DEVELOPMENTAL SPECIFICATION

FOR

SECTION DEV927UHPC

PREPACKAGED ULTRA-HIGH-PERFORMANCE CONCRETE (UHPC)

FINANCIAL PROJECT ID: 436656-1-52-01

This item has been digitally signed and sealed by Benjamin M. Weaver, P.E. on the date adjacent to the seal. Signature must be verified on any electronic copies.

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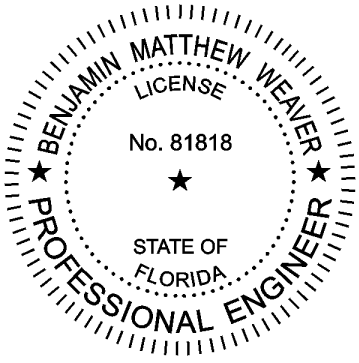

PREPACKAGED ULTRA-HIGH-PERFORMANCE CONCRETE (UHPC)
(REV 4-20-23)

The following new Section is added.

SECTION 927
PREPACKAGED ULTRA-HIGH-PERFORMANCE CONCRETE (UHPC)

927-1 Description.

This Section covers ultra-high-performance concrete (UHPC) products.

927-2 Product Certification.

UHPC Manufacturers must submit product data sheets and certified test reports from an independent laboratory showing that the product meets the requirements of this Section.

Manufacturers seeking evaluation of products for inclusion on the Department's Approved Products List (APL) shall submit an application to the Department and include the documentation identified in 927-3.2. The Department may require material samples for verification testing.

Any change of materials or material sources requires new testing and certification of the conformance of the UHPC with this Specification.

927-3 Materials.

927-3.1 Packaging, Marking and Storage: Deliver product in original, unopened moisture-proof bags with the manufacturer's name, date of manufacture, and clearly marked with the information described below. Store the material in a dry and weather protected enclosure in full compliance with the manufacturer's recommendations. Material must be used within the manufacturer's recommended shelf life.

All containers must be marked with the following information:

1. Packaging date and material expiration date.
2. Weight of each bag and number of bags in each pallet.
3. Storage temperature.
4. Mix components, proportions, yield, and mixing procedure, including the following:

a. Description of the premixed dry materials in each bag.

b. Fibers – the type, diameter, length, and tensile strength of fiber, including the percentage of the mix's dry volume. All fibers reinforcement must comply with the source of supply requirements of Section 6.

c. Admixtures – Indicate if admixtures are part of the premixed component or if they will be delivered in separate bags or containers. Do not use admixtures or additives containing calcium chloride, either in the raw materials or introduced during the manufacturing process.

927-3.2 Product Data Sheet: Provide a product data sheet with the following information:

1. Storage of product components at project site.
2. Mix proportions and yield in cubic yards. For each product, provide a mix design with a maximum allowable water-to-cementitious materials ratio of less than 0.25

3. Ambient and mixture temperatures during mixing, batching, and placement.
4. Batching, mixing, transportation, placement, finishing, and curing.
5. Product properties listed in Tables 927-1 and 927-2
6. The typical fresh properties of UHPC product, including density, flow, working time, and set time of the mix.

Table 927-1: Prepackaged UHPC Properties		
Material Characteristic Description	Test Method	Acceptance Criteria (*)
Temperature of freshly mixed hydraulic cement concrete	ASTM C1064	Specified by the Manufacturer
Flow of UHPC	ASTM C1437(Using Modifications Described in ASTM C1856)	Specified by the Manufacturer
Time of setting of UHPC	ASTM C191 (Using Modifications Described in ASTM C1856)	Specified by the Manufacturer
Concrete Compressive Strength of Cylindrical Concrete Specimens (Non-Heat Treated)	ASTM C39 (using modifications described in ASTM C1856)	≥17,400 psi at 28 days
Tensile strength and relative toughness of cylinders	FM 5-626	For Information Only
Split Cylinder First Cracking Strength	ASTM C496 (Mount LVDTs to the ends of the test cylinder for measuring the first cracking strength.)	≥1,000 psi at 28 days
Flexural Performance of Fiber - Reinforced Concrete (First- Peak Strength)	ASTM C1609 (using modifications described in ASTM C1856)	≥1,200 psi at 28 days
Static Modulus of Elasticity of Concrete in Compression	ASTM C469 (using modifications described in ASTM C1856)	≥6,500,000 psi at 28 days
Length Change of Hardened Concrete	ASTM C157 (using modifications described in ASTM C1856)	≤800 micro-strain at 28 days
(*) For APL approval, the Department may accept values outside of the specified acceptance criteria.		

Table 927-2: UHPC Durability Properties		
Material Characteristic Description	Test Method	Acceptance Criteria (*)
Chloride content	FM 5-516	≤ 0.40 lb/yd^3
Chloride ion permeability	AASHTO T 259 (0.5-inch depth)	< 0.1 lb/yd^3
Scaling Resistance	ASTM C672	Y < 3
Freeze-Thaw Resistance	AASHTO T 161/ASTM C666A (600 cycles)	Relative Dynamic Modulus of Elasticity ≥ 95%
Alkali-Silica Reaction	ASTM C1567	Innocuous (at 28-day Test)
(*) For IPL approval, the Department may accept values outside of the specified acceptance criteria.		