932 NONMETALLIC ACCESSORY MATERIALS FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES.
(REV 9-11-02) (FA 9-11-02) (7-03)

SECTION 932 (Pages 855-866) is deleted and the following substituted:

SECTION 932
NONMETALLIC ACCESSORY MATERIALS FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES

932-1 Joint Materials.

932-1.1 Preformed Joint Filler for Pavement and Structures: Preformed joint filler shall meet the requirements of AASHTO M 153 or AASHTO M 213, or cellulose fiber types meeting all the requirements of AASHTO M 213 except the asphalt content is acceptable provided they contain minimums of 0.2% copper pentachlorophenate as a preservative and 1.0% waterproofing wax. For AASHTO M 153, unless a particular type is specified, either Type I, Type II or Type III may be used.

Preformed joint fillers shall have a thickness equal to the width of the joint required, and shall be furnished in lengths equal to the widths of the slabs in which they are to be installed, except that strips which are of a length not less than the distance between longitudinal joints, or between longitudinal joint and edge, may be used if laced or clipped together in a manner approved by the Engineer. The depth and shape of the joint filler shall conform to the dimensions shown in the plans. For doweled joints, proper provision shall be made for the installation of the dowels.

932-1.1.1 Certification: The Contractor shall provide the Engineer a certification conforming to the requirements of Section 6 from the manufacturer, confirming that the preformed joint filler meets the requirements of this Section.

932-1.1.2 Qualified Products List: The preformed joint filler used shall be one of the products listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

932-1.2 Joint Sealer for Pavement and Structures:

932-1.2.1 General: This Specification covers joint sealer intended for use in sealing joints in asphalt and concrete pavements. These materials may also be used to seal joints in concrete bridges and other structures.

932-1.2.2 Material: The material shall meet the requirements of either ASTM D 1190 (Concrete Joint Sealer, Hot-Poured Elastic Type) or ASTM D 3405 (Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements). Manufacturers or distributors seeking approval of their material in accordance with this Specification shall demonstrate the performance of their products in accordance with Florida Test Methods FM 5-532 or FM 5-533.

932-1.2.3 Certification: The Contractor shall provide the Engineer a certification conforming to the requirements of Section 6 from the manufacturer, confirming that the joint sealer materials meets the requirements of this Section.

932-1.2.4 Qualified Products List: The joint sealant materials used shall be one of the products listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

932-1.2.5 Shipment: The material shall be delivered in containers plainly marked with the manufacturer's name or trademark product name, LOT number and date of expiration.

932-1.2.6 Bond Breaker Rod: The bond breaker rod shall be a closed cell, expanded polyethylene foam rod of the size and dimensions shown on the plans. It shall be compatible with the joint sealant and no bond or reaction shall occur between the rod and the sealant.

All bond breaker rods installed shall be covered by a sealant at the end of each work day.

Bond breaker tape approved by the sealant manufacturer may be used in lieu of bond breaker rod when sealing random cracks.

932-1.3 Low Modulus Silicone Sealant:

932-1.3.1 General: Low Modules Silicone sealant shall be furnished in a one part silicone formulation meeting the requirements specified herein. Manufacturers or distributors seeking approval of Low Modulus Silicone Sealants shall demonstrate the performance of their products in accordance with FM 5-533.

Acetic acid cure sealants are not acceptable. A primer as specified in 932-1.4 for bonding sealant to concrete shall be used if required by the manufacturer. When a manufacturer's product is tested and approved by the Department using a primer, primer will be required for project installation.

Low modulus silicone sealants may be either a non-self-leveling or a self-leveling type, unless specified otherwise in the plans or Specifications.

Silicones shall be identified in the following manner:

Type A - A low modulus, non-sag (non-self-leveling) silicone formulation, used in sealing horizontal and vertical joints in cement concrete pavements and bridges (i.e., concrete-concrete joints). Tooling is required.

Type B - A very low modulus, self-leveling silicone formulation, used in sealing horizontal joints (including joints on moderate slopes) in cement concrete pavements and bridges (i.e., concrete-concrete joints). Tooling is not normally required.

