This Engineering Instruction supersedes the following issuances:

EI 90-001  Pavement Preventive Maintenance Joint and Crack Sealing/Filling Guidelines

EI 94-034  Filling Cracks and/or Joints in Pavements and Filling Shoulder Joints Between Concrete Pavement and Asphalt Concrete Shoulders

EB 90-011  Revisions to EI 90-001

EB 95-036  ASTM D3405 Crack Filler

This Engineering Instruction becomes effective on all Department contracts let on or after April 23, 1998.

Purpose. This Engineering Instruction revises the preventive maintenance guidelines for joint and crack sealing to provide safer pavements for motorcyclists. It transmits new sealing specifications and previously issued specifications still in effect, improved guidelines for project and treatment selection, and updated bid price estimates.

Background. EI 90-1 issued preventive maintenance guidelines and specifications for pavement joint and crack sealing. During 1995, the Department received many complaints from motorcyclists about slippery pavement conditions on crack filling projects. At that time the practice was to fill cracks with sealant and squeegee additional material in bands 100 mm (4 in.) wide over the cracks. This treatment often resulted in the placement of thick, wide bands of the sealant on the pavement surface. Where material was applied in this manner, the pavement provided inadequate lateral support for two-wheeled vehicles and was slippery when wet. To lessen the chance of this happening again, the Department specified a flush-fill, strike-off method of crack sealing in place of the over band method.

Draft versions of the new specifications and guidelines for sealing pavements went into effect soon after the Department became aware of the safety problems with motorcyclists. Sealing contracts for the 1996 construction season used improved versions of the specifications. In the spring of 1996, regional personnel received a full day's training on the art of crack sealing. Participants learned about sealing principles and techniques, sealing materials and their applications, and how to select projects for sealing. Training concluded
with a field demonstration on crack sealing. A video of the training session is available in each region for viewing and training.

The guidelines for sealing hot mix asphalt (HMA) pavements contain many revisions: modified categories of work, changed work schedules, and more specific guidance on project selection. The term “HMA pavements” used herein refers to both new pavements and overlays. Among the specifications transmitted by this Engineering Instruction are new specifications for sealing cracks in HMA pavements. The specified work requires placement of narrow (50 mm) (2 in.), thin (1 mm) (1/32 in.) applications of the sealant on the pavement, centered over cracks. The contractor is responsible for removing excess amounts.

The guidelines for sealing portland cement concrete (PCC) pavements have few changes. The revised guidelines recommend a biennial inspection of the longitudinal joint between the pavement and HMA shoulder to determine the need for sealing.

Use the guidelines to plan the joint and crack sealing program, i.e., identify candidate projects, scope projects for construction, and set priorities. Consult Resident Engineers for a list of recommended sealing projects. They have firsthand knowledge of a pavement's performance and its need for sealing. The guidelines identify factors to consider when deciding whether work gets done by construction contract or by maintenance forces.

This Engineering Instruction makes additional changes to the guidelines or specifications:

1. It eliminates the requirement for each residency to apply a minimum of 11 400 L (3000 gal) of crack sealant annually. Pavement type, age, and condition vary too much among residencies for this to be practical.

2. It restricts the use of fiber reinforced asphalt cement to filling the joint between PCC pavement and HMA shoulders. This material does not perform well in transverse cracks that usually are the "working" type.

3. It eliminates the requirement for using recycled tire rubber in crack sealing materials because the FHWA rescinded this mandate.

4. It lifts the restriction on sealing longitudinal cracks following a favorable review of the 1996 sealing projects by the Materials Bureau.

Transmitted Specifications. Only design engineers will receive a package of specifications upon issuance of this Engineering Instruction. Others needing the specifications may request copies from David Graves of the Materials Bureau at (518)457-4285.

The following are new items:

18403.7508M - Filling Shoulder Joints Between Portland Cement Concrete Pavement and Asphalt Concrete Shoulders Using ASTM D3405

18403.7508 - Filling Shoulder Joints Between Portland Cement Concrete Pavement and Asphalt Concrete Shoulders Using ASTM D3405
The following are unchanged items and their metric equivalents, reissued by this Engineering Instruction:

18403.7507M - Filling Shoulder Joints Between Portland Cement Concrete Pavement and Asphalt Shoulders Using Fiber Reinforced Asphalt Cement

18403.7507 - Filling Shoulder Joints Between Portland Cement Concrete Pavement and Asphalt Shoulders Using Fiber Reinforced Asphalt Cement

18502.701002M - Resealing Transverse Joints in Portland Cement Concrete Pavement, 19 m Pavement Slabs - Silicone Sealant

18502.701002 - Resealing Transverse Joints in Portland Cement Concrete Pavement, 63 ft Pavement Slabs - Silicone Sealant

18502.702002M - Resealing Transverse Joints in Portland Cement Concrete Pavement, 6 m Pavement Slabs - Silicone Sealant

18502.702002 - Resealing Transverse Joints in Portland Cement Concrete Pavement, 20 ft Pavement Slabs - Silicone Sealant
**Cost Impact.** This Engineering Instruction does not revise the sealing specifications for PCC pavements, therefore, sealing costs for these pavements will remain the same. It however makes changes to the guidelines for pavement joint and crack sealing to clarify treatment selection and project prioritization for PCC pavements. These changes are minor and will not affect program cost.

The new specifications and guidelines for HMA pavements are not likely to affect program costs either. They however may reduce the quantity of the sealant used on a project in two ways.

1. The sealing operation will require less material per unit length of crack. The new sealing specifications eliminate the 100 mm (4 in.) wide band of sealant over the crack.

2. Qualifying projects for sealing will have fewer cracks. The specifications and guidelines recommend sealing pavements before the development of extensive or severe cracking.

Cost savings resulting from using less sealing material are insignificant in comparison to a project's fixed costs. Consequently, the Contractor may not lower his bid prices on sealing items. This Engineering Instruction does not affect a project's fixed costs, i.e., labor, mobilization, or maintenance and protection of traffic.

The sealing guidelines for HMA pavements should eventually lower program costs, but any estimate of that savings is speculative. The guidelines recommend the sealing of cracks early in their development and resealing as needed to keep water out of the pavement. This preventive maintenance effort extends the life of the original or rehabilitated pavement by several years, and eventually lengthens the repaving cycle.

**Designer Information.** When filling the longitudinal joint between a PCC pavement and the HMA shoulders, include both item 18403.7507M and item 18403.7508M in the contract. The Contractor will bid them as an optional pair, selecting one for bid. Contract quantities for Item 18403.7507M will be 96% of those for item 18403.7508M. The factor accounts for the volume of fibers added to the asphalt cement in item 18403.7507M. Contract quantities for both items represent the number of gallons of asphalt materials, exclusive of fibers that
may be added. This is also true for the English equivalent of these items.

**Actions by the Main Office Design Quality Assurance Bureau.** The attached specifications shall become main office inserts.

**Actions by the Main Office Construction Division.** Guidance for construction personnel on pavement sealing is available. The Construction Division will incorporate the prepared materials into the Construction Inspection Manual.

**Actions by the Main Office Transportation Maintenance Division.** The Transportation Maintenance Division will prepare and issue guidance covering the sealing of HMA pavements for maintenance personnel.

**Contact Person.** Questions regarding the specifications or materials may be directed to David Graves of the Materials Bureau at (518) 457-4285. Questions regarding sealing by maintenance forces should be directed to John Rondinaro of Transportation Maintenance at (518) 457-6435.
PREVENTIVE MAINTENANCE GUIDELINES
FOR PAVEMENT JOINT AND CRACK SEALING

(EI 97-030, December 1997)

Scope

These guidelines will help designers and maintenance engineers select candidate projects and prescribe pavement sealing treatments for a preventive maintenance program.

Purpose

Joint and crack sealing is a cost-effective strategy available to the Department for extending the service lives of pavements. By sealing the pavement when cracks first appear, the pavement remains watertight to slow subsequent pavement deterioration.

These guidelines recommend sealing pavements while cracks are in good condition. Preventive maintenance treatments are most beneficial when applied to pavement distress in the early stages of development. Previous guidelines transmitted under EI 90-1 allowed the filling of cracks where the distress in the pavement had progressed beyond the condition suitable for sealing operations. Often with the "Band-Aid" treatment, the sealant gets liberally spread on the pavement surface, creating slippery driving conditions. Under this Engineering Instruction, the crack filling treatment is not an option. Older pavements nearing the end of their life, which previously were candidates for the crack filling treatment, may therefore require an overlay sooner than previously planned. Initially this may place additional demands on limited funds for pavement resurfacing, but should level off in a few years when preventive maintenance efforts extend pavement life.

The main reasons for sealing pavements follow:

1. Eliminate or significantly reduce the amount of incompressible material (deicing sand) which infiltrates the pavement surface. Incompressible material retained in portland cement concrete (PCC) pavement joints can lead to joint spalling and/or slab blowups at joints in hot weather. Incompressible material may cause a hot mix asphalt (HMA) pavement to "push up" at the edges of the crack when the pavement expands due to thermal changes. Both situations decrease the rideability of the pavement.

2. Reduce the amount of surface water entering the subbase to slow pavement deterioration and extend service life. Surface water infiltrating through the cracks and joints can penetrate into the base and subbase materials, causing a loss of strength in these materials. Load-related failures may result. This reasoning is not applicable to pavement designs using permeable bases.
Categories of Work

Pavement preventive maintenance joint and crack sealing consists of the following types of work:

1. **Resealing Transverse and Longitudinal Joints in Portland Cement Concrete Pavement** - Work includes one or more of the following: transverse joint resealing, longitudinal joint resealing, and PCC pavement/PCC shoulder joint resealing. Work consists of removing the defective sealant, sawing the joints (if necessary) to construct a sealant reservoir, abrasive blast cleaning the sides of the reservoir, and sealing the joints with a silicone. Alternatively, longitudinal joints may be sealed with rubberized asphalt sealant.

2. **Sealing Cracks in Portland Cement Concrete Pavement** - Work includes sawing a sealant reservoir in cracks, abrasive blast cleaning the sides of the reservoir, and sealing with a silicone sealant.

3. **Filling Joints between the Portland Cement Concrete Pavement and Hot Mix Asphalt Shoulders** - Work consists of cleaning the joints by high pressure air blasting and filling the joints with either a rubberized asphalt sealant or fiber reinforced asphalt filler.

4. **Routing and Sealing Cracks in Hot Mix Asphalt Pavement** - Work consists of routing a sealant reservoir in well-defined single cracks (a transverse thermal crack for example), cleaning the openings by high pressure air blasting, and sealing with a rubberized asphalt sealant.

5. **Sealing Cracks in Hot Mix Asphalt Pavement** - Work consists of cleaning well-defined single cracks by high pressure air blasting and sealing with a rubberized asphalt sealant.

Project Selection

Transportation Maintenance Resident Engineers are the Department's first line pavement managers. Their intimate knowledge of pavements in their residency is invaluable in carrying out pavement management strategies. As such, Resident Engineers are the primary decision makers for identifying and scheduling projects for pavement maintenance and rehabilitation. They decide which roads need sealing, the appropriate sealing treatment, and the contract arrangements for completing the work. Parameters outlined in these guidelines will help with project selection and in choosing a sealing method. Deciding whether to seal cracks with State forces or by contract involves consideration of factors that vary with the residency. Some examples are work load, personnel skill level and experience, project location, volume of traffic, availability of competent contractors in the area, OGS contract availability, etc. The regional pavement management group may review the candidate projects, sealing methods, and contract type selected by the Resident Engineer for program and funding compatibility.
Briefly outlined below is a five-step procedure recommended for selecting projects to include in a pavement sealing program, and for designing their cost-effective treatments.

1. **Maintain a database of pavement work histories.** Minimum types of information to include are: pavement type, pavement location, the category of work, limits of work, and date of work. Basic pavement types are: full-depth PCC, full-depth HMA, and HMA overlays of PCC. The broad categories of work associated with each pavement type are: reconstruction, rehabilitation, corrective maintenance, and preventive maintenance. Joint and crack sealing are specified for each of these work categories. For a complete description of treatments and their timing, refer to the Pavement Rehabilitation Manuals, Volumes I and II, prepared by the Materials Bureau.

2. **Identify candidate pavements.** Do a sort on the database to produce a list of pavements that are candidates for sealing. Key criteria are pavement type, the category of work, and date of work. Guidelines for identifying projects based on age are in the section on Treatment Selection.

