

PREFORMED BRIDGE JOINT SEAL

Effective: December 21, 2016

Revised: March 1, 2019

Description. This work shall consist of furnishing all labor, equipment and materials necessary to prepare the joint opening and install preformed bridge joint seal(s) at the locations specified. Unless otherwise detailed on the plans or specified herein, the maximum rated movement for this joint type is 4 inches (100 mm).

Materials: Unless otherwise specified, one of the following prefabricated joint seals will be permitted.

- (a) Preformed Pre-compressed, Silicone Coated, Self-Expanding Sealant System. This Sealant system shall be comprised of three components: 1) cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated with highway-grade, fuel resistant silicone; 2) field-applied epoxy adhesive primer, 3) field-injected silicone sealant bands.

The preformed, pre-compressed silicone joint seal shall, as a minimum, be according to the following:

- The joint seal shall be held in place by a non-sag, high modulus silicone adhesive.
- The joint seal shall be compatible with the epoxy and header material.
- The joint seal shall withstand the effects of vertical and lateral movements, skew movements and rotational movement without adhesive or cohesive failure.
- The joint seal shall be designed so that, the material is capable of movement of +50%, -50% (100% total) of nominal material size. The joint seal shall be one continuous gland in length and width.
- Changes in plane and direction shall be executed using factory fabricated transition assemblies fabricated to the angle(s) specified on the plans. The transitions shall be watertight at the inside and outside corners through the full movement of the product.
- The depth of the joint shall be recessed 3/4 in. (19 mm) below the riding surface throughout the normal limits of joint movement.
- The joint seal shall be resistant to ultraviolet rays.
- The joint seal shall be resistant to abrasion, oxidation, oils, gasoline, salt, and other materials that may be spilled on or applied to the surface.
- The manufacturer shall certify that the joint composition shall be free of any waxes or wax compounds; asphalts or asphalt compounds.

The joint material shall meet the following physical properties:

| Property | Requirement | Test Method |
|--|-------------------------------|--------------------|
| Tensile Strength of Silicone Coating (min) | 140 psi | ASTM D 412 |
| UV Resistance of Joint System | No Changes--2000 Hours | ASTM G155-00A |
| Density of Cellular Polyurethane Foam (Unconfined) | 4.0 lb/ cu ft (200kg/cu m) | ASTM D545 |
| Heat Aging Effects (Silicone Coating) | No cracking, chalking | ASTM C 792 |
| Joint System Operating temp range (min) | -40° F to 185° F | ASTM C 711 |

The adhesive shall be a two-component, 100% solid, modified epoxy meeting the requirements of ASTM C881, Type I, Grade 3, Class B & C. The adhesive shall also have the following properties:

| Property | Requirement | Test method |
|--------------------------|-------------------------|--------------------|
| Tensile Strength | 2,500 psi (24 MPa) min. | ASTM D638 |
| Compressive Strength | 7000 psi (48 MPa) min. | ASTM D695 |
| Bond Strength (Dry Cure) | 2000 psi (28MPa) min | ASTM C882 |
| Water Absorption | 0.1% by weight | ASTM D570 |

The silicone band adhesive shall have the following properties:

| Property | Requirement | Test Method |
|-------------------------|---|--------------------|
| Movement Capability | +50/-50% | ASTM C 719 |
| Elongation at Break | >600% | ASTM D 5893 |
| Slump | ≤=0.3" | ASTM D 2202 |
| Hardness (Shore A) max. | 20 | ASTM C 661 |
| Tack free time (max) | 60 minutes | ASTM C 679 |
| Heat Aging Effects | No cracking, chalking | ASTM C 792 |
| Resilience | ≥ 75% | ASTM D5329 |
| Bond | 0% Adhesive or Cohesive Failure after 5 cycles @100%extension | ASTM D 5329 |

(b) Preformed Silicone Joint Seal. The preformed silicone joint seal used for this item shall conform to the following specifications:

**Table 1
Physical Properties of Preformed Silicone Gland**

| Property | Requirement | Test Method |
|----------------------------------|---------------------------|--------------------|
| Rated Movement Capability | +2 ¼ inch total | N/A |
| Tensile Strength, psi. | 1000 min | ASTM D 412 |
| Elongation | 400% min | ASTM D 412 |
| Tear (die B) | 100 ppi. min | ASTM D 624 |
| Hardness Durometer (Shore A). | 55 +/- 5 max | ASTM D 2240 |
| Compression set at 212°F, 70 hrs | 30% max | ASTM D 395 |
| Heat Aged Properties | 5pt max loss on Durometer | ASTM D 573 |
| Tensile and Elongation % Loss | 10 % max | |

The color of the preformed silicone seal shall be black, made by the addition of Carbon Black fillers which increases UV resistance, tensile strength, and abrasion wear properties.

The locking adhesive shall be non-sag, high modulus silicone adhesive conforming to the following specifications:

Table 2
Physical Properties of the Silicone Locking Adhesive

| Property | Requirement | Test Method |
|--------------------------|---------------------------------------|--------------------|
| Tensile Strength, psi. | 200 min | ASTM D 412 |
| Elongation, % | 450 min | ASTM D 412 |
| Tack Free Time, minutes. | 20 max. | ASTM C 679 |
| Cure Time ¼" bead, hrs | 24 max | ASTM C 679 |
| Resistance to U.V. | No cracking, chalking, or degradation | ASTM C793 |
| VOC (g/L) | 0 | ASTM D 3960 |

Any rips, tears, or bond failure will be cause for rejection.

