
USACE / NAVFAC / AFCESA UFGS-02982 (August 2004)

Preparing Activity: NAVFAC Superseding
UFGS-02982N (September 1999)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

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SECTION 02982

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08/04

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SECTION 02982

RESEALING OF JOINTS IN RIGID PAVEMENT 08/04

NOTE: This guide specification covers the requirements for removal of old sealing materials from existing joints of portland cement concrete pavement and resealing of joints.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

NOTE: For joints in new pavement, use Section 02762 JOINTS REINFORCEMENT AND MOORING EYES IN CONCRETE PAVEMENTS. When crack repair is involved, edit accordingly, including the section title. This specification should not be used for liquid oxygen compatible joint seals.

NOTE: The following information shall be shown on the project drawings:

1. Spacing, width, and type of joints in concrete pavements to be sealed.
2. Typical details of existing joints.
3. Depth of existing sealant to be removed for each type of joint, if not specified.

4. Detail of type of joint to be refaced or widened with a concrete saw. Show extent of new width and depth of sawing to provide the proper shape factor of the void space in the joint. For materials, other than silicone, the ratio of the depth to width (d/w) of the sealant reservoir should generally be not less than 1 nor greater than 1.5. For silicone sealant a depth to width ratio of approximately 0.5 is preferred. Depending upon the width of the refaced joint, the thickness of the sealant bead should be between 6 and 13 mm 1/4 and 1/2 inch. Following are the recommended details for silicone sealants:

<u>Refaced Joint Width</u>	<u>10 mm</u>	<u>13 mm</u>	<u>19 mm</u>	<u>25 mm</u>
Recess Below Surface	6 mm	6 mm	6 mm	13 mm
Thickness of Sealant	6 mm	6 mm	10 mm	13 mm
Backer Rod Diameter	13 mm	16 mm	22 mm	31 mm
Total Depth of Joint	25 mm	28 mm	38 mm	56 mm
<u>Refaced Joint Width</u>	<u>3/8"</u>	<u>1/2"</u>	<u>3/4"</u>	<u>1"</u>
Recess Below Surface	1/4"	1/4"	1/4"	1/2"
Thickness of Sealant	1/4"	1/4"	3/8"	1/2"
Backer Rod Diameter	1/2"	5/8"	7/8"	1 1/4"
Total Depth of Joint	1"	1 1/8"	1 1/2"	2 1/4"

5. Location and type of bond breaker or back-up.

6. Identify type of sealant based on proposed use of pavements. (See note in paragraph entitled "Joint Sealant.")

7. For joint details see MIL-HDBK-1021/4.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

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 C 603	(2004) Extrusion Rate and Application Life of Elastomeric Sealants
ASTM C 639	(2001) Rheological (Flow) Properties of Elastomeric Sealants
ASTM C 661	(1998) Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
ASTM C 679	(2003) Tack-Free Time of Elastomeric Sealants
ASTM C 719	(1993; R 1998) Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
ASTM C 792	(1993; R 1998) Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants
ASTM C 793	(2004) Effects of Accelerated Weathering on Elastomeric Joint Sealants
ASTM D 412	(1998a; R 2002e1) Vulcanized Rubber and Thermoplastic Elastomers - Tension

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS SS-S-1401	(Rev C; Am 1) Sealant, Joint, Non-Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Asphalt Concrete Pavements
FS SS-S-1614	(Rev A; Am 1) Sealants, Joint, Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Tar Concrete Pavements
FS SS-S-200	(Rev E; Am 2) Sealant, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland Cement Concrete Pavement

1.2 SUBMITTALS

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's

Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Joint sealant

Submit catalog cuts, specifications, material Safety Data Sheets and other information documenting conformance to contract requirements.

SD-04 Samples

NOTE: Liquid joint sealer proposed for use in airfield pavements should be tested by the U.S. Army Corps of Engineer, Waterways Experiment Station, P. O. Box 631, Vicksburg, MS 39180, Attn: Larry Lynch, telephone: (601) 634-4274, before acceptance. Project Managers should assure that sufficient funds (approximately \$1500) are available and that the 45 day testing time requirement has been taken into account when establishing contract completion time. For small projects involving approximately less than 3,000 m 10,000 linear feet of joint sealing, the requirement for testing may be waived provided that a Factory Test Report is submitted. In no case should materials not meeting the applicable specification be accepted.

