



Florida Department of Transportation

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June 17, 2008

Dr. Leslie McCarthy, PhD, P.E.
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section 926
Proposed Specification: 9260000 Epoxy Compounds

Dear Dr. McCarthy:

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

Michael Bergin and Paul Vinik of the State Materials Office proposed this change to delete epoxies no longer used by the Department and to include test methods for evaluation of Types A and B.

Please review and transmit your comments, if any, within four weeks. Comments should be sent via Email to ST986RP 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 414-4110.

Sincerely,

Signature on File

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

RP/ft
Attachment

cc: Gregory Jones, General Counsel
Florida Transportation Builders' Assoc.
State Construction Engineer
Marvin Williams, Federal Highway Administration

EPOXY COMPOUNDS.
(REV ~~1-1018-6-11-0808~~)

SECTION 926 (Pages 796 - 803) is deleted and the following substituted:

SECTION 926
EPOXY COMPOUNDS

926-1 Types of Compounds.

Epoxy resin compounds for application to portland cement concrete, bituminous cement concrete, metals and other type surfaces shall be two-component systems of the applicable of the following types as designated.

| Type | Description |
|--------------|--|
| A | An epoxy resin, for bonding fresh concrete to hardened concrete. |
| B | An epoxy resin adhesive, for bonding hardened concrete to hardened concrete and constructing doweled splices in precast prestressed concrete piles. |
| C | An epoxy resin adhesive, for bonding traffic markers to hardened concrete and to asphalt concrete. |
| D | A coal tar, modified epoxy resin for application as a skid-resistant or protective overlay for cement concrete. |
| E | A fluid epoxy for crack injection in the repair of old structures. |
| F | An epoxy for repairing spalled areas on concrete bridge structures with these subtypes: |
| F-1 | A non sagging gel type for vertical surfaces |
| F-2 | A pourable type for repairs where forms are to be used. |
| G | An epoxy for rebuilding expansion joints and associated wearing surfaces. |
| H | An epoxy for structural bonding where asphalt overlays are to be in contact with the hardened compound. |
| I | An epoxy for filling small holes in concrete such as lifting bolt cut-outs on beams, etc. |
| J | An epoxy for installing rebar and anchor bolts into hardened concrete. |
| K | An epoxy for underwater sealing of the bottom of the jacket of an integral pile jacket system. |
| L | An epoxy for coating the interior of sewage disposal tanks. |
| M | An A coal tar epoxy for coating for bulkhead sheet piles steel sheet piles and H piling piles for fender systems -(water immersion). |
| N | An epoxy for preparing mortars and concrete for patching portland cement concrete pavement. |
| O | An epoxy coating system consisting of a penetrant and a surface coating to be used singly or in combination for the protection of concrete surfaces, both new and repaired. |
| P | An epoxy for bonding metals |
| Q | An epoxy for use in post tensioning anchorage protection systems. |
| <i>ST</i> | <i>Hot applied coal tar epoxy tape</i> |

926-2 Epoxy Design Requirements.

926-2.1 General: All types of compounds except ~~D~~, L, *and* M, ~~and~~ O shall contain no volatile solvent.

All types of compounds except ~~C~~, F, J, L, M, *and* N ~~and~~ O shall be basically pure reactive material with a maximum ash content of 2%.

All types shall have simple mix ratios of one to one or two to one or shall be supplied in pre-measured containers in which all of the contents of both packages are to be mixed.

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.

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.

926-2.2 Qualified Products List: All epoxy materials shall be one of the products listed on the Department's Qualified Products List. Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

Products may only be used for applications recommended by the manufacturer.

926-2.3 Certification: The Contractor shall provide the Engineer with certification from the manufacturer of the epoxy, confirming that the requirements of this Section are met. The certification shall conform to the requirements of Section 6. Each certification shall cover only one batch of epoxy materials.

926-3 Specific Requirements for Types A and B Compounds.

926-3.1 Mixing and Application: Types A and B epoxy compounds (for bonding fresh concrete to hardened concrete or bonding precast concrete parts) shall be mixed, applied, and cured in accordance with the manufacturer's directions, or as might be directed otherwise by the Engineer.

