

## SECTION 03152

# CONCRETE JOINT CONTROL

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Joint Filler and Joint Sealer
- B. Waterstops

#### 1.2 REFERENCES

- A. AASHTO M 148: Liquid Membrane-Forming Compounds for Curing Concrete.
- B. AASHTO M 153: Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- C. AASHTO M 213: Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- D. AASHTO T 132: Tensile Strength of Hydraulic Cement Mortars.
- E. AASHTO Standard Specifications for Highway Bridges.
- F. ASTM C 509: Elastomeric Cellular Preformed Gasket and Sealing Material.
- G. ASTM C 719: Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
- H. ASTM D 412: Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
- I. ASTM D 794: Determining Permanent Effect of Heat on Plastics.
- J. ASTM D 1084: Viscosity of Adhesives.
- K. ASTM D 1621: Compressive Properties of Rigid Cellular Plastics.
- L. ASTM D 1622: Apparent Density of Rigid Cellular Plastics.

- M. ASTM D 1623: Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- N. ASTM D 2240: Rubber Property-Durometer Hardness.
- O. ASTM D 2628: Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
- P. ASTM D 5329: Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt and Portland Cement Concrete Pavements.
- Q. ASTM D 6690: Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- R. Federal Specification TT-S-00230.
- S. Military Specification 8802.

### **1.3 SUBMITTALS**

- A. For Silicone Joint Sealer: Furnish manufacturer's certified test results of each lot of the joint sealant material to Engineer, except for the bond to cement mortar test. Certificate must show use of primers, where applicable.

## **PART 2 PRODUCTS**

### **2.1 PREFORMED ELASTOMERIC JOINT SEALANTS**

- A. Preformed elastomeric joint seal material made of vulcanized elastomeric compound using polymerized chloroprene as the only basic elastomer.
- B. Engineer approves the shape of any joint sealer prior to submission of the individual production lot.
- C. Department evaluation requirements for any joint seal geometry are:
  - 1. Overall width of sealer: 7/16 inch minimum.
  - 2. Overall depth of sealer: maximum of 1 inch when compressed to 7/32 inch.
  - 3. Materials Physical Property: Conform to ASTM D 2628.

4. Maintain the force-deflection requirements in Table 1.

**Table 1**

<b>Deflection Condition</b>	<b>Force Requirement</b>
Seal compressed to 3/8 inch width	2 lb/inch minimum
Seal compressed to 7/32 inch width	12 lbs/inch maximum

5. Heat-age the specimens used for determining the original force-deflection relationship in an oven for 70 hours at 212 degrees F. under 50 percent deflection.
6. Subject the specimens to another force-deflection test after heat-aging and comply with the requirements in Table 2.

**Table 2**

<b>Deflection Condition</b>	<b>Force Requirement</b>
Seal compressed to 3/8 inch width	1 lb/inch minimum
Seal compressed to 7/32 inch width	12 lbs/inch maximum

- D. Use a one-component, polychloroprene, lubricant adhesive containing only soluble phenolic resins blended with anti-oxidants and acid acceptors in an aromatic hydrocarbon solvent mixture with the following properties:
1. Average net weight 7.8 lbs/gallon  $\pm$  5 percent.
  2. Solids content by weight of 25 lbs  $\pm$  3 percent. Meet ASTM D 1084.
  3. Suitable viscosity for use with installation equipment.
  4. Film strength of 2,300 psi minimum tensile strength and 750 minimum percent elongation before breaking. Meet ASTM D 412.
  5. Manufactured within 9 months of use.
  6. Deliver in containers plainly marked with the manufacturer's name or trade mark, lot number, date of manufacture. Send manufacturer's certification of specification compliance.
- E. Department may sample and test materials after delivery to the project site.

## **2.2 HOT-POURED JOINT SEALANT**

- A. As specified for general requirements, physical properties, packing, marking, and sampling. Meet ASTM D 6690 Type II.
- B. Test physical requirements as specified in ASTM D 5329.

### **2.3    PREMOLDED JOINT FILLERS**

- A.    As specified.
- B.    Meet AASHTO M 153 and AASHTO M 213.

### **2.4    SILICONE JOINT SEALER**

- A.    Select and use a prequalified sealant from the Approved Products List, available from the Department.
- B.    Silicone joint sealer and special category for self-leveling: Both made of low-modulus silicone specifically formulated to seal Portland Cement Concrete Pavement joints.
- C.    Furnish in a one-part, non-acid curing formulation.
- D.    Meet the following physical requirements:
  - 1.    Refer to the plan details.
  - 2.    Backer rod compatible with the sealant and all components of the joint sealant system. Meet the requirements for Backer Rod.
  - 3.    Prevent any bond or adverse reaction from occurring between the backup materials and the sealant.
- E.    Meet the test requirements in Tables 3 and 4.

**Table 3**

<b>Test Requirements (Silicone Joint Sealer) and Test Methods</b>		
Tensile Stress; 150 percent max elongation, 7-day cure at 77 ± 3 degrees F. And 45-55 percent relative humidity (rh).	45 psi	ASTM D 412 (DIE C)
Flow	0.3 inch maximum	MIL S 8802
Extrusion Rate 100 degrees to 0 degrees F.	0.2 - 0.6 lbs/min	MIL S 8802
Tack-Free Time		MIL S 8802
Specific Gravity	1.01 - 1.515	ASTM D 794 Method A
Durometer Hardness, shore A: cured 7 days at 77 ±3 degrees F and 45-55 percent relative humidity (rh).	10-25 (0 degrees F)	ASTM D 2240
Shelf life	6 month minimum from date of shipment from plant or point of manufacture.	
Ozone and Ultraviolet (UV) Resistance	No chalking, cracking, or bond loss after 5000 hours	
Bond to concrete mortar concrete briquette air cured 14 days 77 ±3 degrees F.	50 psi minimum	
Movement capability and adhesion. Magnitude of cycles movement shall be appropriate for sealant category, cure 7 days in air 77 ±3 degrees F then 7 days in water 77 ±3 degrees F.	+100 percent and -50 percent of joint width. No more than 0.5 square inches (adhesive or cohesive) failure in the 3 specimens combined after 10 cycles.	

