

01005 - STATEMENT OF WORK

PART 1 - GENERAL

1.01 STATEMENT OF WORK: This is a general overview of the project. Follow details shown by the specifications and drawings, interpreted in accordance with contract clauses.

- A. Provide all labor, material, plant, equipment, supplies, and coordination required to:
 - 1. Provide for the necessary removal, disposal and replacement of sections of concrete streets in need of repair throughout Macon-Bibb County. Replacement striping shall be considered as the responsibility of the contractor and shall be submitted as a portion of the unit price for repairs completed
- B. Price: Accomplish work shown for the original bid price. This includes special work times for utility outages and repair of damages. Any work performed outside the scope of work for this project without the express written permission by Macon-Bibb County will be at the liability of the contractor. The words "at no additional cost to the Government" are implied whether stated or not.

1.02 CONTRACT SITE AND WORK RESTRICTIONS:

Work area is restricted to the area at the construction site. Provide a seven day notification prior to a road closure so that the approved detour may be publicized in the local paper or other media outlets. Any traffic detours require the submittal of a traffic control plan to the Macon-Bibb County Traffic Engineering for approval 7 days before enacting said plan. All equipment must remain on public right of way during work hours and can be stored safely on the right of way while not in use provided it does not cause a traffic flow or sight distance problem. Any offsite parking/storage will require a written agreement between the owner of the private property and the contractor performing the work.

1.03 HOURS OF WORK:

- A. Standard work hours for this project are normal work hours of 8:00 AM to 5:00 PM local time, Monday through Friday. Work must stop on official City-County holidays unless specifically approved in advance.
- B. Alternate Work Hours
 - 1. If the Contractor desires to work another set of standard hours submit written request five (5) workdays before the date desired to work the different standard.
 - 2. To work special hours or days such as to continue paving until dark, request verbal approval from the Engineer at least four hours in advance.
 - 3. The Government reserves the right to refuse these requests. In addition, work requiring inspector presence such as placing concrete may not be possible outside normal hours on short notice. Digging outside of normal hours will normally not be approved. Any work outside of the

01005 - STATEMENT OF WORK

standard working hours performed without the permission of the engineer will require sampling and analysis by a geotechnical engineering firm at the expense of the contractor.

C. All references to days mean calendar days unless otherwise noted.

1.04 SUBMITTALS:

A. General: Provide the following submittals in accordance with instructions found in Section 01300, Submittals and Contractor Furnished Items.

B. Material Submittals: Omitted.

PART 2 - PRODUCTS - OMITTED

PART 3 - EXECUTION

3.01 COORDINATION: The contractor shall coordinate work between different disciplines.

A. Locations shown are approximate and may be moved if approved by the Engineer.

B. Manufacturers' recommendations and/or requirements, if more stringent than the specifications and drawings, shall be followed at no additional cost to the Government.

Section 01005 Submittals

| <u>Para #</u> | <u>Description</u> | <u>Date Required</u> | <u>Inspector Check Mark</u> |
|---------------|----------------------|----------------------|---------------------------------|
| 1.02 | Closure Notice | 7 days prior | _____ |
| 1.03 B.1 | Alternate Work Hours | 5 days prior | _____ |

<<<<< END OF SECTION >>>>>

01040 – SITE REQUIREMENTS

PART 1 - GENERAL

1.01 UTILITY OUTAGES: Request any necessary utility outages in writing to the appropriate utility with a copy to the Engineer, a minimum of 14 days before the proposed outage. These may have to be scheduled at other than normal working hours depending on the impact to the users served by the utilities. These are at no additional cost to the Government. The contractor is responsible for working with existing utility company to relocate existing utilities at the utilities' own expense except where indicated otherwise on the drawings. The contractor is responsible for notifying the public of any impending utility outages 7 days prior to the temporary loss of said utility.

1.02 SUBMITTALS: Omitted

- A. General: Provide the following submittals in accordance with instructions found in Section 01300, Submittals and Contractor Furnished Items.
- B. Material Submittals: None required under this section.

1.03 SAFEGUARDING COMMUNICATION FACILITIES: For work that will interfere with buried fiber optics cable, aerial cable, house cable, underground cable, or other communication facilities, notify the utility and the Engineer in writing 14 days before the scheduled construction. Do no work until receiving approval.

PART 2 – PUBLIC NOTIFICATION:

The contractor will be responsible for notifying all affected parties of the construction activity a minimum of 48 hrs prior to work beginning. The notification will include the duration of any potential inconvenience such as construction activity that will reduce the affected right of way to one lane of traffic or if the roadway will remain in a state of disrepair for some duration without construction (ex. curing FDR applications before applying an asphalt topping or the relocation of utilities in the right of way)

PART 3 - EXECUTION

3.01 DIGGING/EXCAVATION REQUIREMENTS: Any utility location information provided for this project is for general bidding purposes only. The contractor shall determine actual locations and quantities at the site by calling the Georgia Utilities Protection Center prior to accomplishing any digging. .

- A. Damage: The contractor is responsible for any damage to underground structures and utility lines identified on the drawings and any identified and marked in the field as a result of obtaining the utility location. If any underground utility is damaged, notify the utility and the Engineer immediately.
- B. Cutting of Roads, Streets, and Paved Parking Areas:
 - 1. Mark, barricade, and illuminate construction work on or near roads or streets which may present a traffic hazard in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Closures of streets, parking lots, and other traffic areas will not be permitted unless approved by the Engineer after written request 14 days before the scheduled closure & a detailed traffic control plan has been approved by the Macon-Bibb County Traffic Engineer's Office.

01040 – SITE REQUIREMENTS

2. Road cuts shall be backfilled immediately after completion of associated utility work. When the road is reopened, the cut shall be filled with temporary or permanent materials to a smooth condition, or metal plates or other approved methods shall be employed to prevent discomfort or damage to vehicular traffic. Road cuts shall be permanently closed within 5 working days unless approved otherwise by the Engineer. Provide advance signage warning motorists of the condition in accordance with the MUTCD. Repair streets as shown on the drawings.

3.02 STORAGE AREA: The contractor shall obtain permission for all storage on private property. Materials stored on the county or state right of way must be obtained from the appropriate agency. Any damage to the Contractor's equipment or loss of materials or property will not incur any additional costs to the Government

3.03 LOCATING AND IDENTIFYING UNDERGROUND LINES AND STRUCTURES:

- A. Regardless of statements in other Spec sections, provide warning tapes over new buried underground utilities and structures. Follow these requirements if the other Spec sections are less detailed and stringent.
- B. These include all underground items such as utility lines, storm drainage lines, water and sewer lines, traffic signal loops and utility pits and manholes with tops below grade. Do not proceed with any work if the proper locates have not been acquired. Positive identification of actual location and depth of the utility facilities is the sole responsibility of the contractor.
- C. Provide a warning tape of standard industrial width and thickness with imprinted words identifying the type of utility line or structure below it. Place along the length (and width if not a utility line) of the protected item at one-foot depth below grade.

3.04 SITE MAINTENANCE, CLEAN UP, AND RESTORATION

- A. Maintain the work site in a neat, orderly, and safe manner. Cut grass regularly to maintain site to community standards.
- B. Remove scrap, waste, and excess materials promptly. Provide signs, barricades, and lights as required to protect personnel.
- C. Do not allow trash and debris to accumulate and become unsightly. Sweep up and collect in contractor-maintained disposal containers daily. Dispose of collected debris weekly as a minimum.
- D. Store materials on site in a neat and orderly manner.
- E. Restore the project site to its final condition as required by the contract as soon as possible.
- F. Do not open trenches or excavations until material is on-hand or scheduled to arrive within three days. Close excavations or ditches as soon as the work has been placed, inspected, and accepted by the government.

Section 1040 Submittals

01040 – SITE REQUIREMENTS

| Para # | Description | Date Required | Inspector Checklist |
|--------|------------------------------|-------------------------|---------------------|
| 1.01 | Utility Outage Requests | 14 days prior to outage | _____ |
| 3.01 B | Road/Parking Closure Request | 14 days prior | _____ |

<<<<< END OF SECTION >>>>>

01300 - SUBMITTALS AND CONTRACTOR FURNISHED ITEMS

PART 1 - GENERAL

1.01 GENERAL:

A. Basic: Provide items requiring drawings, diagrams, certifications, manufacturers' literature, data brochures, technical data, sample requests, forms, and other data as noted under each specification section.

B. Contractor Responsibility: Review, Corrections, or Comments made on the Submittals do not relieve the contractor from compliance with the requirements of the Drawings, Specifications, Addendums, and Contract Documents. By entering into this contract, the contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish, install, and use. Review of shop drawing will be general only for basic conformance with the design concept. The Government's review of such drawings, schedules, or cuts shall not relieve the contractor from the responsibility for correcting all errors of any sort contained in the submittals. The contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

1.02 OMITTED:

1.03 SUBMITTAL INSTRUCTIONS: Submittal requirements for each specification section are listed in those respective sections. The following apply to all sections.

A. Material Submittals:

1. Complete Submissions: All items requiring submittals prior to construction activities for each section should be provided at one time unless noted otherwise or logically required. In some instances the specifications may require certain items from one or more specifications sections to be submitted at one time.
2. Submittal Checklist: The contractor shall complete a copy of the checklist provided in the submittals paragraph of each specification section. This checklist shall be provided with each submittal. Submittal information shall be arranged in order to correspond with each checklist.
3. Time: The Contractor shall have approved submittals before ordering any equipment under this contract. If equipment is ordered prior to receiving approval, it will be solely at the Contractor's risk. Under no circumstances will material be installed prior to approval of submittals. There will be no time schedule for providing material submittals unless noted elsewhere in the specifications. The Contractor will be required to manage his materials/equipment lead times and obtain approval in sufficient time to complete the work on schedule. Disapproval of incomplete or unsatisfactory submittals shall not be grounds for contract extensions. Other submittals such as as-builts, test reports, etc., shall be provided as indicated. When the word "prior" is used, it shall generally mean prior to the delivery or installation of the product at the work site or prior to the time in question of the item addressed in the specification.
4. Exceptions: If any material proposed for use on this contract deviates from the specifications, the Contractor shall submit those proposed deviations for approval along with detailed

01300 - SUBMITTALS AND CONTRACTOR FURNISHED ITEMS

justification. All exceptions and deviations shall be described in detail with each product submittal. Cost will not be considered a justification for taking exceptions unless a credit is offered to the Government.

5. Substitutions: Products provided by manufacturers other than those specified as the “design basis” shall be considered substitutions.

- a. All features of items submitted as substitutions are implied to be in full compliance with Specifications and Drawings if not specifically noted as "Exceptions."
- b. Where a design basis is referenced in Specifications and Drawings, substitutions must meet or exceed the salient features of the design basis as determined by the Engineer. Exceptions to design basis characteristics must be clearly noted as "Exceptions." The contractor must demonstrate that the product substituted is clearly equal or superior to the specified product, or else the request for substitution will be denied.
- c. Changes required to accommodate approved substitution shall be made at no additional cost to the Government.

B. Other Submittals: Other submittals such as samples, test results, spare parts, and etc. shall be provided as required by each specifications section. Provide 2 copies of each or an electronic copy unless directed otherwise.

1.04 RETURN AND DISAPPROVAL OF SUBMITTALS: The Engineer will return submittals to the Contractor within 14 days after receipt indicating approval or disapproval. Resubmittal of disapproved submittals shall be accomplished within 14 days after receipt of disapproval. Disapproval shall not be cause for time extension.

1.05 SUPERINTENDENT or MANAGER: When requested, provide name and qualifications for review. Provide the name and contact information of the person who will be the primary contact with the Government on this project until project acceptance.

1.06 TURN-IN OF IDENTIFIED EQUIPMENT, SPARE PARTS, TOOLS, AND OTHER MATERIALS: Items indicated in the Submittals section of each specifications and elsewhere, for turn-in to the Government shall be delivered as directed or in the absence of direction, before prefinal inspection. Obtain receipts from Government employees receiving the materials and deliver them to the Engineer before prefinal inspection.

1.07 Omitted

1.08 Omitted

1.09 Omitted

1.10 PRE-AWARD SUBMITTALS: Submit the following items before award, if directed.

A. Experience: Provide documentation on contractor experience relative to this project. After bid opening, the Government may examine contractor experience. The Contractor and/or named subcontractors shall have been regularly engaged in the type work of this project for at least (2) years. Include for each subcontractor the name of the business and the individual responsible for this project.

01300 - SUBMITTALS AND CONTRACTOR FURNISHED ITEMS

B. References: Provide the names, addresses and telephone numbers of at least two customers for whom similar projects were performed in the last (two) years.

1.11 Omitted

END OF SECTION

PART 1 - GENERAL

1.01 GENERAL:

- A. General Scope: This Section provides the requirements necessary to ensure that all construction projects are in environmental compliance. Major environmental program areas which may be affected include natural resources, air quality, underground storage tanks, asbestos, lead-based paint, PCBs, cultural resources, water quality, solid and hazardous wastes, and pollution prevention.
- B. Applicable Regulations and Publications: Comply with all applicable Federal, State of Georgia, any laws and regulations from other states where disposal might occur, and local laws and regulations concerning environmental compliance and pollution prevention.
- C. Ensure all products produced or generated under contract shall meet all stated performance objectives and shall not violate in any manner the environmental requirements of any applicable local, state, or federal entity. Applicable environmental requirements shall include but are not limited to a substance's toxicity, biodegradability, and volatile organic/inorganic compound content.
- D. Macon-Bibb County personnel will conduct no-notice inspections to ensure compliance with all environmental requirements.
- E. Definitions:
 - 1. Engineer-Macon-Bibb County Engineer or his or her designated representative.
 - 2. Inspector-The individual from the Macon-Bibb County Engineering Department designated to perform daily inspection of the contractor's work.
 - 3. Dust - Minute solid particles caused to be suspended by natural forces or by mechanical processes such as, but not limited to, crushing, grinding, milling, drilling, demolishing, shoveling, conveying, covering, bagging, mixing, and sweeping.
 - 4. Open Burning - Any outdoor fire from which the products of combustion are emitted directly into the open air without passing through a stack, chimney or duct.
 - 5. Solid Waste - Defined in CFR 261.2. Examples include garbage, refuse, and other discarded solid material including non-hazardous wastes resulting from industrial, commercial, and agricultural operations.
 - 6. GA EPD - Georgia Environmental Protection Division of the Department of Natural Resources.