Epoxy compounds shall be used only under conditions which are compatible with the material being applied in accordance with the specific directions of the manufacturer.

926-3.2 Performance Tests:

(a) ~~For Epoxy Bonding Compounds: The performance test, upon which the acceptance of epoxy bonding compounds is based, is described below. Test specimens shall be cured at a temperature of $73 \pm 3^{\circ}\text{F}$. The epoxy compounds shall be tested for composite cylinder shear (diagonal shear) as specified below. Epoxy Bonding Compounds shall be prepared and tested in accordance with FM 3-C882.~~

~~The test specimen of concrete shall be prepared in a 3 by 6 inch mold. The first portion of the test specimen may be formed by sawing a full size 3 by 6 inch cylinder on a 45-degree slope from the vertical, giving a maximum height of 4 1/4 inches to a minimum height of 1 1/4 inches, or through the use of an elliptical insert of the same dimensions. The concrete shall be cast as described in AASHTO T 23, using Class III Concrete (Florida DOT designation) with Type III Cement. The specimens shall be cured in the standard manner, and for at least four days. At the end of this period the half cylinder on which the epoxy resin is to be applied shall be prepared for bonding by removal of all loose particles and oil film and then coated with a thick~~

coat of the epoxy compound under test. The portion of the cylinder shall then be replaced in the mold and plastic concrete of the same mix as before added to the mold to form the 3 by 6 inch cylinder. Reference test cylinders are prepared with each batch of concrete.

~~After the composite test cylinder has cured for a 3-day period in a moist cabinet, the compressive strength is determined. This strength is compared to the strength of the weaker of the two concretes from which the test cylinder was made. If the~~*The* ratio of the compressive strength of the composite cylinder to the compressive strength of the weaker concrete ~~is shall not be~~ less than 0.90, ~~the epoxy compound is rejected.~~

(b) ~~For~~ Epoxy Mortars: Epoxy mortar shall be prepared ~~for testing and tested in accordance with FM 3-C882 using two parts of standard concrete sand and one part of mixed epoxy compound. Three 2 inch cubes shall be cast from the epoxy mortar and cured for three days prior to testing. The cubes shall be tested in direct compression.~~ The average compressive strength of the three test specimens shall be at least 5,000 psi.

~~The molds for epoxy mortar test specimens and compressive loading shall be in accordance with AASHTO T 106.~~

926-4 Specific Requirements for Type C Compounds:

~~Epoxy adhesives for pavement markers will be approved on the basis of satisfactory performance in field tests. If, during a one year period, more than 2% of the markers in a test site are displaced due to failure of the adhesive, the adhesive will not be considered acceptable.~~

926-5 Specific Requirements for Type D Compounds:

~~These compounds shall meet the requirements of AASHTO M 200.~~

926-6-4 Specific Requirements for Type E Compounds.

Epoxies for crack injection shall meet the Specification for Type B compound with these additional requirements:

| | |
|--|--|
| Viscosity five minutes after mixing | 300 to 600 cps at 77°F by ASTM D 2393 |
| Wet bond strength to concrete, minimum | 250 psi at seven days by Florida Method FM 5-518 |

926-7-5 Specific Requirements for Type F Compounds.

Epoxies for repairing spalled areas shall meet these requirements:

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

| | |
|--|---|
| Color | Shall match gray color No. 36622 of Federal Standard No. 595a |
| Viscosity | Gel |
| Maximum sand loading | 2.25 parts sand to one part mixed epoxy by volume |
| 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 |

Subtype F-2 for filling larger spalls where a form is required to build back to the original surface 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 Federal Standard No. 595a |
| Maximum sand loading | 2.25 parts sand to one part mixed epoxy by volume |
| 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 Florida Method FM 5-518 |

926-8-6 Specific Requirements for Type G Compounds.

