
USACE / NAVFAC / AFCESA / NASA UFGS-32 01 19 (August 2008)

Preparing Activity: USACE Superseding
UFGS-32 01 19 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2008

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SECTION 32 01 19

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS 08/08

NOTE: This guide specification covers the requirements for field molded sealants in sealing or resealing joints in rigid pavements on airfields, roads, streets, and other areas.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

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

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).

PART 1 GENERAL

NOTE: In preparing contract specifications for concrete pavements the designer will use UFC 3-250-04FA Standard Practice for Concrete Pavements.

1.1 UNIT PRICES

NOTE: Delete this paragraph when lump sum bidding is used.

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 in-place material that has been approved by the Contracting Officer.

1.1.2 Payment

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

1.2 REFERENCES

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 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.

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 509	(2006) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 5893	(2004) Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D 6690	(2007) Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM D 7116	(2005) Standard Specification for Joint Sealants, Hot Applied, Jet Fuel Resistant Types, for Portland Cement Concrete
ASTM D 789	(2007) Determination of Relative Viscosity and Moisture Content of Polyamide (PA)

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 525

(1989) Test Method for Evaluation of
Hot-Applied Joint Sealants for Bubbling
Due to Heating

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS SS-S-200

(Rev E; Am 2) Sealant, Joint,
Two-Component, Jet-Blast-Resistant,
Cold-Applied, for Portland Cement Concrete
Pavement

1.3 SYSTEM DESCRIPTION

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started maintained in satisfactory condition at all times.

1.3.1 Joint Cleaning Equipment

1.3.1.1 Tractor-Mounted Routing Tool

Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

1.3.1.2 Concrete Saw

Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

1.3.1.3 Sandblasting Equipment

NOTE: Sandblasting equipment with a 6.4 mm (1/4
inch) nozzle requires at least 64.7 liters per
second (137 cubic feet per minute) of air to
function efficiently. A larger nozzle would not
serve any useful purpose in cleaning joints.

Include with the sandblasting equipment an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 6.4 mm 1/4 inch. The air compressor shall be portable and capable of furnishing not less than 71 L/s 150 cfm and maintaining a line pressure of not less than 621 kPa 90 psi at the nozzle while in use. Demonstrate compressor capability, under job conditions, before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 25 mm 1 inch above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle as necessary to

secure satisfactory results.

1.3.1.4 Waterblasting Equipment

NOTE: Waterblasting equipment varies considerably with respect to design of wand, nozzle, water pressure, and water volume, depending upon the manufacturer. Consequently, the effectiveness of a particular set of equipment cannot be predicted. Delete this paragraph if waterblasting will not be used.

Include with the waterblasting equipment a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. Provide water tank and auxiliary resupply equipment of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 25 mm 1 inch above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in kPa psi at which the equipment is operating.

1.3.1.5 Hand Tools

NOTE: Where spalled joint edges have not been repaired prior to any previous sealing, it may be necessary for the Contractor to employ other types of small tools for the repair work. Such tools should be carefully evaluated for potential spalling effects prior to approval for use. For repairing concrete pavements adjacent to joints, the designer is referred to Section 32 01 29.61 PARTIAL DEPTH PATCHING OF RIGID PAVING, and to Technical Manual 5-822-9.

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

1.3.2 Sealing Equipment

NOTE: Delete the inappropriate paragraphs.

1.3.2.1 Hot-Poured Sealing Equipment

The unit applicators used for heating and installing [ASTM D 6690] [ASTM D 7116] joint sealant materials shall be mobile and shall be 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 joint 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. The applicator unit shall be designed so that the sealant

will circulate through the delivery hose and return to the inner kettle when not in use.

1.3.2.2 Two-Component, Cold-Applied, Machine Mix Sealing Equipment

Provide equipment used for proportioning, mixing, and installing **FS SS-S-200**

Type M joint sealants designed to deliver two semifluid components through hoses to a portable mixer at a preset ratio of 1 to 1 by volume using pumps with an accuracy of plus or minus 5 percent for the quantity of each component. The reservoir for each component shall be equipped with mechanical agitation devices that will maintain the components in a uniform condition without entrapping air. Incorporate provisions to permit thermostatically controlled indirect heating of the components, when required. However, immediately prior to proportioning and mixing, the temperature of either component shall not exceed **32.2 degrees C 90 degrees F**. Provide screens near the top of each reservoir to remove any foreign particles or partially polymerized material that could clog fluid lines or otherwise cause misproportioning or improper mixing of the two components. Provide equipment capable of thoroughly mixing the two components through a range of application rates of **37.8 to 189 L 10 to 60 gallons** per hour and through a range of application pressures from **345 kPa to 10.3 MPa 50 to 1500 psi** as required by material, climatic, or operating conditions. Design the mixer for the easy removal of the supply lines for cleaning and proportioning of the components. The mixing head shall accommodate nozzles of different types and sizes as may be required by various operations. The dimensions of the nozzle shall be such that the nozzle tip will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval.

