 4:1 as shown in Subsection 150.3.11, Detail 150-H..

b. EIGHTY FOOT (80') SPACING MAXIMUM

- For difference in elevation of two inches ($\leq 2''$) or less.
- Flush areas where equipment or workers are within ten feet ($\leq 10'$) of the travel lane.

c. 200 FOOT SPACING MAXIMUM: Where equipment or workers are more than ten feet ($> 10'$) from travel lane. Lateral offset clearance to be four feet ($4'$) from the travel lane.

- For paved areas, eight feet ($> 8'$) or greater in width that are paved flush with a standard width travel lane.
- For disturbed shoulder areas not completed to typical section that are flush to the travel lane and considered a usable shoulder.

4. Removal of Drums

Drums may be removed after shoulders are completed to typical section and grassed. Guardrail and other safety devices shall be installed and appropriate signs advising of conditions such as soft or low shoulder shall be posted before the drums are removed.

C. Vertical Panels

1. Design

All vertical panels shall meet the minimum requirements of the MUTCD (6F.66). All vertical panels shall have a minimum of 270 square inches of retroreflective area facing the traffic and be a minimum of thirty-six inches ($\geq 36''$) high. The vertical panels shall be in addition a minimum eight inches ($\geq 8''$) wide with a stripe width of six inches ($6''$) – white/fluorescent orange.

2. Application

Vertical panels with retroreflectivity less than Type VI can only be used when traffic drums reduce the travel lane to less than ten feet ($\leq 10'$); vertical panels shall be used to restore the travel lane to ten feet ($\geq 10'$) or greater. No other application of vertical panels with retroreflectivity less than type VI will be permitted.

Vertical panels with a minimum type VI retroreflectivity and six inch ($6''$) stripe may be used for longitudinal channelization in the activity zone where work takes place for short-term stationary lane closures and intermediate-term stationary lane closures. They can be used for lane closures lasting three (3) days and with Engineer approval up to seven (7) days. They shall not be used in the transition zone including the tapers and the tangent lengths between tapers.

D. Cones

1. Design:

All cones shall be a minimum of twenty-eight inches ($\geq 28''$) in height regardless of application and shall meet the requirements of the MUTCD (6F.64).

Retroreflectivity may be deleted from all cones.

2. Application

On interstates, cones shall be prohibited. On all other routes, cones may only be used for longitudinal channelization in the activity zone where work takes place for short-term stationary lane closures. They shall not be used in the transition zone including the tapers and the tangent lengths between tapers. The use of cones for nighttime work will not be permitted. Cones shall not be stored or allowed to be visible on the worksite during nighttime.

Cones may be used for daytime flagging operations including tapers at flagging stations.

E. Barricades

1. Design

Type 3 barricades shall meet the minimum requirements of the MUTCD (6F.68). The Contractor has the option of choosing Type 3 barricades from the QPL-34 or the Contractor may utilize generic barricades that are approved by the Federal Highway Administration (FHWA). When barricades have been specifically crash tested with signs attached, the Contractor has the responsibility to attach the signs as per the manufacturer's recommendations to ensure crashworthiness. If the barricades were not tested with the signs, crashworthy compliance may require that rigid signs be mounted separate from the Type 3 barricade.

The use of Type 1 and Type 2 barricades will not be permitted.

2. Application

Type 3 barricades shall be placed as required by the Plans, the Standards, and as directed by the Engineer.

When a barricade is placed so that it is subject to side impact from a vehicle, a drum shall be placed at the side of the barricade to add target value to the barricade.

F. Warning Lights

1. Design

All warning lights shall meet the requirements of the MUTCD (6F.83).

2. Application:

- a. Type A low-intensity flashing lights shall be used as shown in the Plans, the Standards, and as directed by the Engineer.
- b. Type C Steady-Burn lights shall be used as shown in the Plans, the Standards, and as directed by the Engineer.

150.2.05 Flashing Beacon

The flashing beacon assembly, when specified, shall be used in conjunction with construction warning signs, regulatory, or guide signs to inform traffic of special road conditions which require additional driver attention. The flashing beacon assembly shall be installed in accordance with the requirements of Section 647.

150.2.06 Guardrail

Guardrail shall comply with Section 641 Guardrail and the guardrail standards.

When the removal and installation of guardrail is required, as a part of the Work, the following time restrictions shall apply unless modified by the special conditions:

From the time that the existing guardrail or temporary positive barrier protection is removed, the Contractor has fourteen (14) days to install the new guardrail and anchors. During the interim, the location without guardrail shall be protected with drums spaced at a maximum spacing of twenty feet (20'). The guardrail blunt end is to be treated as a fixed object and shall be protected. The maximum length of rail that can be removed at any time without being replaced with positive barrier protection is a total of 2000 linear feet of existing rail or the total length of one run of existing rail, whichever is less. Based on existing field conditions, the Engineer may review the Work and require that the guardrail be installed earlier than the maximum time allowed.

The Contractor shall install new guardrail, such that traffic exposure to fixed objects is minimized. Within the same workday, temporary attenuators, as defined in Subsection 150.2.10, should be installed on the approach to fixed objects that can't be protected with guardrail. Truck mounted attenuators may be used to shield exposed fixed objects for periods not to exceed fourteen (14) days. No separate payment will be made for truck mounted attenuators, attenuators, or other methods unless provided for in the Contract.

When the roadway is open to traffic, guardrail panels shall be lapped to comply with the directional flow of traffic. Should the staging of the Work require that the lap of the guardrail be changed, this Work shall be completed before the roadway is opened to traffic. The Work to change the lap of any guardrail shall be included in Traffic Control-Lump Sum.

The laps on anchors shall be in accordance with the manufacturer's recommendations and installation instructions. As a result, a trailing anchor may be lapped opposing the flow of traffic.

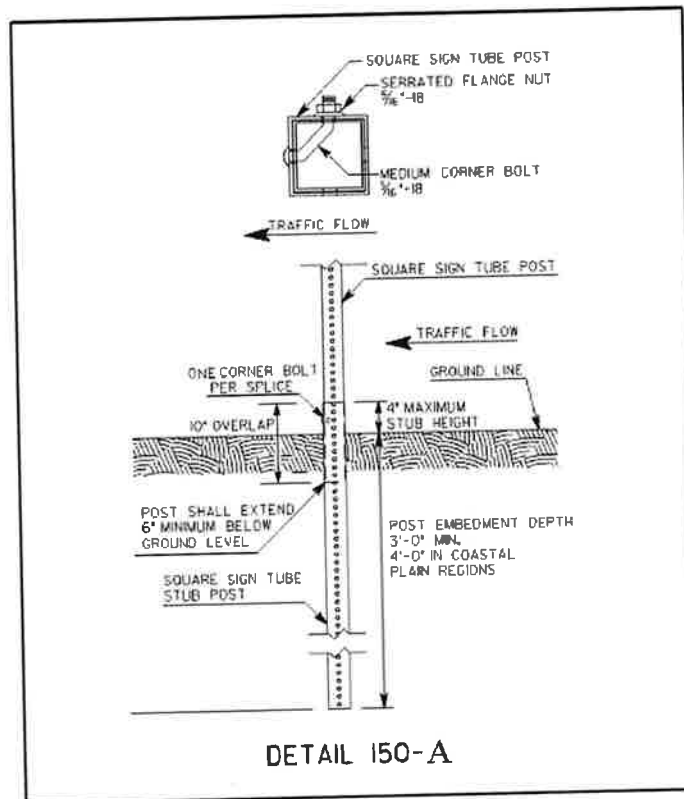
Failure to comply with the above time and quantity restrictions shall be considered as non-compliance under Subsection 150.7.01.

150.2.07 Interim Signs

A. Posts

Permanent mounting height to the bottom of sign shall be seven (7) feet to eight (8) feet measured vertically from the bottom of the sign to the elevation of the near edge of the pavement or from the walkway. Posts for all interim signs should be square tubular post meeting the requirements of Section 911, QPL-35, and Construction Detail T-3A (Type 7, 8, and 9 Square Tube Post Installation Detail). Ground mounted sign(s) that are 48" wide or greater shall be mounted on two posts. For barrier mounted sign, single post mount is allowed. The post(s) shall not extend beyond the top of the sign(s). The sign(s) shall be substantially plumbed and leveled.

Unprotected interim posts shall be spliced as shown in Detail 150-A, unless full length unspliced posts are used. Unprotected post splices will not be permitted any higher than four inches above the ground line to lessen the possibility of affecting the undercarriage of a vehicle. Installation of posts may require establishment of openings in existing pavements, islands, shoulders, etc.



B. Sign Blanks and Panels

All TTC sign blanks and panels should conform to Section 912 of the Specifications. Alternative sign blank materials (composites, polycarbonates, fiberglass reinforced plastics, recycled plastics, etc.) shall have a letter of approval from the Office of Materials and Testing for use as interim construction signs before these materials are allowed to be incorporated into the Work, unless these rigid sign blanks are currently approved as a crashworthy sign blank material under QPL- 34.

Unless specified elsewhere in the Contract, Specifications, Plans, and/or directed by the Engineer, sign sizes are according to the following:

1. All construction signs sizes shall follow the dimensions provided in the MUTCD Table 6F-1 "Temporary Traffic Control Zone Sign and Plaque Sizes" under the column for "Freeway or Expressway".
2. For all other signs used just for staging, the sign sizes shall follow the dimensions provided in the MUTCD Table 2B-1 "Regulatory Sign and Plaque Sizes" for the largest size.
3. Permanent signs used for staging shall be according to Plans.

Plywood blanks or panels will not be permitted.

The use of flexible signs will not be permitted.

For utility work not included in the Contract, the utility Contractor may use flexible signs within the project limits.

150.2.08 Pavement Markings

All temporary traffic striping shall conform to the applicable requirements of Section 652, Section 653, Section 657, Section 658, Section 659, and QPL-46.

A. All Traffic Striping for 45 Days or Less (≤ 45 Days)

All traffic striping that will be in place for 45 days or less shall be 4 inches or greater in width.

B. All Temporary Striping Beyond 45 days (>45 Days)

All traffic striping applied on intermediate surfaces shall be a minimum 5 inches in width or as shown on the Plans. On final surfaces when temporary striping will be overlaid or eradicated, the temporary striping shall be a minimum 5 inches in width.

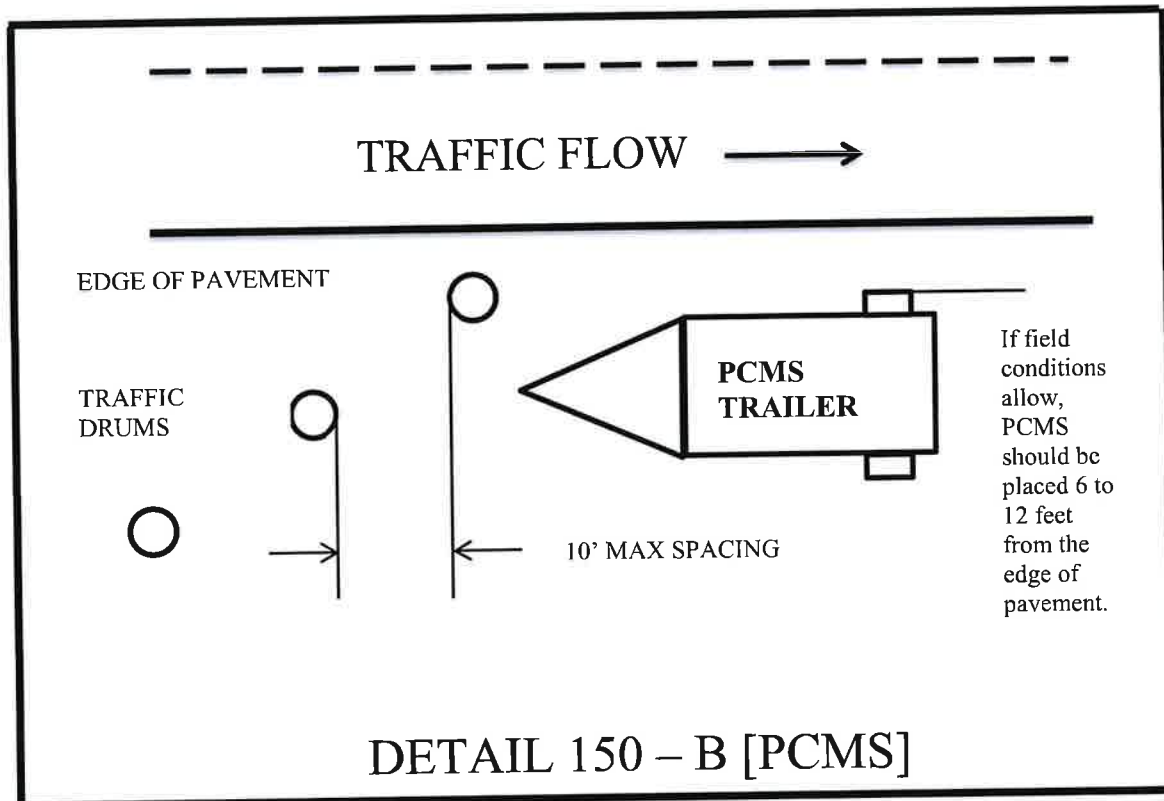
C. All Temporary Traffic Striping on Final Surface

All temporary traffic striping applied to final surfaces which will not be overlaid or grinded may be 4 inches in width or as shown on the Plans.

150.2.09 Portable Changeable Message Signs

When specified, a portable changeable message sign (PCMS) shall meet the minimum requirements of Section 632, MUTCD (6F.60) and be on QPL-82. The maximum amount of messages allowed to be flashed on one PCMS is two phases (flashes). The language and the timing of the messages shall comply with the MUTCD and Section 632. When used as an advanced device, the PCMS should typically be placed ahead of the construction activities. If the PCMS is used as a substitute for another device, then the requirements for the other device apply.

Any PCMS in use, which is not protected by positive barrier protection, shall be delineated by a minimum of three drums that meet the requirement of Subsection 150.2.04.B. The drum spacing shall not exceed a maximum of ten (10') feet as shown in Detail 150-B. When the PCMS is within twenty (20') feet of the opposing traffic flow, the trailing end of the PCMS shall be delineated with a minimum of three drums spaced in the same manner as the approach side of the PCMS.



When not in use, the PCMS shall be removed from the roadway, unless protected by positive barrier protection. If the PCMS is protected by positive barrier protection, the sign panel shall be turned away from traffic when not in use.

150.2.10 Portable Impact Attenuators

This work consists of the furnishing (including spare parts), installation, maintenance, relocation, reuse as required, and removal of Portable Impact Attenuator Units/Arrays.

Portable Impact Attenuator Unit/Arrays installation shall conform to the requirements of Section 648, Manufacturer's recommendations and "(Georgia Standard 4960 "Temporary Barrier (End Treatment Options)" and shall be installed at locations designated by the Engineer, and/or as shown on the Plans. When gating attenuators are used, the Contractor shall maintain the appropriate recovery area in accordance with the manufacturers' recommendations.

Generic sand/water loaded modules are prohibited. Manufacturers' sand/water loaded modules with specific arrays that have been NCHRP 350/MASH approved can be used in appropriate locations.

The test level of protection provided shall equal or exceed the speed limit. Test level 3 shall be used for forty-five (45) mph or above.

150.2.11 Portable Temporary Traffic Control Signals

The use of Portable Temporary Traffic Control Signals shall meet the following minimum requirements:

Only two-lane, two-way roadways will be allowed to utilize Portable Temporary Traffic Control Signals.

All portable traffic control signals shall meet the physical display and operational requirements of conventional traffic signals described in the MUTCD.

Each signal face shall have at least three lenses. The lenses shall be red, yellow, and green in color and shall give a circular type of indication. All lenses shall be twelve (12") inches nominal in diameter. A minimum of two signal faces shall face each direction of traffic. A minimum of one signal head shall be suspended over the roadway travel lane in a manner that will allow the bottom of the signal head housing to be not less than seventeen (17') feet above and not more than nineteen (19') feet above the pavement grade at the center of the travel lane. The second signal head may be located over the travel lane with the same height requirements or the second signal head may be located on the shoulder. When the signal head is located on the shoulder, the bottom of the signal head housing shall be at least eight (8') feet but not more than (15') feet above the pavement grade at the center of highway.

Advance warning signage and appropriate pavement markings shall be installed as part of the temporary signal operation.

The signals shall be operated in a manner consistent with traffic requirements. The signals may be operated in timed-mode or in a vehicle-actuated mode. The signals shall be interconnected in a manner to ensure that conflicting movements cannot occur. To ensure that the appropriate operating pattern, including timing is displayed to the traveling public, regular inspections, including the use of accurate timing devices shall be made by the WTCS. If, at any time, any part of the system fails to operate within these requirements then the use of the signal shall be suspended, and the appropriate flagging operation shall begin immediately.

The (WTCS) shall continuously monitor the portable traffic control signal to ensure compliance with the requirements for maintenance under the MUTCD. The signal shall be maintained in a manner consistent with the intention of the MUTCD, with emphasis on cleaning of the optical system. Timing changes shall be made only by the WTCS. The WTCS shall keep a written record of all timing changes.

The portable temporary traffic signal shall have two power sources and shall be capable of running for seven calendar days continuously.

The Contractor shall have an alternate temporary traffic control plan in the event of failure of the signal.

150.2.12 Raised Pavement Markers

Raised pavement markers (RPMs) shall meet the requirements of Section 654 and QPL-76 .

150.2.13 Rumble Strips

Rumble strips incorporated into the Work shall meet the requirements of Section 429 and the MUTCD. Existing rumble strips that are positioned in the traveled way to warn traffic of a stop condition shall be reinstalled prior to opening to traffic. Based on the following requirements:

Intermediate surfaces that will be in use for more than forty-five (45) calendar days shall have rumble strips reinstalled on the traveled way in the area of a stop condition. Non-refundable deductions in accordance with Subsection 150.7.01 will be assessed for any intermediate surface in place for greater than 45 days without rumble strips.

Rumble strips shall be installed on the final surface within fourteen (14) calendar days of the placement of the final surface in the area of the stop condition. Failure to install within fourteen (14) calendar days will result in assessment of non-refundable deductions in accordance with Subsection 150.7.01.

Prior to the removal of any rumble strips located in the travel lane, stop ahead (W3-1) warning signs shall be double indicated ahead of the stop condition. These warning signs shall be a minimum of 48 inches by 48 inches. These warning signs shall remain in place until the rumble strips have been reinstalled on the traveled way. Any existing warning signs for the stop ahead condition shall be removed or covered while the 48" X 48" (W3-1) signs are in place. When the

rumble strips have been reinstalled, these warning signs should be promptly removed and any existing signage placed back in service.

150.2.14 Temporary Barriers

A. Design:

Temporary barriers shall meet the requirements of Sections 620. The lengths of advancement should be in accordance with Georgia Standard 4000W "Lengths of Advancement, Clear Zone Distances, and Fill Height Embankment". The approach end of the taper should have 10:1 or flatter ground slope. Temporary barriers shall not be used as a channelization device. Their use is in accordance with MUTCD (6F.85).

B. Application:

Temporary barriers shall be placed as required by the Plans, Standards, and as directed by the Engineer. When Temporary barrier is located twenty feet ($\leq 20'$) or less from a travel lane, yellow reflectors shall be fixed to the top of the barrier at intervals not greater than forty feet ($\leq 40'$) in the longitudinal section and twenty feet (20') in the taper section and shall be mounted approximately two inches (2") above the barrier. If both lanes of a two-lane two-way roadway are within twenty feet ($\leq 20'$) or less of the barrier then the reflectors shall be installed for both directions of traffic.

The reflectors shall be one hundred (100) square inches (ASTM Type VII or VIII/ Type XI) reflective sheeting mounted on flat-sheet blanks. The reflectors shall be mounted approximately two inches above the top of the barrier. The reflectors shall be attached to the barrier with adhesive or by a drilled-in anchor type device. The reflectors shall not be attached to a post or board that is placed between the gaps in the barrier sections.

Approach end of Temporary barrier shall be protected according to Georgia Standard 4960 "Temporary Barrier (End Treatment Options)" or by a portable impact attenuator.

On interstates or other controlled access highways where lane shifts or crossovers cause opposing traffic to be separated by less than forty feet ($<40'$), portable barrier should be used as a separator.

150.2.15 Temporary Guardrail Anchorage- Type 12

This work consists of the furnishing, installation, maintenance and removal of Temporary Guardrail Anchorage- Type 12 used for Portable Barrier or temporary guardrail end treatment. Materials used in the Temporary Guardrail Anchorage- Type 12 shall meet the requirements of Section 641 of the Specifications and current Georgia Standards and may be new or used. Materials salvaged from the Project, which meet the requirements of Standards, may be utilized if available. The use of any salvaged materials will require prior approval of the Engineer.

Installation of the Temporary Guardrail Anchorage- Type 12 shall conform to the requirements of the Plans, current Georgia Standards and Section 641 of the Specifications. Installation shall also include sufficient additional guardrail and appurtenances to effect the transition and connection to Temporary Concrete Barrier as required by the details in Georgia Standard 4960 "Temporary Barrier (End Treatment Options)".

150.2.16 Temporary Traffic Signals

Temporary traffic signals shall meet the requirements of Section 647 and the MUTCD.

150.3 Construction Requirements

150.3.01 General

A. Implementation Requirements

No work shall be started on any project phase until the appropriate traffic control devices have been placed in accordance with the Project requirements. Changes to traffic flow shall not commence unless all labor, materials, and equipment necessary to make the changes are available on the Project.

When any shift or change is made to the location of traffic or to the flow patterns of traffic, including pedestrian traffic, the permanent safety features shall be installed and fully operational before making the change. If staging or site conditions prevent the installation of permanent features, then the equivalent interim devices shall be utilized. This work shall also include any necessary removal and reinstallation of guardrail panels to achieve the required panel lap to accommodate the appropriate shift and traffic flow including the final traffic flow configuration. The cost of performing this work shall be included in Traffic Control-Lump Sum.

Any section of the Work that is on a new location shall have all permanent safety features installed and fully operational before the Work is opened to traffic. Safety features shall include, but are not limited to the following items:

Guardrails including anchors and delineation with properly lapped panels

- 1) Cable Barrier
- 2) Impact attenuators
- 3) Traffic signals
- 4) Warning devices
- 5) Pavement markings including words, symbols, stop bars, and crosswalks
- 6) Roadway signs including regulatory, warning, and guide

Outdoor lighting shall be considered as a safety feature for welcome centers, rest areas, and weigh station projects. For typical roadway type projects, new street lighting is not considered a safety feature, unless specifically noted in the Plans or in the special conditions.

B. Maintenance of Traffic Control Devices

Traffic control devices shall be in acceptable condition when first erected on the Project and shall be maintained in accordance with Section 104 throughout the construction period. All unacceptable traffic control devices shall be replaced within twenty-four (24) hours. When not in use, all traffic control devices shall be removed, placed or covered so as not to be visible to traffic. All construction warning signs shall be removed within seven (7) calendar days after time charges are stopped or pay items are complete. If traffic control devices are left in place for more than ten (10) calendar days after completion of the Work, the Department shall have the right to remove such devices, claim possession thereof, and deduct the cost of such removal from any monies due, or which may become due, from the Contractor.

C. Traffic Interruption Restrictions

The Department reserves the right to restrict construction operations when, in the opinion of the Engineer, the continuance of the Work would seriously hinder traffic flow, be needlessly disruptive or unnecessarily inconvenience the traveling public. The Contractor shall suspend and/or reschedule any work when the Engineer deems that conditions are unfavorable for continuing the Work.

Advanced notification requirements to the Contractor to suspend work will be according to the events and the time restrictions outlined below:

Incident management - No advanced notice required

Threatening/Inclement weather - twenty-four (24) hours

Holiday, sporting events, unfavorable conditions - Three (3) calendar days

If the Work is suspended, the Contractor may submit a request for additional Contract time as allowed under Section 108. The Department will review the request and may grant additional Contract time as justified by the impact to the Contractor's schedule. Compensation for loss of productivity, rescheduling of crews, rental of equipment or delays to the Contractor's schedule will not be considered for payment. Additional Contract time will be the only consideration granted to the Contractor.

D. Work Zone Restrictions

1. Interstate

The Contractor should not simultaneously perform work on both the inside shoulder and outside shoulder on either direction of traffic flow when the Work is within 12 feet of the travel-way. Shoulders can be alternated if areas are separated by at least one-half mile of distance.

2. Non-Interstate Divided Highways

The Contractor should not simultaneously perform work on both the inside shoulder and outside shoulder on either direction of traffic flow when the Work is within 12 feet of the travel-way. Shoulders can be alternated if areas are separated by at least one-half mile distance in rural areas or at least 500 feet of distance in urban areas.

3. Non-Divided Highways

- a. The Contractor should not simultaneously perform work on opposite sides of the roadway when the Work is within 12 feet of the travel-way. Shoulders can be alternated if areas are separated by at least one-half mile of distance in rural areas or at least 500 feet of distance in urban areas.
- b. On two-lane projects where full width sections of the existing subgrade, base or surfacing are to be removed, and new base, subgrade, or surfacing are to be constructed, the Contractor should maintain one-lane of traffic through the construction area by removing and replacing the undesirable material for half the width of the existing roadway at a time. Replacement should be made such that paving is completed to the level of the existing pavement in the adjacent lane by the end of the workday or before opening all the roadway to traffic.

E. Work Zone Geometric Restrictions

There should be no reduction in the total number of available traffic lanes including turning lanes that existed prior to construction, except as specifically allowed by the Contract and as approved by the Engineer.

Travel lane Clearances: All portions of the Work should maintain the following minimum requirements:

Horizontal: The combined dimensions of the paved shoulder and the roadway surface remaining outside the Work Zone should be no less than sixteen feet ($\geq 16'$) in width at any location.

Vertical: The overhead clearance should not be reduced to less than fifteen feet ($\geq 15'$) at any location.

The restrictions above apply to all shifts, lane closures, on-site detours and off-site detours whether shown in the Contract or proposed by the Contractor. It shall be the responsibility of the Contractor to verify that these minimum requirements have been met before proceeding with any phase of the Work. Two-lane, two-way roadways may have temporary horizontal restrictions of less than sixteen feet ($\geq 16'$) during flagging operations. The minimum horizontal clearance should be restored before the flagging operation is removed.

F. Clear Zone

At the end of the workday, all equipment, materials, and TTC devices not in use should be moved out of the clear zone or behind positive protection. The clear zone is defined by Georgia Standard 4000W "Lengths of Advancement, Clear Zone Distances, Fill Height Embankment". For urban roadway with curb, the minimum set back is six (6') feet from the curb face. If stored behind positive protection, proper lengths of advancement should be maintained. If stored behind guardrail the items shall be a minimum five feet ($\geq 5'$) from the face of the guardrail and not in the recovery zone of the anchor.

The WTCS shall monitor the Work to ensure that all the rocks, boulders, construction debris, stockpiled materials, equipment, tools and other potential hazards are kept clear of the travel lane.

G. Milled Surface Restrictions

Unless modified by the special conditions, a milled surface on any asphaltic concrete surface shall not be allowed to remain open to traffic for a period of time that exceeds thirty (> 30) calendar days.

H. Construction Vehicles

The Contractor's vehicles shall travel in the direction of normal roadway traffic and shall not reverse direction except at intersections, interchanges, or approved temporary crossings. The Contractor may submit a plan requesting that construction traffic be allowed to travel in the opposite direction of normal traffic when it would be desirable to modify traffic patterns to accommodate specific construction activities.

Prior approval of the Engineer shall be obtained before any construction traffic is allowed to travel in a reverse direction. If the Contractor's submittal is approved, the construction traffic shall be separated from normal traffic by appropriate traffic control devices.

The parking of Contractor's and/or workers' personal vehicles within the work area or adjacent to traffic is prohibited. It shall be the responsibility of the WTCS to ensure that any vehicle present at the worksite is necessary for the completion of the Work.

I. Environmental Impacts

The Contractor shall ensure that dust, mud, and other debris from construction activities do not interfere with normal traffic operations or adjacent properties.

J. Existing Street Lights

Existing street lighting shall remain lighted as long as practical and until removal is approved by the Engineer.

K. Nighttime Work Lighting

Adequate temporary lighting shall be provided at all nighttime work sites where workers will be immediately adjacent to traffic.

L. Removal/Reinstallation of Miscellaneous Items

In the prosecution of the Work, if it becomes necessary to remove any existing signs, markers, guardrail, etc. not covered by specific pay item, they shall be removed, stored and reinstalled, when directed by the Engineer, to line and grade, and in the same condition as when removed.

150.3.02 Personnel – Worker Safety Apparel

In accordance with MUTCD (6D.03) all workers, within the right-of-way who are exposed either to traffic or to work vehicles and construction equipment within the TTC zone, shall wear high-visibility safety apparel that meets the Performance Class 2 or better.

150.3.03 Signage - General

A. Signing Requirements of the Temporary Traffic Control (TTC) Plan

When existing regulatory, warning or guide signs are required for proper traffic and pedestrian control, the Contractor shall maintain these signs in accordance with the TTC plan. The Contractor shall review the status of all existing signs, interim signs added to the Work, and permanent sign installations that are part of the work to eliminate any conflicting or non-applicable signage in the TTC Plan. The Contractor's review of all signs in the TTC Plan shall establish compliance with the requirements of the MUTCD and Section 150. Any conflicts shall be reported to the Engineer immediately and the WTCS shall take the necessary measures to eliminate the conflict.

The Contractor shall make every effort to eliminate the use of interim signs as soon as the Work allows for the installation of permanent signs.

All existing illuminated signs shall remain lighted and be maintained by the Contractor.

Existing street name signs shall be maintained at street intersections.

Refer to section **150.2.05.B. Sign Blanks and Panels** for size and material requirements.

B. Conflicting or Non-Applicable Signs

Any sign(s) or portions of a sign(s) that are not applicable to the TTC plan shall be covered so as not to be visible to traffic or shall be removed from the roadway when not in use. The WTCS shall review all traffic shifts and changes in the traffic patterns to ensure that all conflicting signs have been removed. The review shall confirm that the highest priority signs have been installed and that signs of lesser significance are not interfering with the visibility of the high priority signs. High priority signs include signs for road closures, shifts, detours, lane closures and curves. Any signs, such as speed zones and speed limits, passing zones, littering fines and litter pick up, that reference activities that are not applicable due to the presence of the Work shall be removed, stored and reinstalled when the Work is completed.

Failure to promptly eliminate conflicting or non-applicable signs shall be considered as non-performance under Subsection 150.7.01.

C. Removal of Existing Signs and Supports

The Contractor shall not remove any existing signs and supports without prior approval from the Engineer. All existing signs and supports which are to be removed shall be stored and protected if this material will be required later in the Work as part of the TTC plan. If the signs are not to be utilized in the Work, then the signs will become the property of the Contractor unless otherwise specified in the Contract documents.

D. Interim Guide, Warning and Regulatory Signs

Interim guide, warning, or regulatory signs required to direct traffic and pedestrians shall be furnished, installed, reused, and maintained by the Contractor in accordance with the MUTCD, the Plans, Special Provisions, Special Conditions, or as directed by the Engineer. These signs shall remain the property of the Contractor. When the signs are used for long-term stationary operations as defined MUTCD (6G.02), the bottom of all interim signs shall be mounted seven feet (7') to eight feet (8') above the level of the pavement edge or sidewalk. The signs offset should

be six feet (6') to twelve feet (12') from the pavement edge or two feet ($\geq 2'$) minimum for sidewalks according to MUTCD (6F-1). Special Conditions under Subsection 150.6 may modify this requirement.

Portable signs may be used when the duration of the Work is less than three (3) days or as allowed by the special conditions in Subsection 150.6. Portable interim signs shall be mounted a minimum of one foot ($\leq 1'$) above the level of the pavement edge for directional traffic of two (2) lanes or less and at seven feet (7') for directional traffic of three (3) or more lanes according to MUTCD (6F-2). Signs shall be mounted at the height recommended by the manufacturer's crashworthy testing requirements.

All sign blanks shall be rigid whether the sign is mounted as a portable sign, on a Type III barricade or as a permanent mount height sign. Utilities and their subcontractors working in the project limits, and not included in the project Contract, may use non-rigid signs.

E. Existing Special Guide Signs

Existing special guide signs on the Project shall be maintained until conditions require a change in location or legend content. When change is required, existing signs shall be modified and continued in use if the required modification can be made within existing sign borders using design requirements (legend, letter size, spacing, border, etc.) equal to that of the existing signs, or of Subsection 150.3.E.2. Differing legend designs shall not be mixed in the same sign.

1. Special Guide Signs

Special guide signs are those expressway or freeway guide signs that are designed with message content (legend) that applies to a particular roadway location. When an existing special guide sign is in conflict with work to be performed, the Contractor shall remove the conflicting sign and reset it in a new, non-conflicting location which has been approved by the Engineer.

2. Interim Special Guide Signs

When it is not possible to utilize existing signs, either in place or relocated, the Contractor shall furnish, erect, maintain, modify, relocate, and remove new interim special guide signs in accordance with the Plans or as directed by the Engineer. Interim special guide signs that may be required in addition to, or a replacement for, existing expressway and freeway (interstate) signs shall be designed and fabricated in compliance with the minimum requirements for guide signing contained in Part 2E "Guide Signs - Freeway and Expressway" of the MUTCD. All interstate shields on these signs shall be 48 inches and 60 inches for two-numeral and three-numeral routes, respectively.

The road name of the exit or route shield shall be placed on the exit gore sign.

3. Interim Overhead Guide Sign Structures

Interim overhead special guide sign structures are not required to be lighted unless specifically required by the Plans. If lighting is required, the sign shall be lighted as soon as erected and shall remain lighted, during the hours of darkness, until the interim sign is no longer required. The Contractor shall notify the Power Company at least thirty (30) days prior to desire connection to the power source.

4. Permanent Special Guide Signs

The installation of new permanent special guide signs and the permanent modification or resetting of existing special guide signs, when included in the Contract, shall be accomplished as soon as practical to minimize the use of interim special guide signs. If lighting is required by the Plans, all new permanent overhead special guide signs shall be lighted as soon as erected.

F. Stop Sign Regulated Intersections

For intersections that utilize stop sign(s) to control the flow of traffic and to restrict the movement of vehicles, the stop sign(s) shall be maintained for the duration of the Work or until such time that the stop condition is eliminated or until an interim or permanent traffic signal can be installed to provide proper traffic control. The traffic signal shall be installed and properly functioning before the removal of the existing stop sign(s) is permitted. If the existing intersection is enhanced traffic control features, such as stop lines, double indicated stop signs, oversized signs, advanced warning stop ahead signs, rumble strips on the approaches or flashing beacons located overhead or on the shoulders then these features shall be maintained for the duration of the project or until the permanent traffic control plan has been implemented.

Whenever the staging of the Work requires that the traveled way be relocated or realigned the Contractor shall reinstall all enhanced traffic control features noted above on the newly constructed sections of the Work. The cost of relocating the stop lines, stop signs, advanced warning signs, the rumble strips and the flashing beacons shall be included in the price bid for Traffic Control - Lump Sum unless individual pay items are included in the Contract for rumble strips and/or flashing beacons. When pay items are included in the Contract for rumble strips or flashing beacons then these items will be paid per each.

When staging requires the relocation or realignment of an existing stop condition, it may be necessary to consider the addition of enhanced traffic control features even though none existed at the original location. Horizontal and vertical alignment changes at a new location may have decreased or restricted sight distance or the stop condition may occur sooner than in the previous alignment. If these conditions occur, then the Engineer and/or the WTCS should consider additional measures to enhance the motorist's awareness of the changes even though the staging plans may not address enhanced features. Stop signs should be a minimum of 36 inches for interim situations. The use of 48 inch stop signs may be warranted under project specific conditions. Flags may be used on interim/permanent stop signs that are mounted at seven (7') feet in height for a short duration in order to direct additional attention to a new or relocated stop sign(s). Flags should not be used for durations exceeding two weeks unless unusual or site specific conditions warrant a longer period of time. The use of Type "A" flashing red light(s) attached to the stop sign(s) may be appropriate during the same period that the flags are in use to increase attention.

The use of rumble strips and/or PCMS may be considered. The use of new rumble strips, where none previously existed, shall have the prior approval of District Traffic Operations before being included as part of the temporary traffic control plan. The message(s) displayed on any PCMS shall have the prior approval of the Engineer and the message(s) shall be included as part of the TTC plan for the interim staging.

The placement of any additional interim ground mounted signs and posts or stop lines shall be considered as incidental to the price bid for Traffic Control - Lump Sum. The installation of rumble strips, flashing beacons or the use of Portable Changeable Message Signs (PCMS) shall be considered as Extra Work unless pay items are included in the Contract.

G. Low Shoulder Signage

1. Low Shoulder for Construction/Reconstruction/Resurfacing Projects

"Low Shoulder" (W8-9) signs shall be erected when a difference in elevation less than four (< 4') feet from the traveled way, exceeds one inch (> 1") but does not exceed three inches (≤ 3 ") between the travel lane and any type of shoulder.

The spacing of the signs shall not exceed one (1) mile and the signs shall be placed immediately past each crossroad intersection. The "Low Shoulder" signs shall remain in place until the difference in elevation is eliminated and the shoulder has been dressed and permanently grassed for a minimum of thirty (30) calendar days. These signs shall be furnished, installed, maintained and removed by the Contractor as part of Traffic Control-Lump Sum. These signs shall be fluorescent orange with black borders.

2. Shoulder Drop-Off for Construction/Reconstruction/Resurfacing Project

"Shoulder Drop-Off" (W8-17) signs shall be used when a difference in elevation, less than four feet (< 4') from the traveled way, exceeds three inches (> 3") and is not protected by positive barrier protection. These warning signs shall be placed in advance of the drop-off.

The spacing of the signs shall not exceed one (1) mile and the signs shall be placed immediately past each crossroad intersection. The "Shoulder Drop-Off" signs shall remain in place until the difference in elevation is eliminated and the shoulder has been dressed and permanently grassed for a minimum of thirty (30) calendar days. These signs shall be furnished, installed, maintained, and removed by the Contractor as part of Traffic Control-Lump Sum. These signs shall be black borders on fluorescent orange background.

H. Bump Signage

A bump sign (W8-1) shall be utilized when a transverse joint in the pavement structure has a vertical difference in elevation of three quarters ($\geq 3/4$ "") of an inch or greater in depth with no horizontal taper to ramp the traffic from one elevation to the other. This condition typically occurs at approach slabs during pavement milling operations and at transverse joints in asphaltic pavement lifts. Other conditions include utility and storm drainage repairs that require concrete placement for patching and/or steel plating.

The W8-1 sign shall be placed sufficiently in advance to warn the motorist of the condition.

I. Sign Visibility

All existing, interim and new permanent signs shall be installed to be completely visible and legible for an advance distance in compliance with the MUTCD. Any clearing required for maintaining the line of sight to existing, interim or permanent signs shall be done as part of the requirements of the TTC plan. The clearing shall include any advance warning signs, both interim and permanent, that are installed as a part of the Work including advance warning signs that are installed outside the limits of the project. Limbs, brush, construction equipment and materials shall be kept clear of the driver's line of sight to all signs that are part of the TTC plan.

150.3.04 Advance Warning Signs

A. Project Signs - All Type of Highways

Advance warning signs shall be placed ahead of the work area in accordance with Part 6 of the MUTCD and unless noted below shall include a series of at least three advance road work (W20-1) signs placed at the termini of the project. The series shall have the legend ROAD WORK (1500 FEET, 1000 FEET, AND 500 FEET).

At grade intersecting roadways and on-ramps shall be signed with a minimum of one ROAD WORK AHEAD sign.

When work terminates at a "T" intersection, a minimum of one "ROAD WORK AHEAD" sign shall be placed in advance of the intersection and one "END ROAD WORK" sign shall be placed at the termination end of the intersection. Field conditions may require the use of additional warning signage.

1. State Routes

Advanced Warning Signs on State Routes shall be a minimum dimension of forty-eight inches by forty-eight inches (48" x 48"). When a State Route intersects a project which consists of adding travel lanes, reconstructing an existing roadway or new location work, the State Route approaches shall have a minimum of three (W20-1) advanced warning signs (1500 ft., 1000 ft., 500 ft.). The termination end of an intersecting State Route shall have END ROAD WORK signage.

The W20-1 signs shall be placed at the termini of the project or sufficiently in advance of the termini to allow for lane shifts, lane closures and other activities which may also require advanced warning signs. The advanced warning signs for the project should not overlap with the advanced warning signs for lane shifts, lane closures, etc.

The length of a work zone should be held to the minimum length required to accomplish the Work. If a project has multiple individual worksites within the overall limits of the project, each site should be signed individually if the advance warning signs for each site can be installed without overlapping an adjacent worksite. As soon as the work is completed at any individual site, the warning signs shall be removed from that site.

Project mileage indicated on the G20-1 sign shall be the actual project mileage rounded up to the nearest whole mile. Projects less than two (< 2) miles in length or individual worksites that are part of a multiple worksite project may delete this sign. The G20-1 sign shall be forty-eight inches by twenty-four inches (48" x 24") and the G20-2 sign shall be forty-eight inches by twenty-four inches (48" x 24").

2. Interstate, Limited Access and Multilane Divided Highways

In addition to the W20-1 signs required at 500 ft., 1000 ft. and 1500 ft., multi-lane divided highways shall also have additional advanced warning signs installed with the legend "ROAD WORK (2 MILES, 1 MILE and 1/2 MILE). All construction warning signs on divided highways shall be double indicated (i.e., on the left and right sides of the roadway.) If the use of the half (1/2) mile, one (1) mile and two (2) mile advanced warning signs cause an overlap with other work or do not benefit field conditions then the Engineer may review the use of these signs and eliminate their installation. When the posted speed limit is fifty (\leq 50) mph or less, the one-half (1/2) mile, one (1) mile and two (2) mile signs should be eliminated especially in urban areas.

The W20-1 advance warning signs for ROAD WORK 500 FEET; 1000 FEET; and 1500 FEET shall be temporarily covered when work involving the advanced warning signs for lane shifts and lane closures overlap these signs. The ROAD WORK 1/2 MILE, ROAD WORK 1 MILE, and ROAD WORK 2 MILES shall be in place when the 500, 1000 and 1500 feet signs are temporarily covered.

When the Temporary Traffic Control zone already has advanced warning (W20-1) signs installed the W20-1 signs required for lane closures under Standard 9106 should be eliminated.

3. Ramp Work on Limited Access Highways

The work zone shall not be signed for the entire length of the mainline of a limited access highway when only short individual worksites, interchange or ramp work is being performed.

When work is restricted to ramp reconstruction or widening activities, the advance warning signs on the mainline section of the limited access highway shall be limited to the use of portable advance warning signs. These portable advance warning signs shall only be utilized when work activity is within the gore point of the ramp and the mainline traveled way or work is active in the acceleration/deceleration lane adjacent to the mainline traveled way. Portable advance warning signs (W20-1: 1500 ft./1000 ft./500 ft.) shall be installed on the traveled way of the limited access highway when the above conditions are present. The advance warning signs shall be installed only in one direction where work is active. All portable signs shall be double indicated. When work is not active, the ramp work shall be advanced warned by the use of a single forty-eight inches by forty-eight inches (48" x 48") "ROAD WORK AHEAD" (W20-1) with an "ON RAMP" plaque (W13-4p) sign along the right shoulder of the mainline traveled way prior to the beginning of the taper for the deceleration lane. Differences in elevation shall be in compliance with the requirements of Subsection 150.3.11 prior to the removal of the portable (W20-1) advanced warning signs from the mainline.

B. Highway Work Zone

In accordance with Georgia Code, O.C.G.A. § 40-6-188, all sections or segments of the roadway under construction or reconstruction shall be signed as a Highway Work Zone except non-state highway two-lane two-way resurfacing projects. Two conditions can be applied to a Highway Work Zone. Condition 1 is when no reduction in the existing speed limit is required. Condition 2 is when worksite conditions require a reduction of the speed limit through the designated Work Zone. Properly marking a Highway Work Zone shall include the following minimum requirements:

1. No Reduction in the Existing Posted Speed Limit in Highway Work Zone

- a. Signage shall be posted at the beginning point of the Highway Work Zone warning the traveling public that increased penalties for speeding violations are in effect. The beginning point of Highway Work Zone is at the project limits, start of work zone, or at the start of the first taper. The HWZ-2 sign shall be placed a minimum of 600 feet in advance of the Highway Work Zone and shall not be placed more than 1000 feet in advance of the Work Zone. If no speed reduction is required, it is recommended that the HWZ-2 be placed at 750 feet from the work area between the ROAD WORK 500 FT. and the ROAD WORK 1000 FT. signs.

HWZ-2 signs shall be placed at intervals not to exceed one mile for the length of the project. HWZ-2 signs should be placed on the mainline after all major intersections except State Routes. State Routes shall be signed as per the requirements for intersecting roadways below.

- b. The existing speed limit shall be posted at the beginning of the Work Zone. Existing Speed Limit signs (R2-1) shall be maintained.
- c. Intersecting state routes shall be signed in advance of each intersection with the Work Zone with an HWZ-2 sign to warn motorists that increased fines are in effect. All other intersecting roadways that enter into a designated Highway Work Zone may be signed in advance of each intersection with the Work Zone. When construction equipment and personnel are present in the intersection on the mainline of a multi-lane roadway, the intersecting side roads shall be signed in advance with HWZ-2 signs. As soon as the work operation clears the intersection, the signage may be removed.
- d. Sign HWZ-3 shall be posted at the end of the Highway Work Zone indicating the end of the zone and indicating that increased penalties for speeding violations are no longer in effect.
- e. When a designated Highway Work Zone is no longer necessary, all signs shall be removed immediately.

2. Reducing the Speed Limit in a Highway Work Zone

Highway Work Zone signs shall be posted as required in Condition 1 above and in accordance with Detail 150-C.

A "Reduce Speed Limit Ahead" (W3-5) sign shall be posted 600 feet prior to the reduced speed limit.

Then a "Speed Limit" signage (R2-1) for the reduced speed limit shall be erected at the beginning of the Work Zone. Additional signs shall be placed at whichever is least:

- a. on non-interstate roads after every junction with a numbered (state or U.S.) route.
- b. on interstates entrance ramp 1,500 feet from the end of the entrance taper. Detail 150-D
- c. on non-interstate and interstate, a maximum spacing of no greater than one (1) mile apart.

On multi-lane divided highways, the speed limit signs shall be double indicated when the reduced speed is in use.

Additional signs may be necessary to adjust for actual field conditions.

For limited access (interstate) highways and controlled access multi-lane divided highways, the posted speed limit shall be reduced as required below.

When any one or more of the following conditions exist and the existing speed limit is sixty-five (65) mph or seventy (70) mph, the speed limit shall be reduced by ten (10) mph. If the existing speed limit is sixty (60) mph, the speed limit should be reduced by five (5) mph. If the existing speed limit is fifty-five (≤ 55) mph or less, the Contractor can only reduce the speed limit with the prior approval of the Engineer. The reduction in the speed limit shall be no greater than ten (10) mph:

- a) Lane closure(s) of any type and any duration.

- b) The difference in elevation exceeds two inches (> 2") adjacent to a travel lane as shown in Subsection 150.3.11, Detail 150-E, Detail 150-F.
- c) Any areas where equipment or workers are within ten feet (10') of a travel lane.
- d) Temporary portable concrete barriers located less than two feet (2') from the traveled way.
- e) As directed by the Engineer for conditions distinctive to this project.

When the above conditions are not present, the speed limit shall be immediately returned to the existing posted speed limit. A speed reduction shall not be put in place for the entire length of the project unless conditions warranting the speed reduction are present for the entire project length. All existing speed limit signs within the temporary speed reduction zone shall be covered or removed while the temporary reduction in the speed limit is in effect. All signs shall be erected to comply with the minimum requirements of the MUTCD.

At a minimum, the following records shall be kept by the WTCS:

- a) Identify the need for the reduction.
- b) Record the time of the installation and removal of the temporary reduction.
- c) Fully describe the location and limits of the reduced speed zone.
- d) Document any accident that occurs during the time of the reduction.