Epoxies for rebuilding expansion joints shall be pourable types which may be mixed with sand and with these requirements for the mix:

| | |
|--|--|
| Compressive strength | |
| at 24 hours, minimum | 4,500 psi |
| at seven days, minimum by the method of 926-3.2(b) | 7,500 psi |
| Bond to wet concrete at seven days by Florida Method FM 5-518 | 250 psi |
| Maximum sand loading | 2.25 parts to one part mixed epoxy by volume |
| Elongation in tension at seven days, ASTM D 638, minimum | 2% |
| Color | Natural |
| Exotherm, maximum by test method ASTM D 2471, 1 pint sample size | 110°F |

926-9-7 Specific Requirements for Type H Compounds.

Epoxies for structural bonding where bituminous pavement overlays will come in contact with the hardened compound shall meet the requirements for Types A and B compounds above and the manufacturer shall provide 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.

926-10-8 Specific Requirements for Type I Compounds.

Epoxies for cosmetic patching of small areas on new concrete structures and components shall be of any non-sagging grade which has a gray color matching that of Shade 36622 of the Federal Standards and which has been demonstrated to the Engineer to bond satisfactorily to the concrete.

926-11-9 Specific Requirements for Type J Compounds.

Epoxies for installing rebar and anchor bolts into the hardened concrete shall meet the requirements of Section 937 and be installed in accordance with Section 416. When the Contract Documents call for the use of Type J, Class I, II, III, IV, epoxy or a Class IV Adhesive Anchor System, use materials meeting the requirements of Section 937, constructed in accordance with

Section 416. Use materials meeting Section 937 to construct doweled splices for prestressed concrete piles.

926-12-10 Specific Requirements for Type K Compounds.

Epoxies for sealing the bottom of integral pile jackets in the repair of concrete piles shall be a type which will harden underwater with these requirements for the sand-epoxy mix:

| | |
|---|---|
| Compressive strength at seven days, minimum by the method described in 926-3.2(b) | 4,500 psi |
| Bond | |
| to wet concrete, minimum | 250 psi |
| to wet pile jacket, minimum (by Florida Method FM 5-518) | 150 psi |
| Maximum sand loading | 2.25 parts to one part mixed epoxy by volume |
| Viscosity of mixed epoxy component at 77°F, five minutes by ASTM D 2393 | 1,000-2,000 cps |

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

926-13-11 Specific Requirements for Type L Compounds.

Epoxies for coating the interior of sewage disposal system tanks shall be of an approved type. Manufacturers shall submit data and a record of previous usage showing satisfactory performance in the protection of concrete from the aggressive effect of sewage for a five year minimum to the ~~Office of Materials and Research~~ *State Materials Office*.

926-14-12 Specific Requirements for Type M Compounds.

Epoxies for coating steel ~~H piling used in fender systems~~ *bulkhead sheet and H piles used in bridges, fender systems and other structures subject to immersion in water* shall comply with the requirements of Corps of Engineers Specification C-200. Products not meeting these requirements may be approved by the ~~Office of Materials and Research~~ *State Materials Office* on the basis of data furnished by the manufacturer documenting equal or superior performance.

Application ~~of the epoxy coating shall be according to the manufacturers published recommendations with the additional requirements that application shall be in two coats of approximate equal thickness and the total dry film thickness measured by a magnetic gauge shall be not less than 16 mils~~ *meet the requirements of Section 560 for a coal tar epoxy coating.*

926-15-13 Specific Requirements for Type N Compounds.

Epoxies for making epoxy mortar or concrete for patching portland cement concrete pavement shall be any of approved products listed at the time of the work. Mix designs for mortar and concrete shall be submitted to the Engineer at the time of the preconstruction conference. Approval shall be by a field demonstration made by the Contractor using the criteria of bond to the pavement, matching color, durability, and absence of excessive surface slicking under traffic flow for acceptance.

The basic approval of new adhesives shall be made by the ~~Office of Materials and Research~~*State Materials Office* using a six months road test with mortar-concrete mix designs recommended by the epoxy manufacturer.

