

HPM® FR

Hollow Monofilament Micro Synthetic Fiber

Product Description

PIONEER® HPM® FR is a new type of engineering fiber with low melting point that offers crack resistance and blast resistance, featuring a hollow cross-section. The HPM® FR fibers are distributed in a three-dimensional random orientation throughout the concrete, helping to control cracking and reduce early-age shrinkage cracks. In the event of a fire, these unique hollow fibers act as channels for the escape of high-pressure steam within the concrete, reducing spalling at high temperatures and significantly enhancing the concrete's fire and blast resistance.

Uses

PIONEER® HPM® FR is suitable for various concrete applications to all types of concrete which demonstrate a need for resistance to fire spalling, intrinsic cracking, and improved water tightness:

- Tunnel
- High rise buildings
- Concrete framed structures
- Bridges / underpasses
- Multi story garages
- Oil Platforms
- Precast
- Shotcrete

Product Advantages

PIONEER®HPM®FR improves the tensile strength of concrete, helps prevent crack formation, and enhances durability. It also offers excellent blast resistance and can provide critical escape time during a fire, which is why it is certified as a fire-resistant material for tunnels.

- Easy to mix and quickly disperses
- Reduces fire explosive spalling
- Increases cohesion and reduces segregation
- Reduces settlement and bleeding
- Enhances durability
- Provides cost-effective control of plastic shrinkage
- Provides overall higher quality of concrete.
- Buy crucial escape time during a fire

How It Works

Concrete, especially high-strength concrete, has a high density, making it difficult for water vapor inside to escape when exposed to fire. This vapor accumulates and creates high pressure, which can eventually lead to explosive spalling of the concrete cover. In standard fire tests, concrete can crack after just 8 to 45 minutes of heating. PIONEER®HPM®FR features a unique hollow structure and is distributed in a three-dimensional random orientation within the concrete. When exposed to flames, the hollow fibers immediately act as channels for vapor escape. As the temperature of the concrete rises and exceeds the 160°C melting point of the fibers, the fibers melt, creating wider pathways for vapor to escape. This rapid release of vapor helps prevent explosive spalling in fire conditions. Incorporating these blast-resistant and crack-preventing fibers into concrete enhances its crack resistance and impermeability, and significantly improves its fire resistance and safety in the event of a fire.

Anti-bursting Test

PIONEER®HPM®FR significantly enhances the fire resistance of concrete, providing effective protection against explosive spalling. The image below compares the blast resistance of HPM® FR concrete with that of ordinary concrete under a 1200°C heat exposure for 120 minutes. In fire testing, ordinary concrete cracks within a few minutes and collapses within 30 minutes, whereas PIONEER® HPM® FR concrete shows almost no visible damage after 120 minutes without any intervention.

Compliance and Certification

- Complies with ASTM C1116/ C1116M, Type III fiber reinforced concrete and therefore ASTM D7508.
- Complies with European Standard EN 14889-2:2006 Fibres for Concrete Part 2: Class Ia and carries the CE marking.
- UL/ULc Classification: For use as an alternate or in addition to the welded wire fabric used in floor-Ceiling D700, D800, D900, G229, G243, G256, & G514 Series Designs.

Physical Properties

- Specific Gravity: 0.75-0.85
- Material: 100% virgin homopolymer polypropylene
- Fiber Type: Monofilament micro synthetic fiber
- Cross-sectional Shape: Hollow
- Diameter: 0.0016 (0.04mm)
- Nominal Length: 0.5 in. (12 mm)
- Tensile Strength: 15-44 ksi (100-300 MPa)
- Melt Point: 302-320°F(150-160 °C)

- Alkali, Acid, and Salt Resistance: High
- Limit Crack Grade: Grade One (Crack reduction coefficient exceeds 70%)
- Explosion-proof Performance: After 120 minutes of fire exposure, the specimen of explosion-proof fiber concrete showed no apparent damage in the absence of contact.

Addition Rates

The standard addition rate for PIONEER® HPM® FR is 2.0 to 4.0 lb/yd³ (900 to 1800 g/m³) of concrete.

Length

The standard lengths for PIONEER® HPM® FR fibers is 0.5 inch (12mm). Custom lengths can be selected based on project requirements—please contact a PIONEER® sales representative for custom length options.

Packaging

PIONEER® HPM® FR are available in a variety of packaging options, For custom packaging, please reach out to a PIONEER® sales representative.