Type C - An ultra-low modulus, self-leveling silicone formulation, used in sealing horizontal joints (including joints on moderate slopes) in cement concrete pavements and bridges (i.e., concrete-concrete joints). It can also be used to seal the joints between cement concrete pavements and asphaltic concrete shoulders (including asphalt-asphalt joints). Tooling is not normally required.

932-1.3.2 Physical Requirements:

SILICONE SEALANT TYPE	Type A	Type B	Type C
Flow (maximum)	0.3 inches [7.6 mm]		
Extrusion rate	1.25-4.2 g/s	1.7-11.0 g/s	4.58-9.2 g/s
Tack-free time at 77 ± 3ºF [25 ± 1.5ºC] and 45 to 55% Relative Humidity	20-75 minutes	120 minutes, maximum	60 minutes, maximum
Specific gravity	1.1 to 1.515	1.10 to 1.40	1.26 to 1.34
Durometer hardness, Shore A (Cured seven days at 77 ± 3ºF [25 ± 1.5ºC] and 50 ± 5% Relative Humidity)	10-25		
Durometer hardness, Shore 00 (Cured 21 days at 77 ± 3ºF [25 ± 1.5ºC] and 50 ± 5% Relative Humidity)		40-80	20-80
Tensile stress (maximum) at 150% elongation	45 psi [300 kPa],	40 psi [275 kPa],	15 psi [100 kPa],

SILICONE SEALANT TYPE	Type A	Type B	Type C
Elongation (Cured seven days at 77 ± 3ºF [25 ± 1.5ºC] and 50 ± 5% Relative Humidity)	800% minimum		
Elongation (Cured 21 days at 77 ± 3ºF [25 ± 1.5ºC] and 50 ± 5% Relative Humidity)		800% minimum	1400% minimum
Ozone and Ultraviolet Resistance	No chalking, cracking or bond loss after 5,000 hours, minimum.		
Bond to concrete mortar briquets (primed if required) (Cured seven days at 77 ± 3ºF [25 ± 1.5ºC] and 50 ± 5% Relative Humidity)	50 psi [350 kPa] minimum		
Bond to concrete briquets (Cured 21 days at 77 ± 3ºF [25 ± 1.5ºC] and 50 ± 5% Relative Humidity)		40 psi [275 kPa], minimum	35 psi [240 kPa], minimum (includes bond to asphalt)
Movement Capability	No adhesive or cohesive failure and adhesion, 10 cycles at -50 to +100%		

932-1.3.3 Methods of Test:

Flow..... MIL S 8802
Extrusion Rate..... MIL S 8802
Tack Free Time..... MIL S 8802
Specific Gravity..... ASTM D 792, Method A
Durometer Hardness.....ASTM D 2240
Tensile Stress.....ASTM D 412 (Die C)
Elongation .....ASTM D 412 (Die C)
Ozone and Ultraviolet .....ASTM C 793

Bond to mortar briquets:

Portland Cement Mortar: Briquets shall be molded and cured 28 days minimum in accordance with AASHTO T 132. Cured briquets shall be dried at 230 ± 5ºF [110 ± 2.5ºC], sawed in half and bonded together with a thin section of sealant. After cure of sealant, briquets will be tested in accordance with AASHTO T 132.

Asphaltic Concrete: Briquets shall be molded using types S-III bituminous concrete mixture as specified in Section 331, using the briquets molds of AASHTO T 132. Compacted briquets shall be sawed in half and bonded together with a thin section of sealant. After cure of sealant, briquets will be tested in accordance with AASHTO T 132.

Movement capability and adhesion.....ASTM C 719

932-1.3.4 Field Cure: 6 inch [150 mm] samples of the sealant shall be taken by the Engineer from the joint at the end of a two week curing period and tested for durometer hardness (by Florida Method ANSI/ASTM D 2240), except that the requirements of a 1 inch [25 mm] sample width shall not apply. A minimum hardness of 7.0 is required as evidence of adequate cure.

932-1.3.5 Tolerance: A tolerance in cross-sectional height at midpoint of -1/16 to +3/16 inch [-1.6 to +4.8 mm] will be allowed to the nominal values shown for each joint width on the plan sheet. The Engineer shall check one joint for each 1,000 feet [300 m] of roadway by cutting out specimens. If the cross section of the cut specimen is out of the allowable range, additional specimens shall be taken as follows. One joint every 100 feet [30 m] of pavement not to exceed 500 feet [150 m]. If the average of the specimens is out of tolerance, the Contractor

shall remove and replace the entire 500 feet [150 m] section at his expense. Installation tolerance shall be verified at 1,000 feet [300 m] intervals.