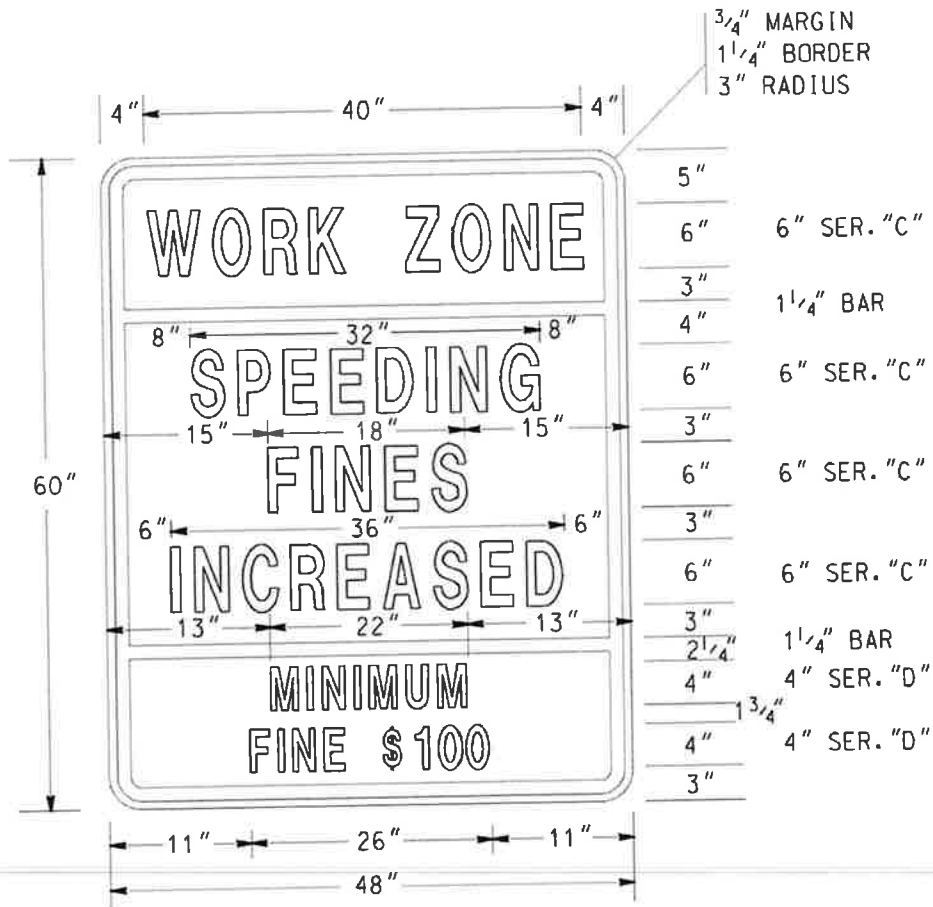
A copy of the weekly records for reduced speed zones shall be submitted to the Engineer.

When a pilot vehicle is used on a two-lane two-way roadway, the speed limit should not be reduced. For special conditions specific to the Work, on two-lane two-way roadways or multi-lane highways, the Contractor may reduce the posted speed limit with the prior approval of the Engineer.

3. Variable Speed Limit Zones

Projects that are within or extends into variable speed limit zones shall be posted according to condition 1 with HWZ-1, HWZ-2, and HWZ-3 signs. No additional "speed limit" signs, (R2-1), shall be posted. Any reduction or increase in speed limits will be controlled by the normal operation of the variable speed limit system.

Upon request, a maximum speed limit of fifty-five (55) mph may be set for the project limits.



HWZ-2

COLORS

TOP PANEL

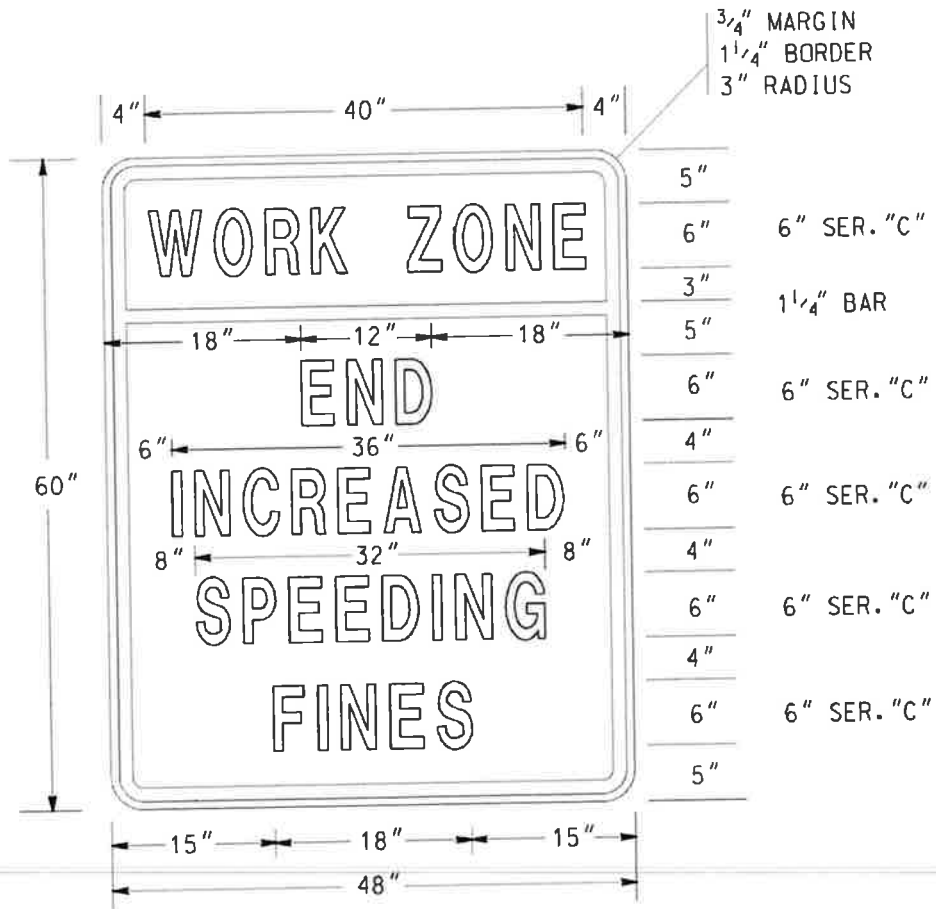
LEGEND & BORDER - BLACK (NON-REFL)
 BACKGROUND - FLUORESENT ORANGE

MIDDLE & BOTTOM PANELS

LEGEND & BORDER - BLACK
 BACKGROUND - WHITE

NOTES:

1. ALL HWZ-2 SIGN PANELS SHALL BE RIGID.
2. THE SIZE OF THE HWZ-2 SIGN SHALL NOT BE REDUCED FOR USE ON TWO-LANE ROADWAYS.



HWZ-3

COLORS

TOP PANEL

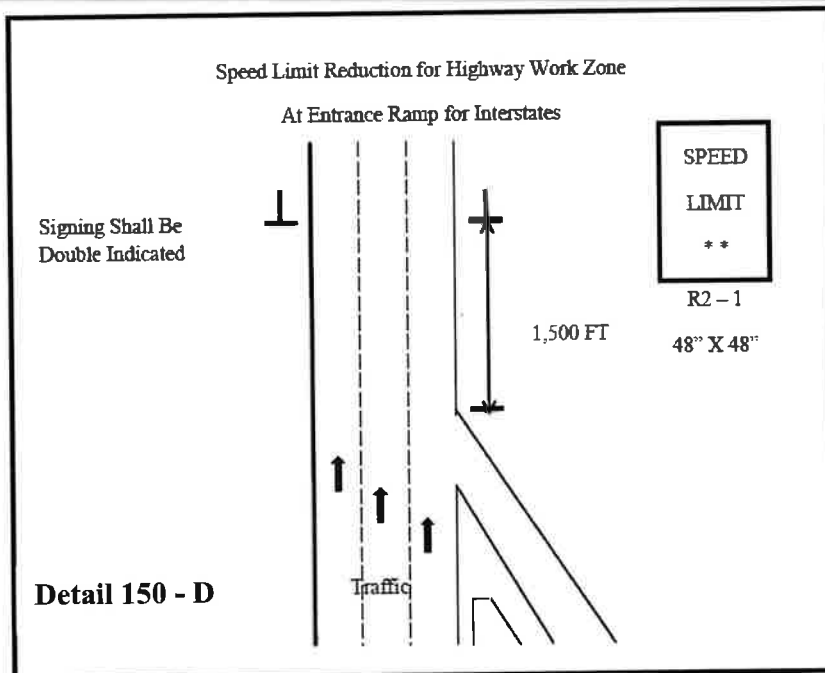
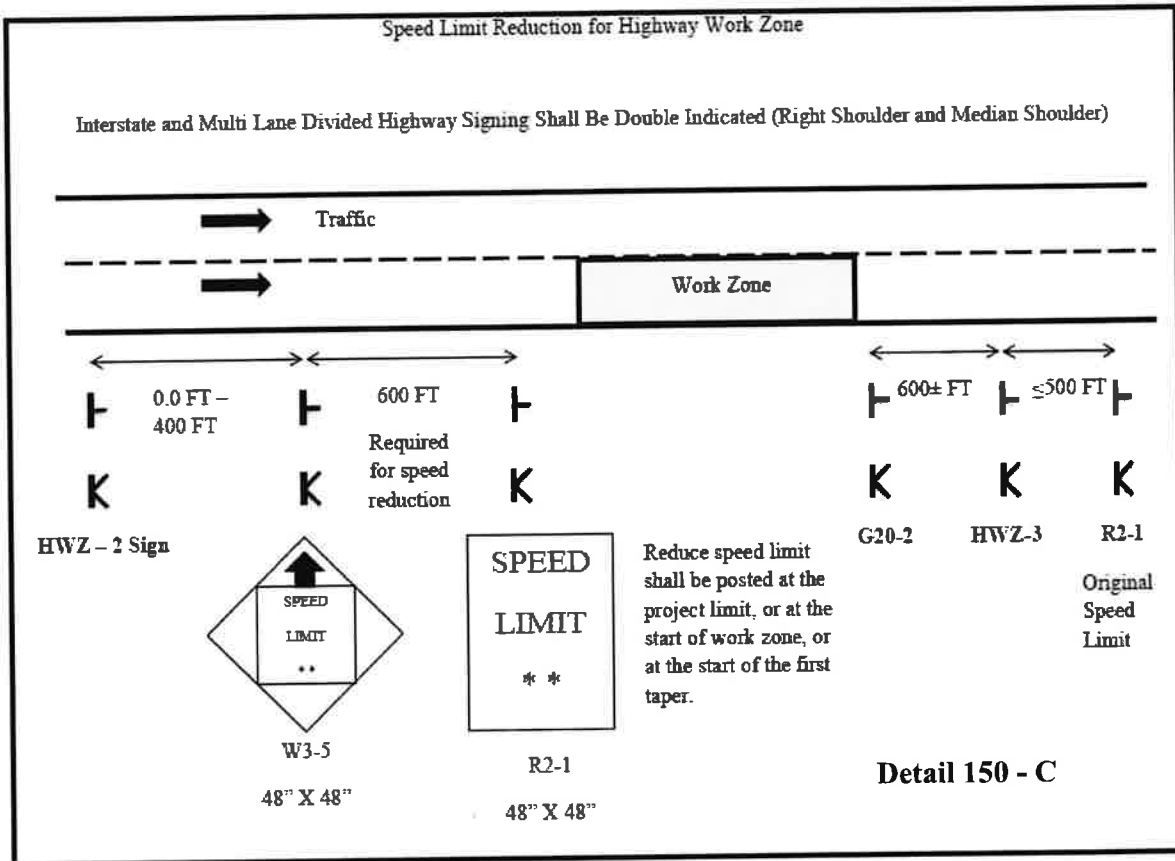
LEGEND & BORDER - BLACK (NON-REFL)
 BACKGROUND - FLUORESENT ORANGE

BOTTOM PANEL

LEGEND & BORDER - BLACK (NON-REFL)
 BACKGROUND - WHITE

NOTES:

1. ALL HWZ-3 SIGN PANELS SHALL BE RIGID.
2. THE SIZE OF THE HWZ-3 SIGN SHALL NOT BE REDUCED FOR USE ON TWO-LANE ROADWAYS.



C. Installation/Removal of Work Area Signage

No payment will be made for Traffic Control-Lump Sum until the Work has actually started on the Project. The installation of traffic control signage does not qualify as the start of work. Advanced warning signs shall not be installed until the actual beginning of work activities. Any permanent mount height signs installed as the work is preparing to start shall be covered until all signs are installed unless all signs are installed within seven (≤ 7) calendar days after beginning installation.

All temporary traffic control devices shall be removed as soon as practical when these devices are no longer needed. When work is suspended for short periods of time, temporary traffic control devices that are no longer appropriate, shall be removed or covered.

All construction warning signs shall be removed within seven (≤ 7) calendar days after time charges are stopped or pay items are complete. If traffic control devices are left in place for more than ten (> 10) calendar days after completion of the Work, the Department shall have the right to remove such devices, claim possession thereof, and deduct the cost of such removal from any monies due, or which may become due, the Contractor.

CORRECTIVE LIST WORK: Portable signs shall be utilized to accomplish the completion of all corrective list items, if the corrective list is the only work being performed. The portable signs shall be removed daily. All permanent mount height signs shall be removed prior to the beginning of the corrective list only work, except "Low/Soft Shoulder" signs and any signs that have the prior written approval of the Engineer to remain in place while the corrective list work is in progress.

Failure to promptly remove the construction warning signs within the seven (7) calendar days after the completion of the Work or failure to remove or cover signs when work is suspended for short periods of time shall be considered as non-performance under Subsection 150.7.01.

150.3.05 Shoulder/Lane Closures

A. Approval/Restrictions

All shoulder closures and lane closures of any type or duration shall have the prior approval of the Engineer.

1. Closure Length

The length of a shoulder closure and a lane closure shall not exceed two (2) miles in length excluding the length of the tapers unless the prior approval of the Engineer has been obtained. The Engineer may extend the length of the closure based upon field conditions; however, the length of a work zone should be held to the minimum length required to accomplish the Work. Shoulder closure and Lane Closures shall not be spaced closer than one mile. The advanced warning signs for the Project should not overlap with the advanced warning signs for lane shifts, lane closures, etc.

2. Duration

The first (7) calendar days in an Urban area and the first three (3) calendar days in a Rural area of any lane closure shall be signed and marked as per Georgia Standard 9106 "Traffic Control Detail for Lane Closure on Multi-Lane Divided Highway" or Georgia Standard 9107 "Traffic Control Detail for Lane Closure on Multi-Lane Undivided Highway". However, lane closures that exist for a duration longer than three (> 3) calendar days may be signed and marked as per the details in Georgia Standard 9121 "Tapers, Signs, and Markings for Passing Lanes", provided the prior approval of the Engineer is obtained. The approved lane drop shall utilize a PCMS and only the signs and markings shown for the termination end of the lane drop in Georgia Standard 9121. All warning signs in the lane drop sequence shall be used. Drums may be substituted for the Type I Crystal Delineators at the same spacing.

B. Shoulder Closures

In accordance with MUTCD 6G.07, when paved shoulders, having a width of eight feet ($\geq 8'$) or more are closed, at least one (1) advance warning sign shall be used. The sign(s) should read SHOULDER CLOSED (W21-5a). The signs are only posted on the side with the shoulder closure. Where the downstream end of the shoulder closure extends beyond the distance that can be perceived by road users, a supplementary plaque bearing the message NEXT XX FEET(W16-4P) or MILES (W7-3aP) should be placed below the SHOULDER CLOSED (W21-5a) sign. These signs shall be placed 500 feet prior to the shoulder closure. For multi-shoulder closures, the Shoulder Closed sign shall be repeated after two (2) miles at 500 feet prior to the next shoulder closure.

A shoulder closure will require a shoulder taper of $(1/3) L$ (L =merging taper length). Traffic drums shall be used for the taper. Arrow boards are not required.

If positive barriers are used to close the shoulder, the taper and drums shall be in accordance with Standard 4960, Temporary Barrier (End Treatment Options). The approach end of the barrier taper should be 10:1 or flatter slope.

C. Lane Closure

1. Advance Warning Signs

The Advance Warning signs shall be in accordance with MUTCD and Georgia Standard 9106 "Traffic Control Detail for Lane Closure on Multi-Lane Divided Highway" and Georgia Standard 9107 "Traffic Control Detail for Lane Closure on Multi-Lane Undivided Highway".

When the Temporary Traffic Control zone already has advanced warning (W20-1) signs installed the W20-1 signs required for lane closures under Standard 9106 and 9107 should be eliminated.

For Interstate, Limited Access and Multi-lane Divided Highways, an additional PCMS shall be placed one (1) mile in advance of a lane closure with a message denoting the appropriate lane closure one (1) mile ahead. No other message shall be displayed on this PCMS. The PCMS shall be placed on the outside shoulder in accordance with Detail 150-B [PCMS]. This is in addition to the other traffic control devices required by Standard 9106.

At the discretion of the Engineer, the Contractor may start placing advance warning signs a half-hour (1/2 hr.) prior to the lane closure.

2. Transition Area – Taper

Drums shall be used on all transition tapers. If traffic drums with retroreflectivity of less than type VI are used for a merge taper that exists into the night, all drums located in the taper shall have, for the length of the taper only, a six inch (6") fluorescent orange (ASTM Type VI, VII, VIII, IX or X) reflectorized top stripe on each drum. The top six inch (6") stripe may be temporarily attached to the drum while in use in a taper. The Engineer may allow the fluorescent orange reflectorized six inch (6") top stripe on each drum in a merging taper to remain in place during daylight hours provided there is a lane closure(s) with a continuous operation that begins during one nighttime period and ends during another nighttime period. All drums that have the six inch (6") top stripe permanently attached shall not be used for any other conditions.

In accordance with MUTCD (6C.08), the minimum length for a merging taper for a lane closure on the travel way shall be as shown in Table 150-1:

TABLE 150-1

Posted Speed Limit, MPH	Lane Width 9 Feet	Lane Width 10 Feet	Lane Width 11 Feet	Lane Width 12 Feet	Maximum Drum Spacing in Tapers, (Feet)
Minimum Taper Length (L) in Feet					
20	60	70	75	80	20
25	95	105	115	125	25
30	135	150	165	180	30
35	185	205	225	245	35
40	240	270	295	320	40
45	405	450	495	540	45
50	450	500	550	600	50
55	495	550	605	660	55
60	540	600	660	720	60
65	585	650	715	780	65
70	630	700	770	840	70
75	675	750	825	900	75

If site conditions require a longer taper, then the taper shall be lengthened to fit particular individual situations.

The length of shifting tapers should be at least one-half (1/2) L.

Multiple Lane Closures:

- a. A maximum of one (1) lane at a time shall be closed with each merging taper.
- b. A minimum tangent length of two (≥ 2) L shall be installed between each individual lane closure taper. The tangent length is part of the transition area. Therefore, only traffic drums can be used in the tangent.

3. Activity Area

The activity area consists of a buffer and the work space. Georgia Standard 9106 "Traffic Control Detail for Lane Closure on Multi-Lane Divided Highway" states "Buffer zones of 300' minimum, 500' desirable are required for tangent sections and shall be increased for horizontal or vertical curves due to sight distance considerations"

Georgia Standard 9107 "Traffic Control Detail for Lane Closure on Multi-Lane Undivided Highway" requires a fifty feet (50') buffer. The buffer shall be increased for horizontal or vertical curves due to sight distance considerations"

The channelization devices are spaced at a maximum of eighty feet (80').

4. Termination Area

Georgia Standard 9106 "Traffic Control Detail for Lane Closure on Multi-Lane Divided Highway" requires a 150 feet buffer and a minimum 200 feet downstream taper.

Georgia Standard 9107 "Traffic Control Detail for Lane Closure on Multi-Lane Undivided Highway" requires 150 feet downstream taper.

D. Removal of Lane Closures

To provide the greatest possible convenience to the public in accordance with Section 107, the Contractor shall remove all signs, lane closure markings, and devices immediately when lane closure work is completed or temporarily suspended for any length of time or as directed by the Engineer. All portable signs and portable sign mounting devices shall be removed from the roadway to an area which will not allow the sign to be visible and will not allow the sign or sign mounting device to be impacted by traffic. All devices shall be stored beyond the clear zone or behind positive protection.

E. Exit and Entrance Ramps

On multi-lane highways, where traffic has been shifted to the inside lanes, the exit and entrance ramps shall have drums placed on both sides of the ramp. This requirement will apply to any situation where traffic is shifted to contra flows or inside staging lanes to facilitate reconstruction work in the vicinity of exit and entrance ramps. The temporary ramp taper length should be greater than, or equal to, the existing taper length. Interim EXIT gore signs shall be placed at the ramp divergence. The "EXIT OPEN" sign shown in Figure TA-42 of the MUTCD shall be utilized. For exit ramps, drums spacing shall be decreased to ten feet (10') for 200 feet in advance of the temporary gore and be decreased to ten feet (10') for the first 100 feet of the temporary gore, and throughout the exit ramp. For on-ramps, drums should be used 200 feet prior to the ramp and end 100 feet past the merge taper. The drum spacing for the on ramp may be decreased but should not obstruct the view of the drivers i.e. for the ramp vehicles.

150.3.06 Traffic Pacing Method

A. Pacing of Traffic

With prior approval from the Engineer, traffic may be paced allowing the Contractor up to twenty (20) minutes maximum to work in or above all lanes of traffic for the following purposes:

1. Placing bridge members or other bridge work.
2. Placing overhead sign structures.
3. Other work items requiring interruption of traffic.

The Contractor shall provide a uniformed law enforcement officer with patrol vehicle and blue flashing light for each direction of pacing. The law enforcement officer, Engineer, and flaggers at ramps shall be provided with a radio which will provide continuous contact with the Contractor.

When ready to start the work activity, the law enforcement vehicle will act as a pilot vehicle slowing the traffic, thereby providing a gap in traffic allowing the Contractor to perform the Work. Any on-ramps between the pace and the work area shall be blocked during pacing of traffic, with a flagger properly dressed and equipped with a Stop/Slow paddle. Each ramp should be opened after the law enforcement vehicle has passed.

Pilot vehicles shall travel at a safe pace speed. The Contractor shall provide a vehicle to proceed in front of the law enforcement vehicle and behind the other traffic in order to inform the Contractor's work force when all vehicles have cleared the area.

Traffic should not be permitted to stop during pacing unless approved by the Engineer.

B. Methods of Signing for Traffic Pacing

At a point not less than 1,000 feet in advance of the beginning point of the pace, the Contractor shall place a PCMS sign with the message "TRAFFIC SLOWED AHEAD **EXPECT** SHORT DELAY".

150.3.07 Flagging Operations

A. Flaggers

Flaggers shall be provided as required to handle traffic, as specified in the Plans or Special Provisions, and as required by the Engineer.

B. Flagger Certification

All flaggers shall meet the requirements of the MUTCD and shall have received training and a certificate upon completion of the training from one of the following organizations:

National Safety Council
American Traffic Safety Services Association (ATSSA)

On-line classes are not accepted.

Failure to provide certified flaggers as required above shall be reason for the Engineer suspending work involving the flagger(s) until the Contractor provides the certified flagger(s). Flaggers shall have proof of certification and valid identification (photo I.D.) available any time they are performing flagger duties.

C. Flagger Appearance and Equipment

Flaggers shall wear Performance Class 2 or better for day time activities. Flaggers shall wear Performance Class 3 or better high-visibility clothing for night time activities. Flagger stations shall be illuminated at night according to MUTCD (6F.82). They shall use a Stop/Slow paddle meeting the requirements of the MUTCD (6E.03) for controlling traffic. The Stop/Slow paddles shall have a shaft length of seven feet ($\geq 7'$) minimum. The Stop/Slow paddle shall be retroreflectorized for both day and night usage. In addition to the Stop/Slow paddle, a flagger may use a flag as an additional device to attract attention. This flag shall meet the minimum requirements of the MUTCD (6E.03). The flag shall, as a minimum, be twenty-four inches ($\geq 24''$) square and red or red/orange in color.

D. Flagger Warning Signs

Signs for flagger traffic control shall be placed in advance of the flagging operation, in accordance with the MUTCD and Georgia Standard 9102 "Traffic Control Detail for Lane Closure on Two-Lane Highway". In addition, signs at regular intervals, warning of the presence of the flagger shall be placed beyond the point where traffic can reasonably be expected to stop under the most severe conditions for that day's work.

E. Pilot Vehicle Requirements

Pilot vehicles should be required during placement of bituminous surface treatment or asphaltic concrete on two-lane roadways unless otherwise specified. Pilot vehicles shall meet the requirements of the MUTCD (6C.13).

F. Automated Flagger Assistance Devices

The Contractor may request, in writing, the use of Automated Flagger Assistance Devices (AFAD). The equipment shall meet the requirements of MUTCD (6E.04). As a part of this request, the Contractor shall also submit an alternate temporary traffic TTC plan in the event of a failure of the AFAD. Any alternate plan that requires the use of flaggers shall include the use of certified flaggers. The Contractor shall obtain the approval of the Engineer before the use of any AFAD will be permitted.

G. Portable Temporary Traffic Control Signals

The Contractor may request, in writing, the substitution of portable temporary traffic control signals for flaggers on two-lane two-way roadways provided the temporary signals meets the requirements of the MUTCD, Section 647, and subsection 150.2.11. As a part of this request, the Contractor shall also submit an alternate TTC plan in the event of a failure of the signals. Any alternate plan that requires the use of flaggers shall include the use of certified flaggers. The Contractor shall obtain the approval of the Engineer before the use of any portable temporary traffic control signals will be permitted.

150.3.08 Traffic Signals

A. Responsibility/Cost

If the sequence of operations, staging, or the TTC plan requires the relocation or shifting of any components of an existing traffic signal system then any work on these traffic signals will be considered as part of Traffic Control – Lump Sum.

B. Law Enforcement Officer Requirement

In accordance with Georgia law § 40-6-20, law enforcement officers shall be used to regulate and maintain traffic control at functioning signalized intersections when lane closures or traffic shifts block or restrict movements causing interference with road user flows and will not allow the activated traffic signal to guide the traffic through the signal site.

150.3.09 Mobile Operations

A mobile operation is defined by a minimum speed of three (3) mph. When pavement markings (centerlines, lane lines, and edge lines) are applied in a continuous operation by moving vehicles and equipment, the following minimum equipment and warning devices shall be required. These devices and equipment are in addition to the minimum requirements of the MUTCD.

All vehicles shall be equipped with the official slow moving vehicle symbol sign. All vehicles shall have a minimum of two (2) flashing or rotating beacons visible in all directions. All protection vehicles shall have an arrow panel mounted on the rear. All vehicles requiring an arrow panel shall have, as a minimum, a Type B panel. All vehicle mounted signs shall be mounted with the bottom of the sign a minimum height of forty-eight inches (48") above the pavement. All sign legends shall be covered or removed from view when work is not in progress.

The lead vehicle may be a separate vehicle or the work vehicle applying the pavement markings may be used as the lead vehicle. The lead vehicle shall have an arrow panel mounted so that the panel is easily visible to oncoming (approaching) traffic. The arrow panel should operate in the caution mode.

The work vehicle(s) applying markings shall have an arrow panel mounted on the rear. The arrow panel should typically operate in the caution mode. The work vehicle placing cones shall follow directly behind the work vehicle applying the markings.

A protection vehicle shall follow the last work vehicle at all times and shall be equipped with a truck mounted attenuator that shall be certified for impacts not less than sixty-two (62) mph in accordance with MASH/NCHRP350 Test Level Three (3).

150.3.10 Pavement Markings

A. General

Full pattern pavement markings in conformance with Section 3A and 3B, except 3B.02, of the MUTCD are required on all courses before the roadway is opened to traffic, unless noted in this section. No passing zones shall be marked to conform to Subsection 150.3.10.D.1.b. During construction and maintenance activities on all highways open to traffic, both existing markings and markings applied under this Section shall be fully maintained until Final Acceptance. If the pavement markings are, or become, unsatisfactory in the judgment of the Engineer due to wear, weathering, or construction activities, they shall be restored immediately.

Markings on the final surface course, which must be removed, shall be a removable type. The Contractor will be permitted to use paint, thermoplastic, or tape on pavement which is to be overlaid as part of the Project, unless

otherwise directed by the Engineer. Partial (skip) reflectorization (i.e. reflectorizing only a portion of a stripe) will not be allowed.

1. Resurfacing Projects

Pavement markings shall be provided on all surfaces that are placed over existing markings. Interim and final markings shall conform in type and location to the markings that existed prior to resurfacing unless changes or additions are noted in the Contract. The replacement of parking spaces will not be required unless a specific item or note has been included in the Contract. Any work to make additions to the markings that existed prior to resurfacing is to be considered as extra work.

2. Widening and Reconstruction Projects

If the lane configuration is altered from the preconstruction layout then pavement markings will be as required by the Plans or the Engineer.

3. New Location Construction Projects

Pavement marking plans will be provided.

B. Installation and Removal of Pavement Markings

1. Installation

All pavement markings, both interim and permanent, shall be applied to a clean surface. The Contractor shall furnish the layout and preline the roadway surface for the placement of pavement markings applied as part of the TTC plan. All interim marking tape and RPM's on the final surface shall be removed prior to the placement of the final markings.

The Contractor shall sequence the Work in such a manner as to allow the installation of markings in the final lane configuration at the earliest possible stage of the Work.

2. Removal

Markings no longer applicable shall be removed in accordance with [Section 656](#). The elimination of conflicting pavement markings by overpainting with unapproved paint or any type of liquid asphalt is not acceptable.

3. Intermediate Surface

Interim markings shall be removed by methods that will cause minimal damage to the pavement surface, while also ensuring that traveling public will not be confused or misdirected by any residual markings remaining on the intermediate surface. The use of approved black-out tape and black-out paint (manufactured for the sole purpose of covering existing pavement markings) may be permitted on some interim surfaces, provided the results are satisfactory to the Engineer.

4. Final Surface

No interim paint or thermoplastic markings will be permitted on any final surface unless the interim markings are in alignment with the location of the permanent markings and the interim marking will not interfere or adversely affect placement of the permanent markings. The proposed method of removal for layout errors that require markings to be removed from the final surface shall have the prior approval of the Engineer. Any damage to the final pavement surface caused by the pavement marking removal process shall be repaired at the Contractor's expense by methods acceptable and approved by the Engineer. [Section 400](#) shall apply when corrective measures are required. The use of black-out tape or black-out paint will not be permitted under any circumstance to correct layout errors on any final surface.

Traffic shifts that are done on the final surface shall be accomplished using interim traffic marking tape that can be removed without any blemishing of the final surface. Interim traffic marking tape shall be used on any of the following final surfaces; asphaltic concrete, Portland cement concrete, and bridge deck surfaces. The Contractor may propose alternate traffic markings and removal methods on the final surface. Submitted proposals shall include the type of material, method of removal and a cost comparison to the traffic marking tape method. Prior to any approval, the Contractor shall field demonstrate to the satisfaction of the Engineer that the proposed traffic markings can be removed without any blemishing of the final surface. If the proposal is determined to be acceptable, a supplemental agreement will be executed prior to the installation of the proposed alternate traffic markings. The supplemental agreement shall denote the type of traffic marking materials, method of removal and any cost and/or time savings to the Department. The Department will not consider or participate in any cost increase that may result from implementing the proposed alternate method.

5. Pay Factor Reduction for Asphaltic Concrete Final Surfaces

When the correction of an error in the layout of the final pavement markings requires the final surface to be grounded, blemished, scarred, or polished the pay factor shall be reduced to 0.95 for the entire surface area of the final topping that has a blemish, polished or a scarred surface. The reduced pay factor shall not be confined to only the width and length of the stripe or the dimensions of the blemished areas, the whole roadway surface shall have the reduced pay factor applied. The area of the reduced pay factor shall be determined by the total length and the total width of the roadway affected. If the affected area is not corrected, the reduction in pay shall be deducted from the final payment for the topping layer of asphaltic concrete. The Engineer shall make the final determination whether correction or a reduced pay factor is acceptable.

The eradication of pavement markings on intermediate and final concrete surfaces shall be accomplished by a method that does not grind, polish, or blemish the surface of the concrete. The method used for the removal of the interim markings shall not spall chip the joints in the concrete and shall not damage the sealant in the joints. Any joint or sealant repairs shall be included in the bid price for Traffic Control-Lump Sum. The proposed method of removal shall have the prior approval of the Engineer.

Failure to promptly remove conflicting or non-applicable pavement markings shall be considered as non-performance under Subsection 150.7.01.

6. Preparation and Planning for Traffic Shifts

When shifting of traffic necessitates removal of centerline, lane lines, or edge lines, all such lines shall be removed prior to, during, or immediately after any change to present the least interference with traffic. Interim traffic marking tape shall be used as a temporary substitute for the traffic markings being removed.

Before any change in traffic lane(s) alignment, marking removal equipment shall be present on the project for immediate use. If marking removal equipment failures occur, the equipment shall be repaired or replaced (including leasing equipment if necessary), so that the removal can be accomplished without delay.

Except for the final surface, markings on asphaltic concrete may be obliterated by an overlay course, when approved by the Engineer. When an asphaltic concrete overlay is placed for the sole purpose of eliminating conflicting markings and the in place asphaltic concrete section will allow, said overlay will be eligible for payment only if designated in the Plans. Overlays to obliterate lines will be paid for only once and further traffic shifts in the same area shall be accomplished with removable markings. Only the minimum asphaltic concrete thickness required to cover lines will be allowed. Excessive build-up will not be permitted. When an overlay for the sole purpose of eliminating conflicting markings is not allowed, the markings no longer applicable shall be removed in accordance with Section 656.

C. Raised Pavement Markers

Retroreflective raised pavement markers (RPMs) shall be placed as listed below for all asphaltic concrete pavements before the roadway is open to traffic, unless noted this section. On the final surface, RPMs shall be placed according to the timeframes specified in Subsection 150.3.10.D for full pattern pavement markings. When Portland Cement

Concrete is an intermediate or final surface and is open to traffic, one (1) calendar day is allowed for cleaning and drying before the installation of RPMs is required.

Raised pavement markers are not allowed on the right edge lines under any situation.

Retroreflective raised pavement markers (RPMs) shall be placed and/or maintained on intermediate pavements surfaces on all highways that the final ride surface is not completed within 45 calendar days which is open to traffic. This includes all resurfacing projects along with widening and reconstruction projects. The RPMs shall be placed as follows:

1. Supplementing Lane Lines:
 - a. Eighty foot (80') center on skip lines with curvature less than three degrees. (Includes tangents)
 - b. Forty foot (40') centers on solid lines and all lines with curvature between three degrees and six degrees.
 - c. Twenty foot (20') centers on curves over six degrees.
 - d. Twenty foot (20') centers on lane transitions or shifts.
2. Supplementing Ramp Gore Lines:
 - a. Twenty foot (20') centers, two each, placed side by side.
3. Other Lines:
 - a. As shown on the Plans or directed by the Engineer.

D. Exceptions for Interim Markings

Some exceptions to the time of placement and pattern of markings are permitted as noted below; however, full pattern pavement markings are required for the completed project.

1. Two-Lane, Two-Way Roadways

a. Skip Lines

If used, interim temporary tape or paint skip (broken) stripe may only be used for a maximum of three (3) calendar days. The stripes shall be at least two feet ($> 2'$) long with a maximum gap of thirty-eight feet ($\leq 38'$). On curves greater than six degrees ($> 6^\circ$), a one-foot ($1'$) stripe with a maximum gap of nineteen feet ($\leq 19'$) shall be used. In lane shift areas, solid lines will be required.

Interim raised pavement markers may be substituted for the interim skip (broken) stripes. If raised pavement markers are substituted for the two foot ($2'$) interim skip stripe, three (3) markers spaced at equal intervals over a two feet ($2'$) distance will be required. No separate payment will be made if the interim raised pavement markers are substituted for interim skip lines.

Interim raised pavement markers shall be retro-reflective, shall be the same color as the pavement markers for which they are substituted, and shall be visible during daytime.

The type of interim marker and method of attachment to the pavement shall be approved by the Office of Materials and Testing but in no case will the markers be attached by the use of nails. Flexible reflective markers, Type 14 or Type 15, may be used for a maximum of three (3) calendar days as an interim marker. Any flexible reflective markers in use shall be from the QPL-76.

The interim raised pavement markers shall be maintained until the full pattern pavement markings are applied. At the time full pattern markings are applied the interim raised markers shall be removed in a manner that will not interfere with application of the full pattern pavement markings.

b. No Passing Zones Two-Lane, Two-Way Roadways

Passing zones shall be re-established in the locations existing prior to resurfacing unless otherwise noted in the Contract. No changes to the location of passing zones shall be done without the written approval of the Engineer. For periods not to exceed three (3) calendar days where interim skip centerlines are in place, no-passing zones shall be identified by using post or portable mounted DO NOT PASS regulatory signs (R4-1) twenty-four inches by thirty inches (24" x 30") at the beginning and at intervals not to exceed one-half ($\leq 1/2$) mile within each no-passing zone. A post or portable mounted PASS WITH CARE regulatory sign (R4-2) twenty-four inches by thirty inches (24" x 30") shall be placed at the end of each no-passing zone. Post mounted signs shall be placed in accordance with the MUTCD. Portable signs shall be secured in such a manner to prevent misalignment and minimize the possibility of being blown over by weather conditions or traffic.

On new location projects and on projects where either horizontal or vertical alignments has been modified, the location of No-Passing Zones will be identified by the Engineer.

c. Edge lines

• Bituminous Surface Treatment Paving

Edge lines will not be required on intermediate surfaces (including asphaltic concrete leveling for bituminous surface treatment paving) that are in use for a period of less than sixty (<60) calendar days except at bridge approaches, on lane transitions, lane shifts, and in such other areas as determined by the Engineer. On the final surface, edge lines shall be placed within thirty (≤ 30) calendar days of the time that the final surface was placed.

• All Other Types of Pavement

Edge lines will not be required on intermediate surfaces that are in use for a period of less than thirty (<30) calendar days except at bridge approaches, on lane transitions, lane shifts, and in such other areas as determined by the Engineer. On the final surface, edge lines shall be placed within fourteen (≤ 14) calendar days of the time that the surface was placed.

2. Multi-Lane Highways – With No Paved Shoulder(s) or Paved Shoulder(s) Four Feet or Less ($\leq 4'$)

a. Undivided Highways (Includes Paved Center Turn Lane)

- Centerlines and No-Passing Barrier-Full Pattern centerlines and no-passing barriers shall be restored before opening to traffic.
- Lane lines- Interim skip (broken) stripe as described in Subsection 150.3.10.D.1.a. may be used for periods not to exceed three (≤ 3) calendar days. Skip lines are not permitted in lane shift areas. Solid lines shall be used.
- Edge lines- Edge lines shall be placed on intermediate and final surfaces within three (3) calendar days of obliteration.

b. Divided Highways (Grass or Raised Median)

- Lane lines- Full pattern skip stripe shall be restored before opening to traffic. Skip lines are not permitted in lane shift areas. Solid lines shall be required.

- Centerline/Edge line- Solid lines shall be placed on intermediate and final surfaces within three calendar days of obliteration.
3. Limited Access Roadways and Roadways with Paved Shoulders Greater Than Four Feet (> 4')
- a. Same as Subsection 150.3.10.D.2 except as noted in (b) below.
 - b. Edge lines-
 - Asphaltic Concrete Pavement- Edge lines shall be placed on intermediate and final surfaces prior to opening to traffic.
 - Portland Cement Concrete Pavement- Edge lines shall be placed on any surface open to traffic no later than one calendar day after work is completed on a section of roadway. All water and residue shall be removed prior to daily striping.

4. Ramps for Multi-Lane Divided Highways

A minimum of one solid line edge stripe shall be placed on any intermediate surface of a ramp prior to opening the ramp to traffic. The other edge stripe may be omitted for a maximum period of three (3) calendar days on an intermediate surface. Appropriate channelization devices shall be spaced at a maximum of twenty-five feet (25') intervals until the other stripe has been installed.

The final surface shall have both stripes placed prior to opening the ramp to traffic.

5. Miscellaneous Pavement Markings

a. Final Surface

School zones, railroads, symbols, words and other similar markings shall be placed on final surfaces conforming to Section 652 within fourteen (14) calendar days of completion of the final surface. Final markings shall conform to the type of pay item in the Plans. When no pay item exists in the Plans the final markings shall conform to Section 652 for painted markings.

b. Intermediate Surface

Intermediate surfaces that will be in use for more than forty-five (45) calendar days shall have the miscellaneous pavement markings installed to conform to the requirement of Section 652. Under Subsection 150.6, Special Conditions, or as directed by the Engineer these markings may be eliminated.

c. Stop Line

All stop signs and traffic signals shall have temporary twelve inch (12") stop lines placed in accordance with MUTCD (3B.16) on all surfaces prior to opening to traffic. Temporary tape **may** be used.

150.3.11 Differences in Elevations Between Travel Lanes and Shoulders

All time frames and requirements may be changed with the Engineer's approval.

A. Differences in Elevations

Difference in elevations due to construction between travel lanes and/or shoulders within the clear zone should be limited to the following:

1. Difference of two inches ($\leq 2"$) or less between adjacent travel lanes should remain for a maximum period of fourteen (14) calendar days.

2. Difference of two inches ($\leq 2''$) or less between adjacent travel lane and paved shoulder should remain for a maximum of thirty (30) calendar days. Traffic control devices shall be in accordance with Detail 150-G.
3. Difference of greater than two inches ($> 2''$) is permitted for continuous operations. Traffic control devices shall be in accordance with Detail 150-E.
4. Difference of greater than two inches ($> 2''$) between travel lanes and/or shoulders for non-continuous operations will not be allowed for more than a twenty-four (24) hour period. For the first twenty-four (24) hours, traffic control shall be in accordance with Detail 150-E. After twenty-four (24) hours the section should be healed according to Detail 150-H. This condition can exist for a maximum sixty (60) calendar days.
 - a. A single length of area that does not exceed 1000 feet total length may be left open as a startup area for periods not to exceed forty-eight (48) hours provided the Contractor can demonstrate the ability to complete the Work in a proficient manner. Prior approval of the Engineer shall be obtained before any startup area may be allowed.
 - b. For cement stabilized base, work adjacent to the travel lane and/or shoulders shall be healed as per Detail 150-H within forty-eight (48) hours after the seven (7) calendar day curing period is complete for each section placed. During the placement and curing period, traffic control shall be in accordance Detail 150-E.

Failure to meet these requirements shall be considered as non-performance of Work under Subsection 150.7.01.

B. Healed Section

Healed section and traffic control devices should be placed in accordance with Detail 150-H. If crushed stone materials are used to provide a healed section no separate payment will be made for the material used to heal any section. The Contractor may submit a plan to utilize existing pay items for crushed stone provided the plan clearly demonstrates that the materials used to heal an area will be incorporated into the Work with minimal waste. Handling and hauling of any crushed stone used to heal shall be kept to a minimum. The Engineer shall determine if the crushed stone used to heal meets the Specifications for gradation and quality when the material is placed in the final location.

C. Emergency Situations

Inclement weather, traffic accidents, and other events beyond the control of the Contractor may prevent the Work from being completed as required above. The Contractor shall notify the Engineer in writing stating the conditions and reasons that have prevented the Contractor from complying with the time limitations. The Contractor shall also outline a plan detailing immediate steps to complete the Work. Failure to correct these conditions on the first calendar day that conditions will allow corrective work shall be considered as non-performance of Work under Subsection 150.7.01.

D. Plating

Plating for drainage structures, utility facilities, etc. is prohibited on the interstates. Plating on State Routes and secondary roads will require the prior approval of the project Engineer. Steel plates shall not be used on highways with a posted speed greater than forty-five (45) mph. The plate shall completely cover the pavement cut or excavation. The plate shall be adequately secured and shall provide a safe and reasonable transition to the adjoining roadway surface. An asphalt wedge can be used to provide a smooth transition over the plate(s). Temporary traffic control warning signs W8-24 shall be posted in advance warning motorist about plates in roadway in accordance with the MUTCD. Plating should not remain in place for more than four (4) calendar days.

E. Asphaltic Concrete Resurfacing Projects

1. Shoulder Construction Included as a Part of the Contract

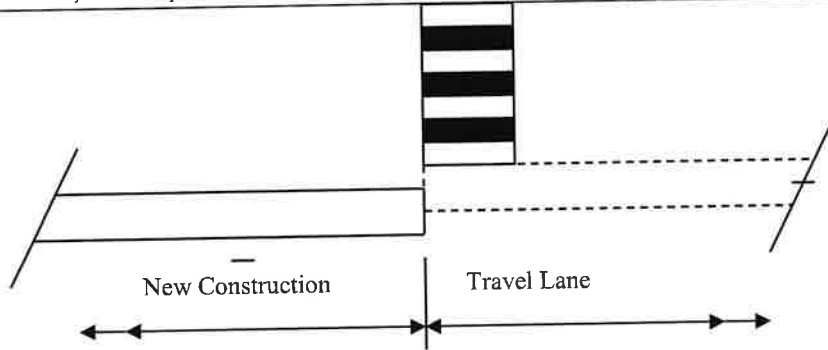
When the placement of asphaltic concrete materials creates a difference in elevation greater than two inches (> 2") between the earth shoulder (grassed or un-grassed) and the edge of travel lane or between the earth shoulder and a paved shoulder that is less than four feet (< 4') in width, the Contractor shall place and maintain drums in accordance with the requirements of Subsection 150.2.04.B.3. When the edge of the paved surface is tapered with a safety edge, drums may be spaced at two (2) times the speed limit in MPH. Drums shall remain in place and be maintained until the difference in elevation has been eliminated by the placement of the appropriate shoulder materials.

2. Shoulder Construction Not Included as a Part of the Contract

When the placement of asphaltic concrete materials creates a difference in elevation greater than two inches (> 2") between the earth shoulder (grassed or un-grassed) and the edge of travel lane or between the earth shoulder and a paved shoulder that is less than four feet (< 4') in width, the Contractor shall notify the Engineer, in writing, when the resurfacing work including all corrective list items has been completed.

Drums spaced at twenty foot (20') intervals. **Note:** If the travel way width is reduced to less than ten feet (< 10') by the use of drums, vertical panels shall be used in lieu of drums.

Location of drums when Elevation Difference exceeds four inches (> 4")

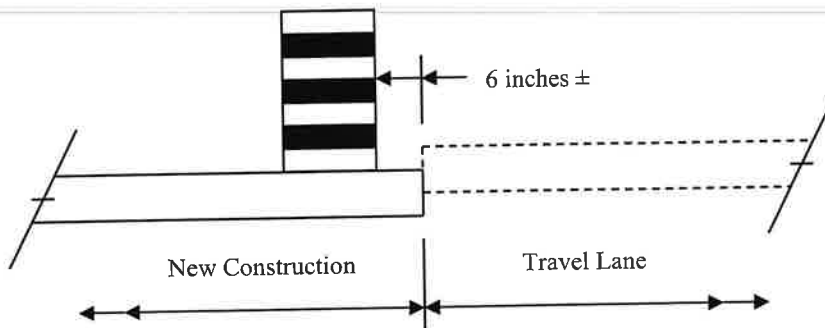


ELEVATION DIFFERENCE GREATER THAN FOUR INCHES (> 4")

DETAIL 150-E

Drums spaced at forty foot (40') intervals.

Location of drums when Elevation Difference is greater than two inches (> 2") to four inches (4")

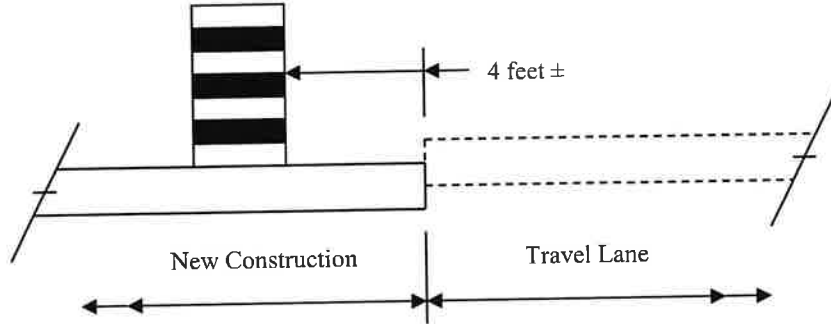


ELEVATION DIFFERENCE GREATER THAN TWO INCHES (> 2") TO FOUR INCHES (4")

DETAIL 150-F

Drums spaced at eighty foot (80') intervals.

Location of drums when Elevation Difference is two inches ($\leq 2''$) or less.



ELEVATION DIFFERENCE OF TWO INCHES ($\leq 2''$) OR LESS

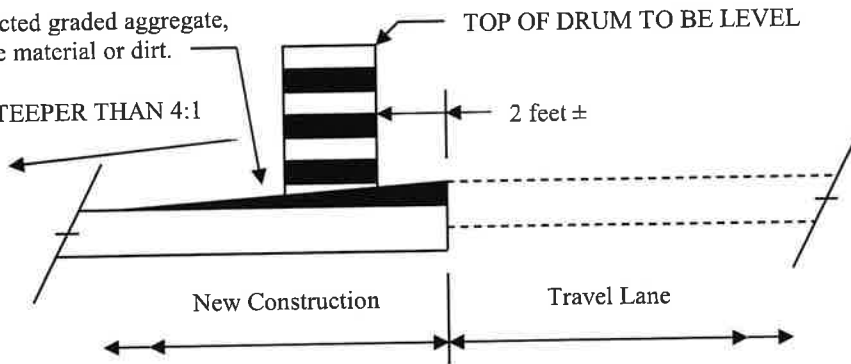
DETAIL 150-G

Location of drums immediately after completion of healed sections spaced at 40 foot (40') intervals

Healed Section

Compacted graded aggregate, subbase material or dirt.

