

PRODUCT DATA SHEET

King[®] RS-D1

RAPID STRENGTH SHOTCRETE MATERIAL FOR DRY-MIX PROCESS APPLICATIONS

PRODUCT DESCRIPTION

King[®] RS-D1 is a rapid hardening shotcrete mix formulated for dry-process applications. It is a pre-blended, pre-packaged, dry-process shotcrete material powered by Rapid Set[®] technology, containing controlled blended aggregates and other carefully selected components. King[®] RS-D1 offers enhanced shooting characteristics, greatly reduced setting times and very rapid strength development.

WHERE TO USE

- Rehabilitation of concrete bridges, dams, reservoirs, subway 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

King[®] RS-D1 ST

- Ground support applications for mining, tunneling, and other underground openings
- Rehabilitation of marine structures
- Lining and rehabilitation of sewers, and other tunnels

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 ma-

terial 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
- Compatible with integral, pre-applied, and/or post-applied corrosion inhibitors*
- Designed with natural normal-density non-reactive aggregates to eliminate potential alkali-aggregate reactivity (AAR)

OPTIONAL FEATURES AND BENEFITS

MICRO-SYNTHETIC FIBRE (SY)

- Synthetic fibres reduce cracking caused by intrinsic stresses
- Type III synthetic fibre 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 FIBRE (ST)

- Different grades of RS-D1 ST with higher and lower dosages of steel fibre are available upon request.

EXAMPLES:

- For King[®] RS-D1 with synthetic fibres and Gradation No. 2, the name of the product would be King[®] RS-D1 SY G2.

APPROVALS / CERTIFICATES

GRADATION

- By default King[®] RS-D1 & King[®] RS-D1 ST are blended to meet *ACI 506 "Guide to Shotcrete", Table 1.1,*

Gradation No. 1

- King® RS-D1 G2 & King® RS-D1 ST G2 are blended to meet ACI 506 "Guide to Shotcrete", Table 1.1, Gradation No. 2

PRODUCT INFORMATION

Packaging	<ul style="list-style-type: none"> 30 kg (66 lb) bags 1 000 kg (2 205 lb) FIBC Products containing macro-synthetic fibres (MF) or steel fibres (ST) can only be packaged in bulk bags (FIBC).
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*Custom packaging is available to suit specific project requirements

Shelf Life	12 months in original packaging, unopened
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Storage Conditions	Material should be stored in a dry, covered area, protected from the elements. For optimum performance it is recommended to store the material between 5°C (40°F) and 35°C (95°F) .
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Underground environments

Physical properties may be adversely affected if material is stored in temperatures below 5°C (40°F), material stored below these temperatures should be allowed to warm to ambient underground temperatures before shooting. For optimum performance it is recommended to store the material between 5°C (40°F) and 35°C (95°F) .

TECHNICAL INFORMATION

Compressive Strength		50 % HUMIDITY CURE	ASTM C116
	1 hour	10 MPa (1 500 psi)	
	2 hours	15 MPa (2 175 psi)	
	3 hours	21 MPa (3 000 psi)	
	1 day	25 MPa (3 625 psi)	
		50 % HUMIDITY CURE	ASTM C1604
	7 days	32 MPa (4 640 psi)	
	28 days	38 MPa (5 500 psi)	

Modulus of Elasticity in Compression	MODULUS OF ELASTICITY	ASTM C469
	28 days	25.3 GPa

Tensile Strength in Flexure		ASTM C78
	28 days	5.4 MPa (785 psi)

Flexural Rigidity	King® RS-D1 ST					ASTM C1550
	1 day					
	Toughness as a function of flexure					
	Peak applied load	5 mm	10 mm	20 mm	30 mm	40 mm
	17 kN (3 821 lbf)	> 75 J	> 140 J	> 230 J	> 250 J	> 300 J
	28 days					
	Toughness as sa function of flexure					
	Peak applied load	5 mm	10 mm	20 mm	30 mm	40 mm
	27 kN (6 070 lbf)	> 100 J	> 200 J	> 300 J	> 350 J	> 400 J



