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USACE / NAVFAC / AFCEC / NASA UFGS-32 13 73 (April 2008)  
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Preparing Activity: USACE Superseding  
UFGS-32 13 73 (April 2006)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2015

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### SECTION 32 13 73

#### COMPRESSION JOINT SEALS FOR CONCRETE PAVEMENTS 04/08

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NOTE: This guide specification covers the requirements for polychloroprene compression seals used for sealing joints of rigid pavements for airfields, roads, streets, hardstands, and other areas.

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 items(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).

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#### PART 1 GENERAL

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NOTE: For U.S. Air Force pavements, the engineer will specify the uncompressed width of the seals to be used, and the width of the saw cut reservoir including tolerances. The minimum sawed joint seal reservoir width will be 13 mm (1/2 inch). The specified uncompressed seal width will be twice the specified nominal saw cut reservoir width, i.e., for a 13 mm (1/2 inch) wide joint seal reservoir saw cut, a 25 mm (1 inch) uncompressed width joint seal should be specified.

Total joint opening and movement must be considered when specifying the size of the joint and seal. The

engineer should carefully consider all factors affecting the proper sizing of the joint seal to assure the seal remains within the allowable compression range and that the working range of the proposed seal is always greater than the total movement of the joints. The computational procedures in UFC 3-250-08FA Chapter 7, Appendix C, should be followed. Factors to be considered are saw cut reservoir width including tolerances, maximum pavement thermal expansion and contraction, pavement shrinkage during curing and pavement temperature limitations during joint seal reservoir sawing.

Compression joint seal size, general shape and dimensional tolerances, especially uncompressed seal width, must be shown on the drawings or specified in this section. Manufacturer's literature is helpful in determining the seal size with the anticipated joint movement.

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## 1.1 UNIT PRICES

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NOTE: Paragraphs MEASUREMENT and PAYMENT will be deleted for lump sum bidding.

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### 1.1.1 Measurement

The quantity of each sealing item to be paid for will be determined by measuring the length of in-place material that has been approved.

### 1.1.2 Payment

Payment will be made at the contract unit bid prices per unit length for the sealing items scheduled, including approved trail joint installation. Include in the unit bid prices the cost of all labor, materials, 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 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 D2628	(1991; R 2011) Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D2835	(1989; R 2012) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 548	(1988) Standard Specification for Jet-Fuel and Heat-Resistant Preformed Polychloroprene Elastomeric Joint Seals for Rigid Pavements
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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 to reflect only the submittals required for the project.

The Guide Specification technical editors have designated 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 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.

An "S" following a submittal item indicates that the submittal is required for the Sustainability Notebook to fulfill federally mandated sustainable

requirements in accordance with Section 01 33 29  
SUSTAINABILITY REPORTING.

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" 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.] Submittals with an "S" are for inclusion in the  
Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY  
REPORTING. Submit the following in accordance with Section 01 33 00  
SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment  
Manufacturer's Instructions

SD-04, Samples

Compression Seals; G[, [\_\_\_\_\_]]

SD-06 Test Reports

Test Requirements

#### 1.4 QUALITY ASSURANCE

##### 1.4.1 Safety

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NOTE: Delete this paragraph if liquid oxygen (LOX)  
equipment, storage, or piping is not within the  
project area and renumber subsequent paragraphs. If  
LOX equipment, storage, or piping is within the  
project area, the designer will use continuously  
reinforced concrete slabs in the 7.6 meter (25 feet)  
clear area of LOX to reduce the number of joints.  
If joints cannot be eliminated within the clear  
area, then the joints in the area should be  
thoroughly cleaned and sealed with a LOX compatible  
sealant that has been approved by Headquarters, U.S.  
Army Corps of Engineers (CEMP-ET) or the appropriate  
Air Force Major Command. The Major Command or  
CEMP-ET should be contacted to obtain a list of  
approved materials.

A MIXTURE OF LOX AND ANY ORGANIC MATERIAL IS  
EXTREMELY FLAMMABLE, AND MAY SELF-IGNITE OR EXPLODE.

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Donot place compression joint seals within 7.5 meters 25 feet of liquid  
oxygen (LOX) equipment, LOX storage, or LOX piping.

