

## SECTION 03240 - FIBROUS REINFORCING

### PART 1 – GENERAL

#### 1.01 RELATED DOCUMENTS

- A. The General Provisions of the contract, including the General Provisions for Construction Projects (2016), Special Provisions, and General Requirements of the Specifications, apply to the work specified in this Section.

#### 1.02 SUMMARY

- A. Section includes synthetic fiber reinforcement for concrete for the following:
  - 1. Roadway Pavement Slabs at the second level of the Ewa and Diamond Head concourse roadways
- B. Related Sections
  - 1. Section 03215 – MICROCOMPOSITE PLAIN AND DEFORMED BARS FOR CONCRETE REINFORCEMENT for concrete reinforcement bars.
  - 2. Section 03300 – STRUCTURAL CONCRETE for cast-in-place roadway pavement slab.

#### 1.03 REFERENCES

- A. ASTM International (ASTM):
  - 1. ASTM C94 - Standard Specification for Ready-Mixed Concrete
  - 2. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete
  - 3. ASTM C1550 - Standard Test Method for Flexural Toughness of Fiber Reinforced Concrete (Using Centrally Loaded Round Panel)
  - 4. ASTM C1579 - Standard Test Method for Evaluating Plastic Shrinkage Cracking of Restrained Fiber Reinforced Concrete (Using a Steel Form Insert)
  - 5. ASTM C1609 - Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete
  - 6. ASTM C1812 - Standard Practice for Design of Journal Bearing Supports to be Used in Fiber Reinforced Concrete Beam Tests

7. ASTM D7508 - Standard Specification for Polyolefin Chopped Strands for Use in Concrete
8. ASTM C 1399 - Standard Test Method For Obtaining Average Residual-Strength Of Fiber-Reinforced Concrete
9. ASTM D 3822 - Standard Test Method For Tensile Properties Of Single Textile Fibers

B. American Concrete Institute (ACI):

1. ACI PRC-544.1 Report on Fiber Reinforced Concrete
2. ACI PRC-544.3 Guide for Specifying, Proportioning, and Production of Fiber-Reinforced Concrete
3. ACI PRC-544.5 Report on the Physical Properties and Durability of Fiber-Reinforced Concrete

C. American National Standards Institute/ Steel Deck Institute (ANSI/SDI):

1. C - 2017 Standard for Composite Steel Floor Deck – Slabs

#### 1.04 DEFINITIONS

- A. Equivalent diameter: Diameter of a circle having an area equal to the average cross-sectional area of a fiber.
- B. Fibrillated: A slit film fiber where sections of the fiber peel away, forming branching fibrils.
- C. Monofilament: Single filament fiber typically cylindrical in cross-section.
- D. Plastic shrinkage: A reduction in volume of concrete prior to its final set.
- E. Synthetic macrofiber: Synthetic fibers with diameters or equivalent diameters greater than 0.012 in. (0.3 mm). These also have longer lengths and are used at higher dosages than synthetic microfibers.
- F. Synthetic microfiber: Synthetic fibers with diameters or equivalent diameters less than 0.012 in. (0.3 mm).

#### 1.05 SUBMITTALS

- A. Submit under provisions of Section 01300 SUBMITTALS

- B. Product Data: Manufacturer's data sheets of fibers to be used.
- C. Manufacturer's Certificate: Certificate showing the conformance of fibers to specified performance requirements.

#### 1.06 QUALITY CONTROL

- A. Provide products from one manufacturer.
- B. Pre-construction trial mixtures using proposed ingredients shall be evaluated to ensure that specified concrete properties are achieved, particularly, the workability of the mixture. This is specifically important when dosages of 5 lb/yd<sup>3</sup> (3 kg/m<sup>3</sup>) or more of the synthetic macrofibers are used. Consult the manufacturer of synthetic macrofibers for details.
- C. A meeting shall be held two weeks prior to placement of fiber reinforced concrete to discuss the Project and materials. Fiber Manufacturer's Representative shall be present at the meeting.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Synthetic fibers shall be delivered to the manufacturer of concrete in a ready-to-use package such as in pre-weighed degradable bags.
- B. User of synthetic fibers shall store the fibers in a dry, covered area free of contamination.
- C. Use of synthetic fibers shall be as recommended by the manufacturer.

### PART 2 – PRODUCTS

#### 2.01 SYNTHETIC FIBERS

- A. Synthetic Macro-fibers:
  - 1. Macro-synthetic fibers shall be manufactured from virgin polyolefins (polypropylene and polyethylene) and comply with ASTM C 1116.4.1.3. Fibers manufactured from materials other than polyolefins must show documentary evidence confirming their long term resistance to deterioration when in contact with moisture and alkalies present in cement paste and/or the substances present in air-entraining and chemical admixtures.
  - 2. The minimum fiber length shall be 1.50 inches.
  - 3. Macro-synthetic fibers shall have an aspect ratio (length divided by the equivalent diameter of the fiber) between 45 and 150.

4. Macro-synthetic fibers shall have a minimum tensile strength of 40 ksi when tested in accordance with ASTM D 3822.
5. Minimum dosage rate in pounds of fibers per cubic yard of concrete shall be established by determining a minimum average residual strength of no less than 150 psi when tested in accordance with ASTM C 1399. The minimum fiber dosage rate shall be 3 lbs/cubic yard.
6. Macro-synthetic fibers shall have a minimum modulus of elasticity of 400 ksi when tested in accordance with ASTM D 3822.” Shall be manufactured from virgin polyolefins (polypropylene and polyethylene) e) and comply with ASTM C 1116.4.1.3. a proprietary blend of polypropylene resins in compliance with ASTM D7508 for macro-chopped strands or hybrids chopped strands, for use in fiber-reinforced concrete meeting the requirements of ASTM C1116, Type III.

### PART 3 – EXECUTION

#### 3.01 BATCHING, MIXING AND TRANSPORTING

- A. Batching of materials shall be in accordance with ASTM C94 and ASTM C1116.
- B. Introduce fibers into the mixing system at any time, except when the cement is being introduced. Mix for at least 5 minutes after the addition of the fibers.
  1. Fibers shall be dispensed into the mixing system in accordance with the recommendations of the manufacturer.
- C. Mixing and transporting concrete shall be in accordance with ASTM C1116.

#### 3.02 PLACING, CONSOLIDATION AND FINISHING

- A. Placing, consolidation and finishing of concrete shall be in accordance with the recommendations of ACI PRC-544.3.
  1. Additional water shall not be added in the field.
- B. Vibrating screed, laser screed or roller screed shall be used for consolidating concrete in large square footage industrial and commercial interior slabs-on-ground.

3.03 CURING AND PROTECTION

- A. Curing and protection of concrete shall be in accordance with Section 03300 –  
STRUCTURAL CONCRETE.

PART 4 – MEASUREMENT AND PAYMENT

4.01 BASIS OF MEASUREMENT AND PAYMENT

Work under this section will not be measured nor paid for separately, but shall be considered incidental to and included in the prices bid for the various items of work in this project.

END OF SECTION