

	KING MS-D1	KING MS-D1 ST	KING MS-D1 MF	KING MS-D3	KING MS-D3 ST	KING MS-D3 MF	KING RS-D1	KING HC-D1	KING MS-W1	SikaCem-900 Geo W
TARGETED APPLICATION	Civil Construction & Tunneling							Civil Repair	Civil Construction & Tunneling	Civil Repair
PROCESS	Dry-mix									
KEY FEATURES	Standard shotcrete mix design	Steel fiber reinforcement	Macro-synthetic fiber reinforcement	High-early strength development	High-early strength development with steel fiber reinforcement	High-early strength development with marco-synthetic fiber reinforcement	Rapid early-age strength development	Low shrinkage and low cracking potential	On-demand wet-mix shotcrete	High chemical resistant geopolymer
MAIN USES	<ul style="list-style-type: none"> Concrete rehabilitation New construction Concrete lining 	<ul style="list-style-type: none"> Ground support Structural rehabilitation 		<ul style="list-style-type: none"> Concrete rehabilitation New construction Ground support 	<ul style="list-style-type: none"> Ground support Structural rehabilitation 		<ul style="list-style-type: none"> Ground support Concrete rehabilitation requiring quick return-to-service 	<ul style="list-style-type: none"> Concrete rehabilitation 	<ul style="list-style-type: none"> Concrete and structural rehabilitation New construction Concrete lining Ground support 	<ul style="list-style-type: none"> Concrete lining
OPTIONAL FEATURES (different additives can be combined in a single mix e.g. MS-D1 X SY)	<ul style="list-style-type: none"> Setting accelerator: MS-D1 X, X2 or X3 Micro-synthetic fiber: MS-D1 SY Corrosion inhibitor: MS-D1 CI Potable water application (NSF-61 approved): MS-D1 PW Waterproofing admixture: MS-D1 CW Low-dust admixture: MS-D1 LD Gradation No. 2: MS-D1 G2 			<ul style="list-style-type: none"> Setting accelerator: MS-D3 X, X2 or X3 Micro-synthetic fiber: MS-D3 SY Corrosion inhibitor: MS-D3 CI Waterproofing admixture: MS-D3 CW Low-dust admixture: MS-D3 LD Gradation No. 2: MS-D3 G2 				<ul style="list-style-type: none"> Micro-synthetic fiber: RS-D1 SY Corrosion inhibitor: RS-D1 CI Retarded set-time: RS-D1 RT Low-dust admixture: RS-D1 LD Gradation No. 2: RS-D1 G2 	<ul style="list-style-type: none"> Setting accelerator added at the nozzle: Sika Sigunit Micro-synthetic fiber: MS-W1 SY Corrosion inhibitor: MS-W1 CI Waterproofing admixture: MS-W1 CW Steel fiber: MS-W1 ST Macro-synthetic fiber: MS-W1 MF Gradation No. 2: MS-W1 G2 	
INITIAL SET (ASTM C 1117)	MS-D1: 4 hours MS-D1 X: 60 minutes MS-D1 X2: 20 minutes MS-D1 X3: 5 minutes			MS-D3: 3 hours MS-D3 X: 45 minutes MS-D3 X2: 15 minutes MS-D3 X3: 3 minutes			5-10 minutes		4 hours (without addition of setting accelerator at the nozzle)	20-30 minutes
FINAL SET (ASTM C 1117)	MS-D1: 6 hours MS-D1 X: 70 minutes MS-D1 X2: 30 minutes MS-D1 X3: 10 minutes			MS-D3: 5 hours MS-D3 X: 60 minutes MS-D3 X2: 25 minutes MS-D3 X3: 5 minutes			10-20 minutes		6 hours (without addition of setting accelerator at the nozzle)	30-40 minutes
KEY MECHANICAL PROPERTIES	Compressive Strength (ASTM C116 mod ; ASTM C1604)	Flexural Toughness - 28 days (ASTM C1550)	Flexural Toughness - 28 days (ASTM C1550)	Compressive Strength (ASTM C116 mod ; ASTM C1604)	Flexural Toughness - 28 days (ASTM C1550)	Flexural Toughness - 28 days (ASTM C1550)	Compressive Strength (ASTM C116 mod ; ASTM C1604)	Uniaxial Drying Shrinkage (ASTM C157)	Uniaxial Drying Shrinkage (ASTM C157)	Chemical Resistance (ASTM C267)