Joint filler

Separating tape

Joint backer rod

Joint sealant

Furnish for testing a five gallon sample of each joint seal with associated primer to the Contracting Officer a minimum of 60 days prior to its use on the job. Each container shall be factory sealed and must contain a factory applied label showing the following information:

Name of sealant

Identification of component, or primer

Specification number and type

Manufacturer's name

Manufacturer's lot and batch number

Date of Manufacture (month and year)

Shelf life retest date (month and year)

List of hazardous components

Quantity of material in container (volume)

Storage instructions

Instructions for use

SD-06 Test Reports

NOTE: Liquid joint sealer proposed for use in airfield pavements should be tested by the U.S. Army Corps of Engineer, Waterways Experiment Station, P. O. Box 631, Vicksburg, MS 39180, Attn: Larry Lynch, telephone: (601) 634-4274, before acceptance. Project Managers should assure that sufficient funds (approximately \$1500) are available and that the 45 day testing time requirement has been taken into account when establishing contract completion time. For small projects involving approximately less than 3,000 m 10,000 linear feet of joint sealing, the requirement for testing may be waived provided that a Factory Test Report is submitted. In no case should materials not meeting the applicable specification be accepted.

NOTE: Factory test report should be required for joint seals on projects when the Government testing is waived.

[Joint sealant]

SD-07 Certificates

Equipment list

SD-08 Manufacturer's Instructions

Joint sealant

Instructions shall include, but not be limited to: storage requirements, ambient temperature and humidity ranges, and moisture condition of joints for successful installation; requirements for preparation of joints; safe heating temperature; mixing instructions; installation equipment and procedures; application and disposal requirements; compatibility of sealant with filler material; curing requirements; and restrictions to be adhered to in order to reduce hazards to personnel or to the environment. Submit instructions at least 30 days prior to use.

1.3 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for visible damage, and unload and store with a minimum of handling. Joint materials shall be delivered in original sealed containers and shall be protected from freezing or overheating. Provide jobsite storage facilities capable of maintaining temperature ranges within manufacturers recommendations.

1.4 ENVIRONMENTAL REQUIREMENTS

Work shall not proceed when weather conditions detrimentally affect the quality of cleaning joints or applying joint sealants. Joint preparation and sealing shall proceed only when weather conditions are in accordance with manufacturer's instructions. During installation, surfaces shall be dry and sealant and bond breakers shall be protected from moisture.

1.5 TRAFFIC CONTROL

Do not permit vehicular or heavy equipment traffic on the pavement in the area of the joints being sealed during the protection and curing period of the joint sealant. At the end of the curing period, traffic may be permitted on the pavement when approved.

1.6 EQUIPMENT

Submit a equipment list and description of the equipment to be used and a statement from the supplier of the joint sealant that the proposed equipment is acceptable for installing the specified sealant. Equipment for heating, mixing, and installing joint seals shall be in accordance with the instructions provided by the joint seal manufacturer. Furnish equipment, tools, and accessories necessary to clean existing joints and install liquid joint sealants. Maintain machines, tools, and other equipment in proper working condition.

1.6.1 Joint Cleaning Equipment

1.6.1.1 Routing Tool

To remove old sealant from joints, select rectangular shaped routing tool that is adjustable to varying widths and depths required. The equipment shall be capable of maintaining accurate cutting depth and width control. The joint plow shall be equipped with a spring or hydraulic mechanism to release pressure on the tool prior to spalling the concrete.

1.6.1.2 Concrete Saw

Self-propelled power saw with diamond saw blades designed for sawing, refacing, widening, or deepening existing joints as specified without damaging the sides, bottom, or top edge of joints. Blades may be single or gang type with one or more blades mounted in tandem for fast cutting. Select saw adequately powered and sized to cut specified opening with not more than two passes of the saw through the joint.

