Preparing Activity: USACE Superseding
UFGS-32 01 17.61 (May 2017)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SEALING CRACKS IN ASPHALT PAVING

05/22

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SECTION 32 01 17.61

SEALING CRACKS IN ASPHALT PAVING
05/22

NOTE: This guide specification covers the requirements for sealing cracks in bituminous pavements.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

NOTE: Treatment of cracks in asphalt pavements can consist of sealing or filling the crack. There are differences in both materials and methods for crack sealing or crack filling. Crack sealing uses specialized sealants to seal working cracks and prevent moisture infiltration into the pavement substructure. Crack filling uses ordinary materials (asphalt cement and emulsions) to fill non-working cracks and reduce moisture infiltration into the pavement substructure. Working cracks are typically transverse or reflective cracks that move more than 3 mm 1/8 inch due to seasonal temperature variations. Non-working cracks are typically longitudinal cracks and block cracks. This

specification covers crack sealing using routed and cleaned cracks sealed with joint sealant.

For additional information concerning crack sealing and filling of bituminous pavements see UFC 3-270-01, "O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair"

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1.1 UNIT PRICES

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NOTE: Delete paragraphs Measurement and Payment for lump sum bidding. If cracks of different widths are measured and paid separately, revise the following paragraphs to properly describe each crack condition found within the repair area.

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1.1.1 Measurement

Determine the quantity of each sealing item to be paid for by actual measurement of the number of linear meters feet of approved in-place material.

1.1.2 Payment

Payment will be made at the contract unit bid prices per linear meter foot for the sealing items scheduled. Include in the unit bid prices the cost of all labor, materials, and the use of all equipment and tools required to complete the work.

1.2 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2021) Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D789	(2015) Determination of Relative Viscosity and Moisture Content of Polyamide (PA)
ASTM D6690	(2015) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Equipment, Tools, And Machines; G[, [_____]]

SD-03 Product Data

Manufacturer's Instructions; G[, [_____]]

Crack Sealant; G[, [_____]]

Backer Rod; G[, [_____]]

SD-06 Test Reports

Laboratory Tests; G[, [_____]]

1.4 QUALITY ASSURANCE

Test the crack sealant and backup materials for conformance with the referenced applicable material specification. Perform testing of the materials in an approved, independent laboratory; submit certified copies of the test reports for approval [_____] days prior to the use of the materials at the job site. Submit reports of all tests. Samples will be retained by the Government for possible future testing, if the materials appear defective during or after application. Furnish samples of materials, in sufficient quantity to be tested by the Government upon request. Conformance with the test requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of materials that have been satisfactorily installed.

1.5 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the job site for defects; unload, and store them with a minimum of handling to avoid damage. Provide storage facilities at the job site to protect materials from weather and maintain them at the temperatures recommended by the manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS

Apply the materials only when the ambient air temperature and the pavement temperature within the joint wall are at least 4 degrees C 40 degrees F and rising. Do not apply sealant if moisture is observed in the crack.

1.7 ACCEPTANCE

1.7.1 Crack Sealant

Inspect the crack sealant for proper cure and rate of set, tack free surface, bonding to the bituminous pavement, cohesive separation within the sealant, reversion to liquid, and entrapped air and voids. Remove sealants exhibiting any of these deficiencies, at any time prior to the final acceptance of the project, and replace as specified herein.

1.7.2 Test Section

Prior to the cleaning and sealing of the cracks for the entire project, construct a test section at least 60 m 200 feet long using the specified materials and approved equipment to demonstrate the proposed preparation

and sealing of all cracks of the project. Following the completion of the test section and before any other crack is sealed, inspect the test section to determine that the materials and installation meet the requirements specified. If materials or installation do not meet requirements, remove the materials and reclean and reseal the cracks. [When the test section meets the requirements, it can be incorporated into the permanent work and accepted for payment. Seal all other cracks in the manner approved and successfully completed for sealing the test section.]

PART 2 PRODUCTS

2.1 SEALANTS

****

NOTE: Use the state DOT guidance to specify the Performance Grade (PG) asphalt binder for roads and streets in the project vicinity. The sealant manufacturer will use this PG value to determine the ASTM D 6690 Type (I through IV) suitable for the project. Type III sealant is equivalent to the cancelled Federal Spec SS-S-1401C grade requirement, which includes evaluation of immersed bond at -29 degrees C -20 degrees F.

Additional guidance on selecting the asphalt binder PG grade includes the following: Asphalt Institute MS-26, The Asphalt Binder Handbook; the Asphalt Institute's State Binder Specification Database, or the FHWA LTPPBind software.

If the bituminous pavement is covered by a fuel-resistant pavement sealer, seal the cracks using the above mentioned sealants and then cover with a fuel-resistant pavement sealer. Do not use fuel-resistant crack sealants in asphalt pavements for compatibility reasons.

