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Preparing Activity: LANTNAVFACENGCOM Based on NFGS-02761C

ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

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SECTION 02762

JOINTS, REINFORCEMENT, AND MOORING EYES IN CONCRETE PAVEMENTS  
09/02

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NOTE: This guide specification is issued by the  
Atlantic Division, Naval Facilities Engineering  
Command for regional use in Italy.

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NOTE: This guide specification covers joints,  
mooring eyes, and reinforcement in concrete pavement  
for runways, taxiways, paved areas, and roads.

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NOTE: The following information should be shown on  
the drawings:

1. Spacing, width, and type of joints in pavements,  
and locations and character of other joints,  
including joints between runways and taxiway, and  
blast pavements, taxiways and warm-up pad, and  
between concrete pavement and building footings,  
walls, columns, and other structures; and transverse  
construction joints for emergency stops.
2. Detail formed groove if such joints are required.
3. Detail type of joints. See MIL-HDBK 1021/4 for  
suggested joint details to be included on the  
project drawings.
4. Areas to be sealed with materials resistant to  
jet blast and jet fuel; areas to be sealed with jet  
fuel resistant materials; areas to be sealed with  
material not resistant to jet blast or jet fuel.
5. Type of joint filler for expansion joints.
6. Type and location of joint seal materials. If  
compression seals are permitted, show typical joint

detail and sealant.

7. Location and detail of mooring eyes. See MIL-HDBK 1021/4.

8. For reinforced concrete, type and spacing of reinforcement.

9. When required, detail tie bars, and dowel bars including placement tolerances.

10. It should be noted that:

a. Contraction joints are made with a initial 3 mm deep sawcut to control cracking and a second cut is made at a later time to the required sealant shape (reservoir), unless equipment is designed to saw the finished shape in one pass is available.

b. Butt type joints are used only in conjunction with high quality granular base materials stabilized with cement, such as, "cement-treated base" or "asphalt-stabilized base". Once the concrete is placed, the joint line is grooved by sawing to the required sealant reservoir dimensions.

c. Expansion joints are formed full depth at a width of 19 mm. The space is filled with preformed joint filler to within 19 mm of the top of the pavement surface; the remaining space is filled with liquid joint sealant to within 6 mm plus or minus 3 mm from the top.

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Comments and suggestion on this 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.

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.

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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the

basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 775/A 775M	(1995; Rev. A) Epoxy-Coated Reinforcing Steel Bars
ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 603	(1990) Extrusion Rate and Application Life of Elastomeric Sealants
ASTM C 639	(1995) Rheological (Flow) Properties of Elastomeric Sealants
ASTM C 661	(1993) Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
ASTM C 679	(1987; R 1992) Tack-Free Time of Elastomeric Sealants
ASTM C 719	(1993) Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
ASTM C 792	(1993) Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants
ASTM C 793	(1991) Effects of Accelerated Weathering on Elastomeric Joint Sealants
ASTM D 412	(1992) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 2628	(1991) Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D 2835	(1989; R 1993) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements

FEDERAL SPECIFICATIONS (FS)

FS SS-S-200	(Rev. E; Am. 2) Sealants, Joint, Two-Component, Jet-Blast Resistant, Cold-Applied, For Portland Cement Concrete Pavement
FS L-C-530	(Rev. C) Coating, Pipe, Thermoplastic Resin
FS TT-P-664	(Rev. D) Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant
FS SS-S-1401	(Rev. C) Sealant, Joint, Non-Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Asphalt Concrete Pavements
FS SS-S-1614	(Rev. A) Sealants, Joint, Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Tar Concrete Pavements

ITALIAN NATIONAL ASSOCIATION FOR UNIFICATION OF STANDARDS (UNI)

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**NOTE: A UNI Norm is a technical normative recognized as Italian Law, submitted by a private organization "Ente Nazionale Italiano di Unificazione" for Italy and is available only in the Italian language. It is the National Standard.**  
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UNI 5294	Mechanical tests of ferrous material. Reverse bend rreat for steel wire
UNI 8926	(1986) Steel wires to be used in manufacturing of electrically welded fabrics and lattice girders for the reinforcement of concrete
UNI 9610	Building - Silicone sealants for joints - Requirements and test
UNI 10622	(1997) Zinc-coated (galvanized) steel bars and wire rods for concrete reinforcement
UNI 11001	(1962) Code of practice for edge preparation in fusion welding of steel structures

ITALIAN/EUROPEAN HARMONIZATION STANDARDS (UNI EN)(UNI ENV)(CEI EN)  
(UNI EN ISO)(UNI ISO)

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NOTE: A UNI EN, UNI ENV, CEI EN, UNI EN ISO or UNI ISO is a European Standard with a coincident Italian National Standard or International Standard. The two standards are identical, with most (but not all) EN's available in the English language and the UNI available only in the Italian language.