3. **Evaluate pavement condition.** Pavement condition and the condition of previous work are important factors when deciding whether a sealing project is appropriate. Each pavement listed in the database sort requires a field investigation to evaluate its condition. For PCC pavements, the age of the pavement drives the scheduling of joint and crack sealing. Joint seals, however, need to be checked periodically for premature failure. HMA pavements, upon inspection, may have too few cracks for sealing by contract at this time. These pavements will need a field inspection again the following year to decide if distress levels are now appropriate for sealing. Severely distressed pavements are not good candidates for sealing. The purpose of crack sealing is to slow distress development, not correct it. Crack sealing is not a solution for making a seriously distressed pavement last through another winter. The section, Treatment Selection, describes the level of cracking considered acceptable at the time of construction for the sealing of HMA pavements.

4. **Select pavement sealing treatment and decide contract arrangements.** The type, age, and physical condition of the pavement and previous work are important factors in designing and scheduling joint and crack sealing projects. Keep in mind that a pavement will continue to deteriorate after the field investigation until work is done to stop deterioration or improve condition. Some pavements may even fall apart over a winter to a point where they may no longer be good candidates for sealing. It is therefore important to schedule a project for work before the pavement distresses reach the upper levels considered acceptable for sealing.

   Equally important is the remaining service life of the pavement, which must be greater than the expected life of the planned sealing treatment. Pavement sealing is not a good investment if the treatment outlasts the pavement.

Sealing specifications for HMA pavements offer choices in crack preparation and in the method of measurement for payment purposes. A rout and seal treatment may last five years compared to two years for a clean and seal treatment. Routing of the full-width transverse cracks in HMA pavements is an effective treatment because thermal movement is greatest with this type of crack. Consider a
rout and seal treatment if the remaining life of the pavement may exceed five years. The Regional Materials Engineer can help with an assessment of remaining pavement life.

Other factors important to each region must be considered to complete the project. Some examples are, who will do the work (State forces or contractors) and the funding source.

5. **Set priorities.** Available resources may limit what work gets done and when. Following is a prioritized listing of the work categories considered cost effective:

   a. Resealing Joints (Transverse and Longitudinal) in PCC Pavement.

   b. Sealing Cracks in PCC Pavement.

   c. Filling PCC-Pavement/HMA-Shoulder Joints.

   d. Routing and Sealing Cracks in HMA Pavement.

   e. Cleaning and Sealing Cracks in HMA Pavement.

Regions may establish sub-priorities within the above categories of work to account for pavement age and traffic volume. Generally, sealing projects on young pavements with high traffic volumes (or many trucks) are very cost-effective.

**Treatment Selection**

Following are general guidelines for sealing pavements, given the type of pavement and its age.

**Full-depth PCC Pavement**

A. General

   Clean and seal transverse joints at 8-year intervals. Clean and seal longitudinal joints at 16 years. Rout and seal slab cracks at 8-year intervals. Clean and fill pavement/HMA shoulder joints at 2-year intervals.

B. Specific

   At 8, 16 and 24 years, evaluate slab and joint condition for sealing. Complete needed slab repairs, high severity crack repairs, and joint corrective maintenance before doing preventive maintenance sealing of slab joints and cracks.
Full-depth HMA Pavement and HMA Overlays

A. General

Rout and seal full-width transverse cracks and other selected pavement cracks at 5-year intervals. Alternatively, clean and seal pavement cracks at 2-year intervals. Clean and seal the centerline and pavement/shoulder joints at 2-year intervals.

B. Specific

Evaluate the need for sealing pavement cracks at 2-year intervals. Candidate pavements must have well defined and spaced cracks with little or no secondary cracking. Ideally, not more than 90 m (300 ft) of transverse cracking should occur in 150 m (500 ft) of travel lane, which amounts to a spacing of 6 m (20 ft) between cracks. Typically less than 25% of the crack's length should have secondary cracking.

HMA Overlays of PCC Pavements

A. General

Reseal sawed-and-sealed transverse joints in five to eight years after construction, and rout and seal full-width transverse cracks at 5-year intervals. Rout and seal other pavement cracks at 5-year intervals, or alternatively clean and seal pavement cracks at 2-year intervals. Clean and seal the centerline and pavement/shoulder joints at 2-year intervals.

B. Specific

Evaluate the need for sealing pavement cracks at 2-year intervals. Candidate pavements must have well defined and spaced cracks with little or no secondary cracking. Ideally, not more than 90 m (300 ft) of transverse cracking should occur in 150 m (500 ft) of travel lane, which amounts to a spacing of 6 m (20 ft) between cracks. Typically less than 25% of the crack's length should have secondary cracking.

Overview of Sealing Treatments

The following listing provides general information on treatments for each of the work categories listed earlier. It identifies the source of funds and the specified materials, and gives a description of the work, the preferred application times, item numbers, unit cost, and service life. The Region should substitute their own estimated costs if available.
Resealing Transverse and Longitudinal Joints in PCC Pavements

Funding Source: Maintenance by Contract

Recommended Materials: Silicone (Approved List)
                        ASTM D3405 (Approved List) - alternative for longitudinal joints

Character of Work: - Remove existing joint sealant
                    - Saw additional joint width if necessary
                    - Abrasive blast clean each wall of the sealant reservoir
                    - Air blast each wall of the sealant reservoir
                    - Place backer rod to the proper depth
                    - Extrude sealant into the sealant reservoir such that the sealant is
                      3 mm (1/8 in.) below the surface of the pavement
                    - Tool sealant, if required

Preferred Application Time: Summer

Item Nos: 18502.701002M - Transverse - 19 m slabs
          18502.701002 - Transverse - 63 ft slabs
          18502.702002M - Transverse - 6 m slabs
          18502.702002 - Transverse - 20 ft slabs
          18502.7401M - Longitudinal
          18502.7401 - Longitudinal

Estimated Unit Cost: $9.90/m or $3.00/ft (material and application only)

Estimated Service Life: Transverse joints - 8 years minimum, varies with slab length
                        Longitudinal joints - 16 years
Sealing Cracks in PCC Pavements

Funding Source: Maintenance by Contract

Recommended Materials: Silicone (Approved List)

Character of Work: - Sawcut a sealant reservoir in cracks having a width ≥ 3 mm (1/8 in.). Cracks < 3 mm (1/8 in.) need not be sealed.
- Abrasive blast both faces of the sealant reservoir
- Air blast both faces of the sealant reservoir
- Backer rod may be used at the contractor's discretion
- Extrude sealant into the crack/reservoir such that the top of the sealant is 3 mm (1/8 in.) below the surface of the pavement
- Tool sealant, if required

Preferred Application Time: Summer

Item Nos: 18502.7601M and 18502.7601

Estimated Unit Cost: $9.90/m or $3.00/ft (material and application only)

Estimated Service Life: No estimate of service life due to limited number of jobs completed using this material. However, it is expected that a service life similar to PCC joint resealing will result.
Filling Joints between the PCC Pavements
and HMA Shoulders

Funding Source:  
- Primarily Highway Maintenance  
- Some Maintenance by Contract

Recommended Materials:  
ASTM D3405 (Approved List - OGS contract)

Character of Work:  
- Air blast debris from joint. Hot air lance may be used for this purpose and to dry the joint.  
- Pour filler into joint (use backer rod if joint is wide)  
- Squeegee filler such that a band of filler 3 mm (1/8 in.) high and 100 mm (4 in.) wide is left over the pavement/shoulder joint.

Preferred Application Time:  
Spring or fall

Item Nos:  
18403.7507M, 18403.7507, 18403.7508M, and 18403.7508

Estimated Unit Cost:  
$1.32/l or $5.00/gal - (material and application only)  
- This is highly variable dependent on crack characteristics

Estimated Service Life:  
2 years
Routing and Sealing Cracks in HMA Pavements and HMA Overlays

Funding Source:  
- Primarily Maintenance by Contract  
- Some work could be performed by Highway Maintenance

Recommended Materials:  
ASTM D3405 (Approved List - OGS contract)

Character of Work:  
- Rout a sealant reservoir in cracks having a width ≥ 3 mm (1/8 in.) and ≤ 25 mm (1 in.). Cracks < 3 mm (1/8 in.) need not be sealed.  
- Air blast debris from reservoir. Hot air lance may be used for this purpose and to dry the joint.  
- Pour sealant into reservoir  
- Squeegee sealant to a thin film no wider than 50 mm (2 in.) and no thicker than 1 mm (1/32 in.)

Preferred Application Time:  
Spring or fall

Item Nos:  
18403.7601M and 18403.7601

Estimated Unit Cost:  
$1.30/m or $0.40/ft (material and application only)

Estimated Service Life:  
5 years
Sealing Cracks in HMA Pavements and HMA Overlays

_Funding Source:_
- Primarily Maintenance by Contract
- Some work may be performed by Highway Maintenance

_Recommended Materials:_
ASTM D3405 (Approved List - OGS contract)

_Character of Work:_
Cracks <3 mm (1/8 in.) need not be sealed.
- Air blast debris from crack. Hot air lance may be used for this purpose and to dry the joint.
- Pour sealant into crack
- Squeegee sealant to a thin film no wider than 50 mm (2 in.) and no thicker than 1 mm (1/32 in.)

_Preferred Application Time:_ Spring or fall

_Item Nos:_
18403.7602M and 18403.7602

_Estimated Unit Cost:_ $1.25/l or $4.70/gal (material and application only)
- Highly variable dependent on crack characteristics.

_Estimated Service Life:_ 2 years
Routing, Cleaning, and Sealing Cracks in HMA Pavements and HMA Overlays
(Payment by Liter or Gallon)

**Note on usage:** This is an alternate item for routing cracks. Payment for the work is based on the volume of sealant used. Construction inspectors may find this method of measurement easier and less time consuming than measuring the length of routed and sealed cracks.

**Funding Source:**
- Primarily Maintenance by Contract
- Some work may be performed by Highway Maintenance

**Recommended Materials:**
ASTM D3405 (Approved List - OGS contract)

**Character of Work:**
- Rout a sealant reservoir in cracks having a width $\geq 3$ mm (1/8 in.) and $\leq 25$ mm (1 in.). Cracks $< 3$ mm (1/8 in.) need not be sealed.
- Air blast debris from reservoir. Hot air lance may be used for this purpose and to dry the joint.
- Pour sealant into reservoir
- Squeegee sealant to a thin film no wider than 50 mm (2 in.) and no thicker than 1 mm (1/32 in.)

**Preferred Application Time:** Spring or fall

**Item Nos:** 18403.7603M and 18403.7603

**Estimated Unit Cost:** $1.30/l or $5.00/gal (material and application only)

**Estimated Service Life:** 5 years
Selective Routing of Cracks in HMA Pavements and HMA Overlays

**Note on usage:** The items for this treatment are paired with the 18403.79M and 18403.79 items of the following treatment when only selected cracks will be routed prior to sealing. An example may be when a designer chooses to rout and seal only the transverse working cracks and seal without routing all other cracks (longitudinal and nonworking pavement cracks).

**Funding Source:**
- Primarily Maintenance by Contract
- Some work may be performed by Highway Maintenance

**Character of Work:**
- Rout a sealant reservoir in cracks having a width $\geq 3$ mm (1/8 in.) and $\leq 25$ mm (1 in.).

**Item Nos:** 18403.78M and 18403.78

**Estimated Unit Cost:** $1.00/m or $0.30/ft (routing only)

**Estimated Service Life:** 5 years

- AND -

Cleaning, and Sealing Cracks in HMA Pavements and HMA Overlays

**Funding Source:**
- Primarily Maintenance by Contract
- Some work may be performed by Highway Maintenance

**Recommended Materials:** ASTM D3405 (Approved List - OGS contract)

**Character of Work:**
- Seal routed cracks and cracks having a width $\geq 3$ mm (1/8 in.) and $\leq 25$ mm (1 in.). Cracks $< 3$ mm (1/8 in.) need not be sealed.
- Air blast debris from reservoir or crack. Hot air lance may be used for this purpose and to dry the joint.
- Pour sealant into reservoir
- Squeegee sealant to a thin film no wider than 50 mm (2 in.) and no thicker than 1 mm (1/32 in.)

**Preferred Application Time:** Spring or fall

**Item Nos:** 18403.79M and 18403.79

**Estimated Unit Cost:** $1.25/l or $4.70/gal (material and application only)

**Estimated Service Life:** 5 years for routed cracks and 2 years if not routed
**ITEM 18403.7508 M**

**FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING ASTM D3405**

**DESCRIPTION**

This work shall consist of cleaning and filling the shoulder joint between portland cement concrete pavement and asphalt concrete shoulders with plastic joint material ASTM D3405.