1.6.1.3 Sandblasting Equipment

Commercial type capable of removing residual sealer, oil, or other foreign material. Equipment shall include an air compressor, hose and nozzles of proper size, shape, and opening. Attach an adjustable guide that will hold the nozzles aligned with the joint to effectively and efficiently clean without damage to concrete edges. Adjust height, angle of inclination, or size of nozzles to sandblast joint faces and not bottom of joint.

1.6.1.4 Air Compressor

Portable air compressor capable of operating the sandblasting equipment and capable of blowing out sand, water, dust adhering to sidewalls of concrete, and other objectionable materials from the joints. The compressor shall furnish air at a pressure not less than 620 kPa 90 psi and a minimum rate of 0.07 cubic meter of air per second 150 cubic feet of air per minute at the nozzles and free of oil.

1.6.1.5 Vacuum Sweeper

Self-propelled, vacuum pickup sweeper capable of completely removing loose sand, water, joint material, and debris from pavement surface.

1.6.1.6 Hand Tools

When approved, hand tools such as brooms and chisels may be used in small areas for removing old sealant from joints and repairing or cleaning the joint faces.

1.6.2 Joint Sealing Equipment

Joint sealing equipment shall be of a type required by the joint seal manufacturer's installation instructions. Equipment shall be capable of installing sealant to the depths, widths and tolerances indicated. When malfunctions are noted, joint sealing shall not proceed until they are corrected.

1.6.2.1 Hot-Poured Liquid Sealant

Install hot-poured sealant materials with unit applicators which will heat

and extrude the sealant. Equip the mobile units with double-wall agitator type kettles with an oil medium in the outer space for heat transfer, a direct-connected pressure-type extruding device with nozzles shaped for insertion in the joints to be filled, and a positive device for controlling the temperature of oil and sealer. Design the applicator so that the sealant will circulate through the delivery hose and return to the kettle when not sealing a joint. Insulate the applicator wand from the kettle to the nozzle. Select dimensions of the nozzles such that the tip of the nozzle will easily feed sealant into the void space of the joint. Equip the nozzle tip with a metal cross-bar to ensure that the top of the sealant fed into the joint is level and within the indicated tolerance below the pavement surface.

1.6.2.2 Two-Component Cold-Applied Liquid Sealants

For two component cold applied machine mixed sealants the equipment shall be capable of delivering each component within an accuracy of 5 percent. Equip reservoirs for each component with mechanical agitation devices. Equip equipment with thermostatically controlled indirect heating of components when required. Equipment shall include screens over each reservoir to eliminate foreign particles or partially polymerized material which may clog lines. Equipment shall be capable of intimately mixing the two components through a range of application rates from 0.011 to 0.63 liter per second 10 to 60 gallons per hour and through a range of pressures from 345 to 1034 kPa 50 to 150 pounds per square inch. [Hand-mixing of cold-applied two component sealant may be done at the option of the Contractor for sealants conforming to FS SS-S-200, Type H].

1.6.2.3 Equipment for Silicone Sealant

Equipment for silicone sealant shall be air powered pump, components, and hoses as recommended by the sealant manufacturer. Hoses and seals shall be lined to prevent moisture penetration and withstand pumping pressures. Equipment shall be free of contamination from previously used or other type sealant.

1.7 SAFETY PROVISIONS

NOTE: Specify sandblasting of joint walls as a light cleaning method following sawing of joints. Sandblasting may cause some minor deterioration around the joint area. Secure station permission before sandblasting. If necessary, insert a cross-reference to Section 01575, "Temporary Environmental Controls."

In accordance with the provisions of the contract respecting "Accident Prevention," the Contractor shall take appropriate measures to control worker exposure to toxic substances during the work. Provide personnel protective equipment as required. Material Safety Data Sheets (Department of Labor Form OSHA-20 or comparable form) shall be available on the site. [Sandblasting operations shall conform to paragraph entitled "Abrasive Blasting" of Section 01575N TEMPORARY ENVIRONMENTAL CONTROLS.]