1.3.2.3 Two-Component, Cold-Applied, Hand-Mix Sealing Equipment

Mixing equipment for **FS SS-S-200** Type H sealants shall consist of a slow-speed electric drill or air-driven mixer with a stirrer in accordance with the **manufacturer's recommendations**.

1.3.2.4 Cold-Applied, Single-Component Sealing Equipment

NOTE: Some ASTM D 5893 sealants cure when exposed to moisture. When the sealant is moisture sensitive it is necessary to use Teflon-lined hoses to prevent the sealant from curing in the hoses.

The equipment for installing **ASTM D 5893** single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

1.4 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

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, Air Force, and NASA projects.

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

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

SD-03 Product Data

Manufacturer's Recommendations[; G][; G, [____]].

Printed copies of manufacturer's recommendations, [____] days prior to use on the project, where installation procedures, or any part thereof, are required to be in accordance with those recommendations. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

Equipment.

List of proposed equipment to be used in performance of construction work including descriptive data, [____] days prior to use on the project.

SD-04 Samples

Materials[; G][; G, [____]].

Samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval [____] days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.5 QUALITY ASSURANCE

1.5.1 Safety

NOTE: Delete this paragraph if liquid oxygen (LOX) equipment, storage, or piping is not within the project area. Joint sealant should not be used within 8 m (25 feet) of any LOX equipment or storage. If LOX equipment, storage, or piping is within the project area, the designer will use continuously reinforced concrete slabs in the 8 m (25 feet) clear area of LOX to reduce the number of joints. If joints cannot be eliminated within the 8 m (25 feet) clear area, then the joints in the area should be thoroughly cleaned and left unsealed. LOX MUST NOT BE PERMITTED TO MIX WITH ANY ORGANIC MATERIAL.

Do not place joint sealant within 8 m 25 feet of any liquid oxygen (LOX) equipment, LOX storage, or LOX piping. Thoroughly clean joints in this area and leave them unsealed.

1.5.2 Test Requirements

NOTE: Select the applicable statement for testing and determining specification compliance and delete the inapplicable statement. The first statement will be selected for all projects except where the project is less than 200 liters (50 gallons) or 200 kg (500 pounds) of material. When the project requires less than 200 liters (50 gallons) or 200 kg (500 pounds) of sealant, the first statement can be deleted and the sealant and back-up material may be accepted on certified certificate which contains the test data showing compliance with the laboratory test requirements. The cost of testing can be obtained from U.S. Army Corps of Engineer Division Laboratories or Waterways Experiment Station.

Test the joint sealant and backup or separating material for conformance with the referenced applicable material specification. [The materials will be tested by the Government. No material shall be used at the project prior to receipt of written notice that the materials meet the laboratory requirements. The cost of the first test of samples will be borne by the Government. If the samples fail to meet specification requirements,

replace the materials represented by the sample and test the new materials at the Contractor's expense.] [Perform testing of the materials in an approved independent laboratory and submit certified copies of the test reports for approval [_____] days prior to the use of the materials at the job site. Samples will be retained by the Government for possible future testing should the materials appear defective during or after application.] Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

1.5.3 Trial Joint Sealant Installation

Prior to the cleaning and sealing of the joints for the entire project, prepare a test section at least 60 m 200 feet long using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, inspect the test section to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, remove the materials, and reclean and reseal the joints at no cost to the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. Prepare and seal all other joints in the manner approved for sealing the test section.

1.6 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 for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 10 degrees C 50 degrees F and rising at the time of application of the materials. Do not apply sealant if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

NOTE: Select joint sealants based on the proposed use and local experience. ASTM D 6690 (Type II or Type III) sealants should be specified for areas that will not receive fuel spillage, engine blast and heat exposure (i.e., areas where aircraft warm up their engines.) Type II sealant conforms to the discontinued ASTM D 3405 requirements. Type III contains all of the requirements of Type II and has additional requirements for a water immersed bond test and an oven-aged resilience test as required by SS-S-1401C. ASTM D 6690 (Type II or Type III) sealants are normally used on roadways, vehicle parking lots, and on some aircraft taxiways. ASTM D 7116 sealants should be specified for areas that

will receive fuel spillage but not heat or engine blast exposure. ASTM D 7116 sealants are normally used on aircraft parking aprons and some vehicle maintenance areas. ASTM D 6690 and ASTM D 7116 sealants must be tested in accordance with COE CRD-C 525 in addition to the appropriate specification.