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UNI EN ISO 9047	Building construction - Sealants - Determination of adhesion/cohesion properties at variable temperatures
UNI ISO 10065	(1994) Steel bars for reinforcement of concrete - Bend and rebend tests
UNI EN 500-5	Mobile road construction machinery - Safety - Specific requirements for joint cutters
UNI EN 26927	Building construction - Jointing products - Sealants - Vocabulary
UNI EN 28339	Building construction Jointing products - Sealants - Determination of tensile properties
UNI EN 28339-A1	Building construction Jointing products - Sealants - Determination of tensile properties - Amendment
UNI EN 28340	Building construction Jointing products - Sealants - Determination of tensile properties at maintained extension
UNI EN 28394	Building construction Jointing products - Determination of extrudability of one-component sealants
UNI EN 29048	Building construction Jointing products - Determination of extrudability of sealants using standardized apparatus
UNI ENV 10080	(1997) Steel for the reinforcement of concrete - Weldable ribbed reinforced steel B 500 - Technical delivery conditions for bars, coils and welded fabric
UNI EN ISO 10563	Building construction - Sealants for joints - Determination of change in mass and volume

ITALIAN LAWS AND NORMS (D.M.)(LAW)(CIRC.)

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NOTE: Italian laws and normatives are the legislative regulations and decrees issued by the Italian government in the form of laws, norms, decrees, circulars, and letters. These Laws and Decrees concur together with Norms and Standards in forming the governing directives for construction.

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D.M. 09/01/1996 Technical norms for the design, execution and testing of cast-in-place reinforced concrete, pre-cast prestressed reinforced concrete and steel structures

DM 65 (14 February 1992) Technical Norms for the execution of reinforced concrete, and pre-stressed concrete and steel structures

LAW 1086 (5 November 1071) Norms for Construction of Normal or Prestressed Reinforced Concrete and Steel Structures

ITALIAN WELDING INSTITUTE (IIS)

IIS Italian Welding Institute Publications and Manuals

1.2 SUBMITTALS

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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 is 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. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. 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.

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Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Mooring eyes

Preformed Compression seals

Manufacturer's catalog data in the form of catalog cuts may be submitted in lieu of drawings for the listed items.

SD-06 Test Reports

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**NOTE: Factory test report should be required for joint seal when Government testing is waived.**

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[Joint sealer]

SD-07 Certificates

Equipment list

Submit a list and description of equipment to be used. Equipment for heating, mixing and installing joint seals shall be in accordance with instructions provided by joint seal manufacturer.

Blocking media

Separating tape

Dowel

Reinforcement

Joint seal

SD-08 Manufacturer's Instructions

Joint sealants

Preformed compression seals

[Dowel Assemblies]

Instructions for joint sealants 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.

SD-11 Closeout Submittals

Joint sealer

Joint filler

A record of joint sealant and filler materials used shall be furnished, in duplicate, to the Contracting Officer in the following format:

MILITARY BASE/AREA	MATERIAL	SPECIFICATION DESIGNATION/TYPE	MANUFACTURER
_____ _____	_____ _____	_____ _____	_____ _____
MATERIAL USED (MFR DESIG)	EXACT ON-SITE LOCATION	QUANTITY OF SEALANT	DATE APPLIED
[_____] [_____]	[_____] [_____]	[_____] [_____]	[_____] [_____]

1.3 DELIVERY, STORAGE, AND HANDLING

Inspect for damage, unload, and store materials delivered to site in accordance with manufacturer's instructions.

1.3.1 Joint Seal Materials

Deliver liquid joint sealants and lubricants in original sealed containers and protect from freezing and high temperatures. Store preformed joint fillers in a manner to maintain straightness and avoid damage.