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Joint Sealant

NOTE: Select joint sealants based on service conditions of pavements. Joint sealants may be either two-component cold applied, single component cold applied (silicone), or hot-applied. Silicone sealants may be exclusively specified at the option of the design engineer when supported by lower life cycle costs.

Single Component Cold Applied Silicone: Silicone sealant may be used for general purpose sealing and re-sealing of joints in concrete pavements not subject to severe jet fuel or lubricant spillage. Silicone will swell up under fuel spills. This may result in an unsatisfactory seal in aircraft or vehicle servicing areas where spillage is frequent and severe. Laboratory test data has shown that silicone seals possess resistance to the heat and velocity of jet engines and they may be used as an alternative to FS SS-S-200 material in the end 305 m 1000 ft. of runways.

FS SS-S-200 - For sealing joints in portland-cement concrete pavements subjected to the spillage of lubricating oils, hydraulic fluids, jet fuel and to the heat and blast of jet aircraft engines including simulated aircraft carrier decks within standard runways.

FS SS-S-1614 - For sealing joints and cracks in pavements subject to the spillage of lubricating oils and jet fuel. It is not intended to be resistant to the heat and blast of jet aircraft engines except when the aircraft is moving at moderate speeds.

FS SS-S-1401 - For sealing joints and cracks in pavements not subjected to the spillage of lubricating oils, hydraulic fluids, and fuels. This material may also be used to seal cracks in asphalt concrete pavements. It is not intended to be resistant to the heat and blast of jet aircraft engines except when the aircraft is moving at moderate speeds.

2.1.1.1 Two Component Cold-Applied Sealing Compound

NOTE: Either choose Type H (hand mixed, retarded cure) or M (machine mixed, fast curing), or indicate both and permit the Contractor to exercise the option depending on field conditions or scheduling

constraints. Restrict use of Type H to small projects or limited areas of large projects.

[FS SS-S-200, Type [H] [M]].

2.1.1.2 Sealant, Joint, Jet-Fuel Resistant, Hot-Applied

[FS SS-S-1614, for portland cement and tar concrete pavements.]

2.1.1.3 Sealant, Joint, Non-Jet Fuel Resistant, Hot Applied

[FS SS-S-1401, for portland cement and asphalt concrete pavements.]

2.1.1.4 Single Component Cold-Applied Silicone

Silicone sealant shall be self leveling, non-acid curing, and meet the following requirements:

<u>TEST</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
Weight Loss	ASTM C 792 Modified (see note 1 below)	10 percent max.
Flow	ASTM C 639 (Type I)	smooth and level
Extrusion Rate	ASTM C 603	30 sec. max.
Tack Free Time	ASTM C 679	5 hours max.
Hardness (Shore 00) (see note 2 below)	ASTM C 661	30 - 80
Tensile Stress at 150 Percent Elongation (see note 2 below)	ASTM D 412 (Die C)	207 kPa max.
Tensile Stress at 150 Percent Elongation (see note 2 below)	ASTM D 412 (Die C)	30 psi max.
Percent Elongation (see note 2 below)	ASTM D 412 (Die C)	700 min.
Accelerated Weathering	ASTM C 793	pass 5000 hours
Bond and Movement Capability	ASTM C 719	pass 10 cycles at ± 50 percent movement (no adhesion or cohesion failure)
Flame Resistance	FS SS-S-200	pass

Notes:

1. Percent weight loss of wet (uncured) sample after placing in forced-draft oven maintained at 70 degrees \pm 2 degrees C 158 degrees \pm 1

