

## PRODUCT DATA SHEET

# King<sup>®</sup> HC-D1

ENHANCED SHRINKAGE CRACKING RESISTANCE SHOTCRETE MATERIAL FOR DRY-MIX PROCESS APPLICATIONS



### PRODUCT DESCRIPTION

King<sup>®</sup> HC-D1 is a pre-packaged and pre-blended shotcrete material formulated for dry-mix applications, equipped with crack-resistant technology. It contains Portland cement along with other carefully selected components. It offers enhanced shooting characteristics and physical properties, highly crack-resistant repair material, along with compatibility with existing concrete substrates that allows for durable repairs.

### USES

Rehabilitation of concrete bridges, dams, reservoirs, tunnels, marine structures, parking ramps, and other concrete structures

### CHARACTERISTICS / ADVANTAGES

- Low cracking potential (according to AASHTO T334)
- Very low shrinkage
- Physical properties similar to conventional concrete, thus offering excellent compatibility with existing concrete
- Air-entrainment providing superior resistance to freeze-thaw cycling and salt-scaling resistance
- Improved adhesive and cohesive plastic properties
- Significantly reduced rebound, resulting in lower material usage
- Very low permeability
- Designed with natural, normal-density, non-reactive, fine and coarse aggregates to eliminate potential alkali-aggregate reactivity (AAR)

### PRODUCT INFORMATION

<b>Packaging</b>	66 lb (30 kg) bag 2205 lb (1000 kg) FIBC* Custom packaging is available to suit specific project requirements <i>*Flexible Intermediate Bulk Container</i>
<b>Shelf Life</b>	12 months in original, unopened packaging
<b>Storage Conditions</b>	Stored in a dry, covered area, protected from the elements between 40°F - 95°F (5°C - 35°C)

# TECHNICAL INFORMATION

<b>Compressive Strength</b>		<b>ASTM C1604</b>
	1 day	2175 psi (15 MPa)
	3 days	3000 psi (21 MPa)
	7 days	3625 psi (25 MPa)
	28 days	5075 psi (35 MPa)
<b>Modulus of Elasticity in Compression</b>	<b>MODULUS OF ELASTICITY</b>	<b>ASTM C469</b>
	7 days	3.8 x 10 <sup>6</sup> psi (25.9 GPa)
	28 days	4.5 x 10 <sup>6</sup> psi (30.8 GPa)
<b>Flexural Strength</b>	<b>FLEXURAL STRENGTH</b>	<b>ASTM C78</b>
	7 days	725 psi (5.0 MPa)
	28 days	1015 psi (7.0 MPa)
<b>Splitting tensile strength</b>	<b>SPLITTING TENSILE STRENGTH</b>	<b>ASTM C496</b>
	7 days	465 psi (3.2 MPa)
	28 days	550 psi (3.8 MPa)
<b>Tensile Adhesion Strength</b>	<b>TENSILE BOND STRENGTH</b>	<b>ASTM C1583</b>
	28 days	290 psi (2.0 MPa)
<b>Slant Shear Strength</b>	<b>BOND STRENGTH BY SLANT SHEAR(MODIFIED)</b>	<b>ASTM C882</b>
	7 days	2145 psi (14.8 MPa)
	28 days	2785 psi (19.2 MPa)
<b>Shrinkage</b>	<b>UNIAXIAL DRYING SHRINKAGE*</b>	<b>ASTM C157</b>
	28 days	0.022%
	56 days	0.029%
	180 days	0.036%
<b>Restrained Shrinkage / Expansion</b>	<b>ESTIMATION OF CRACKING POTENTIAL * **</b>	<b>AASHTO T 334</b>
	Age at cracking	No cracks after 100 days
	Maximum strain	-0.0098.8%
	Stress rate	3.77 psi (0.026 MPa) per day (low cracking potential)
<b>Coefficient of Thermal Expansion</b>		<b>CRD-C39</b>
	28 days	6.1 x 10 <sup>6</sup> /°F (11.0 x 10 <sup>6</sup> /°C)
<b>Rapid Chloride Permeability</b>	<b>CHLORIDE ION PENETRABILITY</b>	<b>ASTM C1202</b>
	28 days	500 Coulombs
<b>Porosity</b>	<b>AIR CONTENT</b>	<b>ASTM C457</b>
	6 % ± 2 %	
	<b>MAXIMUM AIR VOIDS SPACING FACTOR</b>	<b>ASTM C457</b>
	0.0118 in	
	<b>BOILED ABSORPTION</b>	<b>ASTM C642</b>
	28 days	6.0 %
	<b>MAXIMUM VOLUME OF PERMEABLE VOIDS</b>	<b>ASTM C642</b>
28 days	15.0 %	