**MATERIALS**

Filler shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for concrete and asphalt pavements. The material will be accepted on the basis of the manufacturer’s certification that it conforms to the requirements of ASTM D3405 and that the name of the Primary Source (Manufacturer) and trade name appears on the current approved list. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the filler
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer’s recommendations pertaining to heating and application.

**CONSTRUCTION DETAILS**

**General.** The Contractor shall furnish all equipment necessary for cleaning and filling the shoulder joints. All equipment shall be approved by the Engineer before its use.

Filling shall be done at locations shown on the Plans or as directed by the Engineer.

All joints shall be thoroughly cleaned of all dust, dirt, moisture, foreign material, incompressibles or any other extraneous materials by high pressure air, hot air lance, wire brush or other suitable method or tool approved by the Engineer. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the joint surfaces. The Contractor shall maintain these devices and see that they are functioning properly. The joints shall be cleaned a minimum of 13 mm deep. The material and debris removed from the joint shall be removed from the pavement and shoulder to prevent re-contamination of the joint.

Immediately prior to filling and after the joint has been prepared as specified above, both joint faces shall be thoroughly cleaned to a minimum depth of 13 mm using compressed air. The joint sides shall appear thoroughly clean and dry prior to filling. The Contractor may be ordered to reclean joints if in the opinion of the Engineer adequate cleaning and drying is not being obtained. Final cleaning or recleaning may be performed with the use of a hot air lance. When using a hot air lance, care shall be taken so as not to burn, scorch, or ignite the adjoining pavement. Any joints not filled the same day shall be recleaned prior to filling.
The Contractor shall be responsible for protecting traffic and property from hazard or damage during the joint cleaning operation. Materials and methods used for this purpose will be subject to the approval of the Engineer.

The filler shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the filler through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the filler. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the filler material in the hopper. Before any filling shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any filling if thermometers are found to be defective or missing.

Prior to any filling the temperature of the filler shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer’s recommended minimum pouring temperature and equal to or below the manufacturer’s recommended safe heating temperature. For this purpose, the Contractor shall provide a 20 liter bucket and two (460 mm stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge filler into the 20 liter bucket and the Engineer shall immediately measure the temperature of the filler. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper filler pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper filler pouring temperature between individual filling operations.

Filler material heated beyond the safe heating temperature shall not be used. Filler material may be reheated or heated in excess of six hours providing the manufacturer’s recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.

If in the opinion of the Engineer, the Contractor displays an inconsistency in ability to perform the joint cleaning or filling operation the Contractor shall cease operations until achieving compliance with the required criteria in a consistent manner.

The filler shall be placed when ambient air temperature is at or above 5°C. Reasonable care should be taken so as not to obliterate pavement markings.

Joints shall be filled by slightly overfilling and using a “V” shaped squeegee or sealing shoe to form a band 100 mm wide and 1.5 mm to 3 mm thick, with tapered edges, centered over the joint. The squeegee shall have a flexible (neoprene type) edge capable of conforming to the pavement surface. During the filling operation, the distance between the filler application wand and the squeegee shall not exceed 600 mm. Traffic shall not
be allowed on the filler until it has cured sufficiently to prevent tracking. A low pressure light spray of water may be used to accelerate cooling of the filler. Blotting with fine aggregate will not be allowed. Filler that becomes damaged or that is installed improperly shall be repaired. Damaged or deficient areas shall have the surfaces properly cleaned and new filler installed to the satisfaction of the Engineer at the Contractor’s expense.

**METHOD OF MEASUREMENT**

The quantity to be paid for shall be the actual number of liters of ASTM D3405 corrected to 15°C liters used to complete the work.

No payment will be made for waste material.

**BASIS OF PAYMENT**

The unit price bid shall include the cost of all labor, equipment and materials necessary to complete the work.
FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING ASTM D3405

DESCRIPTION

This work shall consist of cleaning and filling the shoulder joint between portland cement concrete pavement and asphalt concrete shoulders with plastic joint material ASTM D3405.

MATERIALS

Filler shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for concrete and asphalt pavements. The material will be accepted on the basis of the manufacturer’s certification that it conforms to the requirements of ASTM D3405 and that the name of the Primary Source (Manufacturer) and trade name appears on the current approved list. Each container shall be legibly marked with the following information:

Manufacturer's name
Trade name of the filler
Manufacturer's lot or batch number
Pouring temperature
Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer’s recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. The Contractor shall furnish all equipment necessary for cleaning and filling the shoulder joints. All equipment shall be approved by the Engineer before its use.

Filling shall be done at locations shown on the Plans or as directed by the Engineer.

All joints shall be thoroughly cleaned of all dust, dirt, moisture, foreign material, incompressibles or any other extraneous materials by high pressure air, hot air lance, wire brush or other suitable method or tool approved by the Engineer. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the joint surfaces. The Contractor shall maintain these devices and see that they are functioning properly. The joints shall be cleaned a minimum of ¾” deep. The material and debris removed from the joint shall be removed from the pavement and shoulder to prevent re-contamination of the joint.

Immediately prior to filling and after the joint has been prepared as specified above, both joint faces shall be thoroughly cleaned to a minimum depth of ½” using compressed air. The joint sides shall appear thoroughly clean and dry prior to filling. The Contractor may be ordered to reclean joints if in the opinion of the Engineer adequate cleaning and drying is not being obtained. Final cleaning or recleaning may be performed with the use of a hot air lance. When using a hot air lance, care shall be taken so as not to burn, scorch, or ignite the adjoining pavement. Any joints not filled the same day shall be recleaned prior to filling.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the joint cleaning operation. Materials and methods used for this purpose will be subject to the approval of the Engineer.
The filler shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the filler through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the filler. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the filler material in the hopper. Before any filling shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any filling if thermometers are found to be defective or missing.

Prior to any filling the temperature of the filler shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer’s recommended minimum pouring temperature and equal to or below the manufacturer’s recommended safe heating temperature. For this purpose, the Contractor shall provide a five gallon bucket and two (18 inch stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge filler into the five gallon bucket and the Engineer shall immediately measure the temperature of the filler. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper filler pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper filler pouring temperature between individual filling operations.

Filler material heated beyond the safe heating temperature shall not be used. Filler material may be reheated or heated in excess of six hours providing the manufacturer’s recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.

If in the opinion of the Engineer, the Contractor displays an inconsistency in ability to perform the joint cleaning or filling operation the Contractor shall cease operations until achieving compliance with the required criteria in a consistent manner.

The filler shall be placed when ambient air temperature is at or above 40°F. Reasonable care should be taken so as not to obliterate pavement markings.

Joints shall be filled by slightly overfilling and using a “V” shaped squeegee or sealing shoe to form a band 4" wide and 1/16" to 1/8" thick, with tapered edges, centered over the joint. The squeegee shall have a flexible (neoprene type) edge capable of conforming to the pavement surface. During the filling operation, the distance between the filler application wand and the squeegee shall not exceed 2 feet. Traffic shall not be allowed on the filler until it has cured sufficiently to prevent tracking. A low pressure light spray of water may be used to accelerate cooling of the filler. Blotting with fine aggregate will not be allowed. Filler that becomes damaged or that is installed improperly shall be repaired. Damaged or deficient areas shall have the surfaces properly cleaned and new filler installed to the satisfaction of the Engineer at the Contractor’s expense.
METHOD OF MEASUREMENT

The quantity to be paid for shall be the actual number of gallons of ASTM D3405 corrected to 60°F gal. used to complete the work.

No payment will be made for waste material.

Basis of Payment

The unit price bid shall include the cost of all labor, equipment and materials necessary to complete the work.
ITEM 18403.7601 M    ROUTING, CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

DESCRIPTION

This work shall consist of routing, cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for routing, cleaning, and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than 3 mm wide nor more than 25 mm wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are 3 mm or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be routed, cleaned and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.

Crack Preparation. Cracks meeting the description above under General shall be routed to ensure that the crack has an adequate reservoir. Routing shall be accomplished with a router that can produce a vertical sided groove with minimal edge spalling. The groove shall have the approximate dimensions of 16 mm wide by 13 mm deep.
Cracks 16 mm to 25 mm wide shall have a router run through to ensure the full minimum width to the minimum depth.

All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth of 13 mm. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

**Sealant Melting.** The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a 20 liter bucket and two (460 mm stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the 20 liter bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.

Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.
Sealing. The sealant shall be placed when ambient air temperature is at or above 5°C.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin "film" of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 25 mm and no greater than 50 mm wide, and 1 mm thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealant until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts, or that has sunk into the crack more than 10 mm below the pavement surface, shall be repaired. The areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

**METHOD OF MEASUREMENT**

This work shall be measured by the number of meters of cracks sealed.

**BASIS OF PAYMENT**

The unit price bid per meter shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM 18403.7601  ROUTING, CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

DESCRIPTION

This work shall consist of routing, cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for routing, cleaning, and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than \( \frac{1}{8} \) inch wide nor more than 1 inch wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are \( \frac{1}{8} \) inch or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be routed, cleaned and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.

Crack Preparation. Cracks meeting the description above under General shall be routed to ensure that the crack has an adequate reservoir. Routing shall be accomplished with a router that can produce a vertical sided
groove with minimal edge spalling. The groove shall have the approximate dimensions of \(\frac{3}{4}\) inch wide by \(\frac{1}{2}\) inch deep. Cracks \(\frac{3}{4}\) inch to 1 inch wide shall have a router run through to ensure the full minimum width to the minimum depth.

All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth of one-half inch. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

**Sealant Melting.** The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a five gallon bucket and two (18 inch stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the five gallon bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.
Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.

**Sealing.** The sealant shall be placed when ambient air temperature is at or above 40°F.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin "film" of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 1 inch and no greater than 2 inches wide, and 1/32 inches thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealant until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts, or that has sunk into the crack more than ½ inches below the pavement surface, shall be repaired. The areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

**METHOD OF MEASUREMENT**

This work shall be measured by the number of linear feet of cracks sealed.

**BASIS OF PAYMENT**

The unit price bid per linear foot shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM 18403.7602 M  CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

DESCRIPTION

This work shall consist of cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for cleaning and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than 3 mm wide nor more than 25 mm wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are 3 mm or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be cleaned and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.

Crack Preparation. All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth.
of 13 mm. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

**Sealant Melting.** The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a 20 liter bucket and two (460 mm stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the 20 liter bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.

Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.
Sealing. The sealer shall be placed when ambient air temperature is at or above 5°C.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin "film" of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 25 mm and no greater than 50 mm wide, and 1 mm thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealer until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts shall be repaired. Damaged areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Deficient areas where crack sealant has sunk into the crack more than 10 mm below the pavement surface shall be cleaned with high pressure air and additional sealant applied to meet the specified thin film amount, at the unit price bid. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

METHOD OF MEASUREMENT

This work shall be measured by the number of liters of sealant, corrected to 15°C, used to complete the work. No payment will be made for waste material.

BASIS OF PAYMENT

The unit price bid per liter shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM 18403.7602  CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

DESCRIPTION

This work shall consist of cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for cleaning and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than ⅛ inch wide nor more than 1 inch wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are ½ inch or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be cleaned and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.

Crack Preparation. All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth...
CLEANING AND SEALING CRACKS 
IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

of one-half inch. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

**Sealant Melting.** The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a five gallon bucket and two (18 inch stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the five gallon bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.

Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.
Sealing. The sealer shall be placed when ambient air temperature is at or above 40°F.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin "film" of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 1 inch and no greater than 2 inches wide, and 1/32 inches thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealer until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts shall be repaired. Damaged areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Deficient areas where crack sealant has sunk into the crack more than 3/8 inches below the pavement surface shall be cleaned with high pressure air and additional sealant applied to meet the specified thin film amount, at the unit price bid. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

METHOD OF MEASUREMENT

This work shall be measured by the number of gallons of sealant, corrected to 60°F, used to complete the work. No payment will be made for waste material.

BASIS OF PAYMENT

The unit price bid per gallon shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM 18403.7603 M  ROUTING, CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405 (PAYMENT BY LITER)

DESCRIPTION

This work shall consist of routing, cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed under this item shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for routing, cleaning, and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than 3 mm wide nor more than 25 mm wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are 3 mm or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be routed, cleaned, and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.
ITEM 18403.7603 M  ROUTING, CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405 (PAYMENT BY LITER)

Crack Preparation. Cracks meeting the description above under General shall be routed to ensure that the crack has an adequate reservoir. Routing shall be accomplished with a router that can produce a vertical sided groove with minimal edge spalling. The groove shall have the approximate dimensions of 16 mm wide by 13 mm deep. Cracks 16 mm to 25 mm wide shall have a router run through to ensure the full minimum width to the minimum depth.