NO STEEPER THAN 4:1



HEALED SECTION

DETAIL 150-H

150.3.12 Work Zone Law Enforcement

Work zone law enforcement consists of utilizing a uniformed law enforcement officer equipped with patrol vehicle and blue flashing lights to enforce traffic laws in construction work zones and the administration of this service. Payment for work zone law enforcement will be made only for the utilization in work zones during lane closures, traffic pacing, or other activities that occur within travel lanes. The Contractor will be responsible for negotiating a rate of reimbursement and making reimbursement to that law enforcement agency.

The Contractor will be responsible for coordinating and scheduling the utilization of the work zone law enforcement. The Engineer may require the use of work zone law enforcement at specific times and locations.

Work zone law enforcement will be required in all work zones during lane closures, traffic pacing, or other activities that occur within travel lanes on the interstate.

150.4 Measurement

150.4.01 Traffic Control Items

A. Traffic Control

When listed as a pay item in the Proposal, payment will be made at the lump sum price bid, which will include all traffic control not paid for separately, and will be paid as follows:

When the first Construction Report is submitted, a payment of twenty-five percent (25%) of the lump sum price will be made. For each progress payment thereafter, the total of the Project percent complete shown on the last pay statement plus twenty-five percent (25%) will be paid (less previous payments), not to exceed one hundred percent (100%).

When no payment item for Traffic Control-Lump Sum is shown in the Proposal, all of the requirements of Section 150 and the Temporary Traffic Control Plan shall be in full force and effect. The cost of complying with these requirements will not be paid for separately, but shall be included in the overall bid submittal.

B. Changeable Message Sign, Portable

Portable changeable message sign will be measured as specified in [Section 632](#).

C. Flashing Beacon Assembly

Flashing beacon assemblies will be measured as specified in [Section 647](#).

D. Pavement Markings

Pavement markings will be measured as specified in Section 150.

E. Portable Impact Attenuators

Each portable impact attenuator will be measured by the unit/array which shall include all material components, hardware, incidentals, labor, site preparation, and maintenance, including spare parts recommended by the manufacturer for repairing accident damage. Each unit will be measured only once regardless of the number of locations installed, moves required, or number of repairs necessary because of traffic damage. Upon completion of the project, the units shall be removed and retained by the Contractor.

F. Signs

When shown as a pay item in the Contract, interim special guide signs will be paid for as listed below. All other regulatory, warning, and guide signs, as required by the Contract, will be paid for under Traffic Control Lump Sum or included in the overall bid submitted.

1. Interim ground mounted or interim overhead special guide signs will be measured for payment by the square foot. This payment shall be full compensation for furnishing the signs, including supports as required, erecting, illuminating overhead signs, maintaining, removing, re-erecting, and final removal from the Project. Payment will be made only one time regardless of the number of moves required.
2. Remove and reset existing special guide signs, ground mount or overhead, complete, in place, will be measured for payment per each. Payment will be made only one time regardless of the number of moves required.
3. Modify special guide signs, ground mount or overhead, will be measured for payment by the square foot. The area measured shall include only that portion of the sign modified. Payment shall include materials, removal from posts or supports when necessary, and remounting as required.

G. Temporary Audible Information Device

Temporary audible information devices are measured as the actual number furnished and installed in accordance with the manufacturer's recommendations, which shall include all necessary materials, equipment, labor, site preparation, maintenance and removal. Each temporary audible information device will be paid for only one time regardless of the number of times it's reused during the duration of the Work. These devices shall remain the property of the Contractor.

H. Temporary Barrier

Temporary barrier shall be measured as specified in Sections 620.

I. Temporary Curb Cut Wheelchair Ramps

Temporary curb cut wheelchair ramps are measured as the actual number formed and poured, complete and accepted, which shall include all necessary materials, equipment, labor, site preparation, maintenance and removal. No additional payment will be made for sawing existing sidewalk and removal and disposal of removed material for temporary wheelchair ramp construction. No additional payment will be made for constructing the detectable warning surface.

J. Temporary Guardrail Anchorage, Type 12

Temporary guardrail anchorage- Type 12 will be measured by each assembly, complete in place and accepted according to the details shown in the Plans, which shall also include the additional guardrail and appurtenances necessary for transition and connection to temporary concrete barrier. Payment shall include all necessary materials, equipment, labor, site preparation, maintenance and removal.

K. Temporary Walkways with Detectable Edging

Temporary walkways with detectable edging will be measured in linear feet (meters), complete in place and accepted, which shall include all necessary materials, equipment, labor, site preparation, temporary pipes, passing spaces, maintenance and removal. Excavation and backfill are not measured separately for payment. No payment will be made for temporary walkways where existing pavements or existing edging (that meets the requirements of MUTCD) are utilized for the temporary walkway. Payment for temporary detectable edging, including approved barriers and channelizing devices, installed on existing pavement shall be included in Traffic Control-Lump Sum.

L. Traffic Signal Installation- Temporary

Temporary traffic signal installation will be measured as specified in Section 647.

M. Work Zone Law Enforcement

When work zone law enforcement is shown as a pay item, work zone law enforcement will be measured for payment by the hour. The Contractor shall provide a daily work record containing the actual number of hours charged by the law enforcement officer. The daily work record shall be compiled on a form provided by the Department, signed by the law enforcement officer, signed by the Contractor's Worksite Traffic Control Supervisor attesting that the law enforcement was utilized during the time recorded, and then submitted to the Engineer.

Work zone law enforcement will be measured for payment by the hour up to the maximum number of hours included in the Contract. The Engineer may at his discretion increase the maximum number of hours.

Payment shall be full compensation for reimbursing the law enforcement agency and for all cost incurred by the Contractor in coordinating, scheduling, and administering the item work zone law enforcement.

If no work zone law enforcement pay item is included in the Contract, then all work zone law enforcement cost shall be included in Traffic Control – Lump Sum.

150.5 Reserved

150.6 Special Conditions

Special Conditions, if used, will be included elsewhere in the Contract.

150.7 Payment

When shown in the Schedule of Items in the Proposal, the following items will be paid for separately. Payment will be made under:

Item No. 150	Traffic control -	Lump Sum
Item No. 150	Traffic control, solid traffic stripe __ inch, (color)	Per linear mile
Item No. 150	Traffic control, skip traffic stripe __ Inch, (color)	Per linear mile
Item No. 150	Traffic control, solid traffic stripe, thermoplastic 24 inch, color	Per linear mile
Item No. 150	Traffic control, raised pavement markers –all types	Per each
Item No. 150	Remove and reset, existing special guide signs, overhead, complete-in-place	Per each
Item No. 150	Temporary walkways with detectable edging	Per linear foot
Item No. 150	Temporary curb cut wheelchair ramps	Per each
Item No. 150	Temporary audible information device	Per each
Item No. 150	Work Zone Law Enforcement	Per hour

150.7.01 Enforcement and Adjustments

The safe passage of pedestrians and traffic through and around the temporary traffic control zone, while minimizing confusion and disruption to traffic flow, shall have priority over all other Contractor activities. Continued failure of the Contractor to comply with the requirements of Section 150 - Traffic Control will result in non-refundable deductions of monies from the Contract as shown in this Subsection for non-performance of Work.

Failure of the Contractor to comply with this Specification shall be reason for the Engineer suspending all other work on the Project except erosion control and traffic control, taking corrective action as specified in Section 105, and/or withholding payment of monies due to the Contractor for any work on the Project until traffic control deficiencies are corrected. These other actions shall be in addition to the deductions for non-performance of traffic control.

SCHEDULE OF DEDUCTIONS FOR EACH CALENDAR DAY OF DEFICIENCIES OF TRAFFIC CONTROL INSTALLATION AND/OR MAINTENANCE		
ORIGINAL TOTAL CONTRACT AMOUNT		
From More Than	To and Including	Daily Charge
\$0	\$100,000	\$250
\$100,000	\$1,000,000	\$650
\$1,000,000	\$5,000,000	\$1,300
\$5,000,000	\$20,000,000	\$2,000
\$20,000,000	\$40,000,000	\$2,600
\$40,000,000	\$-----	\$4,000

Section 205—Roadway Excavation

205.1 General Description

Roadway excavation shall conform to the lines, grades, and cross-sections shown on the Plans or established by the Engineer.

If artifacts of historical or archaeological significance are encountered, temporarily stop excavation operations until directed by the Engineer. See Subsection 107.13.A.

Roadway excavation includes the following:

- Excavating, hauling, and placing or disposing of materials (not removed under another Contract Item) from within the limits of areas designated in the Contract.
- Excavating ditches (except channel excavation) and filling and/or plugging abandoned wells (both dug and drilled) located within the Right-of-Way and construction easements according to Georgia Standard 9031H.
- Removing paving, aggregates, and ballast not incorporated into the new work as a result of alignment shifts, grade changes, or reasons that may or may not be shown on the Plans.
- Salvaging aggregates, paving, (only if designated on the Plans) and removed railroad ballast.
- The Department claims salvaged materials unless the Engineer directs that materials be wasted. Dispose of materials not salvaged. Stockpile salvaged materials on the Project unless other sites for stockpiling are shown on the Plans.

205.1.01 Definitions

General Provisions 101 through 150.

205.1.02 Related References

A. Related Specifications

Section 107—Legal Regulations and Responsibility to the Public

Section 109—Measurement and Payment

Section 201—Clearing and Grubbing Right-of-Way

Section 202—Random Clearing and Grubbing

Section 208—Embankments

Section 209—Subgrade Construction

Section 411—Asphaltic Concrete Pavement, Partial Removal

Section 610—Removal of Miscellaneous Roadway Items

B. Related Documents

General Provisions 101 through 150.

205.1.03 Submittals

General Provisions 101 through 150.

Section 205 — Roadway Excavation

205.2 Materials

Define excavated material, regardless of its nature or composition, as “unclassified excavation” unless otherwise specified in the Plans.

The Engineer will designate materials that are unsuitable.

205.2.01 Delivery, Storage, and Handling

A. Disposal of Surplus Material

Unless directed by the Engineer, do not waste excavated material until satisfying embankment and backfill requirements, unless material is designated on the Plans as “Unsuitable for embankment or backfill construction.”

Dispose of materials to be wasted according to Subsection 201.3.05.E and the following information:

- Use suitable surplus material to widen embankments uniformly or to flatten fill slopes, or deposit the material in places on the Right-of-Way as directed by the Engineer.
- Do not leave an unsightly pile of material that will damage abutting property or deposit material above the grade of the adjacent roadway unless so directed by the Engineer.
- Do not place the edge of a waste bank nearer than 10 ft. (3 m) from the top of a cut slope.

Dispose of unsuitable and surplus materials unless they are used as fill for slopes, abandoned ditches, or other areas shown on the Plans.

- Deposit unsuitable material excavated from ditches and do not allow it to remain within 3 ft (1 m) of the ditch edge. Spread material neatly in level, uniform layers.
- Use suitable materials from ditches for constructing roadway embankments unless otherwise directed by the Engineer.

B. Waste Disposal Areas

When unable to dispose of unsuitable or surplus excavation material on the Right-of-Way, dispose of it in the following areas:

1. Disposal Areas Shown on Plans

Check disposal areas shown on the Plans. They may or may not be adjacent to the Right-of-Way.

When shown on the Plans, the Department will obtain Right-of-Way or easement to permit disposal of material. The Plans contain the amounts of royalties and the conditions for the acquiring of the waste easement.

When the Department furnishes the waste areas, and the Engineer provides measurements of the area used, do the following:

- a. Promptly pay royalties to the owners of waste pits.
- b. Meet other conditions agreed to with the owners.
- c. Submit to the Engineer a written statement signed by the owner stating that the owner has been paid in full and the agreed conditions, including proper draining and final clean-up, have been fulfilled to the owner's satisfaction before receiving final payment from the Department.

The Department will not make separate payment for these costs of acquisition.

If the property owner is not paid within 60 days after the Engineer has furnished the measurement, the Department may pay the property owner directly any amounts due, and deduct it from funds due the Contractor.

This provision does not affect the obligation of the Contractor under his bond or the rights of the property owner or the Department under the bond.

In case of dispute between the Contractor and the Department, the Chief Engineer will make the final and conclusive decision.

When disposal areas are shown on the Plans and are elected to be used, comply with the terms of the option before resorting to other areas.

Section 205 — Roadway Excavation

2. Disposal Areas Not Shown on Plans

When waste disposal areas are not shown on the Plans, obtain suitable disposal areas at no expense to the Department.

Exercise the right to sell or otherwise dispose of the surplus material in these cases. (See Subsection 107.22 and Subsection 107.23.)

3. Reclamation

Reclaim disposal areas according to Section 160.

205.3 Construction Requirements

205.3.01 Personnel

General Provisions 101 through 150.

205.3.02 Equipment

General Provisions 101 through 150.

205.3.03 Preparation

General Provisions 101 through 150.

205.3.04 Fabrication

General Provisions 101 through 150.

205.3.05 Construction

Perform roadway excavation according to the Plans, and all of the requirements of this Subsection.

1. Provide adequate openings in spoil banks to allow the adjacent land surface to drain.
2. To carry water from the side hill, cut surface ditches at the top of cut slopes that extend to each end of the cuts.
3. Turn side ditches or gutters that empty from cuts to embankments outward to avoid embankment erosion.
4. Discharge water from surface ditches at terraces or in tail ditches cut along contour lines (wherever possible).
5. Provide outlets or flumes for roadway ditches where necessary according to the Plans.
6. Surface ditches, outlets, and other such ditches will be paid for as "unclassified excavation."
7. Uniformly round the intersection of cut slopes with natural ground surfaces, including the beginning and end of cut slopes.
8. Bring cut slopes to the grade and cross-section shown on the Plans or established by the Engineer.
9. Finish to reasonably uniform surfaces acceptable for seeding and mulching operations.
10. Dispose of material from slides and overbreaks that occur before Final Acceptance as directed by the Engineer.

A. Constructing Serrated Slopes

Construct serrated slopes as follows:

1. Grade the backslope according to the Construction Detail.
The pay line is the template line or the final staked cross-section slope line. The Department will not make additional measurement or payment for constructing serrated slopes.
2. Start the first serration (step) as designated on the Construction Detail. Ensure that it is level instead of parallel to the roadway grade.
3. Use the tilt-control blade bulldozer to cut steps in alternate directions.

Section 205 — Roadway Excavation

B. Constructing Non-serrated Slopes

Construct non-serrated slopes by leaving the front and back slopes in a roughened condition to provide a seed bed for temporary or permanent grassing operations.

C. Erosion and Siltation Control

Take the measures necessary throughout the Project to control erosion and to prevent silting of rivers, streams, and impoundments. Construct drainage facilities and perform all other construction work that contributes to erosion and siltation control in conjunction with earthwork operations as required by Section 161.

D. Rock Excavation

Remove rock and dispose of it as shown on the Plans or as directed by the Engineer. Transition any flattening of a cut slope already begun when rock is encountered to ensure the cut has a pleasing appearance.

Use the presplitting technique to reduce overbreakage and to establish a free surface or shear plane in the rock along the cut periphery or proposed break lines.

- Presplit a periphery plane to the excavation depth before blasting within the plane.
- Conduct the presplitting process by drilling appropriately sized holes at intervals that will ensure a neat break, to the desired depth, along the plane of the proposed cut. Load and stem the holes with an appropriate light charge explosive, and detonate the explosives simultaneously.
- Allow an 18 in. (450 mm) offset in the slope to begin succeeding drilling operations when the depth of the cut is more than can be drilled from the top.

Create a relatively smooth shear plane as indicated in the Plans with localized irregularities that do not exceed 2 ft. (600 mm) behind or 1 ft. (300 mm) in front (roadway side) of the plane surface.

Do not presplit slopes flatter than 1:1.

1. Overbreakage

Material that is excavated beyond or below the cross-section shown on the Plans or designated will be at the Contractor's expense, except unavoidable overbreakage in solid rock. The allowable overbreakage is a maximum of 2 ft. (600 mm) below or outside the original template lines. Backfill to replace material removed below the limits specified at no expense to the Department.

2. Precautions

See Use of Explosives in Subsection 107.12.

3. Rock and Boulders

Handle rock and boulder excavation as follows:

- a. Excavate solid rock and boulders in the roadbed to at least 1 ft (300 mm) below the finished subgrade elevation and backfill the space to the correct grade with suitable subgrade material.
 - b. Leave the side slopes of rock cuts with uniform faces whether or not the excavation is carried beyond the specified side slope.
 - c. Remove loose rock on cut slopes immediately after blasting.
 - d. Place stones, broken rock, and boulders found within the construction limits and not required for other construction, into embankment slopes when possible.
4. Ensure that sloped surfaces conform to the typical section shown on the Plans or to natural cleavage planes compatible with the typical section. Leave sloped surfaces safe and natural looking.

E. Unsuitable Material Excavation

The Engineer may require unsuitable material be removed from its location.

1. Remove material and backfill with properly compacted approved material.
2. Undercut material to the depth shown on the Plans or established by the Engineer in cut areas where the material is not suitable for subgrades or shoulders. Backfill the area with suitable material.
3. Excavate unsuitable material in roadway cuts and dispose of the material as directed by the Engineer.

Section 205 — Roadway Excavation

The Department will not designate the unsuitable material excavation as a separate Pay Item unless specifically designated on the Plans, but will pay for it as "Roadway Excavation—Unclassified."

F. Obliteration of Old Roads

Obliterate old roads or other areas by completing the following work as directed by the Engineer:

- Obliterate discontinued roads or other areas inside or outside the Project construction limits.
- Grade, scarify, plow, and harrow obliterated areas.

The Department will pay for excavation (other than that necessary for finishing and dressing) as "roadway excavation—unclassified." Follow this procedure to obliterate the road:

1. Fill old ditches and grade the roadway after the old road is no longer needed for traffic. Restore the original contour of the ground and produce a surface of naturally rounded slopes.
2. Use borrow required for the new roadway from fills in the old road (where feasible).
3. Place surplus and waste material from the new roadway in cuts in the old road (where feasible).
4. Break down and remove or bury old structures not required to maintain drainage flow. Remove and store material with salvage value, or use it in the new construction.
5. Scarify, harrow, and smooth the old surface. Re-grass disturbed areas or establish a vegetative cover according to Section 160 or Section 700 as applicable.

G. Surcharge Removal

Remove and properly dispose of materials placed as surcharge for consolidation or other purposes.

1. Waste the material removed or use it for other purposes as specified on the Plans or in the Special Provisions.
2. Provide other areas for disposal if adequate areas are not available for disposing of excess surcharge within the Right-of-Way.

H. Use of Select Materials

Conserve and use excavated materials suitable for subgrade, shoulder construction, plant topsoil, blanket for fill slopes, or other purposes as directed by the Engineer according to Subsection 104.06.

1. Reserve suitable material by either leaving it in its original position or stockpiling it as directed by the Engineer.
2. Haul select materials directly from the excavation area to the final placement area whenever possible. Do not stockpile materials unless specifically directed.

The Department will again pay for "roadway excavation—unclassified," which includes necessary hauling and placement, when the material is removed from the stockpile.

I. Final Finishing of Roadway

After excavation has been completed use the following procedure to finish the roadway:

1. Shape the surface of the roadbed and slopes to reasonably true grade alignment and cross-section shown on the Plans or established by the Engineer. Finish according to Section 209.
2. Leave cut slope surfaces in rock reasonably uniform and remove loose overhanging rock.
3. Open all ditches, drains, and culverts constructed to effectively drain the roadway.
The Department will make no separate payment for finishing done under this Section. Include the work in the cost of the roadway excavation.
4. Maintain the excavated areas until final acceptance of the Project.

205.3.06 Quality Acceptance

General Provisions 101 through 150.

205.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

Section 205 — Roadway Excavation

205.4 Measurement

Original ground surface measurements will be obtained using conventional methods, photogrammetric means, or a combination of these methods. The Engineer will determine the method(s) and time when the measurements are to be taken for each Project.

The volume of Roadway Excavation—Unclassified, authorized and accepted by the Engineer, will be computed by the method of average end areas, or other acceptable means, using the original ground surface, the final ground surface, cross-section, or approved templates.

The final ground surface will be obtained from conventional field measurements, as-built templates, photogrammetric means, or a combination of these methods. The Engineer will determine the method(s) to be used on each Project.

The measurement will include:

- Overbreakage and slides in roadway excavation, unless they are caused by Contractor negligence
- Authorized excavation of rock or unsuitable material below template grade
- Material re-excavated from stockpiles and used in construction as directed by the Engineer
- Surcharge removal

Excavation outside of staked lines and slopes will never be measured for payment unless ordered or approved by the Engineer.

Ditch excavation will be measured as specified in paragraph one, above.

Retaining wall construction will be measured to the back and bottom of the select material backfill or footing as the Engineer determines. Any exception outside these lines by the Grading Contractor to provide stable slopes and positive drainage will not be measured and will be considered incidental to the work.

Filling or plugging abandoned wells will not be measured for payment but all costs shall be included in the price bid for Roadway Excavation when Item 205 is shown as a pay item. Otherwise all costs shall be included in the overall contract bid price.

Removing paving, aggregates, and ballasts will be measured and included in the computations for roadway excavation when Section 205 is shown as a pay item (unless those items are shown in the Plans as a separate pay item).

205.4.01 Limits

General Provisions 101 through 150.

205.5 Payment

Removing paving, aggregates, and ballast will be paid for at the Contract Price bid per cubic yard (meter) when Item 205 is shown as a Pay Item, unless the items are shown in the Plans as a separate Pay Item.

The Department will withhold a percentage of the progress payments for the estimated quantity of earthwork (not to exceed 5 percent) until final dressing, subgrade construction, and satisfactory disposal of unsuitable or surplus materials is completed. This percentage withheld shall be in addition to that specified in Subsection 109.07.

The Contract Price per cubic yard (meter) for "roadway excavation—unclassified" will be paid for quantities of excavation measured according to Subsection 205.4. Payment is full compensation for

- Excavating, hauling, placing, and compacting excavated material.
- Removing, loading, hauling, stockpiling as designated, and sawing pavement when payment is included under Item 205.
- Pre-splitting rock, disposing of unsuitable or surplus materials, excavating, shaping, disposing of unsatisfactory excavated materials, maintaining ditches (except channel excavation specified in Section 204), constructing subgrades and shoulders, and finishing, dressing, and maintaining the work until Final Acceptance.

Payment will be made under:

Section 205 — Roadway Excavation

Item No. 205

Unclassified excavation

Per cubic yard (meter)

205.5.01 Adjustments

General Provisions 101 through 150.

**DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA**

SUPPLEMENTAL SPECIFICATION

Section 315—Cement Stabilized Reclaimed Base Construction (CSRB)

Replace Section 315 with the following:

315.1 General Description

This work includes constructing a cement stabilized base course by pulverizing the existing flexible pavement, underlying base and subgrade, and mixing with Portland cement. Construct according to these specifications and to the lines, grades, thickness, and typical cross-sections shown on the plans or established by the Engineer.

315.1.01 Related References

General Provisions 101 through 150

A. Standard Specifications

Section 109—Measurement and Payment

Section 301—Soil Cement Construction

Section 412—Bituminous Prime

Section 814—Soil Base Materials

Section 821—Cutback Asphalt

Section 824—Cationic Asphalt Emulsion

Section 830—Portland Cement

Section 880—Water

B. Referenced Documents

GDT 19 – Determining Maximum Density of Soil-Cement mixtures

GDT 20 – Determining Field Density of soils with <45% retained on the No. 10 sieve and < 10% retained on the 1 in. sieve

GDT 21 - Determining Field Density of soils containing >45% retained on the No.10 sieve or >10% retained on the 1 in. sieve

GDT 59 - Testing Density of roadway materials with Nuclear Gauge

GDT 65 – Laboratory Design of Soil-Cement and Cement Stabilized Graded Aggregate

GDT 67 – Family of Curves Method for determining Maximum Density of soils

GDT 86 – Determining the compressive strength of Cement Stabilized Base cores taken from the roadway

Section 315 — Cement Stabilized Reclaimed Base Construction (CSRB)

315.1.02 Submittals

Prior to construction, submit a Construction Work Plan to the Engineer consisting of the proposed equipment, materials, and operation procedures. If the Engineer determines that the work plan is not satisfactory, revise the procedures and augment or replace equipment, as necessary, to complete the work.

315.1.03 Mix Design

The Contractor shall submit a mix design to the Office of Materials and Testing for approval at least three weeks prior to construction. The Mix Design process shall be completed in accordance with GDOT Test Method/GDT 65 by an accredited materials laboratory. The sampling, testing, proportioning, and documentation shall be completed by an accredited materials laboratory. The Contractor will be responsible for ensuring that appropriate traffic control measures are in place during the sampling operations. In-place samples of the road structure shall be taken at a minimum frequency of 1000 ft. (300m) per two lanes; alternating the sample locations to achieve a sample every 500 lane-feet (152m). Additional samples may be needed to represent material changes and/or problem areas. Each sample shall contain at least 30 lbs. (14kg) of proportionally blended materials to be reclaimed. The Portland cement used in the design process must be from an approved source listed on GDOT's Qualified Products List/QPL3 and representative of the same material to be used in construction.

The mix design submittal to the Office of Materials and Testing shall include the following:

1. Approximately 100 lbs. (45kg) of proportionally blended material from all in-place samples taken from the roadway.
2. A one-gallon sample (plastic container) of the stabilizer used in the mix design.
3. All Test Data (charts, graphs, spreadsheets, etc.) along with design parameters. Test data should include the target gradation of the blended material, optimum moisture content of mixing, and application rate of the stabilizer to meet the design requirements.

Note: Since the Mix Design is based on source specific materials, any changes to materials or sources will render the design invalid.

315.2 Materials

Ensure that materials meet the requirements of the following GDOT Standard Specifications:

Material	Section
Blotter material (sand)	412.3.05.G.3
Soil Base Material	814.2.02
Cutback asphalt, RC-30, RC-70, RC-250 or MC-30, MC-70, MC-250, CSS-1h, AE-P, CRS-2	821.2.01
Portland Cement (Type I or Type II)	830.2.01
Water	880.2.01

Section 315 — Cement Stabilized Reclaimed Base Construction (CSRB)

315.3 Construction Requirements

315.3.01 Personnel

Ensure that only experienced and capable personnel operate equipment.

315.3.02 Equipment

Equipment used in CSRB construction must meet the following requirements and be approved by the Engineer prior to the beginning of construction. All equipment shall be in satisfactory condition and capable of its intended purpose. The Engineer may at any time reject any equipment that is deemed unsafe, erratic, or produces an inadequate performance.

Note: Equipment type, size, operation and condition are subject to the Engineer's approval and must be adjusted and/or replaced upon their request.

A. Reclaimer

CSRB will require a reclaimer unit that meets the following requirements:

1. Designed expressly for reclamation capable of pulverizing and mixing through asphaltic pavement, granular/soil base, Subbases, and subgrade down to depths of at least 12 in. (300mm).
2. Having a cutting drum with a minimum width of 8 ft. (2m).
3. Capable of continuously mixing materials to a homogenous blend and at a consistent depth.
4. Powered by an engine of at least 500 horsepower with steerable front and rear wheels.
5. Controlled by an electronic metering system capable of injecting mix water directly into the mixing chamber and has automatic sensors to monitor water application and mixing depth.

B. Spreader

For CSRB construction, use a cyclone-type mechanical spreader or its equivalent that will spread Portland cement in a relatively dust-free process. Spreader must have an electronic or mechanical metering system which monitors the application rate.

Note: The use of pneumatic tubes to transfer cement or lime directly onto the roadway will not be allowed.

C. Additional Equipment (Water Truck, Compaction and Grading equipment, and Prime Distributer)

Additional equipment necessary to complete the work must be in satisfactory condition and proper for its intended purpose. Compactive equipment includes a sheep's foot roller, vibratory steel wheel roller and a pneumatic rubber tire roller. Use the correct size/type rollers or combination thereof that is capable of achieving the required density. A pressure distributor that complies with GDOT Standard Specifications/Subsection 424.3.02.B will be required to apply the bituminous prime coat.

Note: Equipment type, size, operation and condition are subject to the Engineer's approval and must be adjusted and/or replaced upon their request.

315.3.03 Preparation

Prior to commencing reclaiming operations, blade grass and excess soil a minimum of 12 in. (300mm) from the edge of pavement. Locate, mark and preserve existing centerline, manholes, and utilities (gas, water, and electric lines). Relocate mailboxes and other appurtenances within such proximity to the roadway as to risk damage or interfere with the work. Remove sections of driveway aprons in the right-of-way where necessary to permit the reclaimer to operate without damaging the machinery or driveway pavement. If necessary, saw-cut a neat parallel line to the proposed edge of pavement and remove the concrete along the road. After all work is complete, replace appurtenances to their original location as nearly as possible.

Section 315 — Cement Stabilized Reclaimed Base Construction (CSRB)

315.3.04 Construction

A. Weather Limitations

1. Mix only when the weather permits the course to be finished without interruption and within the time specified.
2. Mix materials only when the moisture of the materials to be used in the mixture meets the specified limits.
3. Begin mixing only when the air temperature is above 40°F in the shade and rising.

B. Moisture Adjustment

Adjust the moisture content of the roadway materials to within 100 to 120 percent of the optimum moisture immediately before spreading the cement. The optimum moisture content is determined by the Job Mix Design and can be adjusted by the Engineer.

C. Cement Application

1. Apply cement on days when wind will not interfere with spreading.
2. Apply cement at the rate specified on the Job Mix Design (as established by GDT-65) and mix to the depth shown on the Plans. The Engineer may alter the spread rate during the progress of construction if necessary. Maintain the application rate within ± 10 percent of that specified by the Engineer.
3. Provide both equipment and personnel to measure the application rate of cement placed. Each tanker of cement shall be checked by using a square yard cloth/certified scales and by determining the overall coverage area of each tanker. Multiple checks may be necessary to ensure that the spread rate is maintained within the ± 10 percent limit.
4. If the cement content falls below the 10 percent limit in the mixing area, add additional cement to bring the affected area within the tolerance specified, make necessary adjustments to the spreader, and perform additional checks to ensure the problem is corrected. If the cement content is more than the 10 percent limit in the mixing area, the excess quantity will be deducted from the Contractor's pay for cement.
5. Regulate operations to limit the application of cement to sections small enough so that all of the mixing, compacting, and finishing operations can be completed within the required time limits.
6. Pass only spreading and mixing equipment over the spread cement and operate this equipment so that it does not displace cement.
7. Replace damaged cement at no cost to the Department when damage is caused by:
 - a. Hydration due to rain, before or during mixing operations.
 - b. Spreading procedures are contrary to the requirements stated above.
 - c. Displacement by the Contractor's equipment or other traffic.

D. Mixing

1. Begin mixing as soon as possible after the cement is spread and continue until a homogeneous and uniform mixture is produced. The Engineer at any time may require adjustments or replacement of equipment if a homogeneous and uniform mixture conforming to these Specifications is not achieved.
2. Continue pulverizing until the base mixture is uniform in color and conforms to the following gradation requirements:
 - a. 100 percent passing the 3 in. sieve (76.1mm) or the natural size of the in-situ aggregate.
 - b. 55 percent of the roadway material, excluding gravel, passes the No. 4 sieve (4.75mm).
3. Add water as needed to maintain or bring the moisture content to within the moisture requirements immediately after the preliminary mixing of the cement and roadway material.
4. Mix the additional water homogeneously into the full depth of the mixture.

E. Compaction and Finishing

1. Test Section
-

Section 315 — Cement Stabilized Reclaimed Base Construction (CSRB)

- a. A test section shall be constructed with the first tanker of cement delivered to the project. The length of the test section will be determined by area in which the entire tanker of cement will cover.
 - b. The Engineer will evaluate compaction, moisture, homogeneity of mixture, thickness of stabilization, and finished base surface. If the Engineer deems necessary, revise the compaction procedure or replace equipment.
2. Time Limits
- a. Complete compaction within 2 hours after the cement has been applied.
 - b. Do not perform vibratory compaction on materials more than 90 minutes old, measured from the time cement was added to the mixture.
 - c. Complete all operations within 4 hours from adding cement to finishing the surface.
3. Moisture Control
- a. During compaction, ensure that the moisture is uniformly distributed throughout the mixture at a level of between 100 and 120 percent of the optimum moisture content.
4. Compaction Requirements
- a. Use a sheep's foot roller, steel wheel roller or pneumatic-tired roller for initial compactive effort unless an alternate method is approved by the Engineer.
 - b. Compact the cement-stabilized base course to at least 98 percent of the maximum dry density established on the Job Mix Design.
 - c. Uniformly compact the mixture and then shape to the grade, line, and cross-section shown on the Plans.
 - d. Remove all loosened material accumulated during the shaping process. Do not use additional layers of cement-treated materials in order to conform to cross-sectional or grade requirements.
 - e. Use a pneumatic-tired roller to roll the finished surface until it is smooth, closely knit, and free from cracks or deformations, and conforming to the proper line, grade, and cross-section.
 - f. In places inaccessible to the roller, obtain the required compaction with mechanical tampers approved by the Engineer. Apply the same compaction requirements as stated above in Subsection 315.3.04.E.4.
 - g. Perform grading operations immediately after the placement and compaction operations. Roll the stabilized base course again with a pneumatic-tired roller.
- F. Construction Joints
1. Form a straight transverse joint at the end of each day's construction or whenever the work is interrupted.
 2. Create the straight transverse joint by cutting back into the completed work to form a true vertical face free of loose or shattered material.
 3. Form the joint at least 2 ft. (0.6m) from the point where the spreader strike-off plate comes to rest at the end of the day's work, or at the point of interruption.
 4. Form a longitudinal joint as described above if cement-stabilized mixture is placed over a large area where it is impractical to complete the full width during one day's work. Use the procedure for forming a straight transverse joint. Remove all waste material from the compacted base.
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Section 315 — Cement Stabilized Reclaimed Base Construction (CSRB)

G. Priming the Base

1. The surface of the completed base course must be moist cured until the bituminous prime is applied.
2. Apply prime only to an entirely moist surface. If weather delays prime application, apply prime as soon as the surface moisture is adequate.
3. Apply bituminous prime according to GDOT Standard Specifications/Section 412 as soon as possible and in no case later than 24 hours after completion of the finishing operations.
4. Protect finished portions of the cement-stabilized base course that are used by equipment in the construction of an adjoining section to prevent marring or damaging of the completed work. Protect the stabilized area from freezing during the curing period.
5. Apply cure coat depending on project ADT:
 - < 400 ADT: Prime and sand.
 - ≥ 400 ADT: Apply single 89 surface treatment layer.

H. Opening to Traffic

1. Correct any failures caused by traffic at no additional cost to the Department. Make repairs specified in GDOT Standard Specifications/Subsection 300.3.06.B whenever defects appear. This preservation action does not relieve the Contractor of his responsibility to maintain the work until final acceptance as specified in GDOT Standard Specifications/Section 105.

315.3.05 Quality Acceptance

A. Compaction Tests

1. Determine the maximum dry density from representative samples of compacted material, according to GDOT Test Method/GDT 19 or GDT 67.
2. Determine the in-place density of finished courses according to GDOT Test Method/GDT 20, GDT 21 or GDT 59 as soon as possible after compaction, but before the cement sets.

B. Gradation Tests

1. Ensure that the gradation of the completely mixed cement-stabilized base course meets the requirements as stated above in Subsection 315.3.04.D.2.

C. Finished Surface Tests

1. Check the finished surface of the cement-stabilized base course transversely using one of the following tools:
 - a. A template, cut true to the required cross-section and set with a spirit level on non-super elevated sections.
 - b. A system of ordinates measured from a string line.
 - c. A surveyor' level.
 2. Ensure the ordinates measured from the bottom of the template, string line, or straightedge, to the surface do not exceed ½ in. (12.5mm) at any point.
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Section 315 — Cement Stabilized Reclaimed Base Construction (CSRB)

D. Thickness Tolerances

1. Determine the thickness of the cement-stabilized base course by making as many checks as necessary to determine the average thickness, but not less than one check per 1000 ft. (300m) per 2 lanes. Checks shall be taken after the completion of the base course and prior to priming.
2. If any measurement is deficient in thickness by more than ½ in. (12.5mm), make additional measurements to isolate the affected area. Correct any area deficient by more than ½ in. (12.5mm) to the design thickness by using one of the following methods:
 - a. Apply GDOT approved asphaltic concrete 9.5mm Superpave.
 - b. Reconstruct to the required thickness.

No payment will be made for any Asphaltic Concrete 9.5mm Superpave used to correct deficiencies nor will pavement be made for removing and reconstructing the deficient work.

3. If any measurement exceeds thickness by more than ½ in. (12.5mm), make additional measurements to isolate the affected area. If the basis of payment is per cubic yard and the average thickness for any mile increment exceeds the allowable ½ in. (12.5mm) tolerance the excess quantity in that increment will be deducted from the Contractor's payments. The excess quantity is calculated by multiplying the average thickness that exceeds the allowable ½ in. (12.5mm) tolerance by the surface area of the base, as applicable.

315.4 Measurement

A. Cement-Stabilized Base Course

Measure the surface length along the centerline when payment is specified by the square yard. The width is specified on the plans. Measure irregular areas, such as turnouts and intersections, by the square yard.

B. Portland Cement

Measure Portland cement by the ton.

C. Bituminous Prime

Bituminous prime is not measured for separate payment. Include the cost of furnishing and applying bituminous prime according to the provisions of GDOT Standard Specifications/Section 412 in the Unit Price Bid for each individual base item.

315.5 Payment

A. Cement-Stabilized Base Course

Cement-stabilized base, in-place and accepted, will be paid for at the Contract Unit Price per square yard. Payment will be full compensation for roadbed preparation, mixing on the road, shaping, pulverizing, watering, compaction, defect repair, bituminous prime and maintenance.

B. Portland Cement

Portland cement will be paid for at the Contract Unit Price per ton. Payment is full compensation for furnishing, hauling, and applying the material. Only Type I or Type II Portland cement incorporated into the finished course will be paid for and no payment will be made for cement used to correct defects due to the Contractor's negligence, faulty equipment, or error.

Section 315 — Cement Stabilized Reclaimed Base Construction (CSRB)

Payment will be made under:

Item No. 315	Cement Treated Base Course	Per square yard (meter)
Item No. 315	Portland Cement	Per ton (megagram)

Section 325—Stabilized Base Material for Patching

325.1 General Description

This work includes patching with soil-cement construction, cement stabilized graded aggregate construction, or select material stabilized construction. Construct according to the Plans, the Proposal, or as directed by the Engineer.

325.1.01 Definitions

General Provisions 101 through 150.

325.1.02 Related References

A. Standard Specifications

Section 109—Measurement and Payment

Section 209—Subgrade Construction

Section 301—Soil-Cement Construction

Section 316—Cement Stabilized Graded Aggregate Construction

Section 412—Bituminous Prime

Section 810 – Roadway Materials

B. Referenced Documents

General Provisions 101 through 150.

325.1.03 Submittals

General Provisions 101 through 150.

325.2 Materials

Ensure that materials meet the requirements of the following Specifications:

Material	Section
Soil-Cement Construction	301
Cement Stabilized Graded Aggregate Construction	316
Bituminous Prime	412
Subgrade Construction	209

Ensure that the subgrade stabilizer-select material meets the requirements of Subsection 810.2.01, *Roadway Materials—Class IIB3* or better. Any special gradation will be specified by a Special Provision.

325.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

325.3 Construction Requirements

Ensure that all labor, equipment, and materials necessary to ensure a continuous patching operation are on hand before patching begins.

Section 325 — Stabilized Base Material for Patching

325.3.01 Personnel

General Provisions 101 through 150.

325.3.02 Equipment

Provide all the equipment required for the type of patching used.

A concrete mixer with proper weight and moisture control will be considered as a stationary mixing plant for the production of patching material under this Specification.

325.3.03 Preparation

Prepare stabilized base material areas for patching as follows:

1. Trim the sides of the areas to be patched and leave them vertical. Remove all loose material.
2. Remove unsatisfactory material to the depth shown on the Plans or as directed by the Engineer; remove at least 6 in. (150 mm) of material.
3. If unsatisfactory material is below a plane that is 1 ft. (300 mm) below the existing surface, undercut the area as necessary.
4. Backfill the area with subgrade stabilizer-select material to 1 ft. (300 mm) below the existing surface. Use subgrade that meets the requirements of Section 209.

325.3.04 Fabrication

General Provisions 101 through 150.

325.3.05 Construction

Patch during traffic unless otherwise specified. Follow the requirements of Section 301 unless otherwise stated in this Specification.

Patch stabilized base material areas as follows:

1. Thoroughly compact patches at the optimum moisture to at least 100 percent of the maximum laboratory dry density.
2. Compact to the required degree with a conventional steel wheel, pneumatic tired roller, mechanical tampers, or other devices.
3. Lightly spray or mop each patch with bituminous prime. Sand primed areas subject to traffic as directed by the Engineer.

325.3.06 Quality Acceptance

General Provisions 101 through 150.

325.3.07 Contractor Warranty and Maintenance

Repair or replace damaged or destroyed patch at no additional cost to the Department.

325.4 Measurement

A. Base Material

Base material is measured by the cubic yard (meter), loose volume, as specified in Subsection 109.01, *Measurement and Quantities*.

Section 325 — Stabilized Base Material for Patching

B. Subgrade Stabilizer-Select Material

Subgrade stabilizer-select material is measured by the cubic yard (meter), loose volume, as specified in Subsection 109.01, *Measurement and Quantities*.

325.4.01 Limits

General Provisions 101 through 150.

325.5 Payment

A. Base Material

The accepted quantity of base material will be paid for at the Contract Unit Price per cubic yard (meter). This payment will be full compensation for:

- Flagging and directing traffic
- Preparing the patched area
- Furnishing material, including Portland cement and bituminous prime
- Loading, unloading, and hauling material
- Crushing
- Processing
- Mixing
- Spreading
- Watering
- Compacting
- Maintaining material

B. Subgrade Stabilizer-Select Material

Subgrade stabilizer-select material will be paid for at the Contract Unit Price per cubic yard (meter) complete in place and accepted. Payment will be full compensation for:

- Removing and disposing asphalt pavements, base materials, and unsatisfactory subgrades
- Furnishing all material
- Loading, hauling, and unloading material
- Mixing
- Compacting
- Finishing
- Watering

Payment will be made under:

Item No. 325	Soil-cement stabilized base course for patching	Per cubic yard (meter)
Item No. 325	Graded aggregate, cement stabilized base for patching	Per cubic yard (meter)
Item No. 325	Subgrade stabilizer-select material for patching	Per cubic yard (meter)

325.5.01 Adjustments

General Provisions 101 through 150.

Section 400—Hot Mix Asphaltic Concrete Construction

400.1 General Description

This work includes constructing one or more courses of bituminous plant mixture on the prepared foundation or existing roadway surface. Ensure the mixture conforms with lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

This section includes the requirements for all bituminous plant mixtures regardless of the gradation of the aggregates, type and amount of bituminous material, or pavement use.

Acceptance of work is on a lot-to-lot basis according to the requirements of this Section and Section 106.

400.1.01 Definitions

Segregated Mixture: Mixture lacking homogeneity in HMA constituents of such magnitude there is a reasonable expectation of accelerated pavement distress or performance problems. May be quantified by measurable changes in temperature, gradation, asphalt content, air voids, or surface texture.

Wearing Course: The upper course of asphaltic concrete placed on a roadway, airport or other asphalt pavement.

Surface Course: The upper course of asphaltic concrete placed on a roadway, airport or other asphalt pavement and also includes the dense-graded asphaltic concrete mixture beneath Open Graded Friction Course (OGFC) or Porous European Mixture (PEM).

Intermediate (Binder) Course: The lift(s) of asphaltic concrete above the base course and below the wearing course.

Asphaltic Concrete Base Course: The lower lift(s) of asphaltic concrete generally placed on graded aggregate base (GAB), soil cement or other stabilized base material.

New Construction: A roadway section more than 0.5 mile (800 m) long that is not longitudinally adjacent to the existing roadway. If one or more lanes are added longitudinally adjacent to the existing lane, the lane(s) shall be tested under the criteria for a resurfacing project. If work is performed on the existing roadway including leveling, grade changes, widening and/or resurfacing then that lane shall be tested under the criteria for a resurfacing project.

Trench Widening: Widening no more than 4 ft. (1.2 m) in width.

Comparison Sample: Opposite quarters of material sampled by the Contractor.

Independent Sample (Quality Assurance Sample): A sample taken by the Department to verify an acceptance decision without regard to any other sample that may also have been taken to represent the material in question.

Referee sample: A sample of the material retained during the quartering process which is used for evaluation if a comparison of Contractor and Departmental split sample test results is outside allowable tolerances.

400.1.02 Related References

A. Standard Specifications

Section 106—Control of Materials

Section 109—Measurement and Payment

Section 152—Field Laboratory Building

Section 413—Bituminous Tack Coat

Section 424—Bituminous Surface Treatment

Section 802—Aggregate for Asphaltic Concrete

Section 828—Hot Mix Asphaltic Concrete Mixtures

Section 400 — Hot Mix Asphaltic Concrete Construction

B. Referenced Documents

AASHTO T 324

AASHTO T 315

AASHTO T 209

AASHTO T 202

AASHTO T 49

Department of Transportation Standard Operating Procedure (SOP) 15

Department of Transportation Standard Operating Procedure (SOP) 27

Department of Transportation Standard Operating Procedure (SOP) 40

Department of Transportation Standard Operating Procedure (SOP) 46

GDT 38

GDT 39

GDT 42

GDT 59

GDT 73

GDT 78

GDT 83

GDT 119

GDT 125

GDT 126

GDT 134

GSP 15

GSP 21

QPL 1

QPL 2

QPL 7

QPL 26

QPL 30

QPL 39

QPL 41

QPL 45

QPL 65

QPL 67

QPL 70

QPL 77

QPL 88

QPL 91

Section 400 — Hot Mix Asphaltic Concrete Construction

QPL 92 (A, B, C)

QPL 97

400.1.03 Submittals

A. Invoices

Furnish formal written invoices from a supplier for all materials used in production of HMA when requested by the Department. Show the following on the Bill of Lading:

- Date shipped
- Quantity in tons (megagrams)
- Included with or without additives (for asphalt cement)

Purchase asphaltic cement directly from a supplier listed on Qualified Products List 7 and provide copies of Bill of Lading at the Department's request.

B. Paving Plan

Before starting asphaltic concrete construction, submit a written paving plan to the Engineer for approval. Include the following on the paving plan:

- Proposed starting date
- Location of plant(s)
- Rate of production
- Average haul distance(s)
- Number of haul trucks
- Paver speed feet (meter)/minute for each placement operation
- Mat width for each placement operation
- Number and type of rollers for each placement operation
- Sketch of the typical section showing the paving sequence for each placement operation
- Electronic controls used for each placement operation
- Temporary pavement marking plan

If staged construction is designated in the plans or contract, provide a paving plan for each construction stage.

If segregation is detected, submit a written plan of measures and actions to prevent segregation. Work will not continue until the plan is submitted to and approved by the Department.

C. Job Mix Formula

Submit to the Engineer a written job mix formula proposed for each mixture type to be used based on an approved mix design. Furnish the following information for each mix:

- Specific project for which the mixture will be used
- Source and description of the materials to be used
- Mixture I.D. Number
- Proportions of the raw materials to be combined in the paving mixture
- Single percentage of the combined mineral aggregates passing each specified sieve
- Single percentage of asphalt by weight of the total mix to be incorporated in the completed mixture
- Single temperature at which to discharge the mixture from the plant
- Theoretical specific gravity of the mixture at the designated asphalt content
- Name of the person or agency responsible for quality control of the mixture during production

Section 400 — Hot Mix Asphaltic Concrete Construction

Do the following to have the Job Mix Formulas approved in accordance with SOP 40 *Approval of Contractor Job Mix Formulas* and to ensure their quality:

1. Submit proposed job Mix Formulas for review at least two weeks before beginning the mixing operations.
2. Do not start hot mix asphaltic concrete work until the Engineer has approved a job mix formula for the mixture to be used. No mixture will be accepted until the Engineer has given approval.
3. Provide mix designs for all SMA, Superpave and 4.75 mm mixes to be used. The Department will provide mix design results for other mixes to be used.
4. After a job mix formula has been approved, assume responsibility for the quality control of the mixtures supplied to the Department according to Subsection 106.01, *Source of Supply and Quantity of Materials*.