**Table 4**

<b>Test Requirements for Self-Leveling (Silicone Joint Sealer) and Test Methods</b>		
Flow, sag, or slump	Self-leveling	
Extrusion Rate	6-12 lbs/min.	MIL S 8802
Elongation, percent minimum	800 at 21 days	ASTM D 412 DIE C, Mod.
Modulus at 150 percent elongation	30 psi maximum after 21 days	
Adhesion +0 Concrete (minimum percent elongation)	+600 after 21 days	ASTM D 3583 (Sect. 14, Mod.)
Accelerated Weathering	No chalking, cracking, or bond loss after 5000 hours	
Shelf Life	6 month min. from date of shipment from plant or point of manufacture.	
Durometer Hardness, Shore OO: cured 14 days at 77 ±3 degrees F and 45-55 percent, rh	20-80 (0 degrees F)	ASTM D 2240
Movement capability and adhesion. Magnitude of cycles movement shall be appropriate for sealant category, cure 14 days in air 77 ±3 degrees F, and then 7 days in water 77 ±3 degrees F	+100 percent and -50 percent of joint width. No more than 0.5 square inches (adhesive or cohesive) failure in the 3 specimens combined after 10 cycles.	

- F. Department determines the bond to concrete mortar with the following test:
1. Test as specified in AASHTO T 132.
  2. Briquettes molded as specified, sawed in half, and bonded with a thin section of sealant.
  3. Briquettes dried to a constant weight in oven at 100 ± 5 degrees F.
- G. Department uses the following test following ASTM C 719 for movement capability and adhesion:
1. Prepare 1 inch by 1 inch by 3 inch concrete blocks as specified.
  2. Use a sawed face for the bond surface.

3. Seal 2 inches of block, leaving 1/2 inch on each end of specimen unsealed.
  4. Dimension the sealant to a 3/8 inch depth and a 1/2 inch width.
  5. Subject sealant to movement as specified.
  6. Magnitude of the movement must meet each specific category, and the rate of extension or compression must be 1/8 inch per hour.
- H. Take one or more random samples (minimum of 2 quarts per sample) of each lot and seal in airtight containers.
1. Notify Engineer when stockpiles located at either the job site or the vendor's place of business are ready to be sampled.
    - a. Establish job site stockpiles at least 30 working days prior to use.
    - b. Establish vendor's place of business stockpiles 40 working days prior to use.
  2. The Department may take samples at the sealant manufacturing plant at least 30 days before shipment to the job site.
  3. Laboratory testing may take 30 working days after submitting samples.
- I. Do not place any materials until testing is completed and materials are approved by Engineer.
- J. Sealant must be delivered in the manufacturer's original sealed container, displaying the lot number, expiration date of the shelf-life warranty, and the sealer trade name.
- K. Submit Certificate of Compliance to the Engineer when the sealant is delivered to the job site. Certificate must include:
1. Verification of test results
  2. Manufacturer's name
  3. Lot number
  4. Expiration date of the shelf-life warranty
  5. Sealer trade name
  6. Project destination
  7. Representative sealant

## 2.5 BACKER ROD

- A. Use closed-cell, polyethylene-foam rods conforming to the requirements in Table 5.

**Table 5**

<b>Backer Rod Requirements and Test Methods</b>		
Diameter	Joint width + 1/8 inch	
Density	2 lbs/ft <sup>3</sup>	ASTM D 1622
Tensile Strength	25 psi	ASTM D 1623
Absorption	0.5 percent by volume	ASTM C 509
Compression Deflection	25 percent at 8 psi	ASTM D 1621

## 2.6 JOINT SEALER (STRUCTURES)

- A. Cold-applied, gun-grade, single-component, polyurethane base material that cures under field condition to form a rubber-like, non-sag, elastomeric joint seal, as specified in Federal Specifications TT-S-00230 C. Type II, Class A.
- B. Use material that bonds tightly to the sides of the concrete groove and exhibits the physical properties in Table 6 when cured and tested after 21 days at 73 degrees F.

**Table 6**

<b>Physical Properties of Joint Sealer (Structures) and Test Methods</b>		
Modulus of Elasticity at 100 percent Elongation	132 psi	ASTM D 412
Hardness (Shore A)	40 ± 5	
Elongation (at break)	700 percent	ASTM D 412
Recovery	Greater than 90 percent	
Tensile Strength	190 psi	ASTM D 412
Adhesive in Peel	20 lbs/inch	TT-S00230 C Type II, Class A
Service Range	-40 degree F to 150 degree F	TT-S-00230 C
Initial Cure, Tack Free (Depending on Temperature and Humidity)	6 to 8 hours	
Final Cure	5 to 8 days	
Staining Characteristics	Nonstaining	
Color	Gray	

**2.7 WATERSTOPS**

- A. Provide waterstops as specified.
- B. Meet AASHTO Standard Specifications for Highway Bridges, Division II, Subsection 8.9.2.6.

**PART 3 EXECUTION** Not Used.

END OF SECTION

**Change One**  
**Revised August 29, 2002**  
**Articles Revised**  
**1.2 P, Q**  
**2.2 A, B**