#### 1.4.2 Trial Joint Seal and Lubricant/Adhesive Installation

Prior to the cleaning and sealing of the joints for the entire project, prepare a test section at least 69 meters 200 feet long at a designated location in the project pavement, using the specified materials and the approved equipment to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the trial length and before any other joint is sealed, the trial joints will be inspected by the Government to determine that the materials and installation meet the requirements specified. If materials or installation do not meet requirements, remove the materials, and the joints shall be recleaned and resealed at no cost to the Government. No other joints shall be sealed until the test installation has been approved. If the trial section is approved, it may be incorporated into the permanent work. Seal other joints in the manner approved for sealing the trial joint.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

Materials delivered to the jobsite shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Provide storage facilities that protect materials from weather and maintain materials at temperatures recommended by the manufacturer.

#### 1.6 ENVIRONMENTAL REQUIREMENTS

The ambient temperature and the pavement temperature within the joint wall shall be at least 2 degrees C 35 degrees F and rising at the time of installation of the materials. Sealant installation will not be allowed if moisture or foreign material is observed in the joint.

### PART 2 PRODUCTS

#### 2.1 SYSTEM EQUIPMENT

Provide machines, tools, and equipment, used in the performance of the work required by this section, approved before the work is started and maintained in satisfactory condition at all times. Submit list of proposed equipment to be used in the performance of construction work, including descriptive data, [\_\_\_\_\_] days prior to use on the project.

##### 2.1.1 Joint Cleaning Equipment

###### 2.1.1.1 Concrete Saw

Provide a self-propelled power saw with water-cooled diamond saw blades for cutting joints to the depths and widths specified and for removing filler, existing old joint seal, or other material embedded in the joints or adhered to the joint faces.

###### 2.1.1.2 Sandblasting Equipment

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NOTE: Sandblasting equipment with a 6 mm (1/4 inch) nozzle requires at least 3880 liters (137 cubic feet) per minute of air to function efficiently. A larger nozzle would not serve any useful purpose in cleaning a joint.  
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Include with the sandblasting equipment an air compressor, hose, and a long-wearing venturi-type nozzle of proper size, shape, and opening. The maximum nozzle opening should not exceed 6 mm 1/4 inch. Provide a portable air compressor capable of furnishing not less than 4200 liters 150 cubic feet per minute and maintaining a line pressure of not less than 620 kPa 90 psi at the nozzle while in use. 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 about 25 mm 1 inch above the pavement surface and will direct the blast to clean the joint walls. Adjust the height, angle of inclination, and the size of the nozzle as necessary to ensure satisfactory results.

#### 2.1.1.3 Waterblasting Equipment

Include with the waterblasting equipment a trailer-mounted water tank, pumps, high-pressure hose, a wand with safety release cutoff controls, nozzle, and auxiliary water resupply equipment. The water tank and auxiliary water resupply equipment shall be of sufficient capacity to permit continuous operations. The pumps, hoses, wand, and nozzle shall be of sufficient capacity to permit the cleaning of both walls of the joint and the pavement surface for a width of at least 13 mm 1/2 inch on either side of the joint. A pressure gauge mounted at the pump shall show at all times the pressure in kPa psi at which the equipment is operating.

#### 2.1.2 Sealing Equipment

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**NOTE: Single-axle type seal application equipment should not be permitted; this tool tends to cause excessive stretching and may cut or distort the seal. The following subparagraph may be added only for road, parking lot, and street pavements less than 1800 square meters (2,000 square yards), and for airfield and tracked pavements less than 450 square meters (500 square yards) in area:**

**"The hand operated joint seal application equipment shall be a two-axle, four-wheel machine that shall include means for compressing and inserting the compression seal into the joint and a reel capable of holding one full spool of compression seal. Provide auxiliary equipment to coat both sides of the joint or the seal with lubricant/ adhesive just prior to the installation of the compression seal."**

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Equipment used to install the compression seal shall place the compression seal to the prescribed depths within the specified tolerances without cutting, nicking, twisting, or otherwise damaging the seal. The equipment shall be capable of placing the seal with not more than two percent longitudinal stretch or compression of the seal during installation. The machine shall be an automatic self-propelled joint seal application equipment and engine powered. The machine shall include a reservoir for the lubricant/adhesive, a device for conveying the lubricant/adhesive in the proper quantities to the sides of the compression seal or the sidewalls of the joints, a reel capable of holding one full spool of compression seal, and a power-driven apparatus for feeding the joint seal through a compression device and inserting the seal into the joint. The equipment



shall also include a guide to maintain the proper course along the joint being sealed. The machine shall at all times be operated by an experienced operator.

