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This MANU-SPEC® utilizes the Construction Specifications Institute (CSI) *Project Resource Manual* (PRM), including *MasterFormat*™, *SectionFormat*™ and *PageFormat*™. A MANU-SPEC is a manufacturer-specific proprietary product specification using the proprietary method of specifying applicable to project specifications and master guide specifications. Optional text is indicated by brackets [ ]; delete optional text in final copy of specification. Specifier Notes typically precede specification text; delete notes in final copy of specification. Trade/brand names with appropriate symbols typically are used in Specifier Notes; symbols are not used in specification text. Metric conversion, where used, is soft metric conversion.

This MANU-SPEC specifies steel fibers for use in reinforcing concrete slabs-on-ground and concrete slabs on composite metal decks. These products are manufactured by Bekaert Corp. Revise MANU-SPEC section number and title below to suit project requirements, specification practices and section content. Refer to CSI *MasterFormat* for other section numbers and titles.

**SECTION 03 24 00**  
**FIBROUS REINFORCING**

**PART 1 GENERAL**

1.01 SUMMARY

A. Related Section:

1. Cast-in-Place Concrete: Division 03 cast-in-place concrete sections.

Specifier Note: Article below may be omitted when specifying manufacturer's proprietary products and recommended installation. Retain Reference Article when specifying products and installation by an industry reference standard. If retained, list standard(s) referenced in this section. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced. Conditions of the Contract or Section 01 42 19 - Reference Standards may establish the edition date of standards. This article does not require compliance with standard, but is merely a listing of references used. Article below should list only those industry standards referenced in this section.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM A370 Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
2. ASTM A820 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
3. ASTM C1116 Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
4. ASTM C1609 Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading).
5. ASTM C1399 Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete.

1.03 SYSTEM DESCRIPTION

A. Design Requirements:

Specifier Note: Retain below for slabs-on-ground. Consult with manufacturer for recommendation of concentration rate of fiber and equivalent flexural strength.

1. Steel fiber reinforced concrete shall provide an equivalent flexural strength (EFS) of [\_\_\_\_\_] psi, minimum, when tested in accordance with ASTM C1609, which represents the numerical average of the residual strengths  $f_{150,3.0}$  and  $f_{150,0.75}$ .
2. The equivalent flexural strength (EFS) must be verified by certified test reports in accordance with ASTM C1609 from the fiber manufacturer for concrete containing similar materials using 6 inch x 6 inch (152 x 152 mm) beams and a minimum of 5 replications.

Specifier Note: Retain below for slabs on composite metal decks. Consult the manufacturer for recommendation of concentration rate of fiber and specific average residual strength recommendation.

3. Average Residual Strength: Steel fibers must provide a minimum of 80 psi (551 kPa) average residual strength (ARS) when tested in accordance with ASTM C1399.
4. The average residual strength (ARS) must be verified by certified test reports in accordance with ASTM C1399 from the fiber manufacturer for concrete containing similar materials using a minimum of 9 replications.

B. Performance Requirements:

1. Ultimate Tensile Strength: 145,000 psi (1000 MPa), minimum, when tested in accordance with ASTM A370.

1.04 SUBMITTALS

Specifier Note: Describe certificates intended to document affirmations by the Contractor or other entities that the work is in accordance with the Contract Documents.

- A. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

Specifier Note: Specify submittal of test reports or evaluation service reports intended to document required tests, without repeating the test requirements specified in Division 01.

1. Test and Evaluation Reports:
  - a. Certified test reports showing compliance with specified performance characteristics and physical properties.

Specifier Note: Specify submittals intended to document manufacturer installation, storage, and other instructions.

- B. General: Submit listed submittals in accordance with Conditions of the Contract and Section [01 33 00 - Submittal Procedures] [\_\_\_\_\_].
- C. Product Data: Submit product data, including manufacturer's SPEC-DATA® sheet and installation instructions, for specified products.

Specifier Note: Article below should include prerequisites, standards, limitations and criteria that establish an overall level of quality for products and workmanship for this section. Coordinate article below with Division 01 Quality Assurance Section.

1.05 QUALITY ASSURANCE

Specifier Note: Paragraph below should list obligations for compliance with specific code requirements particular to this section. General statements to comply with a particular code are typically addressed in Conditions of the Contract and Section 01 41 00 - Regulatory Requirements. Repetitive statements should be avoided.