D. Quality Control Program

Submit a Quality Control Plan to the Office of Materials and Testing for approval. The Quality Control Program will be included as part of the certification in the annual plant inspection report.

400.2 Materials

Ensure materials comply with the specifications listed in Table 1.

TABLE 1—MATERIALS SPECIFICATIONS

Material	Subsection
Asphalt Cement, Grade Specified	820.2
Coarse Aggregates for Asphaltic Concrete	802.2.02
Fine Aggregates for Asphaltic Concrete	802.2.01
Mineral Filler	883.1
Heat Stable Anti-Stripping Additive	831.2.04
Hydrated Lime	882.2.03
Silicone Fluid (When approved by the Office of Materials and Testing)	831.2.05
Bituminous Tack Coat: PG 58-22, PG 64-22, PG 67-22	820.2
Hot Mix Asphaltic Concrete Mixtures	828
Fiber Stabilizing Additives	819

When approved by the Office of Materials and Testing and required in the Contract, provide Untaite material, hereafter referred to by the common trade name Gilsonite, as a reinforcing agent for bituminous mixtures. Supply a manufacturer's certification that the Gilsonite is a granular solid which meets the following requirements:

Softening Point (AASHTO: T-53)	300-350 °F (150-175 °C)
Specific Gravity, 77 °F (25 °C) (AASHTO: T-228)	1.04 ± 0.02
Flash Point, COC (AASHTO: T-48)	550 °F (290 °C) Min.
Ash Content (AASHTO: T-111)	1.0% Max.
Penetration, 77 °F (25 °C), 100 gm., 5 sec. (AASHTO: T-49)	0

Section 400 — Hot Mix Asphaltic Concrete Construction

400.2.01 Delivery, Storage, and Handling

Storage of material is allowed in a properly sealed and insulated system for up to 24 hours. Ensure Stone Matrix Asphalt (SMA), Open-Graded Friction Course (OGFC), or Porous European Mix (PEM) mixtures are not stored more than 12 hours. Mixtures other than SMA, OGFC, or PEM may be stored up to 72 hours in a sealed and insulated system, equipped with an auxiliary inert gas system, with the Engineer's approval. Segregation, lumpiness, drain-down, or stiffness of stored mixture is cause for rejection of the mixture. The Engineer will not approve using a storage or surge bin if the mixture segregates, loses excessive heat, or oxidizes during storage.

The Engineer may obtain mixture samples or recover asphalt cement according to GDT 119 or AASHTO T 324. AASHTO T 315, AASHTO T 202, or AASHTO T 49 will be used to perform viscosity and penetration tests to determine how much asphalt hardening has occurred. AASHTO T-324 will be used to perform Hamburg Wheel Tracking Device testing to determine rutting and moisture damage susceptibility.

A. Vehicles for Transporting and Delivering Mixtures

Ensure trucks used for hauling bituminous mixtures have tight, clean, smooth beds.

Follow these guidelines when preparing vehicles to transport bituminous mixtures:

1. Use an approved releasing agent from QPL 39 in the transporting vehicle beds, if necessary, to prevent the mixture from sticking to the bed. Ensure the releasing agent is not detrimental to the mixture. When applying the agent, drain the excess agent from the bed before loading. Remove from the project any transporting vehicles determined to contain unapproved releasing agents.
2. Protect the mixture with a waterproof cover large enough to extend over the sides and ends of the bed. Securely fasten the waterproof cover before the vehicle begins moving.
3. Insulate the front end and sides of each bed with an insulating material with the following specifications:
 - Consists of builders insulating board or equivalent;
 - Has a minimum "R" value of 4.0; and
 - Can withstand approximately 400 °F (200 °C) temperatures

Install the insulating material so it is protected from loss and contamination. A "Heat Dump Body" may be used in lieu of insulation of the bed. "Heat Dump Body" refers to any approved transport vehicle capable of diverting engine exhaust and transmitting heat evenly throughout the dump body to keep asphalt at required temperature. Mark the "Heat Dump Body" clearly with "OPEN" and "CLOSE" position at the exhaust diverter. Install a padlock and lock it in the "OPEN" position when the "Heat Dump Body" is used to transport bituminous mixtures.

4. Mark each transporting vehicle with a clearly visible identification number.
5. Create a hole in each side of the bed so the temperature of the loaded mixture can be checked. Ensure the placement of these holes are located to assure the thermometer is being placed in the hot mix asphaltic concrete mixtures.

Ensure the mixture is delivered to the roadway at a temperature within ± 20 °F (± 11 °C) of the temperature on the job mix formula.

If the Engineer determines a truck may be hazardous to the project or adversely affect the quality of the work, remove the truck from the project.

B. Containers for Transporting, Conveying, and Storing Bituminous Material

To transport, convey, and store bituminous material, use containers free of foreign material and equipped with sample valves. Bituminous material will not be accepted from conveying vehicles if material has leaked or spilled from the containers.

400.3 Construction Requirements

400.3. 01 Personnel

General Provisions 101 through 150.

Section 400 — Hot Mix Asphaltic Concrete Construction

400.3.02 Equipment

Hot mix asphaltic concrete plants producing mix for Department use are governed by Quality Assurance for Hot Mix Asphaltic Concrete Plants in Georgia, Laboratory Standard Operating Procedure No. 27.

The Engineer will approve the equipment used to transport and construct hot mix asphaltic concrete. Ensure the equipment is in satisfactory mechanical condition and can function properly during production and placement operations. Place the following equipment at the plant or project site:

A. Field Laboratory

Provide a field laboratory according to Section 152.

B. Plant Equipment

1. Scales

Provide scales as follows:

- a. Furnish (at the Contractor's expense) scales to weigh bituminous plant mixtures, regardless of the measurement method for payment.
- b. Ensure the weight measuring devices provide documentation complying with Subsection 109.01, *Measurement and Quantities*.
- c. Provide weight devices recording the mixture net weights delivered to the truck when not using platform scales. A net weight system will include, but is not limited to:
 - Hopper or batcher-type weight systems delivering asphaltic mixture directly to the truck
 - Fully automatic batching equipment with a digital recording device
- d. Use a net weight printing system only with automatic batching and mixing systems approved by the Engineer.
- e. Ensure the net weight scale mechanism or device manufacturer, installation, performance, and operation meets the requirements in Subsection 109.01, *Measurement and Quantities*
- f. Provide information on the Project tickets according to Department of Transportation SOP-15.

2. Time-Locking Devices

Furnish batch type asphalt plants with automatic time-locking devices controlling the mixing time automatically. Construct these devices to ensure the operator cannot shorten or eliminate any portion of the mixing cycle.

3. Surge- and Storage-Systems

Provide surge and storage bins as follows:

- a. Ensure bins for mixture storage are insulated and have a working seal, top and bottom, to prevent outside air infiltration and to maintain an inert atmosphere during storage. Bins not intended as storage bins may be used as surge bins to hold hot mixtures for part of the working day. However, empty these surge bins completely at the end of the working day.
 - b. Ensure surge and storage bins can retain a predetermined minimum level of mixture in the bin when the trucks are loaded.
 - c. Ensure surge and storage systems do not contribute to mix segregation, lumpiness, drain-down, or stiffness.
 - d. Ensure the scale mechanism or device manufacture, installation, performance, and operation meets the requirements in Subsection 109.01 *Measurement and Quantities*.
-

Section 400 — Hot Mix Asphaltic Concrete Construction

4. Controls for Dust Collector Fines

Control dust collection as follows:

- a. When collecting airborne aggregate particles and returning them to the mixture, have the return system meter all or part of the collected dust uniformly into the aggregate mixture and waste the excess. The collected dust percentage returned to the mixture is subject to the Engineer's approval.
- b. When the collected dust is returned directly to the hot aggregate flow, interlock the dust feeder with the hot aggregate flow, and meter the flow to maintain a constant, proportioned and uniform flow.

5. Mineral Filler Supply System

When mineral filler is required as a mixture ingredient:

- a. Use a separate bin and feed system to store and proportion the required quantity into the mixture with uniform distribution.
- b. Control the feeder system with a proportioning device meeting these specifications:
 - Is accurate to within ± 10 percent of the filler required
 - Has a convenient and accurate means of calibration
 - Interlocks with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes
- c. Provide flow indicators or sensing devices for the mineral filler system and interlock them with the plant controls to interrupt the mixture production if mineral filler introduction fails to meet the required target value after no longer than 60 seconds.
- d. Add mineral filler to the mixture as follows, according to the plant type:
 - Batch Type Asphalt Plant: add mineral filler to the mixture in the weigh hopper.
 - Continuous Plant Using Pugmill Mixers: feed the mineral filler into the hot aggregate before it is introduced into the mixer to ensure dry mixing is accomplished before the bituminous material is added.
 - Continuous Plants Using the Drier-Drum Mixers: add the mineral filler to ensure dry mixing is accomplished before the bituminous material is added and ensure the filler does not become entrained into the air stream of the drier.

6. Hydrated Lime Treatment System

When hydrated lime is required as a mixture ingredient:

- a. Use a separate bin and feed system to store and proportion the required quantity into the mixture.
- b. Ensure the aggregate is uniformly coated with hydrated lime aggregate before adding the bituminous material to the mixture. Ensure the addition of hydrated lime will not become entrained in the exhaust system of the drier or plant.
- c. Control the feeder system with a proportioning device meeting these specifications:
 - Is accurate to within ± 10 percent of the amount required
 - Has a convenient and accurate means of calibration
 - Interlocks with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes and to ensure mixture produced is properly treated with lime
- d. Provide flow indicators or sensing devices for the hydrated lime system and interlock them with the plant controls to interrupt mixture production if hydrated lime introduction fails to meet the required target value after no longer than 60 seconds.

Section 400 — Hot Mix Asphaltic Concrete Construction

7. Net Weight Weighing Mechanisms

Certify the accuracy of the net weight weighing mechanisms by an approved registered scale serviceperson at least once every 6 months. Check the accuracy of net weight weighing mechanisms at the beginning of Project production and thereafter as directed by the Engineer. Check mechanism accuracy as follows:

- a. Weigh a load on a set of certified commercial truck scales. Ensure the difference between the printed total net weight and weight obtained from the commercial scales is no greater than 4 lbs./1,000 lbs. (4 kg/Mg) of load.

Check the accuracy of the bitumen scales as follows:

- Use standard test weights.
 - If the checks indicate printed weights are out of tolerance, have a registered scale serviceperson check the batch scales and certify the accuracy of the printer.
 - While the printer system is out of tolerance and before its adjustment, continue production only if using a set of certified truck scales to determine the truck weights.
- b. Ensure plants using batch scales maintain ten 50 lb. (25 kg) standard test weights at the plant site to check batching scale accuracy.
 - c. Ensure plant scales are used only to proportion mixture ingredients, and not to determine that pay quantities, are within two percent throughout the range.

8. Fiber Supply System

When stabilizing fiber is required as a mixture ingredient:

- a. Use a separate feed system to store and proportion by weight the required quantity into the mixture with uniform distribution.
 - b. Control the feeder system with a proportioning device meeting these specifications:
 - Is accurate to within ± 10 percent of the amount required. Automatically adjusts the feed rate to maintain the material within this tolerance at all times.
 - Has a convenient and accurate means of calibration.
 - Provide in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds (kg) per minute, to verify feed rate.
 - Interlocks with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes.
 - c. Provide flow indicators or sensing devices for the fiber system and interlock them with the plant controls to interrupt the mixture production if fiber introduction fails or if the output rate is not within the tolerances given above.
 - d. Introduce the fiber as follows:
 - When a batch type plant is used, add the fiber to the aggregate in the weigh hopper. Increase the batch dry mixing time by 8 to 12 seconds from the time the aggregate is completely emptied into the mixer to ensure the fibers are uniformly distributed prior to the injection of asphalt cement into the mixer.
 - When a continuous or drier-drum type plant is used, add the fiber to the aggregate and uniformly disperse prior to the injection of asphalt cement. Ensure the fibers will not become entrained in the exhaust system of the drier or plant.
-

Section 400 — Hot Mix Asphaltic Concrete Construction

9. Crumb Rubber Modifier Supply System

When specified, crumb rubber modifier may be substituted at the Contractor's discretion to produce a PG 76-22 asphaltic cement at the production facility in accordance with Section 820:

- a. Use a separate feed system to store and proportion by weight of the total asphaltic cement, the required percentage of crumb rubber into the mixture.
- b. Control the feeder system with a proportioning device meeting these specifications:
 - Is accurate to within ± 6 percent of the amount required. Automatically adjusts the feed rate to maintain the material within this tolerance at all times.
 - Has a convenient and accurate means of calibration.
 - Provide in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds per minute, to verify feed rate. Ensure the supply system reports the feed in 1 lb. (454 gr.) increments using load cells enabling the user to monitor the depletion of the modifier. Monitoring the system volumetrically will not be allowed.
 - Interlocks with the aggregate weigh system and asphaltic cement pump to maintain the correct proportions for all rates of production and batch sizes.
- c. Provide flow indicators or sensing devices for the system and interlock them with the plant controls to interrupt the mixture production if the crumb rubber introduction output rate is not within the ± 6 percent tolerance given above. This interlock will immediately notify the operator if the targeted rate exceeds introduction tolerances. All plant production will cease if the introduction rate is not brought back within tolerance after 30 seconds. When the interlock system interrupts production and the plant has to be restarted, upon restarting operations; ensure the modifier system runs until a uniform feed can be observed on the output display. Ensure all mix produced prior to obtaining a uniform feed is rejected.
- d. Introduce the crumb rubber modifier as follows:
 - When a batch type plant is used, add the rubber to the aggregate in the weigh hopper. Increase the batch dry mixing time by 15 to 20 seconds from the time the aggregate is completely emptied into the mixer to ensure the modifiers are uniformly distributed prior to the injection of asphalt cement into the mixer. Increase the batch wet mix time by 15 to 20 seconds to ensure the crumb rubber modifier is uniformly blended with the asphaltic cement.
 - When a continuous or drier-drum type plant is used, add the rubber to the aggregate and uniformly disperse prior to the injection of asphalt cement. The point of introduction in the drum mixer will be approved by the Engineer prior to production. Ensure the crumb rubber modifier will not become entrained in the exhaust system of the drier or plant and will not be exposed to the drier flame at any point after induction.
- e. No separate measurement and payment will be made if Contractor elects to utilize crumb rubber.

Section 400 — Hot Mix Asphaltic Concrete Construction

10. Fiber-Reinforcement Supply System

When reinforcement fiber is specified in the contract as a mixture ingredient:

Ensure, that the reinforcement fiber is an approved material and listed on QPL 97" Georgia's List of Approved Reinforcement Fiber". Use a separate Fiber Meetering Device feed system to proportion by weight of the total asphaltic cement, the required percentage of fiber-reinforcement into the mixture.

a. Control the meetering system with a proportioning device meeting these specifications:

- Is accurate to within ± 6 percent of the amount required. Automatically adjusts the feed rate to maintain the material within this tolerance at all times.
- Has a convenient and accurate means of calibration.
- Provides in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds, or (kg) per minute, to verify feed rate
- Interlocks with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes.

b. Provide flow indicators or sensing devices for the fiber system and interlock them with the plant controls to interrupt the mixture production if fiber introduction fails or if the output rate is not within the tolerances given above.

c. Introduce the fiber as follows:

- When a batch type plant is used, add the fiber dosage to the aggregate in the weigh hopper. This may be done with loose fibers and a Fiber Meetering Device or may be done by using pre-measured packages that are specifically designed to disintegrate within the mixing cycle. Increase the batch dry mixing time by 8 to 12 seconds from the time the aggregate is completely emptied into the mixer to ensure the fibers are uniformly distributed prior to the injection of asphalt cement into the mixer.
- When a continuous or drier-drum type plant is used, add the fiber to the aggregate or RAP material at the beginning of the mixing cycle and uniformly disperse prior to the injection of asphalt cement. The final configuration of the fibers at the point when mixing begins, should closely resemble the fibers as they are packaged. Pre-distributing the fibers into their individual form should be avoided. Ensure the fibers will not become entrained in the exhaust system of the drier or plant. The producer should inspect their plant for any protrusions that may accumulate fibers and create the potential for fiber clumps.
- When a continuous or drier-drum type plant is used for limited production volumes, the addition of the fibers may be done by using pre-measured packages that are specifically designed to disintegrate within the mixing cycle and adding them directly into the RAP port of the plant. Because this is not an automated process, a written protocol must be supplied by the producer to demonstrate how they will attain the dosage requirement, and documentation must be supplied by the material manufacturer assuring this method will produce the desired random fiber distribution.

C. Equipment at Project Site

1. Cleaning Equipment

Provide sufficient hand tools and power equipment to clean the roadway surface before placing the bituminous tack coat. Use power equipment complying with Subsection 424.3.02.F, *Power Broom and Power Blower*.

2. Pressure Distributor

To apply the bituminous tack coat, use a pressure distributor complying with Subsection 424.3.02.B, *Pressure Distributor*.

3. Bituminous Pavers

To place hot mix asphaltic concrete, use bituminous pavers that can spread and finish courses that are:

- As wide and deep as indicated on the plans
 - True to line, grade, and cross section
 - Smooth
 - Uniform in density and texture
- a. **Continuous Line and Grade Reference Control.** Furnish, place, and maintain the supports, wires, devices, and materials required to provide continuous line and grade reference control to the automatic paver control system.
 - b. **Automatic Screed Control System.** Equip the bituminous pavers with an automatic screed control system actuated from sensor-directed mechanisms or devices that will maintain the paver screed at a pre-determined transverse slope and elevation to obtain the required surface.
 - c. **Transverse Slope Controller.** Use a transverse slope controller capable of maintaining the screed at the desired slope within ± 0.1 percent. Do not use continuous paving set-ups resulting in unbalanced screed widths or off-center breaks in the main screed cross section unless approved by the Engineer.
 - d. **Screed Control.** Equip the paver to permit the following four modes of screed control. Ensure the method used is approved by the Engineer.
 - Automatic grade sensing and slope control
 - Automatic dual grade sensing
 - Combination automatic and manual control
 - Total manual control

Ensure the controls are referenced with a taut string or wire set to grade, or with a ski-type device or mobile reference at least 30 ft. (9 m) long when using a conventional ski. Approved non-contacting laser or sonar-type skis listed on QPL 91 "Georgia's List of Approved Non-contacting Laser and Sonar-type Electronic Grade and Slope Controls" may be used in lieu of conventional 30 ft. (9 m) skis. Under limited conditions, a short ski or shoe may be substituted for a long ski on the second paver operating in tandem, or when the reference plane is a newly placed adjacent lane.

Automatic screed control is required on all projects; however, when the Engineer determines that project conditions prohibit the use of such controls, the Engineer may waive the grade control, or slope control requirements, or both.

- e. **Paver Screed Extension.** When the laydown width requires a paver screed extension, use bolt-on screed extensions to extend the screeds, or use an approved mechanical screed extension device. When the screed is extended, add auger extensions to assure a length of no more than 18 in. (0.5 m) from the auger to the end gate of the paver. Auger extensions may be omitted when paving variable widths. Ensure the paver is equipped with tunnel extensions when the screed and augers are extended.

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NOTE: Do not use extendible strike-off devices instead of approved screed extensions. Only use a strike-off device in areas that would normally be luted in by hand labor.

4. Compaction Equipment

Ensure that the compaction equipment is in good mechanical condition and can compact the mixture to the required density. The compaction equipment number, type, size, operation, and condition is subject to the Engineer's approval

5. Materials Transfer Vehicle (MTV)

a. Use a Materials Transfer Vehicle (MTV) when placing asphaltic concrete mixtures on projects on the state route system with the following conditions. If a project fails to meet any one of the following conditions, the MTV's use is not required other than during the placement of SMA, PEM and OGFC mixtures. MTVs are required during the placement of SMA, PEM and OGFC mixtures regardless of ADT, project length and mixture tonnage unless waived at the discretion of the Office of Materials and Testing.

1) When to use:

- The two-way ADT is equal to or greater than 6000
- The project length is equal to or greater than 3000 linear feet (915 linear meters)
- The total tonnage (megagrams) of all asphaltic concrete mixtures is greater than 2000 tons (1815 Mg)

2) Where to use:

- Mainline of the traveled way
- Collector/distributor (C/D) lanes on Interstates and limited access roadways
- Leveling courses at the Engineer's discretion

3) Do not use the MTV for the following conditions:

- A resurfacing project that only 9.5 mm mix is required.
- A project with lane width that is equal or less than 11 ft. (3.4 m).
- A passing lane only project.
- When noted on the plans.

b. Ensure the MTV and conventional paving equipment meet the following requirements:

1) MTV

- Has a truck unloading system which receives mixture from the hauling equipment and independently deliver mixtures from the hauling equipment to the paving equipment.
- Has mixture remixing capability approved by the Office of Materials and Testing and is listed on QPL 88 "Georgia's List of Approved Materials Transfer Vehicles".
- Provides to the paver a homogeneous, non-segregated mixture of uniform temperature with no more than 20 °F (11 °C) difference between the highest and lowest temperatures when measured transversely across the width of the mat in a straight line at a distance of one foot to twenty-five feet (0.3 m to 7.6 m) from the screed while the paver is operating. Ensure that the MTV is capable of providing the paver a consistent material flow that is sufficient to prevent the paver from stopping between truck exchanges.

2) Conventional Paving Equipment

- Has a paver hopper insert with a minimum capacity of 14 tons (13 Mg) installed in the hopper of conventional paving equipment when an MTV is used.

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- c. If the MTV malfunctions during spreading operations, discontinue placement of hot mix asphaltic concrete after there is sufficient mix placed to maintain traffic in a safe manner. However, placement of hot mix asphaltic concrete in a lift not exceeding 2 in. (50 mm) may continue until any additional hot mix in transit at the time of the malfunction has been placed. Cease spreading operations thereafter until the MTV is operational.
- d. Ensure the MTV is empty when crossing a bridge and is moved across without any other Contractor vehicles or equipment on the bridge. Move the MTV across a bridge in a travel lane and not on the shoulder. Ensure the speed of the MTV is no greater than 5 mph (8 kph) without any acceleration or deceleration while crossing a bridge.

400.3.03 Preparation

A. Prepare Existing Surface

Prepare the existing surface as follows:

1. Clean the Existing Surface. Before applying hot mix asphaltic concrete pavement, clean the existing surface to the Engineer's satisfaction.
2. Patch and Repair Minor Defects

Before placing leveling course:

- a. Correct potholes and broken areas requiring patching in the existing surface and base as directed by the Engineer.
- b. Cut out, trim to vertical sides, and remove loose material from the areas to be patched.
- c. Prime or tack coat the area after being cleaned. Compact patches to the Engineer's satisfaction. Material for patches does not require a job mix formula but must meet the gradation range shown in Section 828. The Engineer must approve the asphalt content to be used.

3. Apply Bituminous Tack Coat

Apply the tack coat according to Section 413. The Engineer will determine the application rate, which must be within the limitations in Tables 2A and 2B.

TABLE 2A—APPLICATION RATES FOR BITUMINOUS TACK, GAL/YD² (L/M²)

Tack Uses	Minimum	Maximum
Under OGFC and PEM Mixes	0.06 (0.27)	0.08 (0.36)
All Other Mixes	0.04 (0.18)	0.06 (0.27)
Non-tracking Hot Applied Polymer Modified Tack (NTHAPT) (Note 2)	0.06 (0.27)	0.18 (0.81)
<p>Note 1: On thin leveling courses and freshly placed asphaltic concrete mixes, reduce the application rate to 0.02 to 0.04 gal/yd² (0.09 to 0.18 L/m²).</p> <p>Note 2: Use higher application rate (0.12 to 0.18) within the minimum and maximum range under OGFC and PEM Mixes</p>		

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TABLE 2B – APPLICATION RATES FOR ANIONIC EMULSIFIED ASPHALT OR CATIONIC EMULSIFIED ASPHALT BITUMINUS TACK, GAL/YD² (L/M²)

Tack-Uses	Minimum	Maximum
New Asphaltic Concrete Pavement to New Asphaltic Concrete Pavement or Thin Lift Leveling	0.05 (0.23)	0.08 (0.36)
New Asphaltic Concrete Pavement (\leq 25% RAP) to Aged Existing Pavement or Milled Surface	0.06 (0.27)	0.10 (0.45)
New Asphaltic Concrete Pavement ($>$ 25% RAP) to Aged Existing Pavement or Milled Surface	0.08 (0.36)	0.12 (0.54)
Non-tracking Emulsified Asphalt	0.07 (0.32)	0.12 (0.54)
CQS-Special Modified Asphalt Emulsion (Note 1)	0.12 (0.54)	0.28 (1.27)

- Allow standard anionic emulsified asphalt or cationic emulsified asphalt to break per emulsion manufacturer's recommendation. Proceed with paving only after the anionic emulsified asphalt or cationic emulsified asphalt has cured to the satisfaction of the Engineer.
- Do not use anionic emulsified asphalt or cationic emulsified asphalt, other than CQS-Special Modified Asphalt Emulsion in conjunction with a spray paver, under OGFC or PEM on interstates or limited access state routes.

Note 1: Use higher application rate (0.22 to 0.28) within the minimum and maximum under OGFC and PEM Mixes

B. Place Patching and Leveling Course

1. When the existing surface is irregular, bring the surface area to the proper cross section and grade with a leveling course of hot mix asphaltic concrete materials.
2. Place leveling at the locations and in the amounts directed by the Engineer.
3. Use leveling course mixtures meeting the requirements of the job mix formulas defined in:
 - Subsection 400.3.05.A, *Observe Composition of Mixtures*
 - Section 828
 - Leveling acceptance schedules in Subsection 400.3.06.A, *Acceptance Plans for Gradation and Asphalt Cement Content*
4. If the leveling and patching mix type is undesignated, determine the mix type by the thickness or spread rate according to Table 3, but do not use 4.75 mm mix on interstate projects.
5. If patching is required to correct mat deficiencies in the final surface layer, ensure patches extend full lane width and no less than the length of the affected area as determined by the Engineer.

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TABLE 3—LEVELING AND PATCHING MIX TYPES

Thickness	Rate of Spread	Type of Mix
Up to 0.75 in. (19 mm)	Up to 85 lbs./yd ² (46 kg/m ²)	4.75 mm Mix or 9.5 mm Superpave Type 1
0.75 to 1.5 in. (19 to 38 mm)	85 to 165 lbs./yd ² (46 to 90 kg/m ²)	9.5 mm Superpave Type 2
1.5 to 2 in. (38 to 50 mm)	165 to 220 lbs./yd ² (90 to 120 kg/m ²)	12.5 mm Superpave *
2 to 3 in. (50 to 75 mm)	220 to 330 lbs./yd ² (120 to 180 kg/m ²)	19 mm Superpave **
Over 2.5 in. (64 mm)	Over 275 lbs./yd ² (180 kg/m ²)	25 mm Superpave

* This mixture may be used for isolated patches no more than 6 in. (150 mm) deep and no more than 4 ft. (1.2 m) in diameter or length.

** This mixture may be used for patching no more than 4 in. (100 mm) deep in limited confined deep mill and patching locations.

400.3.04 Fabrication

General Provisions 101 through 150.

400.3.05 Construction

Provide the Engineer at least one day's notice prior to beginning construction, or prior to resuming production if operations have been temporarily suspended.

A. Observe Composition of Mixtures

1. Calibration of plant equipment

If the material changes, or if a component affecting the ingredient proportions has been repaired, replaced, or adjusted, check and recalibrate the proportions.

Calibrate as follows:

- a. Before producing mixture for the Project, calibrate by scale weight the electronic sensors or settings for proportioning mixture ingredients.
- b. Calibrate ingredient proportioning for all rates of production.

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2. Mixture control

Compose hot mix asphaltic concrete from a uniform mixture of aggregates, bituminous material, and if required, hydrated lime, mineral filler, or other approved additive.

Ensure the constituents proportional to produce mixtures meeting the requirements in Section 828. The general composition limits prescribed are extreme ranges within which the job mix formula must be established. Base mixtures on a design analysis that meets the requirements of Section 828.

Ensure the field performance of the in-place mixtures meet the requirements of Subsection 828.2B for Permeability, Moisture Susceptibility, Rutting Susceptibility and Fatigue. In-place mix may be evaluated for compliance with Subsection 828.2.B at the discretion of the State Bituminous Construction Engineer under the following conditions:

- Deviates greater than 10 percent on gradation for mixture control sieves from the approved Job Mix Formula based on Acceptance or Independent Samples.
- Deviates greater than 0.7 percent in asphalt cement content from the approved Job Mix Formula based on Acceptance or Independent Samples.
- The calculated mean pavement air voids result in an adjusted pay factor less than 0.80 or any single sub lot result in mean pavement air voids exceeding 10.5 percent.
- Mix produced not using an approved mix design and/or job mix formula.

Remove and replace any material determined to not meet the requirements established in Section 828.2.B at the Contractor's expense.

If control test results show the characteristic tested does not conform to the job mix formula control tolerances given in Section 828, take immediate action to ensure that the quality control methods are effective.

Control the materials to ensure extreme variations do not occur. Maintain the gradation within the composition limits in Section 828.

B. Prepare Bituminous Material

Uniformly heat the bituminous material to the temperature specified in the job mix formula with a tolerance of ± 20 °F (± 11 °C).

C. Prepare the Aggregate

Prepare the aggregate as follows:

1. Heat the aggregate for the mixture and ensure a mix temperature within the limits of the job mix formula.
2. Do not contaminate the aggregate with fuel during heating.
3. Reduce the absorbed moisture in the aggregate until the asphalt does not separate from the aggregate in the prepared mixture. If this problem occurs, the Engineer will establish a maximum limit for moisture content in the aggregates. When this limit is established, maintain the moisture content below this limit.

D. Prepare the Mixture

Proportion the mixture ingredients as necessary to meet the required job mix formula. Mix until a homogenous mixture is produced.

1. Add Mineral Filler

When mineral filler is used, introduce it in the proper proportions and as specified in Subsection 400.3.02.B.5, *Mineral Filler Supply System*.

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2. Add Hydrated Lime

When hydrated lime is included in the mixture, add it at a rate specified in Section 828 and the job mix formula. Use methods and equipment for adding hydrated lime according to Subsection 400.3.02.B.6, *Hydrated Lime Treatment System*.

Add hydrated lime to the aggregate by using Method A or B as follows:

Method A—Dry Form—Add hydrated lime in its dry form to the mixture as follows, according to the type of plant:

- a. Batch Type Asphalt Plant: Add hydrated lime to the mixture in the weigh hopper or as approved and directed by the Engineer.
- b. Continuous Plant Using Pugmill Mixer: Feed hydrated lime into the hot aggregate before it is introduced into the mixer to ensure dry mixing is complete before the bituminous material is added.

Method B—Lime/Water Slurry—Add the required quantity of hydrated lime (based on dry weight) in lime/water slurry form to the aggregate. This solution consists of lime and water in concentrations as directed by the Engineer.

Equip the plant to blend and maintain the hydrated lime in suspension and to mix the hydrated lime with the aggregates uniformly in the proportions specified.

- c. Continuous Plant Using Drier-Drum Mixer: Add hydrated lime so to ensure the lime will not become entrained into the air stream of the drier and to ensure thorough dry mixing will be complete before the bituminous material is added.
- ### 3. Add Stabilizing Fiber
- When stabilizing fiber is included in the mixture, add stabilizing fiber at a rate specified in Section 819 and the Job Mix Formula. Introduce it as specified in Subsection 400.3.02.B.8, *Fiber Supply System*.
- ### 4. Add Gilsonite Modifier

When approved by the Office of Materials and Testing and required by the Contract, add the Gilsonite modifier to the mixture at a rate to ensure eight percent by weight of the asphalt cement is replaced by Gilsonite. Use either PG 64-22 or PG 67-22 asphalt cement as specified in Subsection 820.2.01. Provide suitable means to calibrate and check the rate of Gilsonite being added. Introduce Gilsonite modifier by either of the following methods.

- a. For batch type plants, incorporate Gilsonite into the pugmill at the beginning of the dry mixing cycle. Increase the dry mix cycle by a minimum of 10 seconds after the Gilsonite is added and prior to introduction of the asphalt cement. For this method, supply Gilsonite in plastic bags to protect the material during shipment and handling and store the modifier in a waterproof environment. Ensure the bags are capable of being completely melted and uniformly blended into the combined mixture.
Gilsonite may also be added through a mineral filler supply system as described in Subsection 400.3.02.B.5, *Mineral Filler Supply System*. Ensure the system is capable of injecting the modifier into the weigh hopper near the center of the aggregate batching cycle so the material can be accurately weighed.
- b. For drier-drum plants, add Gilsonite through the recycle ring or through an acceptable means which will introduce the Gilsonite prior to the asphalt cement injection point. The modifier must proportionately feed into the drum mixer at the required rate by a proportioning device which shall be accurate within ± 10 percent of the amount required. Ensure the entry point is away from flames and the Gilsonite will not be caught up in the air stream and exhaust system.

5. Materials from Different Sources

Do not use mixtures prepared from aggregates from different sources intermittently. This will cause the color of the finished pavement to vary.

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E. Observe Weather Limitations

Do not mix and place asphaltic concrete if the existing surface is wet or frozen. Do not lay asphaltic concrete OGFC mix or PEM at air temperatures below 60 °F (16 °C). When using a MTV, OGFC mix or PEM may be placed at 55 °F (13 °C) when approved by the Engineer. For other courses, follow the temperature guidelines in the following table:

TABLE 4—LIFT THICKNESS TABLE

Lift Thickness	Minimum Temperature
1 in. (25 mm) or less	55 °F (13 °C)
1.1 to 2 in. (26 mm to 50 mm)	45 °F (8 °C)
2.1 to 3 in. (51 mm to 75 mm)	40 °F (4 °C)
3.1 to 4 in. (76 mm to 100 mm)	35 °F (2 °C)
4.1 to 8 in. (101 mm to 200 mm)	32 °F (0 °C) and rising. Base material must not be frozen.

F. Perform Spreading and Finishing

Spread and finish the course as follows:

Determine the maximum compacted layer thickness by the type mix being used according to Table 5.

TABLE 5—MIX TYPE MINIMUM, MAXIMUM LAYER AND TOTAL THICKNESS

Mix Type	Minimum Layer Thickness	Maximum Layer Thickness	Maximum Total Thickness
25 mm Superpave	2 1/2 in. (64 mm)	5 in. (125 mm) *	—
19 mm Superpave	1 3/4 in. (44 mm)	3 in. (75 mm) *	—
12.5 mm Superpave	1 3/8 in. (35 mm)	2 1/2 in. (64 mm)**/**	8 in. (200 mm)
9.5 mm Superpave Type 2	1 1/8 in. (29 mm)	1 1/2 in. (38 mm)**	4 in. (100 mm)
9.5 mm Superpave Type 1	7/8 in. (22 mm)	1 1/4 in. (32 mm)	4 in. (100 mm)
4.75 mm Mix	3/4 in. (19 mm)	1 1/8 in. (29 mm)	2 in. (50 mm)
9.5 mm OGFC	75 lbs./yd ² (41 kg/m ²)	95 lbs./yd ² (51 kg/m ²)	—
12.5 mm OGFC	85 lbs./yd ² (46 kg/m ²)	110 lbs./yd ² (60 kg/m ²)	—
12.5 mm PEM	110 lbs./yd ² (60 kg/m ²)	165 lbs./yd ² (90 kg/m ²)	—
9.5 mm SMA	1 1/8 in. (29 mm)	1 1/2 in. (38 mm)	4 in. (100 mm)
12.5 mm SMA	1 3/8 in. (35 mm)	3 in. (75 mm)	6 in. (150 mm)
19 mm SMA	1 3/4 in. (44 mm)	3 in. (75 mm)	—

* Allow up to 6 in. (150 mm) per lift on trench widening. **Allow up to 4 in. (100 mm) per lift on trench widening of ≤ 2 ft. when no overlay is required. ***Place 9.5 mm Superpave and 12.5 mm Superpave up to 4 in. (100 mm) thick for driveway and side road transition.

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1. Unload the mixture into the paver hopper or into a device designed to receive the mixture from delivery vehicles.
2. Except for leveling courses, spread the mixture to the loose depth for the compacted thickness or the spread rate. Use a mechanical spreader true to the line, grade, and cross section specified.
3. For leveling courses, use a motor grader equipped with a spreader box and smooth tires to spread the material or use a mechanical spreader meeting the requirements in Subsection 400.3.02.C, *Equipment at Project Site*.
4. Obtain the Engineer's approval for the sequence of paving operations, including paving the adjoining lanes. Minimize tracking tack onto surrounding surfaces.
5. Ensure the outside edges of the pavement being laid are aligned and parallel to the roadway center line.
6. For New Construction or Resurfacing Contracts containing multiple lifts or courses, arrange the width of the individual lifts so the longitudinal joints of each successive lift are offset from the previous lift at least 1 ft. (300 mm). This requirement does not apply to the lift immediately over thin lift leveling courses.
7. Ensure the longitudinal joint(s) in the surface course and the mix immediately underneath asphaltic concrete OGFC or PEM are at the lane line(s).

NOTE: Perform night work with artificial light provided by the Contractor and approved by the Engineer.

8. Where mechanical equipment cannot be used, spread and rake the mixture by hand. Obtain the Engineer's approval of the operation sequence, including compactive methods, in these areas.
9. Keep small hand raking tools clean and free from asphalt build up. Do not use fuel oil or other harmful solvents to clean tools during the work.
10. Do not use mixture with any of these characteristics:
 - Segregated
 - Nonconforming temperature
 - Deficient or excessive asphalt cement content
 - Otherwise unsuitable to place on the roadway in the work
11. Remove and replace mixture placed on the roadway that the Engineer determines has unacceptable blemish levels from segregation, raveling, streaking, pulling and tearing, or other deficient characteristics. Replace with acceptable mixture at the Contractor's expense. Do not continually place mixtures with deficiencies.
Do not place subsequent course lifts over another lift or course while the temperature of the previously placed mix is 140 °F (60 °C) or greater.
12. Obtain the Engineer's approval of the material compaction equipment. Perform the rolling as follows:
 - a. Begin the rolling as close behind the spreader as possible without causing excessive distortion of the asphaltic concrete surface.
 - b. Continue rolling until roller marks are no longer visible.
 - c. Use pneumatic-tired rollers with breakdown rollers on all courses except asphaltic concrete OGFC, PEM and SMA or other mixes designated by the Engineer.
13. If applicable, taper or "feather" asphaltic concrete from full depth to a depth no greater than 0.5 in. (13 mm) along curbs, gutters, raised pavement edges, and areas where drainage characteristics of the road must be retained. The Engineer will determine the location and extent of tapering.

G. Maintain Continuity of Operations

Coordinate plant production, transportation, and paving operations to maintain a continuous operation. If the spreading operations are interrupted, construct a transverse joint if the mixture immediately behind the paver screed cools to less than 250 °F (120 °C).

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H. Construct the Joints

1. Construct Transverse Joints

- a. Construct transverse joints to facilitate full depth exposure of the course before resuming placement of the affected course.
- b. Properly clean and tack the vertical face of the transverse joint before placing additional material.

NOTE: Never burn or heat the joint by applying fuel oil or other volatile materials.

- c. Straightedge transverse joints immediately after forming the joint.
- d. Immediately correct any irregularity that exceeds 3/16 in. in 10 ft. (5 mm in 3 m).

2. Construct Longitudinal Joints

Clean and tack the vertical face of the longitudinal joint before placing adjoining material. Construct longitudinal joints so that the joint is smooth, well-sealed, and bonded.

3. Construction Joint Detail for OGFC and PEM Mixtures

In addition to meeting joint requirements described above, construct joints and transition areas for 12.5 mm OGFC and 12.5 mm PEM mixtures as follows:

- a. For projects which do not have milling included as a pay item:

- 1) Place OGFC mixture meeting gradation requirements of 9.5 mm OGFC as specified in Section 828 on entrance and exit ramp gore areas and end of project construction joints.
 - Taper mixture from 3/8 in. (10 mm) at end of project to full plan depth within maximum distance of spread for one load of mixture.
 - Taper mixture placed on gore areas from thickness of the edge of the mainline to 3/8 in. (10 mm) at the point of the ramp transverse joint.
- 2) Construct the ramp transverse joint at the point specified in the plans or as directed by the Engineer.
- 3) Mixture placed in the transition and gore areas will be paid for at the contract unit price for 12.5 mm OGFC or 12.5 mm PEM, as applicable.

- b. For projects which have milling included as a pay item:

- 1) Taper milling for a distance of no less than 50 ft. (15 m) to a depth of 2 1/4 in. (59 mm) at the point of the transverse joint.
- 2) Taper thickness, if needed, of the dense-graded surface mix within the 50 ft. (15 m) distance to 1 1/2 in. (40 mm) at the point of the transverse joint.
- 3) Taper thickness of the 12.5 mm OGFC or 12.5 mm PEM to 3/4 in. (19 mm) to ensure the material ties in at grade level with the existing surface at the point of the transverse joint

I. Protect the Pavement

Protect sections of the newly finished pavement from traffic until the traffic will not mar the surface or alter the surface texture. If directed by the Engineer, use artificial methods to cool the newly finished pavement to open the pavement to traffic more quickly.

J. Modify the Job Mix Formula

If the Engineer determines that undesirable mixture or mat characteristics are being obtained, the job mix formula may require immediate adjustment.

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400.3.06 Quality Acceptance

A. Acceptance Plans for Gradation and Asphalt Cement Content

The Contractor will randomly sample and test mixtures for acceptance on a lot basis. The Department will monitor the Contractor testing program and perform comparison and quality assurance testing. The Contractor's Quality Control Technicians shall participate in the Department's Independent Assurance Systems Basis Program.

1. Determine Lot Amount

A lot consists of the tons (megagrams) of asphaltic concrete produced and placed each production day. If this production is less than 500 tons (500 Mg), or its square yard (meter) equivalent, production may be incorporated into the next working day. The Engineer may terminate a lot when a pay adjustment is imminent if a plant or materials adjustment resulting in a probable correction has been made. Terminate all open lots at the end of the month, except for materials produced and placed during the adjustment period. The lot will be terminated as described in Subsection 400.5.01, *Adjustments*.

If the final day's production does not constitute a lot, the production may be included in the lot for the previous day's run; or, the Engineer may treat the production as a separate lot with a corresponding lower number of tests.

2. Determine Lot Acceptance

Determine lot acceptance as found in Subsection 400.5.01, *Adjustments*.

The Department will perform the following task:

Determine the pay factor by using the mean of the deviations from the job mix formula of the tests in each lot and apply it to Table 10 Mixture Acceptance Schedule for Surface Mixes or Table 11 Mixture Acceptance Schedule for Subsurface Mixes, whichever is appropriate. This mean will be determined by averaging the actual numeric value of the individual deviations from the job mix formula, disregarding whether the deviations are positive or negative amounts. Do not calculate lot acceptance using test results for materials not used in the Work. Determine the pay factor for each lot by multiplying the contract unit price by the appropriate pay factor from the Mixture Acceptance Schedule - Table 10 or Table 11. When two or more pay factors for a specific lot are less than 1.0, determine the adjusted payment by multiplying the contract unit price by the lowest pay factor.

If the mean of the deviations from the job mix formula of the lot acceptance tests for a control sieve or for asphalt cement content exceeds the tolerances established in the appropriate Mixture Acceptance Schedule, and if the Engineer determines that the material need not be removed and replaced, the lot may be accepted at an adjusted unit price as determined by the Engineer. If the Engineer determines that the material is not acceptable to leave in place, the materials shall be removed and replaced at the Contractor's expense.

3. Provide Quality Control Program

Provide a Quality Control Program as established in SOP 27 which includes:

- Assignment of quality control responsibilities to specifically named individuals who have been certified by the Office of Materials and Testing
- Provisions for prompt implementation of control and corrective measures
- Provisions for communication with Project Manager, Bituminous Technical Services Engineer, and Testing Management Operations Supervisor at all times
- Provisions for reporting all test results daily through the Office of Materials and Testing computerized Field Data Collection System, AASHTO Trns*port SiteManager, or approved computerized application; other checks, calibrations and records will be reported on a form developed by the Contractor and will be included as part of the project records
- Notification in writing of any change in quality control personnel

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a. Certification Requirements:

- Use laboratory and testing equipment certified by the Department. (Laboratories which participate in and maintain AASHTO accreditation for testing asphaltic concrete mixtures will be acceptable in lieu of Departmental certification.)
- Provide certified quality control personnel to perform the sampling and testing. A Quality Control Technician (QCT) may be certified at three levels:
 - 1) Temporary Certification – must be a technician trainee who shall be given direct oversight by a certified Level 1 or Level 2 QCT while performing acceptance testing duties during the first 5 days of training. The trainee must complete qualification requirements within 30 Georgia Department of Transportation funded production days after being granted temporary certification. A trainee who does not become qualified within 30 Georgia Department of Transportation funded production days will not be re-eligible for temporary certification. A certified Level 1 or Level 2 QCT shall be at the plant at all times during production and shipment of mixture to monitor work of the temporarily certified technician.
 - 2) Level 1 – must demonstrate they are competent in performing the process control and acceptance tests and procedures related to hot mix asphalt production and successfully pass a written exam.
 - 3) Level 2 – must meet Level 1 requirements and must be capable of and responsible for making process control adjustments, and successfully pass a written exam.
 - Technician certification is valid for 3 years from the date on the technician's certificate unless revoked or suspended. Eligible technicians may become certified through special training and testing approved by the Office of Materials and Testing. Technicians who lose their certification due to falsification of test data will not be eligible for recertification in the future unless approved by the State Materials and Testing Engineer.

b. Quality Control Management

- 1) Designate at least one Level 2 QCT as manager of the quality control operation. Ensure the Quality Control Manager meets the following requirements:
 - Be accountable for actions of other QCT personnel.
 - Ensure all applicable sampling requirements and frequencies, test procedures, and Standard Operating Procedures are followed.
 - Ensure all reports, charts, and other documentation are completed as required
- 2) Provide QCT personnel at the plant as follows:
 - If daily production for all mix types is to be greater than 250 tons (megagrams), have a QCT person at the plant at all times during production and shipment of mixture until all required acceptance tests have been completed.
 - If daily production for all mix types will not be greater than 250 tons (megagrams), a QCT may be responsible for conducting tests at up to two plants, subject to random number sample selection.
 - Have available at the plant, or within immediate contact by phone or radio, a Level 2 QCT responsible for making prompt process control adjustments as necessary to correct the mix.

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- 3) Sampling, Testing, and Inspection Requirements.
 - a. Provide all sample containers, extractants, forms, diaries, and other supplies subject to approval of the Engineer.
 - b. Perform daily sampling, testing, and inspection of mixture production that meet the following requirements:
 - 1) Randomly sample mixtures according to GSP 15 and GDT 73 (Method C) and test on a lot basis. In the event less than the specified number of samples are taken, obtain representative 6 in. (150 mm) cores from the roadway at a location where the load not sampled was placed. Take enough cores to ensure minimum sample size requirements are met for each sample needed.
 - 2) Maintain a printed copy of the computer-generated random sampling data as a part of the project records.
 - 3) Perform sampling, testing, and inspection duties of GSP 21.
 - 4) Perform extraction or ignition test (GDT 83 or GDT 125) and extraction analysis (GDT 38). If the ignition oven is used, a printout of sample data including weights becomes a part of the project records. For asphalt cement content only, digital printouts of liquid asphalt cement weights may be substituted in lieu of an extraction test for plants with digital recorders. Calculate the asphalt content from the ticket representing the mixture tested for gradation.
 - 5) Save extracted aggregate, opposite quarters, and remaining material (for possible referee testing) of each sample as follows:
 - Store in properly labeled, suitable containers.
 - Secure in a protected environment.
 - Store for three working days. If not obtained by the Department within three days, they may be discarded in accordance with GSP 21.
 - 6) Add the following information on load tickets from which a sample or temperature check is taken:
 - Mixture temperature
 - Signature of the QCT person performing the testing
 - 7) Calibrate the lime system when hydrated lime is included in the mixture:
 - Perform a minimum of twice weekly during production
 - Post results at the plant for review.
 - Provide records of materials invoices upon request (including asphalt cement, aggregate, hydrated lime, etc.).

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8) Take action if acceptance test results are outside Mixture Control Tolerances of Section 828.

- One sample out of tolerance
 - a. Contact Level 2 - QCT to determine if a plant adjustment is needed.
 - b. Immediately run a process control sample. Make immediate plant adjustments if this sample is also out of tolerance.
 - c. Test additional process control samples as needed to ensure corrective action taken appropriately controls the mixture.
- Two consecutive acceptance samples of the same mix type out of tolerance regardless of Lot or mix design level, or three consecutive acceptance samples out of tolerance regardless of mix type.
 - a. Stop plant production immediately.
 - b. Reject any mixture in storage:
 - Deviating more than 10 percent in gradation from the job mix formula based on the acceptance sample.
 - Deviating more than 0.7 percent in asphalt content from the job mix formula based on the acceptance sample.
 - c. Make a plant correction to any mix type out of tolerance prior to resuming production.
 - Do not send any mixture to the project before test results of a process control sample meets Mixture Control Tolerances.
 - Reject any mixture produced at initial restarting that does not meet Mixture Control Tolerances.

