

PRODUCT DATA SHEET

King® RS-D1 US

RAPID STRENGTH SHOTCRETE MATERIAL FOR DRY-MIX PROCESS APPLICATIONS

PRODUCT DESCRIPTION

King® RS-D1 US is a rapid hardening, pre-blended, and prepackaged shotcrete material formulated for drymix applications. It contains controlled, blended aggregates along with other carefully selected components. It offers enhanced shooting characteristics and physical properties, greatly reduced setting times, along with very rapid strength development.

USES

Overall:

- Rehabilitation of concrete bridges, dams, reservoirs, tunnels, marine structures, and parking ramps
- Lining and rehabilitation of sewers, and water pipes
- New construction including slope stabilization, soil-nailing, shaft, and tunnel lining

Included steel fiber reinforcement (ST):

- 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

CHARACTERISTICS / ADVANTAGES

- Very high early strength for a reduced construction schedule
- Improved performance in presence of running water
- Air-entrainment provides superior resistance to freeze-thaw cycling, and salt-scaling resistance
- Allows earlier re-opening of traffic lanes on bridges, and earlier reentry times in tunnels and parking garages
- Low modulus of elasticity and low drying shrinkage, reducing cracking potential
- Simplified curing method to accelerate construction

schedule

- Significantly reduced rebound, resulting in lower material usage
- Superior ability to build greater thicknesses in a single pass, in both vertical, and overhead orientations
- Improved resistance to water washout
- Improved resistance to sulfate attack
- Very low permeability and low shrinkage Compatible with integral, pre-applied, and/or postapplied corrosion inhibitors
- Designed with natural normal-density nonreactive aggregates to eliminate potential alkali-aggregate reactivity (AAR)

OPTIONAL FEATURES AND BENEFITS

Micro-Synthetic Fiber (SY)

- Micro-Synthetic fibers reduce cracking caused by intrinsic stresses
- Type III synthetic fiber in accordance with ASTM C1116
- Grade FR Class I shotcrete in accordance with ASTM C1480

Corrosion Inhibitor (CI)

- Corrosion inhibitor protects steel reinforcing and other metals embedded in concrete from corrosion induced by carbonation or chlorides
- Pre-blended corrosion inhibitor provides the correct dosage to enhance corrosion protection

Steel Fiber (ST)

- Different grades of RS-D1 ST US with higher and lower dosages of steel fiber are available upon request.
- Significantly increased load carrying capacity
- Significantly increased energy absorbing capacity (toughness)
- Significantly increased impact resistance

Gradation (G2)

- By default, King® RS-D1 US & King® RS-D1 ST US are blended to meet ACI 506 “Guide to Shotcrete”, Table 1.1, Gradation No. 1 (No Added Abbreviation)

PRODUCT INFORMATION

Packaging	65 lb (29.5 kg) bag 2200 lb (997 kg) bulk bag
Shelf Life	12 months in original, unopened packaging
Storage Conditions	Stored in a dry, covered area, protected from the elements between 40°F - 95°F (5°C - 35°C) Underground Environments Stored in a dry, covered area, protected from the elements between 40°F - 95°F (5°C - 35°C) Physical properties may be adversely affected if material is stored in temperatures below 40°F (5°C) and should be allowed to warm to ambient underground temperatures before application

TECHNICAL INFORMATION

Compressive Strength		ASTM C116
		50% Relative Humidity
	1 hr	1500 psi (10 MPa)
	2 hrs	2175 psi (15 MPa)
	3 hrs	3000 psi (21 MPa)
	1 day	3625 psi (25 MPa)
		ASTM C1604
		50% Relative Humidity
	7 days	4640 psi (32 MPa)
	28 days	5500 psi (38 MPa)
Modulus of Elasticity in Compression		ASTM C469
	28 days	3.7 x 10 ⁶ psi (25.3 GPa)
Flexural Strength		ASTM C78
	28 days	785 psi (5.4 MPa)
Shrinkage		ASTM C157
	28 days	0.04%
Freeze-Thaw Stability		ASTM C666
	28 days	100% (Excellent durability factor)
Porosity		ASTM C457
	Air Content	6 ± 2%
		ASTM C457
	Max Air Void Spacing Factor	0.0118 in (300 µm)
		ASTM C642
	Boiled Absorption	6.0 %
		ASTM C642
	Max Volume of Permeable Voids	15.0%

