



Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

ANANTH PRASAD, P.E.
SECRETARY

January 7, 2012

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

Re: Office of Design, Specifications
Section **973**
Proposed Specification: **9730000 Structural Plastics.**

Dear Ms. Gourdine:

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

These changes were proposed by Gevin McDaniel of the State Structures Design Office to include a product acceptance criteria alternative other than QPL listing. Wale member size specifications were changed from 10"x10" to a minimum of 10"x10", and other minor changes are made for consistency.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to SP965TT or trey.tillander@dot.state.fl.us.

If you have any questions relating to this specification change, please call me at 414-4140.

Sincerely,

V. Y. "Trey" Tillander, III, P.E.
State Specifications Engineer

TT/cah

Attachment

cc: Florida Transportation Builders' Assoc.
State Construction Engineer

STRUCTURAL PLASTICS.**(REV 11-1-12)**

SECTION 973 (Pages 1107 – 1109) is deleted and the following substituted:

**SECTION 973
STRUCTURAL PLASTICS**

973-1 Description.

This work covers structural plastic components including fiberglass structurally reinforced composite lumber (SCL) and ~~smaller~~ dimensional fiberglass fiber reinforced composite lumber (FFRCL).

973-2 Product Acceptance.

~~Use only products~~ *Use only products may be structural plastics* listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of products *for listing on the QPL* must submit an application in accordance with Section 6 and include independently certified test reports, *and manufacturer's certification* that the material meets the requirements of this Section.

~~In accordance with Section 6, provide manufacturer's certification that the material meets the requirements of this Section.~~ *Structural plastic components used in Contractor-developed custom designs may be used in place of QPL listed products. See Section 471 for the product acceptance criteria for these components. For Contractor-developed custom designs, meet the product acceptance criteria in Section 471.*

973-3 Materials.

Use polyethylene made from recycled post consumer or post industrial thermoplastics. Mix the plastic with appropriate colorants, UV inhibitors, hindered amine light stabilizers and antioxidants so that the resulting product meets the material property requirements specified in Tables 1 and 2. Structural plastic must not corrode, rot, warp, splinter or crack. The skin must be smooth and black in color unless otherwise specified in the Contract Documents. Skin is the surface material exposed to the atmosphere. Core is the material that surrounds and bonds to the fiberglass reinforcing rods. The use of separate materials for skin and core is at the discretion of each manufacturer; however, if a single material is used, that material must meet the requirements for both skin and core.

Manufacture structural plastic as one continuous piece with no joints or splices to the dimensions and tolerances in accordance with Table 3. Interior voids shall not exceed 3/4 inches in diameter. Structural plastic members shall be free of twist and curvature.

Reinforce ~~square 10 inch x 10 inch~~ fiberglass structurally reinforced composite lumber with a minimum of four ~~1 1/2 inch~~ fiberglass reinforcing rods placed in the corners of the section.

Reinforcing rods must be continuous and offer a minimum flexural strength of 70.0 ksi when tested in accordance with ASTM D4476 and a minimum compressive strength of 40.0 ksi when tested in accordance with ASTM D695. Steel reinforcing rods are not permitted.

Reject any sections of structural plastic containing cracks or splits. Also, inspect the ends of the reinforcing rods and reject any sections containing reinforcing rods with voids or cracks.

Add a minimum of 15% (by weight) chopped fiberglass reinforcement to the polyethylene used for fiberglass structurally reinforced composite lumber and a minimum of 15% (by weight) chopped fiberglass reinforcement for smaller dimensional fiberglass fiber reinforced composite lumber. The fiberglass reinforcement may be reduced when other means of controlling cracking are specified with test results which show long term cracking is nonexistent.

Fiberglass structurally reinforced composite lumber must meet the minimum structural properties listed in Table 4.

~~Smaller d~~Dimensional fiberglass fiber reinforced composite lumber must meet the minimum physical properties listed in Table 5.

Density	ASTM D792	Skin	55-63 pcf
Density	ASTM D792	Core	48-63 pcf
Water Absorption	ASTM D570	Skin	2 hrs:<1.0% weight increase 24 hrs:<3.0% weight increase
Brittleness	ASTM D746	Skin	Brittleness temperature to be less than - 40°C
Impact Resistance	ASTM D256 Method A (Izod)	Skin	Greater than 0.55 ft-lbs/in
Hardness	ASTM D2240	Skin	44-75 (Shore D)
Ultraviolet	ASTM D4329 UVA	Skin	500 hours<10% change in Shore D Durometer Hardness
<i>Abrasion</i>	<i>ASTM D 4060</i>	<i>Skin</i>	<i>Weight Loss: <0.02 oz Cycles=10,000 Wheel=CS17 Load=2.2 lb</i>
Chemical Resistance	ASTM D756 or ASTM D543	Skin/Core Sea Water Gasoline No. 2 Diesel	<1.5% weight increase <9.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	Core	Minimum 2200 psi at break <i>min.</i>
Compressive Modulus	ASTM D695	Core	Minimum 40 ksi <i>min.</i>
Static Coefficient of Friction	ASTM D1894	Skin	Maximum 0.25, wet <i>max.</i>
Nail Withdrawal or Screw Withdrawal	ASTM D6117	Skin/Core	Minimum 60 lb (nail) <i>min.</i> Minimum 400 lb (screw) <i>min.</i>

