Polytorx, LLC

HELIX™ Micro-Rebar

Helix Micro-Rebar replaced rebar cages in Pier 57.

1. Product Name

- Helix Micro-Rebar Concrete Reinforcement

2. Manufacturer

Polytorx, LLC, d.b.a. Helix Steel
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3. Product Description

Helix Micro-Rebar by Polytorx has been used since 2003 to strengthen and reinforce concrete in installations throughout the world.

Basic Use

Helix Micro-Rebar is a twisted steel tensile reinforcement for structural concrete. The twisted geometric design of Helix Micro-Rebar increases the strength and flexibility of the concrete — helping eliminate the formation of cracks and increasing structural capacity.

Helix Micro-Rebar is used as a rebar replacement in structural concrete in a variety of interior and exterior applications:

- Structural walls
- Structural floors
- Structural footings
- Foundations
- Slabs, including slab-on-grade, slab-on-metal-deck, elevated
- Walls, including cast-in-place, tilt-up, precast
- Pavement
- Shotcrete
- Bridges
- In accordance with Uniform Evaluation Service (UES) Report EC 015 and UES ER-279

Composition and Materials

Helix Micro-Rebar is cold-drawn, twisted deformed steel wire meeting ASTM A820, Type 1 standards. Each wire has a minimum of one 360-degree twist.

Size

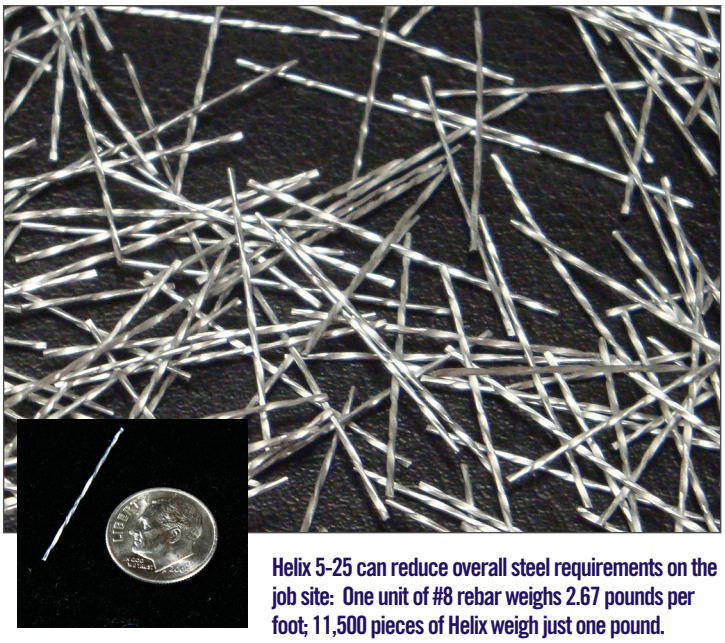
Individual length is 1 inch (25.4 mm) with a 0.02 inch (0.5 mm) diameter and cross sectional area of 0.003 square inches (0.196 mm2). The product is offered in 22.5 lb (10 kg) boxes, 45 lb (22.5 kg) boxes and 2450 lb (1100 kg) bags.

Color, Finish

Helix Micro-Rebar 5-25 is steel with a minimum 1.1 oz/ft^2 (3 g/m^2) electroplated zinc coating for corrosion protection.

Benefits

- Replaces structural rebar for a range of applications
- Increases concrete tensile strength (Modulus of Rupture)
- Improves job site safety by eliminating tripping hazards, lifting strain, and placement cuts associated with rebar
- Reduces installation time and eliminates the need for rebar installation inspection
- Reduces reinforcing costs a minimum of 20% — eliminating rebar placement, scrap, chairs and overlap
- Reduces direct labor and material costs of reinforcement, as well as indirect on-site placement
- Keeps any cracks small and short — meeting guidelines of the American Concrete Institute
- Meets or exceeds Uniform Evaluation Service (UES) Report EC 015 requirements
- Reduces carbon footprint through reduced total steel quantity and potential reduced concrete thickness
- Zinc coating resists rust three times longer than uncoated rebar



Helix 5-25 can reduce overall steel requirements on the job site: One unit of #8 rebar weighs 2.67 pounds per foot; 11,500 pieces of Helix weigh just one pound.

Limitations

Helix Micro-Rebar can replace all rebar/mesh in certain types of structures; rebar, however, can be required for suspended horizontal concrete structures. See UES ER-279 for usage details.