All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth of 13 mm. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

Sealant Melting. The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a 20 liter bucket and two (460 mm stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the 20 liter bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.

Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and...
application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.

Sealing. The sealant shall be placed when ambient air temperature is at or above 5°C.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin "film" of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 25 mm and no greater than 50 mm wide, and 1 mm thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealant until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts shall be repaired. Damaged areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Deficient areas where crack sealant has sunk into the crack more than 10 mm below the pavement surface shall be cleaned with high pressure air and additional sealant applied to meet the specified thin film amount, at the unit price bid. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

METHOD OF MEASUREMENT

This work shall be measured by the number of liters of sealant, corrected to 15°C, used to complete the work.

No payment will be made for waste material.

BASIS OF PAYMENT

The unit price bid per liter shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM  18403.7603  
ROUTING, CLEANING AND SEALING CRACKS  
IN HOT MIX ASPHALT PAVEMENT, ASTM D3405  
(PAYMENT BY GALLON)

DESCRIPTION

This work shall consist of routing, cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed under this item shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for routing, cleaning, and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than \( \frac{1}{8} \) inch wide nor more than 1 inch wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are \( \frac{1}{8} \) inch or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be routed, cleaned, and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.

Crack Preparation. Cracks meeting the description above under General shall be routed to ensure that the crack has an adequate reservoir. Routing shall be accomplished with a router that can produce a vertical sided
groove with minimal edge spalling. The groove shall have the approximate dimensions of \( \frac{5}{8} \) inch wide by \( \frac{1}{2} \) inch deep. Cracks \( \frac{5}{8} \) inch to 1 inch wide shall have a router run through to ensure the full minimum width to the minimum depth.

All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth of one-half inch. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

**Sealant Melting.** The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a five gallon bucket and two (18 inch stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the five gallon bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.
Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.

**Sealing.** The sealant shall be placed when ambient air temperature is at or above 40°F.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin "film" of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 1 inch and no greater than 2 inches wide, and 1/32 inches thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealant until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts shall be repaired. Damaged areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Deficient areas where crack sealant has sunk into the crack more than ½ inches below the pavement surface shall be cleaned with high pressure air and additional sealant applied to meet the specified thin film amount, at the unit price bid. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

**METHOD OF MEASUREMENT**

This work shall be measured by the number of gallons of sealant, corrected to 60°F, used to complete the work.

No payment will be made for waste material.

**BASIS OF PAYMENT**

The unit price bid per gallon shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM 18403.78 M  SELECTIVE ROUTING OF CRACKS IN HOT MIX ASPHALT PAVEMENT

ITEM 18403.79 M  CLEANING AND SEALING CRACKS WITH SELECTIVE ROUTING IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

DESCRIPTION

This work shall consist of routing, cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for routing, cleaning, and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than 3 mm wide nor more than 25 mm wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are 3 mm or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be routed, cleaned and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.
Crack Preparation. Cracks meeting the description above under General shall be routed to ensure that the crack has an adequate reservoir. Routing shall be accomplished with a router that can produce a vertical sided groove with minimal edge spalling. The groove shall have the approximate dimensions of 16 mm wide by 13 mm deep. Cracks 16 mm to 25 mm wide shall have a router run through to ensure the full minimum width to the minimum depth.

All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth of 13 mm. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

Sealant Melting. The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a 20 liter bucket and two (460 mm stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the 20 liter bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.
Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.

**Sealing.** The sealant shall be placed when ambient air temperature is at or above 5°C.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin "film" of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 25 mm and no greater than 50 mm wide, and 1 mm thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealant until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts shall be repaired. Damaged areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Deficient areas where crack sealant has sunk into the crack more than 10 mm below the pavement surface shall be cleaned with high pressure air and additional sealant applied to meet the specified thin film amount, at the unit price bid. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

**METHOD OF MEASUREMENT**

Routing work shall be measured by the number of meters of cracks routed.

Cleaning and sealing work shall be measured by the number of liters of sealant, corrected to 15°C, used to complete the work. No payment will be made for waste material.

**BASIS OF PAYMENT**

Item 18403.78 (Selective Routing) - The unit price bid per meter shall include the cost of furnishing all labor, equipment and materials to complete the work.

Item 18403.79 (Cleaning and Sealing) - The unit price bid per liter shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM 18403.78 SELECTIVE ROUTING OF CRACKS IN HOT MIX ASPHALT PAVEMENT
ITEM 18403.79 CLEANING AND SEALING CRACKS WITH SELECTIVE ROUTING IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

DESCRIPTION

This work shall consist of routing, cleaning and sealing with ASTM D3405, cracks and joints in pavements and shoulders which are either overlaid with or full depth hot mix asphalt. In this specification, the word "crack" shall also mean "joint."

MATERIALS

Crack Sealant. The sealant shall meet the requirements of ASTM D3405; Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements. The sealant shall be delivered in the manufacturer's original sealed containers. The material will be accepted on the basis that the name of the Primary Source (Manufacturer) and trade name appears on the current Approved List. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

Prior to the commencement of work the Contractor shall provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application.

CONSTRUCTION DETAILS

General. All pavement repairs called for on the plans which border a pavement crack to be sealed shall be completed, as specified in the appropriate item(s), prior to commencement of work under this item.

The Contractor shall furnish all equipment necessary for routing, cleaning, and sealing the pavement cracks. All equipment shall meet the description and/or performance requirements described herein and be approved by the Engineer before its use.

Only well defined, single cracks shall be sealed. Sealing shall be limited to cracks not less than 1/8 inch wide nor more than 1 inch wide, at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are 1/8 inch or greater, shall be sealed along their entire length. Where secondary cracking exists, seal only the primary (widest) crack. Do not seal the secondary cracks. The Engineer's determination of which cracks to be routed, cleaned and sealed will be the final basis for the work being performed.

Pavement markings shall not be covered and/or obliterated with crack sealant. No more than 25% of the pavement marking width shall be obliterated or the marking shall be replaced at the Contractor's expense.
Crack Preparation. Cracks meeting the description above under General shall be routed to ensure that the crack has an adequate reservoir. Routing shall be accomplished with a router that can produce a vertical sided groove with minimal edge spalling. The groove shall have the approximate dimensions of ½ inch wide by ½ inch deep. Cracks ½ inch to 1 inch wide shall have a router run through to ensure the full minimum width to the minimum depth.

All cracks shall be thoroughly cleaned of dust, dirt, foreign material, sand and any other extraneous materials by high pressure air or a hot air lance. The cracks shall be cleaned to a minimum depth of one-half inch. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. The Contractor shall maintain these devices and see that they are functioning properly. When using a hot air lance, care shall be taken so as not to burn, scorch or ignite the adjoining pavement. The material and debris shall be blown from the crack and pavement to prevent recontamination of the crack.

The crack sides shall be clean and dry immediately prior to sealing. The Contractor shall reclean cracks that are not clean and dry. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the crack cleaning operation.

Sealant Melting. The sealant shall be heated in a melter constructed either as a double boiler with the space between inner and outer shells filled with heat-transfer medium, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. The melter shall be capable of maintaining the pouring temperature. The melter shall be equipped with positive temperature controls, and with mechanical agitation or a re-circulation pump capable of assuring a homogeneous blend of the sealant. The melter shall have separate thermometers to indicate the temperature of the heat transfer medium and the sealant material in the hopper. Before any crack sealing shall commence, the Engineer shall inspect the melter to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any crack sealing if thermometers are found to be defective or missing.

Prior to any crack sealing the temperature of the sealant shall be measured as it is discharged from the applicator wand. The temperature shall be at least equal to or above the manufacturer's recommended minimum pouring temperature and equal to or below the manufacturer's recommended safe heating temperature. For this purpose, the Contractor shall provide a five gallon bucket and two (18 inch stem) thermometers. The two thermometers are for cross referencing and to provide a backup should one be lost or damaged. The Contractor shall discharge sealant into the five gallon bucket and the Engineer shall immediately measure the temperature of the sealant. The Contractor may submit an alternate method for measuring the discharge temperature for approval by the Engineer.

The discharge hose shall be equipped with a thermostatically controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant pouring temperature. The application wand shall be returned to the
machine if it is not thermostatically heat controlled, and the material recirculated as necessary to maintain the proper sealant pouring temperature between individual crack sealing operations.

Sealant material heated beyond the safe heating temperature shall not be used. Sealant material may be reheated or heated in excess of six hours providing the manufacturer's recommendations pertaining to heating and application allow it. If this is done, the melter shall be recharged with fresh material amounting to at least twenty percent of the volume of material remaining in the melter.

Sealing. The sealant shall be placed when ambient air temperature is at or above 40°F.

Cracks shall be sealed by placing the applicator wand in or directly over the crack recess and carefully discharging the sealant to just fill the crack. The sealant shall be struck-off flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Only a narrow, thin “film” of material shall be permitted on the pavement surface. To create an effective seal the "film" shall be a minimum of 1 inch and no greater than 2 inches wide, and 1/32 inches thick. Sealant in excess of the specified thin "film" amount shall be removed from the pavement surface and disposed of at the Contractor's expense.

Traffic shall not be allowed on the sealant until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting with fine aggregate will not be allowed.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealant not bonded to both sides of the crack shall be removed. The crack shall be recleaned and resealed in accordance with this specification, at the Contractor's expense. Sealant that becomes damaged from traffic or from the removal of over applied amounts shall be repaired. Damaged areas shall be cleaned with high pressure air and then have additional sealant applied to meet the specified thin film amount, at the Contractor's expense. Deficient areas where crack sealant has sunk into the crack more than ½ inches below the pavement surface shall be cleaned with high pressure air and additional sealant applied to meet the specified thin film amount, at the unit price bid. Cleaning of damaged or deficient areas shall not require removal of the sealant from a crack that has been sealed.

METHOD OF MEASUREMENT

Routing work shall be measured by the number of linear feet of cracks routed.

Cleaning and sealing work shall be measured by the number of gallons of sealant, corrected to 60°F, used to complete the work. No payment will be made for waste material.

BASIS OF PAYMENT

Item 18403.78 (Selective Routing) - The unit price bid per linear foot shall include the cost of furnishing all labor, equipment and materials to complete the work.
Item 18403.79 (Cleaning and Sealing) - The unit price bid per gallon shall include the cost of furnishing all labor, equipment and materials to complete the work.
ITEM 18403.7507 M  FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING FIBER REINFORCED ASPHALT CEMENT

DESCRIPTION

This work shall consist of cleaning and filling the shoulder joint between portland cement concrete pavement and asphalt concrete shoulders with fiber reinforced asphalt cement.

MATERIALS

The materials used shall meet the following requirements:

Asphalt Cement: The asphalt cement shall be paving grade asphalt supplied by a primary source as defined in Section 702 and meeting the specification for Materials Designation 702-0500, Viscosity Grade AC-20.

Fibers: The fibers shall meet the following requirements:

- Type of Fiber: Polyester
- Tensile Strength: 480 MPa min.
- Specific Gravity: 1.32-1.40
- Melt Temperature: 246°C min.
- Elongation: 33% ± 9%
- Length of Fiber: 6 mm ± 0.7 mm

Each container shall be legibly marked with the following information:

- Manufacturer's Name
- Trade Name of Fiber
- Type of Fiber

Composition of Sealant Mixture: The asphalt cement shall meet the requirements of Grade AC-20, and when mixed, shall contain a minimum of 5.0%, by weight, of polyester fibers.

Mixing Temperatures: The filler shall be mixed at the temperatures recommended by the fiber manufacturer but shall in no case exceed 163°C.

Acceptance of the bituminous material is based on the name of the primary source appearing on the Department's Approved List of Asphalt Cement for Paving and is contingent upon certification of compliance to these specification requirements by the primary source and subsequent suppliers.

Acceptance of the polyester fibers is based on certification by the manufacturer that the fibers meet the material properties listed under the section "MATERIALS".
CONSTRUCTION DETAILS

General. The Contractor shall furnish all equipment necessary for cleaning and filling the shoulder joints. All equipment shall be approved by the Engineer before its use. Filling shall be done at locations shown on the Plans or as directed by the Engineer.

