

90 color requirements of 905.05(b) and the truncated dome requirements of 905.05(d).

905.06 Precast Concrete Units Not Otherwise Covered

These units shall be cast in substantial permanent steel forms. Structural concrete shall attain a minimum 28-day compressive strength of 3,000 psi as determined in accordance with AASHTO T 22. When air-entrained concrete is specified, it shall have an air content of from 5% to 8% by volume. The precast units shall be cured in accordance with AASHTO M 170. Water absorption of individual cores taken from such units shall not exceed 9%. Additional reinforcement shall be provided as needed to handle the precast units.

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SECTION 906 – JOINT MATERIALS

906.01 Joint Fillers

Joint fillers shall be preformed materials intended to be used in PCCP or as otherwise specified. Joint fillers shall be in accordance with AASHTO M 213 or ASTM D8139. A Type B certification in accordance with 916 shall be provided for joint fillers. The limits of the following shall be shown on the certification.

Property	Test Method
Asphalt Content	ASTM D545
Compressive Strength	ASTM D8139
Density	ASTM D545
Extrusion	ASTM D545
Freeze Thaw Resistance	ASTM D8139
Heat Resistance	ASTM D8139
Recovery	ASTM D8139
Water Absorption	ASTM D545

10 906.02 Joint Sealing Materials

(a) Joint Sealers

Joint sealers shall consist of materials which are intended to be used in sealing joints and cracks in pavements and structures.

1. Silicone Joint Sealants

a. Physical Requirements

Silicone joint sealants shall be in accordance with ASTM D5893.

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b. Field Evaluation

All silicone joint sealants complying with the physical requirements will be subjected to a field evaluation before approval for general use is granted. The

Department will maintain a QPL of Joint Sealants, which comply with the physical requirements and field evaluation.

c. Specific Requirements for Installation of Silicone Joint Sealant

The sealant shall be stored in the original unopened container at or below 90°F. The sealant shall be placed when the ambient temperature is above 40°F. The
 30 equipment used shall be adequate for the placement of the sealant and shall meet the sealant manufacturer's recommendations. Air compressors used for the placement of this sealant shall be equipped with traps which remove moisture and oil from the air.

The sealants which are self-leveling shall be identified as such on the QPL of Joint Sealants and will not require tooling. Sealants not identified as self-leveling on the QPL shall be tooled or applied to wet the joint faces. Sealants which are not self-leveling will not position properly in the joint under their own weight. A backer rod as set out herein shall be used to control sealant configuration and facilitate tooling. Joint configurations shall be as shown on the plans. After a joint has been sealed, all
 40 surplus joint sealer on the pavement surfaces shall be promptly removed. Traffic shall not be allowed over sealed joints until the sealer is tack free.

The sealant shall be delivered in containers plainly marked with manufacturer's name or trademark.

2. Hot Poured Joint Sealant

The sealant shall be in accordance with ASTM D6690, Type II. The material shall be tested in accordance with ASTM D5329 except that after blotting, the surface of the blocks shall be blown dry with compressed air. A Type A certification in
 50 accordance with 916 shall be provided for hot poured joint sealant. The results of the following shall be shown on the certification.

Property	Requirements
Cone Penetration at 25°C	90 maximum
Softening Point °C	80 minimum
Bond, non-immersed	Three 12.5 ±0.2 mm specimens pass 3 cycles at 50 % ext. at -29°C
Resilience, %	60 minimum
Asphalt Compatibility	Pass

The sealing compound shall be delivered in the manufacturer's original sealed container. Each container shall be legibly marked with the name of the manufacturer, the trade name of the sealer, the manufacturing batch number or lot, the pouring temperature, and the safe heating temperature.

The sealant shall be used in accordance with the manufacturer's recommendations.
 60 A backer rod as set out herein shall be used to provide the joint configuration in accordance with the standard drawings.

3. Preformed Elastomeric Joint Seals

This joint shall be in accordance with ASTM D2628. A Type A certification in accordance with 916 shall be provided for joint seals. The results of the following shall be shown on the certification.

