926 EPOXY COMPOUNDS
(REV 5-13-19) (FA 7-15-19) (1-20)

SECTION 926 is deleted and the following substituted:

926-1 Types of Compounds.

Epoxy resin based compounds for application to portland cement concrete, bituminous cement concrete, metals and other type surfaces shall be applicable for the following types as designated. Products may only be used for applications recommended by the manufacturer.

Type	Description
AB*	An epoxy resin, for bonding fresh or hardened concrete to hardened concrete and constructing doweled splices in precast prestressed concrete piles.
E*	A fluid epoxy for crack injection in the repair of old structures.
F F-1* F-2**	An epoxy for repairing spalled areas on concrete bridge structures with these subtypes: A non-sagging gel type for vertical surfaces. A pourable type for repairs where forms are to be used.
H**	An epoxy for structural bonding where asphalt overlays are to be in contact with the hardened compound.
K*	An epoxy for underwater sealing of the bottom of the jacket of an integral pile jacket system.
M***	A coal tar epoxy coating for steel sheet piles and H piles (water immersion) and hot applied coal tar epoxy tape.
PSE*	A two-part epoxy system to match the cast faces of joints between precast segmental concrete superstructure and/or substructure segments.
Q*	An epoxy for use in post tensioning anchorage protection systems.

*Accepted by APL
**Accepted by certified test report
***Accepted by certification

926-2 Epoxy Design Requirements.

926-2.1 General: All types of compounds, except for Type M, shall be thermosetting containing no volatile solvent, and be pure reactive material. All types of compounds except for Type M shall have simple mix ratios of one to one, two to one, or shall be supplied in pre-proportioned containers in which all the contents are to be mixed.

All types of compounds shall be labeled with the manufacturer's name, brand name, component type (resin, hardener or filler), mix ratio, mixing directions, date manufactured, shelf life, and the manufacturer's lot number. Potential hazards shall be stated on each package in accordance with the Federal Hazardous Products Labeling Act.

Certain terms used in this specification shall have these meanings:

low modulus - the stress-strain property for which ultimate tensile strength is attained at over 10% elongation.

high modulus - the stress-strain property for which ultimate tensile strength is attained at under 6% elongation.

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non-sagging gel - grades of mixed compounds which will not perceptibly flow under their own weight on a vertical surface in the unhardened state.

pourable - grades of mixed compound sufficiently fluid that they (either neat or filled) can be cast into and will take the shape of a mold.

Fillers for mixing mortars and grouts shall be recommended by the manufacturer of the epoxy compound and supplied as packages accompanying the epoxy or premixed.

926-2.2 Approved Product List (APL): All epoxy materials shall be one of the products listed on the Department's Approved Product List (APL) unless an alternative acceptance is identified in this Specification. Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 and identify the epoxy type. Include with the submittal product data sheets, safety data sheets (SDS), and certified test reports from an independent laboratory showing the product meets the requirements of this Section. Manufacturers may submit performance test reports from the National Transportation Product Evaluation Program (NTPEP) as acceptable independent laboratory data.

Upon request, submit product samples to the Department for confirmatory testing and Infrared (IR) analysis.

926-3 Specific Requirements for Type AB Epoxy Compounds.

926-3.1 Mixing and Application: Type AB epoxy compounds are used for bonding fresh or hardened concrete to harden concrete and constructing doweled splices in precast prestressed concrete piles.

926-3.2 Performance Tests: Meet the requirements of ASTM C881 Type IV and V, Class C, when tested at 73° ± 2° F.

926-4 Specific Requirements for Type E Compounds.

Epoxies for crack injection shall meet the requirements of ASTM C881 Type IV compound with these additional requirements:

Viscosity five minutes after mixing	300 to 600 cps at 77°F by ASTM D 2556
Wet bond strength to concrete, minimum	250 psi at seven days by FM 5-518

926-5 Specific Requirements for Type F Compounds.

926-5.1: Repairing Spalled Areas: Epoxies for repairing spalled areas shall meet the requirements in this Section.

926-5.2: Subtype F-1: Subtype F-1 epoxy is used for repairing vertical and other surfaces and shall be a trowelable low modulus, non-sagging gel epoxy compound capable of bonding to wet surfaces with these properties:

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Color	Shall match gray color No. 36622 of FED-STD-595
Consistency	Gel
Maximum sand loading	Recommended by the manufacturer
Elongation in tension minimum	10% by ASTM D 638, seven day cure
Wet bond to Steel and Concrete minimum	250 psi by Florida Test Method FM 5-518

926-5.3: Subtype F-2: Subtype F-2 epoxy is used for filling larger spalls where a form is required to build back to the original surface. Materials shall be a pourable low modulus type compound capable of bonding to wet surfaces with these properties:

Color	Shall match gray color No. 36622 of FED-STD-595-
Maximum sand loading	Recommended by the manufacturer
Elongation in tension, minimum	10% by ASTM D 638, seven day cure
Exotherm	110°F by ASTM D 2471, 1 pint sample
Wet bond strength	250 psi at seven days by FM 5-518

Type F-2 epoxy compounds will be accepted by certified test report. Submit to the Engineer testing from the manufacturer of the product for each LOT of material to be incorporated in the project. The test results will indicate that the material is in conformance with the Specifications, and will include actual values from the required tests. Obtain approval from the Engineer before incorporating material into the project.