The two part epoxy primer shall be supplied for application to the vertical faces of the joint opening. The supplied primer shall be equally as effective when bonded to concrete or steel. This primer shall meet the following criteria:

Table 3
Physical Properties of Preformed Silicone Joint System Primer

| Property | Requirement | Test Method |
|----------------------------------|--------------------|---------------------------------------|
| Viscosity (cps) | 44 | ASTM D 2196 |
| Color | Light Amber | Visual |
| Solids (%) | 41 | ASTM D 4209 |
| Specific Gravity | 0.92 | ASTM D 1217 |
| Product Flash Point (°F, T.C.C.) | 48 | ASTM D 56 |
| Package Stability | N/A | One year in tightly sealed containers |
| Cleaning | N/A | Mineral Spirits |
| VOC (g/L) | 520 | ASTM D 3960 |

- (a) Preformed Inverted EPDM Joint Seal. The preformed inverted EPDM joint seal used for this item shall conform to the following specifications:

**Table 1
Physical Properties of Preformed Silicone Gland**

| Property | Requirement | Test Method |
|----------------------------------|--------------------|--------------------|
| Rated Movement Capability | Up To 5 inch total | N/A |
| Tensile Strength, psi. | 1200 psi min | ASTM D 412 |
| Elongation | 400 % min | ASTM D 412 |
| Tear (Die C) | 150 pli. min | ASTM D 624 |
| Durometer Content | 50 +/- 5 max | ASTM D 2240 |
| Water Resistance (70 hrs @ 100c) | 10% max | ASTM D 471 |
| Ozone Resistance | 100 min | ASTM D 1171 |
| Color | Black | Visual |

**Table 2
Physical Properties of the V-Epoxy-R**

V-Epoxy-R adhesive meets the requirements of ASTM C881 Type III, Grade 2. The adhesive shall also have the following properties:

| Property | Requirement | Test Method |
|---|---------------------------------------|--------------------|
| Color | Gray | Visual |
| Viscosity | 45,000 CP (typ.) | N/A |
| Gel Time (minutes) | 30 min. | ASTM C 881 |
| Shelf Life (Separate Sealed Containers) | 12 Months | N/A |
| Resistance to U.V. | No cracking, chalking, or degradation | ASTM C793 |
| VOC (g/L) | 0 | ASTM D 3960 |

Any rips, tears, or bond failure will be cause for rejection.

(d) Bonded Preformed Joint Seal. This joint system shall consist of preformed elastomeric seal bonded to the side walls of the joint opening using an adhesive as specified by the Manufacturer of the joint seal.

The bonded preformed joint seal shall be according to Table 1 of ASTM D2628 with the following exceptions: Compression set shall not be over 40 percent when tested according to Method B (Modified) of ASTM D 395 after 70 hours at 212 °F (100 °C). The Compression-Deflection requirement will not apply to the bonded preformed joint seal.

The adhesive shall be epoxy base, dual component, which resists salt, diluted acids, alkalis, solvents, greases, oils, moisture, sunlight and weathering. Temperatures up to 200 °F (93 °C) shall not reduce bond strength. At 68 °F (20 °C), the bond strength shall be a minimum of 1000 psi (6.9 MPa) within 24 hours.

Any primers or cleaning solutions used on the faces of the joint or on the profile of the sides of the bonded preformed joint seal shall be supplied by the manufacturer of the bonded preformed joint seal.

Any additional installation materials and adhesive for splicing joint sections shall be as supplied by the manufacturer of the preformed joint seal.

The Contractor shall submit the Manufacturer's material certification documentation stating that their materials meet the applicable requirements of this specification for the joint seal(s) installed.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall furnish the Engineer with the manufacturer's product information and installation procedures at least two weeks prior to installation.

The minimum ambient air temperature in which the joint seal can be installed is 40° F (4.4° C) and rising, except for bonded preformed joint seals which shall not be installed when temperatures below 50 °F (10 °C) are predicted within a 48 hour period.

The joint surface shall be completely dry before installing the Joint Seal. For newly placed concrete, the concrete shall be fully cured and allowed to dry out a minimum of seven additional days prior to placement of the seal. Cold, wet, inclement weather will require an extended drying time.

The Joint Seal shall not be installed immediately after precipitation or if precipitation is forecasted for the day. Joint preparation and installation of Joint Seal shall be done during the same day.

Surface Preparation. Surface preparation shall be according to the joint seal manufacturer's written instructions.

After surface preparation is completed, the joint shall be cleaned of debris using compressed air with a minimum pressure of 90 psi (620 kPa). The air compressor shall be equipped with traps to prevent the inclusion of water and/or oil in the air line. The compressed air shall be according to the cleanliness requirements of ASTM D 4285.

When priming is required per the manufacturer's instruction, this operation shall immediately follow cleaning.

Joint Installation. The Joint installation shall be per the manufacturer's instructions; special attention shall be given to insure the joint seal is properly recessed below the top of the riding surface as recommended by the manufacturer.

For bonded joint seals the seal shall be inserted into the joint and held tightly against both sides of the joint until sufficient bond strength has been developed to resist the expected expansion forces.

Opening to traffic. As these joint systems are supposed to be recessed below the top of the riding surface, there should be no restriction, based on the joint seal installation, on when these joints can be reopened to traffic.

Method of Measurement. The installed preformed joint seal will be measured for payment in feet (meters) measured along the centerline of joint, from out to out of the deck, no measurement will be made for joint material used to turn up into the parapet, sidewalk, or median.

Basis of Payment. The preformed bridge joint seal will be paid for at the contract unit price per foot (meter) for PREFORMED JOINT SEAL, of the design movement specified, rounded to the nearest half inch (13 mm).