



Florida Department of Transportation

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ANANTH PRASAD, P.E.
SECRETARY

June 20, 2011

Monica Gourdine
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section **932**
Proposed Specification: **9320100 Nonmetallic Accessory Materials for Concrete Pavement and Concrete Structures.**

Dear Ms. Gourdine:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

These changes are proposed by Nikita Reed of the State Materials Office to replace a MIL Specification with current ASTM Specifications and delete a field test for low modulus silicone sealants.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via Email to SP965RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4280.

Sincerely,

Signature on file

Rudy Powell, Jr., P.E.
State Specifications Engineer

RP/dt

Attachment

cc: Gregory Jones, Chief Civil Litigation
Florida Transportation Builders' Assoc.
State Construction Engineer

NONMETALLIC ACCESSORY MATERIALS FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES – JOINT MATERIALS.

(REV ~~3456-1782615~~-11)

ARTICLE 932-1 (Pages 878 - 883) is deleted and the following substituted:

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 for the asphalt content) is acceptable provided they contain minimums of 0.2% zinc borate as a preservative and 1.5% 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.

932-1.2 Joint Sealer for Pavement and Structures:

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

932-1.2.2 Material: The joint sealant shall be composed of a mixture of materials, typically but not limited to bituminous based, that will melt when heated for application and then solidify to form a resilient and adhesive compound capable of sealing joints in portland cement concrete and/or asphaltic concrete against the infiltration of moisture and foreign materials throughout normal pavement conditions and at ambient temperatures. The manufacturer shall have the option of formulating the material according to their Specifications. However, the requirements delineated in this Specification shall apply regardless of the type of formulation used. The material shall cure sufficiently to not flow from the joint or be picked up by vehicle tires after 3 hours at 77°F. The material shall be capable of a uniform application consistency suitable for filling joints without the inclusion of large air holes or discontinuities and without damage to the material.

Materials for pavement joints shall be tested according to ASTM D 5329.

932-1.2.2.1 Physical Requirements of Joint Sealants for Portland Cement Concrete Only:

Parameter	Limits
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Pour Point	At least 20°F lower than the safe heating temperature as stated by the manufacturer.
Cone-Penetration, Non-immersed at 77°F, 150 g, 5 s	Less than or equal to 90 mm
Flow at 140°F, 5- h	Less than or equal to 5.0 mm
Bond, Non-immersed, 0°F for 5 cycles*	No cracking, separation, or opening that at any point is over 1/4 inch deep, in the sealant or between the sealant and the substrate.
*The depth of a crack, separation or opening shall be measured perpendicular to the side of the sealant showing the defect. At least two test samples in a group of three representing a given sample of sealant shall meet this requirement.	

932-1.2.2.2 Physical Requirements of Joint Sealants for Portland Cement Concrete and/or Asphaltic Concrete:

Parameters	Limits
Pour Point	At least 20° lower than the safe heating temperature as stated by the manufacturer.
Cone-Penetration, Non-immersed at 77°F, 150 g, 5 s	Less than or equal to 90 mm
Flow at 140°F, 5 h	Less than or equal to 3.0 mm
Bond, Non-immersed, -20°F for 3- cycles, 50% extension*	No cracking, separation, or opening that at any point is over 1/4 inch deep, in the sealant or between the sealant and the substrate.
Resilience at 77°F	Recovery greater than or equal to 60%
Asphaltic Concrete Compatibility at 140°F	No failure in adhesion, formation of an oily exudates at the interface between the sealant and the asphaltic concrete, or softening or other deleterious effects on the asphaltic concrete or sealant.
*The depth of a crack, separation or opening shall be measured perpendicular to the side of the sealant showing the defect. At least two test samples in a group of three representing a given sample of sealant shall meet this requirement.	

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

932-1.2.4-3 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 products shall submit product datasheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, and a QPL application in accordance with Section 6. Information on the QPL application must identify the sealant type.

932-1.2.5-4 Shipment Identification: The material shall be delivered in containers plainly marked with the manufacturer's name or trademark product name, LOT number and date of expiration.

932-1.2.6-5 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 Materials:

932-1.3.1 Low Modulus Silicone Sealants: Silicone sealant shall be furnished in a one part or pre-measured two part formulation meeting the requirements specified herein. ~~Manufacturers or distributors seeking approval of Low Modulus Silicone Sealants Types A, B and C 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.

Do not use Low Modulus Silicone Sealants Types A, B or C for bridge expansion joints.

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 asphalt concrete shoulders (including asphalt-asphalt joints). Tooling is not normally required.