Property	ASTM Test Method	Requirements
Tensile strength, minimum, psi (MPa)	D412	2000 (13.8)
Elongation at break, minimum, %	D412	250
Hardness, Type A durometer, points	D2240	55 ±5
Oven aging, 70 h at 212°F (100°C)	D573	
Tensile strength, loss, maximum, %		20
Elongation, loss, maximum, %		20
Hardness, Type A durometer, points change		0 to + 10
Oil Swell, ASTM Oil 3, 70 h at 212°F (100°C) Weight change, maximum, %	D471	45
Ozone resistance	D1149	
20 % strain, 300 ppm in air, 70 h at 104°F (40°C)		no cracks
Low-temperature stiffening, 7 days at 14°F (-10°C)	D2240	
Hardness, Type A durometer, points change		0 to + 15
Low-temperature recovery, 72 h at 14°F (-10°C) 50 % deflection, minimum, %	D2628	88
Low-temperature recovery, 22 h at - 20°F (-29°C), 50 % deflection, minimum, %	D2628	83
High-temperature recovery, 70 h at 212°F (100°C), 50 % deflection, minimum, %	D2628	85
Compression-deflection, at 80 % of nominal width, minimum, lbf/in. (N/m)	D2628	3.5 (613)

4. Polychloroprene Joint Membrane and Adhesive

- 70 Polychloroprene joint membrane shall be general purpose, heavy duty polychloroprene sheeting with nylon fabric reinforcement. The sheeting shall be in accordance with the following:

Property	Test Method	Requirements
Thickness	ASTM D751	0.094 in. ±0.01 in.
Breaking Strength, Grab Test, minimum	ASTM D751	700 lbf x 700 lbf (Longitudinal x transverse)
Adhesive Strip, 1 in. by 2 in.	ASTM D751	9 lbf minimum
Burst Strength	ASTM D751	1,400 psi minimum

A Type B certification in accordance with 916 shall be provided for the polychloroprene joint membrane. The limits of the above shall be shown on the certification.

- 80 The adhesive used to attach the polychloroprene joint membrane to concrete shall be a black styrene-butadiene rubber base material compatible with both concrete and polychloroprene. The adhesive shall be in accordance with the following:

Property	Test Method	Minimum	Maximum
Viscosity, cps	ASTM D2196, RVF #6 sp @ 20 rpm	7,500	18,000
Solids, %	ASTM D1259	28	35
Weight per gal., lb	ASTM D1875	6.6	7.0

A Type C certification in accordance with 916 shall be provided for the polychloroprene joint **membrane** adhesive.

5. Hot Poured Joint Adhesive

Joint adhesive is a hot applied asphalt material that is used to seal the longitudinal construction joint formed between the adjacent HMA pavement courses.

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Joint adhesive shall be in accordance with the following:

Test	Method	Test Result
Softening Point, °F (°C)	AASHTO T 53	> 170 (77)
Ductility @ 77°F (25°C), mm	AASHTO T 51	> 300
Ductility @ 39°F (4°C), mm	AASHTO T 51	> 300
Apparent Viscosity @ 400°F (204°C), cP	ASTM D2669	4,000 – 11,000
Asphalt Compatibility	ASTM D5329	Pass
Cone Penetration @ 77°F (25°C), mm	ASTM D5329	50.0 – 100.0
Flow @ 140°F (60°C), mm	ASTM D5329	< 5
Resilience @ 77°F (25°C), %	ASTM D5329	> 30
Tensile Adhesion @ 77°F (25°C), 1 in. specimen, %	ASTM D5329	> 500
Flexibility @ 0°F (-18°C)	ASTM D3111	Pass
Flash Point, °C (°F)	AASHTO T 48	> 219 (426)

A Type A certification in accordance with 916 shall be provided for hot poured joint adhesive. The results of the above shall be shown on the certification.

(b) Backer Rod

The rod is to act as a bond breaker, to control the thickness of the bead, and to provide support for any required tooling of the sealant.

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1. Requirements

When hot poured material is used, compatibility of the backer rod with the hot sealant shall be verified before use. The backer rod shall be a closed cell expanded polyethylene foam or an isomeric polymer foam rod. Diameter and placement shall be as shown on the plans.

2. Certification

A Type C certification in accordance with 916 shall be provided for the backer rod.

