

914.01

Section 914. JOINT AND WATERPROOFING MATERIALS

914.01. General Requirements. Joint and waterproofing material for use in concrete construction must meet the requirements of this section.

914.02. Testing. Steel joint material testing must be in accordance with ASTM E 8 or ASTM A 370 and the ASTM specifications applicable to the specific material.

Other joint and waterproofing material testing must be in accordance with the specified ASTM, AASHTO or Department methods, as modified by this section.

914.03. Joint Filler for Concrete Construction.

A. **Fiber Joint Filler.** Fiber joint filler for concrete construction must meet the requirements of ASTM D 1751.

Fiber joint filler must not deform or break due to twisting, bending, or handling when exposed to atmospheric conditions.

For concrete pavements, cut fiber joint filler into a rectangular shape and to the widths shown on the plans. Punch holes in the fiber joint filler for load-transfer bars in new concrete pavements as shown on the plans.

B. **Recycled Rubber Joint Filler.** Select recycled rubber joint filler from the Qualified Products List.

For concrete pavements, cut recycled rubber joint filler into a rectangular shape and to the widths shown on the plans. Punch holes in the recycled rubber joint filler for load-transfer bars in new concrete pavements as shown on the plans.

914.04. Joint Sealants for Concrete Construction.

A. **Hot-Poured Joint Sealant.** Hot-poured joint sealant must meet the requirements of ASTM D 6690, for Type II with the following exceptions:

1. Test sealant bond at -20°F for three complete cycles at 100 percent extension.
2. Penetration must be 130 ± 20 dmm at 77°F .
3. Penetration must be at least 40 dmm at 0°F . Prepare and test two specimens after 24 hours of conditioning at 0°F . Complete the test within 20 seconds after removal from the freezer.
4. Use 2NS sand as the fine aggregate in concrete mixture for bond blocks.
5. Allow at least 14 days from receipt of the sample to the time of reporting test results.

6. Material containers must be legibly marked with a non-fading, weather-resistant ink or paint. Include the manufacturer's name or trade name, batch number, recommended pouring temperature, and the maximum safe heating temperature on the label.

B. Backer Rod for Use with Hot-Poured Joint Sealant. Backer rod for use with a hot-poured joint sealant must be solid, round, heat resistant, closed-cell, cross-linked polyethylene foam meeting the requirements of ASTM D 5249, for Type I.

914.05. Epoxy Binder for Joint Spall Repair. Select one of the following types of epoxy binder material mixed with dry 2MS masonry sand to repair spalls adjacent to longitudinal or transverse joint grooves.

- A. If the concrete temperature is from 60 °F to 104 °F, select Type I epoxy binder.
- B. If the concrete temperature is from 35 °F to 59 °F, select Type II epoxy binder.

Epoxy components must be low-viscosity and come packaged to allow easy measurement and mixing in the field at a 1:1 ratio or a 2:1 ratio, by volume. Both component containers must show the volumetric mix ratio.

Epoxy binders must be composed of 100 percent nonvolatile materials and must not contain solvents or pigments. All epoxy binder ingredients must be reactive, become a permanent part of the cured adhesive system, and not lose adhesion due to small amounts of moisture that may be present in the concrete repair area.

Epoxy binders must meet the requirements of Table 914-1.

Mark containers with part, type, lot or batch number, and volumetric proportioning ratio. Allow at least two weeks for testing before intended use.

A batch of each component consists of quantities of material subjected to the same unit chemical or physical mixing process to make the final product uniform.