Salt resistance

	ASTM C672
28 days	0.12 lb / ft ² (0.6 kg / m ²)

Flexural toughness

STEEL FIBER Toughness as a function of flexure					
1 day					
Peak applied load	5 mm	10 mm	20 mm	30 mm	ASTM C1550 40 mm
3821 psi (17 kN)	> 75 J	> 140 J	> 230 J	> 250 J	> 300 J
28 days					
Peak applied load	5 mm	10 mm	20 mm	30 mm	40 mm
6070 psi (27 kN)	> 100 J	> 200 J	> 300 J	> 350 J	> 400 J

Rapid Chloride Permeability

	ASTM C1202
28 days	1200 Coulombs (Low permeability)

APPLICATION INFORMATION**Coverage**

Approx. 0.5 ft³ per 65 lb bag (0.014 m³ per 29.5 kg bag)
 Approx. 16.5 ft³ per 2200 lb FIBC (0.45 m³ per 997 kg bag)

Thinner

	ASTM C1117
Initial	5-10 min
Final	10-20 min

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.

AVAILABILITY/WARRANTY

Each of the following descriptors / features have the possibility of being included in a specific mix design; Either on their own, or combined with any other descriptors / features.

Descriptors / Features of fiber dosages:

Steel Fibers	ST
Micro-Synthetic Fibers	SY

Descriptors / Features of other technologies:

Corrosion Inhibitor	CI
Retarded / Delayed Set Time	RT

APPLICATION INSTRUCTIONS**EQUIPMENT**

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

Contact your Sika Representative for more information.

SURFACE PREPARATION**Temperatures above 40°F (5°C):**

- **Repair or Rehabilitation:** 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 concrete providing a roughened surface and a minimum of ¾ inch (20 mm) clearance behind any corroded reinforcing steel. The perimeter of the repair area should be saw-cut a minimum of ¾ 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).

Temperatures below 40°F (5°C):

▪ **Repair or Rehabilitation:** All surfaces to be in contact with product must be free from 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 the reinforcing steel. The perimeter of the repair area should be sawcut a minimum of ¾ inch (20 mm). To avoid freezing of the interface between the shotcrete and the parent concrete, do not pre-wet the receiving surface. Pneumatically remove any free standing or other fine particles that may interfere with the bond between the product and the substrate. Do not apply when ambient temperature is below or is expected to fall below 20 °F (- 5 °C) within six (6) hours following the application of shotcrete. Do not apply when temperature of receiving surface is below 20 °F (- 5 °C). Material and mixing water temperature must be maintained between 70 °F and 86 °F (20 °C and 30 °C).

▪ **Rock surfaces:** All surfaces to be in contact with the 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. To avoid freezing of the interface between the shotcrete and the parent concrete, do not pre-wet the receiving surface. Pneumatically remove any free standing or other fine particles that may interfere with the bond between the product and the substrate.

APPLICATION

Apply product 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® RS-D1 US & King® RS-D1 ST US should not be applied when ambient, substrate, and material temperatures are below 20°F (-5°C) or above 95°F (35°C)
 - Material should be allowed to warm to at least 60°F (15°C) prior to shooting in order to optimize early age compressive strength results
 - For adverse temperatures, follow ACI recommendations for Cold / Hot Weather Concreting
 - King® RS-D1 ST US recommended minimum inside diameter of shotcrete hoses should be 2 in (50 mm)
- Contact your Sika Representative for more information

CURING TREATMENT

Curing is essential to optimize physical properties of the shotcrete and minimize plastic shrinkage. In order to reduce the construction schedule, this product was developed and tested using a simplified curing method consisting of applying two (2) coats of a water-based curing compound in compliance with ASTM C309 or

C1315. Curing is particularly critical in rapid moisture loss conditions such as high temperatures, high winds and low humidity.

Temperatures below 40°F (5°C):

Good curing conditions are beneficial to optimizing physical properties. Immediately after shotcrete reaches final set, apply two (2) coats of a resin-based liquid membrane curing compound approved for use in cold weather conditions.

CLEANING OF TOOLS

Clean all tools and equipment immediately after use with water. Once hardened, material can only be removed mechanically.

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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Product Data Sheet

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