~~926-16 Specific Requirements for Type O Compounds.~~

~~These compounds shall be fluid penetrants or surface coatings to be used singly or in combination for the protection of concrete surfaces.~~

~~The basic approval of these compounds is through an accelerated electrolysis test, Florida Method FM 5-518. Acceptable products shall meet the minimum resistivity requirements at the end of 10 or 50 days test as described in Florida DOT Research Report 79/207. Manufacturers wishing to qualify products shall obtain the special concrete test cylinders from the Corrosion Section, Office of Materials and Research, apply their coating according to their Specifications, and return the cured specimens for test along with technical literature which shall include the dry film thickness specified.~~

~~Materials other than epoxy may be qualified under this type.~~

926-17-14 Specific Requirements for Type Q Compounds.

These epoxy materials are to be used to protect the anchorages of post-tensioning tendons or bars and other uses indicated in the plans. The material shall produce a low exothermic reaction and have flow and fill characteristics suitable for machine base plate applications. The material will be extended with the aggregate supplied by the manufacturer. Mix with the full aggregate loading unless the use of less aggregate is approved by the Engineer.

The material shall be factory pre-proportioned including factory supplied aggregate. Deliver products in original containers with manufacturer's name, date of manufacture, product identification label and batch numbers. Materials must be within the manufacturer's recommended shelf life. Store and condition the product in full compliance with manufacturer's recommendations.

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 Cubes 7 day Cure at 77°F | > 10,000 psi | ASTM C 579B |
| Tensile Strength at 7 days | > 2,100 psi | ASTM C 307 |
| Flexural Strength at 7day Cure at 77°F | > 3,600 psi | ASTM C 580 |
| Modulus of Elasticity 7 day Cure at 77°F | < 2,100,000 psi | ASTM C 580 |
| Coefficient of Thermal Expansion at 74 to 210°F | < 20 x 10 ⁻⁶ in/in/°F | ASTM C 531 |
| Peak Exotherm, Specimen 12 x 12 x 3 in. | < 150°F | ASTM D 2471 |
| Slant Shear at 7 days (Bond Strength to Concrete) | > 3000 psi | ASTM C 882 |

| | | |
|---------------------------------------|------------------|-------------|
| Thermal Compatibility | 5 Cycles Passed | ASTM C 884 |
| 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 |

926-15 Specific Requirements for Type T Tape Compounds~~Hot Applied Coal Tar Epoxy Tape.~~
~~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.

926-18-156 Packaging, Labeling, and Safety.

All containers shall be identified as Component A - contains epoxy resin or Component B - contains hardener, and shall show the type, mixing directions, batch numbers, manufacturer's name, date of packaging, shelf life expiration date and quantity in pounds or gallons. Mix ratios shall be prominently shown on labels. Potential hazards shall be stated on each package in accordance with the Federal Hazardous Products Labeling Act.

926-19-167 Storage.

Epoxy materials, which have been in storage for more than 12 months, will not be accepted for use.

926-20-178 Fillers.

Fillers for mixing mortars and grouts may be as recommended by the manufacturer of the particular epoxy compound and may be supplied as packages accompanying the epoxy or premixed in accordance with approved properties.

If a manufacturer recommends only the gradation of filler, it must be a silica sand commercially available in Florida and shall be a gradation listed in Table I or a specified blend of these gradations.

The silica sands specified in Table I shall be clean, kiln dried, packaged in strong moisture proof bags, contain no more than 0.2% organic trash, and be chloride free.

Fillers shall not be used with these compounds: Types ~~C~~, E, J, L, *and M*, ~~and O~~.

When the fillers specified in Table I are used, the maximum amount shall be 2.25 volumes to one volume of mixed compound.

| TABLE I GRADATION REQUIREMENTS FOR FILLERS FOR USE WITH EPOXY COMPOUNDS | | | | |
|---|--------------------|--------|--------|--------|
| GRADE | | | | |
| | A | B | C* | D** |
| Sieve Opening Size | Required % Passing | | | |
| No. 4 | | | 95-100 | 95-100 |
| No. 6 | | 90-100 | | |
| No. 8 | | | 0-15 | 85-100 |
| No. 16 | | | | 65-97 |
| No. 20 | 80-100 | 0-20 | | |

| TABLE I GRADATION REQUIREMENTS FOR FILLERS FOR USE WITH EPOXY COMPOUNDS | | | | |
|---|--------------------|---|----|-------|
| GRADE | | | | |
| | A | B | C* | D** |
| Sieve Opening Size | Required % Passing | | | |
| No. 30 | 0-40 | | | 25-70 |
| No. 50 | 0-10 | | | 5-35 |
| No. 100 | | | | 0-7 |

*For use only in sections 1 1/2 inches or greater in thickness.
**Same as quartz sand fine aggregate for cement concrete (902-1.3.1).