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906.03 Preformed Expansion Joint Filler

Preformed expansion joint filler, PEJF, shall be preformed materials intended to be used at bridge component interfaces that are not required to be watertight. PEJF shall be either extruded polystyrene, XPS, or expanded polystyrene, EPS in accordance with ASTM C578. The compressive resistance shall be less than 40 psi, as measured in accordance with ASTM D1621. Water absorption shall be less than 1%, as measured in accordance with ASTM C272. PEJF will be by accepted by visual inspection.

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906.07 Bridge Expansion Joints

Type SS and Type M joints, including anchor assemblies, shall be shop fabricated, delivered, and installed as a continuous unit for lengths up to 46 ft. Joints longer than 46 ft shall be furnished in continuous units or in appropriate shorter sections as shown on the working drawings and approved by the Engineer. Joints used in stage construction shall be furnished in sections appropriate to accommodate the work. All steel joints furnished in sections shall be spliced with welds, with ends prepared for welding in the shop. All welds shall be in accordance with 711.32.

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The profile of the joint in the roadway area shall conform to the roadway cross-section. Where changes in direction are required, such as at curbs or concrete rails, the sections shall be cut to the bevel required to produce the same cross-section on each piece being joined. Slider plates shall be provided at curbs, walkways, and concrete rails as part of the completed joint assembly. The slider plate shall be the same material as the extrusion and shall be galvanized in accordance with ASTM A123.

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All exposed structural steel surfaces, except stainless steel or polytetrafluoroethylene coated, shall be shop painted in accordance with 619.

Type PCF joints shall be fabricated, delivered, and installed in lengths no less than 6 ft. Sections of joint shall be field spliced using silicone sealant in accordance with

the manufacturer's recommendations. Joints shall be furnished with the fewest number of splices possible, and sections less than 6 ft in length shall not be used unless required to complete the remaining length at the ends of a joint or construction phase.

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(a) Type SS

This joint shall consist of preformed elastomeric strip seals and the corresponding steel locking edge rail.

Structural steel shall be in accordance with ASTM A36, ASTM A242, ASTM A588, ASTM A1011, or M 1010 or M 1020 in accordance with ASTM A575.

Sealant and grout shall be in accordance with the manufacturer's recommendation.

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The elastomeric compound used to manufacture the strip seal shall be neoprene and in accordance with ASTM D5973.

The strip seal shall be furnished in one continuous length for the entire limits of the installed joint. The strip seal shall not be field-spliced. Miter cut, vulcanized shop splices will be required in the strip seal. The shop vulcanization of the strip seal splice may be either a hot or cold process so long as the process produces a splice of equal or greater strength than the elastomer.

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A Type B certification in accordance with 916 shall be provided for the elastomeric strip seal. The limits of the following shall be shown on the certification.

Property	Requirements
Tensile Strength	ASTM D412
Elongation at break	ASTM D412
Hardness, Type A durometer, points	ASTM D2240 (modified)
Oven Aging	ASTM D573
Tensile Strength, loss	
Elongation, loss	
Hardness, Type A durometer, points change	
Oil Swell, IRM 903, weight change	ASTM D471
Ozone Resistance	ASTM D1149
Low Temperature Stiffening	ASTM D2240
Compression set	ASTM D395, Method B

A Type C certification in accordance with 916 shall be provided for the structural steel and polyurethane sealant.

(b) Type M

This joint shall consist of prefabricated multiple elastomeric seals, separator beams, and support bars. The structural design of the joint shall be in accordance with

- 180 AASHTO LRFD Bridge Construction Specifications. The joint shall be designed to accommodate the movement shown on the plans.

The joint assembly shall be preset by the manufacturer in accordance with the approved working drawings, joint setting data, and specifications. The assembly shall be properly secured for shipping and contain provision for final field adjustment at the time of installation. The manufacturer shall furnish a copy of the installation instructions prior to the placement of these joints.

- 190 Structural steel shall be in accordance with ASTM A36, ASTM A242, ASTM A588, ASTM A1011, or M 1010 or M 1020 in accordance with ASTM A575.

Sealant and grout shall be in accordance with the joint manufacturer's recommendation.