932-1.3.6 Certification: The Contractor shall provide the Engineer certification conforming to the requirements of Section 6 from the manufacturer, confirming that the low modulus silicone sealant meets the requirements of this Section.

932-1.3.7 Qualified Products List: The low modulus silicone sealant used shall be one of the products listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

932-1.3.8 Shipment: Sealant material shall be delivered in containers plainly marked with the manufacturer's name or trademark, product name, LOT number, and date of expiration.

932-1.4 Primer: When required by the manufacturer's product, a primer shall be used with the Low Modulus Silicone Sealant.

The manufacturer shall perform his quality control tests on each LOT of sealant primer material furnished to each project and furnish a certified report that each LOT of primer material furnished to a project meets his Company's Specifications for that product and the primer is suitable for its intended use.

Sealant primer material shall be delivered in containers plainly marked with the manufacturer's name or trademark and product name, LOT number and date of expiration.

932-1.5 Backer Rod and Tape Bond Breakers: Joint dimensions, bond breaker suitability (by type and project) and other applicable bond breaker uses shall be in agreement with the requirements of Design Standards, Index No. 305. Any modifications or exceptions to these requirements shall be shown in the plans.

For new construction projects or general use where the joints to be sealed have uniform width, a closed cell, expanded polyethylene foam backer rod bond breaker shall be required. For rehabilitation projects and similar joint seals where the joints to be sealed have irregular width, an open cell, expanded polyethylene foam backer rod bond breaker with an impervious skin shall be required.

The backer rod shall be compatible with the joint sealant. No bond or reaction shall occur between the rod and the sealant.

Tape bond breaker approved by the sealant manufacturer may be used in lieu of backer rod bond breaker when sealing joints and/or random cracks, as required.

All installed bond breakers shall be covered by sealant at the end of each work day.

932-2 Pads for Structures.

932-2.1 Resilient Pads: Resilient pads shall be of laminated, preformed, fabric and rubber construction, composed of multiple layers of 8 ounce [0.227 kg] cotton duck impregnated and bound with high-quality natural rubber, or of equivalent and equally suitable materials compressed into resilient pads of uniform thickness. The number of plies shall be such as to produce the specified thickness, after compression and vulcanizing. The finished pads shall withstand compression loads, perpendicular to the plane of the laminations, of not less than 10,000 lb/in^2 [69 MPa] without detrimental reduction in thickness or extrusion.

932-2.2 Neoprene Pads:

932-2.2.1 General: Neoprene pads, (elastomeric bearings) may be either of two types: (1) plain pads, composed of neoprene compound, or (2) composite pads, composed of layers of neoprene compound between which steel plates are bonded. In addition to the internal steel plates, the composite pads may have external steel load plates bonded to the upper or lower elastomeric layer or both.

Unless otherwise shown in the plans, plain pads shall be used only in thicknesses up to 3/4 inch [19 mm]; and pads thicker than 3/4 inch [19 mm] shall be composite.

The pads shall be furnished with the dimensions indicated in the plans and shall be composed of the specified elastomer type, grade, and shear modulus (or hardness) and adequate for the specified design load. The pads shall be tested at the appropriate level and shall satisfy any special requirements in the plans.

The elastomer portion of the elastomeric compound shall be 100% polychloroprene (neoprene). The elastomeric compound shall meet the requirements of ASTM D 2000 for the specific requirements shown in the following table:

Serial Designations for Basic Requirements			Suffix Designations
Durometer 50	Durometer 60	Durometer 70	All Durometer
2BC525	3BC625	3BC725	A14, B14, C12, E034, F17, K21, Z (OZONE)
Note: The complete designation of test requirements consists of the basic designation plus the suffix designation.			