914.05

Table 914-1 Epoxy Binder Physical Requirements		
Test	Type I	Type II
Part A, Epoxy Resin Base Polymer Viscosity, poises at 72 °F (a) (Brookfield viscometer, No. 2 Spindle)	5 – 30	5 – 20
Part B, Modified Curing Agent Viscosity, poises at 72 °F (a) (Brookfield viscometer, No. 2 Spindle)	3 – 30	3 – 20
Mixture A and B Gel Time, minutes (100 g initially at 72 °F)	25 – 50	8 – 15
Tensile Strength at yield, psi at 72 °F (b)(c)	≥3,000	≥2,500
Elongation, Ultimate, percent (c)	≥10	≥10
Absorption (24 h in water at 72 °F) percent by weight (c)	≤1.0	≤1.0
Shear Bond Strength, psi (On sawed concrete at 72 °F)	≥400	≥400
a. Perform viscosity tests in accordance with ASTM D 1084, Method B. b. Perform tensile tests at 0.2 in/min in accordance with ASTM D 638, Type 1 Specimen. c. Perform tensile, elongation, and absorption tests on specimens cut from a 1/8 in thick cast sheet of cured epoxy binder. Core times are 96 h for Type I, 24 h for Type II.		

914.06. Epoxy Resin Adhesive. Epoxy resin adhesive must be capable of being injected into, and flow along, a crack 0.005 inch wide. Select epoxy resin adhesive from the Qualified Products List.

Use a fast-setting grout or a fast-set temporary seal as recommended by the epoxy resin adhesive manufacturer.

914.07. Dowel Bars for Transverse Expansion and Contraction Joints. Dowel bars must be straight, smooth, round bars with the dimensions shown on the plans. Dowel bars must have a minimum yield strength of at least 40,000 psi and a minimum tensile strength of at least 70,000 psi. When welding is required, dowel bars must meet these strength requirements when tested after welding to the dowel basket assembly.

Provide dowel baskets from a Department-approved source. Secure the dowel bars into the baskets by welding or other mechanical method to ensure the dowels will maintain alignment during and after concrete placement.

The ends of dowel bars for expansion and contraction joints must be saw cut or sheared, and free of burrs. If dowel bars are sheared, ensure the ends remain round and do not deform.

Protect dowel bars from corrosion as specified in this subsection.

A. Coatings for Dowel Bars. If required, provide dowel bars coated with an epoxy resin coating selected from the Qualified Products List.

The supplier must identify the epoxy resin coating used and certify that the dowel bars underwent a surface preparation treatment before coating in accordance with the recommendations of the coating manufacturer.

The Engineer will sample and test dowel bars for average coating thickness, and check for chips, cracks, or other damage to the coating, and for the presence of a bond breaker, if required, before installation in the concrete construction. The Engineer may reject dowels with coatings not meeting the thickness requirements, or dowels with coating damage.

Epoxy coated dowel bars must have an average coating thickness not less than 0.010 inch, nor more than 0.014 inch on any bar, with individual determinations on a single bar within a tolerance of ± 0.004 inches of the average. Coating is not required on the end faces of the bars and on the cylindrical surface within 3 inches of the end fixed in the supporting basket by welding or other mechanical means.

To prevent bonding to concrete, epoxy coated dowels must be coated with an asphalt material meeting the requirements of MC-70 or RC-250, as specified in subsection 904.03.B; or an alternate bond release agent selected from the Qualified Products List. Bond release agents must provide a pull-out shear bond stress of the dowel bar no greater than 60 psi for initial and final movement of the dowel from the concrete specimen. The manufacturer of the asphalt material must provide certification to the Engineer that the coating material meets the 60-psi pull-out requirement.

The Contractor or supplier may apply asphalt coatings to the dowel bar and the dowel basket assembly. The manufacturer must apply the alternate bond release agents to the dowel bar and the dowel basket assembly.

B. Sleeves for Dowel Bars. Sleeves for dowel bars must be at least 0.01 inch thick and made of 300 series stainless steel, Monel metal, or a Department-approved equal. The sleeve must cover the bar to within 3 inches of the bar end that will be fixed in the supporting basket by welding or other mechanical means. The sleeve must wrap around the dowel bar and must not move in relation to the bar. A folded lock seam or a continuous weld must fasten the lap. The sleeve must contact the entire bar without gaps.

