

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 3569: Standard Specification for Joint Sealant, Hot-Applied, Elastomeric, Jet-Fuel-Resistant-Type for Portland Cement Concrete Pavements
- Q. ASTM D 5329: Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt and Portland Cement Concrete Pavements
- R. ASTM D 6690: Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
- S. Federal Specifications
- T. Military Specifications

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

| Deflection Condition | Force Requirement |
|------------------------------------|---------------------|
| 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

| Deflection Condition | Force Requirement |
|------------------------------------|---------------------|
| 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 percent minimum 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

| Test Requirements (Silicone Joint Sealer) and Test Methods | | |
|--|---|---------------------|
| 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

| Test Requirements for Self-Leveling (Silicone Joint Sealer) and Test Methods | | |
|---|---|---------------------------|
| 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 | |
| Tensile Adhesion +0 Concrete (minimum percent elongation) | +600 after 21 days | ASTM D 3569 |
| Accelerated Weathering | No chalking, cracking, or bond loss after 5000 hours | |
| Shelf Life | Six 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 three 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 the 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

| Backer Rod Requirements and Test Methods | | |
|---|------------------------|-------------|
| Diameter | Joint width + 1/8 inch | |
| Density | 2 lbs/ft ³ | 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

| Physical Properties of Joint Sealer (Structures) and Test Methods | | |
|--|---------------------------------|---------------------------------|
| 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