1.02 OMITTED

1.03 SUBMITTALS:

- A. General: Provide the submittals in accordance with instructions found in Section 01300, Submittals and Contractor Furnished Items.
- B. Material Submittals: Not required under this section.

1.04 NOTIFICATIONS:

A. Provide to the Engineer all data specified herein to insure compliance with applicable environmental requirements.

1. Permits: Omitted

2. Other Submittals, Notifications, and Approvals: The following submittals, notifications, and approvals are required to maintain compliance:

a. Solid Waste Disposal: The Contractor shall provide a solid waste disposal plan stating how all materials leaving the site shall be disposed of.

(1) The plan shall certify that the Contractor shall dispose of all materials in compliance with all Federal, State of Georgia, and local laws. A senior official of the company shall sign this letter. The plan shall address the disposal of each item addressed in Sections 3.01 and 3.02 as applicable. Non-hazardous solid waste shall be broken down into individual types, i.e., asphalt, concrete, wood, brick, etc.

(2) The plan shall address each landfill to be used. A copy of all landfill permits shall be provided unless the Macon, Wolfe Creek, or Houston County landfill is to be used. The plan shall designate the employee who shall be responsible for verifying that all materials removed from the site are disposed of in accordance with the above referenced laws. The employee shall be an employee of the contractor and shall have authority to act for the contractor. Provide two copies of the Disposal Plan to the Engineer prior to the Pre-construction Conference or 14 calendar days prior to the start of disposal operations if no pre-construction conference is held.

(3) Omitted

(4) Keep on hand evidence of proper disposal of construction debris as well as providing this evidence to the Engineer. Examples of evidence include dump tickets from a licensed sanitary landfill and copies of a current landfill permits from the State of Georgia (unless Macon, Wolfe Creek, or Houston County landfill is used.), manifest, bill of sale, or other record for recycling.

(5) After contract work is completed and prior to final payment, the Contractor shall submit a letter of certification signed by a senior official of the company certifying that all materials removed from the site have been disposed of in accordance with all applicable Federal, State, and local laws.

b. Hazardous Waste: See Section 09 97 02 for requirements.

PART 2 - PRODUCTS - OMITTED.

PART 3 - EXECUTION

3.01 DISPOSAL OF WASTE/EXCESS MATERIAL:

A. Omitted.

B. Non-hazardous Solid Waste or Excess Material, except topsoil and suitable fill material, shall be removed from the site daily unless permitted otherwise by the Engineer. Dispose in a manner approved by the US Environmental Protection Agency and the Georgia Department of Natural

Resources, Environmental Protection Division (EPD). Also comply with applicable local codes and requirements. Equipment/material to be removed from the project but not turned in to the Government is the property of the contractor.

1. Disposal: Use one or more of the following methods to dispose of non-hazardous solid waste.

a. Sanitary Landfill: All solid waste may be disposed of in a sanitary landfill properly licensed by the State of Georgia. If a landfill other than the Macon, Wolfe Creek, or Houston County sanitary landfill is used, provide a copy of the landfill license. Provide proof that any Georgia municipal solid waste disposal facility to which they propose to bring waste, except Macon, Wolfe Creek, or Houston County, is operated by someone who has obtained the certification required by the Georgia Solid Waste Management Act, O.C.G.A. 12-8-24.1.

b. Inert Waste Landfill: Materials not likely to cause production of lechate of environmental concern may be disposed of in an inert waste landfill. Only earth and earth-like products, concrete, cured asphaltic concrete, rock, bricks, yard trimmings, and land clearing debris such as stumps, limbs, and leaves are acceptable for disposal in an inert waste landfill. This definition excludes industrial and demolition waste not specifically listed above. Provide a copy of the written notice of commencement of operation by the landfill as given to the Georgia EPD.

c. Construction/Demolition Disposal Site: Only wood, metal, wallboard, paper, cardboard, as well as materials that can go in an inert waste landfill may be disposed of in this facility. Provide a copy of the landfill license.

d. Recycling: Recycling of materials is strongly encouraged. Materials destined for recycling must meet the definition of non-hazardous wastes under federal/state solid waste regulations. Materials defined as “recovered materials” by GA EPD regulations are excluded from regulation as solid wastes.

e. All materials to be disposed of in other than a sanitary landfill must be kept segregated at the project site from those materials, which are allowed only in a sanitary landfill.

C. Solid Waste Disposal Outside of Georgia: Dispose of no solid waste outside the state of Georgia without prior written approval of the Engineer. If the contractor desires this, he shall provide sufficient information as determined by the Engineer to allow verification

3.02 Omitted:

3.03 PROTECTION OF LAND RESOURCES:

A. General: Do not take any action which shall adversely affect the existing Water Quality Standards classification of any streams, rivers, lakes or reservoirs within or adjacent to the project site or which would otherwise contribute to pollution of these water resources. No fuel, oils, bituminous, calcium chloride, acids, construction waste or otherwise harmful materials shall be permitted to enter these water resources. Preserve the land resources in their present condition or restore to a condition that appears natural and does not detract from the appearance of the surrounding area. If restoration is to be accomplished, the Contractor must submit his restoration plan and receive approval from the County on his proposed procedures.

B. Omitted.

C. Omitted

D. Restoration of Landscape Damage:

1. Do not allow any trees or other debris to get into the storm drainage system.

2. Surface Drainage:

a. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation ponds or shall be graded to control erosion. Temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operating. The area of bare soil exposed by construction operations at any time shall be held to a minimum. Stream crossings by fording with equipment shall be limited to control turbidity. Fills and waste areas shall be constructed by select placement to eliminate pollution to adjacent streams.

b. Stabilization of permanent steep slopes shall be accomplished as soon as possible, using a 2-step procedure, if necessary, to establish vegetation. Apply mulch immediately after finished grading is completed, regardless of season, and delay permanent seeding and fertilizing, if necessary, until the season most favorable for germination.

E. Spills: Prevent the spill of chemicals, fuels, oils, grease, bituminous materials, waste washings, herbicides, cement drainage or any other hazardous materials. Immediately report all spills to the Macon-Bibb County Fire Department, emergency number 911, giving name, telephone number, location of spill, and type and amount of material spilled. Notify the Engineer of the spill immediately following initial reporting to the Fire Department. Take containment action against any hazardous spills, which threaten storm drains and other environmental areas. Ensure clean up of materials spilled as a result of contractor action, or lack thereof. The contractor is responsible for the clean up of material(s) spilled. No spill residue shall be transported off site without specific approval from the Engineer. The contractor shall provide support, as appropriate, for containment and clean up of spills. If the spill exceeds reportable quantity limits, coordinate notification to the National Response Center with the local office of the Environmental Protection Division (EPD) through the Engineer.

3.04 AIR QUALITY:

A. Open burning operations must be approved by the Macon-Bibb County Fire Department and the Georgia Forestry Commission. Note that a burn ban is in effect from 1 May to 30 September of each year.

3.05 DUST CONTROL: Maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work within or without the project boundaries free from dust which could cause a hazard or nuisance to others. Approved temporary

01560 – ENVIRONMENTAL REQUIREMENTS

methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment or similar methods are permitted to control dust. To be approved, sprinkling must be repeated at such intervals as to keep all parts of the disturbed area damp at all times. If sprinkling is used, keep sufficient equipment on the job site at all times. Perform dust control as the work proceeds and whenever a dust nuisance or hazard occurs.

3.06 USING HAZARDOUS MATERIALS IN PERFORMING THE WORK:

- A. Written Notification: Comply with all applicable federal, state, and local requirements concerning use of hazardous materials. Provide written notification to the Engineer when hazardous materials/chemicals are to be used or demolished. This must include the following information:
1. A list of each work activity/process required to use/demolish hazardous materials/chemicals.
 2. A list of hazardous materials/chemicals used.
 3. A Safety Data Sheet (SDS) for each hazardous material/chemical used.
 4. Written procedures for disposing of hazardous waste generated.
 5. Omitted.
 6. For additional hazardous material brought on site during the performance of the contract, the contractor shall provide an updated list and SDS to the Engineer.

3.07 Omitted

3.08 Omitted

3.09 THREATENED AND ENDANGERED SPECIES:

- A. The construction project is not anticipated to have any impact in this area since most plant and animal species of concern exist in wetlands. Any project activities believed to interface with threatened and endangered species shall be coordinated through the Engineer.

3.10 WETLANDS: Comply with water and land protection paragraphs of this Section to prevent construction site sediments and runoff from entering wetlands.

3.11 Omitted

Section 1560 Submittals

| Para # | Description | Date Required | Inspector Check Mark |
|-------------|---------------------------------|---------------------------|-------------------------|
| 1.04 A.2.a | Solid Waste Disposal Plan | at pre-construction conf. | _____ |
| 1.04 A.2.a. | (5) Disposal Certification Ltr. | prior to final payment | _____ |
| 3.01 B.1.c | Landfill License | prior to dumping | _____ |
| 3.06 | Use of Hazardous Chem | Prior to Work | _____ |

01590 – UTILITY RELOCATION

PART 1 – GENERAL

1.01 Cooperation with Utilities: Macon-Bibb County will notify all utility companies, all pipeline owners, all railroad companies, or other parties affected by award of the Contract, giving the name and address of the Contractor, and will assist the Contractor in arranging for all necessary adjustments of the public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction. Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, railroad facilities, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners at their expense, except as otherwise provided for elsewhere in the Contract. It is understood and agreed that the Contractor has considered in his bid all of the permanent and temporary utility appurtenances in their present location or relocated positions, and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him due to any interference from said utility appurtenances or the operation of moving them, with the exception that delays and interruptions to the work are covered in Subsection 1.02. It shall be the Contractor's responsibility to plan with each utility owner a schedule of operations which will clearly set forth at which stage of the Contractor's operations the utility owner will be required to perform his removal and relocation work.

1.02 Contractor's Responsibility for Utility Property and Services

A. Overhead or Underground Utility Facilities

At points where the Contractor's operations are adjacent to or conflict with overhead or underground utility facilities, or are adjacent to other property, damage to which might result in considerable expense, loss, or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made.

B. Utility Facility Owners

The names of known utility owners and the location of known utility facilities will be shown on the Plans or located at the work site, and the Contractor shall give 24-hour notice to such utility owners before commencing work adjacent to said utility facilities which may result in damage thereto. Contractor shall further notify utility owners of any changes in his work schedules affecting required action by the utility owners to protect or adjust their facilities. Notice to the utility companies by Macon-Bibb of the award of contract, under Subsection 1.01, shall not be deemed to satisfy the notice required by this paragraph.

C. Cooperation with Facility Owners

The Contractor shall cooperate with the owners of any underground or overhead utility facilities in their removal and rearrangement operations in order that these operations may progress in a reasonable

01590 – UTILITY RELOCATION

manner, that duplication of rearrangement work may be reduced to a minimum, and that services rendered by those parties will not be unnecessarily interrupted.

D. Interruption of Services

In the event of interruption to water or other utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the said authority in the restoration of service. If utility service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

E. Facilities Supported on Bridges

If the utility facilities are to be supported on bridges, the following provisions shall apply:

1. The Plans will show the location of the facility and the auxiliary items necessary to support the facility.
2. The Contractor who constructs the bridge shall install anchor bolts, thimbles, inserts, or other auxiliary items that are attached to the bridge as a part of the support for the utility facility. The Utility owner, at his or her expense, shall furnish these auxiliary items, unless the Contract indicates that these items are to be furnished by the Contractor as a part of the bridge.
3. The Agency constructing the utility facility shall install hanger rods, pipe rolls, and other attachments necessary for the support of the utility facility as indicated on the Plans. The Utility owner, at his expense, shall furnish these attachments unless otherwise specified. This work shall also include:
 - a. Caulking the openings around the utility where it passes through endwalls to prevent the passage of undesirable materials.
 - b. Painting the exposed portions of utility supports unless such supports are corrosion resistant. Painting shall be done in accordance with the applicable portions of the specifications.
4. The sequence of bridge construction work may be set forth in the Plans and/or the Specifications and will show at what stage of the work a utility owner will be allowed to make the utility installation. Further, all or any portion of the work under Subsection 1.02.E.3 may be included in the bridge contract by the Plans and/or the Specifications.
5. Any damage to the bridge structure caused by the utility installation shall be repaired to the satisfaction of the Engineer at the expense of the agency installing the utility facility.

F. Clearances

The Plans provide for at least minimum clearance of utilities as required by the National Electrical Safety Code, U.S. Department of Commerce, National Bureau of Standards. Any additional clearance the Contractor may desire or require in performing The work shall be arranged by the contractor with the utility owner. Macon-Bibb will pay no extra compensation for such additional clearances.