### 2.1.3 Test Requirements

Submit certified copies of test results, [\_\_\_\_\_] days prior to use of material on the project. Each lot of compression joint seal and lubricant/adhesive shall be sampled, identified, and tested for conformance with the applicable material specification.

- a. A lot of compression seal shall consist of 1 day's production or 6,000 meters 20,000 linear feet for each cross section, whichever is less. A lot of lubricant/adhesive shall consist of 1 day's production. [Samples of the compression joint seal and lubricant/adhesive material shall be submitted and 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.
- b. The cost of testing the samples from each original lot supplied will be borne by the Government. If the samples fail to meet specification requirements, the materials represented by the sample shall be replaced and the new materials tested. A cost of [\_\_\_\_\_] for Government testing of each lot of replacement material will be charged to the Contractor] [Testing of the compression joint seal and lubricant/adhesive material is the responsibility of the Contractor and shall be performed in an approved independent laboratory, and certified copies of the test reports shall be submitted for approval [\_\_\_\_\_] days prior to the use of the materials at the jobsite.
- c. Samples of each lot of material shall also be submitted and will be retained by the Government for possible future testing should the materials appear defective during or after application]. Furnish additional samples of materials, in sufficient quantity to be tested, upon request. Final acceptance will be based on conformance to the specified test requirements and the performance of the in-place materials.

### 2.2 COMPRESSION SEALS

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**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 1200 meters (4,000 linear feet) of compression joint seal material. When the project requires less than this amount of seal material, the first statement can be deleted and the second statement used. The cost of testing can be obtained from U.S. Army Engineer Waterways Experiment Station.

The actual width of the joint seal should be at the option of the Contractor. However, for guidance on unusual circumstances, or for resealing joints in existing pavement that have to be sawed out to an extra width, see UFC 3-250-08FA Chapter 7, "Standard Practice for Sealing Joints and Cracks in Rigid and

## **Flexible Pavements."**

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Regardless of testing responsibility, submit 2.7 meter 9 foot long samples of the materials, [60] [\_\_\_\_\_] days prior to use on the project. Printed directions from the manufacturer on recommended installation criteria shall be furnished with the samples plus the manufacturer's certification that the selected seal is recommended for the installation on this project. Compression joint seal materials shall be a vulcanized elastomeric compound using polychloroprene as the only base polymer. The material and manufactured seal shall conform to [ASTM D2628] [ASTM D2628 and COE CRD-C 548 where jet fuel and/or heat blast resistance is required]. The joint seal shall be a labyrinth type seal. The uncompressed depth of the face of the compression seal (that is to be bonded to the joint wall) shall be greater than the uncompressed width of the seal, except that for seals 25 mm 1 inch or greater in width, the depth need be only 25 mm 1 inch or greater. The actual width of the uncompressed seal for construction and contraction joints shall be [21 or 25] [\_\_\_\_\_] mm [0.75 or 1] [\_\_\_\_\_] inches and for expansion joints shall be [32][\_\_\_\_\_] mm 1.25 [\_\_\_\_\_] inches. The tolerance on the seal shall be plus 3 mm or minus 1.5 mm plus 1/8 inch or minus 1/16 inch.

### **2.3 LUBRICANT/ADHESIVE**

Lubricant/adhesive used for the compression elastomeric joint seal shall be a one-component compound conforming to ASTM D2835.

## **PART 3 EXECUTION**

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**NOTE:** Joint openings of uniform cross section are essential to satisfactory installation of the compression joint seal. Openings must be sawed to provide smooth vertical faces of consistent width, within specified tolerances. Nonuniformity in width or roughness will cause variations in resistance of the joint seal to insertion and will result in irregular depth of insertion, stretching, and a tendency of the joint seal to twist so that the top of the seal is not at the surface.

The proper preparation of joints with respect to the size of joint opening, required cleanliness of vertical and parallel joint faces, and uniform contact between the seal and the joint face can not be overemphasized. The neglect of any facet of these operations can result and has resulted in poor performance of joint seals. For the repair of concrete pavements adjacent to the joints, refer to UFC 3-250-06, Chapter 10, and Section 32 01 29.61 PARTIAL DEPTH PATCHING OF RIGID PAVING.