ASTM D1149:			
	Durometer 50	Durometer 60	Durometer 70
100 pphm OZONE in air by volume, 20% strain, 100º ±2ºF [38 ± 1ºC], 100 hours, Mounting Procedure D518, Procedure A	No Cracks	No Cracks	No Cracks

Adhesion (composite pads only), ASTM D429:			
	Durometer 50	Durometer 60	Durometer 70
Bond made during vulcanization	40 lb/in [7.0 N/mm]	40 lb/in [7.0 N/mm]	40 lb/in [7.0 N/mm]

Unless otherwise specified in the plans, the elastomer shall be 50 Durometer and adequate for 1,000 lb/in^2 [7 MPa] Design Compression Stress.

The pads shall be cast under pressure and heat and shall be individually molded to the size and shape called for in the plans. Pads shall be furnished in one piece, and the elastomer portions shall not be laminated in any manner.

Flash tolerance, finish, rubber-to-metal bonding, and appearance shall meet the requirements of the latest edition of the Rubber Handbook as published by the Rubber Manufacturers Association, Inc., RMA F3 and T.063 for molded bearings and RMA F2 for extruded bearings.

Plain pads may be molded or extruded and vulcanized in large sheets and cut to size. Cutting shall not heat the materials and shall produce a smooth finish to ANSI 250.

The pads shall be prepared and packaged by the manufacturer and shall be shipped in unbroken identifiable packages. Each package shall list the number of pads, the type of pads, and the purchase order number. The required mill test reports shall accompany the packaged pads. No package of pads shall weigh more than 1,800 lbs [820 kg].

932-2.2.2 Dimensional Tolerances: Plain pads and composite pads shall be built to the design dimensions and these Specifications with the following tolerances:

1. Overall Vertical Dimensions:	
Design Thickness 1 1/4 inch [31.8 mm] or less: Design Thickness over 1 1/4 inch [31.8 mm]:	-0, +1/8 inch [-0, +3.2 mm] -0, +1/4 inch [-0, +6.4 mm]
2. Overall Horizontal Dimensions	
36 inches [900 mm] and less:	-0, +1/4 inch [-0, +6.4 mm]

Over 36 inches [900 mm]:	-0, +1/2 inch [-0, +12.7 mm]
3. Thickness of Individual Layers of Elastomer (Composite Pads Only) at any point within the bearing:	±20% of design value but no more than ±1/8 inch [±3.2 mm]
4. Variations from a Plane Parallel to the Theoretical Surface (as determined by measurements at the edge of the bearings)	
Top:	slope relative to the bottom of no more than 0.005 radians
Sides:	1/4 inch [6.4 mm]
5. Position of Exposed Connection Members:	1/8 inch [3.2 mm]
6. Edge Cover of Embedded Laminates or Connection Members:	-0, +1/8 inch [-0, +3.2 mm]
7. Size of Holes, Slots or Inserts:	+1/8 inch [+3.2 mm]
8. Position of Holes, Slots or Inserts:	+1/8 inch [+3.2 mm]

932-2.2.3 Specific Requirements for Composite Pads: The composite (neoprene and steel) pads shall be cast as a unit in a mold and bonded and vulcanized under heat and pressure. The molds shall have standard shop practice mold finish. The internal steel laminates shall be gritblasted and cleaned of all surface coating rust and mill scale before bonding, shall be free of sharp edges and burrs, and shall have a minimum edge cover of 1/4 inch [6.4 mm]. External load plates, if used, shall be protected from rusting by the manufacturer and preferably shall be hot-bonded to the bearing during vulcanization.

Composite pads shall consist of alternate laminations of neoprene and hot-rolled steel sheets molded together as a unit. Unless otherwise shown in the plans, the pads shall meet the following requirements: The outer metal laminations shall be 3/16 inch [4.8 mm], and the inner laminations shall be 14-gauge [2.0 mm]. The outer laminations of neoprene shall be 1/4 inch [6.4 mm]; and the inner laminations shall be of equal thickness, the actual thickness depending upon the number of laminations. Unless otherwise shown in the plans, all components of the composite pad shall be molded together into an integral unit; and all edges of the steel laminations shall be covered by a minimum of 1/4 inch [6.4 mm] of elastomer. Exposed laminations, apparent as a result of manufacturing techniques, shall be sealed flush on the finished bearing pad with a bonded vulcanized patch consisting of material equivalent to that used in the manufacture of the pad. The pad surface shall be free of cuts, blemishes, and molding defects in excess of 3/4 inch [19 mm] in length and 1/8 inch [3.2 mm] in depth and shall be free of foreign matter. The top and bottom bearing surfaces shall each have an integral sealing rib approximately 1/8 inch [3.2 mm] in depth (in addition to the specified total thickness) and 3/16 inch [4.8 mm] in width around their peripheries, which shall be free of cuts, tears, an separations. Variations from specified dimensions for individual laminations shall not exceed those specified in 932-2.2.2. Steel reinforcement in composite pads shall conform to AASHTO M 251.