The elastomeric compound used to manufacture the seal shall be neoprene in accordance with ASTM D5973.

- 200 A Type B certification in accordance with 916 shall be provided for the elastomeric seal. The limits of the following shall be shown on the certification.

Property	Requirements
Tensile Strength	ASTM D412
Elongation at break	ASTM D412
Hardness, Type A durometer, points	ASTM D2240 (modified)
Oven Aging	ASTM D573
Tensile Strength, loss	
Elongation, loss	
Hardness, Type A durometer, points change	
Oil Swell, IRM 903, weight change	ASTM D471
Ozone Resistance	ASTM D1149
Low Temperature Stiffening	ASTM D2240
Compression set	ASTM D395, Method B

A Type C certification in accordance with 916 shall be provided for the structural steel and polyurethane sealant.

Bearings above and below the support bar shall be a nylon or urethane compound with polytetrafluorethylene riding surfaces. All components of the system shall be accessible to periodic inspection and component replacement if necessary.

- 210 The seals shall be in accordance with the requirements as follows:

1. be held in place by compressive forces throughout the normal limits of joint movement,

2. be supplied and installed in one piece,
3. have corner locked edges for a watertight fit,
4. not be any part of the load bearing riding surface,
- 220 5. be installed using seal lubricant-adhesive or be mechanically clamped in position to produce a watertight seal,
6. have a shape which promotes self removal of foreign material during normal joint operation,
7. be recessed 1/2 in. below the riding surface throughout the normal limits of joint movement,
- 230 8. be held in position by the separator beams,
9. have a hollow box shape for joints utilizing urethane or mechanical equilibrium control spacers or a strip seal configuration for joints using a mechanical linkage to maintain equidistant separator beam spacing. The joint shall have a maximum opening of 3 in. per seal.

The separator beams shall be in accordance with the requirements as follows:

- 240 1. provide the riding surface across the joint,
2. have an extruded or machined shape suitable to hold the seals,
3. be stable against tipping, tilting, or lifting during application of traffic loads by use of a suitable shape and connection to the support bar,
4. be supported individually on their own independent support bars,
- 250 5. maintain equidistant spacing through use of suitable urethane equilibrium type control spacers to counter the compressive forces of the seals or through a positive horizontal mechanical linkage or proportioning bar.

The support bars shall be in accordance with the requirements as follows:

1. incorporate stainless steel sliding surfaces to minimize resistance to joint movements,

- 260 2. be supported above, below, and laterally as required to prevent lifting, to transmit bearing loads, and to maintain positioning of the bar.

All support bar boxes and joint housings shall have top, bottom, and sides made of steel plate with 1/2 in. minimum thickness. Anchorages shall consist of looped No. 5 reinforcing bars welded to 1/2 in. steel plates spaced at 9 in. centers. Non-welded steel to steel contact will not be allowed.

(c) Type PCF

- 270 This joint shall be furnished from the QPL of Type PCF Bridge Joints. Joints will be considered for inclusion on the QPL by completing the requirements of ITM 806, Procedure C.

These products shall consist of a highway grade silicone faced self-expanding foam expansion joint seal, a field-applied epoxy adhesive, and a field-applied silicone sealant. The foam seal shall be able to accommodate the thermal movement range shown on the plans and shall have a movement capability of no less than +50% to - 50% of the nominal material size. The silicone facing material shall accommodate a minimum elongation of 600%.

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The foam seal shall be accordance with the following requirements:

Property	Test Method	Requirements
Temperature Service Range	ASTM C711	-40°F to 185°F
UV Resistance	ASTM G155 or ASTM C793	No changes or cracking at 2,000 h

906.08 High Density Bearing Strip

The strip shall be nontoxic multipolymer plastic in accordance with the following requirements:

Property	Test Method	Requirements
Compressive Strength	ASTM D695	8,000 to 9,000 psi
Coefficient of Linear Expansion	ASTM D696	7.62×10^{-4} mm/mm/°C to 1.27×10^{-3} mm/mm /°C

- 290 A Type B certification in accordance with 916 shall be provided for the high-density bearing strip. The limits of the compressive strength test and measurement of the coefficient of linear expansion shall be shown on the certification for the high-density bearing strip.