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### **3.1 PREPARATION OF JOINTS**

Immediately before installation of the compression joint seal, thoroughly clean the joints to remove laitance, filler, existing sealer, foreign material and protrusions of hardened concrete from the sides and upper edges of the joint space to be sealed. Cleaning shall be by sandblasting

or waterblasting and shall extend along pavement surfaces at least 13 mm 1/2 inch on either side of the joint. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water. Demonstrate that the selected cleaning operation meets the cleanliness requirements. Correct any irregularity in the joint face which would prevent uniform contact between the joint seal and the joint face prior to the installation of the joint seal.

### 3.1.1.1 Sawing

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NOTE: Requirements are based on giving the Contractor the option of using either nominal 21 mm (13/16 inch) or 25 mm (1 inch) wide compression seal. The designer will select the required values from columns (3) and (4) of the following tables, based on the geographical area and the nominal sealant width to be used for this project.

The first table is metricated, followed by a similar tabulation in I-P units.

Area	(1) Expected Pavement Temperature Range in Service, Degrees C F	(2) Nominal Uncompressed Sealant Width, mm inch	(3) Nominal Saw Cut, mm inches	(4) Allowable Pavement Temperature Range for Sawing, Degrees C F
Southwest Desert Area	-10 to +71	20.613/16	12.78/16	10 to 4650 to 115
	+10 to +160	25.41	14.39/16	12 to 8255 to 180
Southern U.S.	-18 to +57	20.613/16	12.78/16	-1 to +4430 to 110
	0 to +135	25.41	14.39/16	-1 to +7730 to 170
Other Contiguous U.S.	-35 to +57	20.613/16	12.78/16	-4 to +6025 to 80
	-30 to +135		14.39/16	-4 to 6025 to 140
Alaska and Similar Areas	-57 to +44	20.613/16*	11.17/16	10 to +42*50* to 105
	-70 to +110	25.41	12.78/16	15 to +7160 to 160

\* Note in the project specifications that this seal will not be installed in a saw cut less than 11 mm (7/16 inch) and thus cannot be used in this area if sawing must be done at temperatures less than 10 degrees C (50 degrees F).

The above tables are based on the following:

- a. Tolerance from nominal specified width of uncompressed seal plus 3.2 mm (1/8 inch) and minus 1.6 mm (1/16 inch).

- b. Tolerance from nominal saw cut width plus or minus 1.6 mm (1/16 inch).
- c. Compression seal must be compressed at least 20 percent of its uncompressed width at all times.
- d. Compression seal must never be compressed more than 60 percent of its uncompressed width at any time (narrowest opening in hot weather must be at least 40 percent of uncompressed seal width).

For unusual conditions and for resealing joints in existing pavements where the prepared joint is extra wide, the designer will have to compute values to insert in the blanks using the procedures given in UFC 3-250-08FA, Chapter 7, and the parameters given above. (Before the compression seal is used for resealing joints in existing pavements, it is common practice to resaw the joints, which will give a wider cavity. Width of sawing should be held to the same tolerance as specified for new pavements).

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Clean and open joints to the specified width and depth by sawing. Immediately following the sawing operation, thoroughly clean the joint faces and opening using a water jet to remove saw cuttings or debris remaining on the faces or in the joint opening. Install compression seal within 3 calendar days of the time the joint cavity is sawed. Depth of the joint cavity shall be in accordance with manufacturer's instructions. Where installation procedures are required in accordance with the manufacturer's recommendations, submit printed copies of manufacturers' instructions, [\_\_\_\_\_] days prior to use on the project. The saw cut for the joint seal cavity shall be centered over the joint line. The nominal width of the sawed joint seal cavity shall be as follows; the actual width shall be within a tolerance of plus or minus 1.5 mm 1/16 inch:

- a. If a nominal 20.6 mm 13/16 inch wide compression seal is furnished, the nominal width of the saw cut shall be [\_\_\_\_\_] mm inches when the pavement temperature at the time of sawing is between [\_\_\_\_\_] and [\_\_\_\_\_] degrees C F. If the pavement temperature at the time of sawing is above this range, the nominal width of the saw cut shall be decreased 1.5 mm 1/16 inch. If the pavement temperature at the time of sawing is below this range, the nominal width of the saw cut shall be increased 1.5 mm 1/16 inch.
- b. If a nominal 25.4 mm 1 inch wide compression seal is furnished, the nominal width of the saw cut shall be [\_\_\_\_\_] mm inches when the pavement temperature at the time of sawing is between [\_\_\_\_\_] and [\_\_\_\_\_] degrees C F. If the pavement temperature at the time of sawing is above this range, the nominal width of the saw cut shall be decreased 1.5 mm 1/16 inch. If the pavement temperature at the time of sawing is below this range, the nominal width of the saw cut shall be increased 1.5 mm 1/16 inch.
- c. Measure the pavement temperature in the presence of the Contracting Officer. Make measurement each day before commencing sawing and at any other time during the day when the temperature appears to be varying from the allowable sawing range.

### 3.1.2 Sandblast Cleaning

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NOTE: Delete this paragraph and paragraph entitled  
"Sandblasting Equipment" when sandblasting is  
prohibited.  
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Use a multiple pass sandblasting technique until the surfaces are free of dust, dirt, curing compound, or any residue that might prevent ready insertion or uniform contact of the seal and bonding of the lubricant/adhesive to the concrete.

### 3.1.3 Waterblast Cleaning

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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. The joints may be waterblasted the previous day and cleaned with compressed air immediately prior to sealing. The joints should be inspected to insure no foreign debris remains in the joint before sealing.  
\*\*\*\*\*

Use a multiple pass waterblast technique until the surfaces are free of dust, dirt, curing compound, or any residue that might prevent ready insertion or uniform contact of the seal and bonding of the lubricant/adhesive to the concrete.

### 3.1.4 Rate of Progress

Limit sandblasting or waterblasting of joint faces to the length of joint that can be sealed during the same workday.

## 3.2 INSTALLATION OF THE COMPRESSION SEAL

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NOTE: Temperatures of the pavement and the atmosphere are not as critical for the installation of compression joint seals as they are for poured sealants. Therefore, lower temperatures are acceptable, and under some conditions sealing can proceed satisfactorily at temperatures lower than 2 degrees C (35 degrees F). However, joints should be dry to obtain maximum cementing of the lubricant/adhesive to the concrete and manufacturers should be contacted for special instructions under cold conditions.

Include the bracketed text in this paragraph on projects that the contractor may not be familiar with this practice, predominantly OCONUS projects.

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[ A representative of the joint seal manufacturer shall be present at the trial joint installation to correct any installation issues prior to full installation.

]

### 3.2.1 Time of Installation

Seal joints immediately within 3 calendar days of sawing the joint seal cavity and following concrete cure and the final cleaning of the joint walls. Provide open joints, ready for sealing that cannot be sealed under the specified conditions, with an approved temporary seal to prevent infiltration of foreign material. When rain interrupts the sealing operations, the joints shall be washed, air pressure cleaned, and allowed to dry prior to installing the lubricant/adhesive and compression seal.

### 3.2.2 Sequence of Installation

Seal first longitudinal joints, followed by transverse joints. Install seals in longitudinal joints so that all transverse joint seals will be intact from edge to edge of the pavement. Intersections shall be made monolithic by use of joint seal adhesive and care in fitting the intersection parts together. Extender pieces of seal shall not be used at intersections. Any seal falling short at the intersection shall be removed and replaced with new seal at no additional cost to the Government. Seals that are required to change direction by more than 20 degrees, may require a poured sealant at the intersection. Poured sealant shall be in accordance with compression seal manufacturer's instructions.

### 3.3 SEALING OF JOINTS

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NOTE: Stretching of the compression joint seal beyond the specified maximum must never be permitted, as breaks in the seal could occur later. It is also possible that if the maximum is exceeded, when the longitudinal joints are cut to install the transverse joints that the joint seal material will return to its natural length leaving openings in the final product. Conversely, placing the seal so that the compression seal is compressed longitudinally is also undesirable, as this practice tends to cause unsightly undulations and may exceed depth of installation tolerances.