NOTE: Determine mixture temperature at least once per hour of production for OGFC and PEM mixes.

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4) Comparison Testing and Quality Assurance Program

- a. Periodic comparison testing by the Department will be required of each QCT to monitor consistency of equipment and test procedures. The Department will take independent samples to monitor the Contractor's quality control program.

1) Comparison Sampling and Testing

Retain samples for comparison testing and referee testing if needed as described in Subsection 400.3.06.A.3.b.3. Discard these samples only if the Contractor's acceptance test results meet a 1.00 pay factor and the Department does not procure the samples within three working days.

The Department will test comparison samples on a random basis. Results will be compared to the respective contractor acceptance tests, and the maximum difference is as follows:

TABLE 6—ALLOWABLE PERCENT DIFFERENCE BETWEEN DEPARTMENT AND CONTRACTOR ACCEPTANCE TESTS

Sieve Size	Surface	Sub-surface
1/2 in. (12.5 mm)		4.0%
3/8 in. (9.5 mm)	3.5%	4.0%
No. 4 (4.75 mm)	3.5%	3.5%
No. 8 (2.36 mm)	2.5%	3.0%
No. 200 (75 µm)	2.0%	2.0%
A.C.	0.4%	0.5%

- 1) If test comparisons are within these tolerances:
 - Continue production
 - Use the Contractor's tests for acceptance of the lot
- 2) If test comparisons are not within these tolerances:
 - Another Departmental technician will test the corresponding referee sample.
 - Results of the referee sample will be compared to the respective contractor and Departmental tests using the tolerance for comparison samples given above.
 - a. If referee test results are within the above tolerances when compared to the Contractor acceptance test, use the Contractor's test for acceptance of the effected lot.
 - b. If referee test results are not within the above tolerances when compared to the Contractor acceptance test, the Department will review the Contractor's quality control methods and determine if a thorough investigation is needed.

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b. Independent Verification Sampling and Testing

- 1) Randomly take a minimum of two independent samples from the lesser of five days or five lots of production regardless of mix type or number of projects.
- 2) Compare test deviation from job mix formula to Mixture Control Tolerances in Section 828. If results are outside these tolerances, another sample from the respective mix may be taken. If test results of the additional sample are not within Mixture Control Tolerances, the Department will take the following action:
 - Take random samples from throughout the subject lot(s) as established in Subsection 400.3.06.A.3.b.3 and use these test results for acceptance and in calculations for the monthly plant rating. Applicable pay factors will apply and the contractor QCT test results will not be included in pay factor calculations nor in the monthly plant rating.
 - Determine if the Contractor's quality control program is satisfactory and require prompt corrective action by the Contractor if specification requirements are not being met.
 - Determine if the QCT has not followed Departmental procedures or has provided erroneous information.
 - Take samples of any in-place mixture represented by unacceptable QCT tests and use the additional sample results for acceptance and in calculations for the monthly plant rating and apply applicable pay factors. The Contractor QCT tests will not be included in the pay factor calculations nor in the monthly plant rating.

NOTE: For leveling or dense graded surface courses less than 110 lb./yd² (60 kg/m²) having quality assurance test results outside the Mixture Control Tolerances of Section 828, use the Department's test results only and applicable pay factors will apply.

B. Compaction

Determine the mixture compaction using either GDT 39, GDT 59, or AASHTO T 331. The method of GDT 39 for "Uncoated Specimens, Dense Graded Mixtures Only" shall not apply when the water absorption of a sample exceeds 2.0 percent, as measured according to AASHTO T 166. In this case, either AASHTO T 331 or the paraffin method of GDT 39 shall apply. The compaction is accepted in lots defined in Subsection 400.3.06. A, *Acceptance Plans for Gradation and Asphalt Cement Content* and is within the same lot boundaries as the mixture acceptance.

1. Calculate Pavement Mean Air Voids

The Department is responsible for pavement mean air void acceptance testing. The Contractor is responsible for establishing all roller patterns and any quality control testing. Upon written request by the Contractor, the Office of Materials and Testing will provide nuclear gauge testing assistance for compaction related issues.

The Department will calculate the pavement air voids placed within each lot as follows:

- a. One test per sub-lot.
 - Lots > 400 ton (400 Mg) of mix are divided into 5 sub-lots of equal distance.
 - Lots ≤ 400 tons (400 Mg) of mix are divided into a sub-lot or sub-lots of equal distance at a rate of one per 100 tons (100 Mg) mix each (Example: 299 tons of mix require 3 sublots and 301 tons of mix require 4 sublots). There will be less than 5 sub-lots.
- b. Average the results of all tests run on randomly selected sites in that lot.
- c. Select representative sites randomly using GDT 73.

Density tests are not required for asphaltic concrete placed at 90 lbs./yd² (50 kg/m²) or less, 4.75 mm mix, asphaltic concrete OGFC, PEM, and mixes placed as variable depth or width leveling. Compact these courses to the Engineer's satisfaction. Density tests will not be performed on turn-outs and driveways.

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The targeted maximum Pavement Mean Air Void content for all Superpave and Stone Matrix Asphalt mixtures is 5.0 percent. Ensure that the maximum Pavement Mean Air Voids for all Superpave and Stone Matrix Asphalt mixtures does not exceed 7.0 percent. The maximum Pavement Mean Air Voids for 2 ft. shoulder widening is 9.0 percent. The adjustment period for density is four lots or four production days, whichever is less, in order for the contractor to ensure maximum compactive effort has been achieved, which will yield no more than the specified maximum allowed Mean Air Voids. One additional lot or production day of adjustment may be given for a reduction in asphalt cement content on the JMF made by the Office of Materials and Testing for mix designs incorporating the Corrected Optimum Asphalt Content COAC.

If the contractor needs to adjust the mixture to improve density results, a change in the job mix formula may be requested for approval during the adjustment period so long as the following values are not exceeded:

- Coarse pay sieve $\pm 4\%$
- No. 8 (2.36 mm) sieve $\pm 2\%$
- No. 200 (75 μm) sieve $\pm 1\%$
- Asphalt Content $\pm 0.2\%$
- All value changes must still be within specification limits.

If the Office of Materials and Testing is satisfied that the contractor has exerted the maximum compactive effort and is not able to maintain Pavement Mean Air Voids at no more than 7.0%, the Engineer may establish a maximum target for Pavement Mean Air Voids.

Ensure mixture placed during the adjustment period for density meets the requirements for a 0.90 pay factor in Table 13 of Subsection 400.5.01.C, *Calculate Mean Pavement Air Voids*. Mixture not meeting these density requirements is paid for using the applicable pay factor.

If the mean air voids of the pavement placed within a lot exceeds 100% of the maximum target air voids, if established, and the Engineer determines that the material need not be removed and replaced, the lot may be accepted at an adjusted unit price as determined by the Engineer.

2. Obtain Uniform Compaction

For a lot to receive a pay factor of 1.00 for compaction acceptance, the air void range cannot exceed 5 percent for new construction or resurfacing projects. The range is the difference between the highest and lowest acceptance test results within the affected lot. If the air void range exceeds these tolerances, apply a Pay Factor of 95%.

The 5% reduced pay factor for the compaction range does not apply in these instances:

- The mixture is placed during the adjustment period as defined in Subsection 400.5.01.A, *Materials Produced and Placed During the Adjustment Period*.
- All air void results within a given lot are less than 7.0%.
- A lot containing two subplot or less.
- On two foot trench widening.
- For sub-surfaces mixes including 19 mm and 25 mm Superpave mixes if all air void results within a given lot are $>2.5\% <8\%$.

When lots are reevaluated for range penalty, as shown in Subsection 106.03, *Samples, Tests, Cited Specifications*, sampling and testing is according to GDT 73. Request for reevaluation must be made within 5 working days of notification of the lot results. The following procedures apply:

The Department will reevaluate the lot through additional testing by obtaining and testing three additional cores acquired in representative sites selected randomly throughout each sub-lot representing the high and low in-place air voids as detailed in GDT 73. The additional six cores (three cores from each sub-lot will be averaged) will replace the original five core results for range specified requirements only. The original five cores' results will be reported for Pavement Mean Air Voids for the lot. This will be the final evaluation for compaction range for the lot. Lots will not be re-evaluated for range when the Pavement Mean Air Voids result in a lower than 95% pay factor. Ensure requests for reevaluation are made within 5 working days of notification of the lot results.

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The Department will determine the payment for each lot by multiplying the Contract Unit Price by the adjusted pay factor shown in the Table 7 Average Air Voids Range Acceptance Schedule:

TABLE 7—AVERAGE AIR VOIDS RANGE FOR ACCEPTANCE SCHEDULE

Pay Factor	Range between High and Low Air Void Original 5 cores	Re-evaluated Range between High and Low Air Void Cores 6 New Cores obtained from High (3 cores) and Low location (3 cores)
100	≤ 5 %	≤ 4.50 %
0.95	> 5 %	> 4.50 %

C. Surface Tolerance

In this specification, pavement courses to be overlaid with an OGFC or PEM are considered surface courses. All OGFC or PEM are to be evaluated after the roadway has been opened to traffic for a minimum of 5 days and a maximum of 15 days. Asphaltic Concrete paving is subject to straightedge and visual inspection and irregularity correction as shown below:

1. Visual and Straightedge Inspection

Paving is subject to visual and straightedge inspection during and after construction operations until Final Acceptance. Locate surface irregularities as follows:

- a. Keep a 10 ft. (3 m) straightedge near the paving operation to measure surface irregularities on courses. Provide the straightedge and the labor for its use.
- b. Inspect the base, intermediate, and surface course surfaces with the straightedge to detect irregularities.
- c. Correct irregularities that exceed 3/16 in. in 10 ft. (5 mm in 3 m) for base and intermediate courses and surface courses.

Mixture or operating techniques will be stopped if irregularities such as rippling, tearing, or pulling occur and the Engineer suspects a continuing equipment problem. Stop the paving operation and correct the problem. Correct surface course evaluations on individual Laser Road Profiler test sections, normally 1 mile (1 km) long.

2. Target Surface Profile Smoothness

The Department will use the Laser Road Profiler method to conduct acceptance testing for surface course tolerance according to GDT 126. This testing will be performed only on:

- Surface courses on Projects with mainline traveled way measuring a minimum distance of 1 mile (1600 m)
- Ramps more than 0.5 mile (800 m) long

Combine partial sections measuring less than 0.5 mile (800 m) with the previous full mile for acceptance.

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Achieve the smoothest possible ride during construction. Do not exceed the target Laser Road Profiler smoothness index as shown below:

TABLE 8—PAVEMENT SMOOTHNESS TARGET REQUIREMENTS

Construction Description	Smoothness Index
All Asphaltic Concrete OGFC and PEM on interstate including resurfacing and new construction. Asphaltic Concrete OGFC and PEM placed on state routes as new construction.	750
Asphaltic Concrete SMA or dense-graded surface mixtures placed directly beneath the Asphaltic Concrete OGFC or PEM on interstates. Asphaltic Concrete OGFC and PEM placed on state routes as resurfacing. All new construction on state routes with exception of OGFC and PEM as stated above.	825
All other resurfacing on state routes (excluding LARP, PR, airports, etc.)	900
All Urban new construction and resurfacing on state routes within curb and gutter sections located in posted 40 miles per hour (MPH) or less speed zones.	1175

If the target values are not achieved, immediately adjust the operations to meet the target values. Placement operations may be suspended until a remedial plan to comply with target smoothness requirements is submitted and approved by the Engineer if adjustments do not satisfy target smoothness values.

TABLE 9—PAVEMENT SMOOTHNESS CORRECTIVE WORK REQUIREMENT

Construction Description	Smoothness Index
All Asphaltic Concrete OGFC and PEM placed on interstate including resurfacing and new construction. Asphaltic Concrete OGFC and PEM placed on state routes as new construction.	825
Asphaltic Concrete SMA or dense-graded surface mixtures placed directly beneath the Asphaltic Concrete OGFC or PEM on interstates. Asphaltic Concrete OGFC and PEM placed on state routes as resurfacing. All new construction on state routes with exception of OGFC and PEM as stated above.	900
All other resurfacing on state routes (excluding LARP, PR, airports, etc.)	1025
All Urban new construction and resurfacing on state routes within curb and gutter sections located in posted 40 miles per hour (MPH) or less speed zones.	1250

If surface tolerance deficiencies need correction, obtain the Engineer's approval of the methods and type mix used.

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3. Bridge Approach Profile Smoothness Quality

The following are subject to a ride quality test of roadway approaching each end of a bridge using the Laser Road Profiler, Rainhart Profiler or Lightweight Profiler:

- A state route with 4 lanes or more
- A 2-lane state route with a current traffic count two-way ADT-2,000 vpd or more
- Locations designated on the plans

All other bridge approaches not meeting the above criteria shall meet the 3/16 in. in 10 ft. (5 mm in 3 m) straightedge requirement. When the distance between the ends of two bridges, the end of a bridge and an intersection, or the end of a bridge and a vertical or horizontal curve is less than 540 ft. (165 m) and locations where the testing vehicle cannot maintain minimum testing speed while taking profile measurements will not be tested and will be subject to straightedge requirements.

The bridge approaches will meet the straightedge requirements.

Test ride quality as follows:

For Resurfacing Projects:

- a. The Department will determine a profile smoothness index value using the laser road profiler in accordance with test method GDT 126.
- b. The Department will determine the Half Car Simulation (HCS) IRI for each HMA asphalt 1/10th of mile (0.16 km) segments adjacent to each approach slab joint for each lane. The HCS IRI will be reported in 1/20th of mile (0.08 km) segment readings that will be averaged to calculate the final 1/10-mile section, in accordance with GDT 126.
 - Correct individual bumps or depression exceeding 3/16 in. in 10 ft. (3 mm in 3 m) straightedge requirement as directed by the Engineer.
 - Ensure the profile smoothness index shows an improvement over pre-construction profile smoothness or meets a profile smoothness index of ≤ 1025 mm/km (66 inches/mile) for the average 1/10 mile (0.16 km).
- c. Ensure Resurfacing projects meet the profile smoothness index improvement requirement for the specified 1/10th mile (0.16 km) segment of roadway up to the bridge approach/exit slab joint.

In accordance with Section 106.3.A.3, the Contractor may request reevaluation(s) for Laser Road Profiler Test results on Resurfacing Bridge Projects and straightedge measurement(s) on either that fail to meet specified requirements. Request for reevaluation shall be made to the Engineer within 5 working days of notification of failing results. At the Engineer's approval, reevaluation of failing results using the Lightweight Profiler Test, Laser Road Profiler Test and straightedge measurement(s) shall be conducted in conjunction with representatives from the Office of Materials and Testing in accordance with GDT 126 or GDT 134, whichever is applicable. The Department will perform ride quality testing up to two times on the bridge approaches/exits at no cost to the Contractor. For these reevaluations, evaluation of the bridge exit end may be taken testing towards the bridge against traffic if the contractor provides traffic control, at the contractors' expense, upon request.

For All New Construction Projects:

- a. The Department will determine a profile index value according to test method GDT 78 or GDT 134.
- b. The Department will average the profile index value from the right and left wheelpath for each 100 ft. (30 m) section for each lane.
 - Keep the profile index value under 30 in/mile (475 mm/km), correct individual bumps or depressions exceeding 0.2 in. (5 mm) from blanking band on the profilograph trace.
- c. Ensure New Construction projects meet the profile index value for the specified 100 ft. (30 m) section of roadway up to the bridge joint.
- d. Schedule the ride quality testing on All New Construction projects 5 days before needed by contacting the Office of Materials and Testing. Clean and clear obstructions from the test area.

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Correct the sections that do not meet the ride quality criteria of this specification. After correction, these sections are subject to retesting with the Lightweight Profiler. The Engineer direct the type of correction method, which may include:

- Milling
- Grinding
- Removing and replacing the roadway

No additional compensation will be made.

In accordance with Section 106.3.A.3, the Contractor may request reevaluation(s) for Lightweight Profiler Test results on newly construction bridge projects, Laser Road Profiler Test results on resurfacing bridge projects and straightedge measurement(s) on either that fail to meet specified requirements. Request for reevaluation shall be made to the Engineer within 5 working days of notification of failing results. At the Engineer's approval, reevaluation of failing results using the Lightweight Profiler Test, Laser Road Profiler Test and straightedge measurement(s) shall be conducted by representatives from the Office of Materials and Testing in accordance with GDT 134.

The Department will perform ride quality testing up to two times on the bridge approaches at no cost to the Contractor. Additional testing will be charged to the Contractor in accordance with Section 500.5.01.B.

4. Surface Smoothness Acceptance

When recommended by the Office of Materials and Testing, a pay reduction may be accepted in lieu of correction for roadways and bridge approaches that fail to achieve specified smoothness indexes in accordance with SOP 46 "Procedure for Calculating Pay Reduction for Failing Roadway and Bridge Approach Smoothness" Roadway and Bridge Approach Smoothness. The Office of Materials and Testing may recommend a waiver of profile smoothness requirements when improvement over pre-construction smoothness profile exceeds 25 percent for urban roadways, as defined in Table 9.

D. Reevaluation of Lots

When lots are reevaluated as shown in Subsection 106.03, *Samples, Tests, Cited Specifications*, sampling and testing is according to GDT 73. Ensure request for reevaluation are made within 5 working days of notification of the lot results. The following procedures apply:

1. For asphaltic concrete mixtures other than OGFC and PEM mix types, thin lift courses < 110 lbs./yd² and mixture paid for as patching, the Department will take the same number of new tests using cores taken at randomly selected locations in accordance GDT 73. The Department will use only these test results for gradation and AC content obtained using these cores for acceptance. For OGFC and PEM mix types, thin lift courses < 110 lbs./yd² and mixture paid for as patching, the retained opposite quarter shall be used for mixture acceptance reevaluation when requested by the Contractor. The Department will use the absolute average deviations from the job mix formula for these tests to determine acceptance based on the appropriate column in the Asphalt Cement Content and Aggregate Gradation of Asphalt Concrete Mixture Acceptance Schedule—Table 10 or 11.

2. Compaction Acceptance

The Department will reevaluate the lot through additional testing by cutting the same number of cores originally obtained and averaging these results with the results from the original density tests. The Department will use the average to determine acceptance according to the Compaction Acceptance Schedule in Subsection 400.5.01.C, *Calculate Pavement Mean Air Voids*.

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TABLE 10 — MIXTURE ACCEPTANCE SCHEDULE — SURFACE MIXES

Mixture Characteristics	Pay Factor	Mean of the Deviations from the Job Mix Formula							
		1 Test	2 Tests	3 Tests	4 Tests	5 Tests	6 Tests	7 Tests	8 Tests
Asphalt Cement Content (Extraction, Ignition)	1.00	0.00 - 0.70	0.00 - 0.54	0.00 - 0.46	0.00 - 0.41	0.00 - 0.38	0.00 - 0.35	0.00 - 0.32	0.00 - 0.30
	0.95	0.71 - 0.80	0.55 - 0.61	0.47 - 0.52	0.42 - 0.46	0.39 - 0.43	0.36 - 0.39	0.33 - 0.36	0.31 - 0.34
	0.90	0.81 - 0.90	0.62 - 0.68	0.53 - 0.58	0.47 - 0.51	0.44 - 0.47	0.40 - 0.45	0.37 - 0.40	0.35 - 0.37
	0.80	0.91 - 1.00	0.69 - 0.75	0.59 - 0.64	0.52 - 0.56	0.48 - 0.52	0.44 - 0.47	0.41 - 0.44	0.38 - 0.41
	0.70	1.01 - 1.19	0.76 - 0.82	0.65 - 0.69	0.57 - 0.61	0.53 - 0.56	0.48 - 0.51	0.45 - 0.47	0.42 - 0.44
	0.50	1.20 - 1.40	0.83 - 0.85	0.70 - 0.72	0.62 - 0.64	0.57 - 0.59	0.52 - 0.55	0.48 - 0.51	0.45 - 0.48
3/8 in. (9.5 mm) Sieve (12.5 mm OGFC, 12.5 mm PEM, 12.5 mm Superpave)	1.00	0.00 - 9.0	0.00 - 6.6	0.00 - 5.6	0.00 - 5.0	0.00 - 4.6	0.00 - 4.2	0.00 - 3.9	0.00 - 3.6
	0.98	9.1 - 10.0	6.7 - 7.5	5.7 - 6.3	5.1 - 5.6	4.7 - 5.2	4.3 - 4.7	4.0 - 4.4	3.7 - 4.1
	0.95	10.1 - 11.9	7.6 - 8.4	6.4 - 7.0	5.7 - 6.3	5.3 - 5.8	4.8 - 5.3	4.5 - 5.0	4.2 - 4.6
	0.90	12.0 - 13.0	8.5 - 9.3	7.1 - 7.7	6.4 - 6.9	5.9 - 6.3	5.4 - 5.8	5.1 - 5.4	4.7 - 5.0
	0.85	13.1 - 14.0	9.4 - 10.2	7.8 - 8.6	7.0 - 7.6	6.4 - 6.9	5.9 - 6.3	5.5 - 5.9	5.1 - 5.5
	0.80	14.1 - 14.5	10.3 - 10.5	8.7 - 8.9	7.7 - 8.0	7.0 - 7.5	6.4 - 6.8	6.0 - 6.4	5.6 - 6.0
3/8 in. (9.5 mm) Sieve (12.5 mm SMA)	1.00	0.0 - 6.8	0.00 - 5.0	0.00 - 4.2	0.00 - 3.8	0.00 - 3.4	0.00 - 3.2	0.00 - 2.9	0.00 - 2.7
	0.98	6.9 - 7.5	5.1 - 5.6	4.3 - 4.7	3.9 - 4.2	3.5 - 3.9	3.3 - 3.5	3.0 - 3.3	2.8 - 3.1
	0.95	7.6 - 8.9	5.7 - 6.3	4.8 - 5.2	4.3 - 4.7	4.0 - 4.4	3.6 - 4.0	3.4 - 3.8	3.2 - 3.4
	0.90	9.0 - 9.8	6.4 - 7.0	5.3 - 5.8	4.8 - 5.2	4.5 - 4.8	4.1 - 4.4	3.9 - 4.1	3.5 - 3.8
	0.85	9.9 - 10.5	7.1 - 7.6	5.9 - 6.4	5.3 - 5.7	4.9 - 5.2	4.5 - 4.7	4.2 - 4.4	3.9 - 4.1
	0.80	10.6 - 10.9	7.7 - 7.9	6.5 - 6.7	5.8 - 6.0	5.3 - 5.6	4.8 - 5.1	4.5 - 4.8	4.2 - 4.5
No. 4 (4.75 mm) Sieve (9.5 mm OGFC, 9.5 mm Superpave)	1.00	0.00 - 9.0	0.00 - 6.7	0.00 - 5.7	0.00 - 5.2	0.00 - 4.8	0.00 - 4.4	0.00 - 4.1	0.00 - 3.8
	0.98	9.1 - 10.0	6.8 - 7.6	5.8 - 6.3	5.3 - 5.8	4.9 - 5.4	4.5 - 4.9	4.2 - 4.6	3.9 - 4.3
	0.95	10.1 - 11.9	7.7 - 8.5	6.4 - 6.9	5.9 - 6.4	5.5 - 5.9	5.0 - 5.4	4.7 - 5.0	4.4 - 4.7
	0.90	12.0 - 13.0	8.6 - 9.4	7.0 - 7.5	6.5 - 7.0	6.0 - 6.5	5.5 - 5.9	5.1 - 5.5	4.8 - 5.1

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Mixture Characteristics	Pay Factor	Mean of the Deviations from the Job Mix Formula							
		1 Test	2 Tests	3 Tests	4 Tests	5 Tests	6 Tests	7 Tests	8 Tests
No. 4 (4.75 mm) Sieve (9.5 mm SMA)	0.85	13.1 - 14.0	9.5 - 10.2	7.6 - 8.0	7.1 - 7.6	6.6 - 7.0	6.0 - 6.4	5.6 - 5.9	5.2 - 5.5
	0.80	14.1 - 14.5	10.3 - 10.5	8.1 - 8.3	7.7 - 8.0	7.1 - 7.5	6.5 - 6.9	6.0 - 6.4	5.6 - 5.9
	1.00	0.00 - 6.8	0.00 - 5.0	0.00 - 4.3	0.00 - 3.9	0.00 - 3.6	0.00 - 3.3	0.00 - 3.1	0.00 - 2.8
	0.98	6.9 - 7.5	5.1 - 5.7	4.4 - 4.7	4.0 - 4.4	3.7 - 4.0	3.4 - 3.7	3.2 - 3.4	2.9 - 3.2
	0.95	7.6 - 8.9	5.8 - 6.4	4.8 - 5.2	4.5 - 4.8	4.1 - 4.4	3.8 - 4.0	3.5 - 3.8	3.3 - 3.5
	0.90	9.0 - 9.8	6.5 - 7.0	5.3 - 5.6	4.9 - 5.2	4.5 - 4.9	4.1 - 4.4	3.9 - 4.1	3.6 - 3.8
	0.85	9.9 - 10.5	7.1 - 7.7	5.7 - 6.0	5.3 - 5.7	5.0 - 5.2	4.3 - 4.8	4.2 - 4.4	3.9 - 4.1
	0.80	10.6 - 10.9	7.8 - 7.9	6.1 - 6.2	5.8 - 6.0	5.3 - 5.6	4.9 - 5.2	4.5 - 4.8	4.2 - 4.4
	1.00	0.00 - 7.0	0.00 - 5.6	0.00 - 4.8	0.00 - 4.3	0.00 - 4.0	0.00 - 3.6	0.00 - 3.4	0.00 - 3.2
	0.98	7.1 - 8.0	5.7 - 6.3	4.9 - 5.4	4.4 - 4.8	4.1 - 4.5	3.7 - 4.1	3.5 - 3.8	3.3 - 3.6
No. 8 (2.36 mm) Sieve (OGFC, PEM, Superpave and 4.75 mm mixes)	0.95	8.1 - 9.0	6.4 - 7.0	5.5 - 6.0	4.9 - 5.3	4.6 - 4.9	4.2 - 4.5	3.9 - 4.2	3.7 - 3.9
	0.90	9.1 - 10.9	7.1 - 7.7	6.1 - 6.6	5.4 - 5.8	5.0 - 5.4	4.6 - 4.9	4.3 - 4.6	4.0 - 4.3
	0.85	11.0 - 12.0	7.8 - 8.5	6.7 - 7.2	5.9 - 6.4	5.5 - 5.8	5.0 - 5.3	4.7 - 5.0	4.4 - 4.6
	0.75	12.1 - 12.5	8.6 - 8.8	7.3 - 7.5	6.5 - 6.8	5.9 - 6.3	5.4 - 5.7	5.1 - 5.3	4.7 - 4.9
	1.00	0.00 - 5.3	0.00 - 4.2	0.00 - 3.6	0.00 - 3.2	0.00 - 3.0	0.00 - 2.7	0.00 - 2.6	0.00 - 2.4
	0.98	5.4 - 6.0	4.3 - 4.7	3.7 - 4.0	3.3 - 3.6	3.1 - 3.4	2.8 - 3.1	2.7 - 2.9	2.5 - 2.7
	0.95	6.1 - 6.8	4.8 - 5.3	4.1 - 4.5	3.7 - 4.0	3.5 - 3.7	3.2 - 3.4	3.0 - 3.2	2.8 - 2.9
	0.90	6.9 - 8.2	5.4 - 5.8	4.6 - 5.0	4.1 - 4.5	3.8 - 4.0	3.5 - 3.7	3.3 - 3.5	3.0 - 3.2
	0.85	8.3 - 9.0	5.9 - 6.4	5.1 - 5.4	4.6 - 4.8	4.1 - 4.4	3.8 - 4.0	3.6 - 3.8	3.3 - 3.4
	0.75	9.1 - 9.4	6.5 - 6.6	5.5 - 5.0	4.9 - 5.1	4.5 - 4.7	4.1 - 4.3	3.9 - 4.0	3.5 - 3.7
No. 8 (2.36 mm) Sieve for OGFC and PEM mixes:		When the mean of the deviations from the Job Mix Formula for a particular lot exceeds the tolerance for a 1.00 pay factor in the appropriate column, the lot will be paid for at 0.50 of the Contract Price.							

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TABLE 11 — MIXTURE ACCEPTANCE SCHEDULE — SUBSURFACE MIXES

Mixture Characteristics	Pay Factor	Mean of the Deviations from the Job Mix Formula								
		1 Test	2 Tests	3 Tests	4 Tests	5 Tests	6 Tests	7 Tests	8 Tests	
Asphalt Cement Content (Extraction, Ignition)	1.00	0.00 - 0.80	0.00 - 0.61	0.00 - 0.52	0.00 - 0.46	0.00 - 0.43	0.00 - 0.39	0.00 - 0.36	0.00 - 0.34	
	0.95	0.81 - 0.90	0.62 - 0.68	0.53 - 0.58	0.47 - 0.51	0.44 - 0.47	0.40 - 0.43	0.37 - 0.40	0.35 - 0.37	
	0.90	0.91 - 1.00	0.69 - 0.75	0.59 - 0.64	0.52 - 0.56	0.48 - 0.52	0.44 - 0.47	0.41 - 0.44	0.38 - 0.41	
	0.80	1.01 - 1.19	0.76 - 0.82	0.65 - 0.69	0.57 - 0.61	0.53 - 0.56	0.48 - 0.51	0.45 - 0.47	0.42 - 0.44	
	0.70	1.20 - 1.40	0.83 - 0.85	0.70 - 0.72	0.62 - 0.64	0.57 - 0.59	0.52 - 0.55	0.48 - 0.51	0.45 - 0.48	
	0.50	1.41 - 1.60	0.86 - 0.88	0.73 - 0.75	0.65 - 0.67	0.60 - 0.63	0.56 - 0.60	0.52 - 0.56	0.49 - 0.52	
	1.00	0.00 - 12.9	0.00 - 8.1	0.00 - 6.9	0.00 - 6.1	0.00 - 5.5	0.00 - 5.0	0.00 - 4.7	0.00 - 4.4	
	0.98	13.0 - 14.0	8.2 - 9.1	7.0 - 7.7	6.2 - 6.8	5.6 - 6.1	5.1 - 5.6	4.8 - 5.2	4.5 - 4.9	
1/2 in. (12.5 mm) Sieve (25 mm Superpave)	0.95	14.1 - 15.0	9.2 - 10.1	7.8 - 8.5	6.9 - 7.5	6.2 - 6.7	5.7 - 6.1	5.3 - 5.7	5.0 - 5.4	
	0.90	15.1 - 16.0	10.2 - 11.1	8.6 - 9.3	7.6 - 8.2	6.8 - 7.4	6.2 - 6.7	5.8 - 6.3	5.5 - 5.9	
	0.85	16.1 - 17.0	11.2 - 11.5	9.4 - 9.6	8.3 - 8.6	7.5 - 7.8	6.8 - 7.0	6.4 - 6.5	6.0 - 6.1	
	0.80	17.1 - 18.0	11.6 - 11.9	9.7 - 9.9	8.7 - 9.0	7.9 - 8.1	7.1 - 7.3	6.6 - 6.8	6.2 - 6.4	
	1.00	0.00 - 9.7	0.00 - 6.0	0.00 - 5.2	0.00 - 4.6	0.00 - 4.1	0.00 - 3.8	0.00 - 3.5	0.00 - 3.3	
	0.98	9.8 - 10.5	6.2 - 6.8	5.3 - 5.8	4.7 - 5.1	4.2 - 4.6	3.9 - 4.2	3.6 - 3.9	3.4 - 3.7	
	0.95	10.6 - 11.2	6.9 - 7.8	5.9 - 6.4	5.2 - 5.6	4.7 - 5.0	4.3 - 4.6	4.0 - 4.3	3.8 - 4.0	
	0.90	11.3 - 12.0	7.9 - 8.3	6.5 - 7.0	5.7 - 6.1	5.1 - 5.6	4.7 - 5.0	4.4 - 4.7	4.1 - 4.4	
1/2 in. (12.5 mm) Sieve (19 mm SMA)	0.85	12.1 - 12.8	8.4 - 8.6	7.1 - 7.2	6.2 - 6.5	5.7 - 5.9	5.1 - 5.3	4.8 - 4.9	4.5 - 5.6	
	0.80	12.9 - 13.5	8.7 - 8.9	7.3 - 7.4	6.6 - 6.8	6.0 - 6.1	5.4 - 5.5	5.0 - 5.1	4.7 - 4.8	
	1.00	0.00 - 10.0	0.00 - 7.5	0.00 - 6.3	0.00 - 5.6	0.00 - 5.2	0.00 - 4.7	0.00 - 4.4	0.00 - 4.1	
	0.98	10.1 - 11.9	7.6 - 8.4	6.4 - 7.0	5.7 - 6.3	5.3 - 5.8	4.8 - 5.3	4.5 - 5.0	4.2 - 4.6	
	0.95	12.0 - 13.0	8.5 - 9.3	7.1 - 7.7	6.4 - 6.9	5.9 - 6.3	5.4 - 5.8	5.1 - 5.4	4.7 - 5.0	
	0.90	13.1 - 14.0	9.4 - 10.2	7.8 - 8.6	7.0 - 7.6	6.4 - 6.9	5.9 - 6.3	5.5 - 5.9	5.1 - 5.5	
	3/8 in. (9.5 mm) Sieve (19 mm Superpave, 12.5 mm Superpave)	1.00	0.00 - 0.80	0.00 - 0.61	0.00 - 0.52	0.00 - 0.46	0.00 - 0.43	0.00 - 0.39	0.00 - 0.36	0.00 - 0.34
		0.95	0.81 - 0.90	0.62 - 0.68	0.53 - 0.58	0.47 - 0.51	0.44 - 0.47	0.40 - 0.43	0.37 - 0.40	0.35 - 0.37
0.90		0.91 - 1.00	0.69 - 0.75	0.59 - 0.64	0.52 - 0.56	0.48 - 0.52	0.44 - 0.47	0.41 - 0.44	0.38 - 0.41	
0.80		1.01 - 1.19	0.76 - 0.82	0.65 - 0.69	0.57 - 0.61	0.53 - 0.56	0.48 - 0.51	0.45 - 0.47	0.42 - 0.44	
0.70		1.20 - 1.40	0.83 - 0.85	0.70 - 0.72	0.62 - 0.64	0.57 - 0.59	0.52 - 0.55	0.48 - 0.51	0.45 - 0.48	
0.50		1.41 - 1.60	0.86 - 0.88	0.73 - 0.75	0.65 - 0.67	0.60 - 0.63	0.56 - 0.60	0.52 - 0.56	0.49 - 0.52	
1.00		0.00 - 12.9	0.00 - 8.1	0.00 - 6.9	0.00 - 6.1	0.00 - 5.5	0.00 - 5.0	0.00 - 4.7	0.00 - 4.4	
0.98		13.0 - 14.0	8.2 - 9.1	7.0 - 7.7	6.2 - 6.8	5.6 - 6.1	5.1 - 5.6	4.8 - 5.2	4.5 - 4.9	

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Mixture Characteristics	Pay Factor	Mean of the Deviations from the Job Mix Formula							
		1 Test	2 Tests	3 Tests	4 Tests	5 Tests	6 Tests	7 Tests	8 Tests
No. 4 (4.75 mm) Sieve (9.5 mm Superpave)	0.85	14.1 - 14.5	10.3 - 10.5	8.7 - 8.9	7.7 - 8.0	7.0 - 7.5	6.4 - 6.8	6.0 - 6.4	5.6 - 6.0
	0.80	14.6 - 15.0	10.6 - 10.8	9.0 - 9.2	8.1 - 8.4	7.6 - 7.8	6.9 - 7.3	6.5 - 6.8	6.1 - 6.5
	1.00	0.00 - 10.0	0.00 - 7.6	0.00 - 6.3	0.00 - 5.8	0.00 - 5.4	0.00 - 4.9	0.00 - 4.6	0.00 - 4.3
	0.98	10.1 - 11.9	7.7 - 8.5	6.4 - 6.9	5.9 - 6.4	5.5 - 5.9	5.0 - 5.4	4.7 - 5.0	4.4 - 4.7
	0.95	12.0 - 13.0	8.6 - 9.4	7.0 - 7.5	6.5 - 7.0	6.0 - 6.5	5.5 - 5.9	5.1 - 5.5	4.8 - 5.1
	0.90	13.1 - 14.0	9.5 - 10.2	7.6 - 8.0	7.1 - 7.6	6.6 - 7.0	6.0 - 6.4	5.6 - 5.9	5.2 - 5.5
	0.85	14.1 - 14.5	10.3 - 10.5	8.1 - 8.3	7.7 - 8.0	7.1 - 7.5	6.5 - 6.9	6.0 - 6.4	5.6 - 5.9
	0.80	14.6 - 15.0	10.6 - 10.8	8.4 - 8.6	8.1 - 8.4	7.6 - 8.0	7.0 - 7.4	6.5 - 6.8	6.0 - 6.3
No. 8 (2.36 mm) Sieve (All mixes except SMA)	1.00	0.00 - 8.0	0.00 - 6.3	0.00 - 5.4	0.00 - 4.8	0.00 - 4.5	0.00 - 4.1	0.00 - 3.8	0.00 - 3.6
	0.98	8.1 - 9.0	6.4 - 7.0	5.5 - 6.0	4.9 - 5.3	4.6 - 4.9	4.2 - 4.5	3.9 - 4.2	3.7 - 3.9
	0.95	9.1 - 10.0	7.1 - 7.7	6.1 - 6.6	5.4 - 5.8	5.0 - 5.4	4.6 - 4.9	4.3 - 4.6	4.0 - 4.3
	0.90	10.1 - 11.9	7.8 - 8.5	6.7 - 7.2	5.9 - 6.4	5.5 - 5.8	5.0 - 5.3	4.7 - 5.0	4.4 - 4.6
	0.85	12.0 - 13.0	8.6 - 8.8	7.3 - 7.5	6.5 - 6.8	5.9 - 6.3	5.4 - 5.7	5.1 - 5.3	4.7 - 4.9
	0.75	13.1 - 14.0	8.9 - 9.1	7.6 - 7.8	6.9 - 7.2	6.4 - 6.6	5.8 - 6.1	5.4 - 5.7	5.0 - 5.3
	1.00	0.00 - 6.0	0.00 - 4.7	0.00 - 4.1	0.00 - 3.6	0.00 - 3.4	0.00 - 3.1	0.00 - 2.9	0.00 - 2.4
	0.98	6.1 - 6.8	4.8 - 5.2	4.2 - 4.5	3.7 - 4.0	3.5 - 3.7	3.2 - 3.4	3.0 - 3.2	2.8 - 2.9
	0.95	6.9 - 7.5	5.3 - 5.8	4.6 - 5.0	4.1 - 4.4	3.8 - 4.0	3.5 - 3.7	3.3 - 3.5	3.0 - 3.2
	0.90	7.6 - 8.9	5.9 - 6.4	5.1 - 5.4	4.5 - 4.8	4.1 - 4.4	3.8 - 4.0	3.6 - 3.8	3.3 - 3.5
No. 8 (2.36 mm) Sieve (19 mm SMA)	0.85	9.0 - 9.8	6.5 - 6.6	5.5 - 5.6	4.9 - 5.1	4.5 - 4.7	4.1 - 4.3	3.9 - 4.0	3.6 - 3.7
	0.75	9.9 - 10.5	6.7 - 6.8	5.7 - 5.9	5.2 - 5.4	4.8 - 5.0	4.4 - 4.6	4.1 - 4.3	3.8 - 4.0

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E. Segregated Mixture

Prevent mixture placement yielding a segregated mat by following production, storage, loading, placing, and handling procedures. Ensure needed plant modifications and provide necessary auxiliary equipment. (See Subsection 400.1.01, *Definitions*.)

If the mixture is segregated in the finished mat, the Department will take actions based on the degree of segregation. The actions are described below.

1. Unquestionably Unacceptable Segregation

When the Engineer determines the segregation in the finished mat is unquestionably unacceptable, follow these measures:

- a. Suspend Work and require the Contractor to take positive corrective action. The Department will evaluate the segregated areas to determine the extent of the corrective work to the in-place mat as follows:
 - Perform extraction and gradation analysis by taking 6 in. (150 mm) cores from typical, visually unacceptable segregated areas.
 - Determine the corrective work according to Subsection 400.3.06.E.3.
- b. Require the Contractor to submit a written plan of measures and actions to prevent further segregation. Work will not continue until the plan is submitted to and approved by the Department.
- c. When work resumes, place a test section not to exceed 500 tons (500 Mg) of the affected mixture for the Department to evaluate. If a few loads show that corrective actions were not adequate, follow the measures above beginning with step 1.a. above. If the problem is solved, work may continue.

2. Unacceptable Segregation Suspected

When the Engineer observes segregation in the finished mat and the work may be unacceptable, follow these measures:

- a. Allow work to continue at Contractor's risk.
- b. Require Contractor to immediately and continually adjust operation until the visually apparent segregated areas are eliminated from the finished mat. The Department will immediately investigate to determine the severity of the apparent segregation as follows:
 - Take 6 in. (150 mm) cores from typical areas of suspect segregation.
 - Test the cores for compliance with the mixture control tolerances in Section 828.

When these tolerances are exceeded, suspend work for corrective action as outlined in Subsection 400.3.06.E.3.

3. Corrective Work

- a. Remove and replace (at the Contractor's expense) any segregated area where the gradation on the control sieves is found to vary 10 percent or more from the approved job mix formula, the asphalt cement varies 1.0% or more from the approved job mix formula, or if in-place air voids exceed 13.5% based on GDT 39. The control sieves for each mix type are shown in Subsection 400.5.01.B *Determine Lot Acceptance*.
- b. Subsurface mixes. For subsurface mixes, limit removal and replacement to the full lane width and no less than 10 ft. (3 m) long and as approved by the Engineer.
- c. Surface Mixes. For surface mixes, ensure that removal and replacement is not less than the full width of the affected lane and no less than the length of the affected areas as determined by the Engineer.
- d. Surface tolerance requirements apply to the corrected areas for both subsurface and surface mixes.

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400.3.07 Contractor Warranty and Maintenance

A. Contractor's Record

Maintain a dated, written record of the most recent plant calibration. Keep this record available for the Engineer's inspection at all times. Maintain records in the form of:

- Graphs
- Tables
- Charts
- Mechanically prepared data

400.4 Measurement

Thickness and spread rate tolerances for the various mixtures are specified in Subsection 400.4.A.2.b, Table 12, Thickness and Spread Rate Tolerance at Any Given Location. These tolerances are applied as outlined below:

A. Hot Mix Asphaltic Concrete Paid for by Weight

1. Plans Designate a Spread Rate

- a. Thickness Determinations. Thickness determinations are not required when the plans designate a spread rate per square yard (meter).

If the spread rate exceeds the upper limits outlined in the Subsection 400.4.A.2.b, Table 12, *Thickness and Spread Rate Tolerance at Any Given Location*, the mix in excess will not be paid for.

If the rate of spread is less than the lower limit, correct the deficient course by overlaying the entire lot.

The mixture used for correcting deficient areas is paid for at the Contract Unit Price of the course being corrected and is subject to the Mixture Acceptance Schedule—Table 10 or 11.

- b. Recalculate the Total Spread Rate. After the deficient hot mix course has been corrected, the total spread rate for that lot is recalculated, and mix in excess of the upper tolerance limit as outlined in the Subsection 400.4.A.2.b, Table 12, *Thickness and Spread Rate Tolerance at Any Given Location* is not paid for.

The quantity of material placed on irregular areas such as driveways, turnouts, intersections, feather edge section, etc., is deducted from the final spread determination for each lot.

2. Plans Designate Thickness

If the average thickness exceeds the tolerances specified in the Subsection 400.4.A.2.b, Table 12, *Thickness and Spread Rate Tolerance at Any Given Location*, the Engineer shall take cores to determine the area of excess thickness. Excess quantity will not be paid for.

If the average thickness is deficient by more than the tolerances specified in the Thickness and Spread Rate Tolerance at Any Given Location table below, the Engineer shall take additional cores to determine the area of deficient thickness. Correct areas with thickness deficiencies as follows:

- a. Overlay the deficient area with the same mixture type being corrected or with an approved surface mixture. The overlay shall extend for a minimum of 300 ft. (90 m) for the full width of the course.
- b. Ensure that the corrected surface course complies with Subsection 400.3.06.C.1, *Visual and Straightedge Inspection*. The mixture required to correct a deficient area is paid for at the Contract Unit Price of the course being corrected.

The mixture is subject to the Mixture Acceptance Schedule—Table 10 or 11. The quantity of the additional mixture shall not exceed the required calculated quantity used to increase the average thickness of the overlaid section to the maximum tolerance allowed under the following table.

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TABLE 12—THICKNESS AND SPREAD RATE TOLERANCE AT ANY GIVEN LOCATION

Course	Thickness Specified	Spread Rate Specified
Asphaltic concrete base course	± 0.5 in. (± 13 mm)	± 55 lbs./yd ² (30 kg/m ²)
Intermediate and/or wearing course	± 0.25 in. (± 6 mm)	± 27.5 lbs./yd ² (15 kg/m ²)
Overall of any combination of 1 and 2	± 0.5 in. (± 13 mm)	± 55 lbs./yd ² (30 kg/m ²)

Note: For asphaltic concrete 9.5 mm OGFC and 12.5 mm OGFC, control the spread rate per lot within 7 lbs./yd² (4 kg/m²) of the designated spread rate. For asphaltic concrete 12.5 mm PEM, control the spread rate per lot within 10 lbs./yd² (6 kg/m²) of the designated spread rate.

Note: Thickness and spread rate tolerances are provided to allow normal variations within a given lot. Do not continuously operate at a thickness or spread rate not specified.

When the plans specify a thickness, the Engineer may take as many cores as necessary to determine the average thickness of the intermediate or surface course. The Engineer shall take a minimum of one core per 1,000 ft. (300 m) per two lanes of roadway. Thickness will be determined by average measurements of each core according to GDT 42.

If the average exceeds the tolerances specified in the *Subsection 400.4.A.2.b, Table 12, Thickness and Spread Rate Tolerance at Any Given Location*, additional cores will be taken to determine the area of excess thickness and excess tonnage will not be paid for.

B. Hot Mix Asphaltic Concrete Paid for by Square Yard (Meter)

1. The thickness of the base course or the intermediate or surface course will be determined by the Department by cutting cores and the thickness will be determined by averaging the measurements of each core.
2. If any measurement is deficient in thickness more than the tolerances given in the table above, additional cores will be taken by the Department to determine the area of thickness deficiency. Correct thickness deficiency areas as follows:
 - a. Overlay the deficient area with the same type mixtures being corrected or with surface mixture. Extend the overlay at least 300 ft. (90 m) for the full width of the course.
 - b. Ensure the corrected surface course complies with Subsection 400.3.06.C.1, *Visual and Straightedge Inspection*.
 - c. The mixture is subject to the Mixture Acceptance Schedule—Table 10 or 11.
3. No extra payment is made for mixtures used for correction.
4. No extra payment is made for thickness in excess of that specified.

C. Asphaltic Concrete

Hot mix asphaltic concrete, complete in place and accepted, is measured in tons (megagrams) or square yards (meters) as indicated in the Proposal. If payment is by the ton (megagram), the actual weight is determined by weighing each loaded vehicle on the required motor truck scale as the material is hauled to the roadway, or by using recorded weights if a digital recording device is used.

The weight measured includes all materials. No deductions are made for the weight of the individual ingredients. The actual weight is the pay weight except when the aggregates used have a combined bulk specific gravity greater than 2.75. In this case the pay weight is determined according to the following formula:

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$$T1 = T \times \left\{ \frac{\% AC + \left(\frac{\% \text{ Aggregate} \times 2.75}{\text{combined bulk Specific Gravity}} \right) + \% Y}{100} \right\}$$

Where:

T1	Pay weight, tonnage (Mg)
T=	Actual weight
% AC=	Percent asphalt cement by weight of total mixture
% Aggregate =	Percent aggregate by weight of total mixture minus the hydrated lime
Combined Bulk Sp. Gr.=	Calculated combined bulk specific gravity of various mineral aggregates used in the mixture
% Y=	Percent hydrated lime by weight of mineral aggregate

D. Bituminous Material

Bituminous material is not measured for separate payment.

E. Hydrated Lime

When hydrated lime is used as an anti-stripping additive, it is not measured for separate payment.

F. Field Laboratory

The field laboratory required in this specification is not measured for separate payment.