<u>TEST</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
degrees F for two hours.		
2. Specimen cured 21 days at 23 degrees C \pm 2 degrees C 73 degrees \pm 1 degrees F and 50 percent \pm 5 percent humidity.		
ACCELERATED WEATHERING FACTORY TEST REPORT. For the Accelerated Weathering test, in lieu of testing of actual joint sealant to be used on the project, a report of a factory test, performed within two years of contract award, may be submitted.		
2.1.2 Primers		
Select concrete primer recommended by the manufacturer of the proposed liquid joint sealant.		
2.1.3 Bond Breakers		
2.1.3.1 Blocking Media		
Compressible, nonshrinkable, nonreactive with joint sealant and nonabsorption type such as plastic backer rod, free of oils or bitumens. Blocking media shall be consistent with the joint seal manufacturer's installation instructions and be at least 25 percent larger in diameter than the width of the cleaned and re-faced joints as shown.		
2.1.3.2 Separating Tape		
Polyethylene or polyester tape, 0.075 mm 3 mil minimum thickness, or masking tape, nonreactive, nonabsorptive, adhesive-back tape, width equal to width of cleaned and refaced joints as indicated. Separating tape shall be consistent with the joint seal manufacturer's installation instructions.		

PART 3 EXECUTION

3.1 JOINT PREPARATION

NOTE: Provide details of the existing joints and the required depth of removal of old sealant on the drawings.

Unless otherwise indicated, remove existing material, saw, clean and reseal joints. Do not proceed with final cleaning operations by more than one working day in advance of sealant. Thoroughly clean joints by removing existing joint sealing compound, bond-breakers, dirt, and other foreign material with the equipment specified herein, but not limited thereto. Cleaning procedures which damage joints or previously repaired patches by chipping or spalling will not be permitted. Remove existing sealant to the required depth as indicated. Precise shape and size of existing joints vary, and conditions of joint walls and edges vary and include but are not limited to rounding, square edges, sloping, chips, voids, depressions, and projections.

3.1.1 Removal of Existing Material

NOTE: Specify and show on the plans the depth to remove the old sealant from all types of joints. Show typical existing joint dimensions.

Remove from the joint the existing sealants by using the specified routing tool. After cutting free the existing sealant from both joint faces, remove sealant to the depth required to accommodate the bond breaking material and to maintain the specified depth for the new sealant. For expansion joints, remove existing sealant to a depth of not less than [the indicated depth.] 25 mm one inch. When existing preformed expansion-joint material is more than 25 mm one inch below the surface of the pavement, remove existing sealant to the top of the preformed joint filler. For joints other than expansion joints, remove in-place sealant to the depth as indicated. At the completion of routing operations, clean pavement surface with vacuum sweeper and clean the joint opening by blowing with compressed air. Protect previously cleaned joints from being contaminated by subsequent cleaning operations.

3.1.2 Refacing of Joints

NOTE: Specify refacing of joints by sawing for the following reasons:

1. To widen the joint space or change the shape factor.
2. To straighten the vertical walls inside the joints and remove old sealant.

Reface concrete joint walls. [Re-saw joint grooves to the dimensions indicated.] Refacing shall be by power-driven concrete saw specified herein to remove residual sealant and a minimum of concrete. Removal shall provide exposure of newly clean concrete. Remove burrs and irregularities from sides of joint faces. Immediately after sawing each joint, thoroughly clean saw cut and adjacent concrete surface. Flush with water under pressure, simultaneously blowing water out with compressed air until debris is removed from the joint. Protect adjacent previously cleaned joint spaces from receiving water and debris during the cleaning operation.

[3.1.2.1 Joint Widening (Except Expansion Joints)]

NOTE: Edit this paragraph as required. New joint groove dimensions shall be shown on the plans.

The following information shall be shown on the project drawings:

1. Spacing, width, and type of joints in concrete pavements to be sealed.
2. Typical details of existing joints.
3. Depth of existing sealant to be removed for each type of joint, if not specified.