The Engineer will determine if sleeves do not fully contact dowel bars based on the formation of dimples in the sleeve when tapped lightly with a ball-peen hammer or similar tool.

914.07

As an alternative to placing a sleeve on a carbon steel bar, the Contractor may provide a solid stainless steel bar meeting the other applicable requirements for dowel bars.

C. **Dowel Bar Expansion Caps.** Dowel bars for expansion joints must include metal or plastic expansion caps as shown on the plans and approved by the Engineer. Expansion caps must be sized to provide a slip fit onto the coated bar.

Expansion caps must have a uniform diameter for a length of at least 4 inches and must include a stop to ensure the end of the cap remains at least 1 inch away from the end of the dowel bar during concrete placement. Fabricate metal expansion caps from at least 28-gauge sheet steel, and close at the sides and end by crimping. Plastic expansion caps must be one piece, with a uniform thickness of at least $\frac{1}{16}$ inch, entirely closed on the end.

914.08. Devices for Transverse End-of-Pour Joints. Use straight steel tie bar devices for end-of-pour joints.

Straight tie bars for end-of-pour joints must consist of at least No. 5 steel deformed bars at least 30 inches long meeting the requirements of ASTM A 615, ASTM A 616-96a, ASTM A 617-96a, or ASTM A 706. Epoxy coat straight tie bars as specified in subsection 905.03.C, except the Engineer will not require the application of the epoxy coating within 4 inches of each end of the tie bar, or repair of damage to the coating within 4 inches of each end of the bar.

914.09. Lane Ties for Longitudinal Pavement Joints.

A. **Straight Tie Bars.** Straight tie bars for longitudinal pavement joints must consist of at least No. 5 steel deformed bars at least 24 inches long meeting the requirements of ASTM A 615, ASTM A 616-96a, ASTM A 617-96a, or ASTM A 706. Epoxy coat straight tie bars as specified in subsection 905.03.C, except the Engineer will not require the application of the epoxy coating within 4 inches of each end of the tie bar, or repair of damage to the coating within 4 inches of each end of the bar.

B. **Bent Tie Bars for Bulkhead Joints.** Bent tie bars for bulkhead joints must consist of at least No. 5 steel deformed bars at least 24 inches long as measured around the outside of the bend. The tie bars must have a yield strength of at least 40,000 psi and be capable of withstanding bending to a 90° angle, re-straightening, and then withstanding the pull-out test requirements specified in subsection 602.03.F.

Epoxy coat bent tie bars as specified in subsection 905.03.C, except the Engineer will not require the application of the epoxy coating within 4 inches of each end of the tie bar, or repair of damage to the coating within 4 inches of each end of the bar.

914.10. Structure Expansion Anchors and Bolts. Select expansion anchors from the Qualified Products List in the sizes and shapes shown on the plans. Bolts for flush-type anchors must meet the requirements of ASTM A 307, for Grade A.

914.11. Preformed Waterproofing Membranes and Joint Waterproofing. Select preformed waterproofing fabric system, including the manufacturer's recommended primer, from the Qualified Products List.

914.12. Elastomeric Bearings. Elastomeric bearings must meet the requirements of AASHTO Division II, Section 18.2, "Elastomeric Bearings," for 100 percent virgin polychloroprene bearings. Provide certification to the Engineer that bearings conform to this subsection.

Laminated bearings must have a shear modulus of 100 psi \pm 15 psi. Plain bearings must have a shear modulus of 200 psi \pm 30 psi. Rolled steel sheet laminates must meet the requirements of ASTM A 36 or ASTM A 1011, for Grade 36 or Grade 40. Blast-clean the surfaces of the laminates where elastomers are to be bonded.

914.13. Non-Metallic Washers. Washers used as spacers between pin plates and link plates must be polyethylene, high density, non-metallic washers meeting the requirements of ASTM D 1248, for Type III, Class B.