[1.3.2 Coated Dowel Bars

Coated dowel bars shall be stored in a manner to avoid cracking or perforations in coating. Cover stored dowel bars with tarpaulin or black colored polyethylene film.

### ]1.3.3 Reinforcement

Store reinforcement on pallets or wooden sleepers in a manner to avoid excessive rusting or contamination with soil, grease, oil, or other objectionable material. Store reinforcement in separate piles or racks to avoid loss of identification after bundles of reinforcing bars or mats are broken.

### ]1.4 ENVIRONMENTAL REQUIREMENTS

Forming of joints or applying joint sealants shall not proceed when the underlying layer or surface is frozen, or when, in the opinion of the Contracting Officer, weather conditions will prevent the proper installation of the joint sealants. 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 area of the joints being sealed during the protection and curing period of joint sealant. At end of curing period, traffic may be permitted on pavement when approved.

### 1.6 EQUIPMENT

Maintain machines, tools, and other equipment used in performance of work in proper working conditions at all times. Furnish necessary equipment and accessories to install preformed joint filler, preformed compression seal, and liquid sealant in hardened concrete in accordance with equipment list. Concrete saws shall be adequate to remove filler and saw grooves for all joints.

#### 1.6.1 Joint and Pavement Cleaning Equipment

##### 1.6.1.1 Sandblasting Equipment

Sandblasting equipment for cleaning joints shall include an air compressor, hose, and nozzles of proper size, shape and opening to produce a clean joint. Equip compressor with traps that will maintain compressed air free of oil and water.

##### 1.6.1.2 Power Saws

Concrete saws shall be self-propelled and capable of sawing joints in concrete to indicated width, depth and alignment without spalling or ravelling of concrete and at a production rate to avoid uncontrolled cracking.

##### 1.6.1.3 Vacuum Sweeper

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

## 1.6.2 Joint Sealing Equipment

Joint sealing equipment shall be of a type required by joint seal manufacturer's installation instructions. Equipment shall be capable of installing sealant to depths, widths and tolerances indicated. Inspect equipment periodically during installation of sealant as required but not less than once each work day, to ensure the equipment is functioning properly. If malfunctions are noted, joint sealing shall not proceed until they are corrected.

### 1.6.2.1 Hot-Poured Liquid Sealant

Unit applicators used for heating and installing hot-poured sealant materials shall be mobile and equipped with a double-wall agitator-type kettle with an oil medium in outer space for heat transfer, a direct-connected pressure-type extruding device with nozzle or nozzles shaped for insertion in the joints to be filled, and a positive device for controlling temperature of oil and sealant. Applicator shall be so designed that sealer will circulate through delivery hose and return to kettle when not sealing joint.

### 1.6.2.3 Preformed Joint Seal

Install seals with equipment recommended in writing by sealant manufacturer. Equipment shall be capable of installing joint seal to indicated depth without damaging, distorting, or stretching seal material.

### 1.6.2.4 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 to other type sealant.

## PART 2 PRODUCTS

### 2.1 SOURCE MANUFACTURERS

#### 2.1.1 Joint Sealant Materials

The following manufacturers provide joint sealant products that generally comply with these specifications:

JJoint  
Via dell Vivaio, 15  
40132 Bologna, Italy  
Tel: 051/400086  
Fax: 051/400398

mpm  
materiali protettivi milano s.p.a.  
Via S. Cristoforo, 84  
20090 Trezzano s/N

Sede Di Milano, Italy  
Tel: 02/48400388  
Fax: 02/4451703

Sika Italia S.p.a.  
Via De Amicis 44  
20123 Milano, Italy  
Tel: 02.72126.1  
Fax: 02.8055649

#### 2.1.2 Mooring Eyes

The following manufacturers provide mooring eye components that generally comply with these specifications:

Fischer Italia s.a.s.  
35129 Padova  
Zona Industriale Sud  
Corso Stati Uniti, 25  
Tel: 049/8701011  
Fax: 049/761813

### 2.1 MATERIALS

#### 2.1.1 Joint Filler

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**NOTE: Do not specify joint filler materials that may be incompatible with sealants; i.e. asphalt impregnated fillers (ASTM D 1751) are not compatible with some SS-S-200 and SS-S-1614 materials.**  
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##### 2.1.1.1 For Expansion Joints

Preformed joint filler, [ASTM D 1751] [ASTM D 1752, Type II or Type III]. Filler must be compatible with joint sealer material. Non preformed joint filler shall comply with UNI EN 26927. Filler shall be compatible with joint sealer material.