EPOXY COMPOUNDS.**(REV 6-11-08)**

SECTION 926 (Pages 796 - 803) is deleted and the following substituted:

**SECTION 926
EPOXY COMPOUNDS****926-1 Types of Compounds.**

Epoxy resin compounds for application to portland cement concrete, bituminous cement concrete, metals and other type surfaces shall be two-component systems of the applicable of the following types as designated.

| Type | Description |
|------|---|
| A | An epoxy resin, for bonding fresh concrete to hardened concrete. |
| B | An epoxy resin adhesive, for bonding 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 | An epoxy for repairing spalled areas on concrete bridge structures with these subtypes: |
| F-1 | |
| F-2 | A non sagging gel type for vertical surfaces A pourable type for repairs where forms are to be used. |
| G | An epoxy for rebuilding expansion joints and associated wearing surfaces. |
| H | An epoxy for structural bonding where asphalt overlays are to be in contact with the hardened compound. |
| I | An epoxy for filling small holes in concrete such as lifting bolt cut-outs on beams, etc. |
| J | An epoxy for installing rebar and anchor bolts into hardened concrete. |
| K | An epoxy for underwater sealing of the bottom of the jacket of an integral pile jacket system. |
| L | An epoxy for coating the interior of sewage disposal tanks. |
| M | A coal tar epoxy coating for steel sheet piles and H piles (water immersion). |
| N | An epoxy for preparing mortars and concrete for patching portland cement concrete pavement. |
| P | An epoxy for bonding metals |
| Q | An epoxy for use in post tensioning anchorage protection systems. |
| T | Hot applied coal tar epoxy tape |

926-2 Epoxy Design Requirements.

926-2.1 General: All types of compounds except L, and M shall contain no volatile solvent.

All types of compounds except F, J, L, M, and N shall be basically pure reactive material with a maximum ash content of 2%.

All types shall have simple mix ratios of one to one or two to one or shall be supplied in pre-measured containers in which all of the contents of both packages are to be mixed.

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.

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.

926-2.2 Qualified Products List: All epoxy materials shall be one of the products listed on the Department's Qualified Products List. Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

Products may only be used for applications recommended by the manufacturer.

926-2.3 Certification: The Contractor shall provide the Engineer with certification from the manufacturer of the epoxy, confirming that the requirements of this Section are met. The certification shall conform to the requirements of Section 6. Each certification shall cover only one batch of epoxy materials.

926-3 Specific Requirements for Types A and B Compounds.

926-3.1 Mixing and Application: Types A and B epoxy compounds (for bonding fresh concrete to hardened concrete or bonding precast concrete parts) shall be mixed, applied, and cured in accordance with the manufacturer's directions, or as might be directed otherwise by the Engineer.

Epoxy compounds shall be used only under conditions which are compatible with the material being applied in accordance with the specific directions of the manufacturer.

926-3.2 Performance Tests:

(a) Epoxy Bonding Compounds: Epoxy Bonding Compounds shall be prepared and tested in accordance with FM 3-C882. The ratio of the compressive strength of the composite cylinder to the compressive strength of the weaker concrete shall not be less than 0.90

(b) Epoxy Mortars: Epoxy mortar shall be prepared and tested in accordance with FM 3-C882. The average compressive strength of the three test specimens shall be at least 5,000 psi.

926-4 Specific Requirements for Type E Compounds.

