To:		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 97-030
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Title: **PAVEMENT PREVENTIVE MAINTENANCE GUIDELINES FOR JOINT AND CRACK SEALING**

Distribution:		Approved:
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☒ Regions/Agencies (32)	☐ _____( )	F. J. Clark, Deputy Chief Engineer, Design Division — 12/10/97 Date

This Engineering Instruction supersedes the following issuances:

EI 90-1 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 90-11 Revisions to EI 90-1

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 a 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

18403.7601M - Routing, Cleaning and Sealing Cracks in Hot Mix Asphalt Pavement, ASTM D3405

18403.7601 - Routing, Cleaning and Sealing Cracks in Hot Mix Asphalt Pavement, ASTM D3405

18403.7602M - Cleaning and Sealing Cracks in Hot Mix Asphalt Pavement, ASTM D3405

18403.7602 - Cleaning and Sealing Cracks in Hot Mix Asphalt Pavement, ASTM D3405

18403.7603M - Routing, Cleaning and Sealing Cracks in Hot Mix Asphalt Pavement, ASTM D3405 (Payment by Liter)

18403.7603 - Routing, Cleaning and Sealing Cracks in Hot Mix Asphalt Pavement, ASTM D3405 (Payment by Gallon)

18403.78M - Selective Routing of Cracks in Hot Mix Asphalt Pavement

18403.78 - Selective Routing of Cracks in Hot Mix Asphalt Pavement

18403.79M - Cleaning and Sealing Cracks With Selective Routing in Hot Mix Asphalt Pavement, ASTM D3405

18403.79 - Cleaning and Sealing Cracks With Selective Routing in Hot Mix Asphalt Pavement, 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

18502.7401M - Resealing Longitudinal Joints in Portland Cement Concrete Pavement

18502.7401 - Resealing Longitudinal Joints in Portland Cement Concrete Pavement

18502.7601M - Sealing Cracks in PCC Pavement - Silicone Sealant

18502.7601 - Sealing Cracks in PCC Pavement - Silicone Sealant

The following are ***superseded*** items:

18403.7504 - Sealing Cracks in Asphalt Concrete Pavement, ASTM D3405

18403.7505 - Filling Cracks And/Or Joints in Pavements and Shoulders Using ASTM D3405 with Recycled Tire Rubber

18403.7506 - Filling Shoulder Joints Between Portland Cement Concrete Pavement and Asphalt Concrete Shoulders Using ASTM D3405 with Recycled Tire Rubber

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 (500ft) 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 ≥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:	18403.7603M 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 ≥3 mm (1/8 in.) and ≤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 ≥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 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.

ITEM 18403.7508 M FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING ASTM D3405

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.

ITEM 18403.7508 M FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING ASTM D3405

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.