#### 2.1.2 Bond Breakers

##### 2.1.2.1 Blocking Media

Compressible, non-shrinkable, nonreactive with joint sealant and nonabsorption type such as plastic rod, free of oils or bitumens. Blocking media shall have a water absorption of not more than 5 percent by weight when tested in accordance with ASTM C 509. Blocking media shall be consistent with joint seal manufacturer's installation instructions and be at least 25 percent larger in diameter than width of joints as shown.

##### 2.1.2.2 Separating Tape

Polyethylene or polyester tape, 0.08 mm minimum thickness, or masking tape,

nonreactive, nonabsorptive, adhesive back tape, width equal to width of joints as indicated. Separating tape shall be consistent with joint seal manufacturer's installation instructions.

### 2.1.3 Joint Sealants

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NOTE: Select joint sealants based on service conditions of pavements with joint sealants. 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. 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 spill. This may result in an unsatisfactory seal in aircraft or vehicle servicing areas where spillage is frequent and severe. Areas to be sealed can normally be categorized as (1) critical, (2) semi-critical, and (3) non-critical.

1. Critical areas to be sealed with jet blast resistant materials include 305 m of pavement at the approach end of jet runway, the holding area connecting taxiway and runway where the jets are at rest or move slowly and intermittently, simulated aircraft carrier decks within standard runways and portions of aprons where engine run-up for testing is indicated. Specify FS SS-S-200, Type M (machine mixed) fast cure or Type H (hand mixed) retarded cure liquid sealant or compression seals. Specify FS SS-S-200, Type H for small projects. 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 of runways.

2. Semi-critical areas, such as parking aprons and areas subjected to frequent fuel spillage but not jet-aircraft blast and heat shall be sealed with jet fuel resistant material. Specify FS SS-S-1614 or compression seals.

3. Non-critical areas where neither blast and heat nor fuel spillage occurs, specify FS SS-S-1401 single component cold-applied silicone, or compression seals.

The proposed operations of the station should be carefully studied prior to selecting joint filler materials, compression seals, and liquid joint

**sealants in order to identify the appropriate seals.**

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

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

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

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

2.1.3.4 Single Component Cold-Applied Silicone

Silicone sealant shall be self-leveling, non-acid curing, and meet the following requirements. Material shall comply with definitions given in UNI 9610 and property requirements and testing as per UNI EN 26927.

<u>TEST</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
Weight Loss	UNI EN ISO 10563 Modified (See Note 1)	10 percent max.
Flow	ASTM C 639 (Type I)	Smooth and level
Extrusion Rate	UNI EN 28394	30 sec. max.
Tack Free Time	ASTM C 679	5 hours max.
Hardness (Shore 00) (See Note 2)	ASTM C 661	30 - 80
Tensile Stress at 150 Percent Elongation (See Note 2)	UNI EN 28339 and UNI EN 28339/A1(Die C)	207 kPa
Percent Elongation (See Note 2)	UNI EN 28339and UNI EN 28339/A1(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 Resistant	FS SS-S-200	Pass
Adhesion/Cohesion at Variabgel Temperature:	UNI EN ISO 9047	no cohesion or adhesion failure after two week cycle
Tensile Stress at Long Time:	UNI WN 28340	no cohesion or adhesion failure after 24 hours testing

TEST

TEST METHOD

REQUIREMENTS

NOTES:

1. Percent weight loss of wet (uncured) sample after placing in forced-draft oven maintained at 70 degrees at  $\pm 2$  degrees C for two hours.
2. Specimen cured 21 days at 23 degrees  $\pm 2$  degrees C and 50 percent.

ACCELERATED WEATHERING FACTORY TEST REPORT. For 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.

2.1.3.5 Primers

Select concrete primer recommended by manufacturer of proposed liquid joint sealant.

2.1.3.6 Preformed Compression Seals

ASTM D 2628. ASTM D 2835, for lubricant.

