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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 precede specification text; delete notes in final copy of specification. Trade/brand names with appropriate product model numbers, styles and types are used in Specifier Notes and in the specification text article titled "Acceptable Material." Metric conversion, where used, is soft metric conversion.

This Manu-Spec specifies twisted steel micro reinforcement, as manufactured by Polytorx, LLC, for use as concrete flexural primary and/or secondary concrete reinforcing material.

03 21 00 REINFORCEMENT BARS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: This Section specifies concrete reinforcing using twisted steel micro reinforcement.

Specifier Note: Revise paragraph below to suit project requirements. Add section numbers and titles per CSI *MasterFormat* and specifiers practice.

- B. Related Requirements:

Specifier Note: Include in this Paragraph only those sections and documents that directly affect the work of this section. If a reader of this section could reasonably expect to find a product or component specified in this Section, but it is actually specified elsewhere, then the related Section number(s) should be listed in the Subparagraph below. Do not include Division 00 documents or Division 01 sections as it is assumed all technical sections are related to all project Division 00 documents and Division 01 sections to some degree. Refer to other documents with caution, as referencing them may cause them to be considered part of the Contract.

1. Section [03 33 00 – Cast-In-Place Concrete].
2. Section [].

1.2 REFERENCES

Specifier Note: Define terms unique to this Section and not provided elsewhere in the contract documents. Include in this Article terms unique to the work result specified that may not be commonly known in the construction industry. Delete the following Paragraph if no definitions are required.

- A. Definitions:
1. Twisted steel micro reinforcement (TSMR) in compliance with EC-015 and ER-279.
 2. [].

Specifier Note: Paragraph below may be omitted when specifying manufacturer's proprietary products and recommended installation. Retain References paragraph when specifying products and installation by an industry reference standard. List retained standard(s) referenced in this section alphabetically. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced and update as applicable. Contract Conditions Section 01 42 00 - References may be used to establish the edition date of standards. This paragraph does not require compliance with standard(s). It is a listing of all references used in this section. Only include here standards referenced in the body of the specification in Parts 1, 2 and/or 3. Do not include references to building codes at any level.

B. Reference Standards:

1. American Concrete Institute (ACI):
 - a. ACI 318 Building Code Requirements for Structural Concrete.
 - b. ACI 302.1R Guide for Concrete Floor and Slab Construction.
 - c. ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - d. ACI 549.3R Guide for Specifying, Proportioning, and Production of Fiber-Reinforced Concrete.
 - e. ACI 360 Guide to Design of Slabs-on-Ground.
2. ASTM International (ASTM):
 - a. ASTM A820 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
 - b. ASTM C78/C78M Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
 - c. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete.
 - d. ASTM C1609/C1609M Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading).
3. International Association of Plumbing and Mechanical Officials (IAPMO) Uniform Evaluation Service (UES):
 - a. UES Report EC-015 Uniform Evaluation Criteria For Twisted Steel Micro-Rebar (TSMR) In Concrete.
 - b. UES ER-279 Helix 5-25 Micro-Rebar Concrete Reinforcement System.
4. Underwriter's Laboratories/Underwriter's Laboratories of Canada (UL/ULC):
 - a. UL Report #CBXQ.R25676 Fiber Reinforcement.
5. US Green Building Council (USGBC):
 - a. LEED NC Version 2.2, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
6. [].

Specifier Note: Article below includes submittal of relevant data to be furnished by Contractor before, during or after construction. Coordinate this article with Architect's and Contractor's duties and responsibilities in Contract Conditions and Section 01 33 00 - Submittal Procedures.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's standard specifications and descriptive literature, including:
1. SPEC-DATA product sheet.
 2. UES ER-279.
 3. Catalog pages and cut-sheets illustrating specified products.
 4. Material Safety Data Sheets (MSDS).
 5. Sample Warranty.
 6. [].

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

- B. Manufacturer's written instructions, including:
1. Delivery, storage and handling recommendations.
 2. Preparation and installation recommendations.

3. [].

Specifier Note: Coordinate Article below with Contract Conditions and with Section 01 78 36 - Warranties.

- C. Warranty: Fully executed, issued in [Owner's] name and registered with manufacturer, including:
1. Manufacturer's [1-year] warranty from date of substantial completion, covering defects in materials.
 2. [].

Specifier Note: Retain the following only if specifying for a LEED® project. Specify only the technical submittal requirements necessary to achieve the credits desired for this project.