Type D - An ultra-low modulus, self-leveling silicone formulation, cold-applied, rapid-cure, used to seal expansion joints that experience both thermal and/or vertical movements. The material must cure by chemical reaction and not by evaporation of solvent or fluxing of harder particles. Tooling shall not be required. Use according to Design Standards, Index ~~number~~-No. 21110.

932-1.3.2 Physical Requirements:

<p>SILICON E SEALAN T TYPESilic one Sealant Type</p>	Test Method	Type A	Type B	Type C	Type D
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SILICON E SEALANT TYPE	Test Method	Type A	Type B	Type C	Type D
<i>Silicone Sealant Type</i>					
<i>Flow</i>	<i>ASTM D 5893</i>	<i>No Flow</i>			
<i>Flow Slump</i> (maximum)	MIL S 8802 <i>ASTM D 2202</i>	0.3 inches			
Extrusion rate (minimum)	MIL S 8802 <i>ASTM C 1183, Procedure A</i>	1.25-4.2 g/s <i>20 ml/min</i>	1.7-11.0 g <i>20 ml/min/s</i>	4.58-9.2 g/s <i>20 ml/min</i>	3.3-9.2 g/s <i>20 ml/min</i>
Tack-free time at 77 ± 3°F and 45 to 55% Relative Humidity	MIL S 8802 <i>ASTM C 679</i>	20-75 <i>90 minutes maximum</i>	120 <i>180 minutes, maximum</i>	60- minutes, maximum	30 - 60 minutes
Specific gravity	ASTM D 792, Method A	1.1 to 1.515	1.10 to 1.40	1.26 to 1.34	1.26 to 1.34
Durometer hardness, Shore A (Cured seven days at 77 ± 3°F and 50 ± 5% Relative Humidity)	ASTM D 2240	10-25			
Durometer hardness, Shore 00 (Cured 21 days at 77 ± 3°F and 50 ± 5% Relative Humidity)	ASTM D 2240		40-80	20-80	

SILICON E SEALANT TYPE <i>Silicone Sealant Type</i>	Test Method	Type A	Type B	Type C	Type D
Tensile stress (maximum) at 150% elongation	ASTM D 412 (Die C)	45 psi	40 psi	15 psi	
Elongation (Cured seven days at 77 ± 3°F and 50 ± 5% Relative Humidity)	ASTM D 412 (Die C)	800% minimum			600% minimum
Elongation (Cured 21 days at 77 ± 3°F and 50 ± 5% Relative Humidity)	ASTM D 412- (Die C)		800% minimum	1400% minimum	
Ozone and Ultraviolet Resistance	ASTM C 793	No chalking, cracking or bond loss after 5,000 hours, minimum.			
Bond to concrete mortar briquets (primed if required) (Cured seven days at 77 ± 3°F and 50 ± 5% Relative Humidity)	AASHTO T-132	50 psi minimum			

SILICON E SEALANT TYPE <i>Silicone Sealant Type</i>	Test Method	Type A	Type B	Type C	Type D
Bond to concrete briquets (Cured 21 days at 77 ± 3°F and 50 ± 5% Relative Humidity)	AASHTO T-132		40 psi minimum	35 psi minimum (includes bond to asphalt)	
Movement Capability	ASTM C 719	No adhesive or cohesive failure and adhesion, 10 cycles at -50 to +100%			No adhesive or cohesive failure and adhesion, 10 cycles at +100/-50 % (joints 2" wide)

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 *±plus or minus* 5°F, sawed in half and bonded together with a thin section of sealant. After cure of sealant, briquets shall be tested in accordance with AASHTO T-132.

932-1.3.3 Field Cure: ~~6~~*Six*-inch 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 sample width shall not apply. A minimum hardness of 7.0 is required as evidence of adequate cure.

932-1.3.4 Qualified Products List: The low modulus silicone sealant used shall be one of the products listed on the Department's Qualified Products List. Manufacturers seeking evaluation of their products shall submit product datasheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, an infrared identification curve (2.5 to 15 μm) and a QPL application in accordance with Section 6. Information on the QPL application must identify the sealant type.

932-1.3.5 Identification 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.*

932-1.3.5-6 Primer: When required by the manufacturer's product, a primer shall be used.

The manufacturer shall perform 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.

932-1.3.67 Backer Rod and Tape Bond Breakers: Backer rods and tape shall be compatible with the joint sealant and approved by the sealant manufacturer. No bond or reaction shall occur between the rod and the sealant.

932-1.3.78 Installation: Installation, material selection, joint dimensions, bond breaker suitability (by type and project) shall be in agreement with the requirements of Design Standards, Index Nos. 305 and 21110. 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.