932-2.2.4 Testing for Physical Properties: The pads shall meet the requirements for physical properties as specified in 932-2.2.5 when tested in accordance with ASTM Designations shown. Test specimens shall be prepared in accordance with ASTM D 3183. The pads will be acceptable on the basis of meeting the requirements for Durometer 50, 60 or 70, whichever is called for in the plans.

932-2.2.5 Original Physical Properties:

Durometer	50	60	70
Hardness (ASTM D 2240)	50 ±5 points	60 ±5 points	70 ±5 points
Tensile Strength* (ASTM D 412), minimum	2,250 psi [15.5 MPa]	2,250 psi [15.5 MPa]	2,250 psi [15.5 MPa]
Elongation at Break*, minimum	400%	350%	300%

*Test results of these properties of test samples prepared from finished pads shall not be more than 10% below the specified value.

932-2.2.6 Change in Original Physical Properties: The material, oven-aged 70 hours at 212ºF [100ºC] and tested in accordance with ASTM D 573, shall show the following:

Hardness ..... 0 to +15 points, change
Tensile Strength.....-15% change, maximum
Elongation at Break .....-40% change, maximum

932-2.2.7 Extreme Temperature Characteristics:

Compression Set (ASTM D 395 Method B, 22 hours at 212ºF [100ºC]).....35% maximum

932-2.2.8 Oil Swell:

Volume change (ASTM D 471, using ASTM Oil No. 3, 70 hours at 212ºF [100ºC]) ..... 120% maximum

932-2.2.9 Ozone Cracking Resistance:

Time within which no cracks develop (ASTM D 1149) 100 pphm of ozone in air by volume at 20% strain and a temperature of 100±2ºF [38 ± 1ºC] ..... 100 hours, minimum

932-2.2.10 Bond Between Neoprene and Steel (Composite Pads only):

ASTM D 429, Method B .....40 lb/in [7.0 N/mm]

932-2.2.11 Bearing Tests and Acceptance Criteria: The acceptance criteria shall have two levels. Level I acceptance criteria shall be applied to all pads. Level II acceptance criteria shall be applied to more critical or unusual pads as required in the plans.

Level II test shall also be used to resolve differences over the acceptance of pads to which only Level I tests shall have been applied.

Level I criteria require that the pad be manufactured according to this Specification and any additional requirements specified in the plans. The manufacturer shall proof load each composite pad with a compressive load 1.5 times the maximum design load. If bulging patterns imply laminate placement which does not satisfy design criteria and manufacturing tolerances or if bulging suggests poor laminate bond, the pad shall be rejected. The pad shall be acceptable if the number of surface cracks do not exceed 5; however, if there are more than three separate surface cracks which are greater than 0.08 inch [2 mm] wide and 0.08 inch [2 mm] deep or any one surface crack which is greater than 1.0 inch [25 mm] long and 0.08 inch [2 mm] deep, the pad shall be rejected. Cracks shall be measured under test loading conditions.

Unless otherwise specified in the plans, the maximum design load in pounds [newtons] shall be 1,000 [7.0] times the pad area in square inches [square millimeters].

Level I criteria requires that the elastomer satisfies the minimum properties of 932-2.2.1 except as otherwise specified in the plans. Tensile strength, elongation at break, Durometer hardness, bond strength, and ozone resistance shall be tested for each production LOT of pads. A LOT shall consist of a single type of bearing, of the same design and material, submitted for inspection at the same time, as defined in ASTM D 4014. A new set of all tests shall be required whenever there is a change in the type or source of raw materials, elastomer formulation or production procedures.