2.1.4 Mooring Eyes

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**NOTE: Specify mooring eyes for aircraft aprons or hangars floors if required in the contract, and include "Mooring Eye Details" (MIL-HDBK 1021/4) on the contract drawings.**  
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Plain bars conforming to UNI ISO 10065, as indicated. Welding shall conform to IIS and UNI 11001. [Mooring eyes shall be hot-dip galvanized in accordance with UNI 10622 after fabrication.]

2.1.5 Dowel Bars

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**NOTE: Use dowel bars and assemblies, and tie bars in airfield pavements where permitted by MIL-HDBK 1021/4. For roads, consult the appropriate state highway design manuals.**  
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Bars shall conform to UNI ISO 10065 for plain billet-steel bars of size and length indicated. Remove burrs and projections from bars. Coat sliding portion of each bar with shop applied paint conforming to FS TT-P-664. For doweled expansion joints, fit outer end of sliding portion of each dowel with a tight-fitting metal sleeve which conforms to manufacturer's recommendation for dowel bars.

2.1.6 Coated Dowel Bars

Bars shall conform to UNI ISO 10065 for plain billet-steel bars of the size and length indicated. Remove burrs or projections from dowel bars. Coating system shall conform to FS L-C-530, Type 2. Coat bars with a double coat system or an epoxy coating system for resistance to penetration of oil and salt solutions. Systems shall be in accordance with manufacturer's recommendation for coatings which are not bondable to concrete. Bond coating to dowel bar to resist laps or folds during movement of joint. Coating thickness shall be 0.18 mm minimum and 0.50 mm maximum. For doweled expansion joints, fit the outer end of sliding portion of each dowel with a tight fitting metal sleeve which conforms to manufacturer's recommendation for dowel bars.

#### 2.1.7 Dowel Assemblies

Support dowels with steel baskets or dowel assemblies. Supports shall conform to manufacturers recommendations for rigid welded dowel assemblies, heavy duty type. Weld spacer wires parallel to dowels and weld alternate ends of dowels to sides of assembly. At expansion joints, fit dowels with bar tubes or U-shaped channel caps. Sliding surfaces shall be parallel with longitudinal axis of pavement within a tolerance of 3 mm per 3 m. Sliding end of assembly crossing joint shall alternate on each side of joint for all dowels in each joint.

#### 2.1.8 Tie Bars

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**NOTE: Use tie bars in airfield pavements where permitted by MIL-HDBK 1021/4. For roads, consult the appropriate state highway design manuals.**  
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Bars shall be billet or axle steel deformed bars and conform to UNI ISO 10065 and UNI 10622. [Epoxy coated in accordance with ASTM A 775/A 775M.] [Tie bars shall be hot-dip galvanized in accordance with D.M. 09/01/1996.]

#### 2.1.9 Reinforcement for Slabs

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**NOTE: For projects which require welded steel wire fabric, bar mats, or other type of reinforcement, specify type, grade, and quality of reinforcement.**  
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Welded steel wire fabric and welded deformed steel wire fabric shall conform to UNI 8926 and UNI 10622. Deformed steel bar mats shall conform to UNI ENV 10080. Bar reinforcement shall conform to UNI ISO 10065. Welded wire fabric shall be furnished in flat sheets only.

### PART 3 EXECUTION

#### 3.1 PREPARATION OF SEALANTS

All sealants shall be prepared and applied following manufacturer's

technical instructions, unless otherwise specified here-in.

#### 3.1.1 Liquid Sealants

Prior to use, inspect liquid joint seal to ensure product has not become damaged during shipping and storage, material is of proper lot number and has not reached its shelf life retest date.

#### 3.1.2 Preformed Joint Fillers

Prior to installing inspect preformed joint fillers to ensure they are straight, without damage, and resilient.

#### 3.1.3 Hot-Applied Liquid Sealants

Do not heat sealing materials in excess of the safe heating temperature as shown in manufacturer's instructions. Do not expose sealant to direct heat or flame. Remove and waste sealant which has been over-heated, heated in excess of three hours, or has remained in application equipment at end of day's operation.