Type D Silicone sealant shall be placed when the ambient temperature is rising and is between 55°F and 85°F and the temperature is expected to rise for the next three hours minimum to provide to adequate joint opening and compression of the sealant during curing.

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

A tolerance in cross-sectional height at midpoint of *-minus* 1/16 to *+plus* 3/16 inch 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 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 of pavement, not to exceed 500 feet.

If the average of the specimens is out of tolerance, the Contractor shall remove and replace the entire 500 feet section at no additional expense to the Department.

Installation tolerance shall be verified at 1,000 feet intervals.

932-1.4 Pre-cured Silicone Sealant:

932-1.4.1 General: Pre-cured silicone sealants are intended for sealing vertical joints on concrete surfaces. Type V1 sealant is intended for contraction joints or joints with movements less than 1/4 inch. Type V2 sealant is intended for expansion

joints not exceeding 200% of the nominal joint opening. Type V2 sealant may be substituted for Type V1 sealant. The joint sealant must be listed on the Department's Qualified Products List (QPL).

932-1.4.2 Physical Requirements: Sealant material shall be a nominal 1/16 inch thick, available in standard widths from 1 inch to 6 inches, colored to match the finish surface coating of the concrete, and meet the following minimum testing requirements:

TEST PROPERTY DESCRIPTION	TEST METHOD	TYPE V1	TYPE V2
Minimum Movement, Cohesion/Adhesion	ASTM C 1523	100%	200%
Dry/Room Temperature Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Water Immersion Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Frozen Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Heat Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Artificial Weathering Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Artificial Weathering Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Tear Propagation	ASTM C 1523	NT or PT (No Tear or Partial/Knotty Tear)	NT or PT (No Tear or Partial/Knotty Tear)
Ultimate Elongation	ASTM D 412	250%	500%

932-1.4.3 Qualified Products List: Manufacturers seeking evaluation of their product shall submit an application in accordance with Section- 6. Applications must include test results, an infrared identification curve (2.5 to 15 μm), and a product data sheet with the recommended adhesive and installation requirements.

932-1.5 Compression Seals and Adhesive Lubricant

932-1.5.1 Preformed Elastomeric Compression Seals: Preformed Elastomeric Compression Seals shall meet the requirements of ASTM D 2628 except that immersion oil IRM 903 may be substituted for Oil No. 3 in the Oil Swell test procedure.

932-1.5.2 Compression Seal Adhesive Lubricant: Compression Seal Adhesive Lubricant shall meet the requirements of ASTM D 4070. The material shall be fluid from 5° to 120°F (-15° to 49°C).

932-1.5.3 Certification: The manufacturer shall provide a certified test report for each lot of material furnished to each project along with a statement certifying that the material conforms to this specification and identifying the project number and manufacturer's lot number.

932-1.5.4 Verification Samples: Provide verification samples in accordance with Section 6.

**NONMETALLIC ACCESSORY MATERIALS FOR CONCRETE PAVEMENT
AND CONCRETE STRUCTURES – JOINT MATERIALS.**

(REV 6-15-11)

ARTICLE 932-1 (Pages 878 - 883) is deleted and the following substituted:

932-1 Joint Materials.

932-1.1 Prefomed Joint Filler for Pavement and Structures: Prefomed 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 for the asphalt content) is acceptable provided they contain minimums of 0.2% zinc borate as a preservative and 1.5% waterproofing wax. For AASHTO M-153, unless a particular type is specified, either Type I, Type II or Type III may be used.

Prefomed 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 prefomed joint filler meets the requirements of this Section.

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 asphaltic concrete pavement and portland cement concrete pavement. These materials may also be used to seal joints in portland cement concrete bridges and other structures.

932-1.2.2 Material: The joint sealant shall be composed of a mixture of materials, typically but not limited to bituminous based, that will melt when heated for application and then solidify to form a resilient and adhesive compound capable of sealing joints in portland cement concrete and/or asphaltic concrete against the infiltration of moisture and foreign materials throughout normal pavement conditions and at ambient temperatures. The manufacturer shall have the option of formulating the material according to their Specifications. However, the requirements delineated in this Specification shall apply regardless of the type of formulation used. The material shall cure sufficiently to not flow from the joint or be picked up by vehicle tires after 3 hours at 77°F. The material shall be capable of a uniform application consistency suitable for filling joints without the inclusion of large air holes or discontinuities and without damage to the material.

Materials for pavement joints shall be tested according to ASTM D 5329.