28 days

99 %

Salt resistance

SALT-SCALING RESISTANCE

ASTM C672

0.09 lb/ft<sup>2</sup> (0.46 kg/m<sup>2</sup>)

## APPLICATION INFORMATION

Coverage

Approx. 0.5 ft<sup>3</sup> per 66 lb bag (0.014 m<sup>3</sup> per 30 kg bag)Approx. 16.5 ft<sup>3</sup> per 2205 lb FIBC (0.45 m<sup>3</sup> per 1000 kg FIBC)

## BASIS OF PRODUCT DATA

Results may differ based upon statistical variations depending upon mixing methods and equipment, temperature, application methods, test methods, actual site conditions and curing conditions.

\*The following data was obtained using a 100 % RH curing period of 3 days followed by 50 % RH curing with material and ambient temperatures of 70 °F (21 °C).

\*\*Tested in accordance with the modified test methods indicated in the following article: Girard, S.; Jolin, M.; Bissonnette, B.; and Lemay, J-D. (2017) "Measuring the Cracking Potential of Shotcrete." Concrete International, V. 39, No. 8, 44-48.

The following data was obtained under controlled conditions with material and ambient temperatures of 70 °F (21 °C) . Higher or lower temperatures can respectively accelerate or delay setting time and early-age compressive strength gain.

## ENVIRONMENTAL, HEALTH AND SAFETY

For further information and advice regarding transportation, handling, storage and disposal of chemical products, user should refer to the actual Safety Data Sheets containing physical, environmental, toxicological and other safety related data. User must read the current actual Safety Data Sheets before using any products. In case of an emergency, call CHEMTREC at 1-800-424-9300, International 703-527-3887.

## EQUIPMENT

Special precautions needed when using predampeners with dry blended powdered accelerated shotcrete.

Contact your Sika STM Technical Representative for more information.

## SURFACE PREPARATION

- **Repair or Rehabilitation:** All surfaces to be in contact with King® HC-D1 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 1 inch (25 mm) clearance behind any corroded reinforcing steel. The perimeter of the repair area should be saw-cut a minimum of ¼ inch (20 mm). Clean the area to be repaired with potable water, leaving the concrete saturated but free of standing water (SSD).
- **Rock surfaces:** All surfaces to be in contact with product 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).

## APPLICATION

Apply King® HC-D1 in accordance with the ACI 506 "Guide to Shotcrete" publication.

Performance of in-place shotcrete relies heavily upon application techniques. The shotcrete material, equipment and key personnel should be pre-qualified prior to project start-up to ensure optimum quality of in-place shotcrete.

## OPTIMUM PERFORMANCE

- King® HC-D1 should not be applied when ambient substrate and material temperatures are below 40 °F (5 °C) or above 95 °F (35 °C).
- For adverse temperatures, follow ACI recommendations for Cold / Hot Weather Concreting.

Contact your Sika STM Technical Representative for more information.

## CURING TREATMENT

Curing is essential to optimize physical properties of the shotcrete and minimize shrinkage. King® HC-D1 should be cured immediately after material has reached initial set in accordance with ACI 308 "Guide to Curing Concrete". For optimum results, begin by continuously moist curing for a minimum period of three (3) days. Following the 3 day moist curing period, apply two (2) coats of a curing compound (ASTM C309 compliant). When the area of the repair area does not exceed 9 ft<sup>2</sup> (1 m<sup>2</sup>), it is possible to directly apply two (2) coats of curing compound (ASTM C309 compliant). Curing is particularly critical in rapid moisture loss conditions such as high temperatures, high winds and low humidity.

## CLEANING OF TOOLS

Remove King® HC-D1 from tools and equipment with water. Cured product can only be removed mechanically.

## OTHER RESTRICTIONS

See Legal Disclaimer.

## LEGAL DISCLAIMER

- KEEP CONTAINER TIGHTLY CLOSED
- KEEP OUT OF REACH OF CHILDREN
- NOT FOR INTERNAL CONSUMPTION
- FOR INDUSTRIAL USE ONLY
- FOR PROFESSIONAL USE ONLY

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