

# Instructions for Use of 3-Part Master Specification

## **Steel Fiber Reinforced Concrete (SFRC)**

This specification specifies the use of steel fibers as reinforcement in concrete. Its purpose is to assist design professionals in the preparation of project or office master specifications. It follows guidelines established by the Construction Specifications Institute and, therefore, may be used with minor editing in most master specification systems

This specification assumes that standard section numbers are used in the project or master specifications, and it should be placed in Section 3240-Fibrous Reinforcement.

### Notes:

- Edit carefully to suit project requirements.
- Modify as necessary and delete items that are not applicable.
- Verify that reference section numbers and titles are correct.
- Insure all references to ACI and ASTM specifications, test procedures and state-of-the-art reports are current.

The design professional can find a number of references to steel-fiber reinforcement and to steel fiber-reinforced concrete in ACI and ASTM documents. Some of these documents are listed in Sections 1.02, 6.a and b.

# NyconSF 3-Part Master Specification

03200: CONCRETE REINFORCEMENT/FIBROUS REINFORCEMENT

## **MANUFACTURER**

Nycon, Inc.

101 Cross Street

Westerly RI 02891

Phones: 800.456-9266

401-596-3955

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E-Mail: [nycon@nycon.com](mailto:nycon@nycon.com)

Product

Names: NyconSF Type I and/or NyconSF Type II

03241: FIBROUS CONCRETE REINFORCEMENT

Low-carbon steel fibers are used at dosage rates of 20-120 pounds per cubic yard for a range of concrete reinforcing functions. At lower dosage rates, fibers control shrinkage cracking in plastic and hardened concrete. At higher dosage levels, the steel fibers can be used to modify slab-on-ground thickness and to enhance the physical properties of concrete and shotcrete, specifically, flexural strength.

## **PART 1: GENERAL**

### 1.01 SUMMARY

- A. Section Includes: Low-carbon steel fibers for reinforcing concrete.
- B. Related Sections:
  - 1. Section 03210-Reinforcing Steel
  - 2. Section 03300- Cast-In-Place Concrete
  - 3. Section 03370-Specially Placed Concrete (shotcrete)
  - 4. Section 03400-Precast Concrete
  - 5. Section 03500-Cementitious Decks and Underlayment
- C. All materials furnished per this section shall conform to applicable codes and/or standards.

### 1.02 SUBMITTALS

Submit the following items:

- 1. Product Data: Required Physical property data for product specified per ASTM A820.
- 2. Letter of Certification stating compliance with applicable specifications and/or codes.

3. Samples: Samples of the specific products recommended for use. Samples must be of the length and configuration specified.
4. Quality Assurance/Control Submittals:  
Related concrete test reports from commercial and/or university laboratories.  
Installation instructions (mixing, placing, finishing)  
MSDS
5. Technical Support:  
If the engineer requires technical assistance in developing the design of a specific concrete element, the engineer is directed to contact the engineering group of the manufacturer (see item 2.01.A).
6. References:
  - a. American Concrete Institute (ACI)
    - 1) ACI 211.1-Standard practices for selecting
    - 2) proportions for normal weight, heavyweight and mass concrete
    - 3) ACI 302-Guide for Concrete Floor and Slab Construction
    - 4) ACI 318-Building Code Requirements for Reinforced Concrete
    - 5) ACI 330-Guide for Design and Construction of Parking Lots
    - 6) ACI 345-Guide for Concrete Highway Bridge Deck
    - 7) ACI 360-Design of Slabs on Grade
    - 8) ACI 362-Guide for Design of Durable Parking Structure
    - 9) 506.1R-State-of-the Art Report on Fiber Reinforced Shotcrete
    - 10)544.1R-State-of-the-Art Report on Fiber Reinforced Concrete
    - 11)544.3R-Propportioning, Mixing, Placing, and Finishing Steel Fiber Reinforced Concrete
  - b. American Society of Testing and Materials
    - 1) A820-Specification for steel fiber reinforced concrete
    - 2) C1116-Specification for fiber reinforced concrete and shotcrete
    - 3) C1609-Test method for flexural toughness and first-crack strength of fiber reinforced concrete
    - 4) C78-Test method for flexural strength of concrete
    - 5) C143-Test method for slump of hydraulic cement concrete
    - 6) C995-Test method for time of flow of fiber reinforced concrete through inverted slump cone
    - 7) C94-Specification for ready-mixed concrete
    - 8) C173-Test method for air content of freshly mixed concrete by the volumetric method
    - 9) C231-Test method for air content of freshly mixed concrete by the pressure method

