

### MS-D1 SHRINKAGE REDUCED SHOTCRETE

Silica fume enhanced pre-packaged shotcrete material with shrinkage reducing admixture for dry process applications.

**MS-D1 Shrinkage Reduced Shotcrete** is a pre-blended, pre-packaged dry process shotcrete material containing Portland cement, silica fume, air-entraining admixture, shrinkage reducing admixture, blended aggregates and other carefully selected components. **MS-D1 Shrinkage Reduced Shotcrete** has greatly enhanced shooting characteristics and physical properties.

#### FEATURES & BENEFITS:

- Significantly reduced drying shrinkage (up to 50% at 28 days).
- Reduced potential for cracking.
- Air-entrainment provides superior resistance to freeze-thaw cycling and salt scaling resistance.
- Improved adhesive and cohesive plastic properties.
- Significantly reduced rebound, resulting in lower material usage.
- Improved ability to build greater thicknesses in a single pass in both vertical and overhead orientations.
- Improved resistance to water washout.
- Improved resistance to sulphate attack.
- Very low permeability.
- Can be blended to meet ACI 506 "Guide to Shotcrete", Table 2.1, Gradation #1 or #2.
- Pre-packaged under international quality standards of ISO 9001:2000.

#### USES:

- Rehabilitation of concrete bridges, dams, reservoirs, subway tunnels, marine structures and parking ramps.
- Lining and rehabilitation of sewers and watermains.
- New construction including slope stabilization, soil-nailing, shaft and tunnel linings, pools and other concrete structures.

#### PROCEDURES:

*Surface Preparation (Repair or Rehabilitation):*

All surfaces to be in contact with **MS-D1 Shrinkage Reduced 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 the reinforcing steel. The perimeter of the repair area should be sawcut a minimum of 20 mm (3/4 inch). Clean the area to be repaired with potable water, leaving the concrete saturated but free of standing water (SSD).

### Mixing Strength With Satisfaction

**KING PACKAGED MATERIALS COMPANY**  
**P.O. BOX 699**  
**BURLINGTON, ONTARIO**  
**L7R 3Y5**

#### Application:

Apply **MS-D1 Shrinkage Reduced Shotcrete** in accordance with the ACI 506 "Guide to Shotcrete" publication.

#### Curing:

Curing is essential to optimize physical properties of the shotcrete and minimize plastic shrinkage. **MS-D1 Shrinkage Reduced Shotcrete** should be cured immediately after material has reached initial set in accordance with ACI 308 "Standard Practice for Curing Concrete". Continuously moist cure for a minimum period of 7 days. Alternatively, moist cure for a minimum period of 24 hours and apply a curing compound which 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 ACI 506 "Guide to Shotcrete" publication. The data was obtained during project field tests and in-house shotcrete studies.

#### Compressive Strength

##### ASTM C 42

1 Day	15 MPa (2175 psi)
3 Day	30 MPa (4350 psi)
28 Day	42 MPa (6000 psi)

#### Flexural Strength

##### ASTM C 78

28 Day	6.5 MPa (940 psi)
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#### Air Content

ASTM C 457	6 (+/- 2%)
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#### Maximum Air Void Spacing Factor

ASTM C 457	300 µm
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#### Freeze-Thaw Resistance

ASTM C 666	100%
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#### Salt Scaling Resistance

ASTM C 672	0.2 kg/m <sup>2</sup> (0.04 lb./ft <sup>2</sup> )
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#### Uniaxial Drying Shrinkage

##### ASTM C 157

28 Day	300 µm/m
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**TECHNICAL DATA (Con't):****Boiled Absorption**

ASTM C 642 6.0%

**Maximum Volume of Permeable Voids**

ASTM C 642 15.0%

**Rapid Chloride Permeability**

ASTM C 1202 700 coulombs

**OPTIMUM PERFORMANCE:**

- **MS-D1 Shrinkage Reduced Shotcrete** should not be applied when ambient, substrate and material temperatures are below 5°C (40°F) or above 35°C (95°F).
- For adverse temperatures, follow ACI recommendations for cold/hot weather concreting.
- 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 start-up.
- Material should be stored in a dry covered area protected from the elements.

**YIELD:**

- 30 kg (66 lb.) bag contains approximately 0.014 m<sup>3</sup> (0.5 ft<sup>3</sup>).
- 1,000 kg (2,205 lb.) bag contains approximately 0.45 m<sup>3</sup> (16.5 ft<sup>3</sup>).

**PACKAGING:**

**MS-D1 Shrinkage Reduced Shotcrete** is normally packaged in 30 kg (66 lb.) triple lined bags or 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 job requirements.

**SHELF LIFE:**

Unopened bags have a shelf life of 12 months when stored as recommended.

**SAFETY PROCEDURES:**

**MS-D1 Shrinkage Reduced 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.

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.