	<u>4 hours</u> MS-D1: - MS-D1 X: - MS-D1 X2: 1 MPa (150 psi) MS-D1 X3: 5 MPa (725 psi)	<u>STA</u> Peak applied load: 40 kN (8992 lbf) 5 mm: > 100 J 10 mm: > 215 J 20 mm: > 350 J 30 mm: > 450 J 40 mm: > 500 J	<u>MFC</u> Peak applied load: 20 kN (4 95 lbf) 10 mm: > 80 J 20 mm: > 125 J 30 mm: > 250 J 40 mm: > 350 J	<u>4 hours</u> MS-D3: - MS-D3 X: - MS-D3 X2: 2 MPa (290 psi) MS-D3 X3: 7 MPa (1015 psi)	<u>STA</u> Peak applied load: 40 kN (8992 lbf) 5 mm: > 100 J 10 mm: > 215 J 20 mm: > 350 J 30 mm: > 450 J 40 mm: > 500 J	<u>MFC</u> Peak applied load: 20 kN (4 95 lbf) 10 mm: > 80 J 20 mm: > 125 J 30 mm: > 250 J 40 mm: > 350 J	1 hour: 10 MPa (1500 psi) 2 hours: 15 MPa (2175 psi) 3 hours: 21 MPa (3000 psi) 7 days: 32 MPa (4640 psi) 28 days: 38 MPa (5 500 psi) (at 50% humidity cure)	28 days: 220 µm/m 56 days: 290 µm/m 180 days: 360 µm/m	1 day: 15 MPa (2175 psi) 3 days: 28 MPa (4060 psi) 7 days: 32 MPa (4640 psi) 28 days: 42 MPa (6000 psi)	Sulfuric Acid (pH 1.0): zero mass loss & zero volume loss
	<u>8 hours</u> MS-D1: - MS-D1 X: 5 MPa (725 psi) MS-D1 X2: 6 MPa (870 psi) MS-D1 X3: 8 MPa (1150 psi)	<u>STB</u> Peak applied load: 25 kN (5620 lbf) 5 mm: > 100 J 10 mm: > 190 J 20 mm: > 300 J 30 mm: > 375 J 40 mm: > 425 J	<u>MFD</u> Peak applied load: 15 kN (3370 lbf) 10 mm: > 50 J 20 mm: > 80 J 30 mm: > 150 J 40 mm: > 275 J	<u>8 hours</u> MS-D3: - MS-D3 X: 7 MPa (1015 psi) MS-D3 X2: 8 MPa (1150 psi) MS-D3 X3: 10 MPa (1500 psi)	<u>STB</u> Peak applied load: 25 kN (5620 lbf) 5 mm: > 100 J 10 mm: > 190 J 20 mm: > 300 J 30 mm: > 375 J 40 mm: > 425 J	<u>MFD</u> Peak applied load: 15 kN (3 370 lbf) 10 mm: > 50 J 20 mm: > 80 J 30 mm: > 150 J 40 mm: > 275 J	Flexural properties may be achieved with fiber reinforced options. Available on-demand.	Cracking Potential (AASHTO T 334) Age at cracking: no cracks after 100 days Maximum strain: -98.8 µm/m Stress rate: 0.026 MPa (3.77 psi)/day (low cracking potential)	Flexural properties may be achieved with fiber reinforced options. Available on-demand.	Microbiological Resistance (DIN 19573 ; Class XWW4) Sulfuric Acid (pH 0.0): passed
	<u>12 hours</u> MS-D1: - MS-D1 X: 7 MPa (1015 psi) MS-D1 X2: 8 MPa (1150 psi) MS-D1 X3: 10 MPa (1500 psi)	<u>STC</u> Peak applied load: 20 kN (4496 lbf) 5 mm: > 100 J 10 mm: > 175 J 20 mm: > 270 J 30 mm: > 325 J 40 mm: > 370 J		<u>12 hours</u> MS-D3: - MS-D3 X: 10 MPa (1500 psi) MS-D3 X2: 12 MPa (1750 psi) MS-D3 X3: 14 MPa (2030 psi)	<u>STC</u> Peak applied load: 20 kN (4496 lbf) 5 mm: > 100 J 10 mm: > 175 J 20 mm: > 270 J 30 mm: > 325 J 40 mm: > 370 J					
	<u>1 day</u> MS-D1: 15 MPa (2175 psi) MS-D1 X, X2, X3: 21 MPa (3000 psi)	<u>STD</u> Peak applied load: 20 kN (4496 lbf) 5 mm: > 40 J 10 mm: > 80 J 20 mm: > 125 J 30 mm: > 150 J 40 mm: > 175 J		<u>1 day</u> MS-D3: 21 MPa (3000 psi) MS-D3 X, X2, X3: 25 MPa (3625 psi)	<u>STD</u> Peak applied load: 20 kN (4996 lbf) 5 mm: > 40 J 10 mm: > 80 J 20 mm: > 125 J 30 mm: > 150 J 40 mm: > 175 J					
	<u>3 days</u> MS-D1, X, X2, X3: 28 MPa (4060 psi)			<u>3 days</u> MS-D3, X, X2, X3: 30 MPa (4350 psi)						
	<u>7 days</u> MS-D1, X, X2, X3: 32 MPa (4640 psi)			<u>7 days</u> MS-D3, X, X2, X3: 35 MPa (5075 psi)						
	<u>28 days</u> MS-D1, X, X2, X3: 42 MPa (6000 psi)			<u>28 days</u> MS-D3, X, X2, X3: 42 MPa (6000 psi)						