This testing is required due to bubbling tendencies of hot-applied sealants when used in PCC joints. FS SS-S-200 Type H (hand-mix) or Type M (machine mix) sealants should be specified for areas that are subject to fuel spillage, heat or engine blast. FS SS-S-200 sealants are normally used in aircraft warm up areas, the first five hundred feet of runways, and some aircraft parking aprons. For large projects, FS SS-S-200 Type M is generally specified and Type H is generally specified for small projects; however, either is acceptable. The tack free time for the Type M material is shorter than the Type H material, so if an area needs to be reopened quickly, Type M sealant should be specified. ASTM D 5893 sealants may be specified in place of ASTM D 6690 sealants. ASTM D 5893 covers silicone sealants that provide improved life-cycle cost benefits.

Materials for sealing cracks in the various paved areas indicated on the drawings shall be as follows:

Area	Sealing Material
[]	[ASTM D 6690, Type II and COE CRD-C 525]
[]	[ASTM D 6690, Type III and COE CRD-C 525]
[]	[ASTM D 7116 and COE CRD-C 525]
[]	[FS SS-S-200 Type M]
[]	[FS SS-S-200 Type H]
[]	[ASTM D 5893]

2.2 PRIMERS

When primers are recommended by the manufacturer of the sealant, use them in accordance with the recommendation of the manufacturer.

2.3 BACKUP MATERIALS

NOTE: The use of a bond breaking separation tape or backup material in the joint may prevent an adverse reaction between incompatible materials, maintain the desired configuration (shape factor of the material), and act as a bond breaker to prevent excessive stresses from being placed on the sealant during pavement movement. Therefore, the separating or backup material should be carefully selected and installed to form an effective and durable support for the sealant. Separating or blocking media

should be placed to a depth below the pavement approximately equal to the width of the joint. This is to achieve a shape factor (ratio of the depth of the sealant to the width of the joint) of 1. ASTM D 5893 sealants sometimes require a shape factor of 0.5 instead of 1. This is equivalent to a width-to-depth ratio of 2:1 and will require the standard joint detail to be modified. If a ASTM D 5893 sealant is to be used the placement depth of the bond breaking separating tape or backup material should be adjusted accordingly. Drawings should be included in the contract drawings to indicate application details.

Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 3 degrees C 5 degrees F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

Provide a bond breaking tape or separating material that is a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 3 degrees C 5 degrees F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 3 mm 1/8 inch wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

NOTE: The proper preparation of joints with respect to size of joint opening, required cleanliness of concrete surfaces to be bonded, and proper separation of noncompatible materials from the joint sealant cannot be overemphasized. The same applies to storage, preparation, proportioning, mixing and placement of sealants. The neglect of any facet of these operations can result, and has resulted, in poor performance of the joint sealant.

Immediately before the installation of the sealant, thoroughly clean the joints to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

3.1.1 Existing Sealant Removal

NOTE: Delete this paragraph if the joints have

never been sealed and renumber the subsequent paragraphs. Waterblasters have been used successfully to remove sealants that still have some resilience. A nozzle that puts out a thin stream of water is required to cut the sealant loose from the joint walls. The concrete saw should not be used if it will widen the joint to a width greater than one inch.

Cut loose the in-place sealant from both joint faces and to the depth shown on the drawings, using the [tractor-mounted routing equipment] [concrete saw] [waterblaster] as specified in paragraph EQUIPMENT. Depth shall be sufficient to accommodate any separating or backup material that is required to maintain the depth of new sealant to be installed. Prior to further cleaning operations, remove all loose old sealant remaining in the joint opening by blowing with compressed air. Hand tools may be required to remove sealant from random cracks. Chipping, spalling, or otherwise damaging the concrete will not be allowed.

3.1.2 Sawing

NOTE: Joints often need to be refaced or widened to provide vertical faces and remove damaged concrete. Care should be used when refacing or widening joints so that the joint's width does not exceed 25 mm (1 inch). If the joint width exceeds 25 mm (1 inch), rebuilding of the joint should be considered. All joint walls should be vertical. The edges should not be rounded or beveled unless required by design.

3.1.2.1 Refacing of Joints

NOTE: If the joints have never been sealed, change the title of this paragraph to Facing of Joints and the appropriate words and sentences used. If "dry" sawing is used to face or reface the joints, the debris may be removed using compressed air.