G. Delays

01590 – UTILITY RELOCATION

Delays and interruptions to the work caused by the adjustment or repair of water, gas, or other utility appurtenances and property will be considered for an extension of contract time unless such delays are due to the negligence of the Contractor.

H. Compensation

There will be no direct compensation for complying with the above. Any additional cost to the contractor for the above services, interruptions, or special procedures, shall be included in the over-all bid submitted.

1.03 KNOWN UTILITIES

The following utilities are known to have facilities on the project site. Those requiring relocation are identified below. See the plans for more detailed information on the affected areas. Known existing utilities are shown on the plans. The contractor is responsible for calling the Utilities Location Protection Center prior to digging to have all utilities in the project site located. The contractor is responsible to repair all damages to identified utilities as a result of his operations.

| Utility | Contact | | Relocation Required |
|--------------------------|--|----------------------------------|---------------------|
| Macon Water Authority | Algernon Wallace | 478-464-5662 | Possibly |
| Georgia Power | | | Possibly |
| Downtown | Chris Zeno | 478-784-5705 | |
| South and West | Phillip Saunders | | |
| East of Ocmulgee | Lavelle Lewis | | |
| North | Dennis Pritchett | | |
| AT&T | Mel Redd | 478-788-1040 | Possibly |
| Cox Cable | Mike Adams | 478-256-1544 | Possibly |
| Atlanta Gas Light | Corey Alford | 404-807-4915 | Possibly |
| | (Engineer) Larry Adams (Project Mgr) | 678-725-0421 | |
| Norfolk Southern | Leon Jackson | (404) 529-1251 | No |
| Public Service Telephone | Jeremy Kendrick | 478-847-6524 478-951-7815 (C) | Possibly |

01590 – UTILITY RELOCATION

| | | | |
|---|-----------------------------|----------------------------------|----------|
| Mitchell Harris | | 478-847-6522 478-837-3877 (C) | |
| Southern Telecom | | | Possibly |
| Georgia Public Web | Greg Spell | 770-661-2808 | Possibly |
| 888-662-6324 (24 Hour) | | | |
| Level III | Tony Charlton | 321-312-3225 | Possibly |
| (Formerly KMC Telecom and Telco) | | relo@level3.com | |
| Macon-Bibb (Fiber) | Rob Ryals | 478-751-0401 | Possibly |
| Macon-Bibb Communications (traffic signal loop) | Kevin Poss | 478-751-9266 | Yes |
| Tower Cloud | Lee Clark | 727-471-5600 | No |
| Medical Center of CG | Tim Slocomb | 478-633-1036 | No |
| Windstream | | | No |
| Jointly Owned Natural Gas | Wayne James Ronnie Jones | 478-654-6059 478-952-1605 (C) | No |
| Colonial Pipeline | Kevin Railey | 706-891-7584 | No |
| Hargray | Jason White | 843-815-1062 | Possibly |

1.04 SUBMITTALS:

A. General: Provide the following submittals in accordance with instructions found in Section 01300, Submittals and Contractor Furnished Items.

B. Material Submittals: None required under this section.

01590 – UTILITY RELOCATION

C. Other Submittals: Provide the following submittals as required by the contract or as directed by the Contracting Officer.

| Para # | Description | Date Required | Inspector Checklist |
|---------|----------------------|-----------------|---------------------|
| 1.02 B. | Utility Notification | When Identified | _____ |

<<<<< END OF SECTION >>>>>

Section 652—Painting Traffic Stripe

652.1 General Description

This work includes furnishing and applying reflectorized traffic line paint according to these Specifications. This Item also includes applying words and symbols according to existing markings, specifications, and the current Manual on Uniform Traffic Control Devices. The contractor shall reproduce the existing marking pattern unless directed otherwise. The contractor will be required to video record the existing striping and submit that video to the Macon-Bibb Engineering prior to working on the roadway.

652.1.01 Definitions

Painted Stripes:

Solid or broken (skip) lines.

Skip Traffic Stripes:

Painted segments between unpainted gaps as specified by Macon-Bibb County. The location and color are designated to copy existing markings.

652.1.02 Related References

A. Standard Specifications

[GDOT Section 656—Removal of Pavement Markings](#)

[GDOT Section 870—Paint](#)

B. Referenced Documents

[GDOT QPL 46](#)

AASHTO M 247

652.1.03 Omitted

652.2 Materials

Ensure that materials for painting traffic stripe, words, and symbols meet the following requirements:

| Material | Section |
|---|---|
| Traffic Line Paint 5A and 5B | GDOT 870.2.02.A.2 and 870.2.02.A.3 |
| Glass Beads for Use in Luminous Traffic Lines | AASHTO M 247 Type 1* |

*In addition, meet the following requirements for glass beads:

- Maximum quantity of angular particles is less than 1% by weight
- Maximum quantity of particles with milkiness, scoring, or scratching is less than 2% by weight
- Glass beads do not impart any noticeable hue to the paint film
- Glass beads conforming to the following alternate gradation may be used provided that all other requirements of AASHTO M 247 and this Specification are met.

| Alternate Gradation | |
|---------------------|-----------------|
| Sieve Size | Percent Passing |
| No. 16 (1.190 mm) | 99 - 100 |

Section 652—Painting Traffic Stripe

| | |
|--------------------|---------|
| No. 20 (0.850 mm) | 75 - 95 |
| No. 30 (0.600 mm) | 55 - 85 |
| No. 50 (0.300 mm) | 10 - 35 |
| No. 100 (0.150 mm) | 0 - 5 |

652.2.01 Delivery, Storage, and Handling General

The contractor will be responsible for successful delivery any required storage and handling of any paint products used during the execution of this project.

652.3 Construction Requirements

652.3.01 Personnel

The contractor is responsible for providing qualified personnel to successfully execute this project.

652.3.02 Equipment

A. Traveling Traffic Stripe Painter

Use a traffic stripe painter that can travel at a predetermined speed both uphill and downhill, applying paint uniformly. Ensure that the painter feeds paint under pressure through nozzles spraying directly onto the pavement.

Use a paint machine equipped with the following:

1. Three adjacent spray nozzles capable of simultaneously applying separate stripes, either solid or skip, in any pattern.
2. Nozzles equipped with the following:
 - a. Cutoff valves for automatically applying broken or skip lines
 - b. A mechanical bead dispenser that operates simultaneously with the spray nozzle to uniformly distribute beads at the specified rate
 - c. Line-guides consisting of metallic shrouds or air blasts
3. Tanks with mechanical agitators
4. Small, portable applicators or other special equipment as needed

B. Hand Painting Equipment

Use brushes, templates, and guides when hand painting.

C. Cleaning Equipment

Use brushes, brooms, scrapers, grinders, high-pressure water jets, or air blasters to remove dirt, dust, grease, oil, and other foreign matter from painting surfaces without damaging the underlying pavement.

652.3.03 Preparation

Locate approved paint manufacturers on GDOT [QPL 46](#).

Before starting each day's work, thoroughly clean paint machine tanks, connections, and spray nozzles, using the appropriate solvent. Thoroughly mix traffic stripe paint in the shipping container before putting it into machine tanks.

Before painting, thoroughly clean pavement surfaces of dust, dirt, grease, oil, and all other foreign matter.

652.3.04 Omitted

652.3.05 Construction

A. Alignment

Ensure that the traffic stripe is the specified length, width, and placement. On sections where no previously applied markings are present, ensure accurate stripe location by establishing control points at spaced intervals. Macon-Bibb County will approve control points.

Section 652—Painting Traffic Stripe

B. Application

Apply traffic stripe paint by machine. If areas or markings are not adaptable to machine application, use hand equipment.

1. Application Rate

All work will be subject to application rate checks for both paint and beads.

Apply 5 in wide traffic stripe at the following minimum rates:

- a. Solid Traffic Stripe Paint: At least 25 gal/mile
- b. Skip Traffic Stripe Paint: At least 6.3 gal/mile

| |
|---|
| NOTE: Change minimum rate proportionately for varying stripe widths. |
|---|

2. Thickness

Maintain a 15 mils minimum wet film thickness for all painted areas.

Do not apply paint to areas of pavement when:

- a. The surface is moist or covered with foreign matter.
- b. Air temperature in the shade is below 40 °F
- c. Wind causes dust to land on prepared areas or blows paint and beads around during application.

3. Apply a layer of glass beads immediately after laying the paint. Apply beads at a minimum rate of 6 lbs to each gallon of paint.

C. Protective Measures

Protect newly applied paint as follows:

1. Traffic

Control and protect traffic with warning and directional signs during painting. Set up warning signs before beginning each operation and place signs well ahead of the painting equipment. When necessary, use a pilot car to protect both the traffic and the painting operation.

2. Fresh Paint

Protect the freshly painted stripe using cones or drums. Repair stripe damage or pavement smudges caused by traffic according to GDOT [Subsection 652.3.06](#).

D. Appearance and Tolerance of Variance

Continually deviating from stated dimensions is cause for stopping the work and removing the nonconforming stripe. (See GDOT [Section 656](#).) Adhere to the following measurements:

1. Width

Do not lay stripe less than the specified width. Do not lay stripe more than 1/2 in over the specified width.

2. Length

Ensure that the 10ft painted skip stripe and the 30ft gap between painted segments vary no more than \pm 1ft each.

3. Alignment

- a. Ensure that the stripe does not deviate from the intended alignment by more than 1 in on tangents or curves of 1 degree or less.
- b. Ensure that the stripe does not deviate by more than 2 in on curves exceeding 1 degree.

652.3.06 Quality Acceptance

Ensure that stripes and segments of stripes are clean-cut and uniform. Markings that do not appear uniform or satisfactory, either during the day or night, or do not meet specifications, will be corrected at the contractor's expense. Work will be subject to application rate checks for both paint and beads.

The following will be accepted:

- Sections of painted stripe, words, and symbols that have dried so that paint will not be picked up or marred by vehicle tires
- Sections placed according to these specifications

Section 652—Painting Traffic Stripe

The Contractor will be relieved of responsibility for maintenance on accepted sections.

A. Correction of Alignment

When correcting a deviation that exceeds the permissible tolerance in alignment, do the following:

1. Remove the affected portion of stripe, plus an additional 25 ft. in each direction.
2. Paint a new stripe according to these Specifications.

Remove the old stripe according to GDOT [Section 656](#).

B. Removal of Excess Paint

Remove misted, dripped, or spattered paint to Bibb County's satisfaction. Do not damage the underlying pavement during removal.

Refer to the applicable portions of GDOT [Section 656](#).

652.3.07 Omitted

652.4 Measurement

Roadway striping is measured by the linear mile of painted roadway. The contractor shall measure the length of roadway using an acceptable method or device approved by the Engineer. On curves, chord measurements not exceeding 100 linear feet may be used.

Traffic stripe and markings, complete in place, are measured and accepted for payment as follows:

A. Solid Traffic Stripe

Solid traffic stripes are included in the overall linear length of roadway.

B. Skip Traffic Stripe

Skip traffic stripes are included in the overall linear length of roadway.

C. Pavement Markings

Markings are words and symbols completed and are measured as separate line items in the bid schedule.

- Each letter of words.
- Each directional arrow.
- Linear feet of cross walk measured along the centerline of the cross walk.
- Each stop bar.
- Linear feet of hatching measured along the center line of the hatching when located in the middle of the driving surface but along the longest curve when located at an intersection

652.4.01 Omitted

652.5 Payment

Payment will be full compensation for the work under this Section, including the following:

1. Cleaning and preparing surfaces
2. Furnishing materials, including paints, beads, and thinners
3. Applying, curing, and protecting paints
4. Protecting traffic, including providing and placing necessary warning signs
5. Furnish tools, machine and other equipment necessary to complete the project

652.5.01 Submittals

| Para # | Description | Date Required | Inspector Checklist |
|--------|----------------|---------------|---------------------|
| 652.1 | Striping video | 5 days prior | _____ |
| 652.2 | Paint Mix | 21 days prior | _____ |