All joints shall be thoroughly cleaned of all dust, dirt, moisture, foreign material, incompressibles or any other extraneous materials by high pressure air, hot air lance, wire brush or other suitable method or tool approved by the Engineer. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the joint surfaces. The Contractor shall maintain these devices and see that they are functioning properly. The joints shall be cleaned a minimum of 19 mm deep. The material and debris removed from the joint shall be removed from the pavement and shoulder to prevent re-contamination of the joint.

Immediately prior to filling and after the joint has been prepared as specified above, both joint faces shall be thoroughly cleaned to a minimum depth of 13 mm using compressed air. The joint sides shall appear thoroughly clean and dry prior to filling. The Contractor may be ordered to reclean joints if in the opinion of the Engineer adequate cleaning and drying is not being obtained. Final cleaning or recleaning may be performed with the use of a hot air lance. When using a hot air lance, care shall be taken so as not to burn, scorch, or ignite the adjoining pavement. Any joints not filled the same day shall be recleaned prior to filling.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the joint cleaning operation. Materials and methods used for this purpose will be subject to the approval of the Engineer.

The filler shall be heated in a melter constructed either as a double boiler, with the space between inner and outer shells filled with heat-transfer medium; or with internal tubes or coils carrying the filler through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. Positive temperature control, mechanical agitation and recirculation pumps shall be used. The unit shall be provided with separate thermometers to indicate the temperature of the heat transfer medium and the filler material in the hopper. The mixing unit shall be capable of maintaining the specified mixing temperature, with an allowable variation of ± 5°C. Before any joint filling shall commence, the Engineer shall inspect the filling apparatus to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any joint filling if thermometers are found to be defective or missing.

The Contractor shall be responsible for a safe and efficient method by which the Engineer will be able to accurately measure the temperature of the filler as it is discharged from the applicator wand. The proposed method must be submitted to the Engineer for his approval before the commencement of joint filling operations. The Contractor shall provide the Engineer with two (457 mm stem) thermometers having a temperature range sufficient to meet the requirements of this specification.

The discharge hose shall be equipped with a controlled heating apparatus or shall be insulated sufficiently to maintain the proper filler temperature. The application wand shall be returned to the machine and the material recirculated as necessary to maintain the proper filler application temperature between individual joint filling operations. Reasonable care should be taken so as not to obliterate pavement markings.
ITEM 18403.7507 M FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING FIBER REINFORCED ASPHALT CEMENT

If in the opinion of the Engineer, the Contractor displays an inconsistency in his ability to perform the joint cleaning or filling operation he shall order the Contractor to cease his operations until such time as he can comply with the required criteria in a consistent manner.

The contractor shall obtain the manufacturer's recommendations pertaining to the heating, mixing, and application of the filler, and shall supply a copy to the Engineer. These recommendations shall be adhered to and followed by the contractor with such exceptions as this specification may require.

The filler shall not be placed when pavement or ambient temperatures fall below 5°C. The filler shall be pumped directly into the joint from the mixing unit. The filler shall slightly overfill the joint and be finished in a band 100 mm wide, 1.5 mm to 3 mm thick, centered over the joint.

Blotting with fine aggregate shall directly follow filler application if traffic results in tracking of the joint filling material.

METHOD OF MEASUREMENT

No payment will be made for waste material.

For Fiber Reinforced Asphalt Cement Only

The quantity to be paid for shall be the actual number of liters of asphalt cement (corrected to 15.5°C liters) used to complete the work. The quantity of polyester fiber used will not be incorporated into this measurement.

BASIS OF PAYMENT

The unit price bid shall include the cost of all labor, equipment and materials necessary to complete the work.
DESCRIPTION

This work shall consist of cleaning and filling the shoulder joint between portland cement concrete pavement and asphalt concrete shoulders with fiber reinforced asphalt cement.

MATERIALS

The materials used shall meet the following requirements:

Asphalt Cement: The asphalt cement shall be paving grade asphalt supplied by a primary source as defined in Section 702 and meeting the specification for Materials Designation 702-0500, Viscosity Grade AC-20.

Fibers: The fibers shall meet the following requirements:

Type of Fiber: Polyester
Tensile Strength: 70 ksi min.
Specific Gravity: 1.32-1.40
Melt Temperature: 475°F min.
Elongation: 33% ± 9%
Length of Fiber: 0.25 in. ± 0.03 in. min.

Each container shall be legibly marked with the following information:

Manufacturer's Name
Trade Name of Fiber
Type of Fiber

Composition of Sealant Mixture: The asphalt cement shall meet the requirements of Grade AC-20, and when mixed, shall contain a minimum of 5.0%, by weight, of polyester fibers.

Mixing Temperatures: The filler shall be mixed at the temperatures recommended by the fiber manufacturer but shall in no case exceed 325°F.

Acceptance of the bituminous material is based on the name of the primary source appearing on the Department's Approved List of Asphalt Cement for Paving and is contingent upon certification of compliance to these specification requirements by the primary source and subsequent suppliers.

Acceptance of the polyester fibers is based on certification by the manufacturer that the fibers meet the material properties listed under the section "MATERIALS".
CONSTRUCTION DETAILS

General. The Contractor shall furnish all equipment necessary for cleaning and filling the shoulder joints. All equipment shall be approved by the Engineer before its use. Filling shall be done at locations shown on the Plans or as directed by the Engineer.

All joints shall be thoroughly cleaned of all dust, dirt, moisture, foreign material, incompressibles or any other extraneous materials by high pressure air, hot air lance, wire brush or other suitable method or tool approved by the Engineer. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the joint surfaces. The Contractor shall maintain these devices and see that they are functioning properly. The joints shall be cleaned a minimum of ¾" deep. The material and debris removed from the joint shall be removed from the pavement and shoulder to prevent re-contamination of the joint.

Immediately prior to filling and after the joint has been prepared as specified above, both joint faces shall be thoroughly cleaned to a minimum depth of ½" using compressed air. The joint sides shall appear thoroughly clean and dry prior to filling. The Contractor may be ordered to reclean joints if in the opinion of the Engineer adequate cleaning and drying is not being obtained. Final cleaning or recleaning may be performed with the use of a hot air lance. When using a hot air lance, care shall be taken so as not to burn, scorch, or ignite the adjoining pavement. Any joints not filled the same day shall be recleaned prior to filling.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during the joint cleaning operation. Materials and methods used for this purpose will be subject to the approval of the Engineer.

The filler shall be heated in a melter constructed either as a double boiler, with the space between inner and outer shells filled with heat-transfer medium; or with internal tubes or coils carrying the filler through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. Positive temperature control, mechanical agitation and recirculation pumps shall be used. The unit shall be provided with separate thermometers to indicate the temperature of the heat transfer medium and the filler material in the hopper. The mixing unit shall be capable of maintaining the specified mixing temperature, with an allowable variation of ±10°F. Before any joint filling shall commence, the Engineer shall inspect the filling apparatus to ascertain the presence and working condition of the thermometers. Under no circumstances will the Engineer permit any joint filling if thermometers are found to be defective or missing.

The Contractor shall be responsible for a safe and efficient method by which the Engineer will be able to accurately measure the temperature of the filler as it is discharged from the applicator wand. The proposed method must be submitted to the Engineer for his approval before the commencement of joint filling operations. The Contractor shall provide the Engineer with two (18" stem) thermometers having a temperature range sufficient to meet the requirements of this specification.
The discharge hose shall be equipped with a controlled heating apparatus or shall be insulated sufficiently to maintain the proper filler temperature. The application wand shall be returned to the machine and the material recirculated as necessary to maintain the proper filler application temperature between individual joint filling operations. Reasonable care should be taken so as not to obliterate pavement markings.

If in the opinion of the Engineer, the Contractor displays an inconsistency in his ability to perform the joint cleaning or filling operation he shall order the Contractor to cease his operations until such time as he can comply with the required criteria in a consistent manner.

The contractor shall obtain the manufacturer's recommendations pertaining to the heating, mixing, and application of the filler, and shall supply a copy to the Engineer. These recommendations shall be adhered to and followed by the contractor with such exceptions as this specification may require.

The filler shall not be placed when pavement or ambient temperatures fall below 40°F. The filler shall be pumped directly into the joint from the mixing unit. The filler shall slightly overfill the joint and be finished in a band 4" wide, 1/16" to ⅛" thick, centered over the joint.

Blotting with fine aggregate shall directly follow filler application if traffic results in tracking of the joint filling material.

**METHOD OF MEASUREMENT**

No payment will be made for waste material.

**For Fiber Reinforced Asphalt Cement Only**

The quantity to be paid for shall be the actual number of gallons of asphalt cement (corrected to 60°F gals.) used to complete the work. The quantity of polyester fiber used will not be incorporated into this measurement.

**BASIS OF PAYMENT**

The unit price bid shall include the cost of all labor, equipment and materials necessary to complete the work.
DESCRIPTION

This work shall consist of cleaning and sealing transverse joints in existing portland cement concrete pavement. Joints not having adequate reservoir width or depth shall be sawed to suitable dimensions in accordance with this specification.

MATERIALS REQUIREMENT

Silicone Joint Sealant: The sealant shall be a one part, low modulus silicone formulation that has dynamic movement capability of ±50% of the joint width. Primer shall be used in conjunction with the silicone sealant if required by the manufacturer. Each container shall be legibly marked with the following information:

- Manufacturer's Name
- Trade Name of the Sealant
- Manufacturer's lot or batch number

Backer Rod Material: Backer rod material shall be closed cell polyethylene foam rod.

Backer rod diameter shall be a minimum of 25% larger than the joint width, it shall: support the sealant at its proper depth, prevent the sealant from leaking around and underneath it, and allow the sealant to deform freely when the joint expands and contracts.

BASIS OF ACCEPTANCE

Silicone joint sealants shall be accepted on the basis of the brand name labeled on the container and appearing on the current Approved List titled "Silicone Joint Sealants." The Department reserves the right to conduct supplementary sampling and testing.

CONSTRUCTION DETAILS

General: The Contractor shall seal transverse pavement joints in accordance with the requirements of this specification. Minimum required reservoir and sealant dimensions are contained in Table I. Transverse joints that measure less than the minimum widths or have inadequate reservoir depths shall be sawed to a suitable width and depth.

All pavement repairs including the cleaning and sealing of cracks which border pavement joints must be completed prior to the joint sealing operation.
Seasonal and Temperature Limitations: Joint sealant shall not be placed when pavement or ambient temperatures fall below 4°C or when the pavement is wet.

Initial Joint Preparation and Cleaning: Existing joint sealing material, asphalt, incompressibles and any other material present in the joint reservoir or adhering to the joint wall shall be removed by plow, saw, wire brush, high pressure air or other suitable tools approved by the Engineer to the bottom of the existing joint reservoir. The material and debris removed from the joint shall be removed from the pavement to prevent re-contamination of the joint. Removal of liquid joint sealant from the joint may require running a saw along each joint face to adequately remove all existing joint sealer.

Removal of existing joint sealers shall be scheduled so that no joints are open more than 10 days prior to sealing. After September 30, the Engineer may at his discretion further limit the amount of existing sealer to be removed to avoid open joints through the winter.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during all joint cleaning operations. Materials and methods used for this purpose will be subject to the approval of the Engineer.

Sawing of Joints: Any transverse joint that does not exhibit adequate depth or width as shown on Table I shall be sawed to suitable dimensions in order that proper sealant dimension, sealant recess, and backer rod placement can be achieved. If the joint is faulted the Contractor shall determine joint reservoir depth and width by taking measurements from the top edge of the dropped slab. The sawing shall produce vertical and parallel joint faces. The existing joint dimensions, amount of slab faulting, amount of pavement grinding and time of year joints are sealed, will determine the amount of joint sawing required.

Immediately after sawing the joint, the resulting slurry shall be completely removed from the joint and the immediate area by flushing with a jet of water under pressure and by the use of other tools as necessary.

Final Joint Preparation and Cleaning: Immediately prior to the placement of the backer rod and sealant, both joint faces shall be thoroughly cleaned to the bottom of the new joint reservoir, by sandblasting. The operator of the sandblaster shall tip the nozzle of the equipment so that the blast material is directed against one wall at a time. The joint walls shall be thoroughly clean and indicate a uniform minor abrasion of the wall surface. All joints are to be sandblasted. The joints shall then be blown with a compressed air stream of sufficient power to remove any remaining blast sand, dirt and loose material. Suitable traps or devices shall be installed on the air equipment to prevent moisture and oil from contaminating the joint surfaces. Any joints not sealed the same day shall be reclined and resandblasted prior to sealing.
Sealing: The proper diameter and type of backer rod shall be installed in a manner that will produce the sealant dimensions specified. The joints shall be thoroughly dry and clean at the time of sealing.