If tracked vehicles are to use the pavement, the minimum depth of the seal should be 6 mm (1/4 inch) below the surface of the pavement to prevent treads of tracked vehicles from damaging the compression seal. Depth of installation will be revised to read "10 mm, plus or minus 3 mm" ("3/8 inch, plus or minus 1/8 inch.") On airfield pavements a shallower depth of installation may be desired by the using agency, to reduce the accumulation of dust and debris on top of the compression seal, which could be ingested by aircraft engines. In such cases, the depth of installation will be changed to read "5 mm, plus or minus 3 mm" ("3/16 inch, plus or minus 1/8 inch,") if requested in writing by the using service major command. It is also recommended when the compression seal in the longitudinal intersections

are being cut that a knife blade be used to reduce the possibility of damage to the compression seal on either side of the intersection.

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The sides of the joint seal or the sides of the joint shall be covered with a coating of lubricant/adhesive and the seal installed as specified. Butt joints and seal intersections shall be coated with liberal applications of lubricant/adhesive. Lubricant/adhesive spilled on the pavement shall be removed immediately to prevent setting on the pavement. The in-place joint seal shall be in an upright position and free from twisting, distortion, and cuts. Adjustments shall be made to the installation equipment and procedure, if the stretch exceeds 1 percent. Any seal exceeding 2 percent stretch shall be removed and replaced. The joint seal shall be placed at a uniform depth within the tolerances specified. In-place joint seal which fails to meet the specified requirements shall be removed and replaced with new joint seal at no cost to the Government. The compression joint seal shall be placed to a depth of 6 mm 1/4 inch, plus or minus 3 mm 1/8 inch, below the pavement surface except when the joint is beveled or has a radius at the surface, or unless otherwise directed. For beveled joints or joints with a radius at the surface, the compression joint seal shall be installed at a depth of 3 mm 1/8 inch, plus or minus 3 mm 1/8 inch, below the bottom of the edge of the bevel or radius. No part of the seal shall be allowed to project above the surface of the pavement or above the edge of the bevel or radius. The seal shall be installed in the longest practicable lengths in longitudinal joints and shall be cut at the joint intersections to provide continuous installation of the seal in the transverse joints. The lubricant/adhesive in the longitudinal joints shall be allowed to set for 1 hour prior to cutting at the joint intersections to reduce the possibility of shrinkage. For all transverse joints, the minimum length of the compression joint seal shall be the pavement width from edge to edge.

### 3.4 CLEAN-UP

Upon completion of the project, remove all unused materials from the site, remove any lubricant/adhesive on the pavement surface, and leave the pavement in clean condition.

### 3.5 QUALITY CONTROL PROVISIONS

#### 3.5.1 Application Equipment

Inspect the application equipment to assure uniform application of lubricant/adhesive to the sides of the compression joint seal or the walls of the joint. If any equipment causes cutting, twisting, nicking, excessive stretching or compressing of the seal, or improper application of the lubricant/adhesive, suspend the operation until causes of the deficiencies are determined and corrected.

#### 3.5.2 Procedures

##### 3.5.2.1 Quality Control Inspection

Provide quality control provisions during the joint cleaning process to prevent or correct improper equipment and cleaning techniques that damage the concrete in any manner. Cleaned joints shall be approved by the Government prior to installation of the lubricant/adhesive and compression joint seal.

#### 3.5.2.2 Conformance to Stretching and Compression Limitations

Determine conformance to stretching and compression limitations. Mark the top surface of the compression seal at 300 mm 1 foot intervals in a manner clear and durable to enable length determinations of the seal. After installation, measure the distance between the marks on the seal. If the stretching or compression exceeds 2 percent, remove the seal and replace it with new joint at no additional cost to the Government. The seal shall be removed up to the last correct measurement. The seal shall be inspected a minimum of once per [30] [120] meters [100] [400] feet of seal for compliance to the shrinkage or compression requirements. Measurements shall also be made at the same interval to determine conformance with depth and width of installation requirements. Remove and replace compression seal that is not in conformance with specification requirements with new joint seal at no additional cost to the Government.

#### 3.5.2.3 Pavement Temperature

Determine the pavement temperature by placing a thermometer in the initial saw cut for the joint and record the reading. The thermometer shall remain in the joint for an adequate time to provide a control reading.

#### 3.5.3 Final Inspection

Inspect the joint sealing system (compression seal and lubricant/adhesive) for proper rate of cure and bonding to the concrete, cuts, twists, nicks and other deficiencies. Seals exhibiting any defects, at any time prior to final acceptance of the project, shall be removed from the joint, wasted, and replaced in a satisfactory manner.

-- End of Section --