4. Detail of type of joint to be refaced or widened with a concrete saw. Show extent of new width and depth of sawing to provide the proper shape factor of the void space in the joint. For materials, other than silicone, the ratio of the depth to width (d/w) of the sealant reservoir should generally be not less than 1 nor greater than 1.5. For silicone sealant a depth to width ratio of approximately 0.5 is preferred. Depending upon the width of the refaced joint, the thickness of the sealant bead should be between 6 and 13 mm 1/4 and 1/2 inch. Following are the recommended details for silicone sealants:

<u>Refaced Joint Width</u>	<u>10 mm</u>	<u>13 mm</u>	<u>19 mm</u>	<u>25 mm</u>
Recess Below Surface	6 mm	6 mm	6 mm	13 mm
Thickness of Sealant	6 mm	6 mm	10 mm	13 mm
Backer Rod Diameter	13 mm	16 mm	22 mm	31 mm
Total Depth of Joint	25 mm	28 mm	38 mm	56 mm
<u>Refaced Joint Width</u>	<u>3/8"</u>	<u>1/2"</u>	<u>3/4"</u>	<u>1"</u>
Recess Below Surface	1/4"	1/4"	1/4"	1/2"
Thickness of Sealant	1/4"	1/4"	3/8"	1/2"
Backer Rod Diameter	1/2"	5/8"	7/8"	1 1/4"
Total Depth of Joint	1"	1 1/8"	1 1/2"	2 1/4"

5. Location and type of bond breaker or back-up.

6. Identify type of sealant based on proposed use of pavements. (See note in paragraph entitled "Joint Sealant.")

7. For joint details see MIL-HDBK-1021/4.

Saw joints having grooves less than 10 mm 3/8 inch wide and less than 25 mm one inch deep to a minimum width of [10] [13] [_____] mm [3/8] [1/2] [_____] inch and to the minimum depth, [of] [25 mm] [38 mm] [one inch] [1 1/2 inches] [as indicated].

]3.1.3 Final Cleaning of Joints

3.1.3.1 Sandblasting Cleaning

NOTE: Specify sandblasting of joint walls following sawing of joints. Sandblasting may cause some minor deterioration around the joint area. Secure station permission before sandblasting. If necessary, insert a cross-reference to Section 01575, "Temporary Environmental Controls."

Following removal of existing sealant, and sawing, and immediately before resealing, thoroughly clean newly exposed concrete joint faces and pavement

surface extending up to 50 mm 2 inches from each joint edge by sandblasting until concrete surfaces in the joint space are free of sealants, dust, dirt, water and other foreign materials which would prevent bonding of new sealants to the concrete. Use sand particles of the proper size and quality for the work. Perform sandblasting with specified nozzles, air compressor, and other appurtenant equipment. Position nozzles to clean the joint faces. Make at least two passes; one for each joint face. Make as many passes as required for proper cleaning. Immediately prior to sealing the joint, blow out the joint spaces with compressed air until completely free of sand, water, and dust. Joints shall be dry before installation of joint sealant. Replace expansion joint filler material damaged in performing the work with new materials of the same type and dimensions as the existing material, or with appropriate blocking media.

3.1.4 Bond Breaker

At the time the joints receive the final cleaning and are dry, install bond breaker material as indicated with a steel wheel or other approved device.

3.1.4.1 Blocking Media (Backer Rod) (Except for Expansion Joints)

Plug or seal off the lower portion of the groove by installing the specified blocking media as indicated.

3.1.4.2 Separating Tape

Insert the specified tape as indicated.

3.1.5 Rate of Progress

The final stages of joint preparation, which include placement of bond breakers, if required, shall be limited to only that length of joint that can be resealed during the same workday.

3.1.6 Disposal of Debris

NOTE: Specify location of disposal of debris.

Sweep from pavement surface to remove excess joint material, dirt, water, sand, and other debris by vacuum sweepers or hand brooms. Remove the debris immediately [to a point off station.] [to an area designated by the Contracting Officer.] [in accordance with Section 02220 DEMOLITION.]

3.2 PREPARATION OF SEALANT

3.2.1 Hot-Poured Type

Heat hot-poured sealing materials in accordance with safe heating temperature ranges recommended by the manufacturer. Withdraw and waste sealant that has been overheated or subjected to heating for over 3 hours or that remain in the applicator at the end of the day's operation. Heat sealant in specified equipment.