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Provide crack sealant conforming to ASTM D6690, Type as suitable over the Performance Grade [_____] temperature range for sealing cracks.

2.2 BACKER ROD MATERIALS

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NOTE: The use of backer rod materials in bituminous pavements is to control the routed crack width to depth (W/D) ratio and minimize waste of sealant material. Backer rod material is not required in cracks with a sealant reservoir depth of less than 20 mm 3/4 inch.

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Provide backer rod material that is a compressible, nonshrinking, nonstaining, nonabsorptive material and nonreactive with the crack sealant. Use backer rod with a melting point temperature of at least 2 degrees C 5 degrees F greater than the maximum pouring temperature of the sealant being used, when tested in accordance with ASTM D789. Use material that has a water absorption of not more than 5 percent by weight when tested in accordance with ASTM C509. Use backer rod material that is

25 percent (plus or minus 5 percent) larger in diameter than the nominal width of the crack.

2.3 EQUIPMENT, TOOLS, AND MACHINES

Equipment, tools, and machines used in performance of the work are subject to approval by the Government. Maintain in a satisfactory working condition at all times.

2.3.1 Routing Equipment

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NOTE: Rotary impact routers that are equipped with vertical sided, carbide tipped bits have been used successfully to rout cracks in bituminous pavements. Impact routers that are not equipped with carbide tipped bits normally chip and damage the surrounding pavement and are not be permitted.

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Provide routing equipment which is a self-powered machine operating a power driven tool or bit specifically designed for routing bituminous pavements. Use a bit rotating about a vertical axis at sufficient speed to cut a smooth vertical-walled reservoir in the pavement surface and maintain accurate cutting without damaging the sides or top edges of the reservoir. Provide a router capable of following the trace of the crack without deviation. The use of rotary impact routing devices [will not be permitted for cleaning cracks.][can be permitted if vertical-sided carbide tipped bits are used.]

2.3.2 Air Compressor

Provide air compressor capable of furnishing not less than 0.071 cubic meters per second 150 cubic feet per minute and maintaining a line pressure of not less than 621 kPa 90 psi at the nozzle. Equip the compressor with filters that maintain the compressed air free of oil and water.

2.3.3 Heat Lance

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NOTE: Specify a heat lance if temperatures less than 4 degrees C 40 degrees F or moisture in the cracks are anticipated.

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Provide a heat lance operating with propane and compressed air in combination to provide flame-free high temperature hot air up to 1650 degrees C 3000 degrees F with exit velocities of 915 meters per second 3000 feet per second.

2.3.4 Hand Tools

Hand tools can be used, when approved, for removing defective sealant from cracks and repairing or cleaning the crack faces.

2.3.5 Crack Sealing Equipment

Provide unit applicators, used for heating and installing the hot-poured

crack sealant materials, that are mobile and equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the prepared crack to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. Allow the sealant to circulate through the delivery hose and return to the inner kettle when not in use.

PART 3 EXECUTION

3.1 PREPARATION OF CRACKS

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NOTE: In bituminous pavements that have large quantities of hairline cracks or cracks less than 6 mm 1/4 inch, use a bituminous fog coat or a bituminous seal coat to prevent water intrusion into the base material. See UFC 3-270-01, "O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair", UFGS 32 01 13.62 ASPHALT SURFACE TREATMENT and UFGS 32 12 36.13 ASPHALTIC SEAL AND FOG COAT. Fog coats, seal coats and other asphalt surface treatments are suitable for airfield pavement shoulders. UFC 3-270-01 requires approval by the Pavements DWG for the use of surface treatments on runways or taxiways.

If the pavement being sealed is to receive a hot asphalt concrete overlay, do not seal small cracks. Medium and large cracks can be sealed but maintain the top of the sealant 6 mm 1/4 inch below the pavement surface to prevent "bleeding" of the material through the overlay. If the cracks are overfilled, the sealant material will be tracked onto the pavement.

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Immediately before the installation of the crack sealant, thoroughly dry and clean the cracks to remove oxidized pavement, loose aggregate and foreign debris. Prepare cracks as follows:

3.1.1 Cracks

3.1.1.1 Hairline Cracks

[Cracks that are less than 6 mm 1/4 inch wide do not need to be sealed.] [Seal cracks that are less than 6 mm 1/4 inch wide in accordance with Section [_____].]

3.1.1.2 Small and Medium Cracks

Rout cracks that are 6 to 37 mm 1/4 to 1-1/2 inches wide to a nominal width 3 mm 1/8 inch greater than the existing nominal width and to a depth not greater than 20 mm 3/4 inch. Clean and dry using compressed air or a heat lance.