Primer, if required by the manufacturer of the material, shall be applied to the joint faces in a thin film by brush or spray equipment. The primer shall completely wet the surfaces to be sealed and shall dry tack free prior to installation of the backer rod.

Sealant shall be pumped directly from plastic pails or drums by compressed air powered extrusion pumps designed for moisture curing silicone sealants. Teflon seals and packing and teflon lined hoses are recommended to prevent moisture permeation. Sealant application nozzles should be designed so that sealant is applied within the confines of the joint slot. The sealant shall be applied so that it is below the surface of the slab and completely fills the width of the joint. Immediately after the sealant is applied, it shall be tooled to form a concave surface, provide firm contact with the joint faces and to form the required recess below the slab surface.

Traffic may be allowed over the sealed areas as soon as the Engineer determines that the sealant has cured sufficiently to prevent tracking. If rocking or vertical deflection due to vertical loads is expected the sealant shall be allowed to cure for 2 hours or more, as ordered by the Engineer.

Sealant that becomes damaged, is not properly bonded to the concrete, or that is installed improperly shall be repaired. Damaged or deficient areas shall have the sealant removed, the surfaces properly cleaned, and new sealant installed to the satisfaction of the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT

This work shall be measured by the number of linear meters of joints sealed.

BASIS OF PAYMENT

The unit price bid per linear meter shall include the cost of furnishing all labor, equipment, and materials necessary to complete the work as specified or as directed by the Engineer.
TABLE I
JOINT AND SEALANT DIMENSIONS

<table>
<thead>
<tr>
<th>Joint Width W (mm)</th>
<th>(Minimum)</th>
<th>a (mm)</th>
<th>b (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10*</td>
<td>29</td>
<td>6-10</td>
<td>6-10</td>
</tr>
<tr>
<td>13</td>
<td>32</td>
<td>6-10</td>
<td>6-10</td>
</tr>
<tr>
<td>16**</td>
<td>35</td>
<td>6-10</td>
<td>6-10</td>
</tr>
<tr>
<td>19</td>
<td>41</td>
<td>9-13</td>
<td>6-10</td>
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<td>22</td>
<td>45</td>
<td>9-13</td>
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<td>2550</td>
<td>2</td>
<td>9-13</td>
<td>9-13</td>
</tr>
<tr>
<td>25+</td>
<td>50+</td>
<td>13-16</td>
<td>9-13</td>
</tr>
</tbody>
</table>

* Minimum width for 6m slabs
** Minimum width for 19m slabs

TRANSVERSE JOINT
(SHOWING FAULTED SLAB)

Backer Rod 25% Oversize To Prevent Movement During Sealing
DESCRIPTION

This work shall consist of cleaning and sealing transverse joints in existing portland cement concrete pavement. Joints not having adequate reservoir width or depth shall be sawed to suitable dimensions in accordance with this specification.

MATERIALS REQUIREMENT

Silicone Joint Sealant: The sealant shall be a one part, low modulus silicone formulation that has dynamic movement capability of ±50% of the joint width. Primer shall be used in conjunction with the silicone sealant if required by the manufacturer. Each container shall be legibly marked with the following information:

- Manufacturer's Name
- Trade Name of the Sealant
- Manufacturer's lot or batch number

Backer Rod Material: Backer rod material shall be closed cell polyethylene foam rod.

Backer rod diameter shall be a minimum of 25% larger than the joint width, it shall: support the sealant at its proper depth, prevent the sealant from leaking around and underneath it, and allow the sealant to deform freely when the joint expands and contracts.

BASIS OF ACCEPTANCE

Silicone joint sealants shall be accepted on the basis of the brand name labeled on the container and appearing on the current Approved List titled "Silicone Joint Sealants." The Department reserves the right to conduct supplementary sampling and testing.

CONSTRUCTION DETAILS

General: The Contractor shall seal transverse pavement joints in accordance with the requirements of this specification. Minimum required reservoir and sealant dimensions are contained in Table I. Transverse joints that measure less than the minimum widths or have inadequate reservoir depths shall be sawed to a suitable width and depth.

All pavement repairs including the cleaning and sealing of cracks which border pavement joints must be completed prior to the joint sealing operation.
Seasonal and Temperature Limitations: Joint sealant shall not be placed when pavement or ambient temperatures fall below 40°F or when the pavement is wet.

Initial Joint Preparation and Cleaning: Existing joint sealing material, asphalt, incompressibles and any other material present in the joint reservoir or adhering to the joint wall shall be removed by plow, saw, wire brush, high pressure air or other suitable tools approved by the Engineer to the bottom of the existing joint reservoir. The material and debris removed from the joint shall be removed from the pavement to prevent re-contamination of the joint. Removal of liquid joint sealant from the joint may require running a saw along each joint face to adequately remove all existing joint sealer.

Removal of existing joint sealers shall be scheduled so that no joints are open more than 10 days prior to sealing. After September 30, the Engineer may at his discretion further limit the amount of existing sealer to be removed to avoid open joints through the winter.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during all joint cleaning operations. Materials and methods used for this purpose will be subject to the approval of the Engineer.

Sawing of Joints: Any transverse joint that does not exhibit adequate depth or width as shown on Table I shall be sawed to suitable dimensions in order that proper sealant dimension, sealant recess, and backer rod placement can be achieved. If the joint is faulted the Contractor shall determine joint reservoir depth and width by taking measurements from the top edge of the dropped slab. The sawing shall produce vertical and parallel joint faces. The existing joint dimensions, amount of slab faulting, amount of pavement grinding and time of year joints are sealed, will determine the amount of joint sawing required.

Immediately after sawing the joint, the resulting slurry shall be completely removed from the joint and the immediate area by flushing with a jet of water under pressure and by the use of other tools as necessary.

Final Joint Preparation and Cleaning: Immediately prior to the placement of the backer rod and sealant, both joint faces shall be thoroughly cleaned to the bottom of the new joint reservoir, by sandblasting. The operator of the sandblaster shall tip the nozzle of the equipment so that the blast material is directed against one wall at a time. The joint walls shall be thoroughly clean and indicate a uniform minor abrasion of the wall surface. All joints are to be sandblasted. The joints shall then be blown with a compressed air stream of sufficient power to remove any remaining blast sand, dirt and loose material. Suitable traps or devices shall be installed on the air equipment to prevent moisture and oil from contaminating the joint surfaces. Any joints not sealed the same day shall be recleaned and resandblasted prior to sealing.
Sealing: The proper diameter and type of backer rod shall be installed in a manner that will produce the sealant dimensions specified. The joints shall be thoroughly dry and clean at the time of sealing.

Primer, if required by the manufacturer of the material, shall be applied to the joint faces in a thin film by brush or spray equipment. The primer shall completely wet the surfaces to be sealed and shall dry tack free prior to installation of the backer rod.

Sealant shall be pumped directly from plastic pails or drums by compressed air powered extrusion pumps designed for moisture curing silicone sealants. Teflon seals and packing and teflon lined hoses are recommended to prevent moisture permeation. Sealant application nozzles should be designed so that sealant is applied within the confines of the joint slot. The sealant shall be applied so that it is below the surface of the slab and completely fills the width of the joint. Immediately after the sealant is applied, it shall be tooled to form a concave surface, provide firm contact with the joint faces and to form the required recess below the slab surface.

Traffic may be allowed over the sealed areas as soon as the Engineer determines that the sealant has cured sufficiently to prevent tracking. If rocking or vertical deflection due to vertical loads is expected the sealant shall be allowed to cure for 2 hours or more, as ordered by the Engineer.

Sealant that becomes damaged, is not properly bonded to the concrete, or that is installed improperly shall be repaired. Damaged or deficient areas shall have the sealant removed, the surfaces properly cleaned, and new sealant installed to the satisfaction of the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT

This work shall be measured by the number of linear feet of joints sealed.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of furnishing all labor, equipment, and materials necessary to complete the work as specified or as directed by the Engineer.
### TABLE I
**JOINT AND SEALANT DIMENSIONS**

<table>
<thead>
<tr>
<th>Joint Width W (in.)</th>
<th>(Minimum)</th>
<th>a (in.)</th>
<th>b (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/6*</td>
<td>1 1/8</td>
<td>1/4 - 3/8</td>
<td>1/4 - 3/8</td>
</tr>
<tr>
<td>1/2</td>
<td>1 1/4</td>
<td>1/4 - 3/8</td>
<td>1/4 - 3/8</td>
</tr>
<tr>
<td>5/6**</td>
<td>1 3/8</td>
<td>3/8 - 1/2</td>
<td>1/4 - 3/8</td>
</tr>
<tr>
<td>3/4</td>
<td>1 1/8</td>
<td>3/8 - 1/2</td>
<td>3/8 - 1/2</td>
</tr>
<tr>
<td>7/8</td>
<td>1 1/4</td>
<td>3/8 - 1/2</td>
<td>3/8 - 1/2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3/8 - 1/2</td>
<td>3/8 - 1/2</td>
</tr>
<tr>
<td>1+</td>
<td>2+</td>
<td>1/2 - 5/8</td>
<td>3/8 - 1/2</td>
</tr>
</tbody>
</table>

* Minimum width for 20 ft. slabs
** Minimum width for 63 ft. slabs

### TRANSVERSE JOINT
(SHOWING FAULTED SLAB)

- **W**: Width
- **a**: Depth
- **b**: Sealant width
- **d**: Backer rod width

Backer Rod 25% Oversize To Prevent Movement During Sealing
DESCRIPTION

This work shall consist of cleaning and sealing longitudinal joints in existing portland cement concrete pavements. Joints not having adequate reservoir width or depth shall be sawed to suitable dimensions in accordance with this specification.

MATERIAL REQUIREMENTS

Joint Sealant: Sealants shall meet the requirements of the following:

Silicone Joint Sealant: The sealant shall be a one part, low modulus silicone formulation that has dynamic movement capability of ±50% of the joint width. Primer shall be used in conjunction with the silicone sealant if required by the manufacturer. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number

Highway Joint Sealant (ASTM D3405): The sealant shall meet the requirements of ASTM D3405. The sealant shall be delivered in the manufacturer's original sealed containers. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- Pouring temperature
- Safe heating temperature

BASIS OF ACCEPTANCE

Joint sealants shall be accepted on the basis of the brand name labeled on the container and appearing on the current Approved List titled "Silicone Joint Sealants," or "Highway Joint Sealant (ASTM D3405)." The Department reserves the right to conduct supplementary sampling and testing.

Backer Rod Material: Backer rod material for Silicone Joint Sealant shall be closed cell polyethylene foam rod. Backer rod material for ASTM D3405 sealant shall be any backer rod from the Department's Approved List titled "Backer Rod For Hot Pour Joint Sealants."

Backer rod diameter shall be a minimum of 25% larger than the joint width, it shall: support the sealant at its proper depth, prevent the sealant from leaking around and underneath it, and allow the sealant to deform freely when the joint expands and contracts.
Bond Breaker Tape: Bond breaker tape shall be polyethylene adhesive tape or masking tape. The width of the tape may be equal to but not more than 3 mm narrower than the width of the joint.

CONSTRUCTION DETAILS

General: The Contractor shall seal longitudinal pavement joints with a sealant meeting the requirements of this specification. All joint sealants will require the use of a backer rod or bond breaking tape.

Sealant thickness for silicone joint sealant shall not be less than 6 mm. Sealant thickness for ASTM D3405 joint sealant shall not be less than 19 mm. All sealants shall be recessed 3 mm to 6 mm from the top surface of the pavement. The minimum joint width for longitudinal joints shall be 8 mm. Figures 1 and 2 show typical longitudinal joints and required sealant dimensions.

The Contractor shall adjust his longitudinal joint sealing operations so that any sealing of transverse joints under other items will result in continuous transverse joint sealant across all longitudinal joints.

The Contractor may elect to use a different type joint sealant for the longitudinal joint than was selected for transverse joint sealing. Silicone sealant shall be adequately cured before a hot-poured type sealant is placed in contact with it.

All pavement repairs including the cleaning and sealing of cracks which border pavement joints to be sealed under this item shall be completed, as specified in the appropriate item(s), prior to commencement of the joint sealing operation.

Seasonal and Temperature Limitations: Joint sealant shall not be placed when pavement or ambient temperatures fall below 4°C or when the pavement is wet.