Density	ASTM D792	50-65 pcf
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Table 2 Plastic Material Properties - FFRCL		
Impact Resistance	ASTM D256 Method A (Izod)	Greater than 2.0 ft-lbs/in
Hardness	ASTM D2240	44-75 (Shore D)
Ultraviolet	ASTM D4329 (UVA)	500 hours <10% change in Shore D Durometer Hardness
Chemical Resistance	ASTM D756 or ASTM D543 Sea Water Gasoline No. 2 Diesel	<1.5% weight increase <7.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	Minimum 3000 psi at break <i>min.</i>
Static Coefficient of Friction	ASTM D2394	Minimum 0.25, wet or dry <i>min.</i>
Nail Withdrawal or Screw Withdrawal	ASTM D6117	Minimum 250 lb (nail) <i>min.</i> Minimum 400 lb (screw) <i>min.</i>

Table 3 Dimensions and Tolerances		
Structural Plastic	Dimension	Tolerance
Length	Per order (80 ft Maximum)	0 + <i>minus</i> 0, <i>plus</i> 6 inch
Width – SCL	See Contract Plans	± <i>plus or minus</i> 1/2 inch
Width – FFRCL		± <i>plus or minus</i> 1/4 inch
Height – SCL	See Contract Plans	± <i>plus or minus</i> 1/2 inch
Width – FFRCL		± <i>plus or minus</i> 1/4 inch
Skin Thickness	3/16 inch minimum	n/a
Distance from outer surface to center rebar elements (SCL)	2 inches	± <i>plus or minus</i> 1/2 inch
Straightness (gap, bend or inside while lying on a flat surface)		<1-1/2 inches per 10 feet

Table 4 Minimum Structural Properties for SCL		
Member Size		10 inches x 10 inches <i>min.</i>
Modulus of Elasticity	ASTM D6109	521 ksi <i>min.</i>
Stiffness, E.I.	ASTM D6109	4.05E+08 lb-inch ² <i>min.</i>
Yield Stress in Bending	ASTM D6109	5.3 ksi <i>min.</i>
Weight		30-37 lb/ft

Table 5 Minimum Properties for FFRCL		
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Modulus of Elasticity	ASTM D6109	300,000 psi
Flexural Strength	ASTM D6109	2,500 psi
Compressive Strength	ASTM D6108	2,200 psi
Compressive Strength Perpendicular to grain	ASTM D6108	700 psi

~~The values stated in these tables are the required minimums.~~

STRUCTURAL PLASTICS.**(REV 11-1-12)**

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STRUCTURAL PLASTICS****973-1 Description.**

This work covers structural plastic components including fiberglass structurally reinforced composite lumber (SCL) and dimensional fiberglass fiber reinforced composite lumber (FFRCL).

973-2 Product Acceptance.

Use structural plastics listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of products for listing on the QPL must submit an application in accordance with Section 6 and include independently certified test reports, and manufacturer's certification that the material meets the requirements of this Section.

Structural plastic components used in Contractor-developed custom designs may be used in place of QPL listed products. For Contractor-developed custom designs, meet the product acceptance criteria in Section 471.

973-3 Materials.

Use polyethylene made from recycled post consumer or post industrial thermoplastics. Mix the plastic with appropriate colorants, UV inhibitors, hindered amine light stabilizers and antioxidants so that the resulting product meets the material property requirements specified in Tables 1 and 2. Structural plastic must not corrode, rot, warp, splinter or crack. The skin must be smooth and black in color unless otherwise specified in the Contract Documents. Skin is the surface material exposed to the atmosphere. Core is the material that surrounds and bonds to the fiberglass reinforcing rods. The use of separate materials for skin and core is at the discretion of each manufacturer; however, if a single material is used, that material must meet the requirements for both skin and core.

Manufacture structural plastic as one continuous piece with no joints or splices to the dimensions and tolerances in accordance with Table 3. Interior voids shall not exceed 3/4 inches in diameter. Structural plastic members shall be free of twist and curvature.