- D. Sustainable Design (LEED) Submittals:
1. LEED Submittals: In accordance with Section [01 35 21 – LEED Requirements].
 2. Submit verification for items as follow:
 - a. EQc4.3 Low-emitting Materials.
 - b. IDc1 Innovation in Design.
 - c. MR 5 Regional Materials.
 - d. MRc2 Construction Waste Management.
 - e. MRpc61 Material Disclosure and Assessment.
 - f. MRpc63 Whole Building Life Cycle Assessment.

1.4 QUALITY ASSURANCE

- A. Installer: Experienced in performing work of this Section and in installation of micro reinforcement work similar to that required for this project.
- B. [].

1.5 DELIVERY, STORAGE & HANDLING

- A. Deliver materials in accordance with manufacturer's written instructions.
1. Deliver twisted steel micro reinforcement in manufacturer's original, unopened, undamaged containers with identification labels intact and product name, manufacturer and weight of fibers clearly visible.
 2. Store materials protected from exposure to harmful environmental conditions, clean, dry, frost-free and at recommended temperature and humidity levels.
 - a. Protect pallets against rain and snow.
 - b. Do not stack pallets.
 - c. Protect twisted steel micro reinforcement during handling to prevent contamination.
 - d. Keep packaging sealed until ready for use.
- B. [].

1.6 WARRANTY

- A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official.
1. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.

PART 2 PRODUCTS

Specifier Note: Retain Article below for proprietary method specification. Add product attributes, performance characteristics, material standards and descriptions in other Articles as applicable. Use of such phrases as "or equal," "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.

2.1 MANUFACTURER

- A. Polytorx, LLC
- B. Contact: 300 N. Fifth Avenue, Suite 130, Ann Arbor, MI 48104; Phone: 734-322-2114; Fax: 734-786-1644; Email: info@helixsteel.com; Web: www.helixsteel.com.
- C. Acceptable Material: Helix Micro-Rebar 5-25.

Specifier Note: Retain and edit the following article to suit the project requirements. Different applications will require different performance requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Comply with IAPMO Uniform Evaluation Service (UES) Reports EC-015 and UES ER-279.

Specifier Note: Delete the following Paragraph if the project has no ribbed or undulating surface requirements.

- B. Comply with IBC 722.2.1.1 for ribbed or undulating surfaces.
- C. Structural Concrete: Comply with ACI 318 and ACI 360.
- D. Tensile Performance of Concrete: To UES Report EC-015
- E. Tensile Strength of Wire: 246.5 ksi (1700 MPa) minimum to ASTM A820.
- F. Fire Performance: Comply with UL Report #CBXQ.R25676 – Fiber Reinforcement for slabs on metal deck.
- G. Fire Performance: Comply with UES-279 for walls.

2.3 MATERIALS

- A. Reinforcement Fibers: Cold-drawn, twisted deformed steel wire meeting ASTM A820, Type 1.
 - 1. Coating: Electroplated zinc 1.1 oz/ft² (3 g/m²) factory verified minimum.
 - 2. Ensure each wire fiber has one 360 degree twist minimum.
 - 3. Size: 0.02 inch (0.5 mm) equivalent diameter by 1 inch (25.4 mm) long.

PART 3 EXECUTION

3.1 INSTALLATION

Specifier Note: Verify that Section 03 33 00 – Cast-In-Place Concrete is included in the Project Manual and that it is making reference to the same concrete mixing and placing standards.

- A. Do concrete work in accordance with Section [03 33 00 – Cast-In-Place Concrete].

3.2 DOSING

Specifier Note: Coordinate the following Paragraph with Section 03 33 00 – Cast-In-Place Concrete.

- A. Mix to ASTM C94 and in accordance with manufacturer's written recommendations.
- B. Ensure reinforcement fibers are added to mix and verified in accordance with UES ER-279.

3.3 PLACEMENT

Specifier Note: Coordinate the following Paragraph with Section 03 33 00 – Cast-In-Place Concrete.

- A. Place concrete to ACI 304.

3.4 FINISHING

Specifier Note: Coordinate the following Paragraph with Section 03 33 00 – Cast-In-Place Concrete.

- A. Finish concrete [to ACI 302.1R and to ACI 549.3R] [in accordance with Section 03 33 00- Cast-in-Place Concrete] [] recommendations.

3.5 CLEANING

- A. Upon completion, remove surplus materials, rubbish, tools and equipment.
B. Collect recyclable waste and dispose of at appropriate recycling facilities.
C. [].

Specifier Note: Specify protection methods completed after installation, but prior to acceptance by the owner. Include only statements unique to this Section.

Specifier Note: Coordinate the following Article with Section 01 76 00 - Protecting Installed Construction.

3.6 PROTECTION

- A. Repair or replace adjacent materials damaged by installation of concrete.
B. [].

END OF SECTION