Initial Joint Preparation and Cleaning: Existing joint sealing material, asphalt, incompressibles and any other material present in the joint reservoir or adhering to the joint wall shall be removed by plow, saw, wire brush, high pressure air or other suitable tools approved by the Engineer to the bottom of the existing joint reservoir. The material and debris removed from the joint shall be removed from the pavement to prevent re-contamination of the joint. Removal of liquid joint sealant from the joint may require running a saw along each joint face to adequately remove all existing joint sealer.

Removal of existing joint sealers shall be scheduled so that no joints are open more than 10 days prior to sealing. After September 30, the Engineer may at his discretion further limit the amount of existing sealer to be removed to avoid open joints through the winter.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during all joint cleaning operations. Materials and methods used for this purpose will be subject to the Approval of the Engineer.

Sawing of Joints: Longitudinal joints that do not have adequate width and depth as required by this specification shall be sawed to suitable dimensions in order that proper sealant dimension, sealant recess and
backer rod placement (when required), can be achieved. The existing joint dimensions, amount of slab faulting and amount of pavement grinding will determine the amount of joint sawing required.

Immediately after sawing the joint, the resulting slurry shall be completely removed from the joint and the immediate area by flushing with a jet of water under pressure and by the use of other tools as necessary.

**Final Joint Preparation and Cleaning:** Immediately prior to the placement of the backup material and the sealant, both joint faces shall be thoroughly cleaned to the bottom of the new joint reservoir, by sandblasting. The operator of the sandblaster shall tip the nozzle of the equipment so that the blast material is directed against one wall at a time. The joint walls shall be thoroughly clean and indicate a uniform minor abrasion of the wall surface. All joints are to be sandblasted. The joints shall then be blown with a compressed air stream of sufficient power to remove any remaining blast sand, dirt and loose material. Suitable traps or devices shall be installed on the air equipment to prevent moisture and oil from contaminating the joint surfaces. Any joints not sealed the same day shall be recleaned and resandblasted prior to sealing.

**Sealing:** The proper size and type of backup material shall be installed in a manner that will produce the sealant dimensions specified. The joints shall be thoroughly dry and clean at the time of sealing.

Sealant that becomes damaged, is not properly bonded to the concrete, or that is installed improperly shall be repaired. Damaged or deficient areas shall have the sealant removed, the surfaces properly cleaned, and new sealant installed to the satisfaction of the Engineer at the Contractor's expense.

**Silicone Joint Sealant:** The primer for silicone joint sealant, if required by the manufacturer of the material, shall be applied to the joint faces in a thin film by brush or spray equipment. The primer shall completely wet the surfaces to be sealed and shall dry tack free prior to installation of the backer rod.

Sealant shall be pumped directly from plastic pails or drums by compressed air powered extrusion pumps designed for moisture curing silicone sealants. Teflon seals and packing and teflon lined hoses are recommended to prevent moisture permeation. Sealant application nozzles should be designed so that sealant is applied within the confines of the joint slot. The sealant shall be applied so that it is held below the surface of the slab and completely fills the width of the joint. Immediately after the sealant is applied, it shall be tooled to form a concave surface, provide firm contact with the joint faces and to form the required recess below the slab surface.

Traffic may be allowed over the sealed areas as soon as the Engineer determines that the sealant has cured sufficiently to prevent tracking. If rocking or vertical deflection due to vertical loads is expected the sealant shall be allowed to cure for 2 hours or more, as ordered by the Engineer.

**Hot Poured Joint Sealant ASTM D3405:** A copy of the manufacturer's recommendations pertaining to the heating and application of the sealant shall be submitted to the Engineer prior to the commencement of work; and these recommendations shall be adhered to and followed by the Contractor, with such exceptions as this specification may require.
ITEM 18502.7401 M   RESEALING LONGITUDINAL JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT

The joint sealant shall be heated in a melter constructed either as a double boiler, with the space between inner and outer shells filled with oil or other heat-transfer medium; or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. Positive temperature control, mechanical agitation and recirculation pumps shall be used. The unit shall be provided with separate thermometers to indicate the temperature of the heat transfer medium and the joint sealant material in the hopper. Before any joint sealing shall commence, the Engineer shall inspect the joint sealing apparatus to ascertain the presence of and the working condition of the thermometers. Under no circumstances will the Engineer permit any joint sealing if the thermometers are found to be defective or missing. The Contractor shall provide the Engineer with two (457 mm stem) thermometers, having a temperature range sufficient to meet the requirements of this specification.

The discharge hose shall be equipped with a controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant temperature.

The recommended pouring temperature shall be 5°C below the manufacturer's designated safe heating temperature, with an allowable variation of ± 5°C. Sealant material that has exceeded the safe heating temperature, been heated at the pouring temperature in excess of 6 hours, or been reheated shall not be used.

Care shall be taken not to overfill the joint reservoir. Any excess material shall be removed from the pavement surface, as ordered by the Engineer. Traffic shall not be allowed on the material until it has cured in order to prevent tracking.

METHOD OF MEASUREMENT

This work shall be measured by the number of linear meters of joints sealed.

BASIS OF PAYMENT

The unit price bid per linear meter shall include the cost of furnishing all labor, equipment, and materials necessary to complete the work as specified or as directed by the Engineer.
FIGURE 1
SEALANT WITH BACKER ROD

3 to 6 mm

8 mm

3 mm (min.) for silicone sealant
19 mm (min.) for ASTM D3405 sealant

Sealant
Backer Rod
Crack

FIGURE 2
SEALANTS WITH BOND BREAKER TAPE

3 to 6 mm

8 mm

3 mm (min.) for silicone sealant
19 mm (min.) for ASTM D3405 sealant

Sealant
Bond Breaker tape
Crack
ITEM 18502.7401  RESEALING LONGITUDINAL JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT

DESCRIPTION

This work shall consist of cleaning and sealing longitudinal joints in existing portland cement concrete pavements. Joints not having adequate reservoir width or depth shall be sawed to suitable dimensions in accordance with this specification.

MATERIAL REQUIREMENTS

Joint Sealant: Sealants shall meet the requirements of the following:

Silicone Joint Sealant: The sealant shall be a one part, low modulus silicone formulation that has dynamic movement capability of ±50% of the joint width. Primer shall be used in conjunction with the silicone sealant if required by the manufacturer. Each container shall be legibly marked with the following information:

  Manufacturer's name
  Trade name of the sealant
  Manufacturer's lot or batch number

Highway Joint Sealant (ASTM D3405): The sealant shall meet the requirements of ASTM D3405. The sealant shall be delivered in the manufacturer's original sealed containers. Each container shall be legibly marked with the following information:

  Manufacturer's name
  Trade name of the sealant
  Manufacturer's lot or batch number
  Pouring temperature
  Safe heating temperance

BASIS OF ACCEPTANCE

Joint sealants shall be accepted on the basis of the brand name labeled on the container and appearing on the current Approved List titled "Silicone Joint Sealants," or "Highway Joint Sealant (ASTM D3405)." The Department reserves the right to conduct supplementary sampling and testing.

Backer Rod Material: Backer rod material for Silicone Joint Sealant shall be closed cell polyethylene foam rod. Backer rod material for ASTM D3405 sealant shall be any backer rod from the Department's Approved List titled "Backer Rod For Hot Pour Joint Sealants."

Backer rod diameter shall be a minimum of 25% larger than the joint width, it shall: support the sealant at its proper depth, prevent the sealant from leaking around and underneath it, and allow the sealant to deform freely when the joint expands and contracts.
Bond Breaker Tape: Bond breaker tape shall be polyethylene adhesive tape or masking tape. The width of the tape may be equal to but not more than ⅛ inch narrower than the width of the joint.

CONSTRUCTION DETAILS

General: The Contractor shall seal longitudinal pavement joints with a sealant meeting the requirements of this specification. All joint sealants will require the use of a backer rod or bond breaking tape.

Sealant thickness for silicone joint sealant shall not be less than ¼ inch. Sealant thickness for ASTM D3405 joint sealant shall not be less than ⅜ inch. All sealants shall be recessed ⅛ to ⅜ inch from the top surface of the pavement. The minimum joint width for longitudinal joints shall be 5/16 inch. Figures 1 and 2 show typical longitudinal joints and required sealant dimensions.

The Contractor shall adjust his longitudinal joint sealing operations so that any sealing of transverse joints under other items will result in continuous transverse joint sealant across all longitudinal joints.

The Contractor may elect to use a different type joint sealant for the longitudinal joint than was selected for transverse joint sealing. Silicone sealant shall be adequately cured before a hot-poured type sealant is placed in contact with it.

All pavement repairs including the cleaning and sealing of cracks which border pavement joints to be sealed under this item shall be completed, as specified in the appropriate item(s), prior to commencement of the joint sealing operation.

Seasonal and Temperature Limitations: Joint sealant shall not be placed when pavement or ambient temperatures fall below 40°F or when the pavement is wet.

Initial Joint Preparation and Cleaning: Existing joint sealing material, asphalt, incompressibles and any other material present in the joint reservoir or adhering to the joint wall shall be removed by plow, saw, wire brush, high pressure air or other suitable tools approved by the Engineer to the bottom of the existing joint reservoir. The material and debris removed from the joint shall be removed from the pavement to prevent re-contamination of the joint. Removal of liquid joint sealant from the joint may require running a saw along each joint face to adequately remove all existing joint sealer.

Removal of existing joint sealers shall be scheduled so that no joints are open more than 10 days prior to sealing. After September 30, the Engineer may at his discretion further limit the amount of existing sealer to be removed to avoid open joints through the winter.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during all joint cleaning operations. Materials and methods used for this purpose will be subject to the Approval of the Engineer.
Sawing of Joints: Longitudinal joints that do not have adequate width and depth as required by this specification shall be sawed to suitable dimensions in order that proper sealant dimension, sealant recess and backer rod placement (when required), can be achieved. The existing joint dimensions, amount of slab faulting and amount of pavement grinding will determine the amount of joint sawing required.

Immediately after sawing the joint, the resulting slurry shall be completely removed from the joint and the immediate area by flushing with a jet of water under pressure and by the use of other tools as necessary.

Final Joint Preparation and Cleaning: Immediately prior to the placement of the backup material and the sealant, both joint faces shall be thoroughly cleaned to the bottom of the new joint reservoir, by sandblasting. The operator of the sandblaster shall tip the nozzle of the equipment so that the blast material is directed against one wall at a time. The joint walls shall be thoroughly clean and indicate a uniform minor abrasion of the wall surface. All joints are to be sandblasted. The joints shall then be blown with a compressed air stream of sufficient power to remove any remaining blast sand, dirt and loose material. Suitable traps or devices shall be installed on the air equipment to prevent moisture and oil from contaminating the joint surfaces. Any joints not sealed the same day shall be recleaned and resandblasted prior to sealing.

Sealing: The proper size and type of backup material shall be installed in a manner that will produce the sealant dimensions specified. The joints shall be thoroughly dry and clean at the time of sealing.

Sealant that becomes damaged, is not properly bonded to the concrete, or that is installed improperly shall be repaired. Damaged or deficient areas shall have the sealant removed, the surfaces properly cleaned, and new sealant installed to the satisfaction of the Engineer at the Contractor's expense.

Silicone Joint Sealant: The primer for silicone joint sealant, if required by the manufacturer of the material, shall be applied to the joint faces in a thin film by brush or spray equipment. The primer shall completely wet the surfaces to be sealed and shall dry tack free prior to installation of the backer rod.

Sealant shall be pumped directly from plastic pails or drums by compressed air powered extrusion pumps designed for moisture curing silicone sealants. Teflon seals and packing and teflon lined hoses are recommended to prevent moisture permeation. Sealant application nozzles should be designed so that sealant is applied within the confines of the joint slot. The sealant shall be applied so that it is held below the surface of the slab and completely fills the width of the joint. Immediately after the sealant is applied, it shall be tooled to form a concave surface, provide firm contact with the joint faces and to form the required recess below the slab surface.
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Traffic may be allowed over the sealed areas as soon as the Engineer determines that the sealant has cured sufficiently to prevent tracking. If rocking or vertical deflection due to vertical loads is expected the sealant shall be allowed to cure for 2 hours or more, as ordered by the Engineer.

**Hot Poured Joint Sealant ASTM D3405:** A copy of the manufacturer's recommendations pertaining to the heating and application of the sealant shall be submitted to the Engineer prior to the commencement of work; and these recommendations shall be adhered to and followed by the Contractor, with such exceptions as this specification may require.