Epoxies for crack injection shall meet the Specification for Type B compound with these additional requirements:

| | |
|--|--|
| Viscosity five minutes after mixing | 300 to 600 cps at 77°F by ASTM D 2393 |
| Wet bond strength to concrete, minimum | 250 psi at seven days by Florida Method FM 5-518 |

926-5 Specific Requirements for Type F Compounds.

Epoxies for repairing spalled areas shall meet these requirements:

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

| | |
|--|---|
| Color | Shall match gray color No. 36622 of Federal Standard No. 595a |
| Viscosity | Gel |
| Maximum sand loading | 2.25 parts sand to one part mixed epoxy by volume |
| 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 |

Subtype F-2 for filling larger spalls where a form is required to build back to the original surface 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 Federal Standard No. 595a |
| Maximum sand loading | 2.25 parts sand to one part mixed epoxy by volume |
| 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 Florida Method FM 5-518 |

926-6 Specific Requirements for Type G Compounds.

Epoxies for rebuilding expansion joints shall be pourable types which may be mixed with sand and with these requirements for the mix:

| | |
|---|--|
| Compressive strength | |
| at 24 hours, minimum | 4,500 psi |
| at seven days, minimum by the method of 926-3.2(b) | 7,500 psi |
| Bond to wet concrete at seven days by Florida Method FM 5-518 | 250 psi |
| Maximum sand loading | 2.25 parts to one part mixed epoxy by volume |
| Elongation in tension at seven days, ASTM D 638, minimum | 2% |
| Color | Natural |

| Compressive strength | |
|---|-------|
| Exotherm, maximum by test method ASTM D 2471, 1 pint sample size | 110°F |

926-7 Specific Requirements for Type H Compounds.

Epoxies for structural bonding where bituminous pavement overlays will come in contact with the hardened compound shall meet the requirements for Types A and B compounds above and the manufacturer shall provide 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.

926-8 Specific Requirements for Type I Compounds.

Epoxies for cosmetic patching of small areas on new concrete structures and components shall be of any non-sagging grade which has a gray color matching that of Shade 36622 of the Federal Standards and which has been demonstrated to the Engineer to bond satisfactorily to the concrete.

926-9 Specific Requirements for Type J Compounds.

Epoxies for installing rebar and anchor bolts into the hardened concrete shall meet the requirements of Section 937 and be installed in accordance with Section 416. When the Contract Documents call for the use of Type J, Class I, II, III, IV, epoxy or a Class IV Adhesive Anchor System, use materials meeting the requirements of Section 937, constructed in accordance with Section 416. Use materials meeting Section 937 to construct doveled splices for prestressed concrete piles.

926-10 Specific Requirements for Type K Compounds.

Epoxies for sealing the bottom of integral pile jackets in the repair of concrete piles shall be a type which will harden underwater with these requirements for the sand-epoxy mix:

| | |
|---|--|
| Compressive strength at seven days, minimum by the method described in 926-3.2(b) | 4,500 psi |
| Bond | |
| to wet concrete, minimum | 250 psi |
| to wet pile jacket, minimum (by Florida Method FM 5-518) | 150 psi |
| Maximum sand loading | 2.25 parts to one part mixed epoxy by volume |
| Viscosity of mixed epoxy component at 77°F, five minutes by ASTM D 2393 | 1,000-2,000 cps |

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

926-11 Specific Requirements for Type L Compounds.

Epoxy for coating the interior of sewage disposal system tanks shall be of an approved type. Manufacturers shall submit data and a record of previous usage showing satisfactory performance in the protection of concrete from the aggressive effect of sewage for a five year minimum to the State Materials Office.

926-12 Specific Requirements for Type M Compounds.

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 Corps of Engineers Specification C-200. Products not meeting these requirements may be approved by the State Materials Office on the basis of data furnished by the manufacturer documenting equal or superior performance.

Application of the epoxy coating shall meet the requirements of Section 560 for a coal tar epoxy coating.

926-13 Specific Requirements for Type N Compounds.

Epoxy adhesives for making epoxy mortar or concrete for patching portland cement concrete pavement shall be any of approved products listed at the time of the work. Mix designs for mortar and concrete shall be submitted to the Engineer at the time of the preconstruction conference. Approval shall be by a field demonstration made by the Contractor using the criteria of bond to the pavement, matching color, durability, and absence of excessive surface slicking under traffic flow for acceptance.