### 3.2 JOINTS

Joints shall be type shown and shall form a regular rectangular pattern. Joints shall conform to details shown. Seal joints by procedures indicated. Preformed joint filler installed for expansion joints shall be securely held in position during concreting operations. Wherever curved pavement edges occur, make joints to intersect tangents to curve at right angles. Joints shall be in a continuous straight line extending from edge to edge of pavement. Do not stagger joints in abutting pavements except where shown. Protect joints from curing compounds by covering with tape or rope. Take necessary precautions to ensure proper curing at joints.

#### 3.2.1 Sawing of Joints

Sawing will be conducted when concrete has hardened sufficiently to prevent ravelling or flaking along edges of saw cut and before uncontrolled shrinkage cracking of pavement occurs. Mark alignment of joints by chalk line or other suitable guide. Saw cuts shall not vary from required alignment by more than 13 mm in 3 m. Saw cutting shall be carried on both during the day and at night as required. A supply of saw blades and at least one stand-by sawing unit in working condition will be readily available during sawing operations. Discontinue sawing if a crack develops ahead of a saw cut. If uncontrolled cracking has occurred do not saw cut along the cracks but notify the Contracting Officer immediately. Joint cutter machine shall comply with UNI EN 500-5 as far as safety requirements are concerned.

#### 3.2.2 Protection of Joints

Immediately after each joint is sawed, thoroughly clean saw cut and adjacent concrete surface by flushing with water and blowing with compressed air to remove waste. Respray curing compound on surfaces affected by sawing and cleaning operations but do not permit curing

compound into joints. Protect joints from intrusion of foreign materials by installation of blocking media or separating tape as indicated. Do not seal joints until concrete has cured sufficiently as required by joint sealant manufacturer's instructions.

### 3.2.3 Preformed Compression Seals

Install preformed compression seals in a straight line and plumbed vertically in accordance with manufacturers requirements.

### 3.2.4 Joints at Vertical Surfaces

Construct joints where slabs abut light pads, catch basins, manholes, footings, walls, columns, and structures as expansion joints, 19 mm wide and full depth or thickness of slab. Provide joints with preformed joint filler and joint sealant and form the joints by placing joint filler against the adjacent structure. Keep filler in place with stakes or other approved means until concrete is placed against filler. Fit abutting sections or ends of filler material tightly together to prevent concrete from entering expansion joint space.

### 3.2.5 Expansion Joints

Expansion joints shall have dimensions and spacing shown, and be filled with preformed joint filler and sealant. Hold filler in place accurately and securely during the placing and finishing of concrete. Use metal supports to support filler and protect material from damage during concrete operations. A bulkhead, when used, shall have sufficient strength to remain straight from edge to edge of slab when concrete is placed against it. Stake bulkhead in place securely at right angles to longitudinal or transverse axis and surfaces of concrete slab. Space and drive flat metal stakes to hold filler firmly in position. Deposit concrete and compact and strike off before bulkhead is removed. Do not remove stakes until the concrete has been finished. Under no circumstances shall concrete be left above expansion material or across joint at any point. Cut away carefully concrete spanning ends of the joint next to forms after forms are removed. Fit abutting sections of joint filler material tightly together to prevent concrete from entering expansion joint space.

### 3.2.6 Contraction Joints

Saw joints to dimensions indicated. Joint lines shall be within specified tolerance, straight, and extend for width of transverse joint, and for entire length of longitudinal joint.

### 3.2.7 Construction Joints

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**NOTE: Show detail of keyed joints, butt joints, and doweled construction joints on the drawings. For detail see MIL-HDBK 1021/4, Rigid Pavement Design For Airfields.**  
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[3.2.7.1 Butt Type Joints

Provide butt type joints as indicated by placing fresh concrete against hardened concrete. Clean vertical surface of hardened concrete and then coat with curing compound or asphalt emulsion bond breaker before concrete is placed. After concrete has cured, saw joint line in accordance with procedures specified for sawing joints and to dimensions shown.

]3.2.7.2 Emergency Stops

If an emergency stop occurs remove the concrete back to indicated location of transverse joint and install a dowelled construction joint as shown.

[3.2.7.3 Keyed Joints

Locate keyways as indicated. When concrete is placed using side or stationary forms, use plastic or metal forms securely fastened to concrete form to form keyway in plastic concrete. When concrete is placed using slip-form pavers, form the keyway by metal forms permanently attached to side forms or during slip-form operation by inserting preformed metal or plastic keyway liners which may be left in place.