G. Asphaltic Concrete Leveling

Payment of hot mix asphaltic concrete leveling, regardless of the type mix, is full compensation for furnishing materials, bituminous materials, and hydrated lime (when required) for patching and repair of minor defects, surface preparation, cleaning, hauling, mixing, spreading, and rolling.

Mixture for leveling courses is subject to the acceptance schedule as stated in Subsection 400.3.06.A and Subsection 400.3.06.B.

H. Asphaltic Concrete Patching

Hot mix asphaltic concrete patching, regardless of the type mix, is paid for at the Contract Unit Price per ton (Megagram), complete in place and accepted. Payment is full compensation for:

- Furnishing materials such as bituminous material and hydrated lime (when required)
- Preparing surface to be patched
- Cutting areas to be patched, trimmed, and cleaned
- Hauling, mixing, placing, and compacting the materials

When mixture for patching is paid for by the Department, ensure the mixture is subject to the acceptance schedule as stated in Subsection 400.3.06.A.

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400.4.01 Limits

When the asphaltic concrete is paid for by the square yard (meter) and multiple lifts are used, the number and thickness of the lifts are subject to the Engineer's approval and are used to prorate the pay factor for the affected roadway section.

400.5 Payment

When materials or construction are not within the tolerances in this specification, the Contract Price will be adjusted according to Subsection 106.03, *Samples, Tests, Cited Specifications* and Subsection 400.3.06, *Quality Acceptance*.

Hot mix asphaltic concrete of the various types are paid for at the Contract Unit Price per ton (megagram) or per square yard (meter). Payment is full compensation for furnishing and placing materials including asphalt cement, hydrated lime when required, approved additives, and for cleaning and repairing, preparing surfaces, hauling, mixing, spreading, rolling, and performing other operations to complete the Contract Item.

Payment will be made under:

Item No. 400	Asphaltic concrete <u>type</u> Superpave, <u>group-blend</u> , Including polymer-modified bituminous materials and hydrated lime	Per ton (megagram)
Item No. 400	Asphaltic concrete <u>type</u> , Superpave, <u>group-blend</u> , including bituminous materials and hydrated lime	Per ton (megagram)
Item No. 400	Asphaltic concrete <u>type</u> Superpave, <u>group-blend</u> , Including bituminous materials, Gilsonite modifier, and hydrated lime	Per ton (megagram)
Item No. 400	_____ inches asphaltic concrete, <u>type</u> Superpave, <u>group-blend</u> including bituminous materials, Gilsonite modifier and hydrated lime	Per square yard (meter)
Item No. 400	Asphaltic concrete <u>type</u> Stone Matrix Asphalt, <u>group-blend</u> , including polymer-modified bituminous materials and hydrated lime	Per ton (megagram)
Item No. 400	Asphaltic concrete <u>type</u> OGFC, <u>group 2</u> only, including bituminous materials and hydrated lime	Per ton (megagram)
Item No. 400	Asphaltic concrete <u>type</u> OGFC, <u>group 2</u> only, including polymer-modified bituminous materials and hydrated lime	Per ton (megagram)
Item No. 400	Asphaltic concrete <u>type</u> Porous European Mix, <u>group 2</u> only, including polymer-modified bituminous materials and hydrated lime	Per ton (megagram)

400.5.01 Adjustments

A. Materials Produced and Placed During the Adjustment Period

An adjustment period is allowed at the start of mixing operations for each type of mix placed on the Contract. Asphaltic Concrete OGFC or PEM shall be granted an adjustment period for the first 500 tons (500 Mg) produced for the Contract. A new adjustment period shall not be granted for a change of producer, mix design or asphalt plant location. The adjustment period is provided to adjust or correct the mix and to establish the construction procedures and sequence of operations.

The adjustment period consists of the tons (megagrams) of the affected mix produced and placed on the first day of operation. If this quantity is less than 500 tons (500 Mg), the Engineer may combine the tons (megagrams) produced and placed on the first day of operation with the tons (megagrams) produced and placed on the next production day of the affected mix for the adjustment period.

The material produced and placed during the mixture adjustment period is one lot. If the mix is adjusted during this period, a new lot may be necessary, but a new adjustment period will not be permitted.

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This material shall be paid for at 100 percent of the Contract Unit Price provided it meets the minimum requirements for a 1.00 pay factor for asphalt cement content and a 0.90 pay factor for gradation in the Mixture Acceptance Schedule—Table 10 or 11.

If the material placed during the adjustment period fails to meet the above requirements, it will be paid for using the applicable acceptance schedule. However, when mixture used for leveling at a spread rate of 90 lbs./yd² (50 kg/m²) or less is also used for the surface mix at a spread rate greater than 90 lbs./yd² (50 kg/m²), an additional adjustment period will be allowed for compaction only. This material will be paid for at a 1.00 pay factor provided it:

- Meets the minimum requirements for a 1.00 pay factor in the Mixture Acceptance Schedule—Table 10 or 11 for both asphalt content and gradation.
 - Meets the minimum requirements for a 0.90 pay factor in Table 13 of Subsection 400.5.01C, *Calculate Mean Pavement Air Voids*.

Mixture which does not meet these requirements shall be paid for using the applicable acceptance schedule.

B. Determine Lot Acceptance

Pay factor adjustments are based on control sieves and asphalt cement content. The control sieves used in the mixture acceptance schedule for the various types of mix are indicated below:

Control Sieves Used in the Mixture Acceptance Schedule	
Asphaltic concrete 25 mm Superpave	1/2 in., No. 8 (12.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 19 mm SMA	1/2 in., No. 8 (12.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 19 mm Superpave	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 12.5 mm Superpave	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 12.5 mm SMA	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 12.5 mm PEM	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 12.5 mm OGFC	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 9.5 mm Superpave	No. 4, No. 8 (4.75 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 9.5 mm SMA	No. 4, No. 8 (4.75 mm, 2.36 mm) sieves and asphalt cement
concrete 9.5 mm OGFC	No. 4, No. 8 (4.75 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 4.75 mm Mix	No. 8 (2.36 mm) sieve and asphalt cement

For projects which do not have milling quantities established as a Pay Item, the Department will pay for 12.5 mm OGFC and PEM placed on ramps and end of project transitions under the appropriate mixture pay item, but the mix shall be subject to the same gradation and control sieve requirements as asphaltic concrete 9.5 mm OGFC. Add polymer-modified bituminous material, hydrated lime, and stabilizing fiber to this mix.

The Department will perform the following tasks:

1. Using the Mixture Acceptance Schedule—Table 10 or 11, determine the mean of the deviations from the job mix formula per test results per lot.
2. Determine this mean by averaging the actual numeric value of the individual deviations from the job mix formula; disregard whether the deviations are positive or negative amounts.
3. Use the Asphalt Cement Content and Aggregate Gradation of Asphalt Concrete Mixture Acceptance Schedule—Table 10 to determine acceptance of surface mixes and the Mixture Acceptance Schedule—Table 11 to determine acceptance of subsurface mixes.

Section 400 — Hot Mix Asphaltic Concrete Construction

On Contracts involving 1,000 tons (1000 Mg) or less of asphaltic concrete, the mixture is accepted for 100 percent payment of the asphaltic concrete Unit Price provided it meets the following:

1. Minimum requirements for a 1.00 pay factor for asphalt cement content and a 0.90 pay factor for gradation in the applicable Mixture Acceptance Schedule—Table 10 or 11.
2. Minimum requirements for a 0.90 pay factor in Table 13 of Subsection 400.5.01C, *Calculate Pavement Mean Air Voids*.

If the material placed on Contracts involving 1,000 tons (1000 Mg) or less of asphaltic concrete does not meet the above requirements, the material will be paid for using the applicable acceptance schedule.

C. Calculate Pavement Mean Air Voids

The Department will determine the percent of maximum air voids for each lot by dividing the pavement mean air voids by the maximum pavement mean air voids acceptable.

The Department will determine the payment for each lot by multiplying the Contract Unit Price by the adjusted pay factor shown in the following Air Voids Acceptance schedule:

TABLE 13 - AIR VOIDS ACCEPTANCE SCHEDULE

Pay Factor	Percent of Maximum Air Voids (Lot Average of Tests)	Percent of Maximum Air Voids (Lot Average all Tests) (for Reevaluations)
1.00	≤100	≤100
0.97	100.1 – 105	100.1 – 104
0.95	105.1 – 112	104.1 – 109
0.90	112.1 – 124	109.1 – 118
0.80	124.1 – 149	118.1 – 136
0.70	149.1 – 172	136.1 – 153
0.50	172.1 – 191	153.1 – 166

When recommended by the Office of Materials and Testing, Lots receiving less than 0.5 pay factor shall be removed and replaced at the Contractor's expense.

When the range tolerance is exceeded, the Department will apply a pay factor of 0.95 as described in Subsection 400.3.06.B.2.

D. Asphaltic Concrete for Temporary Detours

Hot mix asphaltic concrete placed on temporary detours not to remain in place as part of the permanent pavement does not require hydrated lime. Hot mix used for this purpose is paid for at an adjusted Contract Price. Ensure the payment for this item covers all cost of construction, maintenance and removal of all temporary mix. Ensure hot mix asphaltic concrete placed as temporary mix meets requirements established in Subsection 400.3.05.F.

Where the Contract Price of the asphaltic concrete for permanent pavement is let by the ton (megagram), the Contract Price for the asphaltic concrete placed on temporary detours is adjusted by subtracting \$0.75/ton (\$0.85/mg) of mix used.

Where the Contract price of the mix in the permanent pavement is based on the square yard (meter), obtain the adjusted price for the same mix used on the temporary detour by subtracting \$0.04/yd² (\$0.05/m²) per 1 in. (25 mm) plan depth.

Section 400 — Hot Mix Asphaltic Concrete Construction

Further price adjustments required in Subsection 400.3.06, *Quality Acceptance*, which are based on the appropriate adjusted Contract Price for mix used in the temporary detour work shall apply should temporary mix be left in place. Ensure hot mix asphalt produced as temporary mix containing no hydrated lime is removed and replaced with permanent mix containing hydrated lime.

E. Determine Lot Payment

Determine the lot payment as follows:

1. When one of the pay factors for a specific acceptance lot is less than 1.0, determine the payment for the lot by multiplying the Contract Unit Price by the adjusted pay factor.
2. When two or more pay factors for a specific acceptance lot are less than 1.0, determine the adjusted payment by multiplying the Contract Unit Price by the lowest pay factor.

If the mean of the deviations from the job mix formula of the tests for a sieve or asphalt cement content exceeds the tolerances established in the Mixture Acceptance Schedule—Table 10 or 11 and if the Engineer determines that the material need not be removed and replaced, the lot may be accepted at an adjusted unit price as determined by the Engineer. If the pavement mean air voids exceed the tolerances established in the Air Voids Acceptance Schedule – Table 13, remove and replace the materials at the Contractor's expense.

If the Engineer determines the material is not acceptable to leave in place, remove and replace the materials at the Contractor's expense.

Section 402—Hot Mix Recycled Asphaltic Concrete

402.1 General Description

This work includes producing and placing hot mix recycled asphaltic concrete that incorporates reclaimed asphalt pavement (RAP), reclaimed asphalt shingles (RAS), virgin aggregate, hydrated lime, and neat asphalt cement.

402.1.01 Definitions

General Provisions 101 through 150.

402.1.02 Related References

A. Standard Specifications

Section 400—Hot Mix Asphaltic Concrete Construction

Section 800—Coarse Aggregate

Section 828—Hot Mix Asphaltic Concrete Mixtures

B. Referenced Documents

SOP 41 *Guidelines for RAP Stockpile Approval*

402.1.03 Submittals

A. Certified Weight Tickets

Notify the Engineer before removing RAP from a stockpile that belongs to the Department. Submit to the Engineer the certified weight tickets of materials removed from the stockpile.

B. Affidavit

Submit to the laboratory an affidavit stating the sources of stockpiled materials to be used on a State project. Include the following information in the letter:

- State project number
- Location from which the material was removed
- Approximate removal dates
- Mix types removed and the estimated quantity of each type in the stockpiles
- Other available information about the stockpiled material such as percentage of local sand in the RAP

Obtain specific approval from the laboratory to use RAP or RAS stockpiles.

Adhere to Guidelines for RAP Stockpile Approval.

Section 402 – Hot Mix Recycled Asphaltic Concrete

402.2 Materials

A. RAP Material Composition

Use RAP materials from any of the following:

- Existing roadway
- Contractor's RAP stockpile that has been approved by the Department
- Department stockpile

NOTE: The location of Department RAP material stockpiles will be given on the plans.

Do not use RAP materials that contain alluvial gravel or local sand in any mixture placed on interstate projects except for mixtures used in shoulder construction. When used in shoulder construction, limit RAP containing local sand or alluvial gravel so that the sand or gravel contributes no more than 20 percent of the total aggregate portion of the mix.

1. RAP Percentage

For non-interstate projects, limit the percentage of RAP allowed in recycled mixes so that the overall amount of alluvial gravel does not exceed 5 percent of the total mix. The percentage of alluvial gravel, local sand, and Group I material in the RAP will be determined through petrographic analysis or available records.

2. RAP furnished to the Contractor but not used in the work remains the Contractor's property.

RAP used in the recycled mixtures for mainline or ramps (if applicable) may make up from 0 to 40 percent of the mixture depending on the amount of RAP available, the production facilities, and whether the mixture meets the requirements in Section 828.

The maximum ratio of RAP material to the recycled mixtures other than SMA is 40 percent for continuous mix type plants and 25 percent for batch type plants. The maximum ratio of RAP material to the recycled mixture is 15 percent for Stone Matrix Asphalt (SMA) mixes.

3. Process RAP Material

Process RAP material to be used in the recycled mixture so that 100 percent will pass the 2 in. (50 mm) sieve. Additional crushing and sizing may be required if the RAP aggregate exceeds the maximum sieve size for the mix type as shown in Section 828. Obtain representative materials from the RAP stockpile for the mix design.

B. RAS Material

RAS materials are produced as a by-product of manufacturing roofing shingles and/or discarded shingle scrap from the reroofing of buildings.

1. Limit the amount of RAS material used in the recycled mixture to no greater than 5 percent of the total mixture weight.
2. Shred the RAS material before incorporating it into the mix to ensure that 100 percent of the shredded pieces are less than 1/2 in. (12.5 mm) in any dimension.
3. Remove all foreign materials such as paper, roofing nails, wood, or metal flashing.
4. Provide test results for Bulk Sample Analysis, known as Polarized Light Microscopy, if post-consumer shingles are used to certify the RAS material is free of asbestos. Test stockpiles at the rate of one test per 1000 tons (megagrams) prior to processing.

Other than as specifically stated in this Subsection, ensure that RAS material is used according to the same requirements as described for RAP material.

C. Asphaltic Concrete Removed from an Existing Roadway

Asphaltic concrete removed from an existing roadway becomes the Contractor's property unless specified otherwise on the plans. RAP material retained by the Department is designated on the plans, and the RAP shall be stockpiled at the location specified on the plans.

Section 402 – Hot Mix Recycled Asphaltic Concrete

D. Local Sand and Group I Material in RAP

Use of local sand in recycled mixes is restricted as stipulated in Section 828 for the Project. However, RAP which contains local sand may be used in surface and intermediate layers of non-interstate projects so long as the RAP percentage used does not contribute more than 5% local sand to the total aggregate portion of the mix. The amount of local sand in the RAP material shall be considered when determining the percentage of local sand in the total mix.

Where Pay Items specify that Group II only aggregate is to be used, RAP which consists primarily of Group II aggregate, but contains some Group I aggregate, shall be limited such that the Group I aggregate makes up no more than 5 percent of the total aggregate portion of the mix. When a Blend I mix is specified, any Group I materials in the RAP will be considered when determining the Group I portion allowed in the total mix as specified in Subsection 828.2.A.2.

E. Asphalt Cement

Using laboratory evaluations, the Department will determine the asphalt cement grade to be used in the recycled mixture. The asphalt cement shall meet the requirements of Section 820.

When the asphalt cement is blended with asphalt cement recovered from the RAP material and after tests on residue from thin film oven tests, the asphalt cement shall have a viscosity of 6,000 to 16,000 poises (600 to 1600 Pa) or as approved by the Engineer. Recover asphalt cement from the recycled mixture to verify that the specified viscosity is being met.

If the Engineer determines during construction that the selected asphalt cement grade is not performing satisfactorily, the Department may change the asphalt cement grade in the mixture, with no change in the Contract Unit Price.

F. Recycled Mixture

The recycled mixture shall be a homogenous mixture of RAP or RAS material, virgin aggregate, hydrated lime, and neat asphalt cement. Ensure that the mixture conforms to an approved mixture design outlined in Section 828.

402.2.01 Delivery, Storage, and Handling

Separate the stockpiles by Project sources and by Group I and Group II aggregate types. Erect a sign on each stockpile to identify the source(s).

If RAP material from different project sources becomes intermixed in a stockpile, only use those materials when approved by the laboratory.

The Department may reject by visual inspection stockpiles that are not clean and free of foreign materials.

402.3 Construction Requirements

402.3.01 Personnel

General Provisions 101 through 150.

402.3.02 Equipment

A. Hot Mix Plant

Use a hot mix plant for the recycling process with necessary modifications approved by the Engineer to process recycled material. Design, equip, and operate the plant so that the proportioning, heating, and mixing yields a uniform final mixture within the job mix formula tolerances.

B. Cold Feed Bin

Proportion the RAP or RAS material using a separate cold feed bin. Ensure that the material meets the size requirements in Subsection 402.2, *Materials*. The ratio of the RAP or RAS to virgin aggregate shall be controlled gravimetrically.

Section 402 – Hot Mix Recycled Asphaltic Concrete

C. Electronic Belt Weighing Devices

Use electronic belt weighing devices to monitor the flow of RAP or RAS and the flow of virgin aggregate. For batch-type plants, the RAP or RAS portion of the mix may be weighed in a weigh hopper before incorporating it into the pugmill. The RAP shall be screened through a 2-inch maximum sized screen prior to crossing the cold feed weigh. Ensure the amount of RAP material incorporated into the asphalt plant does not change after this final measurement is processed by the asphalt plant computer.

D. Feeders and Conveyors

Equip plants with an interlocking system of feeders and conveyors that synchronize the RAP or RAS material flow with the virgin aggregate flow. Ensure that the electronic controls track the flow rates indicated by the belt weighing devices and develop the signal to automatically maintain the desired ratio at varying production rates. Design the RAP or RAS feeder bins, conveyor system, and auxiliary bins (if used) to prevent RAP material from segregating and sticking.

402.3.03 Preparation

General Provisions 101 through 150.

402.3.04 Fabrication

General Provisions 101 through 150.

402.3.05 Construction

Follow the requirements in Section 400 for hot mix recycled asphaltic concrete production and placement, materials, equipment, and acceptance plans except as noted or modified in this specification.

402.3.06 Quality Acceptance

The Department may require additional quality control tests to determine the RAP stockpile consistency and the RAP aggregate quality. In this case, conduct at least three extraction/gradation tests from each individual source. Ensure that aggregate meets the quality standards in Section 800.

402.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

402.4 Measurement

Recycled asphaltic concrete mixture, complete in place and accepted, is measured in tons (megagrams). The weight is determined by recorded weights if an approved recording device is used. Or, the weight is determined by weighing each loaded vehicle on an approved motor truck scale as the material is hauled to the roadway.

402.4.01 Limits

General Provisions 101 through 150.

402.5 Payment

The work performed and the materials furnished as described in this specification will be paid for at the Contract Unit Price per ton (megagram). Payment is full compensation for providing materials, hauling and necessary crushing, processing, placing, rolling and finishing the recycled mixture, and providing labor, tools, equipment, and incidentals necessary to complete the work, including hauling and stockpiling RAP or RAS material.

Section 402 – Hot Mix Recycled Asphaltic Concrete

Payment will be made under:

Item No. 402	Recycled asphaltic concrete ___ mm Superpave, group-blend, including bituminous materials	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete ___ mm Superpave, group-blend, including bituminous materials and hydrated lime	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete ___ mm Superpave, group-blend, including polymer-modified bituminous materials and hydrated lime	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete ___ mm Superpave, Type ___, group-blend, including bituminous materials and hydrated lime	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete _____mm mix, group-blend, including bituminous materials and hydrated lime	Per ton (megagram)
Item No. 402	_____in. (mm) recycled asphaltic concrete type Superpave, group-blend, including bituminous materials	Per square yard (meter)
Item No. 402	_____in. (mm) recycled asphaltic concrete type Superpave, group-blend, including bituminous materials and hydrated lime	Per square yard (meter)
Item No. 402	_____in. (mm) recycled asphaltic concrete type Superpave, group-blend, including polymer-modified bituminous materials and hydrated lime	Per square yard (meter)
Item No. 402	_____in. (mm) recycled asphaltic concrete _____ mm mix, group-blend, including bituminous materials and hydrated lime	Per square yard (meter)
Item No. 402	Recycled asphaltic concrete patching including bituminous materials	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete patching including bituminous materials and hydrated lime	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete leveling including bituminous materials	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete leveling including bituminous materials and hydrated lime	Per ton (megagram)
Item No. 402	Recycled asphaltic concrete type Stone Matrix Asphalt, group-blend, including polymer-modified bituminous materials and hydrated lime	Per ton (megagram)

A. Materials Produced and Placed During the Adjustment Period

An adjustment period is allowed at the start of mixing operations for each type of mix placed on the Contract. A new adjustment period shall not be granted for a change of producer, mix design or asphalt plant location. The adjustment period is provided to adjust or correct the mix and to establish the construction procedures and sequence of operations.

The adjustment period consists of the tons (megagrams) of the affected mix produced and placed on the first day of operation. If this quantity is less than 500 tons (500 Mg), the Engineer may combine the tons (megagrams) produced and placed on the first day of operation with the tons (megagrams) produced and placed on the next production day of the affected mix for the adjustment period.

Section 402 – Hot Mix Recycled Asphaltic Concrete

The material produced and placed during the mixture adjustment period is one lot. If the mix is adjusted during this period, a new lot may be necessary, but a new adjustment period will not be permitted.

This material shall be paid for at 100 percent of the Contract Unit Price provided it meets the minimum requirements for a 1.00 pay factor for asphalt cement content and a 0.90 pay factor for gradation in the Mixture Acceptance Schedule—Table 9 or 10.

If the material placed during the adjustment period fails to meet the above requirements, it will be paid for using the applicable acceptance schedule. However, when mixture used for leveling at a spread rate of 90 lbs./yd² (50 kg/m²) or less is also used for the surface mix at a spread rate greater than 90 lbs./yd² (50 kg/m²), an additional adjustment period will be allowed for compaction only. This material will be paid for at a 1.00 pay factor provided it:

- Meets the minimum requirements for a 1.00 pay factor in the Mixture Acceptance Schedule—Table 9 or 10 for both asphalt content and gradation.
- Meets the minimum requirements for a 0.90 pay factor in Table 12 of Subsection 400.5.01C, *Calculate Mean Pavement Air Voids*.

Mixture which does not meet these requirements shall be paid for using the applicable acceptance schedule.

B. Determine Lot Acceptance

Pay factor adjustments are based on control sieves and asphalt cement content. The control sieves used in the mixture acceptance schedule for the various types of mix are indicated below:

Control Sieves Used in the Mixture Acceptance Schedule	
Asphaltic concrete 25 mm Superpave	1/2 in., No. 8 (12.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 19 mm SMA	1/2 in., No. 8 (12.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 19 mm Superpave	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 12.5 mm Superpave	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 12.5 mm SMA	3/8 in., No. 8 (9.5 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 9.5 mm Superpave	No. 4, No. 8 (4.75 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 9.5 mm SMA	No. 4, No. 8 (4.75 mm, 2.36 mm) sieves and asphalt cement
Asphaltic concrete 4.75 mm Mix	No. 8 (2.36 mm) sieve and asphalt cement

The Department will perform the following tasks:

1. Using the Mixture Acceptance Schedule—Table 9 or 10, of Subsection 400.3.06 to determine the mean of the deviations from the job mix formula per test results per lot.
2. Determine this mean by averaging the actual numeric value of the individual deviations from the job mix formula; disregard whether the deviations are positive or negative amounts.
3. Use the Asphalt Cement Content and Aggregate Gradation of Asphalt Concrete Mixture Acceptance Schedule—Table 9 or 10 of Subsection 400.3.06 to determine acceptance of surface mixes and the Mixture Acceptance Schedule—Table 10 of Subsection 400.3.06 to determine acceptance of subsurface mixes.

On Contracts involving 1,000 tons (1000 Mg) or less of asphaltic concrete, the mixture is accepted for 100 percent payment of the asphaltic concrete Unit Price provided it meets the following:

4. Minimum requirements for a 1.00 pay factor for asphalt cement content and a 0.90 pay factor for gradation in the applicable Mixture Acceptance Schedule—Table 9 or 10 of Subsection 400.3.06.

Section 402 – Hot Mix Recycled Asphaltic Concrete

- 5. Minimum requirements for a 0.90 pay factor in Table 12 of Subsection 402.5.01.C, *Calculate Pavement Mean Air Voids*.

If the material placed on Contracts involving 1,000 tons (1000 Mg) or less of asphaltic concrete does not meet the above requirements, the material will be paid for using the applicable acceptance schedule.

C. Calculate Pavement Mean Air Voids

The Department will determine the percent of maximum air voids for each lot by dividing the pavement mean air voids by the maximum pavement mean air voids acceptable.

The Department will determine the payment for each lot by multiplying the Contract Unit Price by the adjusted pay factor shown in the following Air Voids Acceptance schedule:

TABLE 12 - AIR VOIDS ACCEPTANCE SCHEDULE

Pay Factor	Percent of Maximum Air Voids (Lot Average of Tests)	Percent of Maximum Air Voids (Lot Average all Tests) (for Reevaluations)
1.00	≤100	≤100
0.97	100.1 – 105	100.1 – 104
0.95	105.1 – 112	104.1 – 109
0.90	112.1 – 124	109.1 – 118
0.80	124.1 – 149	118.1 – 136
0.70	149.1 – 172	136.1 – 153
0.50	172.1 – 191	153.1 – 166

When the range tolerance is exceeded, the Department will apply a pay factor of 0.95 as described in Subsection 400.3.06.B.2.

D. Asphaltic Concrete for Temporary Detours

Hot mix asphaltic concrete placed on temporary detours that will not remain in place as part of the permanent pavement does not require hydrated lime. Hot mix used for this purpose is paid for at an adjusted Contract Price. The payment for this item shall cover all cost of construction, maintenance and removal of all temporary mix. Hot mix asphaltic concrete placed as temporary mix shall meet requirements established in Subsection 400.3.05.F.

Where the Contract Price of the asphaltic concrete for permanent pavement is let by the ton (megagram), the Contract Price for the asphaltic concrete placed on temporary detours is adjusted by subtracting \$0.75/ton (\$0.85/mg) of mix used.

Where the Contract price of the mix in the permanent pavement is based on the square yard (meter), obtain the adjusted price for the same mix used on the temporary detour by subtracting \$0.04/yd² (\$0.05/ m²) per 1- in. (25-mm) plan depth.

Further price adjustments required in Subsection 400.3.06, *Quality Acceptance*, which are based on the appropriate adjusted Contract Price for mix used in the temporary detour work shall apply should temporary mix be left in place. Hot mix asphalt produced as temporary mix containing no hydrated lime shall be removed and replaced with permanent mix containing hydrated lime.

E. Determine Lot Payment

Determine the lot payment as follows:

- 1. When one of the pay factors for a specific acceptance lot is less than 1.0, determine the payment for the lot by multiplying the Contract Unit Price by the adjusted pay factor.

Section 402 – Hot Mix Recycled Asphaltic Concrete

2. When two or more pay factors for a specific acceptance lot are less than 1.0, determine the adjusted payment by multiplying the Contract Unit Price by the lowest pay factor.

If the mean of the deviations from the job mix formula of the tests for a sieve or asphalt cement content exceeds the tolerances established in the Mixture Acceptance Schedule—Table 9 or 10 and if the Engineer determines that the material need not be removed and replaced, the lot may be accepted at an adjusted unit price as determined by the Engineer. If the pavement mean air voids exceed the tolerances established in the Air Voids Acceptance Schedule – Table 12, remove and replace the materials at the Contractor's expense.

If the Engineer determines that the material is not acceptable to leave in place, remove and replace the materials at the Contractor's expense.

Section 412—Bituminous Prime

412.1 General Description

This work includes preparing and treating an existing surface with bituminous material and blotter material, if required. Treat the surface according to these specifications and conform to the lines shown on the plans or established by the Engineer.

412.1.01 Definitions

General Provisions 101 through 150.

412.1.02 Related References

A. Standard Specifications

Section 424—Bituminous Surface Treatment

Section 821—Cutback Asphalt

B. Referenced Documents

General Provisions 101 through 150.

412.1.03 Submittals

General Provisions 101 through 150.

412.2 Materials

Unless otherwise specified, select the types of bituminous materials. The Engineer will determine the grade of materials to be used. The specifications for the bituminous materials include:

Material	Section
Cutback Asphalt, RC-30, RC-70, RC-250 or MC-250, MC-30, or MC-70	821.2.01
Blotter Material (Sand)	412.3.05.G.3

412.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

412.3 Construction Requirements

412.3.01 Personnel

General Provisions 101 through 150.

412.3.02 Equipment

Provide equipment that is in good repair, including at least the following units that meet the requirements of Subsection 424.3.02, *Equipment*.

- Pressure distributor
- Power broom and blower
- Aggregate spreader (if required)
- Pneumatic-tired roller

Section 412 — Bituminous Prime

412.3.03 Preparation

See Subsection 412.3.05.B, *Condition of Surface*.

412.3.04 Fabrication

General Provisions 101 through 150.

412.3.05 Construction

Prime the following bases and other areas:

- Cement or lime stabilized bases or sub-bases, regardless of pavement thickness
- Soil or aggregate bases or sub-bases on which bituminous surface treatment will be placed
- Soil or aggregate bases or sub-bases on which less than 5 in. (125 mm) total thickness of hot mix asphaltic concrete will be placed

Prime is not required on driveway construction and paved shoulders.

A. Weather Limitations

Do not apply bituminous prime under any of these conditions:

- Surface is wet.
- Air temperature is below 40 °F (4 °C) in the shade.
- Rain is imminent.
- Weather conditions may prevent proper prime coat construction.

B. Condition of Surface

Ensure that the surface to which the prime is to be applied has been finished to the line, grade, and cross-section specified.

Ensure that the surface is uniformly compacted and bonded. Correct surface irregularities according to the specifications for the construction being primed.

C. Cleaning

Remove from the road loose material, dust, caked clay, and other material that may prevent bonding of the prime with the surface. Use power sweepers or blowers the full width of the prime and 2 ft. (600 mm) more on each side. Where necessary, sweep by hand.

D. Moisture

Ensure that the surface is only slightly damp. If the surface is too wet, allow it to dry. If it is too dry, the Engineer may require that it be sprinkled lightly just before priming.

E. Temperature and Surface Texture

The surface texture and condition of the surface determine the bituminous material grades to be used.

The following table shows the bituminous material grades and application temperatures as they are applied to various surface textures.

Base Texture	Tight	Average	Open
Materials and grade	MC-30 RC-30	RC-70 or MC-70	RC-250 or MC-250
Application temperature °F (°C)	80–120 (27–49)	105–180 (41–82)	145–220 (63–104)

The Engineer will determine the temperature for applying bituminous prime within the limits shown above.

Section 412 — Bituminous Prime

Heat and apply bituminous materials as specified in Subsection 424.3.05.D, *Heating Bituminous Material* and Subsection 424.3.05.E, *Applying Bituminous Material*.

F. Amount and Extent of Prime

The Engineer will determine the exact amount of bituminous material to be used within minimum and maximum rates of 0.15 to 0.30 gal/yd² (0.7 to 1.4 liters/m²). Apply the specified amount as follows:

1. Apply the determined amount uniformly and accurately. Ensure that the amount applied to any 0.5-mile (800 m) section is within 5 percent of the amount specified.
2. Apply the prime the full width of the proposed wearing surface that will be superimposed plus 6 in. (150 mm) more on each side.

G. Protection, Curing, and Maintenance

Do the following after priming the surface:

1. Close to Traffic
Do not allow traffic on the primed surface. Leave the surface undisturbed until the prime thoroughly cures and does not pick up under traffic.
2. Roll
If the surface becomes soft after it is primed, roll the surface longitudinally with a pneumatic-tired roller at no more than 6 mph (10 kph) until the surface is firmly set.
3. Blot
If necessary to prevent the prime from being picked up, spread clean, dry, sharp sand over the surface by hand or mechanically. Apply sand only to places that are tacky and use the least amount needed to prevent pick up. No extra payment for this work or material will be made.
4. Open to Traffic
After rolling and sanding (if required), open the primed surface to ordinary traffic subject to the conditions in Subsection 412.3.05.G.1, *Close to Traffic*.
5. Curing and Maintenance
6. The primed surface is properly cured when it has penetrated the base sufficiently to not be picked up or displaced by traffic. Temperature and weather conditions may increase curing time. Insure the primed surface has cured to the satisfaction of the Engineer prior to its being covered by other construction.
7. Maintain the prime coat and the primed surface course until it is covered by other construction. Repair potholes, scabs, and soft spots prior to covering with other construction. Remove excess bituminous material.

412.3.06 Quality Acceptance

General Provisions 101 through 150.

412.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

412.4 Measurement

Bituminous material for prime is not measured for separate payment.

412.4.01 Limits

General Provisions 101 through 150.

Section 412 — Bituminous Prime

412.5 Payment

Bituminous material for prime is not paid for separately. The cost to clean the surface, furnish, haul and apply materials including water and sand, roll, and perform repairs and maintenance is included in the Unit Price bid for each individual Base Item.

412.5.01 Adjustments

General Provisions 101 through 150.

Section 413—Bituminous Tack Coat

413.1 General Description

This work includes furnishing and applying a bituminous tack coat on a prepared road surface including cleaning the road surface.

413.1.01 Definitions

General Provisions 101 through 150.

413.1.02 Related References

A. Standard Specifications

Section 109—Measurement and Payment

Section 400—Hot Mix Asphaltic Concrete Construction

Section 424—Bituminous Surface Treatment

Section 427—Emulsified Asphalt Slurry Seal

Section 820—Asphalt Cement

Section 822 – Emulsified Asphalt

Section 824—Cationic Asphalt Emulsion

SOP 4

B. Referenced Documents

General Provisions 101 through 150.

413.1.03 Submittals

A. Invoices

Furnish formal written invoices from a supplier for the bituminous materials for sole use of tack coat when requested by the Department. Show the following on the Bill of Lading:

- Date Manufactured for emulsified asphalt materials.
- Date shipped
- Quantity in gallons
- Included with or without additives

Section 413 — Bituminous Tack Coat

413.2 Materials

Ensure materials meet the following specifications:

TABLE 1 – BITUMINOUS MATERIALS

Material	Section
Asphalt cement, performance grade PG 58-22, PG 64-22, or PG 67-22	820.2.01
Approved non-tracking Anionic Emulsified Asphalt	822.2.01
Cationic emulsified asphalt CSS-1h, CRS-1h, CRS-2h, CRS-3, CQS-1h and other approved non-tracking cationic emulsified asphalt products listed on QPL 7	824.2.01

Use any of the materials shown in Table 1 as bituminous tack coat for work performed under Section 400 as directed by the Engineer.

The Department may change the grade or type of bituminous materials without a change in the Contract Unit Price if the Engineer determines the grade or type selected is not performing satisfactorily.

413.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

Emulsified Asphalt

Maintain all equipment used for the delivery, storage, and handling of anionic emulsified asphalt or cationic emulsified asphalt to prevent contamination of the emulsion. Transfer anionic emulsified asphalt or cationic emulsified asphalt directly to the pressure distributor from the transport tanker. Emulsified asphalt may be stored in an onsite bituminous storage tank in accordance with Note 1.

Provide and maintain temperature measuring devices to continuously monitor the temperature of anionic emulsified asphalt or cationic emulsified asphalt in storage and in the pressure distributor. Do not allow anionic emulsified asphalt or cationic emulsified asphalt to freeze.

<p>Note 1: Asphalt emulsion that has been stored longer than 30 days from the time of initial manufacture shall be tested and approved for compliance with specified requirements prior to being used as tack coat for work performed under Section 400</p>
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413.3 Construction Requirements

413.3.01 Personnel

General Provisions 101 through 150.

413.3.02 Equipment

Provide equipment in good repair, including the following units that meet the requirements of Subsection 424.3.02, *Equipment*.

- Power broom and blower
- Pressure distributor

Provide a properly cleaned distributor to avoid contamination with incompatible materials.

413.3.03 Preparation

General Provisions 101 through 150.

Section 413 — Bituminous Tack Coat

413.3.04 Fabrication

General Provisions 101 through 150.

413.3.05 Construction

A. Seasonal and Weather Limitation

Do not apply tack coat if the existing surface is wet or frozen. Do not place emulsified asphalt if the air temperature in the shade is less than 40 °F (4 °C).

B. Application

Coat the entire areas to be paved with the tack coat unless directed otherwise by the Engineer. Apply tack coat with distributor spray bars instead of hand hoses, except in small areas inaccessible to spray bars.

Table 2 - Application Rates for Anionic Emulsified Asphalt or Cationic Emulsified Asphalt, gal/yd² (L/m²)

Tack-Uses	Minimum	Maximum
New Asphaltic Concrete Pavement to New Asphaltic Concrete Pavement or Thin Lift Leveling	0.05 (0.23)	0.08 (0.36)
New Asphaltic Concrete Pavement (≤ 25 % RAP) to Aged Existing Pavement or Milled Surface	0.06 (0.27)	0.10 (0.45)
New Asphaltic Concrete Pavement (> 25 % RAP) to Aged Existing Pavement or Milled Surface	0.08 (0.36)	0.12 (0.54)
<ul style="list-style-type: none"> Allow standard anionic emulsified asphalt or cationic emulsified asphalt to break per emulsion manufacturer's recommendation. Proceed with paving only after the anionic emulsified asphalt or cationic emulsified asphalt has cured to the satisfaction of the Engineer. Do not use anionic emulsified asphalt or cationic emulsified asphalt under OGFC or PEM on interstates or limited access state routes. 		

Note: Application rates for PG Binder Asphalt Cement are specified in Section 400.3.03.A.3.C.

C. Temperature of Material

Apply bituminous materials within the temperature ranges specified below.

TABLE 3 – BITUMINOUS MATERIALS AND APPLICATION TEMPERATURES

Bituminous Materials	Temperature of Application °F (°C)
Asphalt cement	350 - 400 (175 - 205)
Approved non-tracking Anionic Emulsified Asphalt	140 - 180 (60 - 80)
Cationic Emulsified Asphalt CSS-1h, CRS- 1h, CRS-2h, CRS-3, CQS-1h and other approved non-tracking cationic emulsified asphalt products listed on QPL 7	140 - 180 (60 - 80)

D. Cleaning

Immediately before applying the tack coat, clean the entire area free of loose dirt, clay, and other foreign materials.

Section 413 — Bituminous Tack Coat

E. Application Rate

The Engineer will determine the application rate of the bituminous tack coat.

F. Limitations and Areas Coated

Apply only enough tack coat to the prepared road surface that can be covered with the new pavement course the same working day the tack coat is applied.

G. Maintenance and Protection

After applying a standard emulsified asphalt tack coat material, allow it to break per emulsion manufacturer's recommendation. Do not allow construction equipment or traffic on the tack. When directed by the Engineer, provide a revised paving plan when excessive tracking of the tack material by construction related traffic is evident.

413.3.06 Quality Acceptance

General Provisions 101 through 150.

413.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150 shall apply with specific consideration given to General Provision Sections 105.12, 105.14, and 105.16.

413.4 Measurement

Bituminous materials for tack coat applied and accepted are measured as outlined in Subsection 109.02, *Measurement of Bituminous Materials*.

Diluting emulsified tack coat is not ordinarily allowed except when used underneath slurry seal and approved by the Engineer. The composition of diluted emulsified tack coat defined in Subsection 427.3.05, *Construction* is measured by the gallon (liter) of diluted mix.

413.4.01 Limits

General Provisions 101 through 150.

413.5 Payment

The accepted volume of bituminous material will be paid for at the Contract Unit Price per gallon (liter) for bituminous tack coat of the type and grade and approved by the Engineer, complete in place. Payment is full compensation for preparing, cleaning, furnishing, hauling, applying material, and providing incidentals to complete the work.

Payment will be made under:

Item No. 413	Tack coat	Per gallon (liter)
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Section 415—Asphaltic Concrete Open Graded Crack Relief Interlayer

415.1 General Description

This work includes constructing a bituminous plant produced Asphaltic Concrete Open Graded Crack Relief Interlayer (OGI) over the existing roadway surface. The mixture shall serve as asphaltic concrete leveling over irregular surfaces and provide mitigation for reflective cracking prior to the placement of the final surface pavement. The mixture shall conform to the lines, grades, thicknesses, typical sections and cross sections shown on the plans or established by the Engineer.

This section includes the requirements for Asphaltic Concrete Open Graded Crack Relief Interlayer mixtures regardless of the gradation of the aggregates, type and amount of bituminous material, or pavement use. Follow the requirements in Section 400, Section 402 and Section 828 for production and placement, materials, equipment, and acceptance plans except as noted or modified in this specification.

Acceptance of work is on a lot-to-lot basis according to the requirements of this Section, Section 400, Section 402 and Section 106.

415.1.01 Definitions

Asphaltic Concrete Open Graded Crack Relief Interlayer: an open graded mixture placed at a lift thickness that yields stone on stone contact that provides in-place air void content of 18 to 23 percent to mitigate existing cracking within asphaltic concrete pavements.

415.1.02 Related References

A. Standard Specifications

- Section 106—Control of Materials
- Section 109—Measurement and Payment
- Section 152—Field Laboratory Building
- Section 400 – Hot Mix Asphaltic Concrete Construction
- Section 402 – Hot Mix Recycled Asphaltic Concrete
- Section 413—Bituminous Tack Coat
- Section 800 – Coarse Aggregate
- Section 802 - Aggregate for Asphaltic Concrete
- Section 820 – Asphalt Cement
- Section 828—Hot Mix Asphaltic Concrete Mixtures
- Section 831 – Admixtures
- Section 882 – Lime
- Section 883 – Mineral Filler

Section 415 — Asphaltic Concrete Open Graded Crack Relief Interlayer

B. Referenced Documents

AASHTO T 209

AASHTO T 202

AASHTO T 49

AASHTO T 315

Department of Transportation Standard Operating Procedure (SOP) 27

Department of Transportation Standard Operating Procedure (SOP) 15

Department of Transportation Standard Operation Procedure (SOP) 40

GDT 38

GDT 73

GDT 83

GDT 114

GDT 119

GDT 125

GDT 126

GSP 15

GSP 21

QPL 1

QPL 2

QPL 7

QPL 26

QPL 39

QPL 41

QPL 45

415.1.03 Submittals

A. Invoices

Furnish formal written invoices from a supplier for all materials used in production of HMA when requested by Department. Show the following on the Bill of Lading:

- Date shipped
- Quantity in tons (megagrams)
- Included with or without additives (for asphalt cement)

Purchase asphaltic cement directly from a supplier listed on Qualified Products List 7 and provide copies of Bill of Lading at the Department's request.

Section 415 — Asphaltic Concrete Open Graded Crack Relief Interlayer

B. Paving Plan

Before starting asphaltic concrete construction, submit a written paving plan to the Engineer for approval. Include the following on the paving plan:

- Proposed starting date
- Location of plant(s)
- Rate of production
- Average haul distance(s)
- Number of haul trucks
- Paver speed feet (meter)/minute for each placement operation
- Mat width for each placement operation
- Number and type of rollers for each placement operation
- Sketch of the typical section showing the paving sequence for each placement operation
- Electronic controls used for each placement operation
- Temporary pavement marking plan

If staged construction is designated in the plans or contract, provide a paving plan for each construction stage.

If segregation is detected, submit a written plan of measures and actions to prevent segregation. Work will not continue until the plan is submitted to and approved by the Department.

C. Job Mix Formula

Submit to the Engineer a written job mix formula proposed for each mixture type to be used based on an approved mix design. Furnish the following information for each mix:

- Specific project for which the mixture will be used
- Source and description of the materials to be used
- Mixture I.D. Number
- Proportions of the raw materials to be combined in the paving mixture
- Single percentage of the combined mineral aggregates passing each specified sieve
- Single percentage of asphalt by weight of the total mix to be incorporated in the completed mixture
- Single temperature at which to discharge the mixture from the plant
- Theoretical specific gravity of the mixture at the designated asphalt content
- Name of the person or agency responsible for quality control of the mixture during production

Do the following to have the formulas approved in accordance with SOP 40 *Approval of Contractor Job Mix Formulas* and to ensure their quality:

1. Submit proposed job mix formulas for review at least two weeks before beginning the mixing operations.
2. Do not start hot mix asphaltic concrete work until the Engineer has approved a job mix formula for the mixture to be used. No mixture will be accepted until the Engineer has given approval.
3. Provide mix designs for all Asphaltic Concrete Open Graded Crack Relief Interlayer mixtures to be used.
4. After a job mix formula has been approved, assume responsibility for the quality control of the mixtures supplied to the Department according to Subsection 106.01, *Source of Supply and Quantity of Materials*.

D. Quality Control Program

Submit a Quality Control Plan to the Office of Materials and Testing for approval. The Quality Control Program will be included as part of the certification in the annual plant inspection report.

Section 415 — Asphaltic Concrete Open Graded Crack Relief Interlayer

415.2 Materials

The requirements established in Section 400 are to be followed for Asphaltic Concrete Open Crack Relief Interlayer production and placement, materials, equipment, and acceptance plans except as noted or modified in this specification.

Ensure that materials comply with the specifications listed in Table 1.

TABLE 1—MATERIALS SPECIFICATIONS

Material	Subsection
Asphalt Cement, Grade Specified	820.2
Coarse Aggregates for Asphaltic Concrete	802.2.02
Fine Aggregates for Asphaltic Concrete	802.2.01
Mineral Filler	883.1
Heat Stable Anti-Stripping Additive	831.2.04
Hydrated Lime	882.2.03
Silicone Fluid (When approved by the Office of Materials and Testing)	831.2.05
Bituminous Tack Coat: PG 58-22, PG 64-22, PG 67-22	820.2
Hot Mix Asphaltic Concrete Mixtures	828

Section 415 — Asphaltic Concrete Open Graded Crack Relief Interlayer

415.2.01 Mix Design Requirements

The Open Graded Crack Relief Interlayer Mixture shall be formulated to contain approximately 18 to 23 percent in-place air voids after compaction. Use approved mixtures that meet the following mixture control tolerances and design criteria:

TABLE 2 – ASPHALTIC CONCRETE OPEN GRADED CRACK RELIEF INTERLAYER MIXTURE DESIGN AND CONTROL

Sieve Size	Mixture Control Tolerance, %	Design Gradation Limits, % Passing
		Open Graded Crack Relief Interlayer
3/4 in. (19 mm) sieve	±0.0	100
1/2 in. (12.5 mm) sieve	±6.1	80 - 100
3/8 in. (9.5 mm) sieve	±5.6	40 - 65
No. 4 (4.75 mm) sieve	±5.7	10 - 25
No. 8 (2.36 mm) sieve	±4.6	2 - 10
No. 200 (75 µm) sieve	±2.0	2 - 5
Range for % AC	±0.4	4.50 – 5.25
Class of stone (Section 800)		"A" only
Drain-down (AASHTO T305), %		<0.3
Design optimum air voids (%)		20% ± 2%
Control Sieves used in Acceptance Schedule		3/8 in., No. 8 (9.5 mm, 2.36 mm) and Asphalt Cement

Notes:

1. Use only PG 64-22 or PG 67-22 asphalt cement (specified in Section 820).
2. Use no less than 1.0% hydrated lime regardless of aggregates group or source(s) used.
3. Ensure no more than 10 percent Recycled Asphalt Pavement (RAP) is used in Asphaltic Concrete Open Graded Interlayer mixtures.
4. Quality Acceptance Test Results for AC content deviating $> \pm 0.3$ % from the approved Job Mix Formula (JMF) consistently over three Lots may subject the mix to a revised AC content on the project JMF at the discretion of the State Materials Engineer based on statistical trend.
5. Range for % AC is Original Optimum AC (OOAC) at 25 blow Marshall prior to the Corrected Optimum AC (COAC) calculation detailed in SOP 2 (Appendix D).

Section 415 — Asphaltic Concrete Open Graded Crack Relief Interlayer

415.3 Construction Requirements

The requirements established in Section 400 are to be followed for asphaltic concrete mixture production and placement, materials, equipment, and acceptance plans except as noted or modified in this specification.

415.3.01 Personnel

General Provisions 101 through 150.

