

## MS-D3 STRUCTURAL SYNTHETIC FIBER SHOTCRETE

Accelerated, silica fume enhanced, structural macro-synthetic fiber reinforced, pre-packaged shotcrete material for dry process applications. MS-D1 Structural Synthetic Fiber Shotcrete is also available upon request.

MS-D3 Structural Synthetic Fiber Shotcrete is a pre-blended, pre-packaged dry process shotcrete material containing high early Portland cement, silica fume, structural macro-synthetic fibers, blended aggregates and other carefully selected components. MS-D3 Structural Synthetic Fiber Shotcrete is non-corrosive and has greatly enhanced post crack capacity and other physical properties.

### FEATURES & BENEFITS

- Significantly increased load carrying capacity.
- Significantly increased energy absorbing capacity (toughness).
- Significantly increased impact resistance.
- Significantly decreased wear on placing equipment and accessories when compared with steel fibers.
- Increased fire resistance.
- Ideal for use in manways or other areas where people may come in contact with the shotcrete surface.
- Rapid early age strength development.
- Improved adhesive and cohesive plastic properties.
- Improved ability to build greater thicknesses in a single pass in both vertical and overhead orientations.
- Improved resistance to water washout.
- Low permeability.
- Reduction of cracking due to drying shrinkage.
- Can be air-entrained to provide improved durability.
- Blended to meet ACI 506 "Guide to Shotcrete", Table 1.1, Gradation No. 2.
- All King products are manufactured using ISO 9001:2000 Certified Processes.

### USES

- Ground support applications for mining, tunneling and other underground openings.
- Rehabilitation of marine structures.
- Lining and rehabilitation of sewers and other tunnels.
- Slope stabilization, soil nailing, shaft and tunnel linings.

### PROCEDURES

#### Surface Preparation (Rock Surfaces):

All surfaces to be in contact with MS-D3 Structural Synthetic Fiber Shotcrete must be free from dust, oil, grease or any other foreign substances that may interfere with the bond of the material. Remove all loose or delaminated rock. Clean the area with potable water, leaving the substrate saturated but free of standing water (SSD).

#### Surface Preparation (Repair or Rehabilitation):

All surfaces to be in contact with MS-D3 Structural Synthetic Fiber Shotcrete must be free from dust, oil, grease or any other foreign substances that may interfere with the bond of the material. Remove all loose or delaminated concrete providing a roughened surface and a minimum of 25 mm (1 inch) clearance behind any corroded reinforcing steel. The perimeter of the repair area should be sawcut a minimum of 20 mm (¾ inch). Clean the area with potable water, leaving the substrate saturated but free of standing water (SSD).

### Application:

Apply MS-D3 Structural Synthetic Fiber Shotcrete in accordance with the ACI 506 "Guide to Shotcrete" publication.

### Curing:

Good curing conditions are beneficial to optimizing physical properties of MS-D3 Structural Synthetic Fiber Shotcrete. Although the high relative humidity commonly found in underground environments provides for good curing conditions, additional curing is often appropriate and should be performed in accordance with ACI 308 "Guide to Curing Concrete".

For rehabilitation applications, shotcrete should be cured immediately after material has reached initial set in accordance with ACI 308 "Guide to Curing Concrete". Continuously moist cure for a minimum period of 7 days. Alternatively, moist cure for a minimum period of 24 hours and apply King Duro-Cure curing compound or a curing compound that complies with ASTM C 309. Curing is particularly critical in rapid moisture loss conditions such as high temperatures, high winds and low humidity.

### TECHNICAL DATA

The following data is representative of typical values achievable using proper application techniques as outlined in the ACI 506 "Guide to Shotcrete" publication. The data was obtained during project field tests and in-house shotcrete studies.

#### COMPRESSIVE STRENGTH

##### ASTM C1116 (ADAPTED)

8 Hr	7 MPa (1015 psi)
24 Hr	20 MPa (2900 psi)

##### ASTM C 1604

3 Day	35 MPa (5075 psi)
28 Day	45 MPa (6525 psi)

#### FLEXURAL STRENGTH

##### ASTM C 78

28 Day	8 MPa (1160 psi)
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#### FLEXURAL TOUGHNESS

##### ASTM C1550

28 Day		
Peak Load		80 kN
Cumulative energy	10 mm	140 J
	20 mm	250 J
	30 mm	325 J
	40 mm	380 J

#### BOILED ABSORPTION

ASTM C 642	6.0 %
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#### MAXIMUM VOLUME OF PERMEABLE VOIDS

ASTM C 642	14.0 %
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## MS-D3 STRUCTURAL SYNTHETIC FIBER SHOTCRETE

### OPTIMUM PERFORMANCE

- MS-D3 Structural Synthetic Fiber Shotcrete should not be applied when ambient, substrate and material temperatures are below 5°C (40°F) or above 35°C (95°F).
- Performance of in-place shotcrete relies heavily upon application techniques. To ensure optimum quality of in-place shotcrete, the material, equipment and key personnel should be pre-qualified prior to project set-up.

### YIELD

1,000 kg (2,205 lb.) bag contains approximately 0.45 m<sup>3</sup> (16.5 ft<sup>3</sup>).

### PACKAGING

MS-D3 Structural Synthetic Fiber Shotcrete is normally packaged in 1,000 kg (2,205 lb.) re-useable bulk bags and poly wrapped on wooden pallets. All KING products can be custom packaged to suit specific requirements.

### STORAGE AND SHELF LIFE

Material should be stored in a dry covered area protected from the elements. Unopened bags have a shelf life of 12 months. Physical properties of MS-D3 Structural Synthetic Fiber Shotcrete may be adversely affected if material is stored in temperatures below 0°C (32°F). Material stored below these temperatures should be allowed to warm to ambient underground temperatures before shooting.

### SAFETY PROCEDURES

MS-D3 Structural Synthetic Fiber Shotcrete contains Portland cement. Normal safety-wear such as rubber gloves, dust mask and safety glasses used to handle conventional cement based products should be worn. Material Safety Data Sheets are available upon request.

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This product is designed to meet the performance specifications outlined in this product data sheet. If the product is used in conditions for which it was not intended, or applied in a manner contrary to the written recommendations contained in the product data sheet, the product may not reach such performance specifications. The foregoing is in lieu of any other warranties, representations or conditions, expressed or implied, including, but not limited to, implied warranties or conditions of merchantable quality or fitness for particular purposes, and those arising by statute or otherwise in law or from a course of dealing or usage of trade.

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