3.2.2 Cold-Applied, Two Component Type

Reject materials which contain water, hard caking of separated constituents, nonreversible jell, or other unsatisfactory conditions such

as settlement of constituents into a soft mass that cannot be readily and uniformly remixed in the field with simple tools. In conformance with the manufacturer's recommendations, mix individual components in separate shipping containers before transferring components to appropriate reservoirs of application equipment. Thoroughly mix components to ensure homogeneity of components and incorporation of constituents at time of transfer. When necessary, for remixing prior to transfer, warm components to a temperature not exceeding 32 degrees C 90 degrees F by placing components in heated storage or by other approved methods. In no case shall components be heated by direct flame or in single-walled, non-oil-bath heating kettles. [Hand mixing of cold-applied two component sealant may be done at the option of the Contractor for sealants conforming to FS SS-S-200, Type H.]

3.3 INSTALLATION OF SEALANT

3.3.1 Test Section

**NOTE: Specify factory representative for projects
with more than approximately 3,000 m 10,000 linear
feet of re-sealing.**

Install a test section of 60 m 200 linear feet at the start of the sealing operation for each type sealant to be used. [A representative of the joint seal manufacturer shall be on site full time during the installation of the test section.] Test section shall meet contract requirements. The Contracting Officer shall be notified upon completion of the test section.

3.3.2 Time of Application

After approval of the test section, seal joints immediately following final cleaning and placing of bond breakers. Commence sealing joints when walls are dust free and dry, and when weather conditions meet joint seal manufacturer's instructions. If the above conditions cannot be met, or when rains interrupts sealing operations, reclean and permit the joints to dry prior to installing the sealant.

3.3.3 Sealing the Joints

NOTE: Specify 5 hours tack free time for silicone.

Do not install joint sealant until joints to be sealed have been inspected and approved. Install bond breaker just prior to pouring sealant. Fill the joints with sealant from bottom up until joints are uniformly filled solid from bottom to top using the specified equipment for the type of sealant required. Fill joints to 6 mm 1/4 inch below top of pavement within tolerances as indicated, and without formation of voids or entrapped air. Except as otherwise permitted, tool the sealant immediately after application to provide firm contact with the joint walls and to form the indicated sealant profile below the pavement surface. Remove excess sealant that has been inadvertently spilled on the pavement surface. [When two-component sealants are placed, each day check hourly the proportioning capability of the equipment to determine that the preset volume output for each component is being maintained. The material used for these checks may be returned to the proper component reservoir. In no case shall two

component sealants be installed using gravity methods and pouring spouts, except for approved hand mixing methods. When a primer is supplied or recommended by the manufacturer of a two component sealant, apply the primer evenly to the joint faces in accordance with the manufacturer's recommendations.] Check sealed joints frequently to assure that newly installed sealant is cured to a tack-free condition within [3 hours] [5 hours]. Protect new sealant from rain during curing period.

3.4 FIELD QUALITY CONTROL

3.4.1 Sampling Joint Seal

Obtain a one gallon sample of each type of joint seal on the project from material used for each 3,000 m 10,000 linear feet or less of joints sealed.

Store samples according to joint seal manufacturer's instructions. Retain samples until final acceptance of the work by the Contracting Officer.

3.4.2 Joints

Inspect and approve joints which have been cleaned and have backer rods or bond breaking tape installed prior to sealing.

3.4.3 Joint Seal Test Section

Inspect joint seal test section [with the joint seal manufacturer's representative]. [The joint seal manufacturer's representative shall provide written notice of deficiencies and required corrections or adjustments in joint seal installation procedures.] Correct deficiencies and obtain approval of test section [by the Contracting Officer] prior to installing joint seals.

3.4.4 Joint Sealer

Inspect installed joint seals for conformance to contract requirements, joint seal manufacturer's instructions, and the test section. Obtain approval for each joint seal installation.

3.5 ACCEPTANCE

Reject joint sealer that fails to cure properly, or fails to bond to joint walls, or reverts to the uncured state, or fails in cohesion, or shows excessive air voids, blisters, surface defects, swelling, or other deficiencies, or is not properly recessed within indicated tolerances. Remove rejected sealer and reclean and reseal joints in accordance with the specification. Perform removal and reseal work promptly by and at the expense of the Contractor.

-- End of Section --