The joint sealant shall be heated in a melter constructed either as a double boiler, with the space between inner and outer shells filled with oil or other heat-transfer medium; or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. Direct heating shall not be used. Positive temperature control, mechanical agitation and recirculation pumps shall be used. The unit shall be provided with separate thermometers to indicate the temperature of the heat transfer medium and the joint sealant material in the hopper. Before any joint sealing shall commence, the Engineer shall inspect the joint sealing apparatus to ascertain the presence of and the working condition of the thermometers. Under no circumstances will the Engineer permit any joint sealing if the thermometers are found to be defective or missing. The Contractor shall provide the Engineer with two (18" stem) thermometers, having a temperature range sufficient to meet the requirements of this specification.

The discharge hose shall be equipped with a controlled heating apparatus or shall be insulated sufficiently to maintain the proper sealant temperature.

The recommended pouring temperature shall be 10°F below the manufacturer's designated safe heating temperature, with an allowable variation of ± 10°F. Sealant material that has exceeded the safe heating temperature, been heated at the pouring temperature in excess of 6 hours, or been reheated shall not be used.

Care shall be taken not to overfill the joint reservoir. Any excess material shall be removed from the pavement surface, as ordered by the Engineer. Traffic shall not be allowed on the material until it has cured in order to prevent tracking.

**METHOD OF MEASUREMENT**

This work shall be measured by the number of linear feet of joints sealed.

**BASIS OF PAYMENT**

The unit price bid per linear foot shall include the cost of furnishing all labor, equipment, and materials necessary to complete the work as specified or as directed by the Engineer.
ITEM 18502.7401
RESEALING LONGITUDINAL JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT

FIGURE 1
SEALANT WITH BACKER ROD
1/8" to 1/4" 5/16" (min.)
1/4"(min.) for silicone sealant
3/4"(min.) for ASTM D3405 sealant
Sealant
Backer Rod
Crack

FIGURE 2
SEALANTS WITH BOND BREAKER TAPE
1/8" to 1/4" 5/16" (min.)
1/4"(min.) for silicone sealant
3/4"(min.) for ASTM D3405 sealant
Sealant
Bond Breaker tape
Crack
ITEM 18502.7601 M  SEALING CRACKS IN PCC PAVEMENT - SILICONE SEALANT

DESCRIPTION

This work shall consist of sawing, cleaning and sealing cracks in portland cement concrete pavement at locations shown on the plans or where directed by the Engineer.

MATERIALS REQUIREMENTS

Silicone Joint Sealant: The sealant shall be a one part, low modulus silicone formulation that has dynamic movement capability of ±50% of the joint width. Primer shall be used in conjunction with the silicone sealant if required by the manufacturer. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number

Backer Rod Material: Backer rod material shall be closed cell polyethylene foam rod. Backer rod diameter shall be a minimum of 25% larger than the crack width. It shall support the sealant at its proper depth, prevent the sealant from leaking around and underneath it, and allow the sealant to deform freely when the joint expands and contracts.

BASIS OF ACCEPTANCE

Silicone joint sealants shall be accepted on the basis of the brand name labeled on the container and appearing on the current Approved List titled "Silicone Joint Sealants." The Department reserves the right to conduct supplementary sampling and testing.

CONSTRUCTION DETAILS

General: All pavement repairs called for on the plans which border a pavement crack to be sealed under this item shall be completed, as specified in the appropriate item(s), prior to commencement of the crack sealing operation.

The Contractor shall furnish all equipment necessary for sawing, cleaning, and sealing the pavement cracks. All equipment shall be approved by the Engineer before its use.

Sealing will generally be limited to opened cracks at least 3 mm wide at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are 3 mm wide or over, should be sealed along their entire length.

Sealant thickness shall not be less than 6 mm. All sealant shall be recessed 6 mm to 9 mm from the top surface of the pavement.

Seasonal and Temperature Limitations: Joint sealant shall not be placed when pavement or ambient temperatures fall below 4°C or when the pavement is wet.
Crack Preparation: All cracks less than 13 mm wide shall be sawn in areas shown on the contract plans or where directed by the Engineer. Cracks 13 mm and wider shall have a saw run through them to ensure that the crack has a full 13 mm width to a depth of 38 mm to 50 mm.

Sawing shall be accomplished with crack sawing equipment which shall produce vertical sides with a minimum of edge spalling. Other types of equipment, such as vertical spindle type routers, may be approved by the Engineer if satisfactory results are obtained as determined by the Engineer. For cracks less than 13 mm wide, the sawed recess shall have the approximate dimensions of 13 mm wide by 13 mm to 16 mm deep. If the crack is faulted, the Contractor shall determine recess depth by taking measurements from the top edge of the dropped portion of the slab.

All cracks shall be thoroughly cleaned of all dust, dirt, foreign material, incompressibles or any other extraneous materials by high pressure air, plow, saw, wire brush, sandblasting, or other suitable method or tool approved by the Engineer. The material and debris removed from the crack shall be removed from the pavement to prevent recontamination of the crack.

Immediately prior to sealing and after the crack has been prepared as specified above, both crack faces shall be thoroughly cleaned by sandblasting to the full sawcut depth, or to a depth of 13 to 50 mm on cracks 13 mm and wider. All cracks to be sealed are to be sandblasted. The operator of the sandblaster shall tip the nozzle of the equipment so that the blast material is directed against one crack face at a time. The crack face shall appear thoroughly clean and indicate a uniform minor abrasion. The cracks shall then be blown with a compressed air stream of sufficient power to remove any remaining blast sand, dirt and loose material. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during all crack cleaning operations. Materials and methods used for this purpose will be subject to the approval of the Engineer.

Sealing: Primer, if required by the manufacturer of the sealant, shall be applied to the crack faces in a thin film by brush or spray equipment. The primer shall completely wet the surfaces to be sealed and, if a backer rod is required, the primer shall dry tack free before the backer rod is installed. The cracks shall be thoroughly dry and clean at the time of sealing.

For cracks 13 mm and wider, a backer rod of the proper size and type shall be installed at a depth such that the sealant will have a shape factor of 2 (width):1 (depth).

Sealant shall be pumped directly from plastic pails or drums by compressed air powered extrusion pumps designed for moisture curing silicone sealants. Teflon seals and packing and teflon lined hoses are recommended to prevent moisture permeation. Sealant application nozzles should be designed so that sealant is applied within the confines of the crack. The sealant shall be applied so that it is held below the surface of the slab and completely fills the width of the crack. Immediately after the sealant is applied, it shall be tooled to form a concave surface, to provide firm contact with the joint faces, and to form the required recess below the slab surface.
ITEM 18502.7601 M  SEALING CRACKS IN PCC PAVEMENT - SILICONE SEALANT

Traffic may be allowed over the sealed areas as soon as the Engineer determines that the sealant has cured sufficiently to prevent tracking. If rocking or deflection due to vertical loads is expected, the sealant shall be allowed to cure for two hours or more, as ordered by the Engineer.

Sealant that becomes damaged, is not properly bonded to the concrete, or that is installed improperly, shall be repaired. Damaged or deficient areas shall have the sealant removed, the surfaces properly cleaned, and new sealant installed to the satisfaction of the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT

This work shall be measured by the number of linear meters of cracks sealed.

BASIS OF PAYMENT

The unit price bid per linear meter shall include the cost of furnishing all labor, equipment, and materials necessary to complete the work as specified or as directed by the Engineer.
ITEM  18502.7601    SEALING CRACKS IN PCC PAVEMENT - SILICONE SEALANT

DESCRIPTION

This work shall consist of sawing, cleaning and sealing cracks in portland cement concrete pavement at locations shown on the plans or where directed by the Engineer.

MATERIALS REQUIREMENTS

Silicone Joint Sealant: The sealant shall be a one part, low modulus silicone formulation that has dynamic movement capability of ±50% of the joint width. Primer shall be used in conjunction with the silicone sealant if required by the manufacturer. Each container shall be legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number

Backer Rod Material: Backer rod material shall be closed cell polyethylene foam rod. Backer rod diameter shall be a minimum of 25% larger than the crack width. It shall support the sealant at its proper depth, prevent the sealant from leaking around and underneath it, and allow the sealant to deform freely when the joint expands and contracts.

BASIS OF ACCEPTANCE

Silicone joint sealants shall be accepted on the basis of the brand name labeled on the container and appearing on the current Approved List titled "Silicone Joint Sealants." The Department reserves the right to conduct supplementary sampling and testing.

CONSTRUCTION DETAILS

General: All pavement repairs called for on the plans which border a pavement crack to be sealed under this item shall be completed, as specified in the appropriate item(s), prior to commencement of the crack sealing operation.

The Contractor shall furnish all equipment necessary for sawing, cleaning, and sealing the pavement cracks. All equipment shall be approved by the Engineer before its use.

Sealing will generally be limited to opened cracks at least ⅛ inch wide at locations shown on the plans or where directed by the Engineer. Cracks with varying widths, portions of which are ⅛ inch wide or over, should be sealed along their entire length.

Sealant thickness shall not be less than ¼ inch. All sealant shall be recessed ¼ to ½ inch from the top surface of the pavement.

Seasonal and Temperature Limitations: Joint sealant shall not be placed when pavement or ambient temperatures fall below 40°F or when the pavement is wet.
Crack Preparation: All cracks less than ½ inch wide shall be sawn in areas shown on the contract plans or where directed by the Engineer. Cracks ½ inch and wider shall have a saw run through them to ensure that the crack has a full ½ inch width to a depth of 1½ to 2 inches.

Sawing shall be accomplished with crack sawing equipment which shall produce vertical sides with a minimum of edge spalling. Other types of equipment, such as vertical spindle type routers, may be approved by the Engineer if satisfactory results are obtained as determined by the Engineer. For cracks less than ½ inch wide, the sawed recess shall have the approximate dimensions of ½ inch wide by ½ to ¾ inch deep. If the crack is faulted, the Contractor shall determine recess depth by taking measurements from the top edge of the dropped portion of the slab.

All cracks shall be thoroughly cleaned of all dust, dirt, foreign material, incompressibles or any other extraneous materials by high pressure air, plow, saw, wire brush, sandblasting, or other suitable method or tool approved by the Engineer. The material and debris removed from the crack shall be removed from the pavement to prevent recontamination of the crack.

Immediately prior to sealing and after the crack has been prepared as specified above, both crack faces shall be thoroughly cleaned by sandblasting to the full sawcut depth, or to a depth of 1½ to 2 inches on cracks ½ inch and wider. All cracks to be sealed are to be sandblasted. The operator of the sandblaster shall tip the nozzle of the equipment so that the blast material is directed against one crack face at a time. The crack face shall appear thoroughly clean and indicate a uniform minor abrasion. The cracks shall then be blown with a compressed air stream of sufficient power to remove any remaining blast sand, dirt and loose material. Suitable traps or devices shall be installed on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. Any cracks not sealed the same day shall be recleaned prior to sealing.

The Contractor shall be responsible for protecting traffic and property from hazard or damage during all crack cleaning operations. Materials and methods used for this purpose will be subject to the approval of the Engineer.

Sealing: Primer, if required by the manufacturer of the sealant, shall be applied to the crack faces in a thin film by brush or spray equipment. The primer shall completely wet the surfaces to be sealed and, if a backer rod is required, the primer shall dry tack free before the backer rod is installed. The cracks shall be thoroughly dry and clean at the time of sealing.

For cracks ½ inch and wider, a backer rod of the proper size and type shall be installed at a depth such that the sealant will have a shape factor of 2 (width):1 (depth).

Sealant shall be pumped directly from plastic pails or drums by compressed air powered extrusion pumps designed for moisture curing silicone sealants. Teflon seals and packing and teflon lined hoses are recommended to prevent moisture permeation. Sealant application nozzles should be designed so that sealant is applied within the confines of the crack. The sealant shall be applied so that it is held below the surface of the slab and completely fills the width of the crack. Immediately after the sealant is applied, it shall be tooled to form a concave surface, to provide firm contact with the joint faces, and to form the required recess below the slab surface.
ITEM 18502.7601  SEALING CRACKS IN PCC PAVEMENT - SILICONE SEALANT

Traffic may be allowed over the sealed areas as soon as the Engineer determines that the sealant has cured sufficiently to prevent tracking. If rocking or deflection due to vertical loads is expected, the sealant shall be allowed to cure for two hours or more, as ordered by the Engineer.

Sealant that becomes damaged, is not properly bonded to the concrete, or that is installed improperly, shall be repaired. Damaged or deficient areas shall have the sealant removed, the surfaces properly cleaned, and new sealant installed to the satisfaction of the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT

This work shall be measured by the number of linear feet of cracks sealed.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of furnishing all labor, equipment, and materials necessary to complete the work as specified or as directed by the Engineer.