### 1.03 QUALITY CONTROL

A. Qualifications:

It is strongly recommended that a preconstruction trial mix, using proposed ingredients, be fabricated to insure targeted-engineering properties are met and the mix workability is acceptable.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Standard methods of transportation. Product is boxed, palletized and identified for traceability.
- B. Special Instructions: Please read MSDS for handling instructions.
- C. Storage: Keep material dry.
- D. Handling: Open and discharge contents of pre-weighed boxes into mixing system. Use of a conveyor to ribbon-feed fibers into the mixer is the preferred method of introduction.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: No unique/special requirements
- B. Sampling/Testing:  
Externally vibrate all specimens, do not internally rod.  
Preferred air content test method is ASTM C173.

## **PART 2: PRODUCTS**

2.01 FIBROUS CONCRETE REINFORCEMENT

Fiber reinforced concrete or more specifically steel fiber reinforced concrete (SFRC) utilizes discrete steel fibers, typically ¾" to 2" in length to provide certain enhancements to quantifiable concrete properties. These enhancements include modifications to the macro/micro cracking mechanism, impact resistance, fatigue strength and flexural strength. The degree of enhancement is dependent on the dosage level.

- A. Acceptable Manufacturer: Nycon, Inc., 101 Cross Street, Westerly, RI 02891, phones: 800.456-9266, 401-596-3955, fax: 401-596-4242, e-mail: [www.nycon@nycon.com](mailto:www.nycon@nycon.com)
- B. Alternates:

2.02 MATERIALS

- A. Steel Fiber: Low-carbon steel fiber meeting ASTM A820, Type I or II.

## 2.03 PHYSICAL CHARACTERISTICS

- A. Configuration:
  - Primary: Continuous-deformed
  - Alternate: Straight, hooked-end
- B. Length:
  - Primary: 1" or 2"
  - Alternate:  $\frac{3}{4}$ " or 1  $\frac{1}{2}$ "
- C. Dosage
  - Range: Generally 20-120 lbs/cy
  - Design: General design for slab-on-ground is per the Westergaard and/or Myerhof design methodology.
- D. Steel Fiber Reinforced Concrete Design
  - Mix Design: Standard mix design as modified to accommodate the steel fiber dosage level.
  - Compressive Strength: Per standard design procedure.
  - Flexural Strength: As modified per dosage rate of steel fibers.
  - Slump: Without steel fibers: As per standard design  
With steel fibers: As per project design Specifications

## PART 3: EXECUTION

### 3.01 EXAMINATION

- A. Verify by comparing packing slip and box label that product is per specification.
- B. Verify the feed rate and belt width/configuration of the conveyor system.
- C. Verify the procedure established by the ready-mixer/contractor to introduce and completely mix fibers will provide a homogeneous, workable concrete.

### 3.02 INTRODUCING, MIXING, PLACING, FINISHING

- A. Follow procedures outlined in manufacturer's printed instructions.
- B. Comply with standard procedures found in ACI 302 and other related documents.
- C. Vibrating screed, laser screed or roller screed are the preferred methods of consolidating concrete with steel fibers.

### 3.03 MANUFACTURER'S FIELD SUPPORT

- A. Manufacturer will provide field support at preconstruction trial and start-up of project.