Section 652—Painting Traffic Stripe

652.2

Reflective Glass Beads

21 days prior

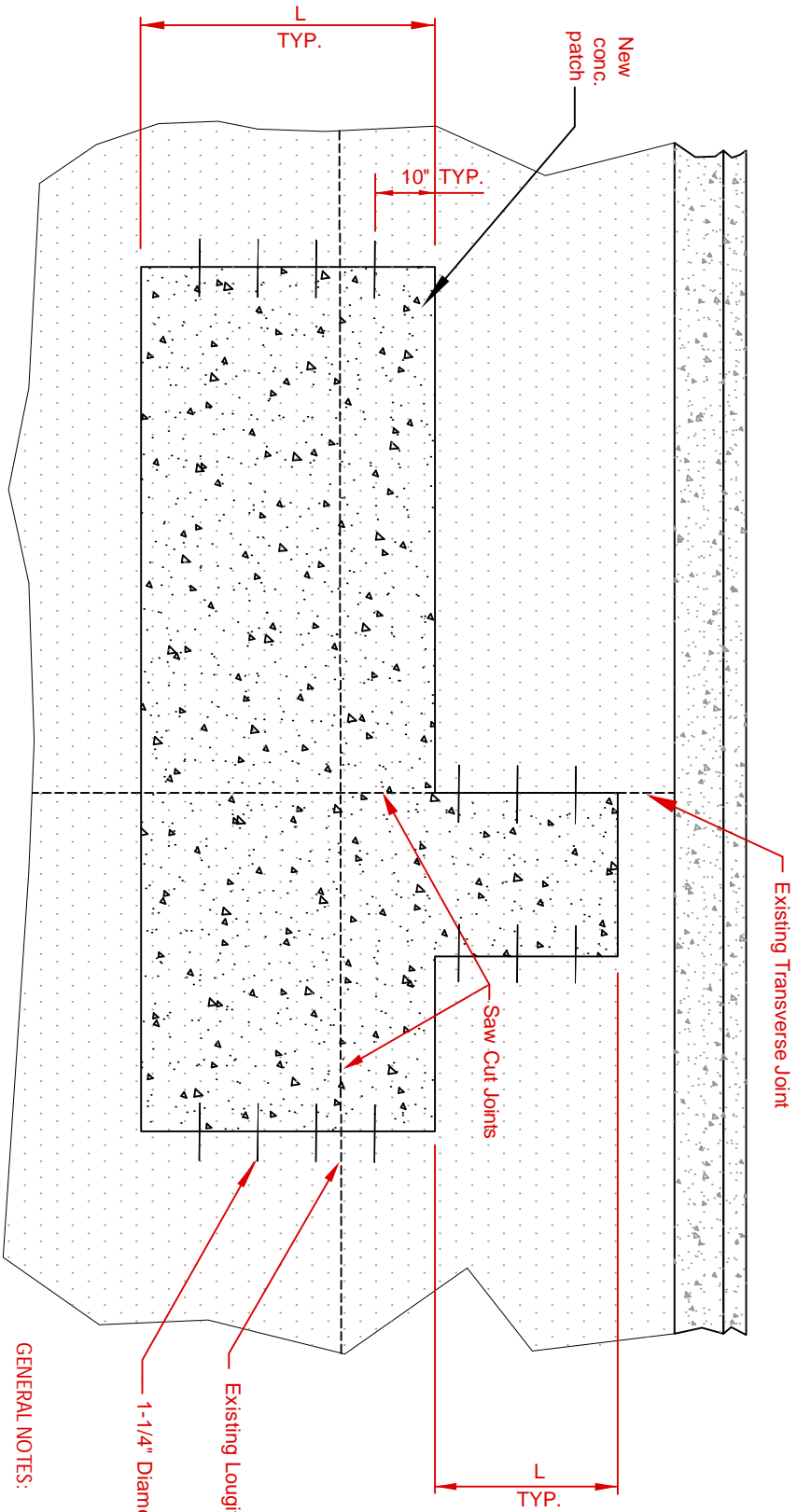
General Notes:

1. The contractor shall verify all utility locations prior to construction, by calling the Utility Protection Center.
2. The contractor will be responsible for coordinating any utility relocations before work begins on said affected roadways.
3. The contractor shall be responsible for furnishing all labor, material; equipment and incidental items needed to provide adequate construction signing, barricades, traffic control devices and other related items for the project area, during the construction period.
4. The contractor shall provide reasonable access to residential, commercial and public properties in the project area. During construction, traffic may be restricted to local traffic, only with approval of the Traffic Engineer.
5. Any surplus excavation shall become the property of the contractor, and disposal shall be the contractor's responsibility at no additional cost.
6. The contractor shall backfill behind replaced curbs as needed.
7. The contractor shall level all disturbed areas with topsoil and hand rake to a uniform appearance.
8. All work shall be done according to the Macon Bibb County provided specifications.
9. Contractor shall be paid at unit bid prices unless otherwise designated.
10. A compactive effort to the satisfaction of Macon-Bibb County will be made on the subgrade/base of every patch before new material is placed.
11. Macon-Bibb County reserves the right to delete any work from this contract.
12. Some streets may have concrete, brick or cobble stone under the existing asphalt.
13. As time is of the essence the contractor agrees to begin work immediately and keep work in progress until the completion of said contract.
14. The contractor shall obtain permission for all storage on private property but must provide Macon-Bibb County with a copy of the written agreement between himself and the private property owner. Materials stored on Macon-Bibb County right of way must be permitted by the appropriate authority (Macon-Bibb Engineering & Macon-Bibb Sheriff's Offices).
15. Macon-Bibb County will not incur any liability for any of the contractor's stolen or damaged property while stored on public right of way.
16. The contractor will be responsible for the installation of ADA approved intersection sidewalk access points where applicable.

2018 LMIG Project Report
Macon-Bibb

| Road Name | Beginning | Ending | Description of Work |
|------------------|------------------|---------------|---|
| Old Forsyth Rd | Rivoli Dr | Forsyth Rd | 1840 SY of demo, disposal & replacement of 8" concrete slabs in random areas along 18' concrete driving surface |
| Park St | Napier Ave | Forsyth Rd | 621 SY of demo, disposal & replacement of 8" concrete slabs in random areas along 20' concrete driving surface |
| Anthony Rd | Felton Ave | Pio Nono Ave | 448 SY of demo, disposal & replacement of 8" concrete slabs in random areas along 33' concrete driving surface |
| Stanislaus Cir | Pio Nono Ave | Pio Nono Ave | 358 SY of demo, disposal & replacement of 8" concrete slabs in random areas along 30' concrete driving surface |
| Hillandale Cir | Pierce Ave | Pierce Ave | 446 SY of demo, disposal & replacement of 8" concrete slabs in random areas along 20' concrete driving surface |

NOTE: Sawed joints do not require dowels.



TYPICAL LESS THAN FULL WIDTH SLAB REPLACEMENT DETAIL

| | |
|-----------------|--------------|
| L = 0'-19" | No Dowel |
| L = 20" - 28" | One Dowel |
| L = 29" - 44" | Two Dowels |
| L = 45" - 60" | Three Dowels |
| L = 61" - 76" | Four Dowels |
| L = 77" - 92" | Five Dowels |
| L = 93" - 108" | Six Dowels |
| L = 109" - 120" | Seven Dowels |
| L = 121" - 136" | Eight Dowels |
| L = 137" - 152" | Nine Dowels |

Existing Transverse Joint

Saw Cut Joints

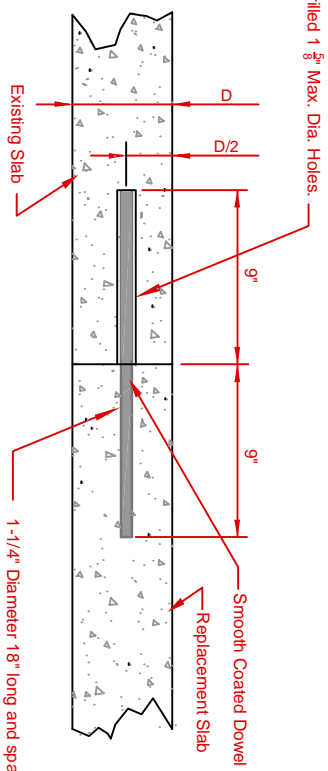
Existing Longitudinal Joint

1-1/4" Diameter 18" long and spaced evenly O.C.

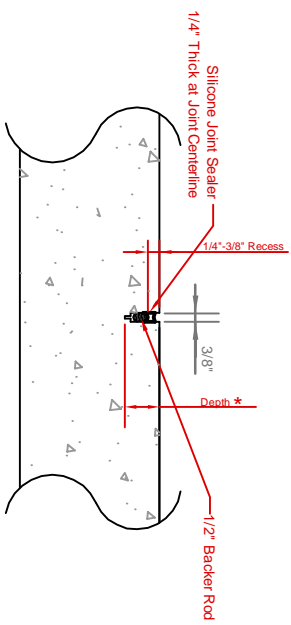
GENERAL NOTES:

1. The engineer will determine which slabs to remove and replace and whether to use full or partial slab replacements. (Partial slab replacements are to be used to the maximum extent possible). For partial slab replacements, the engineer will determine the smallest limits of removal necessary to repair the failed area using the guidelines for slab replacement.

Dowels will be epoxied in place in drilled 1 3/8" Max. Dia. Holes.

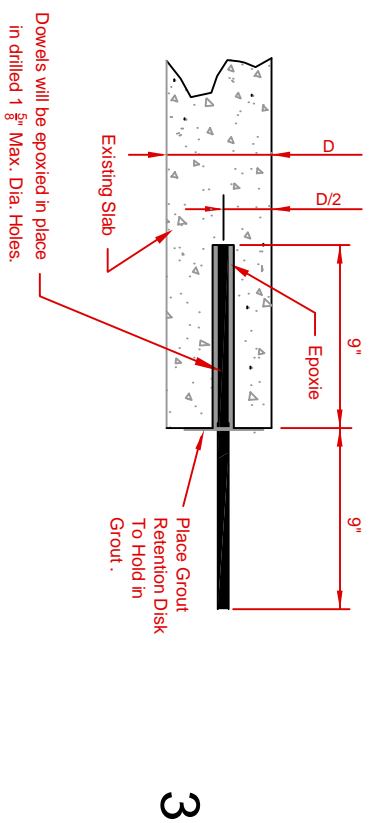
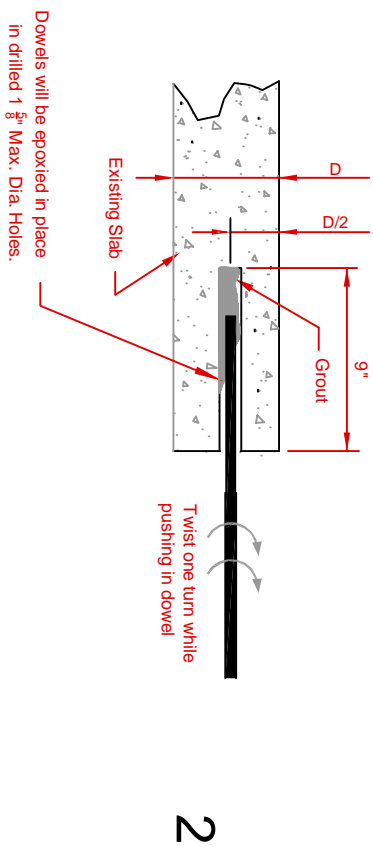
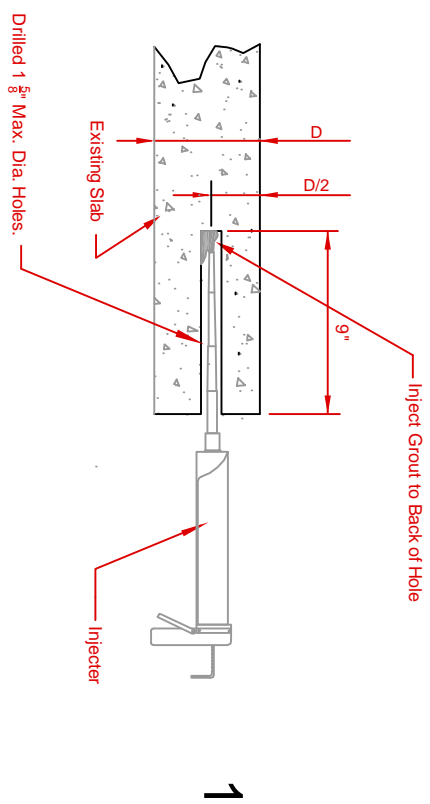


Replacement Slab Joint



* Depth of cut shall be 1/4 the slab thickness for slabs less than seven inches thick and 1/3 the slab thickness for slabs greater than seven inches.

Sawed Contraction Joint



Dowel Details

Section 609—Removal of Portland Cement Concrete Roadway Slabs

609.1 General Description

This work includes removing the full depth of existing jointed Portland cement concrete pavement slabs of various lengths. The slabs to be removed are shown on the Plans or are designated by the Engineer.

609.1.01 Definitions

General Provisions 101 through 150.

609.1.02 Related References

A. Standard Specifications

[Section 886—Epoxy Resin Adhesives](#)

B. Referenced Documents

General Provisions 101 through 150.

609.1.03 Submittals

General Provisions 101 through 150.

609.2 Materials

General Provisions 101 through 150.

609.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

609.3 Construction Requirements

609.3.01 Personnel

General Provisions 101 through 150.

609.3.02 Equipment

General Provisions 101 through 150.

609.3.03 Preparation

General Provisions 101 through 150.

609.3.04 Fabrication

General Provisions 101 through 150.

609.3.05 Construction

The Engineer will determine which slabs to remove and replace and whether to use full or partial slab replacement.

A. Partial Slab Replacements

The Engineer will determine the limits of removal. Remove and replace at least 6 ft (1.8 m) of slab measured longitudinally and 12 ft (3.6 m) measured transversely.

Any slab removal beyond the limits determined by the Engineer will be at no additional cost to the Department for removal and replacement.

1. Saw the slab full depth longitudinally along the center-line joint and shoulder joint and transversely along the area marked for removal, including transverse joints where applicable.
 - a. If approved by the Engineer, omit the shoulder joint cut if doing so does not damage the shoulder.

Section 609—Removal of Portland Cement Concrete Roadway Slabs

- b. If necessary and if approved by the Engineer, make additional cuts within the removal area to remove the damaged slab more easily.
2. Thoroughly remove saw slurry and other contaminants from the over-cutting beyond limits of the removal area. Repair by filling the overcuts with Type II epoxy adhesive that meets the requirements of [Section 886](#).
Clean and fill the overcuts as soon as possible, but no later than when the joints are sealed.
3. Remove the damaged slabs by lifting. Do not fragment the slabs for removal unless approved by the Engineer.
4. Drill holes in each slab section to accommodate the expanding type lift anchors. Remove sections nearest the centerline joint first to minimize damage to the shoulder.

NOTE: During removal, avoid damaging the pavement base, shoulder, or sides that will not be removed.