**932-1.2.2.1 Physical Requirements of Joint Sealants for
Portland Cement Concrete Only:**

Parameter	Limits
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Pour Point	At least 20°F lower than the safe heating temperature as stated by the manufacturer.
Cone-Penetration, Non-immersed at 77°F, 150 g, 5 s	Less than or equal to 90 mm
Flow at 140°F, 5 h	Less than or equal to 5.0 mm
Bond, Non-immersed, 0°F for 5 cycles*	No cracking, separation, or opening that at any point is over 1/4 inch deep, in the sealant or between the sealant and the substrate.
*The depth of a crack, separation or opening shall be measured perpendicular to the side of the sealant showing the defect. At least two test samples in a group of three representing a given sample of sealant shall meet this requirement.	

932-1.2.2.2 Physical Requirements of Joint Sealants for Portland Cement Concrete and/or Asphaltic Concrete:

Parameters	Limits
Pour Point	At least 20° lower than the safe heating temperature as stated by the manufacturer.
Cone-Penetration, Non-immersed at 77°F, 150 g, 5 s	Less than or equal to 90 mm
Flow at 140°F, 5 h	Less than or equal to 3.0 mm
Bond, Non-immersed, -20°F for 3 cycles, 50% extension*	No cracking, separation, or opening that at any point is over 1/4 inch deep, in the sealant or between the sealant and the substrate.
Resilience at 77°F	Recovery greater than or equal to 60%
Asphaltic Concrete Compatibility at 140°F	No failure in adhesion, formation of an oily exudates at the interface between the sealant and the asphaltic concrete, or softening or other deleterious effects on the asphaltic concrete or sealant.
*The depth of a crack, separation or opening shall be measured perpendicular to the side of the sealant showing the defect. At least two test samples in a group of three representing a given sample of sealant shall meet this requirement.	

932-1.2.3 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 products shall submit product datasheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, and a QPL application in accordance with Section 6. Information on the QPL application must identify the sealant type.

932-1.2.4 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.

932-1.2.5 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 Materials:

932-1.3.1 Low Modulus Silicone Sealants: Silicone sealant shall be furnished in a one part or pre-measured two part formulation meeting the requirements specified herein.

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.

Do not use Low Modulus Silicone Sealants Types A, B or C for bridge expansion joints.

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 asphalt concrete shoulders (including asphalt-asphalt joints). Tooling is not normally required.

Type D - An ultra-low modulus, self-leveling silicone formulation, cold-applied, rapid-cure, used to seal expansion joints that experience both thermal and/or vertical movements. The material must cure by chemical reaction and not by evaporation of solvent or fluxing of harder particles. Tooling shall not be required. Use according to Design Standards, Index No. 21110.

932-1.3.2 Physical Requirements:

Silicone Sealant Type	Test Method	Type A	Type B	Type C	Type D
Flow	ASTM D 5893	No Flow			
Slump (maximum)	ASTM D 2202	0.3 inches			
Extrusion rate (minimum)	ASTM C 1183, Procedure A	20 ml/min	20 ml/min	20 ml/min	20 ml/min
Tack-free time at 77 ± 3°F and 45 to 55% Relative Humidity	ASTM C 679	90 minutes maximum	180 minutes, maximum	60 minutes, maximum	30 - 60 minutes
Specific gravity	ASTM D 792, Method A	1.1 to 1.515	1.10 to 1.40	1.26 to 1.34	1.26 to 1.34

Silicone Sealant Type	Test Method	Type A	Type B	Type C	Type D
Durometer hardness, Shore A (Cured seven days at $77 \pm 3^\circ\text{F}$ and $50 \pm 5\%$ Relative Humidity)	ASTM D 2240	10-25			
Durometer hardness, Shore 00 (Cured 21 days at $77 \pm 3^\circ\text{F}$ and $50 \pm 5\%$ Relative Humidity)	ASTM D 2240		40-80	20-80	
Tensile stress (maximum) at 150% elongation	ASTM D 412 (Die C)	45 psi	40 psi	15 psi	
Elongation (Cured seven days at $77 \pm 3^\circ\text{F}$ and $50 \pm 5\%$ Relative Humidity)	ASTM D 412 (Die C)	800% minimum			600% minimum
Elongation (Cured 21 days at $77 \pm 3^\circ\text{F}$ and $50 \pm 5\%$ Relative Humidity)	ASTM D 412 (Die C)		800% minimum	1400% minimum	
Ozone and Ultraviolet Resistance	ASTM C 793	No chalking, cracking or bond loss after 5,000 hours, minimum.			
Bond to concrete mortar briquets (primed if required) (Cured seven days at $77 \pm 3^\circ\text{F}$ and $50 \pm 5\%$ Relative Humidity)	AASHTO T-132	50 psi minimum			