] [3.2.7.4 Doweled Construction Joints

Refer to paragraph entitled "Dowel Assemblies".

]3.2.8 Preparation of Joints

Seal joints unless otherwise indicated. Immediately before installation of sealant, thoroughly clean joints until laitance, curing compound, preformed joint filler, and protrusions of hardened concrete are removed from sides and upper edges of joint space.

3.2.8.1 Cleaning of Sawed Joints

Use a power-driven concrete saw in accordance with UNI EN 500-5 to saw through preformed joint filler and to widen joint to indicated dimensions. Blow loosened materials from joint with compressed air. Clean exposed concrete joint faces and pavement surfaces extending at least 25 mm from edges of joints by thoroughly sandblasting and air blowing until surfaces are free of dust, dirt, curing compound, preformed joint filler, and other material that might prevent bonding of sealer to concrete.

3.2.9 Disposal of Debris

Remove from joints and pavement surface saw cuttings, excess joint material, dirt, water, sand, and other debris. Dispose of the debris immediately in accordance with Section 02220, "Site Demolition."

3.3 INSTALLATION

\*\*\*\*\*

**NOTE: Specify factory representatives for projects with more than 3000 meters of sealed joints.**

\*\*\*\*\*  
Joint preparation, primer and sealant shall be in accordance with joint seal manufacturer's instructions. Install a test section of 150 m at start of 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 test section.] Test section shall meet contract requirements. Contracting Officer shall be notified upon completion of test section.

3.3.1 Bond Breakers

Immediately after joints receive final cleaning, install specified bond breaker in the bottom of joint reservoir to prevent foreign objects or debris from entering joint.

3.3.2 Bonding Agents and Primer

Apply joint seal bonding agents and primer in accordance with joint seal manufacturer's instructions. When primed joint becomes dusty or otherwise contaminated prior to sealing, re-sandblast, air blow, and re-prime joint.

3.3.3 Installation of Liquid Sealants

Do not install liquid joint seals until test section has been inspected and approved by Contracting Officer. Joints shall be dry and free of debris and contaminants prior to placement of sealant. Fill joints to depths and tolerances indicated without formation of voids or entrapped air. Remove excess or spilled sealant from pavement and discard.

3.3.4 Installation of Preformed Compression Seal

Install preformed compression seals in accordance with manufacturer's instructions to dimensions and tolerances indicated. Seal shall be plumb and shall not be stretched or twisted during installation.

3.3.5 Setting Mooring Eyes

\*\*\*\*\*  
**NOTE: When mooring eyes are required in the contract, indicate on the drawings the location of the mooring eyes. Also show a detail of the mooring eye. For detail see MIL-HDBK 1021/4.**  
\*\*\*\*\*

Set mooring eyes accurately, plumb, square, and flush, within a tolerance of 13 mm below top of slab. Depressions may be formed or troweled to required shape. Finish depressions to neat true uniform surfaces.

3.3.6 Dowel Bars

\*\*\*\*\*  
**NOTE: For projects which require dowel bars or coated dowel bars, show location, size, and tolerances on the drawings.**

\*\*\*\*\*

Install bars accurately aligned, vertically and horizontally, at indicated locations and to dimensions and tolerances indicated. Before installation thoroughly grease sliding portion of each dowel. Dowels must remain in position during concrete placement and curing.

### 3.3.7 Coated Dowel Bars

Install bars, accurately aligned vertically and horizontally, at indicated locations and to dimensions and tolerances indicated. Reject coatings which are perforated, cracked or otherwise damaged. While handling avoid scuffing or gouging of coatings.

### 3.3.8 Dowel Assemblies

\*\*\*\*\*

**NOTE:** If dowels are required in the contract, the method of dowel support, such as steel baskets, dowel or basket assemblies, rigid chair supports, or load-transfer devices should be indicated for the required type of joints for reinforced or unreinforced concrete. Alignment is critical so as to prevent binding and spalling. Delete the third sentence if reinforced concrete is not required.

