

Instructions for Use of 3-Part Master Specification

Macro-Fiber Reinforced Concrete

This specification specifies the use of Macro synthetic 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 synthetic-fiber reinforcement and to synthetic fiber-reinforced concrete in ACI and ASTM documents. Some of these documents are listed in Sections 1.02, 6.a and b. A complete list can be furnished by Nycon, Inc. by request.

Nycon XL 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

Fax: 401-596-4242

E-Mail: nycon@nycon.com

Website: www.nycon.com

Product

Name: Nycon XL

03241: FIBROUS CONCRETE REINFORCEMENT

Nycon XL is a new generation synthetic fiber called Macro Synthetic Fibers, which providing post first crack reinforcement in addition to plastic shrinkage reinforcement and secondary/ temperature-shrinkage reinforcement. Nycon XL is specified within a dosage range of 3.0 to 8.0 pounds per cubic yard. Nycon XL is specifically designed to be used at the higher dosage levels in post first crack applications. At these higher dosage levels Nycon XL is appropriate for use in shotcrete tunnel liners and to provide higher fatigue values compared to conventional synthetic fibers.

PART 1: GENERAL

1.01 SUMMARY

- A. Section Includes: Macro Synthetic Fibers or Synthetic Fibers as post first crack and secondary reinforcement for 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 C1116, Section 4.1.3 and Note 3 and ICC ES Acceptance Criteria 32, Sections

4.1.1 and 4.1.2. Additionally vendor or manufacturer must furnish an Engineering Report which provides ASTM C1018 and/or C1399 test data from an ICC qualified commercial laboratory relating to the specification requirements.

2. Letter of Certification stating compliance with applicable specifications and/or codes from the vendor/manufacturer.
3. Samples: Samples of the specific products recommended for use shall be submitted. 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:

In the use of a Macro synthetic fiber the dosage level is critical to success. Therefore the design/project engineer will require 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) ACI 506.1R-State-of-the Art Report on Fiber Reinforced Shotcrete
 - 10)ACI 544.1R-State-of-the-Art Report on Fiber Reinforced Concrete
 - 11)ACI 544.3R-Proportioning, Mixing, Placing, and Finishing Steel Fiber Reinforced Concrete
 - b. American Society of Testing and Materials (ASTM)
 - 1) C1116-Specification for fiber reinforced concrete and shotcrete
 - 2) C1018-Test method for flexural toughness and first-crack strength of fiber reinforced concrete
 - 3) C1399-Test method for obtaining average residual-strength of fiber-reinforced concrete
 - 4) C1550-Test method for flexural toughness of fiber reinforced concrete (using centrally loaded round panel)

- 5) C78-Test method for flexural strength of concrete
- 6) C143-Test method for slump of hydraulic cement concrete
- 7) C995-Test method for time of flow of fiber reinforced concrete through inverted slump cone
- 8) C94-Specification for ready-mixed concrete
- 9) C173-Test method for air content of freshly mixed concrete by the volumetric method
- 10) C231-Test method for air content of freshly mixed concrete by the pressure method

1.03 QUALITY CONTROL

A. Qualifications:

It is recommended that a pre-construction trial mix or mixes, using proposed ingredients, be fabricated to ensure targeted-engineering properties are met and the mix workability is within standard parameters. This recommendation is specifically important when 3 pounds or more of the Macro synthetic fibers are added per cubic yard.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Standard methods of transportation. Product is packaged in pre-weighed bags, boxed, palletized and identified for traceability.
- B. Special Instructions: Please read MSDS for handling instructions.
- C. Storage: Keep material dry.
- D. Handling: Count out and add the proper number of pre-weighed bags of product to the mixing system. There is no correct time to introduce the bags to the concrete. There is a single warning: Do not add the bags containing the fibers at the same time as the cement. When added after all of the standard ingredients have been added and mixed, allow for an extra 3-4 minutes to thoroughly distribute the Macro synthetic fibers.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: No unique/special requirements
- B. Sampling/Testing:
Externally vibrate all specimens for use in strength tests, 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 Macro synthetic fiber reinforced concrete utilizes discrete Macro synthetic fibers, typically a minimum of 1 ½" 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 reduced permeability. Most important, the Macro fibers contribute to the properties measured by ASTM Test Methods C1018, C1399 and C1550. The degree of enhancement is dependent on the dosage level in addition to the properties of the concrete matrix.

- 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
- B. Alternates:

2.02 MATERIALS

- A. Macro Synthetic Fiber: Collated fibrillated polyolefin fibers meeting requirements of ASTM C1116 Section 4.1.3 and Note 3 and ICC ES AC 32 Sections 4.1.1 and 4.1.2 in additions to those requirements established by the design/structural engineer for ASTM C1018 or C1399.

2.03 PHYSICAL CHARACTERISTICS

- A. Configuration:
Primary: Collated Fibrillated (continuous network)
- B. Length:
Primary: 1 ½",
Alternate: 2"
- C. Dosage
Range: 3.0-8.0 pounds/cy
Specific Dosage to be determined based on project specifications
- D. Synthetic Fiber Reinforced Concrete Design
Mix Design: Standard mix design as modified to accommodate the Macro fibers when dosage level is 3 or more pounds per cubic yard.
Compressive Strength: Per project specifications.
Flexural Strength: Per project specification.
Slump: Per project specifications. Note if there is a difference for plain concrete versus SnFRC.

PART 3: EXECUTION

3.01 EXAMINATION

- A. Verify by comparing packing slip and box label that product is per specification as well as weight of individual bags.
- B. Verify the bag weight and/or combination of multiple bags complies with the project specifications.
- C. Verify that the number of bags to be added per cubic yard and per truckload of concrete meet the project requirements.
- D. Verify the synthetic fibers will have sufficient mixing time to insure proper distribution.

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 in large square footage industrial and commercial interior slabs-on-grade.

3.03 MANUFACTURER'S FIELD SUPPORT

- A. Manufacturer will provide field support at pre-construction trial and start-up of project when requested.
- B. Manufacturer will provide phone access to technical support to ready mixer and project personnel.