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NOTE: Repairs of large cracks greater than 37 mm

1-1/2 inches wide are not covered by this specification. Consult UFC 3-270-01, "O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair," Chapters 3 and 4 and Standard Drawing 2-34b for construction details and incorporate as appropriate.

****

3.1.1.3 Large Cracks

Do not seal cracks that are greater than 37 mm 1-1/2 inches wide. [Refer to the drawings for repair methods for large cracks].

3.1.2 Existing Sealant Removal

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NOTE: Delete this paragraph if the cracks have never been sealed in the past.

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Cut loose the in-place sealant from both crack faces and to a depth shown on the drawings. Remove sealant to a depth sufficient to accommodate any backer rod material that is required to maintain the depth of new sealant to be installed. Prior to further cleaning operations, remove all old loose sealant remaining in the crack opening by blowing with compressed air.

3.1.3 Routing

Perform routing of the cracks using a rotary router with a bit that is at least 3 mm 1/8 inch wider than the nominal width of the crack to remove all residual old sealant (resealing), oxidized pavement and any loose aggregate in the crack wall.

3.1.4 Cleaning

Use compressed air or a heat lance to clean the crack faces and the pavement surfaces extending a minimum of 13 mm 1/2 inch from the crack edges. Use a multiple-pass technique until the surfaces are free of dust, dirt, old sealant residue, moisture, or foreign debris that might prevent the sealant material from bonding to the asphalt pavement. Use a heat lance when pavement temperature is less than 4 degrees C 40 degrees F. Do not burn the pavement, a slight darkening is acceptable. Immediately follow the heat lance with the sealing operation.

3.1.5 Backer Rod Material

When required, use backer rod material in all cracks that otherwise would require excessive sealant or exceed the sealant reservoir depth. Insert the backer rod material into the lower portion of the crack as shown on the drawings. Place the backer rod so that the top of the backer rod is a maximum of 19 mm 3/4 inch and a minimum width to depth ratio of 1 below the top of the pavement. Ensure that the backer rod material is placed evenly at the specified depth and is not stretched or twisted during installation.

3.1.6 Rate of Progress of Crack Preparation

Limit the stages of crack preparation, which include routing, air pressure or heat lance cleaning and placing of the backer rod material, to only

that linear footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

Do not heat hot-poured sealants in excess of the safe heating temperature recommended by the manufacturer, as shown on the sealant containers. Withdraw and waste sealant that has been overheated or subjected to application temperatures for over 4 hours or that has remained in the applicator at the end of the day's operation.

3.3 INSTALLATION OF SEALANT

Submit manufacturer's instructions [_____] days prior to the use of the material on the project. Installation of the material will not be allowed until the instructions are received.

3.3.1 Time of Application

Seal cracks immediately following final cleaning and drying of the crack walls and following the placement of the backer rod material (when required). Place sealant only when cracks are dry. Reclean cracks that cannot be sealed under the conditions specified, or when rain interrupts sealing operations, and allow to dry or dry by mechanical means prior to installing the sealant.

3.3.2 Sealing the Crack

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NOTE: Slightly underfill cracks to preclude tracking the material onto the pavement surface. For airfield pavements, recess the sealant 3 mm 1/8 inch below the pavement surface; for roads, streets and parking lots, recess the sealant 6 mm 1/4 inch. For pavements that are to receive an overlay, recess the sealant a minimum of 6 mm 1/4 inch and a maximum of 13 mm 1/2 inch below the pavement surface.

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Immediately preceding, but not more than 15 m 50 feet ahead of the crack sealing operations, perform a final cleaning and drying with compressed air or heat lance. This distance can be increased if demonstrated and approved during the test section. Fill the cracks from the bottom of reservoir formed by the routing or the top of the backer rod up to [3] [6] mm [1/8] [1/4] inch below the pavement surface. Remove excess or spilled sealant from the pavement by approved methods and discard it. Install the sealant in a manner which prevents the formation of voids and entrapped air. Make multiple passes with the applicator wand as necessary to obtain the specified sealant depth from the pavement surface. Do not use gravity methods or pouring pots to install the sealant material. Do not permit traffic over newly sealed pavement until authorized. Check sealed cracks frequently to ensure that the newly installed sealant is cured to a tack-free condition within 3 hours.

3.4 CLEANUP

Upon completion of the project, remove unused materials from the site and leave the pavement in a clean condition.

3.5 QUALITY CONTROL PROVISIONS

3.5.1 Crack Cleaning

Provide quality control provisions during the crack cleaning process to correct improper equipment and cleaning techniques that damage the bituminous pavement in any manner.

3.5.2 Crack Seal Application Equipment

Inspect the application equipment to ensure conformance to temperature requirements and proper installation. If evidence of bubbling, improper installation, and failing to cure or set are identified, suspend operations until causes of the deficiencies are determined and corrected.

-- End of Section --