415.3.02 Construction

Asphaltic concrete plants that produce mix for Department use are governed by Quality Assurance for Hot Mix Asphaltic Concrete Plants in Georgia, Laboratory Standard Operating Procedure No. 27.

Follow requirements established in Section 400 for production and placement, materials, equipment, acceptance plans and adjustments except as noted or modified in this specification.

- A. Apply a bituminous tack coat according to Section 413. The Engineer will determine the application rate, which must be within the limits of 0.06 gal/yd² to 0.10 gal/yd² (0.27 L/m² to 0.45 L/m²) (residual asphalt cement).
- B. The mix shall be produced and placed at a temperature of 250°F with a tolerance of ± 20°F.
- C. Place the mix to a compacted lift thickness of 1-inch (25 mm). For construction purposes, the target thickness will be converted to spread rate based on the bulk specific gravity of the asphaltic concrete mixture being used as shown in the following equation:
$$\text{Spread rate (lbs./yd}^2\text{)} = t * G_{mb} * 46.8 \quad (\text{Spread rate (kg/ m}^2\text{)} = t * G_{mb})$$

Where: t = Compacted lift thickness (inches, mm)
G_{mb} = bulk specific gravity of the mix from the approved mix design

The spread rate shall be controlled within 10 lbs./yd² (6 kg/m²).

- D. Do not place mix at air temperatures below 50 °F (10 °C).
- E. The mix shall be compacted in a manner to achieve 18 to 23 percent in-place air voids. Steel wheel rollers operating in static mode **only** will be used to seat the lift of Asphaltic Concrete Open Graded Crack Relief Interlayer mixture. Pneumatic tire rollers shall not be allowed on the Asphaltic Concrete Open Graded Crack Relief Interlayer mat.

415.4. Measurement

Asphaltic Concrete Open Graded Crack Relief Interlayer mixture, complete, in place and accepted, is measured in tons (megagrams). If the spread rate exceeds the upper limits outlined in Subsection 415.3.02.C by > 15 lbs./yd², the mix in excess will not be paid for. If the rate of the spread is ≤ 10 lbs./yd² than the lower limit, the deficient course is subject to correction by overlaying the entire lot. The mixture used for correcting deficient areas is paid for at the Contract Unit Price of the course being corrected and is subject to mixture control requirements established in Table 2 – Asphaltic Concrete Open Graded Crack Relief Interlayer Mixture Design and Control. After the deficient course has been corrected, the total spread rate for that lot is recalculated, and the mix in excess of the upper limits outlined in Subsection 415.3.02.C will not be paid for.

415.5 Payment

Asphaltic Concrete Open Graded Crack Relief-Interlayer mix is paid for at the Contract Unit Price per ton (megagram). Payment is full compensation for furnishing and placing materials including asphalt cement, hydrated lime, approved additives, and for cleaning and repairing, preparing surfaces, hauling, mixing, spreading, rolling, and performing other operations to complete the Contract Item.

Section 415 — Asphaltic Concrete Open Graded Crack Relief Interlayer

Payment will be made under:

Item No. 415	Asphaltic Concrete Open Graded Crack Relief Interlayer, group-blend, Including bituminous materials and hydrated lime	Per ton (megagram)
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415.5.01 Adjustments

A. Materials Produced and Placed During the Adjustment Period

Follow requirements established in Section 400 for production and placement, materials, equipment, acceptance plans and adjustments except as noted or modified in this specification.

Asphaltic Concrete Open Graded Crack Relief Interlayer shall be granted an adjustment period for the first Lot or day, whichever is less, produced for the Contract. A new adjustment period shall not be granted for a change of producer, mix design or asphalt plant location. The adjustment period is provided to adjust or correct the mix and to establish the construction procedures and sequence of operations. Test the mixture in accordance with Section 400.3.06. Maintain the asphalt cement content and gradation within the limits provided in Table 2 – Asphaltic Concrete Open Graded Interlayer Mixture Design and Control. The Engineer will not use these test results in the acceptance for payment decision, but production and placement operations shall cease for failure to meet mixture control tolerances established in Table 2 – Asphaltic Concrete Open Graded Interlayer Mixture Design and Control.

415.5.02 Determine Lot Acceptance

The Engineer will accept the mixture based on visual inspection. The mixture shall be inspected for texture, segregation, bleeding, fat spots, raveling, delamination, tearing, targeted in-place air void content and slippage areas. Remove and replace any areas determined to be unacceptable to the Engineer.

Section 432—Mill Asphaltic Concrete Pavement

432.1 General Description

This work includes milling existing asphaltic concrete pavement to restore proper grade and/or transverse slope, removing structurally unsound material, providing clearance for overlay in curb and gutter sections, or other purposes deemed necessary due to existing conditions. Perform the work according to these Specifications and Plan details.

432.1.01 Definitions

General Provisions 101 through 150.

432.1.02 Related References

A. Standard Specifications

Section 109—Measurement and Payment

B. Referenced Documents

GDT 126

432.1.03 Submittals

General Provisions 101 through 150.

432.2 Materials

432.2.01 Delivery, Storage, and Handling

When specified, stockpile the milled material at locations shown on the plans.

1. Uniformly stockpile the materials approximately 6 – 8 ft. (1.8 – 2.4 m) high.
2. Maintain the existing drainage pattern of water from the stockpile storage area.
3. Dress the reclaimed asphalt area to drain rainwater from the material.
4. Obtain the Engineer's approval of the stockpile locations and the method used to prevent milled material degradation, segregation, and reconsolidation.

432.3 Construction Requirements

432.3.01 Personnel

General Provisions 101 through 150.

432.3.02 Equipment

A. Conventional Milling Equipment

Use power-driven, self-propelled milling equipment that is the size and shape that allows traffic to pass safely through areas adjacent to the work. Also, use equipment that is:

- Designed to mill and remove a specified depth of existing asphalt paving
- Equipped with grade and slope controls operating from a string line or ski and based on mechanical or sonic operation
- Capable of removing pavement to an accuracy of 1/8 in. (3 mm)
- Furnished with a lighting system for night work, as necessary
- Provided with conveyors capable of side, rear, or front loading to transfer the milled material from the roadway to a truck

B. Micro-milling Equipment

When micro-milling is specified, use power-driven, self-propelled micro-milling equipment possessing the size and shape to allow traffic safe passage through areas adjacent to the work. Also, ensure the micro milling is equipped as follows:

- Equipped with a cutting mandrel with carbide or equivalent tipped cutting teeth designed for micro-milling bituminous pavement full lane width to close tolerances. Micro-milling heads with less than full lane widths may be used for non-mainline travel way when approved by the engineer and milled surface meets all specified acceptance criteria.
- Equipped with grade and slope controls operating from a string line or ski and based on mechanical or sonic operation
- Capable of removing pavement to an accuracy of 1/16 in. (1.6 mm.)
- Furnished with a lighting system for night work, as necessary
- Provided with conveyors capable of side, rear, or front loading to transfer the milled material from the roadway to a truck.

C. Dust Control

Provide power brooms, vacuum sweepers, power blowers, or other means to remove loose debris or dust. Do not allow dust control to restrict visibility of passing traffic or to disrupt adjacent property owners.

432.3.03 Preparation

General Provisions 101 through 150.

432.3.04 Fabrication

General Provisions 101 through 150.

Section 432 — Mill Asphaltic Concrete Pavement

432.3.05 Construction

A. Conventional Milling Operation

Follow the plans to mill the designated areas and depths including bridge decks, shoulders, and ramps, as required. Ensure the following requirements are met:

1. Schedule the construction operation. Use milling methods that will produce a uniform finished surface and maintain a constant cross slope between extremities in each lane.
2. Provide positive drainage to prevent water accumulation on the milled pavement, as shown on the plans or directed by the Engineer.
3. Bevel back the longitudinal vertical edges greater than 2 in. (50 mm.) that are produced by the removal process and left exposed to traffic. Bevel them back at least 3 in. for each 2 in. (75 mm. for each 50 mm.) of material removed. Use an attached mold board or other approved method.
4. When removing material at ramp areas and ends of milled sections, taper the transverse edges 10 ft. (3 m) to avoid creating a traffic hazard and to produce a smooth surface.
5. Protect with a temporary asphaltic concrete tie-in (paper joint) vertical edges at other areas such as bridge approach slabs, drainage structures, and utility appurtenance greater than 1/2 in. (12.5 mm) that are left open to traversing vehicles. Place the temporary tie-in at taper rate of at least 6 to 1 horizontal to vertical distance.
6. Remove dust, residue, and loose milled material from the milled surface. Do not allow traffic on the milled surface and do not place asphaltic concrete on the milled surface until removal is complete.

The reclaimed asphaltic pavement becomes the Contractor's property unless otherwise specified.

B. Micro-milling Operation

Ensure the micro-milling operations comply with Subsection 432.3.05.B, when micro-milling is specified in the contract to remove aged open-graded mix types, remove wheel ruts and other surface irregularities; restore proper grade and/or transverse slope of pavement as indicated in the Plans and as directed by the Engineer. The micro-milled surface shall provide a texture suitable for use as a temporary riding surface or an immediate overlay with OGFC or PEM with no further treatment or overlays. Micro-milling is required when placing OGFC or PEM mixtures on a milled surface. The use of the micro-milled pavement as a temporary riding surface shall be a maximum of five (5) Available days. Perform the work according to these Specifications and Plan details.

1. Micro-milling Process

- a. Follow the Plans to micro-mill the designated areas and depths including bridge decks, shoulders, and ramps, as required. Ensure the following requirements are met:
 - Prior to commencement of the work, construct a test section that is 1000 ft. (305 m) in length with a uniformly textured surface and cross section as approved by the Engineer.
 - The final pavement surface shall have a transverse pattern of 0.2 in. (5 mm) center to center of each strike area. The targeted difference between the ridge and valley (RVD) measurement of the mat surface shall not exceed 1/16 in. (1.6 mm).
 - Milled surface acceptance testing will be performed using the Laser Road Profiler in accordance with GDT-126. Ensure the measured indices meet a target of 825 mm/km in the test section.
 - Work shall be halted and the contractor shall submit a written plan of action detailing what steps will be taken to improve operations if any of these requirements are exceeded in the test section. If approved by the Engineer, the contractor will construct another 1000 ft. (305 m) test section. This test section shall be located in a different area than the initial section using the approved corrective action. This designated section shall be micro-milled to conform to the same requirements as those required in the initial test section. The contractor shall not be allowed to start continual micro-milling until an acceptable test section is obtained.

Section 432 — Mill Asphaltic Concrete Pavement

- b. Ensure micro-milling methods produce a uniform finished surface and maintain a constant cross slope between extremities in each lane.
- c. Provide positive drainage to prevent water accumulation on the micro-milled pavement, as shown on the Plans or directed by the Engineer.
- d. Bevel back the longitudinal vertical edges greater than 2 in. (50 mm) produced by the removal process and left exposed to traffic. Bevel the vertical edges back at least 3 in. for each 2 in. (75 mm for each 50 mm) of material removed. Use an attached mold board or other approved method.
- e. Taper the transverse edges 10 ft. (3 m) to avoid creating a traffic hazard and to produce a smooth surface when removing material at ramp areas and ends of milled sections.
- f. Protect with a temporary asphaltic concrete tie-in (paper joint) vertical edges at other areas such as bridge approach slabs, drainage structures, and utility appurtenances greater than 1/2 in areas left open to traversing vehicles. Place the temporary tie-in at taper rate of at least 6 to 1 horizontal to vertical distance.
- g. Remove dust, residue, and loose milled material from the micro-milled surface. Do not allow traffic on the milled surface and do not place asphaltic concrete on the milled surface until removal is complete.

432.3.06 Milling Quality Acceptance

A. Conventional Milling Acceptance Criteria

Ensure that the milling operation produces a uniform pavement texture that is true to line, grade, and cross-section.

Milled pavement surface acceptance testing will be performed using the Laser Road Profiler method in GDT 126. Milled pavement will be evaluated on individual test sections, normally 1 mile (1 km) long.

When the milled surface is to be left as the final wearing surface, ensure that indices do not exceed:

- 1025 on milled pavement surfaces on interstates when the milled surface will be the final wearing surface
- 1175 for other on-system routes when the milled surface will be the final wearing surface
- 1175 on Interstates and 1325 for other on-system routes if the milled surface will be overlaid

Remill mile (kilometer) areas to meet the specified limits when the indices are exceeded. Remill at no additional cost to the Department.

Milled pavement surfaces are subject to visual and straightedge inspection. Keep a 10 ft. (3 m) straightedge near the milling operation to measure surface irregularities of the milled pavement surface. Remill irregularities greater than 1/8 in. per 10 ft. (3 mm in 3 m) at no additional cost to the Department.

Ensure that the cross slope is uniform and that no depressions or slope misalignments greater than 1/4 in. per 12 ft. (6 mm in 3.6 m) exist when the slope is tested with a straightedge placed perpendicular to the center line.

Section 432 — Mill Asphaltic Concrete Pavement

B. Micro-Milling Acceptance Criteria

Ensure the micro-milling operation produces a uniform pavement texture true to line, grade, and cross section. Micro-mill additional depth to eliminate excessive scabbing of the in place material as directed by the Engineer. Micro-milled pavement surface acceptance testing will be performed using the Laser Road Profiler method in GDT 126.

Micro-milled pavement will be evaluated on individual test sections, measuring 0.50 mile (0.50 km). Ensure micro-milled pavement meets specified measured tolerances for RVD and profile surface smoothness indices of Target 825 mm/km and not exceed the Correction index of 900 mm/km

- Micro-milled pavement surfaces are subject to visual and straightedge inspections. Ensure a 10 ft. (3 m). straightedge is kept at the micro-milling operation to measure surface irregularities of the milled pavement surface.
- Any areas exceeding 1/8 in. (3.2 mm) between the ridge and valley of the mat surface or fail to meet pavement surface acceptance testing using the Laser Road Profiler shall subject the micro-milled surface to a pay reduction of 20% based on the micro-milling unit cost per square yd. at the recommendation of the Office of Materials and Testing.
- Any areas exceeding 3/16 in. (4.8 mm) between the ridge and valley of the mat surface or fail to meet pavement surface acceptance testing using the Laser Road Profiler shall subject the locations to being removed and replaced with acceptable material as directed by the Engineer at no additional cost to the Department. All corrective work shall be performed in a minimum 500 ft. section.
- Ensure the cross slope is uniform and no depressions or slope misalignments greater than 1/4 in. per 12 ft. (6 mm in 3.6 m) exist when the slope is tested with a straightedge placed perpendicular to the center line.

432.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

432.4 Measurement

Conventional milling and micro-milling existing asphaltic concrete pavement is measured by the square yard (meter) as described in Subsection 109.01, *Measurement and Quantities*.

432.4.01 Limits

General Provisions 101 through 150.

432.5 Payment

Conventional milling and micro-milling asphaltic concrete pavement, measured as specified, will be paid for at the Contract Unit Price bid per square yard (meter). The price bid for this item includes the credit value of all Reclaimed Asphalt Pavement (RAP) recovered, and no adjustment in the unit price for this item or other items will be considered for variations in the amount of RAP actually recovered.

Payment is full compensation for furnishing equipment, milling, hauling, stockpiling milled material, and satisfactorily performing the work.

Payment will be made under:

Item No. 432	Mill asphaltic concrete pavement, ___ in (mm) depth	Per square yard (meter)
Item No. 432	Mill asphaltic concrete pavement, variable depth	Per square yard (meter)
Item No. 432	Micro-mill asphaltic concrete pavement, variable depth	Per square yard (meter)

Section 432 — Mill Asphaltic Concrete Pavement

432.5.01 Adjustments

General Provisions 101 through 150.

Section 611—Relaying, Reconstructing, or Adjusting to Grade of Miscellaneous Roadway Structures

611.1 General Description

This work includes relaying, reconstructing, resetting, adjusting to grade, capping minor structures, resetting guard rail, or adjusting other miscellaneous roadway structures as specified in the proposal or on the plans.

611.1.01 Definitions

General Provisions 101 through 150.

611.1.02 Related References

A. Standard Specifications

Section 610—Removal of Miscellaneous Roadway Items

Section 641—Guard Rail

Section 668—Miscellaneous Drainage Structures

Section 854—Castings and Forgings

B. Referenced Documents

General Provisions 101 through 150.

611.1.03 Submittals

General Provisions 101 through 150.

611.2 Materials

Most materials for the work in this specification are salvaged from the removal of existing structures. The Engineer will determine the suitability of the salvaged material for use.

Use other materials to complete the structure, such as mortar, sand-cement grout, sand for sand cushion, bituminous filler, brick, and other materials that meet the requirements of the applicable specifications for such materials for use in new structures of the same character and type.

611.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

611.3 Construction Requirements

611.3.01 Personnel

General Provisions 101 through 150.

611.3.02 Equipment

General Provisions 101 through 150.

611.3.03 Preparation

General Provisions 101 through 150.

611.3.04 Fabrication

General Provisions 101 through 150.

611.3.05 Construction

A. Miscellaneous Roadway Items

Follow these procedures to construct miscellaneous roadway items:

1. Remove existing structures to be rebuilt according to Section 610.
2. Clean the material salvaged for use in the rebuilt structure and stockpile it in convenient places. Protect it from damage until it is used.
3. Dispose of the portions of structures not suitable for reuse as provided in Section 610. Replace them with suitable new material.
4. Relay or rebuild the structures according to the Specifications for new structures of the same type.
5. Adjust to the required grade miscellaneous structures specified in the proposal or on the plans by raising or lowering the upper portion of the fixture, including sleeve extensions, adjustable manhole rings, gaskets, mastic, mortar, masonry, and other material.
6. Furnish materials such as mortar, sand-cement grout, sand cushion, bituminous filler, brick, castings, and other materials to excavate, trench, prepare earth foundation, backfill, and other work necessary to complete the item.

B. Capping an Existing Structure

When capping an existing structure requires removing adjacent existing pavement, sidewalk, curb, gutter, or other improvement not otherwise affected by the work, follow these guidelines:

1. Remove the improvements to expose only the portion of the structure to be modified.
2. Replace the removed improvements to the Engineer's satisfaction without additional compensation.
3. Remove enough existing masonry to lower the top elevation to a point not less than the thickness of the cap plus 3 ft. (1 m) below subgrade elevation, unless otherwise indicated.
4. Cap the remaining portion of the structure with a fitted reinforced concrete cover constructed to the general details shown on the plans.

Grates, rings, plates, covers, hoods, or other castings or fittings removed while capping and not re-used become the property of the Department unless otherwise indicated on the plans.

C. Resetting Guard Rail

When resetting the guard rail is specified in the Proposal:

1. Reset guard rail removed according to Section 610 where the plan indicates and to the required post spacing.
2. Furnish materials, including additional hardware, offset blocks, and posts.
3. Replace posts that do not conform to the plans.
4. Follow the applicable provisions of Section 641.

D. Raising Manholes

When raising manholes:

1. Adjustments may be made by using adjustable extension rings that do not require removing the existing manhole frame.
2. Ensure that the extension device locks to the existing frame and permits height and diameter adjustment. The adjustable extension ring to be used shall have the Engineer's prior approval.
3. Choose an extension ring compatible with the existing casting and cover. Ensure that the adjustment range conforms to the finished pavement surface.

Section 611 — Relaying, Reconstructing, or Adjusting to Grade of Miscellaneous Roadway Structures

- a. Use an adjustable extension ring made of materials that meet the requirements of Subsection 854.2.01 or are manufactured from ASTM A 36/A 36M steel and approved by the Office of Materials and Research.
- b. Ensure that the extension ring and cover are machine ground to reduce contact irregularity. Ensure that the grates are rattle proof.
- c. Obtain the Engineer's approval for the type of adjustable extension ring used.

E. Replacing Fences

Replace fences removed under Section 610 in kind, using the removed materials as far as possible. Unless the Plans provide for new fence at the particular location, include new materials required in the Bid Price for resetting fence.

611.3.06 Quality Acceptance

General Provisions 101 through 150.

611.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

611.4 Measurement

Relaying, reconstructing, or adjusting to grade, capping minor structures, resetting guard rail, or adjusting other miscellaneous roadway structures is measured to determine the unit or units of each type completed and accepted.

Manhole tops to be raised or lowered 2 ft. (600 mm) or less are considered "Adjust to Grade."

Manhole tops to be raised between 2 ft. (600 mm) and 6 ft. (1.8 m), or tops to be lowered more than 2 ft. (600 mm), are considered "Reconstruct Manhole" and are paid as shown in Subsection 611.5, *Payment*.

Remove manholes to be raised more than 6 ft (1.8 m) as clearing and grubbing and construct a new manhole in its place according to Section 668.

611.4.01 Limits

General Provisions 101 through 150.

611.5 Payment

Relaying, reconstructing, resetting, adjusting to grade, capping minor structures, resetting guard rail, or adjusting other miscellaneous roadway structures will be paid for at the Contract Unit price. Payment is full compensation for relaying, resetting, reconstructing, or adjusting to grade the structures as specified in this Specification.

Excavation and backfill necessary for capping is considered incidental to the Item and is not paid for separately.

Tapping a new pipeline into an existing structure is not considered reconstruction of the existing structure.

Payment will be made under:

Item No. 611	Relay	Per unit shown in Proposal
Item No. 611	Reconstruct	Per unit shown in Proposal
Item No. 611	Reset	Per unit shown in Proposal
Item No. 611	Adjust to grade	Per unit shown in Proposal
Item No. 611	Cap minor structures	Per unit shown in Proposal

611.5.01 Adjustments

General Provisions 101 through 150.

Section 653—Thermoplastic Traffic Stripe

653.1 General Description

This work includes furnishing and applying standard, wet weather, and audible profiled thermoplastic reflectorized pavement marking compound. Ensure markings conform to plan details and locations, these specifications, and the Manual on Uniform Traffic Control Devices.

Thermoplastic traffic stripe consists of solid or broken (skip) lines, words, and symbols according to plan color, type, and location.

653.1.01 Definitions

Thermoplastic Marking Compound: A heated compound extruded or mechanically sprayed on the pavement that cools to pavement temperature. When combined with glass spheres and/or reflective composite optics it produces a reflectorized pavement marking.

Short Lines: Crosswalks, stop bars, arrows, symbols, and crosshatching. Extrude short lines rather than spraying them on.

653.1.02 Related References

A. Specifications

Section 656—Removal of Pavement Markings

B. Referenced Documents

QPL 46

QPL 71

SOP 37

SOP 38

SOP 39

Federal Test Standard Number 595B

Federal Test Standard Number 695B

AASHTO M 247

AASHTO M 249

ASTM D 92

ASTM D 476

ASTM D 2240

ASTM D 4960

ASTM E 1710

ASTM E 2177

40 CFR 261.24

EPA Method 3050

EPA Method 3052

EPA Method 6010

EPA Method 7000A

Section 653 — Thermoplastic Traffic Stripe

653.1.03 Submittals

Ensure the producers of the thermoplastic compound and the producers of both the intermix and drop-on glass spheres furnish to the Department copies of certified test reports showing results of all tests specified in this Section. Also ensure that producers certify that the materials meet the other requirements of this Section by submitting copies of certification at the time of sampling.

653.2 Materials

A. General Characteristics of Thermoplastic

Use thermoplastic material produced from an approved source listed on QPL 46. Use thermoplastic material that meets the requirements of AASHTO M 249 with the following exceptions:

1. Material Composition

Ensure the resin of the thermoplastic material is an alkyd binder. Ensure the alkyd binder consists of a mixture of synthetic resins and a high boiling point plasticizer. Ensure at least one synthetic resin is a solid at room temperature. Ensure at least 50 percent of the binder composition is 100 percent maleic-modified glycerol ester resin. Ensure at least 18 percent by weight of the entire material formulation consists of binder. Do not use alkyd binder that contains petroleum-based hydrocarbon resins. Ensure the finished thermoplastic material is not adversely affected by contact with pavement materials or by petroleum droppings from traffic. Use thermoplastic material that has been evaluated (2-year field evaluation) by the National Transportation Product Evaluation Panel (NTPEP) test facility or other approved test facility.

2. Suitability for Markings

Use thermoplastic material that is especially compounded for traffic markings and has the following characteristics:

- Prevents markings from smearing or spreading under normal traffic conditions at temperatures below 120 °F (49 °C)
- Gives a uniform cross section, with pigment evenly dispersed throughout the material
- Has a uniform material density and character throughout its thickness
- Allows the stripe to maintain its original dimensions and placement
- Ensures that the exposed surface is free from tack and is not slippery when wet
- Does not lift from the pavement in freezing weather
- Has cold ductility properties that permit normal movement with the road surface without chipping or cracking

Section 653 — Thermoplastic Traffic Stripe

3. Color

Confirm the color of thermoplastic by providing data from the manufacturer to the Area Manager as follows:

- a. White – Use titanium dioxide that meets the requirements of ASTM D 476, Type II, Rutile, as the pigment for white thermoplastic material. Do not use anatase titanium dioxide pigment. Ensure thermoplastic material is free from dirt or tint. Ensure white thermoplastic material heated for 240 ± 5 minutes at 425 ± 3 °F (218 ± 3 °C) and cooled to 77 ± 3 °F (25 ± 2 °C) matches Federal Test Standard Number 695B-Color 17925. Ensure that the Y tristimulus value is measured to be a minimum value of 45. Ensure the material, when compared to the magnesium oxide standard using a standard color spectrophotometer according to ASTM D 4960, meets the following:

Scale	Definition	Magnesium Oxide Standard	Sample
Rd	Reflectance	100	75 min.
a	Redness-Greenness	0	-5 to + 5
b	Yellowness-Blueness	0	-10 to + 10

- b. Yellow – Use only non-hazardous pigments as defined by the Resource Conservation and Recovery Act (RCRA) Subarticle C rules, table 1 of 40 CFR 261.24 “Toxicity Characteristic”. Do not use yellow thermoplastic containing more than 3.0 ppm lead by weight when tested in accordance with the most recent

EPA Methods 3050 and 6010 or 7000. Ensure yellow thermoplastic material heated for 240 ± 5 minutes at 425 ± 3 °F (218 ± 2 °C) and cooled to 77 ± 3 °F (25 ± 2 °C) matches AMS-STD-595. Ensure that the Y tristimulus value is measured to be a minimum value of 45. Ensure the material, when compared to PR#1 Chart using a standard color spectrophotometer according to ASTM D 4960, plots within the following chromaticity coordinates:

	1	2	3	4
X	0.455	0.510	0.472	0.530
Y	0.444	0.485	0.400	0.456

- c. Black – The black pigment must produce a completely opaque, black stripe when applied on the road and after 70 hr of weatherometer exposure in accordance with ASTM G 155 using Exposure Cycle 1 with a quartz inner filter glass and Type “S” Borosilicate outer filter glass. Ensure that Y tristimulus value is measured to be a maximum value of 5.
- d. Ensure the in-service daytime chromaticity for yellow, white, and black material plots within the following coordinates after a period of 30 days:

	1		2		3		4	
	x	y	x	y	x	y	x	y
White	0.290	0.315	0.310	0.295	0.350	0.340	0.330	0.360
Yellow	0.435	0.429	0.510	0.485	0.449	0.377	0.530	0.456
Black	0.355	0.355	0.305	0.305	0.285	0.325	0.335	0.375

Section 653 — Thermoplastic Traffic Stripe

4. Indentation Resistance

Measure the hardness by a Shore Durometer, Type A2, as described in ASTM D 2240. Maintain the temperature of the Durometer, 4.4 lb. (2 kg) load and the specimen for 2 hours at 115 °F (45 °C). Apply the Durometer and 4.4 lb. (2 kg) load to the specimen. The reading must fall between 50 to 75 units, after 15 seconds.

5. Reheating

Ensure that the compound does not break down, deteriorate, scorch, or discolor if held at application temperature of 425 °F (218 °C) for 6 hours and if reheated up to 4 times to the application temperature. Ensure that the color of white and yellow thermoplastic comply with Subsection 653.2.A.3.a and Subsection 653.2.A.3.b after prolonged heating or reheating.

6. Intermixed Glass Spheres and Reflective Composite Optics

Ensure glass spheres meet the requirements of AASHTO M 247.

Do not use glass spheres and /or reflective composite optics containing greater than 200 ppm total arsenic, 200 ppm total antimony, or 200 ppm total lead when tested according to US EPA Methods 3052 and 6010C, or other approved methods.

7. Flashpoint

Ensure the thermoplastic flashpoint is not less than 500 °F (260 °C) as determined by ASTM D 92.

B. Drop-On Glass Spheres and Reflective Composite Optics

Ensure glass spheres meet the requirements of AASHTO M 247. Use spheres produced from an approved source listed on QPL 71. Glass spheres conforming to an alternative gradation may be used provided all other requirements of AASHTO M 247 and this specification are met. Do not use glass spheres and /or reflective composite optics containing greater than 200 ppm total arsenic, 200 ppm total antimony, or 200 ppm total lead when tested according to US EPA Methods 3052 and 6010C, or other approved methods.

C. Sealing Primer

Place the particular type of binder-sealer at the application rate as recommended in writing by the thermoplastic material manufacturer.

653.2.01 Delivery, Storage, and Handling

Use material delivered in 50 lb (22.7 kg) unit cardboard containers or bags strong enough for normal handling during shipment and on-the-job transportation without loss of material.

Ensure that each unit container is clearly marked to indicate the following:

- Color of the material
- Process batch number or similar manufacturer's identification
- Manufacturer's name
- Address of the plant
- Date of manufacture

653.3 Construction Requirements

653.3.01 Personnel

General Provisions 101 through 150.

653.3.02 Equipment

Depending on the marking required, use hand equipment or truck-mounted application units on roadway installations.

A. Application Machine

Ensure that each application machine is equipped with the following features:

- Parts continuously mix and agitate the material.
- Truck-mounted units for lane, edge, and center lines operate at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of striping material and capable of following straight lines and making normal curves in a true arc.
- Conveying parts between the main material reservoir and the shaping die or gun prevent accumulation and clogging.
- Parts that contact the material are easily accessible and exposable for cleaning and maintenance.
- Mixing and conveying parts, including the shaping die or gun, maintain the material at the plastic temperature with heat transfer oil or electrical element-controlled heat. Do not use an external source of direct heat.
- Parts provide continuously uniform stripe dimensions.
- Applicator cleanly and squarely cuts off stripe ends and applies skip lines. Do not use pans, aprons, or similar appliances that the die overruns.
- Parts produce varying widths of traffic markings.
- Applicator is mobile and maneuverable enough to follow straight lines and make normal curves in a true arc.

B. Automatic Bead Dispenser

Apply glass spheres and/or reflective composite optics to the surface of the completed stripe using a dispenser attached to the striping machine to automatically dispense the beads/optics instantaneously upon the installed line. Synchronize the glass sphere/optics dispenser cutoff with the automatic cutoff of the thermoplastic material.

C. Special Kettles

Use special kettles for melting and heating the thermoplastic material. Use kettles equipped with automatic thermostatic control devices that provides positive temperature control and prevents overheating. Ensure that the applicator and kettles are equipped and arranged according to the requirements of the National Fire Underwriters.

D. Hand Equipment

Use hand equipment for projects with small quantities of lane lines, edge lines, and center lines, or for conditions requiring the equipment. Use hand equipment approved by the Engineer.

Ensure hand equipment can hold 150 lbs. (68 kg) of molten material and is maneuverable to install crosswalks, arrows, legends, lane, edge, and center lines.

E. Auxiliary Vehicles

Supply the necessary auxiliary vehicles for the operation.

653.3.03 Preparation

For asphaltic concrete pavement, do not begin placement of thermoplastic striping until 15 calendar days after completion of the final surface course.

653.3.04 Fabrication

General Provisions 101 through 150.

Section 653 — Thermoplastic Traffic Stripe

653.3.05 Construction

A. General Application

Notify the Engineer prior to the placement of the thermoplastic materials. Furnish the Engineer with the manufacturer's name and batch numbers of the thermoplastic materials and glass spheres to be used. Ensure that the approved batch numbers appear on the thermoplastic materials and glass spheres packages.

Thoroughly clean pavement areas to be striped. Use hand brooms, rotary brooms, air blasts, scrapers, or other approved methods that leave the pavement surface clean and undamaged. Take care to remove all vegetation and road film from the striping area. Ensure all new Portland cement concrete pavement surfaces are mechanically wire brushed or abrasive cleaned to remove all laitance and curing compound before being striped.

Lay stripe with continuous uniform dimensions.

Apply the type of stripe at each location according to the Plans, using one of the following methods:

- Spray techniques
- Extrusion methods wherein one side of the shaping die is the pavement and the other three sides are contained by or are part of the suitable equipment to heat and control the flow of material.
- Extrusion methods using a pressurized ribbon gun to control the application of material.

1. Temperature

Apply thermoplastic traffic stripe only when the pavement temperature in the shade is above 40 °F (4 °C).

To ensure optimum adhesion, install the thermoplastic material in a melted state at the manufacturer's recommended temperature but not at less than 375 °F (190 °C).

2. Moisture

Do not apply when the surface is moist. When directed by the Engineer, perform a moisture test on the Portland cement concrete pavement surface. Perform the test as follows:

- a. Place approximately 1 yd² (1m²) of roofing felt on the pavement surface.
- b. Pour approximately 1/2 gallon (2 L) of molten thermoplastic onto the roofing felt.
- c. After 2 minutes, lift the roofing felt and inspect to see if moisture is present on the pavement surface or underside of the roofing felt.
- d. If moisture is present, do not proceed with the striping operation until the surface has dried sufficiently to be moisture free.

3. Sealing Primer

To ensure optimum adhesion, apply a binder-sealer material before installing the thermoplastic in each of the following cases:

- Where directed by the Engineer for sprayed thermoplastic
- Old asphaltic concrete pavements with exposed aggregates
- Portland cement concrete pavements
- Bridge Deck Polymer Overlay

Ensure that the binder-sealer material forms a continuous film that mechanically adheres to the pavement and dries rapidly. Use a binder-sealer currently in use and recommended by the thermoplastic material manufacturer according to QPL 46.

Apply the binder-sealer immediately in advance of, but concurrent with, the application of the thermoplastic material. Apply in a continuous film over the pavement surface.

4. Bonding to Old Stripe

If the old stripe is to be renewed by overlaying with new material, ensure the new material bonds to the old line without splitting or cracking.

5. Offset from Construction Joints

Off-set longitudinal lines at least 2 in (50 mm) from construction joints of Portland cement concrete pavements.

Section 653 — Thermoplastic Traffic Stripe

6. Crosswalks, Stop Bars, and Symbols

Make crosswalks, stop bars, and symbols at least 3/32 in (2.4 mm) thick at the edges and no more than 3/16 in (4.8 mm) thick at the center.

7. Thickness

a. Maintain the following minimum average dry thicknesses above the surface on all types of pavements

- 0.090 in. (2.3 mm) * for lane lines
- 0.060 in. (1.5 mm) * for edge lines
- 0.120 in. (3.0 mm) * for gore area lines
- 0.120 in. (3.0 mm) * for polymer overlay edge lines and lane lines

(See below for '*' reference.)

Compute the minimums by the amount of material used each day, as follows:

(For 6 in wide stripe)	
* Average Thickness (in) =	$[(\text{lbs. used}) \div (\text{total linear feet})] \times 0.236$
(For 150 mm wide stripe)	
* Average Thickness (mm) =	$[(\text{kg used}) \div (\text{total linear meters})] \times 4.0$
(For 10 in wide stripe)	
* Average Thickness (in) =	$[(\text{lbs. used}) \div (\text{total linear feet})] \times 0.118$
(For 250 mm wide stripe)	
* Average Thickness (mm) =	$[(\text{kg used}) \div (\text{total linear meters})] \times 2.0$

b. Audible Profiled Thermoplastic – Apply a flat edge line having a thickness of 0.100 inches – 0.150 inches (100 mils – 150 mils) above the surface on all types of pavements, exclusive of bumps.

8. Glass Spheres and Reflective Composite Optics

- a. Apply glass spheres and/or reflective composite optics to installed stripe surface above the minimum rate recommended by the thermoplastic material manufacturer to produce the required retro-reflectivity value in accordance with Subsection 653.3.06.
- b. Apply the glass sphere and/or reflective composite optics top-coating with a pressure-type gun specifically designed for applying glass spheres and/or reflective composite optics that will embed at least one-half of the sphere's and optic's diameter into the thermoplastic immediately after the material has been applied to the pavement.
- c. Audible Profiled Thermoplastic– Apply glass sphere and/or reflective composite optics to all markings at the rates determined by the manufacturer's recommendations as identified in the APL system.

9. Dimensions of Raised Bumps:

- a. Apply the raised bumps with a profile such that the leading and trailing edges are sloped at a sufficient angle to create an audible and vibratory warning.
- b. Bumps on the edge line and centerline marking shall be at least 0.45 in. (11 mm) at the highest point of the bump, above the pavement surface including the base line. The height measures after the application of the drop-on retroreflective elements or glass spheres.
- c. Bumps shall have a minimum baseline coverage dimension of 2.5 in. (65 mm) in both the transverse and longitudinal directions.
- d. The bumps may have a drainage channel. The width of each drainage channel will not exceed 0.25 in. (6 mm) at the bottom of the channel. The longitudinal distance between bumps shall be approximately 30 in. (762 mm).

Section 653 — Thermoplastic Traffic Stripe

B. Removing Existing Stripe

Remove existing stripe according to Section 656.

Remove 100 percent of existing traffic stripe from:

- Portland cement concrete pavement where the new stripe will be placed at the same location as the existing marking
- Pavement where the new stripe will be placed at a different location from the existing markings

C. Tolerance and Appearance

- a. No traffic stripe shall be less than the specified width and shall not exceed the specified width by more than 1/2 in. (13 mm). The length of the 15 ft. (4.5 m) segment for skip stripe and the 25 ft. (7.5 m) gap between segments may vary plus or minus 1 ft. (300 mm). The alignment of the stripe shall not deviate from the intended alignment by more than 1 in. (25 mm) on straight lines. On curves up to and including 1 degree (radius of 1745 m or greater), the alignment of the stripe shall not deviate from the intended alignment by more than 1 in. (25 mm). On curves exceeding 1 degree (radius less than 1745 m), the alignment of the stripe shall not deviate from the intended alignment by more than 2 in. (50 mm).
- b. Stop work when deviation exceeds the above dimensions and remove the nonconforming stripe.
- c. No more than 1 percent of the bumps or more than three consecutive bumps are missing or broken (less than half a bump remaining) within the first 45 days under traffic, replace all failed bumps at no cost to the Department.
- d. If the bumps are replaced and more than 2 percent of the replaced bumps fail within the first 45 days under traffic, the replacement period will be extended an additional 45 days from the date all replacement bumps were installed.
- e. If at the end of the additional 45 days more than 2 percent of all bumps (initial and replacement) fail, replace all failed bumps at no expense to the Department.

D. Traffic Marking Protection (Audible Profile Thermoplastic)

Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause, at no additional cost to the Department.

653.3.06 Quality Acceptance

A. General

For a minimum of 30 days from the time of placement, ensure the thermoplastic pavement marking material and/or audible profiled thermoplastic shows no signs of failure due to blistering, excessive cracking, chipping, bleeding, staining, discoloration, oil content of the pavement materials, smearing or spreading under heat, deterioration due to contact with grease deposits, oil, diesel fuel, or gasoline drippings, spilling, poor adhesion to the pavement material, vehicular damage, and normal wear. In the event that failures mentioned above occur, ensure corrective work is completed at no additional cost to the Department.

Obtain pavement marking retroreflectivity values with a 30-meter geometry retro-reflectometer.

B. Initial Retroreflectivity

1. Longitudinal Lines

Within 30 days of installation, ensure the in-place markings meet the following minimum reflectance values:

a. Standard

	White	Yellow
Dry (ASTM E 1710)	400 mcd/lux/m ²	300mcd/lux/m ²

b. Wet Weather

	White	Yellow
Dry (ASTM E 1710)	400 mcd/lux/m ²	300 mcd/lux/m ²
Wet recovery (ASTM E 2177)	150 mcd/lux/m ²	125 mcd/lux/m ²

Section 653 — Thermoplastic Traffic Stripe

c. Audible Profile Thermoplastic

	White	Yellow
Dry (ASTM E 1710)	300 mcd/lux/m ²	250 mcd/lux/m ²

For each center line, edge line, and skip line, measure retroreflectivity 9 times for each mile; 3 times within the first 500 ft. (152 m), 3 times in the middle, and 3 times within the last 500 ft. (152 m). For projects less than one mile (1600 m) in length, measure retroreflectivity 9 times as above.

Record all retroreflectivity measurements on the form OMR CVP 66 in SOP 39.

2. Messages, Symbols, and Transverse Lines

At the time of installation, ensure the in-place markings when tested according to ASTM E 1710 meet the following minimum reflectance value of 275 mcd/lux/m².

Perform at a minimum, one retroreflectivity measurement at one message, one symbol and one transverse line per intersection. Take one measurement per mile (1600 m) for locations other than intersections (i.e. school messages, railroad messages, bike symbols etc.)

C. Six Month Retroreflectivity (Longitudinal Lines)

Maintain the following minimum reflectance values for 180 days after installation:

1. Standard

	White	Yellow
Dry (ASTM E 1710)	400 mcd/lux/m ²	300 mcd/lux/m ²

2. Wet Weather

	White	Yellow
Dry (ASTM E 1710)	400 mcd/lux/m ²	300 mcd/lux/m ²
Wet recovery (ASTM E 2177)	150 mcd/lux/m ²	125 mcd/lux/m ²

3. Audible Profile Thermoplastic

	White	Yellow
Dry (ASTM E 1710)	300 mcd/lux/m ²	250 mcd/lux/m ²

Retest the in-place markings according to Subsection 653.3.06.B.1, 180 days after installation to ensure these minimum retro-reflectance values are maintained.

NOTE: The Contractor is responsible for retro-reflectivity testing. Furnish initial test results to the Engineer within 30 days of application. Furnish additional testing for a period that totals 180 days from initial application or the stoppage of contract time, whichever comes first.

D. Thickness

1. New Striping

Check the thicknesses on all skip lines, edge lines and center lines with an approved traffic marking thickness gage consisting of 3 dials as follows:

For each center line, edge line, and skip line, measure thickness above the pavement 3 times for each mile (1600 m); once within the first 500 ft. (150 m), once in the middle, and once within the last 500 ft. (150 m). For projects less than one mile (1600 m) in length, measure the thickness above the pavement 3 times.

Record all thickness measurements on the form OMR CVP 66 in SOP 39.

2. Recapping Refurbishment Thermoplastic

Place durable tape, film, or metal plate of known and uniform thickness on an area to be striped. After the striping has passed over, remove the sample and measure the thickness with calipers or a micrometer.

For each center line, edge line, and skip line, measure thickness above the pavement 3 times for each mile (1600 m); once within the first 500 ft. (150 m), once in the middle, and once within the last 500 ft. (150 m). For projects less than one mile (1600 m) in length, measure the thickness above the pavement 3 times.

Submit results to the Engineer.

Section 653 — Thermoplastic Traffic Stripe

3. Audible Profiled Thermoplastic

Ensure the thickness of white and yellow pavement marking conform to Subsection 653.3.05.A.7.b

Record all thickness measurements on the form OMR CVP 66 in SOP 39 and submit to the Engineer.

The Engineer will verify the thickness of the pavement marking in accordance with Subsection 653.3.05.A.7.b within 30 days of receipt of the Contractor's certification.

Thickness measurement may be performed using a strong adhesive tape to install a metal plate (approximately 6 inches (150 mm) wide by 8 inches (200 mm) long, the thickness of the plate can be 1/8 inch (3 mm) as long as the plate does not deform) to the roadway where the pavement marking will be placed. After the material has dried remove the plate and check the thickness of the pavement marking material on the plate with a micrometer.

E. Corrective Work

For each mile (1600 m) section, if the thermoplastic traffic stripe fails to meet Plan details or specifications or deviates from stated dimensions, correct it at no additional cost to the Department. If removal of pavement markings is necessary, perform it according to Section 656 and place it according to this specification. No additional payment will be made for removal and replacement of unsatisfactory striping. Ensure corrective work is completed at no additional cost to the Department. Perform testing according to this specification. Any retest due to failures will be performed at no additional cost to the Department. Furnish all test reports to the Department.

Retro-reflectivity and Thickness Longitudinal Line Deficiency: A deficiency will ensue when two or more Location Average results as recorded on form OMR CVP 66 within a One-Mile (1600 m) Section do not meet the performance criteria herein. The entire line within this one-mile (1600 m) section will be determined to be deficient. If the evaluated section is less than 1.0 mile (1600 m), a single Location Average result not meeting the performance criteria herein will result in the entire line to be determined to be deficient.

Retro-reflectivity Transverse Markings and Symbol Deficiency: A single Location Average result on the marking or symbol not meeting the performance criteria herein will result in the marking or symbol to be determined to be deficient.

653.3.07 Verification

See SOP 39

653.4 Measurement

When stripe will be paid for by the square yard (meter), the actual number of square yards (meters) painted will be measured. The space between the stripes will be included in the overall measurement.

Linear measurements may be made by electronic measuring devices attached to a vehicle.

Thermoplastic traffic stripe, complete in place and accepted, is measured as follows:

A. Solid Traffic Stripe (Including Audible Stripe)

Stripe is measured by the linear foot (meter), linear mile (kilometer), or square yard (meter). Breaks or omissions in solid lines or stripes at street or road intersections are not measured for payment.

B. Skip Traffic Stripe

Skip stripe is measured by the gross linear mile (kilometer) as specified. The unpainted space between the painted stripes is included in the overall measurement if the plan ratio of one to three (15 ft. [4.5 m] segment and 25 ft. [7.5 m] gap or other patterns as designated on the plans) remains uninterrupted. Measurement begins and ends on a stripe.

C. Words and Symbols

Each word or symbol complete according to plan dimensions is measured by the Unit.

653.4.01 Limits

General Provisions 101 through 150.

Section 653 — Thermoplastic Traffic Stripe

653.5 Payment

Payment is full compensation for the Work under this section, including:

- Cleaning and preparing surfaces
- Furnishing all materials
- Applying, curing, and protecting stripe
- Protecting traffic, including providing necessary warning signs
- Furnishing tools, machines, and other equipment necessary to complete the Item

Measurement and payment for removing pavement markings will be according to Section 656 when shown in the Proposal as a payment Item. Otherwise, removal will not be paid for separately, but will be included in the payment for other Work under this section.

Payment will be made under:

Item No. 653	Thermoplastic solid traffic stripe, __ in. (mm), (color)	Per linear foot (meter)
Item No. 653	Thermoplastic solid traffic stripe, __ in. (mm), (color)	Per linear mile (kilometer)
Item No. 653	Thermoplastic skip traffic stripe, __ in. (mm), (color)	Per gross linear foot (meter)
Item No. 653	Thermoplastic skip traffic stripe, __ in. (mm), (color)	Per gross linear mile (kilometer)
Item No. 653	Audible profiled thermoplastic solid traffic stripe, __ in. (mm), (color)	Per linear foot (meter)
Item No. 653	Audible profiled thermoplastic solid traffic stripe, __ in. (mm), (color)	Per linear mile (kilometer)
Item No. 653	Audible profiled thermoplastic skip traffic stripe, __ in. (mm), (color)	Per gross linear foot (meter)
Item No. 653	Audible profiled thermoplastic skip traffic stripe, __ in. (mm), (color)	Per gross linear mile (kilometer)
Item No. 653	Thermoplastic pavement markings, words, and symbols (color), type _____	Per each
Item No. 653	Thermoplastic traffic stripe	Per square yard (meter)
Item No. 653	Wet Weather Thermoplastic solid traffic stripe, __ in. (mm), (color)	Per linear foot (meter)
Item No. 653	Wet Weather Thermoplastic solid traffic stripe, __ in. (mm), (color)	Per linear mile (kilometer)
Item No. 653	Wet Weather Thermoplastic skip traffic stripe, __ in. (mm), (color)	Per gross linear foot (meter)
Item No. 653	Wet Weather Thermoplastic skip traffic stripe, __ in. (mm), (color)	Per gross linear mile (kilometer)
Item No. 653	Wet Weather Thermoplastic pavement markings, words, and symbols (color), type _____	Per each
Item No. 653	Wet Weather Thermoplastic traffic stripe	Per square yard (meter)

653.5.01 Adjustments

General Provisions 101 through 150.

Section 654—Raised Pavement Markers

654.1 General Description

This work includes furnishing and placing raised pavement markers according to the plans or as directed by the Engineer. Use markers that conform to plan shapes, dimensions, and tolerances.

654.1.01 Definitions

General Provisions 101 through 150.

654.1.02 Related References

A. Standard Specifications

Section 868—Bituminous Adhesive for Raised Pavement Markers

Section 886—Epoxy Resin Adhesives

Section 919—Raised Pavement Marker Materials

B. Referenced Documents

QPL 74

654.1.03 Submittals

General Provisions 101 through 150.

