

PRODUCT DATA SHEET

King[®] RS-D2

RAPID STRENGTH SHOTCRETE MATERIAL FOR DRY-MIX PROCESS FOR UNDERGROUND APPLICATIONS

PRODUCT DESCRIPTION

King[®] RS-D2 is a pre-blended, pre-packaged, dry-process shotcrete mix powered by Rapid Set[®] technology, containing blended aggregates and other carefully selected components. King[®] RS-D2 presents greatly enhanced shooting characteristics, providing greatly reduced setting times and very rapid strength development

WHERE TO USE

- Ground support applications for mining, tunneling and other underground openings.
- Construction of underground bulkheads, backfill barricades, pillars, ventilation walls and other underground concrete structures.

CHARACTERISTICS / ADVANTAGES

- Very rapid early age strength development
- Improved adhesive and cohesive plastic properties
- Significantly reduced rebound, resulting in lower material usage
- Superior ability to build greater thicknesses in a single pass in both vertical and overhead orientations
- Low shrinkage

OPTIONAL FEATURES & BENEFITS

MICRO-SYNTHETIC FIBRES (SY)

- Synthetic fibers reduce cracking caused by intrinsic stresses
- Type III synthetic fiber in accordance with ASTM C 1116
- Grade FR Class I shotcrete in accordance with ASTM C 1480

MACRO-SYNTHETIC FIBRES (MF)

- 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 fibres
- Ideal for use in man-ways or other areas where people may come in contact with the shotcrete surface
- Reduced cracking due to drying shrinkage
- Very rapid early-age strength development
- Improved adhesive and cohesive plastic properties

Product	Dosage of fibres
King [®] RS-D2 MFB	high
King [®] RS-D2 MFC	medium
King [®] RS-D2 MFD	low

STEEL FIBRE(ST)

Different grades of King[®] RS-D2 ST with higher and lower dosage of steel fibres are available upon request.

- Significantly increased load carrying capacity
- Significantly increased energy absorbing capacity (toughness)
- Significantly increased impact resistance

Examples:

- For King® RS-D2 ST with Gradation No. 1, the name of the product would be King® RS-D2 ST G1.
- For King® RS-D2 MF with a high dosage of macro-synthetic fibres, and Gradation No. 2, the name of the product would be King® RS-D2 MFB
- For King® RS-D2 with Gradation No. 1, the name of the product would be King® RS-D2 G1

APPROVALS / CERTIFICATES

Gradation

- By default King® RS-D2, King® RS-D2 MF and King® RS-D2 ST are blended to meet ACI 506 “*Guide to Shotcrete*”, Table 1.1, Gradation No. 2
- King® RS-D2 G1, King® RS-D2 MF G1 and King® RS-D2 ST G1 are blended to meet ACI 506 “*Guide to Shotcrete*”, Table 1.1, Gradation No. 1

PRODUCT INFORMATION

Packaging	<ul style="list-style-type: none"> 1000 kg (2205 lb) bag Products containing macro-synthetic fibres (MF) or steel fibres (ST) can only be packaged in bulk bags (FIBC) <p>* Custom packaging is available to suit specific project requirements</p>
Shelf Life	12 months in original, unopened packaging
Storage Conditions	Store dry, ensuring that product is not exposed to rain, condensation or high humidity.

TECHNICAL INFORMATION

Compressive Strength	+21 °C (70°F)		ASTM C116 (MODIFIED)
	2 hours	21 MPa (3000 psi)	
	1 day	30 MPa (4350 psi)	ASTM C1604
	7 days	40 MPa (5800 psi)	
	28 days	50 MPa (7250 psi)	

Tensile Strength in Flexure	King® RS-D2	King® RS-D2 ST	King® RS-D2 MF	ASTM C78
	7 days	5.5 MPa (800 psi)	-	
28 days	6.0 MPa (870 psi)	5.4 MPa (785 psi)	5.4 MPa (785 psi)	

Flexural rigidity	ASTM C1550
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MACRO-SYNTHETIC FIBRE (MF)

Dosage	Age	Peak load applied	Toughness at 40 mm
King® RS-D2 MFB	1 day	20 kN (4495 lbf)	> 350 J
	28 day	25 kN (5620 lbf)	> 400 J

Dosage	Age	Peak load applied	Toughness at 40 mm
King® RS-D2 MFC	1 day	15 kN (3370 lbf)	> 325 J
	28 day	20 kN (4485 lbf)	> 350 J

Dosage	Age	Peak load applied	Toughness at 40 mm
King® RS-D2 MFD	1 day	10 kN (2245 lbf)	> 250 J
	28 day	15 kN (3370 lbf)	> 275 J

STEEL FIBRE (ST)

1 Day

Peak applied load Toughness a function of flexure

	5 mm	10 mm	20 mm	30 mm	40 mm
17 kN (3821 lbf)	> 75 J	> 140 J	> 230 J	> 250 J	> 300 J

28 Days



Peak applied load	Toughness as a function of flexure				
	5 mm	10 mm	20 mm	30 mm	40 mm
27 kN (6070 lbf)	> 100 J	> 200 J	> 300 J	> 350 J	> 400 J

Porosity	BOILED ABSORPTION				ASTM C642
	7.0 %				
	MAXIMUM OF PERMEABLE VOIDS				ASTM C642
	King® RS-D2		15.0 %		
King® RS-D2 MF		14.0 %			

APPLICATION INFORMATION

Yield	Approx. 0.45 m ³ (16.5 ft ³) / 1000 KG (2 205 lb) bag <small>*Yield in service may slightly vary according to projects conditions</small>		
Curing Time	Good curing conditions are beneficial to optimizing the physical properties. 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".		
Setting Time	Initial	5 minutes	ASTM C1117
	Final	10 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.

OTHER DOCUMENTS

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 descriptor/feature:

Air-entrained (E)	Synthetic fibres (SY)
Steel fibres (ST)	Macro-synthetic fibres at different dosage (MF, MFB, MFC)

LIMITATIONS

- The use of predampener in conjunction with dry-process, accelerated shotcrete is not recommended. Contact your local SikaTechnical Representative for more information.
- Physical properties may be adversely affected if material is stored in temperatures below 0 °C (32 °F).
- It is important to note that 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.

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

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® RS-D2 in accordance with the ACI 506 "Guide to Shotcrete" publication.

OPTIMUM PERFORMANCE

- Material should be allowed to warm to at least +15 °C (60 °F) prior to shooting in order to optimize early age compressive strength results.

King® RS-D2 MF

- King® RS-D2 MF should not be applied when ambient, substrate and material temperatures are below +5 °C (40 °F).
- Recommended minimum inside diameter of shotcrete hoses should be 50 mm (2 in).

King® RS-D2 ST

- Recommended minimum inside diameter of shotcrete hoses should be 50 mm (2 in).

CLEAN UP

Clean all tools and equipment after use with water. Once hardened, the product 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.