Silicone Sealant Type	Test Method	Type A	Type B	Type C	Type D
Bond to concrete briquets (Cured 21 days at 77 ± 3°F and 50 ± 5% Relative Humidity)	AASHTO T-132		40 psi minimum	35 psi minimum (includes bond to asphalt)	
Movement Capability	ASTM C 719	No adhesive or cohesive failure and adhesion, 10 cycles at -50 to +100%			No adhesive or cohesive failure and adhesion, 10 cycles at +100/-50 % (joints 2" wide)

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 plus or minus 5°F, sawed in half and bonded together with a thin section of sealant. After cure of sealant, briquets shall be tested in accordance with AASHTO T-132.

932-1.3.3 Field Cure: Six-inch 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 sample width shall not apply. A minimum hardness of 7.0 is required as evidence of adequate cure.

932-1.3.4 Qualified Products List: The low modulus silicone sealant used shall be one of the products listed on the Department's Qualified Products List. Manufacturers seeking evaluation of their products shall submit product datasheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, an infrared identification curve (2.5 to 15 μm) and a QPL application in accordance with Section 6. Information on the QPL application must identify the sealant type.

932-1.3.5 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.

932-1.3.6 Primer: When required by the manufacturer's product, a primer shall be used.

The manufacturer shall perform 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.

932-1.3.7 Backer Rod and Tape Bond Breakers: Backer rods and tape shall be compatible with the joint sealant and approved by the sealant manufacturer. No bond or reaction shall occur between the rod and the sealant.

932-1.3.8 Installation: Installation, material selection, joint dimensions, bond breaker suitability (by type and project) shall be in agreement with the requirements of Design Standards, Index Nos. 305 and 21110. 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.

Type D Silicone sealant shall be placed when the ambient temperature is rising and is between 55°F and 85°F and the temperature is expected to rise for the next three hours minimum to provide to adequate joint opening and compression of the sealant during curing.

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

A tolerance in cross-sectional height at midpoint of minus 1/16 to plus 3/16 inch 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 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 of pavement, not to exceed 500 feet.

If the average of the specimens is out of tolerance, the Contractor shall remove and replace the entire 500 feet section at no additional expense to the Department.

Installation tolerance shall be verified at 1,000 feet intervals.

932-1.4 Pre-cured Silicone Sealant:

932-1.4.1 General: Pre-cured silicone sealants are intended for sealing vertical joints on concrete surfaces. Type V1 sealant is intended for contraction joints or joints with movements less than 1/4 inch. Type V2 sealant is intended for expansion joints not exceeding 200% of the nominal joint opening. Type V2 sealant may be substituted for Type V1 sealant. The joint sealant must be listed on the Department's Qualified Products List (QPL).

932-1.4.2 Physical Requirements: Sealant material shall be a nominal 1/16 inch thick, available in standard widths from 1 inch to 6 inches, colored to match the finish surface coating of the concrete, and meet the following minimum testing requirements:

TEST PROPERTY DESCRIPTION	TEST METHOD	TYPE V1	TYPE V2
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TEST PROPERTY DESCRIPTION	TEST METHOD	TYPE V1	TYPE V2
Minimum Movement, Cohesion/Adhesion	ASTM C 1523	100%	200%
Dry/Room Temperature Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Water Immersion Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Frozen Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Heat Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Artificial Weathering Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Tear Propagation	ASTM C 1523	NT or PT (No Tear or Partial/Knotty Tear)	NT or PT (No Tear or Partial/Knotty Tear)
Ultimate Elongation	ASTM D 412	250%	500%

932-1.4.3 Qualified Products List: Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6. Applications must include test results, an infrared identification curve (2.5 to 15 μm), and a product data sheet with the recommended adhesive and installation requirements.

932-1.5 Compression Seals and Adhesive Lubricant

932-1.5.1 Preformed Elastomeric Compression Seals: Preformed Elastomeric Compression Seals shall meet the requirements of ASTM D 2628 except that immersion oil IRM 903 may be substituted for Oil No. 3 in the Oil Swell test procedure.

932-1.5.2 Compression Seal Adhesive Lubricant: Compression Seal Adhesive Lubricant shall meet the requirements of ASTM D 4070. The material shall be fluid from 5° to 120°F (-15° to 49°C).

932-1.5.3 Certification: The manufacturer shall provide a certified test report for each lot of material furnished to each project along with a statement certifying that the material conforms to this specification and identifying the project number and manufacturer's lot number.

932-1.5.4 Verification Samples: Provide verification samples in accordance with Section 6.