4. Technical Data

Applicable Standards

ASTM International (ASTM)

- **ASTM A820** Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
- **ASTM C78** Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
- **ASTM C94** Standard Specification for Ready-Mixed Concrete
- **ASTM C1609** Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete

American Concrete Institute (ACI)

- **ACI 318** Building Code Requirements for Structural Concrete
- **ACI 360** Guide to Design of Slabs-on-Ground

International Code Council

IBC 722.2.1.1 Ribbed or undulating surfaces

IAPMO Uniform Evaluation Service (UES)

- **UES EC-015** Uniform Evaluation Criteria For Twisted Steel Micro-Rebar (TSMR) In Concrete

Approvals, Certifications

IAPMO Uniform Evaluation Service (UES)

- **UES Evaluation Report ER-279** Helix 5-25 Micro-Rebar Concrete Reinforcement System

Underwriters Laboratories Inc. (UL)

Helix 5-25 is UL/ULC certified for use as an alternate or an addition to welded wire fabric in floors and ceilings, UL Report #CBXQ.R25676 – Fiber Reinforcement.

Environmental Performance

LEED®

Comprised of 50% recycled steel, Helix 5-25 may contribute points toward LEED project certification in the following categories:

- EQc4.3 Low-emitting Materials: 1 point
- IDc1 Innovation in Design: 1–4 points
- MR 5 Regional Materials: 1–2 points
- MRc2 Construction waste management: 1–2 points
- MRpc61 Material disclosure and assessment: 1–2 points
- MRpc63 Whole building life cycle assessment: 1 point

Carbon Footprint

Each pound of Helix Micro-Rebar used in place of rebar reduces C02 from 1.8 lb to 0.6 lb.

Fire Performance

Helix 5-25 is permitted as a specified reinforcement in walls in accordance with IBC 722.2.1.1 and as an alternative or an addition to the welded wire fabric used in concrete members under UL Design G256 and G514.

Physical Properties

- Tensile Strength, ASTM A820: 275 ksi (1850 MPa) 246,000 (1700 N/mm2) minimum
- See Table 2
- See **UES Evaluation Report ER-279**

Table 2 – Physical Properties

Helix 5-25 dosage	Mean Modulus of Rupture (psi)		
lb/yd^3	f'c = 3000 psi	f'c = 4000 psi	f'c = 5000 psi
0	493	569	636
5	531	613	686
10	541	625	699
15	552	637	712
20	562	649	725
25	572	660	738
30	582	672	752
35	592	684	765
40	603	696	778
45	613	708	791
50	623	719	804
55	633	731	817
66	656	757	846

See UES ER-279 for complete table and instructions

5. Installation

Preparatory Work

Deliver steel fiber in manufacturer's original, unopened, undamaged containers with identification labels intact and product name, manufacturer and weight of fibers clearly visible.

Store materials protected from exposure to harmful environmental conditions, clean, dry, frost-free and at recommended temperature and humidity levels. Keep packaging sealed until ready for use. Protect pallets against rain and snow. Do not stack. Protect steel fiber reinforcement during handling to prevent contamination.

Prior to placing, remove mud, oil or other materials that will adversely affect or reduce bond at the time the concrete is placed.

Dosing

Mixing should be done accordance with ASTM C94 and the mixing instructions below. Dosages of Helix added to the mix should be noted on the batch documentation in accordance with Uniform Evaluation Service ER-279 Section 5.15 and verified using the procedure in ER 279 Appendix A.

Mixing

Ready Mix Plants (Wet or Dry) - Preferred

Rigorously adhere to the following to prevent Helix from clumping:

- Place all Helix into the truck drum at one time
- Add a minimum of 20% of the mix water into the drum with the drum turning at charging speed
- Turn truck drum at charging speed for six minutes. Clumps break into 2D layers as they fall over the mixing fins, with water acting as a lubricant
- Use normal procedures to add the sand, aggregate and cement (or concrete)
- Mix until homongeneous to ensure Helix is completely disbursed throughout the concrete.