Shrinkage	UNIAXIAL DRYING SHRINKAGE		ASTM C157
	28 days	400 µm/m	
Chloride Ion Diffusion Resistance	CHLORIDE ION PENETRABILITY		ASTM C1202
	28 days	1 200 Coulombs (Low permeability)	
Porosity	AIR CONTENT		ASTM C457
	6 % ± 2 %		
	MAXIMUM AIR VOID SPACING FACTOR		ASTM C457
	300 µm		
	BOILED ABSORPTION		ASTM C642
	28 days	6.0 %	
	MAXIMUM VOLUME OF PERMEABLE VOIDS		ASTM C642
	28 days	15.0 %	
Freeze thaw resistance	28 days	100 % (Excellent durability factor)	ASTM C666
Salt Resistance	SALT SCALING RESISTANCE		ASTM C672
	0.6 kg/m ² (0.12 lb/ft ²)		

APPLICATION INFORMATION

Yield	<ul style="list-style-type: none"> ▪ Approx. 0.014 m³ (0.5 ft³) / 30 kg (66 lb) bag ▪ Approx. 0.45 m³ (16.5 ft³) / 1 000 kg (2 205 lb) bag 		
	*Yield in service may slightly vary according to project conditions		
Setting Time	Initial	5-10 minutes	ASTM C 1117
	Final	10-20 minutes	

BASIS OF PRODUCT DATA

All technical data stated in this Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

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

OTHER DOCUMENTS

Each of the following features may be included a specific mix design (on their own, or combined).

Corrosion Inhibitor (CI)	Retarded/Delayed Set-Time (RT)
Steel Fibres (ST)	Gradation 2 (G2)
Micro Synthetic Fibres (SY)	

LIMITATIONS

- 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
- Use of a predampener in conjunction with dry-pro-

cess, accelerated shotcrete is not recommended. Contact your local SikaTechnical Representative for more information

ENVIRONMENT, HEALTH & SAFETY

User must read the most recent corresponding Safety Data Sheets (SDS) before using any products. The SDS provides information and advice on the safe handling, storage and disposal of chemical products and contains physical, ecological, toxicological and other safety-related data.

APPLICATION INSTRUCTIONS

SURFACE PREPARATION

FOR APPLICATION AT TEMPERATURES ABOVE +5 °C (40 °F)

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).

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 20 mm (¾ in) clearance behind any corroded reinforcing steel. The perimeter of the repair area should be saw-cut a minimum of 20 mm (¾ in). Clean the area to be repaired with potable water, leaving the concrete saturated but free of standing water (SSD)

FOR APPLICATIONS AT TEMPERATURES BELOW +5 °C (40 °F)

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.

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 25 mm (1 in) clearance behind the reinforcing steel. The perimeter of the repair area should be saw-cut a minimum of 20 mm (¾ in). 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 -5 °C (20 °F) within six (6) hours following the application of shotcrete. Do not apply when temperature of receiving surface is below -5 °C (20 °F). Material and mixing water temperature must be maintained between +20 °C and +30 °C (70 °F and 86 °F).

APPLICATION

Apply product in accordance with the *ACI 506 "Guide to Shotcrete"* publication.

OPTIMUM PERFORMANCE

- King® RS-D1 & King® RS-D1 ST should not be applied when ambient and substrate temperatures are below -5 °C (20 °F) or when ambient, substrate and material temperatures are above +35 °C (95 °F).
- For adverse temperatures, follow ACI recommendations for Cold/Hot Weather Concreting.

TEMPERATURES BELOW 5°C (40°F):

Do not apply King® RS-D1 when ambient temperature is below or is expected to fall below -5 °C (20 °F) within 6 hours following the application of shotcrete.

Do not apply when temperature of receiving surface is below -5 °C (20 °F). Material temperature should be maintained above 10 °C (50 °F) at the time of application.

CURING TREATMENT

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.

FOR APPLICATIONS AT TEMPERATURES BELOW 5 °C (40 °F)

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.

CLEAN UP

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

LOCAL RESTRICTIONS

Note that as a result of specific local regulations the declared data and recommended uses for this product may vary from country to country. Consult the local Product Data Sheet for exact product data and uses.

LEGAL NOTES

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product's suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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PRODUCT DATA SHEET

King® RS-D1

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