- A. Regulatory Requirements: In accordance with Section [01 41 00 - Regulatory Requirements] [\_\_\_\_\_].

Specifier Note: Article below should include special and unique requirements. Coordinate article below with Division 01 Product Requirements Section.

1.06 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 01 Product Requirements Section.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

- C. Storage: Store materials in manufacturer’s original containers protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- D. Handling: Protect materials from dirt, corrosion, oil, grease and other contaminants.

**PART 2 PRODUCTS**

Specifier Note: Retain article below for proprietary method specification. Add product attributes, performance characteristics, material standards and descriptions as applicable. Use of such phrases as “or equal” or “or approved equal” or similar phrases may cause ambiguity in specifications. Such phrases require verification (procedural, legal and regulatory) and assignment of responsibility for determining “or equal” products.

**2.01 STEEL FIBER REINFORCING**

Specifier Note: Paragraph below is an addition to CSI *SectionFormat* and a supplement to MANU-SPEC. Retain or delete paragraph below per project requirements and specifier’s practice.

- A. Manufacturer: Bekaert Corp.
  - 1. Contact: Building 500, Suite 100, 1395 S. Marietta Pkwy., Marietta, GA 30067-4440; Telephone: (800) 241-4126, (770) 421-8520; Fax: (770) 421-8521; E-mail: [dramix@bekaert.com](mailto:dramix@bekaert.com); website: [www.bekaert.com/building](http://www.bekaert.com/building).

Specifier Note: Retain only one of the following fiber types. Consult with manufacturer for assistance in making selection.

- B. Dramix RL 45/50 BN Steel Fibers:
  - 1. Material: Uncoated low carbon steel, ASTM A820 Type I, cold drawn wire and ASTM C1116 Type I.
  - 2. Length (L): 50 mm (2.0 inches).
  - 3. Diameter (D): 1.05 mm (0.041 inch), maximum.
  - 4. Aspect Ratio (L/D): 48, minimum.
  - 5. Anchorage: End deformed.
  - 6. Surface Condition: Clean and free of rust, oil and deleterious materials.
  - 7. Configuration: Loose, round drawn wire, hook-ended.

Specifier Note: Retain below for slabs-on-ground.

- 8. Concentration Rate: [ ] pcy to meet required equivalent flexural strength (1.03.A.1).
- C. Dramix RC 65/60 BN Steel Fibers:
  - 1. Material: Uncoated low carbon steel, ASTM A820 Type I, cold drawn wire and ASTM C1116 Type I.
  - 2. Length (L): 60 mm (2.36 inches).
  - 3. Diameter (D): 0.9 mm (0.035 inch), maximum.
  - 4. Aspect Ratio (L/D): 67, minimum.
  - 5. Anchorage: End deformed.
  - 6. Surface Condition: Clean and free of rust, oil and deleterious materials.
  - 7. Configuration: Collated (glued bundles), round drawn wire, hook-ended.

Specifier Note: Retain below for slabs-on-ground.

- 8. Concentration Rate: [ ] pcy to meet required equivalent flexural strength (1.03.A.1).

**2.02 PRODUCT SUBSTITUTIONS**

- A. Substitutions: Substitutions in accordance with Section [01 25 13 - Product Substitution Procedures] [No substitutions permitted].

**2.03 MIXING**

- A. Steel Fibers:

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1. Steel fibers may be added during or after batching of concrete materials.
  2. Do not add steel fibers as the first component in the mixer.
  3. Add fibers at a maximum rate of 132 lb/minute (60 kg/minute).
- B. Slump Adjustment:
1. Adjust concrete mixture to achieve a minimum slump of 5 inches (127 mm) at the point of placement, preferably with water reducing admixtures.
  2. Mix concrete for minimum of 5 minutes ( $\pm$  70 revolutions) at maximum drum rotation (12 - 18 rpm) to disperse steel fiber evenly.

### **PART 3 EXECUTION**

Specifier Note: Paragraph below is an addition to CSI *SectionFormat* and a supplement to MANU-SPEC. Retain or delete paragraph below per project requirements and specifier's practice.

#### **3.01 MANUFACTURER'S INSTRUCTIONS**

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.
- B. Do not disturb concrete surface paste covering near surface steel fiber during finishing.
- C. Saw cut must be 1/3 depth if using wet cut saw.

**END OF SECTION**