5. Repair the damaged shoulder area to the Engineer's satisfaction at the Contractor's expense.
6. If the adjacent concrete pavement is damaged during removal, enlarge the removal area to include the damaged sections of adjacent concrete.
All applicable rules regarding the minimum size of remaining slab will apply as shown on the Plans.
Remove and replace additional slab lengths damaged from removing the initial slab at the Contractor's expense.
7. Remove loose underlying base material to produce a sound, well-compacted base.
8. Thoroughly tamp the material loosened in the removal process to the Engineer's satisfaction before replacing the slab.
9. Dispose of the slabs and underlying base material removed during this work.
10. Obtain the disposal site and necessary permits and agreements.

609.3.06 Quality Acceptance

General Provisions 101 through 150.

609.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

609.4 Measurement

Slabs and portions of slabs removed are measured by the square yard (meter) using the average squared dimensions. Removing underlying base material and cleaning and repairing overcuts is not measured for payment.

609.4.01 Limits

General Provisions 101 through 150.

609.5 Payment

Slabs and portions of slabs, measured as specified in [Sub section 609.4, "Measurement"](#) above, will be paid for at the Contract Unit Price bid. Payment is full compensation for sawing, cleaning, repairing over-cutting, and removing and disposing of the concrete and any underlying base material.

Payment will be made under:

| | | |
|--------------|---------------------|-------------------------|
| Item No. 609 | Remove roadway slab | Per square yard (meter) |
|--------------|---------------------|-------------------------|

609.5.01 Adjustments

General Provisions 101 through 150.

Section 653—Thermoplastic Traffic Stripe

653.1 General Description

This work includes furnishing and applying thermoplastic reflectorized pavement marking compound. Ensure that 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 compound extruded or mechanically sprayed on the pavement that cools to pavement temperature. When combined with glass spheres it produces a reflectorized pavement marking.

Short Lines: Crosswalks, stop bars, arrows, symbols, and crosshatching. Extrude short lines rather than spraying them on. Unless otherwise specified, spray all other lines.

653.1.02 Related References

A. Standard Specifications

[Section 652—Painting Traffic Stripe](#)

B. Referenced Documents

[QPL 46](#)

Federal Test Method Standard 141, Method 4252

ASTM D 1155

ASTM D 620

ASTM D 570

ASTM D 256

ASTM D 2240

ASTM E 28

ASTM 121

653.1.03 Submittals

Ensure that the producers of the thermoplastic compound and 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. Final Acceptance, however, will be based on satisfactory test results from samples obtained by the Department before delivery.

653.2 Materials

A. General Characteristics of Thermoplastic

1. Deterioration

Use thermoplastic material with the following characteristics:

- a. Does not deteriorate upon contact with:
 - Pavement materials
 - Petroleum droppings from traffic
 - Chemicals, such as sodium chloride or calcium chloride, used to prevent formation of ice on roadways or streets
- b. Does not scorch, discolor, or deteriorate if kept at the manufacturer's recommended application temperature, or at least 375 °F (190 °C), for up to 4 hours.
- c. Has a temperature versus viscosity characteristic that remains constant from batch to batch through four re-heatings.

Section 653—Thermoplastic Traffic Stripe

2. Fumes

Use material that in the plastic state does not give off fumes that are toxic or harmful to persons or property.

B. Detailed Characteristics of Thermoplastic

1. Material Composition

Use material binder with the following characteristics:

- A mixture of synthetic resins, with at least one resin that is solid at room temperature, and high boiling point plasticizers
- A total binder content of 18 percent to 35 percent by weight
- A pigmented binder that is well-dispersed and free of dirt, foreign objects, or ingredients that cause bleeding, staining, or discoloration

The binder shall be Type A—alkyd. Ensure that at least 33% of the binder composition or at least 8% by weight of the entire material formulation is a maleic-modified glycerol ester of resin. Ensure that the finished thermoplastic pavement marking material is not adversely altered by contact with oily pavement materials or by contact from oil dropping onto the pavement surface from traffic.

Ensure that the filler has the following characteristics:

- White calcium carbonate or equivalent
- Compressive strength of 5,000 psi (34.5 MPa)

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

3. Drying Time

When applied at a temperature range of 400 °F to 425 °F (204 °C – 218 °C) and a thickness of 1/8 in. to 3/16 in. (3 mm to 5 mm), the material shall set to bear traffic in a maximum of 2 minutes when the air temperature is 50 °F ± 3 °F (10 °C ± 2 °C) and shall set to bear traffic in a maximum of 10 minutes when the air temperature is 90 °F ± 3 °F (32 °C ± 2 °C).

4. ReflectORIZATION

Ensure that during manufacturing, reflectorizing glass spheres were mixed into the compound to the following specifications:

- At least 16 percent by weight using glass spheres with a minimum refractive index of 1.65
- At least 25 percent by weight using glass spheres with a minimum refractive index of 1.50

C. Physical Requirements of Thermoplastic

1. Color

Confirm the color of thermoplastic as follows:

- a. White thermoplastic material contains at least 8 percent by weight titanium dioxide that meets the requirements of ASTM D 476, Type II, Rutile. The white thermoplastic material shall be pure white and free from dirt or tint.

The material, when compared to the magnesium oxide standard using a standard color spectrophotometer according to ASTM D 4960, shall meet the following:

| Scale | Definition | Magnesium Oxide Standard | Sample |
|-------|-------------|--------------------------|---------|
| Rd | Reflectance | 100 | 75 min. |

Section 653—Thermoplastic Traffic Stripe

| | | | |
|---|---------------------|---|-------------|
| a | Redness-Greenness | 0 | -5 to + 5 |
| b | Yellowness-Blueness | 0 | -10 to + 10 |

Compare yellow material to match Federal Test Standard Number 595, Color 13538.

2. Color Retention

Use thermoplastic stripe tested for color retention as follows:

- a. Test specimens prepared from samples submitted according to ASTM D 620 by the Department Inspector.
- b. Use an ultraviolet light source as specified in the test procedure, or use a 275 watt sunlamp with a built-in reflector.
- c. Ensure that after 100 hours of exposure to the light source, the test specimens show no color change when compared to an unexposed specimen.

3. Water Absorption

Ensure that materials have no more than 0.5 percent by weight of retained water when tested by ASTM D 570, procedure (a).

4. Softening Point

Ensure that materials have a softening point of at least 175 °F (79 °C) as determined by ASTM E 28.

5. Specific Gravity

Ensure that the specific gravity of the thermoplastic compound at 77 °F (25 °C) is between 1.9 to 2.5.

6. Impact Resistance

Use material with an impact resistance of at least 10 in-lbs at 77 °F (1.13 N·m at 25 °C), tested as follows:

- a. Heat for 4 hours at 400 °F (204 °C).
- b. Cast into bars of 1 in² (625 mm²) cross sectional area, 3 in (75 mm) long.
- c. Place with 1 in (25 mm) extending above the vise in a cantilever beam (Izod type) tester using the 25 in-lbs (2.82 N·m) scale. This instrument is described in ASTM D 256.

7. 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 at 115 °F (45 °C). Apply the Durometer and 4.4 lb. (2 kg) load to the specimen and the reading shall be between 50 to 75 units, after 15 seconds.

8. Low Temperature Stress Resistance

- a. Furnish sample test blocks as follows:
 - 1) Coat the samples using the same method as the planned installation of the compound.
 - 2) Coat the samples with at least 32 in² (206 mm²) of the compound.
- b. Have the samples tested as follows:
 - 1) Immerse a sample in cold water for one hour.
 - 2) Immediately place the sample in a freezer chest or other insulated cold compartment and maintain at a temperature of -20 °F (-29 °C) for 24 hours.
 - 3) After 24 hours, remove the sample and bring it to normal room temperature.

Following the test, confirm that the sample does not crack, flake, or fail to adhere to the substrate.

9. Reheating

Ensure that the compound does not break down, deteriorate, scorch, or discolor if held for 6 hours at the plastic temperature of 425 °F (218 °C); or if reheated up to the plastic temperature 4 times.

10. Abrasion Resistance

Have the material tested for abrasion resistance as follows:

- a. Ensure that the maximum loss of the material does not exceed 0.4 grams when subjected to 200 revolutions on a Taber Abraser at 77 °F (25 °C), using H-22 Calibrade wheels that are weighted to 500 grams.
- b. Keep the wearing surface wet with distilled water throughout the test.

Section 653—Thermoplastic Traffic Stripe

- c. Prepare the panel by forming a representative lot of material at a thickness of 0.125 in. (3.18 mm) on a 4 in (100 mm) square steel plate with a thickness of 0.050 ± 0.001 in ($1.27 \text{ mm} \pm 0.03 \text{ mm}$), on which a primer has been previously applied.

11. Yellowness Index

The white thermoplastic material shall not exceed a yellowness index of 0.12 according to AASHTO T 250.

12. Flowability

After heating the thermoplastic material for 240 ± 5 minutes at $425 \text{ °F} \pm 3 \text{ °F}$ ($218 \text{ °C} \pm 2 \text{ °C}$) and testing the flowability, ensure that the white thermoplastic has a maximum of 21 percent residue according to AASHTO T 250.

13. Flowability-Extended Heating

After heating the thermoplastic material for 8.0 ± 0.5 hours at $425 \text{ °F} \pm 3 \text{ °F}$ ($218 \text{ °C} \pm 2 \text{ °C}$), while stirring the last 6 hours and testing for flowability, ensure that the thermoplastic has a maximum percent residue of 28 according to AASHTO T 250.

14. Storage Life

The material shall meet the requirements of this specification for 1 year. Ensure that the thermoplastic melts uniformly with no evidence of skins or unmelted particles during the 1-year period.

D. Physical Requirements of Glass Spheres

1. Premixed Glass Spheres

Ensure that the compound has been manufactured with glass spheres in the proportion specified in [Subsection 653.2.B.4. —Reflectorization.I](#). The glass spheres contained in the material shall meet the following requirements:

- Index of Refraction.** Determine the index of refraction of the premixed glass spheres by the liquid immersion method at 77 °F (25 °C).
- Roundness.** Ensure that the minimum percentages of premixed glass spheres are true spheres according to the following table:

| Minimum Index of Refraction | Percent of Overall Beads | Percent of Beads Retained on any Sieve |
|-----------------------------|--------------------------|--|
| 1.65 | At least 75% | At least 70% |
| 1.50 | At least 70% | At least 60% |

- Imperfections.** Ensure that no more than 5 percent of the spheres show air inclusions, bubbles, lap lines, chill wrinkles, or other imperfections when viewed through a 60-power microscope in the refractive index liquid.
- Foreign Matter.** Ensure that the quantity of foreign matter does not exceed 1 percent.
- Gradation.** Have the beads tested using ASTM: D 1214 to ensure they have the following gradations:

| U.S. Sieve Standard Sieve Size | Percent Passing |
|--------------------------------|-----------------|
| No. 16 (1.18 mm) | 100 |
| No. 30 (600 μm *) | 60 to 90 |
| No. 50 (300 μm) | 15 to 40 |
| No. 80 (180 μm) | 0 to 10 |
| No. 100 (150 μm) | 0 to 5 |
| * μ = micro meter | |

- Chemical Resistance.** Use material manufactured with glass spheres that withstand immersion in water and acids without corroding or etching, and withstand sulfides without darkening or decomposing. Have the chemical resistance tested by placing a 3 g to 5 g sample in each of three glass beakers or porcelain dishes and immersing as follows:

- Cover the first with distilled water.

Section 653—Thermoplastic Traffic Stripe

- Cover the second with a 3N solution of sulfuric acid.
- Cover the third with a solution of 50 percent sodium sulfide, 48 percent distilled water, and 2 percent Aerosol 1B or similar wetting agent.

Ensure that after one hour no darkening, hazing, or other evidence of instability is evident when examined microscopically.

2. Drop-On Glass Spheres

Ensure that these spheres meet the requirements of [Subsection 652.2](#).

E. Requirements of Sealing Primer

Place the particular type of two-part epoxy 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. Spray Application Machine

Ensure that each spray application machine is equipped with the following features:

- Parts continuously mix and agitate the material.
- Truck-mounted units for lane, edge, and center lines can operate at a minimum of 5 mph (8 kph) while installing striping.
- 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 to the surface of the completed stripe using a dispenser attached to the striping machine to automatically dispense the beads instantaneously upon the installed line. Synchronize the glass sphere dispenser cutoff with the automatic cutoff of the thermoplastic material.

Section 653—Thermoplastic Traffic Stripe

C. Special Kettles

Use special kettles for melting and heating the thermoplastic material. Kettles equipped with automatic thermostatic control devices provide positive temperature control and prevent 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 that require the equipment. Use hand equipment approved by the Engineer.

Ensure that 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

General Provisions 101 through 150.

653.3.04 Fabrication

General Provisions 101 through 150.

653.3.05 Construction

A. General Application

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. All new Portland Cement Concrete pavement surfaces shall be 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.

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. Binder-Sealer

To ensure optimum adhesion, apply a binder-sealer material before installing the thermoplastic in each of the following cases:

- Extruded thermoplastic
- Where directed by the Engineer for sprayed thermoplastic
- Old asphaltic concrete pavements with exposed aggregates

Section 653—Thermoplastic Traffic Stripe

- Portland cement concrete pavements as directed by the Engineer

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](#).

To ensure optimum adhesion, apply a two-part epoxy binder-sealer on all Portland cement concrete pavements for either sprayed or extruded thermoplastic material.

Apply the epoxy 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

The old stripe may 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.