926-6 Specific Requirements for Type H Compounds.

Type H epoxies for structural bonding where bituminous pavement overlays will come in contact with the hardened compound shall meet the requirements for Types AB compounds above. Submit from the manufacturer test data showing that cutback and emulsified asphalts, asphalt cement, and bituminous mixes shall bond to but not soften or otherwise damage the epoxy after a curing period of four days.

Type H epoxy compounds will be accepted by certified test report. Submit to the Engineer testing from the manufacturer of the product for each LOT of material to be incorporated in the project. The test results will indicate that the material is in conformance with the Specifications and will include actual values from the required tests. Obtain approval from the Engineer before incorporating material into the project.

926-7 Specific Requirements for Type K Compounds.

Type K epoxies are used for sealing the bottom of integral pile jackets in the repair of concrete piles. These epoxies will be extended with the aggregate supplied by the manufacturer. The epoxy shall be factory pre-proportioned including factory supplied aggregate and meet the following requirements:

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Compressive strength at seven days, minimum by ASTM C 579B	4,500 psi
Bond Strength by FM 5-518	
to wet concrete, minimum	250 psi
to wet pile jacket, minimum	150 psi
Viscosity of mixed epoxy component at 77°F, five minutes by ASTM D 2556	1,000-2,000 cps

The epoxy shall be capable of flowing through water in the void area of the jacket and hardening under water so as to provide a water tight seal of the depth indicated in the Plans or approved shop drawings and to maintain this seal during subsequent construction steps.

926-8 Specific Requirements for Type M Compounds.

Type M Coal Tar epoxy coatings for steel sheet and H piles used in bridges, fender systems and other structures subject to immersion in water shall comply with the requirements of SSPC Paint 16 with Type 1 pitch. Application of the epoxy coating shall meet the requirements of Section 560 for a coal tar epoxy coating.

Hot applied coal tar epoxy tape used to protect tie back rods on sheet pile walls and bulkheads shall comply with the requirements of American Water Works Association standard C203. Application shall be according to the manufacturers published recommendations.

Submit to the Engineer a manufacturer certification, confirming that the coal tar epoxy meets the requirements of this Section. The certification shall conform to the requirements of Section 6. Do not incorporate these materials into the project until the Engineer has accepted and approved the certification for the material. Submit such certification for each LOT of material delivered to the project. In each certification, identify the serial or LOT numbers of the containers certified.

926-9 Specific Requirements for Type PSE Epoxy Compounds.

Precast Segmental Epoxy (PSE) compounds are used for match-cast joints between precast concrete segments. Normal set PSE shall remain workable for a short open time (about one hour) and meet the requirements of ASTM C881, Type VI Grade 3. Slow set PSE shall remain workable over an extended open time (about eight hours), meet the requirements of ASTM C881, Type VII Grade 3, and have a compressive yield strength of 6,000 psi at 14 days.

PSE compounds shall be factory pre-proportioned and formulated to provide application temperature ranges which are suitable for the erection of match cast segments with substrate temperatures between 40°F and 105°F with a minimum of at least two, but preferably three, formulations dividing the range into approximately equal subranges which overlap by at least 5ºF.

926-10 Specific Requirements for Type Q Compounds.

Type Q epoxy compounds are used to protect the anchorages of post-tensioning tendons or bars and other uses indicated in the Plans. The material shall produce a low

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exothermic reaction and have flow and fill characteristics suitable for machine base plate applications. The material shall be factory pre-proportioned including factory supplied aggregate. Mix with the full aggregate loading unless the use of less aggregate is approved by the Engineer.

The epoxy grout plus aggregate mix shall meet or exceed the specified physical properties stated herein as determined by the following standard ASTM test methods.

Property	Test Value	Test Method
Compressive Strength at 7 day Cure at 77°F	> 10,000 psi	ASTM C 579B
Tensile Strength at 7 days, Cure at 77ºF	> 2,100 psi	ASTM C 307
Flexural Strength at 7days Cure at 77ºF	> 3,600 psi	ASTM C 580
Modulus of Elasticity 7 days Cure at 77ºF	< 2,100,000 psi	ASTM C 580
Coefficient of Thermal Expansion at 74° to 210°F	< 20 x 10^{-6} in/in/ºF	ASTM C 531
Peak Exotherm, Specimen 12 x 12 x 3 in.	< 150ºF	ASTM D 2471
Slant Shear at 7 days (Bond Strength to Concrete)	> 3000 psi	FM 5-587
Thermal Compatibility	90% of control	FM 5-609
Linear Shrinkage at 7 days	0.025%	ASTM C 531
Flowability and Bearing Area	90% Contact area	ASTM C 1339
Gel Time, Specimen 12 x 12 x 3 in.	< 4:00 (hr.)	ASTM D 2471