Level II criteria require that all Level I conditions are satisfied, except that individual conditions may be waived by the Engineer if Level II certification is used as an arbitration of disputes. Any failure at Level II shall constitute rejection of the entire LOT. As a minimum, shear modulus and compressive stiffness shall be determined in accordance with ASTM D 4014. The shear modulus may be determined by testing a piece of the finished pad as specified in ASTM D 4014 (if possible), or a comparable non-destructive test may be performed

on the complete pad. A compressive stiffness test shall be performed on the complete pad. The shear modulus shall fall within 15% of the value specified in the plans or within the following limits if no value for shear stiffness is specified:

Durometer Hardness	50	60	70
Shear Modulus at 73ºF [23ºC]	85-110 psi [0.59 to 0.76 MPa]	120-155 psi [0.83 to 1.07 MPa]	160-260 psi [1.10 to 1.79 MPa]
creep deflection at 25 years instantaneous deflection	25%	35%	45%

The compressive stiffness shall vary by no more than 10% from the median value of all pads, nor more than 20% from the design value, if specified. However, a compressive stiffness and a shear stiffness shall not both be specified for the same pad.

For the properties of the rubber compound to be measured by test in Level I, one extra pad shall be produced per LOT, selected at random for the necessary destructive sampling. The rubber samples shall be cut from interior laminates of the pad. In the sampling, internal surfaces exposed by vertically sawing through the middle of the pads, shall be measured for Durometer hardness as a check on completeness of vulcanization. All readings for hardness shall fall within the range for the Durometer value specified.

For Level II non-destructive testing, two pads per LOT shall be provided. For LOTs exceeding 50 pads, at least one additional pad shall be tested for every 50 pads or part thereof.

When plain or laminated neoprene pads are detailed in the plans and fabricated in accordance with the plans and Specification, submittal of shop drawings will not be required. The Contractor shall submit shop drawings to the Engineer for approval prior to fabrication of neoprene pads that are not fabricated as detailed in the plans or have external steel load plates or other materials bonded to the upper or lower elastomeric layers.

The Contractor shall also provide the Department with written notification 30 days prior to the start of pad production. This notification shall include the project number, quantity and size of pads being produced, manufacturer's name, location, and the name of the representative who will coordinate production, inspection, sampling and testing with the Department.

After completion of pad production, the Contractor shall allow the Department 14 days after notification for selecting the pads to be tested. The time required for testing shall be determined by the testing lab selected by the Contractor. All tests shall be conducted by an independent laboratory approved by the Department and under the direction of the Engineer. The Department reserves the right to perform additional Level I or check tests on no more than one pad per LOT, if deemed necessary. As a convenience and by agreement, the independent laboratory may use the manufacturer's test facilities providing that testing machines are shown to comply with AASHTO T 67.

The Contractor shall provide all pads, including pads that are needed for fulfilling testing requirements. All costs of testing and any extra pads needed for testing shall be borne by the Contractor and included in the bid price for the bearing pads.

If a pad fails the requirements of the compressive proof load, the pad shall be rejected (other tests failures affect LOT acceptance). If a pad for a given LOT fails to meet other test requirements specified herein, all pads in that LOT shall be rejected. In this event, the Contractor may provide two additional pads from the rejected LOT for a repeat test at Level II. All costs associated with additional (repeat) tests shall be borne by the Contractor. Both pads must pass Level II Test for acceptance of the LOT.

932-2.2.12 Mill Analysis Reports: For both plain pads and composite pads, six certified copies of the manufacturer's complete mill analysis, including actual results of all tests specified in this Subarticle, and properly identified by project number, shall be furnished to the Engineer by the Contractor. The mill analysis reports shall be for material representative of that furnished.

The manufacturer shall certify that each pad satisfies the design specification. Each composite pad shall be permanently marked. The marking shall consist of the order number, LOT number, pad identification number, and elastomer type and hardness number. Where possible, unless otherwise specified in the plans, the marking shall be on a face which is visible after erection of the structure.

932-2.2.13 Certification: The Contractor shall provide the Engineer a certification conforming to the requirements of Section 6 from the manufacturer, confirming that the bearing pads, (neoprene, elastomeric and composite pads) meets the requirements of this Section.