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. Film Thickness

a. Maintain the following minimum average film thicknesses on all open graded asphalt concrete friction courses:

- 0.120 in (3.0 mm)* for lane lines
- 0.090 in (2.3 mm)* for edge lines
- 0.150 in (3.8 mm)* for gore area lines

b. Maintain the following minimum average film thicknesses on all other pavement types:

- 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

(See below for * reference.)

Compute the minimums by the amount of material used each day, as follows:

| | |
|---------------------------------|--|
| (For 5 in wide stripe) | |
| * Average Film Thickness (in) = | $[(\text{lbs used}) \div (\text{total linear feet})] \times 0.236$ |
| (For 125 mm wide stripe) | |
| * Average Film Thickness (mm) = | $[(\text{kg used}) \div (\text{total linear meters})] \times 4.0$ |
| (For 10 in wide stripe) | |
| * Average Film Thickness (in) = | $[(\text{lbs used}) \div (\text{total linear feet})] \times 0.118$ |
| (For 250 mm wide stripe) | |
| * Average Film Thickness (mm) = | $[(\text{kg used}) \div (\text{total linear meters})] \times 2.0$ |

8. Glass Spheres

- Apply glass spheres to installed stripe surface at a minimum rate of 14 lbs of spheres to each 100 square feet ((700 g/m²) of thermoplastic material.
- Apply the glass sphere top-coating with a pressure-type gun specifically designed for applying glass spheres that will embed at least one-half of the sphere's diameter into the thermoplastic immediately after the material has been applied to the pavement.

B. Removing Existing Stripe

Remove existing stripe according to [Section 656](#).

Remove 100 percent of existing traffic stripe from:

Section 653—Thermoplastic Traffic Stripe

- 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

No traffic stripe shall be less than the specified width and shall not exceed the specified width by more than 1/2 in (13mm). The length of the 10 ft (3 m) segment for skip stripe and the 30 ft (9 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 tangents and on curves up to and including 1 degree (radius of 1745 m or greater). 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).

Stop work when deviation exceeds the above dimensions, and remove the nonconforming stripe.

653.3.06 Quality Acceptance

Segments of the thermoplastic traffic stripe that have been placed according to the Plans and Specifications may be accepted 30 days after the required work is complete in that segment.

If 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.

653.3.07 Contractor Warranty and Maintenance

After segments are accepted, the Contractor will be relieved of maintenance on those segments.

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

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 (10 ft [3 m] segment and 30 ft [9 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.

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

Section 653—Thermoplastic Traffic Stripe

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 | Thermoplastic pavement markings, words, and symbols (color), type _____ | Per each |
| Item No. 653 | Thermoplastic traffic stripe | Per square yard (meter) |

653.5.01 Adjustments

General Provisions 101 through 150.

Section 833—Joint Fillers and Sealers

833.1 General Description

This section includes the requirements for joint fillers and sealers, as follows:

| Joint Sealers | Joint Fillers |
|---|--|
| Hot-poured Preformed elastic Silicone sealant and bond breaker For bridge decks: Neoprene Ethylene propylene diene monomer For inductive loops: Polyurethane sealant | Preformed Preformed foam Water-blown urethane Elastomeric polymer type joint compound |

833.1.01 Related References

A. Standard Specifications

[Section 106— Control of Materials](#)

[Section 461— Sealing Roadway and Bridge Joints and Cracks](#)

B. Referenced Documents

| AASHTO | | ASTM | | |
|--------|--------|-------|--------|--------|
| M 153 | C 679 | D 471 | D 822 | D 1622 |
| M 213 | C 793 | D 573 | D 1056 | D 1623 |
| M 220 | C 1016 | D 746 | D 1171 | D 1752 |
| T 42 | D 412 | D 792 | D 1149 | D 2240 |

[GDT 15](#)

[GDT 47](#)

[GDT 62](#)

[GDT 70](#)

[GDT 106](#)

[QPL 20](#)

[QPL 66](#)

[QPL 75](#)

833.2 Materials

833.2.01 Preformed Joint Filler

A. Requirements

General Provisions 101 through 150.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Use preformed joint filler that meets either AASHTO M 153 or AASHTO M 213 requirements. For a list of sources, see [QPL 20](#).

Ensure that cellulose fiber types meet the requirements of AASHTO M 213 (except for the asphalt content) and contain minimums of 0.2 percent zinc borate as a preservative and 1.5 percent waterproofing wax.

D. Materials Warranty

General Provisions 101 through 150.

833.2.02 Hot-Poured Joint Sealers

A. Requirements

Type

Use a hot-poured joint sealer that is a mixture of materials compatible with asphalt, with or without rubber. The sealer shall have the following characteristics:

Forms a resilient and adhesive compound

Effectively seals joints and cracks in pavements against moisture during repeated cycles of expansion and contraction

Does not flow from the joint and cannot be picked up by vehicle tires at an ambient temperature of 125 °F (50 °C)

Compound Characteristics

Use a compound that has a uniform pouring consistency capable of completely filling joints without forming large air holes or discontinuities.

Do not pour if the compound temperature is above 450 °F (230 °C).

Follow the pouring temperature and safe heating temperature set by the compound manufacturer for each lot or batch.

Be sure the temperatures are shown on the label. The safe heating temperature is defined as the highest temperature to which the sealing compound can be heated and still meet all the requirements.

Physical Characteristics

Use a hot-poured joint sealer that has the following properties:

| Property | Required Measurement |
|--|---|
| Penetration | Less than 0.35 in (9 mm.) |
| Flow | Less than 0.12 in (3 mm). |
| Resilience | Minimum recovery of 60%. |
| Bond to concrete 0 °F, ± 2 °F (-18 °C, ± 1 °C) | The compound does not separate or have gaps within or between the compound and the blocks. |
| Compatibility (with asphaltic concrete) | Adhesion does not fail. Oily exudate does not form at the interface between the sealing compound and the asphaltic concrete. The sealant does not soften or have deleterious effects on the asphaltic concrete. |

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will test as follows:

| Test | Method |
|--------------------------|------------------------|
| Hot-poured joint sealers | GDT 62 |

D. Materials Warranty

General Provisions 101 through 150.

833.2.03 Elastomeric Polymer Type Joint Compound

A. Requirements

1. Type

Furnish elastomeric polymer-type joint sealing compound in two components—a base compound and a curing agent.

- a. Base compound: A gasoline-resistant elastomeric polymer modified with plasticizers, activators, and inert fillers.

Curing agent: A blend of accelerators and extenders.

Compound Characteristics

Use a sealing compound that can be mixed to a homogenous consistency at the site and applied by an approved mechanical device or poured and troweled manually.

- a. If a compound is to be machine-mixed and applied, it shall have a minimum work life of 5 minutes at 80 °F, ± 5 °F (27 °C, ± 3 °C).

If a compound is to be manually mixed and applied, it shall have a minimum work life of 30 minutes at 80 °F, ± 5 °F (27 °C, ±3 °C).

Use a mixture that completely fills the joints without forming air holes or discontinuities, when mixed according to the manufacturer’s instructions.

Use a compound that is self-leveling when placed in the joint, but that does not show appreciable flow or movement along a superelevated joint.

Use material that does not soften or show any apparent defect after being immersed in water for 7 days.

Use a material that forms a tack-free, rubber-like compound that seals pavement or bridge joints within 24 hours of application.

Physical Properties

Use material that has the following physical properties:

| Property | Required Measurement |
|--|---|
| Cone penetration | Between 0.1 in (2.5 mm) and 0.39 in (10 mm) |
| Flow | No appreciable flow |
| Resilience (air- and oven-cured samples) | Minimum recovery of 75% |
| Bond | No cracks, separation, or other opening over 1/ 4 in. (6 mm) deep in the sealer or between the sealer and block |
| Solubility | Not to exceed 2 percent; no apparent defects that affect the material as a sealant |

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will test as follows:

| Test | Method |
|----------------------------|------------------------|
| Elastomeric joint compound | GDT 15 |

D. Materials Warranty

General Provisions 101 through 150.

833.2.04 Preformed Elastic Joint Sealer

A. Requirements

This section also covers adhesives and lubricants for the sealers.

1. Type

Use a preformed elastic joint sealer that is a vulcanized elastomeric compound using polymerized chloroprene as the only basic elastomer. The joint sealers include both open and closed cell sealers.

Certification

- a. Submit certified test results of each lot of the joint sealer materials furnished to each Project, either from your tests or from the manufacturer of the preformed joint sealer.

The Department will conduct the joint sealer recovery test on random samples from each shipment received or each manufacturer’s lot.

Submit certified test results of each lot of the lubricant furnished to each Project, either from your tests or from the manufacturer of the joint sealer lubricant/adhesive or adhesive.

Preformed Open Cell Joint Sealer

- a. Bridge and Roadway Seals: Use sealer that meets the following physical requirements:

| Physical Property | Requirement |
|---|--------------------------------------|
| Tensile strength | Min. 2,000 psi (14 MPa) |
| Elongation at break | Min. 250% |
| Hardness, Type A durometer | 55±5 |
| Oven aging, 70 hours @ 212 °F (100 °C) Tensile strength, change Elongation, change Hardness, change | Max. -30% Max. -40% +10 points |
| Oil swell, ASTM oil No. 3: Volume change, 70 hrs. @ 212 °F (100 °C) | Max. 80% |
| Ozone resistance, 20% strain: 300 ppm in air, 70 hrs. @ 100 °F (38 °C) (wipe with solvent to remove surface contaminants) | No cracks |
| Joint sealer recovery under 50% deflection: Recovery after 70 hrs. @ 212 °F (100 °C) Recovery after 72 hrs. @ 14 °F (-10 °C) Recovery after 22 hrs. @ -20 °F (-29 °C) | Min. 85% Min. 88% Min. 83% |

Bridge Seals: Use a sealer that meets the following compression/deflection requirements:

| Nominal Size, in (mm) | Movement Capability*, in (mm) | Min. Force 4 lb. per linear inch (18 N per 25 mm) @ Width, in (mm) | Min. Force—30 lb per linear inch (133 N per 25 mm) Max. Force—100 lb per linear inch (445 N per 25 mm) @ Width in (mm) |
|--------------------------|----------------------------------|---|--|
| 2 (50) | 13/16 (20) | 1-7/8 (47) | 1-1/16 (27) |
| 2-1/2 (63) | 1-1/8 (28) | 2-3/8 (60) | 1-1/4 (32) |
| 3 (75) | 1-3/8 (34) | 2-7/8 (73) | 1-1/2 (38) |
| 3-1/2 (88) | 1-5/8 (40) | 3-3/8 (86) | 1-3/8 (34) |
| 4 (100) | 1-3/4 (43) | 3-7/8 (98) | 2-1/8 (54) |

*Movement capability is the movement allowed within the widths of the specified maximum and minimum forces. The design maximum and minimum joint width is based on these widths. The installation width depends on the temperature at the time of installation.

Roadway Seals: Use a compression/deflection sealer that accommodates the movement specified on the Plans with a minimum force of 4 lbs per linear inch (18 N per linear 25 mm), not exceeding 20 lbs per linear inch (89 N per linear 25 mm), exerted on the joint faces.

Preformed Closed Cell Joint Sealer for Roadways

- a. Use a preclosed cell polychloroprene joint sealer that meets the following physical requirements:

| Physical Property | Requirement |
|--|--|
| Dimensions | Meet Plan requirements for movement and depth |
| Surfaces | Smooth and clean |
| Compression/deflection | Allow movement specified on the Plans with a minimum force of 4 lbs per linear inch (18 N per linear 25 mm) exerted on the joint faces and maximum deflection equal to 50% of the original width |
| Joint sealer recovery under 50% deflection | 85% recovery (compressed to half original thickness for 22 hours @ 158 °F (70 °C), then compression removed for 48 hours at room temperature) 85% recovery after 22 hours at 0 °F (-18 °C) |
| Water absorption | Maximum 5% weight increase |
| Ozone resistance | No cracking after exposure of sample at 20% strain to 100 ppm ozone for 70 hours at 100 °F (38 °C) |

Joint Sealer Lubricants/Adhesives

- a. Lubricant/Adhesive for Preformed Roadway Seals: Use a lubricant/adhesive with the joint sealer that is a one-component polychloroprene compound, containing only soluble phenolic resins blended with antioxidants and acid acceptors in an aromatic, hydrocarbon solvent mixture. The lubricant shall have the following physical properties:

| Physical Property | Requirement |
|---|--------------------------------------|
| Average net weight per gallon (liter) | 7.84 lbs (940 grams) |
| Solid content | 22-28% by weight |
| Film strength Tensile strength Elongation before breaking | Min. 2,300 psi (16 MPa) Min. 750% |

Adhesive for Preformed Bridge or Roadway Seals: Use an adhesive that is a one-part moisture curing polyurethane and hydrocarbon solvent mixture with the following physical properties:

| Physical Property | Requirement |
|---------------------------------------|--|
| Average net weight per gallon (liter) | Min. 8 lbs (960 grams) |
| Solids content | Min. 72% by weight |
| Film strength (ASTM D 412) | 1,200 psi (8 MPa) |
| Elongation before breaking | 350% |
| Viscosity | Perform suitably with the installation equipment Remain fluid from 5 to 120 °F (-15 to 49 °C) |

Product Delivery

Deliver each lot of the lubricant/adhesive in containers plainly marked with the manufacturer’s name or trademark, lot number, and date of manufacture.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

1. Preformed Open Cell Joint Sealer

| Test | Method |
|---------------------------------|------------------------|
| Tensile strength and elongation | ASTM D 412 |
| Hardness | ASTM D 2240 |
| Oven-aging | ASTM D 573 |
| Oil swell | ASTM D 471 |
| Ozone Resistance | ASTM D 1149 |
| Joint sealer recovery | GDT 47 |
| Compression/Deflection | GDT 70 |

Preformed Closed Cell Joint Seals for Roadway

| Test | Method |
|--|------------------------|
| Compression/Deflection | GDT 70 |
| Joint sealer recovery (Run the hot recovery at 158 °F (70 °C) instead of 212 °F (100 °C). Allow seals to recover for 48 hours at room temperature before measuring.) | GDT 47 |
| Water Absorption | ASTM D 1056 |
| Ozone Resistance | ASTM D 471 |

Joint Sealer Lubricants/Adhesives

| Test | Method |
|---------------|------------|
| Film Strength | ASTM D 412 |

D. Materials Warranty

For joint sealer lubricants/adhesives:

1. Store the lubricant/adhesive at 50 ° to 80 °F (10 ° to 27 °C).
- Retest any lubricant/adhesive not used within 270 days of its manufacture.