\*\*\*\*\*

Dowels for transverse contraction joints shall be installed in unreinforced concrete by presetting in steel baskets. At transverse expansion joints set dowels with dowel assemblies. [In reinforced concrete, set dowels at joints with steel baskets, unless approved otherwise.] [Dowels in longitudinal construction joints must be drilled and grouted with an approved grout.] Before construction commences method for installing dowel bars shall be approved.

### 3.3.9 Tie Bars

\*\*\*\*\*

**NOTE:** When tie bars are required in the contract, indicate location on drawings. Show bar size and spacing required and method of support.

\*\*\*\*\*

Install bars, accurately aligned horizontally and vertically, at indicated locations. [For slipform construction, insert bent tie bars by hand or other approved means.]

### 3.3.10 Setting Slab Reinforcement

\*\*\*\*\*

**NOTE:** For contracts which require reinforcing steel, specify the type, size and material of reinforcement. Edit paragraph to specify method of placement as appropriate for thickness of the

**concrete.**

\*\*\*\*\*

Type and amount of steel reinforcement shall be as shown. For pavement thickness of 300 mm or more, install reinforcement steel by strike-off method wherein concrete is deposited on underlying material, consolidated and struck to indicated elevation of steel reinforcement. Place reinforcement on prestruck surface, then place remaining concrete and finish in required manner. If second lift causes steel to be displaced horizontally from its original position, increase thickness of first lift and depress reinforcement into plastic concrete to required elevation. Increase in thickness shall be only as necessary to permit correct horizontal alignment to be maintained. Remove and replace portions of bottom layer of concrete that have been placed more than 30 minutes without being covered with top layer. Wire mesh reinforcement may be placed with mechanical mesh placers and vibrated into place. For pavements less than 300 mm thick, reinforcement may be positioned on suitable chairs prior to concrete placement or reinforcement steel may be depressed into plastic concrete to the required elevation after concrete has been spread. At expansion, contraction and construction joints, place reinforcement as indicated. Reinforcement, when placed in concrete, shall be free of mud, oil, scale or other foreign materials. Place reinforcement accurately and wire securely. Laps at splices shall be 300 mm minimum and distances from ends and sides of slabs and joints shall be as indicated.

3.4 FIELD QUALITY CONTROL

3.4.1 Joints

Joints which have been cleaned and have backer rods or bond breaking tape installed shall be inspected and approved prior to sealing.

3.4.2 Joint Seal Test Section

Inspect joint seal test section [with the joint seal manufacturer's representative.] [Joint seal manufacturer's representative shall provide written notice of any 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 additional joint seal.

3.4.3 Joint Sealer

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

3.4.4 Reinforcement

Inspect reinforcement prior to installation to assure it is free of loose flaky rust, loose scale, oil, mud, or other objectionable material.

3.4.5 Dowels

Inspect dowel placement prior to placing concrete to assure that dowels are of size indicated, and are spaced, aligned and painted and oiled as specified. Dowels shall not deviate from vertical or horizontal alignment after concrete has been placed by more than 3 mm per 300 mm.

#### 3.4.6 Reinforcement and Dowel Testing

Steel reinforcement and dowels shall be tested on field in accordance with LAW 1086 and D.M. 09/01/1996, UNI 5294 and UNI CNR 10020. Strength tests shall always be carried out by a laboratory officially authorized by the Italian Ministry of Public Works. Sample collection on field for external laboratory shall be carried out under direction of the Contracting Officer, without prior notification to the Contractor. Also, as for as testing on factory in compliance with D.M. 09/01/1996 is concerned, manufacturer shall periodically test mechanical properties and chemical composition of steel production through both an in-house laboratory and an external laboratory officially authorized by the Italian Public Work Ministry. At least two tests per years shall be carried out by the external laboratory, that will collect sample on factory without prior notification to the manufacturer. Steel supplier or manufacturer shall provide certification by the official laboratory of the most recent test for mechanical properties and chemical composition.

#### 3.5 ACCEPTANCE

Joint sealer that fails to cure properly, or fails to bond to joint walls, or reverts to uncured state or fails in cohesion, or shows excessive air voids, blisters, surface defects, swelling, or other deficiencies, or is not recessed within indicated tolerances shall be rejected. Remove rejected sealer and reclean and reseal joints in accordance with the specifications.

-- End of Section --