The basic approval of new adhesives shall be made by the State Materials Office using a six months road test with mortar-concrete mix designs recommended by the epoxy manufacturer.

926-14 Specific Requirements for Type Q Compounds.

These epoxy materials are to be used to protect the anchorages of post-tensioning tendons or bars and other uses indicated in the plans. The material shall produce a low exothermic reaction and have flow and fill characteristics suitable for machine base plate applications. The material will be extended with the aggregate supplied by the manufacturer. Mix with the full aggregate loading unless the use of less aggregate is approved by the Engineer.

The material shall be factory pre-proportioned including factory supplied aggregate. Deliver products in original containers with manufacturer's name, date of manufacture, product identification label and batch numbers. Materials must be within the manufacturer's recommended shelf life. Store and condition the product in full compliance with manufacturer's recommendations.

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 Cubes 7 day Cure at 77°F | > 10,000 psi | ASTM C 579B |
| Tensile Strength at 7 days | > 2,100 psi | ASTM C 307 |
| Flexural Strength at 7day Cure at 77°F | > 3,600 psi | ASTM C 580 |

| | | |
|--|--------------------------------|------------|
| Modulus of Elasticity 7 day Cure at 77°F | < 2,100,000 psi | ASTM C 580 |
| Coefficient of Thermal Expansion at 74 to 210°F | < 20×10^{-6} in/in/°F | ASTM C 531 |

| | | |
|--|------------------|-------------|
| Peak Exotherm, Specimen 12 x 12 x 3 in. | < 150°F | ASTM D 2471 |
| Slant Shear at 7 days (Bond Strength to Concrete) | > 3000 psi | ASTM C 882 |
| Thermal Compatibility | 5 Cycles Passed | ASTM C 884 |
| 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 |

926-15 Specific Requirements for Type T Tape Compounds.

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.

926-16 Packaging, Labeling, and Safety.

All containers shall be identified as Component A - contains epoxy resin or Component B - contains hardener, and shall show the type, mixing directions, batch numbers, manufacturer's name, date of packaging, shelf life expiration date and quantity in pounds or gallons. Mix ratios shall be prominently shown on labels. Potential hazards shall be stated on each package in accordance with the Federal Hazardous Products Labeling Act.

926-17 Storage.

Epoxy materials, which have been in storage for more than 12 months, will not be accepted for use.

926-18 Fillers.

Fillers for mixing mortars and grouts may be as recommended by the manufacturer of the particular epoxy compound and may be supplied as packages accompanying the epoxy or premixed in accordance with approved properties.

If a manufacturer recommends only the gradation of filler, it must be a silica sand commercially available in Florida and shall be a gradation listed in Table I or a specified blend of these gradations.

The silica sands specified in Table I shall be clean, kiln dried, packaged in strong moisture proof bags, contain no more than 0.2% organic trash, and be chloride free.

Fillers shall not be used with these compounds: Types E, J, L, and M.

When the fillers specified in Table I are used, the maximum amount shall be 2.25 volumes to one volume of mixed compound.

| TABLE I GRADATION REQUIREMENTS FOR FILLERS FOR USE WITH EPOXY COMPOUNDS | | | | |
|---|--------------------|--------|--------|--------|
| GRADE | | | | |
| | A | B | C* | D** |
| Sieve Opening Size | Required % Passing | | | |
| No. 4 | | | 95-100 | 95-100 |
| No. 6 | | 90-100 | | |
| No. 8 | | | 0-15 | 85-100 |
| No. 16 | | | | 65-97 |
| No. 20 | 80-100 | 0-20 | | |
| No. 30 | 0-40 | | | 25-70 |
| No. 50 | 0-10 | | | 5-35 |
| No. 100 | | | | 0-7 |

*For use only in sections 1 1/2 inches or greater in thickness.
 **Same as quartz sand fine aggregate for cement concrete (902-1.3.1).