833.2.05 Water-Blown Urethane Joint Filler

A. Requirements

1. Type

Furnish water-blown urethane joint filler in two components.

- a. Mix according to the manufacturer’s recommendations and use in pressure relief joints and regular expansion joints.

Mix the material at the site and foam it in the joint. Use closed-cell material.

Physical Requirements

- a. Use the material that meets the following requirements after mixing:

| Times at 80 °F, ± 5 °F (27 °C, ± 3 °C) | Minimum | Maximum |
|---|----------|------------|
| Cream time (interval after mixing the two components and before the material begins to expand). | 1 minute | 5 minutes |
| Expansion time (interval between when the material starts and stops expanding). | | 10 minutes |
| Tack free time (Determine whether the material is tack free by touching lightly. Begin | | 10 minutes |

| | | |
|--|--|--|
| the time requirement for tack free time when the expansion time ends.) | | |
|--|--|--|

Use material that meets the following requirements after curing:

| Physical Property | Requirement |
|--|---|
| Weight per cubic foot (meter) | 4lbs, ± 0.4 lbs (64 kg, ± 6 kg) |
| Compression to 50% thickness | 40 to 130 psi (275 to 895 kPa) |
| Recovery (compressed to 50% thickness, released, then tested 10 minutes later) | Min. 65% |
| Extrusion when compressed 50% | Max. 0.125 In (3 mm) |
| Moisture absorption | Max. 0.10 lb/ft. ² (490 g/m ²) of exposed area |

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

| Test | Method |
|-------------------------------|--|
| Weight per cubic foot (meter) | AASHTO T 42 [omit drying at 220 °F (104 °C)] |
| Compression to 50% thickness | AASHTO T 42 |
| Recovery after compression | AASHTO M 213 |
| Extrusion | AASHTO T 42 |
| Moisture absorption | AASHTO T 42 (calculate absorption based on exposed area) |

D. Materials Warranty

General Provisions 101 through 150.

833.2.06 Silicone Sealants and Bond Breakers

Prepare and install silicone and bond breakers according to [Section 461](#).

A. Requirements

1. Silicone

Furnish silicone sealant in a one-part or two part silicone formulation. Use sealant that is compatible with the surface to which it is applied. Do not use acid-cure sealants on Portland cement concrete.

- a. Use silicone that meets the physical requirements in [Table 1](#). For a list of silicone joint sealant sources, please see [QPL 66](#). Identify silicones as the following types:
 - 1) Type A—A one part, low modulus, non-sag silicone. Used to seal horizontal and vertical joints in Portland cement concrete pavements and bridges. Tooling is required.
 - 2) Type B—A one part, very low modulus, self-leveling silicone. Used to seal horizontal joints in Portland cement concrete pavements and bridges. Tooling is not normally required.
 - 3) Type C—A one part, ultra-low modulus, self-leveling silicone. Used to seal horizontal joints in Portland cement concrete pavements and bridges and joints between Portland cement concrete pavement and asphaltic concrete shoulders. Tooling is not normally required.
 - 4) Type D—A two part, ultra low modulus, self-leveling, rapid cure silicone. Used to seal horizontal joints in Portland cement concrete pavements and bridges and joints between Portland cement concrete pavement and asphaltic concrete shoulders. Tooling is not required.

Use sealant that is compatible with the surface to which it is applied. Do not use acid-cure sealants on Portland cement concrete.

Use silicone that meets the following physical requirements:

Table 1—Physical Requirements for Silicone Sealants

| Type Silicone | A | B | C | D |
|---|---|----------------|----------------|----------------|
| Tensile Stress at 150% Strain, Max. psi (kPa) (Note 1) | 45 (310) | 40 (275) | 15 (105) | 25 (175) |
| Durometer Hardness, Shore [0 °F and 77 °F ± 3 °F (-18 °C and 25 °C ± 2 °C)] (Note 1) | —All 10-25 | —00II 40-80 | —00II 20-80 | —00II 40-80 |
| Bond to Concrete Mortar, Min. psi (kPa) (Note 1) (Note 3) | 50 (345) | 40 (275) | 35 (240) | 35 (240) |
| Tack Free Time (Skin-over) (Max. Minutes) (Note 2) | 90 | 90 | 90 | 30 |
| Extrusion Rate (Min. Grams/Minute) (Note 4) | 75 | 90 | 100 | 200-550 |
| Non-volatile (Min. %) | 90 | 90 | 90 | 90 |
| Specific Gravity | 1.1 - 1.5 | 1.1 - 1.5 | 1.1 - 1.5 | 1.2 - 1.5 |
| Shelf Life (from date of shipment) | 6 Months | 6 Months | 6 Months | 6 Months |
| Movement Capability & Adhesion (Note 1) | No adhesive or cohesive failure after 10 cycles at 0 °F (-18 °C). | | | |
| Ozone and U.V. Resistance (Note 1) | No chalking, cracking or bond loss after 5,000 hours. | | | |
| Note 1: The cure time for these specimens shall be 21 days for Type A and 28 days for Type B, C and D. Specimens shall be cured at 77 °F ± 3 °F (25 °C ± 2 °C) and 50±5% relative humidity. | | | | |
| Note 2: At conditions of 77 °F ± 3 °F (25 °C ± 2 °C) and 50±5% relative humidity. | | | | |
| Note 3: Type C and D silicone shall also meet its bond strength requirement to asphalt concrete. | | | | |
| Note 4: Type D extrusion rate shall be within the range specified. | | | | |

Bond Breakers

Bond breakers shall be chemically inert and resistant to oils, gasoline, solvents, and primer, if one is required. Install silicone sealants over a bond breaker to prevent the sealant from bonding to the bottom of the joint.

- a. Use bond breakers that are chemically inert and resistant to oils, gasoline, solvents, and primer, if one is required.

Do not use bond breaker that will stain or adhere to the sealant.

Use either a backer rod or tape bond breaker.

1) Backer Rods

| | |
|--------|---|
| Type L | Closed-cell, expanded polyethylene foam |
| Type M | Closed-cell, polyolefin foam with a closed-cell skin over an open-cell core |

Use backer rods that meet the following physical requirements:

| Physical Property | Requirement |
|-------------------|--|
| Density | 2 lb/ft ³ (30 kg/m ³)min. |
| Tensile strength | 25 psi (170 kPa) min. |
| Water absorption | 0.02 g/cm ³ max. |

2) Bond Breaking Tapes

Type N bond breaking tapes are made from extruded polyethylene with a pressure-sensitive adhesive on one side.

Bond breaking tapes may be used with all three types of silicone, but is suitable for bridge joints only.

Bond breaking tapes shall have a minimum thickness of .005 in (0.13 mm.).

Joint Sealant Certification

Submit, at no cost to the Department, a minimum of 30 gal (100 L) of material and certified test results on each lot of joint sealant furnished to a Project.

Submit a certification that verifies the sealant meets all the test requirements of this Specification, except the Bond to Concrete Mortar and Shore Durometer Hardness at 0 °F (-18 °C).

B. Fabrication

Prepare and install silicone and bond breakers according to [Section 461](#).

C. Acceptance

1. Silicone

Test the silicone as follows:

| Test | Method |
|---|--------------------------|
| Tensile stress | ASTM D 412 (die C) |
| Durometer hardness | ASTM D 2240 |
| Bond to concrete mortar | GDT 106 |
| Tack free time (skin-over) | GDT 106* |
| Extrusion rate | GDT 106 |
| Non-volatile | GDT 106 |
| Specific gravity | ASTM D 792 (Method A) |
| Movement capability and adhesion | GDT 106 |
| Ozone and UV resistance | ASTM C 793 |
| *In cases of dispute, use ASTM C 679 as a referee test. | |

Bond Breakers

Test the bond breaker backer rods as follows:

| Test | Method |
|------------------|-------------|
| Density | ASTM D 1622 |
| Tensile strength | ASTM D 1623 |
| Water absorption | ASTM C 1016 |

Department Responsibility

The Department will:

- a. Evaluate the sealant in the field before accepting any silicone sealants that meet the requirements of this Specification.

Install the material submitted by the Contractor in roadway and/or bridge joints. The material shall be in place for two winters without failure before being accepted.

Reject any sealant or bond breaker that is evaluated and approved, yet fails in actual use.

D. Materials Warranty

General Provisions 101 through 150.

833.2.07 Neoprene for Bridge Deck Joint Seals

A. Requirements

1. Type

Use a neoprene material for bridge deck joint seals that is a vulcanized elastomeric compound with polymerized chloroprene as the only basic elastomer.

- a. Ensure the neoprene meets the physical requirements in Table 2.

Table 2—Physical Requirements for Neoprene

| Test | Requirements | Test Method |
|--|------------------------|--------------|
| Tensile strength Before aging | 1500 psi (10 MPa) min. | ASTM D 412 |
| After oven-aging for 70 hrs. @ 212 °F (100 °C) | 30% max. loss | ASTM D 573 |
| Elongation at breaks Before aging | 250% min. | ASTM D 412 |
| After oven aging for 70 hrs. @ 212 °F (100 °C) | 40% max. | ASTM D 573 |
| Hardness Type A Durometer Before aging | 63 ± 10 points | ASTM D 2240 |
| After oven-aging for 70 hrs. @ 212 °F (100 °C) | 0 to +15 points change | ASTM D 2240 |
| After aging for 70 hrs. @ 14 °F (-10 °C) | 0 to +15 points change | ASTM D 2240 |
| Ozone Resistance: After 70 hrs. @ 104 °F (40 °C), under 20% strain in 300 pphm in air (Wipe specimens with toluene before test to remove surface contaminants) | No cracks | ASTM D 1149 |
| Weight change in oil After 22 hrs. in oil No. 2 [ASTM D 471] | 45% max. | AASHTO M 220 |
| Recover under 50% deflection (type II only) After 70 hrs. @ 212 °F (100 °C) | 85% min. | AASHTO M 220 |
| After 72 hrs. @ 14 °F (-10 °C) | 88% min. | AASHTO M 220 |
| After 22 hrs. @ -22 °F (-30 °C) | 85% min. | AASHTO M 220 |

Certification

Submit certified test results on the joint seal system according to [Subsection 106.05](#), —Materials Certification.¶

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test according to the methods indicated in Table 2.

D. Materials Warranty

General Provisions 101 through 150.

833.2.08 Ethylene Propylene Diene Monomer for Bridge Deck Joint Seals

A. Submittals

1. Type

Use an ethylene propylene diene monomer (EPDM) material for bridge deck joint seals that is 100 percent EPDM compound.

Ensure the compound shall meet the following physical requirements:

| Physical Property | Requirement |
|----------------------------|-------------------------|
| Hardness, Type A Durometer | 80 ± 5 |
| Tensile strength | Min. 2,000 psi (14 MPa) |

| | |
|--|--------------------------------|
| Elongation at break | 200% |
| Low temperature | Not brittle at -67 °F (-55 °C) |
| Weather resistance | No cracks |
| Ozone resistance (70 hours, 100 °F (38 °C), under 20% strain, 100 pphm in air) | No cracks |

Certification

Submit certified test results of the joint seal system according to [Subsection 106.05](#), —Materials Certification.¶

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test the EPDM as follows:

| Test | Method |
|---|-------------|
| Hardness, Type A Durometer | ASTM D 2240 |
| Tensile strength | ASTM D 412 |
| Elongation at break | ASTM D 412 |
| Low temperature | ASTM D 746 |
| Weather resistance | ASTM D 1171 |
| Ozone resistance (70 hours, 100 °F (38 °C) under 20% strain, 100 pphm in air) | ASTM D 1149 |

D. Materials Warranty

General Provisions 101 through 150.

833.2.09 Polyurethane Sealant for Inductive Loops

A. Requirements

1. Type

Use polyurethane sealant that is a one component, moisture-curing, flexible sealant formulated to encapsulate inductive detector loop wires and leads embedded in asphaltic or Portland cement concrete. For a list of sources, see [QPL 75](#).

Submit, at no cost to the Department, at least 12, 29 oz. (857 mL) cartridges of the material.

Physical Characteristics

Use a sealant that will:

Remain flexible to -20 °F (-30 °C) (necessary to protect the wire from the stress of pavement movement).

Fully encapsulate the wire but resist flowing out on inclined or crowned roads.

Be compatible with asphaltic concrete.

Not soften the asphaltic concrete to a degree that would cause widening of the joint, when installed in a simulated joint in the laboratory.