Accomplish [refacing] [facing] of joints using a concrete saw as specified in paragraph EQUIPMENT [to remove all residual old sealant and a minimum of concrete from the joint face to provide exposure of newly cleaned concrete, and, if required, to enlarge the joint opening to the width and depth shown on the drawings.] [to saw through sawed and filler-type joints to loosen and remove material until the joint is clean and open to the full specified width and depth.] Stiffen the blade with a sufficient number of suitable dummy (used) blades or washers. Thoroughly clean, immediately following the sawing operation, the joint opening using a water jet to remove all saw cuttings and debris.

3.1.2.2 Refacing of Random Cracks

NOTE: A vertical spindle routing device may be used

to clean random cracks. Random cracks that are approximately 25 mm (1 inch) wide may be sandblasted clean to prevent additional widening of the crack instead of sawing or routing.

Accomplish sawing of the cracks using a power-driven concrete saw as specified in paragraph EQUIPMENT. The saw blade shall be 152 mm 6 inches or less in diameter to enable the saw to follow the trace of the crack. Stiffen the blade, as necessary, with suitable dummy (or used) blades or washers. Immediately following the sawing operation, thoroughly clean the crack opening using a water jet to remove all saw cuttings and debris.

3.1.3 Sandblasting

NOTE: Sandblasting of joints may not be permitted under certain conditions. Blowing sand and dust may either violate atmospheric pollution statutes, or may drift into areas where it would be objectionable. When sandblasting is prohibited, cleaning the joints with a waterblaster or wire brushes may be substituted. Wire brushes usually do not clean as well as the sandblaster or waterblaster and should only be used for small areas. When wire brushes are used, attention should be given to ensure worn brushes are not used and that the joints are being adequately cleaned. When waterblasting is required instead of sandblasting, replace the word sandblasting with waterblasting.

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 13 mm 1/2 inch from the joint edges shall be [sandblasted] [waterblasted] clean. use a multiple-pass technique until the surfaces are free of dust, dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water.

3.1.4 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.1.5 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

3.1.6 Rate of Progress of Joint Preparation

Limit the stages of joint preparation, which include sandblasting, air pressure cleaning and placing of the back-up material to only that lineal footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

NOTE: Delete the inappropriate paragraphs.

3.2.1 Hot-Poured Sealants

Sealants conforming to [ASTM D 6690] [ASTM D 7116] shall not be heated 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.

3.2.2 Type M Sealants

Inspect the FS SS-S-200 Type M sealant components and containers prior to use. Reject any materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory. Settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools will not be cause for rejection. Prior to transfer of the components from the shipping containers to the appropriate reservoir of the application equipment, thoroughly mix the materials to ensure homogeneity of the components and incorporation of all constituents at the time of transfer. When necessary for remixing prior to transfer to the application equipment reservoirs, warm the components to a temperature not to exceed 32 degrees C 90 degrees F by placing the components in heated storage or by other approved methods but in no case shall the components be heated by direct flame, or in a single walled kettle, or a kettle without an oil bath.

3.2.3 Type H Sealants

Mix the FS SS-S-200 Type H sealant components either in the container furnished by the manufacturer or a cylindrical metal container of volume approximately 50 percent greater than the package volume. Thoroughly mix the base material in accordance with the manufacturer's instructions. The cure component shall then be slowly added during continued mixing until a uniform consistency is obtained.

3.2.4 Single-Component, Cold-Applied Sealants

Inspect the ASTM D 5893 sealant and containers prior to use. Reject any materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory. Settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools will not be cause for rejection.

3.3 INSTALLATION OF SEALANT

3.3.1 Time of Application

Seal joints immediately following final cleaning of the joint walls and

following the placement of the separating or backup material. Open joints, that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.3.2 Sealing Joints

NOTE: Joints should be slightly underfilled to preclude extrusion of the material above the surface of the pavement at summertime temperatures. For airfield pavements, the sealant should be recessed 3 mm (1/8 inch) below the pavement surface; for roads, streets and parking lots, the sealant should be recessed 6 mm (1/4 inch). For pavements that receive tracked vehicle traffic, the sealant should be recessed a minimum of 6 mm (1/4 inch) below the pavement surface after it has cured or cooled to ambient temperature.

Immediately preceding, but not more than 15 m 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to [3] [6] mm [1/8] [1/4] inch plus or minus 1.5 mm 1/16 inch below the pavement surface. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.4 INSPECTION

3.4.1 Joint Cleaning

Inspect joints during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints will be approved prior to installation of the separating or back-up material and joint sealant.

3.4.2 Joint Sealant Application Equipment

Inspect the application equipment to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set will be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.4.3 Joint Sealant

Inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost

to the Government.

3.5 CLEAN-UP

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

-- End of Section --