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Bobby Jindal, Governor
Sherri H. LeBas, P.E., Secretary

March 26, 2015

Mr. Charles W. Bolinger
Division Administrator
Federal Highway Administration

Subject: Steel Fiber Reinforced Concrete Overlay System Certification

Dear Mr. Bolinger:

In accordance with the provisions of 23 CFR 635.411(a), the Louisiana Department of Transportation and Development has determined on the basis of performance and extended service life that a Steel Fiber Reinforced Concrete (SFRC) overlay system consisting of an epoxy based underlayment, epoxy bond coat and a steel fiber reinforced concrete overlay is a necessary proprietary product system to be used for State Project No. H.010498, I-310: Luling Bridge Deck Overlay and Repair.

The epoxy underlayment is composed of EPON 828 epoxy resin and EPI-KURE 3164 curing agent, both manufactured by Hexion Specialty Chemicals, along with Aramid/E-Glass Hybrid Fabric available from VECTORPLY Corporation as product number "KEWM-2808". An epoxy bond coating consisting of EPI-REZ RESIN WD-510 and EPI-CURE Curing Agent 3072, also manufactured by Hexion Specialty Chemicals is to be used between the underlayment and the concrete overlay. The concrete overlay is a Portland cement concrete reinforced with deformed end steel wire fibers meeting ASTM A820, Type I, low carbon wire classification.

The same overlay system system was installed as one of several test sections on the Luling Bridge several years ago as part of study to examine different overlay methodologies for steel orthotropic decks. The performance of the segment of the bridge which received the previously described system was superior to segments receiving other types of overlay. This observed performance necessitates the use of the same materials to ensure similar performance. Furthermore, the epoxy resin cured system used for saturating the dry fibers of the underlayment has very good electrical insulating characteristics, dielectric properties, and chemical resistance to a broad range of chemicals, which will help to protect the steel deck.

In accordance with 23 CFR 635.411(a), the Department is authorized to certify this decision with the following statement:

I, Janice P. Williams, DOTD Chief Engineer of the Louisiana Department of Transportation and Development, do hereby certify that in accordance with the requirements of 23 CFR 635.411 (a)-(2), that the epoxy based underlayment, epoxy bond coat and steel fiber reinforced concrete overlay system, as described previously in this letter, is a necessary proprietary product system that is essential for performance and extended service life.

This certification is for State Project No. H.010498 only. This certification will be posted on the Department's website.

Sincerely,

Janice P. Williams, P.E.
DOTD Chief Engineer

Attachment
System Product Properties
cc: Hector W. Santiago, P.E., FHWA

H.010498**I-310: Luling Bridge Deck Overlay and Repair**

Overlay System Component Properties

**Epoxy Resin Properties
(EPON 828)**

Property	Value
Viscosity@ 77°F (25°C)	110-150
Pounds per Gallon @ 77°F (25°C)	9.7 lbs/gal
Density @ 77°F (25°C)	1.16 g/ml
Physical form	Clear liquid
Vapor pressure @ 170°F (77°C)	0.03 mm Hg
Refractive index @ 77°F (25°C)	1.573
Specific heat	0.5 BTU/lb/°F

**Epoxy Resin Curing Agent Properties
(EPI-KURE 3164)**

Property	Value
Chemical Type	Polyamide Solution
Viscosity@ 77°F (25°C)	70-110
Gel Time @ 77°F (25°C)	49 min
Density	8.2 lb/gal

Mixing Ratio for Epoxy Resin and Curing Agent

Property	Value or Range
Resin	42.4% wt.
Curing Agent	57.6% wt.
Resin to Curing Agent Volume Ratio	1.00:1.61 (+/- 2%)

Composite Underlayment Fabric

0°/90° Woven Twill Double Cloth E-Glass/Aramid Hybrid fabric stitched to a layer of chopped E-Glass mat with a total weight of approximately 35.3 oz/sq.yd.

Fiber Architecture Data

E-Glass 0 °	9.5 oz/sq.yd
Aramid 0 °	4.1 oz/sq.yd
E-Glass 90 °	9.5 oz/sq.yd
Aramid 90 °	4.1 oz/sq.yd
Chopped Mat	8.10 oz/sq.yd

Underlayment Fabric Properties

Property	Value or Range
Fiber Direction	0° - 90°
Base Fabric weight	27.2 oz. / sq. yd.
Mat weight	8.1 oz. / sq. yd.
Total weight	35.3 oz./sq. yd. (approx.)
E-Glass Minimum Strand Tensile Strength (ASTM D2343)	375,000 psi
E-Glass Minimum Interlaminar Dry Shear Strength (ASTM D 2344)	9,620 psi
Aramid Minimum Strand Tensile Strength (ASTM D2343)	525,000 psi
Aramid Minimum Strand Tensile Modulus (ASTM D2343)	18x10 ⁶ psi

Steel Fiber Reinforcement Properties

Conform to ASTM A820, Type I, low carbon, end deformed and characteristic requirements listed below:

Characteristic	Requirement
Length	2.0 inches plus or minus 5 percent
Maximum Diameter	0.039 inches plus or minus 5 percent
Minimum Aspect Ratio L/D	50 plus or minus 5 percent, with an aspect ratio defined as the length of the fiber divided by its diameter
Deformations	End deformed
Surface Condition	Use steel fibers clean and free of rust, oil and deleterious materials.
Configuration	Collated (glued bundles) for ease of mixing are allowed. Round drawn wire and hook-ended for optimal anchorage is required.
Fiber Minimum Ultimate Tensile Strength	150,000 psi
Admixture Dosage	Minimum 84 pounds of steel fiber per cubic yard of mix.
Use steel fibers incorporated into the concrete mix possessing a minimum 28-day ASTM C 1018 Residual Strength Factor R _{10,50} ,	87 percent when the concrete mix is properly cured.