654.2 Materials

Ensure that materials meet the requirements of the following specifications:

Material	Section
Bituminous Adhesive	868
Epoxy Resin Adhesives	886
Pavement Markers	919

654.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

654.3 Construction Requirements

654.3.01 Personnel

General Provisions 101 through 150.

Section 654 — Raised Pavement Markers

654.3.02 Equipment

Before beginning construction, clean marker replacement equipment and ensure that it is mechanically sound.

A. Containers and Stirring Devices

Clean containers and stirring devices (paddles, propellers for drills, etc.) before hand-mixing epoxy.

B. Automatic Mixing Device

1. Cleaning

Clean the mixing head to the automatic epoxy mixing equipment after stopping work for any extended period of time. The length of down-time allowed depends on the pot life of the adhesive system being used.

2. Mixing Ratio

Use an automatic mixing device that delivers separate components to the mixing head in a one-to-one ratio by volume.

3. Sample Valves

Equip the lines feeding the mixing head with suitable valves to allow samples to be taken for checking the ratio of each component.

C. Bituminous Adhesive Equipment

Clean and maintain equipment for melting, stirring, and dispensing bituminous adhesive according to the bituminous adhesive manufacturer's requirements.

654.3.03 Preparation

General Provisions 101 through 150.

654.3.04 Fabrication

General Provisions 101 through 150.

654.3.05 Construction

A. Adhesive Types

Cement markers to pavement surfaces with a Type I-R Epoxy or Type I-S Epoxy (see Section 886), or with a bituminous adhesive (see Section 868). Space markers according to the plans.

1. **Type I-R Epoxy.** Use Type I-R Epoxy when the pavement temperature is above 50 °F (10 °C), or when traffic conditions require a rapid setting system.
2. **Type I-S Epoxy.** Use Type I-S Epoxy when the pavement temperature is above 60 °F (15 °C) and traffic conditions permit a slower setting system.
3. **Bituminous Adhesive.** Use bituminous adhesive when the pavement temperature is above 40 °F (4 °C) or when traffic conditions require a rapid setting material.

B. Handling and Applying Adhesives

Obtain an epoxy adhesive furnished as two separate components. Combine and use the components as follows:

1. Immediately before use, thoroughly stir the individual components with separate paddles. Reject material permanently increasing in viscosity or showing settling of pigments, filler, or thixotropic additives that cannot be readily redispersed.
2. After stirring or agitating the two separate components, mix them in a one-to-one ratio and blend thoroughly until obtaining a uniform color without streaks.
3. At time of mixing, ensure that the temperature of both components is 60 ° to 80 °F (15 ° to 27 °C). If necessary, heat components using indirect heat to avoid locally overheating and decomposing the material. Do not heat adhesive above 120 °F (49 °C).

Section 654 — Raised Pavement Markers

4. Place markers between the start of mixing the epoxy system and the termination of the pot life. The Engineer will designate the allowable pot life based on environmental factors. Never use a partially set mixed system that does not readily extrude around the perimeter of the marker when pressed to the roadway.
5. When using an approved fast-setting epoxy system, mix the separate components with a two-component type automatic mixing and extrusion apparatus, and place markers immediately.
6. Use bituminous adhesive furnished in approximately 30 lb. (14 kg) cubes.
 - a. Heat the cubes in an oil-jacketed melting pot.
 - b. Maintain the bituminous adhesive at the manufacturer-recommended temperature during placement of the markers.
 - c. Discard bituminous adhesive heated above 450 °F (232 °C).

C. Placement of Markers

1. Surface Cleaning

Clean pavement of dirt, curing compound, grease, oil, paint, moisture, loose or unsound layers, or other material that would impair the bond between the adhesive and the roadway.

- a. Use either sand-blasting or grinding equipment to clean. Remove the dust before placing the marker.
- b. Provide cleaning equipment air lines with suitable traps to prevent oil or moisture from being redeposited on the road surface.

2. Placement Limits

Place markers as follows:

- a. Do not place markers over joints in rigid pavement.
- b. Do not place markers when pavement temperature is below 40 °F (4 °C).
- c. When possible, wait 60 to 90 days before placing markers using epoxy adhesive on newly constructed asphaltic concrete pavements.

3. Marker Placement Using Epoxy Adhesives

Place markers using epoxy adhesives as follows:

- a. Place enough adhesive on the cleaned pavement or the bottom of the marker to completely cover the contact area of the marker.
- b. Press the marker firmly to the pavement.
- c. Allow a slight bead of epoxy adhesive to extrude from under the marker edges.
- d. Remove adhesive on the face of the marker or adhesive that obscures the marker. Do not use thinners or solvents to clean epoxy adhesives from the markers.

4. Marker Placement Using Bituminous Adhesives

Place markers using bituminous adhesives as follows:

- a. Place enough bituminous adhesive on the cleaned pavement or the bottom of the marker to completely cover the contact area of the marker.
- b. Press the marker firmly to the pavement.
- c. Allow a slight bead of adhesive to extrude from under the marker edges.
- d. Remove adhesive on the face of the marker or adhesive that obscures the marker.
- e. Place the marker before the bituminous adhesive cools and does not extrude around the perimeter of the marker when pressed to the roadway.

654.3.06 Quality Acceptance

Refer to QPL 74 for raised pavement markers that have met these requirements.

Section 654 — Raised Pavement Markers

654.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

654.4 Measurement

The number of each type of installed and accepted pavement marker is counted separately for payment.

654.4.01 Limits

General Provisions 101 through 150.

654.5 Payment

Raised pavement markers will be paid for at the Unit Price for each Unit of each type. Payment is full compensation for furnishing and installing each marker.

When designated, payment will also include recessing the marker.

Payment will be made under:

Item No. 654	Raised pavement markers type_____	Per each
Item No. 654	Raised pavement markers type_____(recessed)	Per each

654.5.01 Adjustments

General Provisions 101 through 150.

Section 828—Hot Mix Asphaltic Concrete Mixtures

828.1 General Description

This specification includes the requirements for hot mix asphaltic concrete mixtures, including:

- Open-graded surface mixtures (OGFC and PEM)
- Stone Matrix Asphalt mixtures (SMA)
- Superpave mixtures
- Fine-graded (4.75 mm) mixtures

828.1.01 Definitions

The Nominal Maximum Sieve Size is one standard sieve size larger than the first sieve to retain more than ten percent of the aggregate, per AASHTO R35. Mixture types in this section are identified according to Nominal Maximum Sieve Size.

828.1.02 Related References

A. Standard Specifications

Section 400-Hot Mix Asphaltic Concrete Construction

Section 402-Hot Mix Recycled Asphaltic Concrete

Section 800-Coarse Aggregate

Section 802-Aggregates for Asphaltic Concrete

Section 819-Fiber Stabilizing Additives

Section 820-Asphalt Cement

Section 831-Admixtures

Section 882-Lime

Section 883-Mineral Filler

B. Referenced Documents

AASHTO R30

AASHTO R35

AASHTO T 321

AASHTO T 112

AASHTO T 209

AASHTO T 305

AASHTO T 312

AASHTO T 245

AASHTO T 324

AASHTO T 340

SOP-36

SOP-2

GDT 1

GDT 56

GDT 63

GDT 66
GDT 114
GDT 115
GDT 123
QPL 1
QPL 2
QPL 7
QPL 26
QPL 41
QPL 77
QPL 81

828.2 Materials

A. Requirements

Use approved hot mix asphalt concrete mixtures that meet the following requirements:

1. Produce each asphalt mixture according to a Department approved Job Mix Formula and Asphalt Mix Design, see Subsection 400.1 for submittal and approval of Job Mix Formulas.
2. Ensure individual acceptance test results meet the Mixture Control Tolerances specified in the appropriate table below, Subsections 828.2.01 through 828.2.04.
3. Ensure the Engineer approves all materials used to prepare and place the mixtures before incorporating them into the Work. Use only the ingredients listed in the approved Asphalt Mix Design and Job Mix Formula. For virgin aggregates use sources meeting the requirements of Section 802 and are listed in QPL 1 or QPL 2; for mixes in which local sand is permitted, use the approved sand source identified in the mix design. For mixtures containing Reclaimed Asphalt Pavement (RAP), use only RAP from the approved stockpile identified in the mix design. Use asphalt cement meeting the requirements of Section 820, from a source listed in QPL 7.
4. Obtain approved SMA mix designs, Superpave mix designs and 4.75 mm mix designs from a mix design laboratory certified by the Department. Obtain approved mix designs for types PEM and OGFC mixtures from the Department's Office of Materials, which produces and furnishes these mix designs.
5. Ensure all SMA mix designs are designed in accordance with GDT-123 ("Determining the Design Proportions of Stone Matrix Asphalt Mixtures"). Ensure SMA mix designs are verified and approved by the Department prior to use. Ensure Superpave and 4.75 mm mix designs are designed in accordance with SOP-2 ("Control of Superpave Bituminous Mixture Designs") and are approved by the Department as provided therein. Ensure these mixes are designed by a laboratory and technician certified in accordance with SOP-36, ("Certification of Laboratories and Personnel for Design of SMA and Superpave Asphalt Mixtures").
6. Use only mixtures composed of the aggregate groups and blends indicated in the Proposal and Plans by their pay item designations, defined as follows:

Section 828 — Hot Mix Asphaltic Concrete Mixtures

TABLE 1 – AGGREGATE GROUPS

Pay Item Designation	Allowable Aggregate Groups
Group I or II	Group I, Group II, or Blend I
Group II only	Group II only
Blend I	Either 100% Group II material or a blend of Group I and Group II. Do not use Group I material for more than 60%, by weight, of the total aggregate nor more than 50%, by weight, of the coarse aggregate fraction.

7. For patching or leveling use Group I, Group II, or Blend I. Mix types for patching and leveling are specified in Subsection 400.3.03.B.
8. Include lime (hydrated lime) from an approved source and meeting the requirements of Section 882 in all paving courses except as otherwise provided in the Contract. For a list of approved sources of lime, see QPL 41.
 - a. Add lime to each mixture at the rate prescribed in the approved mix design.
 - b. Ensure mix designs using only virgin aggregate include lime at a minimum rate of 1.00% of the total dry aggregate weight. Ensure mix designs using RAP include lime at a minimum rate equal to 1.00% of the virgin aggregate fraction plus 0.50% of the aggregate in the RAP fraction.
 - c. Add more lime or add lime plus an approved Heat-Stable Anti-Stripping Additive meeting the requirements of Section 831, if necessary to meet requirements for mixture properties, and pursuant to an approved mix design. However, the Department will not make additional payment for these materials. For a list of sources of Heat-Stable Anti-Stripping Additives, see QPL 26.
 - d. Where specifically allowed in the contract on LARP, airport, and parking lot projects, an approved Heat-Stable Anti-Stripping Additive meeting the requirements of Section 831 may be substituted for hydrated lime. Ensure the mix gradation is adjusted to replace the lime with an equivalent volume of fines passing the 0.075 mm sieve. Add Heat-Stable Anti-stripping Additive at a minimum rate of 0.5 percent of the asphalt cement portion.
9. Use performance grade PG 64-22 or PG 67-22 asphalt cement in all mix designs and mixtures except as follows:
 - a. The State Materials Engineer will determine the performance grade to be used, based on Table 2 – Binders Selection Guideline for Reclaimed Asphalt Pavement (RAP) Mixtures, AASHTO M323 and laboratory testing results as required in Section 828.2.B for mixtures containing $\geq 25\%$ equivalent binder replacement for RAP/RAS mixtures.
 - b. Use only grade PG 76-22, excluding shoulder construction in the following mixes: all SMA, 12.5 mm PEM, 9.5 mm and 12.5 mm OGFC, 12.5 mm Superpave, on projects with two-way ADT greater than 25,000; and in all mixtures for which polymer-modified asphalt is specified in the pay item.
10. Use of local sand is restricted as follows:
 - a. Do not place mixtures containing local sand on the traveled way of the mainline or ramps of the Interstate System. Mixtures with local sand may be used for shoulder construction on these facilities.
 - b. Ensure local sand will not constitute more than 20 % of the total aggregate weight of any mix design or production mix.
 - c. Subject to the above limits, 19 mm, 12.5 mm, and 9.5 mm Superpave mix designs and 4.75 mm mix designs containing local sand may be used on projects with a current ADT not exceeding 4,000 VPD providing that all performance testing meets specified requirements.
 - d. 25 mm Superpave mix designs containing not more than 20 % local sand may be used on all facilities except the main line and ramps of the Interstate System.
 - e. Obtain local sand for use in asphalt mixtures from a source approved by the Department.

Section 828 — Hot Mix Asphaltic Concrete Mixtures

- f. Approval of local sand sources: The Department will sample, test, and approve sources of local sand. Ensure local sand contains no more than 7.0% clay by weight and is free of foreign substances, roots, twigs, and other organic matter. Ensure sand is free of clay lumps, as determined by AASHTO T 112, and has a sand equivalent value exceeding 25%, as determined by GDT 63.

B. Fabrication

1. Design procedures: For all Superpave and 4.75 mm mixes, ensure conformance with the Superpave System for Volumetric Design (AASHTO T 312 and AASHTO R30), as adapted in SOP-2. Ensure Superpave mixes are designed at a design gyration number (N_{des}) of 65 gyrations and initial gyration number (N_{ini}) of 6 gyrations. Ensure 4.75 mm mixes, (N_{des}) are designed at 50 gyrations, and (N_{ini}) at 6 gyrations. Open-graded mix designs will be designed by the Department in accordance with GDT 114. In all cases, the procedure for measuring Maximum Specific Gravity (G_{mm}) is AASHTO T 209. In addition to gradation and volumetric analysis, ensure mix designs include the following performance tests, as applicable.
 2. Performance Test:
 - a. Permeability test: Ensure Superpave and Stone Matrix mix designs include testing according to GDT -1 Measurement of Water Permeability of Compacted Asphalt Paving Mixtures. Ensure specimen air voids for this test are $6.0 \pm 1.0\%$. The average permeability of three specimens may not exceed 3.60 ft per day (125×10^{-5} cm per sec).
 - b. Moisture susceptibility test: Fabricate and test specimens in accordance with GDT 66, when required by the Office of Materials and Testing due to visible signs of stripping in laboratory fabricated or plant produced asphaltic concrete mixtures, ensure specimen air voids for this test are $7.0 \pm 1.0\%$ for all mixes excluding Stone Matrix mixes. Ensure specimen air voids for this test are $6.0 \pm 1.0\%$ for Stone Matrix mixes. The minimum tensile splitting ratio is 0.80, except a tensile splitting ratio of no less than 0.70 may be acceptable if all individual strength values exceed 100 psi (690 kPa). Ensure average splitting strength of the three conditioned and three controlled samples are not less than 60 psi (415 kPa) for either group. Ensure retention of coating as determined by GDT 56 is not less than 95%.
 - c. Hamburg Wheel-Tracking Test for rutting and moisture susceptibility test: Ensure mix designs of all mix types except Open-graded Surface Mixes (OGFC and PEM), and Open-graded Crack Relief Interlayer (OGI) mix, include testing in accordance with AASHTO T 324. Ensure specimen air voids for this test are $7.0 \pm 1.0\%$ for all mix types and at a testing temperature of 50°C (122°F). Use the testing and acceptance criteria established in Table 2.

TABLE 2 – HAMBURG WHEEL TRACKING DEVICE TESTING AND ACCEPTANCE CRITERIA

Binder Performance Grade (PG)	Mix Type	Number of Passes	Maximum Rut Depth	Stripping Inflection Point
PG 64-22 and PG 67-22	4.75 mm, 9.5 mm SP Type I, and 9.5 mm SP Type II	15,000	≤ 12.5 mm	$> 15,000$
PG 64-22 and PG 67-22	12.5 mm SP, 19 mm SP and 25 mm SP	20,000	≤ 12.5 mm	$> 20,000$
PG 76-22	All Mix types	20,000	≤ 12.5 mm	$> 20,000$

Tested specimens shall be inspected for any visible signs of stripping and any mix design's tested specimens that fail to maintain 95% of asphalt cement coating, as described in GDT 56 section D.2.d, will be required to meet specified requirements for GDT 66 as detailed in 828.2.B.2.b.

- d. Fatigue testing: The Department may verify dense-graded mix designs by fatigue testing according to AASHTO T 321 or other procedure approved by the Department.

Section 828 — Hot Mix Asphaltic Concrete Mixtures

C. Acceptance

See Subsection 106.03 and Section 400. Ensure individual test results meet the Mixture Control Tolerances listed in Subsections 828.2, 828.2.01, 828.2.02, 828.2.03, or 828.2.04, whichever applies with the following exception. Ensure field verification results for rutting susceptibility tests performed on laboratory fabricated and/or roadway cores obtained from asphalt plant produced mixtures meet specified requirements for AASHTO T 324 as detailed in Subsection 828.2.B.2.c. All GDOT approved mix designs are required to have full field mix design verifications, using plant produced mixture, sampled by the contractor and submitted to the applicable GDOT laboratory (Central or District) at a minimum of once per two years. Field mix design verification results that fail to comply with performance testing specified in Subsection 828.2.B will require a complete laboratory mix design verification, to be completed by the original mix designer, for continued use of that design. If a mix design has not been produced within two years, a full field mix design verification will be sampled by the contractor and submitted to the applicable GDOT laboratory (Central or District) on the first Lot produced thereafter. Any mix design that fails to meet performance test requirements established in Subsection 828.2.B, using laboratory fabricated specimens due to failing field mix design results, may subject that mix design to invalidation after the field mix design verification results are confirmed with a second field mix design verification. Field mix design verifications as specified in Section 402, Section 400, SOP 2 and GSP 21, are not precluded by the requirements specified herein.

D. Materials Warranty

See General Provisions 101 through 150.

828.2.01 Open-Graded Surface Mixtures

A. Requirements

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure Open-Graded Surface Mixtures meet the following mixture control tolerances and mix design criteria:

Sieve Size	Mixture Control Tolerance, %	Design Gradation Limits, % Passing		
		9.5 mm OGFC	12.5 mm OGFC	12.5 mm PEM
3/4 in. (19 mm) sieve	±0.0		100*	100*
1/2 in. (12.5 mm) sieve	±6.1	100*	85-100	80-100
3/8 in. (9.5 mm) sieve	±5.6	85-100	55-75	35-60
No. 4 (4.75 mm) sieve	±5.7	20-40	15-25	10-25
No. 8 (2.36 mm) sieve	±4.6	5-10	5-10	5-10
No. 200 (75 µm) sieve	±2.0	2-4	2-4	1-4
Range for % AC	±0.4	6.0-7.25	5.75-7.25	5.5-7.0
Class of stone (Section 800)		"A" only	"A" only	"A" only
Drain-down (AASHTO T305), %		<0.3	<0.3	<0.3

* Mixture control tolerance is not applicable to this sieve for this mix.

1. In 12.5 mm and 9.5 mm OGFC and 12.5 mm PEM mixes, use only PG 76-22 asphalt cement (specified in Section 820).
2. Ensure all OGFC and PEM mixes include a stabilizing fiber of the type (cellulose or mineral) specified in the mix design and meeting the requirements of Section 819. Ensure the dosage rate is as specified in the mix design and sufficient to prevent drain-down exceeding the above tolerance.

B. Fabrication

See Section 400.

Section 828 — Hot Mix Asphaltic Concrete Mixtures

828.2.02 Stone Matrix Asphalt Mixtures

A. Requirements

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure Stone Matrix Asphalt mixtures meet the following mixture control tolerances and mix design criteria:

Sieve Size	Mixture Control Tolerance	Design Gradation Limits, Percent Passing		
		9.5 mm SMA	12.5 mm SMA	19 mm SMA
1 in. (25 mm) sieve	±0.0			100*
3/4 in. (19 mm) sieve	±7.0	100*	100*	90-100
1/2 in. (12.5 mm) sieve	±6.1	98-100**	85-100	44-70
3/8 in. (9.5 mm) sieve	±5.6	70-100	50-75	25-60
No. 4 (4.75 mm) sieve	±5.7	28-50	20-28	20-28
No. 8 (2.36 mm) sieve	±4.6	15-30	16-24	15-22
No. 50 (300 µm) sieve	±3.8	10-17	10-20	10-20
No. 200 (75 µm) sieve	±2.0	8-13	8-12	8-12
Range for % AC (Note 1)	±0.4 (Note 2)	6.0-7.5	5.8-7.5	5.5-7.5
Design optimum air voids (%)		3.5 ±0.5	3.5 ±0.5	3.5 ±0.5
% aggregate voids filled with AC (VFA)		70-90	70-90	70-90
Tensile splitting ratio after freeze-thaw cycle GDT-66		80%	80%	80%
Drain-down (AASHTO T305), %		<0.3	<0.3	<0.3

*Mixture control tolerance is not applicable to this sieve for this mix.

**Mixture control tolerance is ± 2.0% for this sieve for 9.5 mm SMA mixes placed at spread rates greater than 135 lb./yd². For 9.5 mm SMA mixes placed at spread rates of 135 lb./yd² or less, 100 % passing is required on this sieve.

Note 1: Range for % AC is Original Optimum AC (OOAC) at 35 gyrations (Gyratory compactor) or 50 blows (Marshall compactor) prior to Corrected Optimum AC (COAC) calculation detailed in GDT 123 (Appendix A)

Note 2: Quality Acceptance Test Results for AC content that deviate > ± 0.3% from the approved Job Mix Formula (JMF) consistently over three lots may subject the mix to a revised AC content on project JMF at the discretion of the State Materials Engineer based on statistical trend.

1. Ensure SMA mixtures are compacted at 35 gyrations with the Superpave Gyratory compactor or 50 blows with the Marshall compactor.
2. Ensure SMA mixtures contain mineral filler and fiber stabilizing additives and meet the following requirements:
 - a. Asphalt cement grade PG-76-22 (specified in Section 820) is required in all SMA mixtures.
 - b. Aggregates for SMA meet the requirements of Subsection 802.2.02.A.3.
 - c. Use the approved mineral filler specified in the mix design and meeting the requirements of Section 883. Approved sources of mineral filler are listed in QPL 81.

Use the approved Fiber Stabilizing Additive of the type (cellulose or mineral) specified in the mix design and meeting the requirements of Section 819. Approved sources of Fiber Stabilizing Additive are listed in QPL 77.

Section 828 — Hot Mix Asphalt Concrete Mixtures

The dosage rate will be as specified in the mix design and sufficient to prevent drain-down exceeding the above tolerance.

B. Fabrication

See Section 400.

828.2.03 Superpave Asphalt Concrete Mixtures

A. Requirements for Superpave Mixtures (except Parking Lot Mixtures)

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure Superpave Asphalt Concrete mixtures meet the following mixture control tolerances and mix design limits:

1. Gradation limits for Superpave mixtures are as follows:

Sieve Size	Mixture Control Tolerance	Design Gradation Limits, Percent Passing				
		9.5 mm Superpave Type I	9.5 mm Superpave Type II	12.5 mm Superpave (Note 1)	19 mm Superpave	25 mm Superpave
1½ in. (37.5 mm)						100*
1 in. (25.0 mm)	± 8.0			100*	100*	90-100
¾ in. (19.0 mm)	±8.0**	100*	100*	98-100****	90-100	55-89**
½ in. (12.5 mm)	±6.0***	98-100****	98-100****	90-100	60-89***	50-70
⅜ in. (9.5 mm)	±5.6	90-100	90-100	70-89	55-75	
No. 4 (4.75 mm)	±5.6	65-85	55-75			
No. 8 (2.36 mm)	±4.6	48-55	42-47	38-46	32-36	30-36
No. 200 (75 µm)	±2.0	5.0-7.0	5.0-7.0	4.5-7.0	4.0-6.0	3.5-6.0
Range for % AC (Note 3)	± 0.4 (Note 2)	5.50-7.25	5.25-7.00	5.00-6.25	4.25-5.50	4.00-5.25

* Mixture control tolerance is not applicable to this sieve for this mix.

** Ensure mixture control tolerance is within ± 10.0% for this sieve for 25 mm Superpave.

***Ensure mixture control tolerance is within ± 8.0% for this sieve for 19 mm Superpave.

****Ensure mixture control tolerance is within ± 2.0% for this sieve for 12.5 mm and 9.5 mm mixes.

Note 1: Use PG 76-22 in 12.5 mm Superpave, excluding shoulder construction, on all projects with ADT greater than 25,000 as detailed in the Contract Pay Item.

Note 2: Quality Acceptance Test Results for AC content deviating > ± 0.3 % from the approved Job Mix Formula (JMF) consistently over three Lots may subject the mix to a revised AC content on the project JMF at the discretion of the State Materials Engineer based on statistical trend.

Note 3: Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC (COAC) calculation detailed in SOP 2 (Appendix D).

Section 828 — Hot Mix Asphaltic Concrete Mixtures

2. Volumetric limits are as follows:

Design Parameter	Mix Type	Limits
% of Max. Specific Gravity (Gmm) at design gyrations, (Ndes)	All	96%
% Gmm at the initial number of gyrations, Ni	All	91.5% maximum
% voids filled with asphalt (VFA) at Ndes	9.5 mm Type I	Min. 72; Max. 80
	9.5 Type II and 12.5 mm	Min. 72; Max. 76
	19 mm	Min. 71; Max 76
	25 mm	Min. 69; Max 76
Fines to effective asphalt binder ratio (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)*	All	> 7.00
Minimum % Voids in Mineral Aggregate (VMA) Note: VMA shall be calculated using the effective specific gravity of the aggregate (Gse). See SOP-2SP.	25 mm	13.0
	19 mm	14.0
	12.5 mm	15.0
	9.5 Type I	16.0
	9.5 Type II	16.0

*Superpave Mixtures approved prior to January 31, 2012, may be adjusted to meet Minimum Film Thickness requirements by the State Materials Engineer.

B. Requirements for Superpave Parking Lot Mixes (NOT FOR STANDARD HIGHWAY/STREET PAVING)

1. Surface layers for parking facilities:

Sieve Size	Mixture Control Tolerance	Design Gradation Limits, Percent Passing		
		4.75 mm Mix	9.5 mm Superpave Type I	9.5 mm Superpave Type II
1 in. (25.0 mm) sieve	± 8.0			
3/4 in. (19.0 mm) sieve	±8.0**		100*	100*
1/2 in. (12.5 mm) sieve	±6.0	100*	98-100****	98-100****
3/8 in. (9.5 mm) sieve	±5.6	90-100	90-100	90-100
No. 4 (4.75 mm) sieve	±5.6	75-95	65-85	55-75
No. 8 (2.36 mm) sieve	±4.6	60-65	48-55	42-47
No. 50 (300 µm) sieve	+3.8	20-50		
No. 200 (75 µm) sieve	±2.0	4-12	5.0-7.0	5.0-7.0
Range for Total AC	+ 0.4	6.00 - 7.50	5.50 - 7.25	5.25 - 7.00

Section 828 — Hot Mix Asphaltic Concrete Mixtures

2. Subsurface layers for parking facilities:

Sieve Size	Mixture Control Tolerance	Design Gradation Limits, Percent Passing		
		12.5 mm Superpave	19 mm Superpave	25 mm Superpave
1 in. (25.0 mm) sieve	± 8.0	100*	100*	100* 90-100
3/4 in. (19.0 mm) sieve	±8.0**	98-100****	90-100	55-89**
1/2 in. (12.5 mm) sieve	±6.0***	90-100	60-89***	50-70
3/8 in. (9.5 mm) sieve	±5.6	70-89	55-75	
No. 8 (2.36 mm) sieve	±4.6	38-46	32-36	30-36
No. 200 (75 µm) sieve	±2.0	4.5-7.0	4.0-6.0	3.5-6.0
Range for Total AC	+ 0.4	5.00 - 6.25	4.25 - 5.50	4.00 - 5.25

All * and notes apply to both 828.2.03.B.1 and 828.2.03.B.2.

*Mixture control tolerance is not applicable to this sieve for this mix.

**Ensure mixture control tolerance is within ±10.0% for this sieve for 25 mm Superpave mixes.

*** Ensure mixture control tolerance is within ±8.0% for this sieve for 19 mm Superpave mixes.

****Ensure mixture control tolerance is within ±2.0% for this sieve for 12.5 mm and 9.5 mm Superpave mixes.

Note 1: Quality Acceptance Test Results for AC content deviating $> \pm 0.3\%$ from the approved Job Mix Formula (JMF) consistently over three Lots may subject the mix to a revised AC content on the project JMF at the discretion of the State Materials Engineer based on statistical trend.

Note 2: Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC (COAC) calculation detailed in SOP 2 (Appendix D).

3. Volumetric limits for parking facilities are as follows:

Design Parameter	Mix Type	Limits
% of Max. Specific Gravity (Gmm) at design gyrations, Ndes)	All	96%
% Gmm at the initial number of gyrations, Ni	All	91.5 % maximum
% voids filled with asphalt (VFA) at Ndes	9.5 mm Type I	Min. 72; Max. 80
	9.5 Type II and 12.5 mm	Min. 72; Max. 78
	19 and 25 mm	Min. 71; Max 76
Fines to effective asphalt binder ration (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)*	4.75 mm	> 6.00
	All other types	> 7.00
Minimum % Voids in Mineral Aggregate (VMA)	25 mm	13.0

Section 828 — Hot Mix Asphaltic Concrete Mixtures

Design Parameter	Mix Type	Limits
Note: VMA shall be calculated using the effective specific gravity of the aggregate (G _{se}). See SOP-2	19 mm	14.0
	12.5 mm	15.0
	9.5 mm Types I, II	16.0

* Mixtures approved prior to January 31, 2012, may be adjusted to meet Minimum Film Thickness requirements by the State Materials Engineer.

C. Fabrication

See Section 400.

828.2.04 Fine-Graded Mixtures

A. Requirements

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure that fine-graded mixtures meet the following mixture control tolerances and design limits:

ASPHALTIC CONCRETE - 4.75 mm Mix		
Sieve Size	Mixture Control Tolerance	Design Gradation Limits, % passing
1/2 in. (12.5 mm) sieve*	±0.0	100*
3/8 in. (9.5 mm) sieve	±5.6	90-100
No. 4 (4.75 mm) sieve	±5.7	75-95
No. 8 (2.36 mm) sieve	±4.6	60-65
No. 50 (300 μm) sieve	±3.8	20-50
No. 200 (75 μm) sieve	±2.0	4-12
Range for % AC	±0.4	6.00 – 7.50
Design optimum air voids (%)		4.0 – 7.0
% Aggregate voids filled with AC		60 - 80
Minimum Film Thickness (microns)		> 6.00

* Mixture control tolerance is not applicable to this sieve for this mix.

Note 1: Quality Acceptance Test Results for AC content deviating $> \pm 0.3$ % from the approved Job Mix Formula (JMF) consistently over three Lots may subject the mix to a revised AC content on the project JMF at the discretion of the State Materials Engineer based on statistical trend.

Note 2: Range for % AC is Original Optimum AC (OOAC) at 50 gyrations prior to the Corrected Optimum AC (COAC) calculation detailed in SOP 2 (Appendix D).

B. Fabrication

See Section 400.

C. Acceptance

See Subsection 106.3 and Section 400. Ensure individual test results meet the Mixture Control Tolerances listed in Subsections 828.2, 828.2.01, 828.2.02, 828.2.03, 828.2.04, whichever applies.

D. Materials Warranty

See General Provisions 101 through 150.

PROJECT # T-17-0012
SPLOST #4A ROADWAY REHABILITATION

APPENDIX E

Thermoplastic Striping Specifications



Office of Materials and Testing
Qualified Products List

Source	Source #/ Location	Address	Contact	Product	Acceptance for Dry (ASTM E 1710) / Wet (ASTM E 2177)	Trade Name	Color	C.T.T. No.	Material Code
3M Company Traffic Control Materials Div.	24/ St. Paul, MN	3M Center Bldg. 225-5S008 P. O. Box 33225 St. Paul, MN 55133-3225 www.mmm.com	800-553-1380 651-737-9644	Polyurea	Dry	LPM 1200	Y	----	TRAF65801
				Polyurea	Dry	LPM 1201	W	----	TRAF65802
				Polyurea	Dry	LPM 5000	W	----	TRAF65802
				Polyurea	Dry	LPM 5001	Y	----	TRAF65801
3M Company	74-01/ USA	Traffic Control Materials Division 3M Center Bldg. 225-5S008 P.O. Box 33225 St. Paul, MN 55133-3225 www.mmm.com/tcm	651-733-0582 800-553-1380	Tape (PB)	Dry	Stamark Series 380 IES	Y	----	TRAF65706
				Tape (PB)	Dry	Stamark Series 380 IES	W	----	TRAF65702
				Tape (PB-WF)	Dry & Wet	Stamark Series AW380	W	----	TRAF65708
				Tape (PB-WF)	Dry & Wet	Stamark Series AW380	W	----	TRAF65707
				Tape (TR)	Dry	Stamark Series 710	Y	----	TRAF65710
				Tape (TR)	Dry	Stamark Series 710	W	----	TRAF65704
Advance Traffic Markings	74-02/ USA	P.O. Box H Becker Farms Industrial Park Roanoke Rapids, NC 27870 www.trafficmarking.com	252- 536-2574	Tape (TR)	Dry	ATM-200	Y		TRAF65710
				Tape (TR)	Dry	ATM200	W		TRAF65704
				Tape (PA)	Dry	ATM-300	Y		TRAF65705
				Tape (PA)	Dry	ATM-300	W		TRAF65701
				Tape (PA)	Dry	ATM-400	Y		TRAF65705
				Tape (PA)	Dry	ATM-400	W		TRAF65701
Brite-Line	74-06/	10660 E. 51 st Ave.	678-720-	Tape (TR)	Dry	Series 100	Y		TRAF65710

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APPENDIX F

High Density Mineral Bond (HA5®) Specifications

SECTION 32 01 13.68
HIGH DENSITY MINERAL BOND SEAL

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Application of an asphalt-aggregate *bond seal* coat as a high density roadway surface preservation treatment.

1.2 REFERENCES

A. AASHTO Standards:

T 59 Standard Method of Test for Emulsified Asphalts.

T 111 Standard Method of Test for Mineral Matter or Ash in Asphalt Materials.

B. ANSI Standards:

B74.8 Ball Mill Test for Friability of Abrasive Grain.

C. ASTM Standards:

C 128 Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.

C 170 Compressive Strength of Dimension Stone.

C 1326 Knoop Indentation Hardness of Advanced Ceramics.

D 1644 Nonvolatile Content (Solids by weight).

D 2172 Quantitative Extraction of Bitumen From Bituminous Paving Mixtures.

D 2196 Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer.

D 2486 Determining Wear Resistance in Cycles.

D 2939 Emulsified Bitumens Used as Protective Coatings.

D 3740 Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

D 6937 Determining Density of Emulsified Asphalt.

D 3960 Determining Volatile Organic Compound Content of Paints and Related Coatings.

E 70 pH of Aqueous Solutions with the Glass Electrode.

1.3 SUBMITTALS

- A. Mix Design: Provide the following. Allow ENGINEER 10 days to evaluate the submittal.
1. Date of mix design. If older than 60 days from date of submission, recertify mix design.
 2. Proportions of aggregate, filler, water, polymer, and emulsion in the mix.
 3. Residual in-place bitumen content, in *pounds per square yard*.
 4. Residual in-place aggregate or mineral solids content, in *pounds per square yard*.
 5. Thickness target for each application coat, in *gallons per square yard*.

6. Total minimum thickness, in *gallons per square yard*.
 7. Results of a wear resistance test current within one (1) calendar year of the proposed mix design.
- B. Before Placement: Submit at least 48 hours before delivery.
1. Traffic control plan, Section 01 55 26.
 2. List of construction equipment to be used.
 3. Certificate from emulsion supplier stating emulsion meets requirements in this section.
 4. Names, certification levels, and years of experience of testing agency's field technicians that are assigned to the Work. Verify laboratory complies with ASTM standards.
 5. Warranty.
- C. Reports: If requested by ENGINEER, submit the following.
1. List of five (5) projects that have successful product applications on bituminous surfaces. Provide names of project contacts.
 2. Source and field quality control testing reports performed by CONTRACTOR and Suppliers.

1.4 QUALITY ASSURANCE

- A. Foreman of CONTRACTOR's crew or Supplier's representative has completed at least three (3) projects of similar scope. If crew foreman does not have such experience, Supplier must provide a full-time representative on site during application.
- B. Use a laboratory that complies with ASTM D 3740 and follows Section 01 45 00 requirements.
- C. Verify mixture delivered to site contains the same emulsion specified in the mix design.
- D. Do not change source of the asphalt emulsion or aggregate without supporting changes in the mix design.
- E. Reject product that does not meet requirements.

1.5 WEATHER

- A. Temperature:
 1. Apply surface treatment material if air and pavement surface temperatures in the shade are 55 deg F. and rising.
 2. Cease application if air or pavement surface temperatures are projected to fall below 45 deg F. within 48 hours.
- B. Moisture and Wind:
 1. Do not apply surface treatment material to a wet surface (no visible standing water or high sheen), during rain, 24 hours prior to forecast rain, or in unsuitable windy weather.
 2. Cease work if weather or other conditions prolong opening pavement surface to traffic.

1.6 NOTICE

- A. Follow Laws and Regulations concerning when and to whom notices are to be given at least three (3) days before applying surface treatment material.

- B. Indicate application time and when the surface can be used. If necessary, include a map showing closed-off areas.
- C. Provide phone numbers of at least two (2) individuals who represent the CONTRACTOR who can be reached at any time during the work.
- D. Warn of potential vehicle tow away and other construction issues affecting neighborhood.
- E. Should work not occur on specified day, issue an updated notice.

1.7 ACCEPTANCE

A. General:

- 1. Acceptance is by Lot.
- 2. If non-complying material has been installed and no price for the material is specified, apply price adjustment against cost of work requiring complying material as part of its installation, Section 01 29 00.
- 3. Dispute resolution, Section 01 35 10.
- 4. Opening surface treatment to vehicular traffic does not constitute acceptance.
- 5. Observation of CONTRACTOR's field quality control testing does not constitute acceptance. Such testing, however, may be used by ENGINEER for acceptance if requirements of Section 01 35 10 are met.

B. Asphalt Binder:

- 1. Lot size is total contracted product placement. Sub-lot size is one (1) day's production.
- 2. Of all sub-lot samples collected, randomly select one and test it for the physical properties in this section. The lot is acceptable if this single test meets requirements. If the test does not meet requirements, continue testing other samples for compliance.
- 3. At ENGINEER's discretion, a lot with deficient sub-lot properties may be accepted if pay for the lot is reduced using one of the following applicable pay factors, or lot may be accepted at 50 percent pay if lot is in Reject.

<u>Pay Factor</u>	<u>Number of Non-complying Tests</u>
1.00	0
0.90	1
0.80	2
0.70	3
Reject	4

C. Placement:

- 1. Mat appearance.
 - a. No runoff onto concrete curbs, gutter pans, and shoulders.
 - b. No streaking, drilling, drag marks, or squeegee marks.
 - c. No light spots.
 - d. No de-bonding.
 - e. Straight longitudinal edges with proper joints.
- 2. Mat thickness, bitumen content and aggregate content.

- a. Lot size is one (1) day's production. Sub-lot size is 0.5 lane mile.
 - b. Collect and test five (5) equally spaced samples from the initial sub-lot. Upon review of the initial sub-lot test results and at ENGINEER's discretion, acceptance of subsequent sub-lots may be based upon one or less samples from each subsequent sub-lot.
3. Pay Adjustment: Not applicable. Correct mat deficiencies at no additional cost to OWNER.

1.8 WARRANTY

- A. Both the CONTRACTOR and Supplier shall provide a two (2) year minimum written warranty when the existing pavement is in an appropriate condition (CONTRACTOR and Supplier to determine condition). Warranty covers delaminating, peeling and premature surface wear.
 - 1. Before placement notify ENGINEER if pavement condition or application condition voids the warranty.
 - 2. ENGINEER may allow or cancel product application at no cost to OWNER if warranty cannot be given.
- B. Acceptable performance after two (2) year period is no delaminating, peeling, or inter-aggregate loss in surface wear. Mechanical disturbances by snow plow chatter, studded tires, etc. are excluded from warranty. Repair defective coverage at no additional cost to OWNER.

PART 2 PRODUCTS

2.1 ASPHALT BINDER

- A. Crack Pouring Asphalt: Rubberized asphalt or asphalt rubber hot pour, Section 32 01 17.
- B. Tack Coat: SS or CSS grade, Section 32 12 13.13. Use a tack coat that is compatible with seal coat application.
- C. Emulsified Asphalt: Inorganic, non-ionic, thixotropic mineral colloid at 25 deg C that meets the following requirements. Inorganic is defined as a non-carbon based emulsifier.

Table 1 – Emulsion Properties			
Criterion	Standard	Min	Max
Brookfield Viscosity at 77 deg F (Spindle 5, 20 rpm), cPs	D 2196	11,000	20,000
pH	E 70	5.0	7.5
Density, lbs./gal	T 59	8.5	9.0
Asphalt Cement Content, percent by weight	D 2172	45	50
Solids Content, percent by weight	T 59	50	54
Ash Content, percent by weight	T 111	4.0	6.0

2.2 AGGREGATE

- A. Clean and free from organic matter or other detrimental substances. Composed of sand, clay, slate and corundum. Properties of slate and corundum as follows.

1. Slate

Table 2 – Slate

Physical Properties

Criterion	Standard	Min	Max
Specific Gravity	C 128		2.7
Compression, psi	C 170	11,000	

2. Refined Corundum:

Table 3 – Corundum

Physical Properties

Criterion	Standard	Min	Max
Specific Gravity	C 128	3.9	
Knoop 100 Hardness	D 1326	2,000	
Ball Mill Friability (14 grit)	B74.8		50

2.3 ADDITIVES

- A. Water is clean, non-detrimental, and free from salts and contaminant.
 B. Polymers and other additives as necessary to achieve mix design performance.

2.4 MIX DESIGN

- A. Completed high density mineral bond material, prior to being loaded for install, must meet the following requirements.

Table 4 – Mix Properties

Criterion	Standard	Min	Max
Asphalt Content, percent by weight	D 2172	17	20
Solids Content, percent by weight	D 1644	55	63
Initial Brookfield Viscosity at 77°F (Spindle 4, 20 rpm), cPs	D 2196	5,500	9,000
Ash Content, percent by weight	T 111	38	
Ash Content of Solids, percent by weight (a)	T 111	65	
Density, lbs/gal	T 59	11	
pH	E 70	6.0	8.0
Total Inorganic Aggregate Content, percent by weight (b)	T 111	37	
Total Sand Content, percent by weight			6.0
Maximum VOC, g/L	D 3960		5
Resistance to Re-emulsification	D 2939	No re-emulsification	
Wear Resistance, percent loss by weight (c)	D 2486		4
NOTES:			

- (a) Ash content as a percentage of solids content.
- (b) Ash content of completed mix minus ash content of base non-ionic emulsion. Total inorganic aggregate content is defined as slate, refined corundum, and sand.
- (c) ASTM D 2486 (Modified): Prepare sample at 48 wet mils on glass panel. Dry at 77 deg F for three (3) days. Immerse in water for 24 hours at 77°F. Test scrub resistance with 1,000 gram brass brush for 12,000 cycles. Report percent of dry film lost.

PART 3 EXECUTION

3.1 CONSTRUCTION EQUIPMENT

- A. Paver: Use a continuous flow mixing unit.
 - 1. Capable of applying at least 15,000 square yards of material per day.
 - 2. Equipped with full sweep agitation system to assure proper suspension of fine aggregates.
 - 3. Equipped with an operator control station that adjusts material spread rate in accordance with project calibration process.
 - 4. Equipped with a filtering system to catch particles that plug nozzles.
 - 5. Equipped with a retractable spray bar capable of applying mixture without drilling. The bar should be positioned to meet calibration requirements.
- B. Storage Tanks:
 - 1. When delivering mix from the central mixing plant to a job site storage tank, use only storage tanks with a capacity to contain the entire transport load.
 - 2. Ensure that all site storage tanks have internal full sweep mixing mechanisms and mixing capability that can provide at any given point in the tank a homogenous mix.

3.2 PREPARATION

- A. Paver Calibration: On a test strip at least 300 feet long, determine the correct pump settings, spray bar height, and ground speed for the application equipment. Apply material with pump settings at 80 percent of maximum output (plus or minus 5 percent) and a ground speed of 300 to 400 feet per minute.
 - 1. Do not begin or continue application without ENGINEER's knowledge of the calibration process and equipment settings.
 - 2. Do not deviate from calibration settings without ENGINEER's knowledge.
- B. Surface Repair: Method of payment to be determined by ENGINEER if any of the following repairs are required.
 - 1. Raising low areas to grade, lowering high areas to grade, hole patching, inlays.
 - 2. Providing tack coat on highly absorbent, polished, oxidized, or raveled asphalt surfaces or on brick and concrete surfaces.
 - 3. Crack sealing and crack repairing, Section 32 01 17.
 - 4. Pushing or shoving pavement repairs.
 - a. Mill damaged area at least three (3) inches below required surface elevation.

- b. Install and compact three (3) inches of PG64-22-DM-3/4 asphalt concrete, Section 32 12 16.19.
- C. Masking: Mask-off Street Fixtures, end of streets, intersections.
- D. Traffic Control:
 - 1. Implement traffic control plan requirements. Provide safe passage for pedestrians and vehicles. Do not proceed without flaggers if work requires maintaining two-way vehicular traffic.
 - 2. Grind off existing pavement markings and lane stripes. If existing markings and stripes are to be reestablished, use reflective tabs to mark existing locations before applying surface treatment material. Unless specified otherwise, cost is included in the work of this section.
- E. Cleaning:
 - 1. Remove loose material, mud spots, sand, dust, oil, vegetation and other objectionable material.
 - 2. Do not flush water, or apply pressurized water over cracked pavement unless ENGINEER allows its' use and a sufficient time is allowed for drying.

3.3 PROTECTION

- A. Trees, Plants, Ground Cover:
 - 1. Protect trees, plants and other ground cover from damage.
 - 2. Prune trees to allow equipment passage underneath, Section 32 01 93. Repair tree damage at no additional cost to OWNER.
- B. Protect structures, curb, gutter, sidewalks, guard rails, guide posts, etc. from physical damage.

3.4 APPLICATION

- A. General: Two separate applications coats are required. The first application must be thoroughly set and free of any damp areas before the second application begins.
- B. Spreading:
 - 1. Keep material delivery at a constant rate even if forward speed of lay-down machine varies.
 - 2. Do not reduce application rate along edges or around manhole covers.
 - 3. Apply both applications right to the edge of the pavement. Do not leave uncovered areas near curbs, Street Fixtures, or edges on either application.
 - 4. Make straight lines at all locations.
 - 5. Place product out to right-of-way line on side streets and intersections.
 - 6. Use hand squeegees to spread mix in areas that cannot be reached with distribution spray bar.
 - a. Provide complete and uniform coverage.
 - b. Avoid unsightly appearance from hand work.
- C. Joints:
 - 1. Make transverse joints straight-cut butt type, not over-lap type.
 - 2. Place longitudinal joints on lane lines. Limit overlap to three (3) inches maximum.
 - 3. Stop and correct paving operation if longitudinal or transverse joints have uncovered

areas or unsightly appearance.

D. Lines:

1. Make straight lines along lip of gutters, shoulders, end of streets, and in street intersections. No runoff on these areas will be permitted.
2. Vary edge lines no more than one (1) inch per 100 feet.

3.5 TOLERANCES

- A. First application = *0.20 gallons per square yard minimum.*
- B. Second application = *0.16 gallons per square yard minimum.*

3.6 FIELD QUALITY CONTROL

- A. Emulsion density testing, AASHTO T 59. If testing shows material non-compliance, remove installed product and halt operations until new material is delivered and is known to be in compliance.
- B. Measure the total amounts of material installed, and verify it meets the application rate.

3.7 AFTER APPLICATION

- A. Raise reflective tabs that were covered over by application.
- B. Clean Street Fixtures.
- C. Do not apply permanent pavement markings or striping material until layout and method of payment has been determined by ENGINEER, and final application of surface treatment material has been in place at least 10 days, or as permitted by ENGINEER. Layout must be verified by ENGINEER prior to application.

3.8 REPAIR

- A. Remove delaminated or non-compliant product found after installation and apply acceptable product.
- B. Remove spatter, mar and overcoat from curb, gutter, sidewalk, guard rails, guide posts, etc.
- C. Remove overcoat from Street Fixtures.
- D. Make edge and end lines straight. Provide a good appearance.
- E. Leave no streaks, holes, bare spots, or cracks through which liquids or foreign matter could penetrate to the underlying pavement.
- F. Repair collateral damage caused by construction.

3.9 OPENING TO TRAFFIC

- A. Cure time depends on type of asphalt, mixture characteristics and weather. Keep traffic off surface until material does not track out.

END OF SECTION