Use a cured polyurethane sealant that meets the following physical requirements:

| Physical Property | Requirement |
|----------------------------|-------------------------|
| Hardness, Type A Durometer | 35-85 |
| Tensile strength | Min. 150 psi (1035 kPa) |
| Elongation at break | Min. 200% |
| Flexibility 20 °F (30 °C) | No cracks |
| Weathering resistance | Slight chalking |

Furnish certified test results of the loop sealant according to [Subsection 106.05](#), —Materials Certification.¶

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

1. Test the polyurethane sealant for inductive loops as follows:

| Test | Method |
|-----------------------------|--|
| Hardness, Type A Durometer | ASTM D 2240 |
| Tensile strength | ASTM D 412 [die C pulled at 20 in (500 mm)/min] |
| Elongation at break | ASTM D 412 [die C pulled at 20 in (500 mm)/min] |
| Flexibility -20 °F (-30 °C) | 25 mil (0.64 mm) free film bend (180°) over a 1/2 in (13 mm) mandrel |
| Weathering resistance | ASTM D 822; Weatherometer 350 hrs., cured 7 days, 77 °F (25 °C), 50% relative humidity |

Department Responsibility

The Department will:

- a. Evaluate the polyurethane sealant for inductive loops in the field before approving it for use. The material also must meet the requirements of this Specification.

Install the material in asphaltic inductive loops. The material shall be in place for one winter without failure before being accepted.

Reject any sealant that is evaluated and approved, yet fails in actual use.

D. Materials Warranty

General Provisions 101 through 150.

833.2.10 Preformed Foam Joint Filler

A. Requirements

1. Type

Use a preformed foam joint filler consisting of polyethylene, polyurethane, neoprene, natural rubber, or isomeric polymer closed-cell foam and ultraviolet, stable resistant to oils, chemicals, ozone, and weathering. Ensure the joint filler conforms to the following physical requirements:

| Test | Requirement |
|--|--|
| Cell Structure (Compression—Deflection to 50% of original thickness | Closed Cell 10 – 20 psi (70- 140 kPa) |
| Recovery (After 50% compression of original thickness) | 95% min. |
| Water Absorption | 1% volume max. |
| Extrusion at 50% compression of original thickness | 0.25 in (6 mm) |

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test according to ASTM D 1752.

D. Materials Warranty

General Provisions 101 through 150.

Section 853—Reinforcement and Tensioning Steel

853.1 General Description

This section includes the requirements for reinforcement and tensioning steel, including:

- Steel bars
- Pretensioning steel wire strand
- Post-tensioning steel wire
- Post-tensioning steel bars
- Plain steel bars with threaded ends
- Steel wire
- Welded steel wire fabric
- Dowel bars
- Dowel (tie) bars
- Bar supports
- Epoxy coating

853.1.01 Related References

A. Standard Specifications

[Section 514—Epoxy Coated Steel Reinforcement](#)

B. Referenced Documents

| AASHTO | ASTM | |
|--------------|----------------|---------------|
| M 32/ M 32M | A 153/ A 153 M | A 653/ A653M |
| M 55/ M55M | A 416/ A 416M | A 709/ A 709M |
| M 284/ M284M | A 421/ A 421M | A 722/ A 722M |
| | | D 1248 |

[QPL 12](#)

[QPL 55](#)

[QPL 61](#)

CRSI Manual of Standard Practices

853.2 Materials

A. Requirements

NOTE: Notify the Office of Materials and Research at least two weeks before blast cleaning the steel reinforcement bars and applying the epoxy coating. This time will allow the Department to schedule an inspection.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

853.2.01 Steel Bars for Concrete Reinforcement

A. Requirements

1. Type

- a. Use deformed billet steel bars from rolling mills listed on [QPL 61](#) and from fabricators listed on [QPL 12](#)

Section 853—Reinforcement and Tensioning Steel

- b. Use deformed billet steel bars that meet the requirements of ASTM A 615/ A 615M for bar reinforcement in concrete, unless otherwise designated.
- c. Use deformed billet steel for longitudinal bars in continuously reinforced concrete pavement that meet the requirements of ASTM A 615/ A 615M, Grade 60 (420).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the material based on either [QPL](#) approval or on tests conducted by the Department.

The Department will not accept bent bars that have been straightened and rebent.

D. Materials Warranty

General Provisions 101 through 150.

853.2.02 Pretensioning Steel Wire Strand

A. Requirements

1. Type

Use steel wire that meets all the requirements of ASTM A 416/A 416M. Use Grade 270 for prestressed concrete bridge members.

- a. If you plan to use strands that differ in size from those covered in ASTM A 416/A 416M submit to the Engineer complete data on the proposed strands, as stated below.

2. Certification

Submit a certification from the manufacturer that shows the results of the required tests, including stress-strain curves, and conformance to these Specifications.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the steel based on the results of tests made by the Department and the certification from the manufacturer.

D. Materials Warranty

General Provisions 101 through 150.

853.2.03 Post-tensioning Steel Wire

A. Requirements

1. Type

Use steel cable for post-tensioning that meets ASTM A 421/ A 421M, Type BA or WA, as specified.

2. Certification

Submit a certification from the manufacturer that shows the results of the required tests, including stress-strain curves, and conformance to these Specifications.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the steel based on the results of tests made by the Department and the certification from the manufacturer.

D. Materials Warranty

General Provisions 101 through 150.

Section 853—Reinforcement and Tensioning Steel

853.2.04 Post-tensioning Steel Bars

A. Requirements

1. Type

Use high-strength steel bars for post-tensioning that meet the requirements of ASTM A 722/ A 722M, Type II.

2. Drawings

a. Show all appurtenances to be used with the bars on shop drawings.

b. Show all dimensions and steel requirements on the drawings.

c. Use the appropriate ASTM designation for the steel, if possible.

3. Certification

Submit a certification that shows the results of the required tests, including stress-strain curves, and conformance to this Specification.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the steel based on the results of the tests made by the Department and on the certification from the manufacturer.

D. Materials Warranty

General Provisions 101 through 150.

853.2.05 Plain Steel Bars—Threaded Ends

A. Requirements

Use plain steel bars with threaded ends that meet the requirements of ASTM A 709/ A 709M, Grade 36 (250), 50(345), or 70W(485W).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the steel based on the certification from the manufacturer.

D. Materials Warranty

General Provisions 101 through 150.

853.2.06 Steel Wire for Concrete Reinforcement

A. Requirements

Use steel wire that meets the requirements of AASHTO M 32/ M 32M and is the size shown on the Plans.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the steel based on the results of the tests made by the Department or on the certification from the manufacturer.

D. Materials Warranty

General Provisions 101 through 150.

Section 853—Reinforcement and Tensioning Steel

853.2.07 Welded Steel Wire Fabric for Concrete Reinforcement

A. Requirements

1. Use welded steel wire fabric of the size and dimension shown on the Plans and that meets the requirements of AASHTO M 55/ M 55M.
2. Use a vendor listed on [QPL 55](#).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the steel based on the results of the tests made by the Department or on a certification from the manufacturer.

D. Materials Warranty

General Provisions 101 through 150.

853.2.08 Dowel Bars

A. Requirements

Type: Use dowel bars for concrete pavement that are plain, round steel bars that meet or exceed the tensile requirements of Table 2—Tensile Requirements for Deformed Bars, ASTM A 615/ A 615M, Grade 40 (300).

B. Fabrication

Coat dowel bars with either high density polyethylene or epoxy, as follows:

1. High Density Polyethylene

Use polyethylene with the following characteristics

| | |
|-------------------------|---|
| Thickness | 12 to 20 mils (0.30 to 0.51 mm) |
| Texture | Smooth and dense enough to provide adequate bond-breaking characteristics |
| Undercoating (adhesive) | Modified rubber blend; 2 to 7 mils (0.05 to 0.18 mm) thick |

Ensure that the undercoating retains its elasticity and effectively seals small cuts or abrasions from moisture migrating under the polyethylene plastic outer coating.

2. Epoxy

Prepare the dowels for coating, select the epoxy material, apply the epoxy, and sample and test the properties of coated bars according to the requirements of [Section 514](#).

- a. Apply a uniform, smooth coating to the bars that results in a film 12 mils, ± 2 mils (0.30mm, ± 0.05 mm) thick after curing.
- b. Do not coat the cut ends.
- c. Handle the coated dowels carefully to prevent damage to the coating or bar. However, bars can be welded through the epoxy to one side of the supportive basket.

C. Acceptance

The Department will accept the steel based on the results of the tests made by the Department or on the certification of the manufacturer.

The Department will reject dowel bars with burred or deformed ends.

D. Materials Warranty

General Provisions 101 through 150.

Section 853—Reinforcement and Tensioning Steel

853.2.09 Dowel (Tie) Bars

A. Requirements

Use uncoated, plain or deformed billet-steel bars that meet the requirements of ASTM A 615/ M, Grade 40 (300) for dowel bars or tie bars in curbs, concrete medians, and other areas specified on the Plans.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the steel based on the results of the tests made by the Department or on the certification of the manufacturer.

D. Materials Warranty

General Provisions 101 through 150.

Section 886—Epoxy Resin Adhesives

886.1 General Description

This section includes the requirements for all epoxy adhesives used in highway construction or maintenance.

886.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

AASHTO T 237

ASTM 2240

Federal Hazardous Products Labeling Act

[GDT 58](#)

[QPL 15](#)

886.2 Materials

886.2.01 Epoxy Resin Adhesives

A. Requirements

1. Use the types of epoxy adhesives below:
 - a. Type I-R: Rapid-setting marker adhesive for bonding raised pavement markers to pavement.
 - b. Type I-S: Standard setting marker adhesive for bonding raised pavement markers to pavement.
 - c. Type II: Epoxy adhesive for bonding plastic concrete to hardened concrete.
 - d. Type III: Epoxy adhesive for bonding hardened concrete to hardened concrete, or for bonding miscellaneous materials such as metals.
 - e. Type IV: Epoxy adhesive for creating an epoxy mortar for use with clean concrete or mortar sand.
 - f. Type V: Epoxy adhesive for repairing cracks in concrete by intrusion grouting.
 - g. Type VI: Epoxy adhesive for a complete application or as a component in the application of a skid resistant or protective coating on hardened Portland cement concrete or asphaltic concrete.
 - h. Type VII: Discontinued.
 - i. Type VIII: Epoxy adhesive used for anchors and dowel bar implants. Either mix this epoxy by machine to the proper ratio or package it in a two-component cartridge with a mixing nozzle that thoroughly mixes the two components as they are dispensed. Use a nozzle at least 8 in (200 mm) long.
2. Furnish the epoxy adhesive as two separate components.
3. Viscosity

Ensure that the viscosities of the separate components are similar and conducive to easy blending of the epoxy adhesive system.

 - a. Submit the viscosity for the epoxy adhesive system to the Engineer.
 - b. Ensure that the viscosity of the mixed system is compatible with the intended use of the system.
4. Labeling

Clearly label each container of the separate components of an epoxy adhesive system with the following information:

Table 1
Mixed Epoxy Adhesive Systems Requirements

- Specification number and type
 - Component designation (A or B)
 - Manufacturer’s batch number—a batch is a single charge of all components in a mixing chamber
 - Expiration date (shelf life for separate components in original containers)
 - Mixing ratio and directions (by volume or weight as designated by the manufacturer)
 - Potential hazards and precautions according to the Federal Hazardous Products Labeling Act
5. Stencil the component designation on the top of each container.
6. Physical Requirements
- Ensure that the mixed epoxy adhesive system meets the applicable requirements of [Table 1](#).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Each epoxy adhesive system shall meet the requirements of this Section.

If the Department qualifies or disqualifies a system for one of the types specified, it will not affect the qualification or disqualification of any other type.

The Department will reject any epoxy adhesive system that meets all the requirements of this Section, but fails in actual use. For a list of sources, see [QPL 15](#).

D. Materials Warranty

General Provisions 101 through 150.

Table 1
Mixed Epoxy Adhesive Systems Requirements

| Property | Type Designation | | | | | | | | | Test Method |
|--|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----|-----------|------------------------|
| | I-R | I-S | II | III | IV | V | VI | VII | VIII | |
| Pot Life at 77 °F (25 °C) (minutes) | 6-11 | 8-13 | 30 | 10-45 | 30-60 | 10-45 | 30-60 | — | 3-10 | GDT 58 |
| Elongation at 77 °F (25 °C) (percent) | — | — | — | — | 30** | — | 30** | — | 5% Max. | GDT 58 |
| Bond Strength, psi (MPa) at 1 hr and 77 °F (25 °C) | 180 (1.2) | — | — | — | — | — | — | — | — | GDT 58 |
| at 3 hr and 77 °F (25 °C) | — | 180 (1.2) | — | — | — | — | — | — | 250 (1.7) | |
| at 24 hr and 77 °F (25 °C) | 400 (2.8) | 400 (2.8) | 400 (2.8) | 400 (2.8) | 250 (1.7) | 400 (2.8) | 250 (1.7) | — | 400 (2.8) | |
| Shore D Hardness at 77 °F (25 °C) | — | — | — | — | 75 Max. | — | 35-65 | — | — | ASTM: 2240 |
| SAG Test | — | — | — | — | — | — | — | — | No Sag | AASHTO: T 237 |

Table 1
Mixed Epoxy Adhesive Systems Requirements

| | | | | | | | | | | |
|--------------------------|---|---|-----------|----|----|----|---|---|---|--------------------------|
| Wet Bond Test ,psi (MPa) | — | — | 400 (2.8) | — | — | — | — | — | — | AASHTO: T 237 Section 31 |
| Shelf Life*** (months) | 6 | 6 | 6 | 24 | 12 | 24 | 6 | — | 6 | |

Note: * Values are minimums except where a range is shown, or otherwise noted.

** Epoxy adhesive system only. *** For separate components in original containers.