Site Batching Into Mix Trucks (loaded truck at construction site)

- Set the drum to charging speed
- Use Helix Dosing Unit (available from Polytorx, LLC). The dosing unit breaks up clumps and ensures Helix goes into the truck at a controlled rate (about one box per minute). When Helix is added at this stage, it must enter the mixer clump free, with no clumps larger than 2" entering the mixer
- As Helix is added, it may collect on any residual concrete on the interior surfaces of the hopper. Push the Helix into the drum, avoiding clumps. Adding a slippery lining such as PVC sheeting to the hopper may help avoid these buildups
- Mix at charging speed for 5 minutes (60 revolutions) after Helix is added

Pan Mixer/Drum Mixer

- Set the mixer to the proper speed
- Add Helix at a rate of 45–60 seconds per 45 lbs (20 kg)
- Helix should be added with the aggregates
- Mix at maximum speed for 5 minutes after adding Helix

Effects on Slump

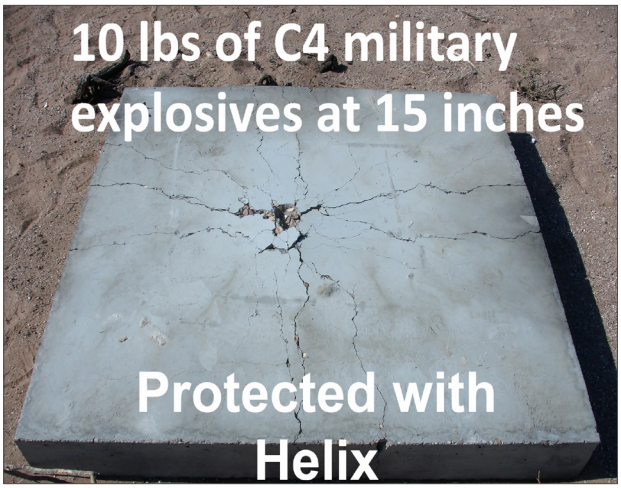
A slump of 5" (125 mm) or higher will facilitate strike off. A slump lower than 5" is not recommended, as this will prevent surface segregation of the cement and fines from the aggregate and Helix. Slump should be measured on the initial load and adjustments made with a water reducer or plasticizer — not water.

Pumping Helix

Helix 5-25 Micro-Rebar is 1" long and presents minimal pumping resistance. A minimum 3" line should be used to pump Helix reinforced concrete.

Placing & Finishing

Helix reinforced concrete can be finished according to standard, proper finishing procedures and can be stained and stamped using normal procedures.



Helix 5-25 used in place of rebar saves approximately one day of labor per 10,000 ft^2.

Finishing Tips

Step 1 - Screeding

A vibrating screed is recommended. Allow the concrete to swell above the grade line in front of the screed so it can fully engage the concrete as it levels the concrete back to grade.

Step 2 - Bull Floating

Bull floating eliminates ridges and fills in voids left by screeding. The importance of bull floating cannot be understated as the process aids the separation of the cement and fines from the aggregate.

Step 3 - Floating

Power floating, using floating pans installed over finishing blades, is critical as it breaks open the concrete surface. Large aggregate and Helix float downwards while cement and fine aggregates are sucked to the surface. A raised ridge of paste of ½" to ¾" (13–20 mm) should be visible around the pans.

If power floating is not done sufficiently or if it is started too late, both aggregate and Helix will remain on the surface or just below as segregation could not occur.

Step 4 - Troweling

The purpose of troweling is to produce a dense, smooth, hard surface. Troweling is done immediately after power floating. No troweling should ever be done on a surface that has not been power or hand floated.

Building Codes

Ensure installation complies with the requirements of all applicable local, state and federal code jurisdictions.

6. Availability and Cost

Helix Micro-Rebar is available throughout the United States and Canada. The product is priced to provide savings over traditional reinforcement. For cost and availability within a specific region, visit **www.helixfiber.com/where-buy-helix**.

7. Warranty

Installed and used as directed, the manufacturer warrants Helix Micro-Rebar in Polytorx designs, in designs reviewed and approved by Polytorx prior to installation, and designs in compliance with UES ER-279 and installation instructions. For warranty details, visit **www.helixfiber.com**.

8. Maintenance

No special maintenance is required.

9. Technical Services

Technical assistance, including product literature, test results, project lists, assistance in preparing project specification or installation supervision, is available from the manufacturer. For questions about specifications, compliance with UES ER 279 IBC/IRC/ACI code regulations, product usage or product installation, contact Polytorx.

For assistance in calculating Helix mix ratios, visit **www.helixcalculator.com.**

Polytorx on-staff engineers are available for engineering support. Contact **tech@helixsteel.com.**

10. Filing Systems

- CMD
- Manu-Spec®
- Additional product information is available from the manufacturer upon request

Distributed by:

Ferguson Safety Products
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