Reinforce square fiberglass structurally reinforced composite lumber with a minimum of four fiberglass reinforcing rods placed in the corners of the section.

Reinforcing rods must be continuous and offer a minimum flexural strength of 70.0 ksi when tested in accordance with ASTM D4476 and a minimum compressive strength of 40.0 ksi when tested in accordance with ASTM D695. Steel reinforcing rods are not permitted.

Reject any sections of structural plastic containing cracks or splits. Also, inspect the ends of the reinforcing rods and reject any sections containing reinforcing rods with voids or cracks.

Add a minimum of 15% (by weight) chopped fiberglass reinforcement to the polyethylene used for fiberglass structurally reinforced composite lumber and a minimum

of 15% (by weight) chopped fiberglass reinforcement for smaller dimensional fiberglass fiber reinforced composite lumber. The fiberglass reinforcement may be reduced when other means of controlling cracking are specified with test results which show long term cracking is nonexistent.

Fiberglass structurally reinforced composite lumber must meet the minimum structural properties listed in Table 4.

Dimensional fiberglass fiber reinforced composite lumber must meet the minimum physical properties listed in Table 5.

Property	ASTM Standard	Location	Requirement
Density	ASTM D792	Skin	55-63 pcf
Density	ASTM D792	Core	48-63 pcf
Water Absorption	ASTM D570	Skin	2 hrs:<1.0% weight increase 24 hrs:<3.0% weight increase
Brittleness	ASTM D746	Skin	Brittleness temperature to be less than - 40°C
Impact Resistance	ASTM D256 Method A (Izod)	Skin	Greater than 0.55 ft-lbs/in
Hardness	ASTM D2240	Skin	44-75 (Shore D)
Ultraviolet	ASTM D4329 UVA	Skin	500 hours<10% change in Shore D Durometer Hardness
Abrasion	ASTM D 4060	Skin	Weight Loss: <0.02 oz Cycles=10,000 Wheel=CS17 Load=2.2 lb
Chemical Resistance	ASTM D543	Skin/Core Sea Water Gasoline No. 2 Diesel	<1.5% weight increase < 9.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	Core	2200 psi at break min.
Compressive Modulus	ASTM D695	Core	40 ksi min.
Static Coefficient of Friction	ASTM D1894	Skin	0.25, wet max.
Nail Withdrawal or Screw Withdrawal	ASTM D6117	Skin/Core	60 lb (nail) min. 400 lb (screw) min.

Property	ASTM Standard	Requirement
Density	ASTM D792	50-65 pcf
Impact Resistance	ASTM D256 Method A (Izod)	Greater than 2.0 ft-lbs/in
Hardness	ASTM D2240	44-75 (Shore D)
Ultraviolet	ASTM D4329 (UVA)	500 hours <10% change in Shore D Durometer Hardness

Table 2 Plastic Material Properties - FFRCL		
Chemical Resistance	ASTM D756 or ASTM D543 Sea Water Gasoline No. 2 Diesel	<1.5% weight increase <7.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	3000 psi at break min.
Static Coefficient of Friction	ASTM D2394	0.25, wet or dry min.
Nail Withdrawal or Screw Withdrawal	ASTM D6117	250 lb (nail) min. 400 lb (screw) min.

Table 3 Dimensions and Tolerances		
Structural Plastic	Dimension	Tolerance
Length	Per order (80 ft Maximum)	minus 0, plus 6 inch
Width – SCL Width – FFRCL	See Contract Plans	plus or minus 1/2 inch plus or minus 1/4 inch
Height – SCL Width – FFRCL	See Contract Plans	plus or minus 1/2 inch plus or minus 1/4 inch
Skin Thickness	3/16 inch minimum	n/a
Distance from outer surface to center rebar elements (SCL)	2 inches	plus or minus 1/2 inch
Straightness (gap, bend or inside while lying on a flat surface)		<1-1/2 inches per 10 feet

Table 4 Structural Properties for SCL		
Member Size		10 inches x 10 inches min.
Modulus of Elasticity	ASTM D6109	521 ksi min.
Stiffness, E.I.	ASTM D6109	4.05E+08 lb-inch ² min.
Yield Stress in Bending	ASTM D6109	5.3 ksi min.
Weight		30-37 lb/ft

Table 5 Minimum Properties for FFRCL		
Modulus of Elasticity	ASTM D6109	300,000 psi
Flexural Strength	ASTM D6109	2,500 psi
Compressive Strength	ASTM D6108	2,200 psi
Compressive Strength Perpendicular to grain	ASTM D6108	700 psi