■ Production Plant Locations

Boisbriand QC
Brandford ON
Sudbury ON

■ Shotcrete Packaging

Pre-packaged shotcrete material
Available in 30 kg (~0.014 m³) and 1000 kg (~0.45 m³)

■ Shotcrete Nomenclature

Corrosion inhibitor: CI
Gradation No. 2 (according to ACI PRC-506): G2
Low-dust admixture: LD
Macro-synthetic fiber: MF
Micro-synthetic fiber: SY
Potable water application (NSF-61 approved): PW
Retarded set-time: RT
Setting accelerator: X, X2, X3, UG, UG2 & UG3
Steel fiber: ST
Waterproofing admixture: CW

Note: the data is representative of typical values achievable using proper application techniques as outlined in the ACI PRC-506 “Guide to Shotcrete” publication, with material and ambient temperatures of 21 °C (70 °F). Higher or lower temperatures can respectively accelerate or delay set-time and early-age compressive strength gain.

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BUILDING TRUST
CONSTRUIRE LA CONFIANCE





SHOTCRETE TUNNELING & MINING

	KING MS-D3 UG	KING MS-D3 UG ST	KING MS-D3 UG MF	KING MS-W1 UG	KING MS-W1 UG ST	KING MS-W1 UG MF	KING ARMOURGUARD / KING RS ARMOURGUARD	KING RS-D2	KING RS-D2 STB	KING RS-D2 MF	
TARGETED APPLICATION	Mining applications: underground construction and ground control										
PROCESS	Dry-mix			Wet-mix			Dry-mix				
KEY FEATURES	High-early strength development	High-early strength development with steel fiber reinforcement	High-early strength development with macro-synthetic fiber reinforcement	On-demand wet-mix shotcrete 4 hours pot-life, slump 200 +/- 50 mm	On-demand wet-mix shotcrete with steel fiber reinforcement	On-demand wet-mix shotcrete with macro-synthetic fiber reinforcement	Heavy steel fiber reinforcement for superior impact & abrasion resistance	Rapid early-age strength development	Rapid early-age strength development and steel fiber reinforcement	Rapid early-age strength development and macro-synthetic fiber reinforcement	
MAIN USES	• Construction and ground support for underground applications						• Ore pass linings and brows • Truck dumps • Ore and rock chutes		• Ground support (early re-entry) • Critical repair (shutdown)	• Ground support (early re-entry) • Early-age energy absorption capacity and impact resistance	• Ground support (early re-entry) • Early-age energy absorption capacity and impact resistance
OPTIONAL FEATURES (different additives can be combined in a single mix, e.g. MS-D3 UG2 CW)	• Setting accelerator: MS-D3 UG, UG2 or UG3 • Micro-synthetic fiber: MS-D3 UG SY • Corrosion inhibitor: MS-D3 UG CI • Waterproofing admixture: MS-D3 UG CW • Low-dust admixture: MS-D3 UG LD			• Setting accelerator added at the nozzle: Sika Sigunit • Micro-synthetic fiber: MS-W1 UG SY • Corrosion inhibitor: MS-W1 UG CI • Waterproofing admixture: MS-W1 UG CW				• Micro-synthetic fiber: RS-D2 SY • Corrosion inhibitor: RS-D2 CI • Red pigmentation: RS-D2 RED • Waterproofing admixture: RS-D2 CW • Low-dust admixture: RS-D2 LD			
INITIAL SET (ASTM C 1117)	MS-D3 UG: 10 minutes MS-D3 UG2: 5 minutes MS-D3 UG3: 3 minutes			Under 10 minutes (with addition of setting accelerator at the nozzle)			Armourguard: 5 minutes RS Armourguard: 5 minutes		5 minutes		
FINAL SET (ASTM C 1117)	MS-D3 UG: 45 minutes MS-D3 UG2: 20 minutes MS-D3 UG3: 10 minutes			Under 45 minutes (with addition of setting accelerator at the nozzle)			Armouguard: 10 minutes RS Armourguard: 10 minutes		10 minutes		
KEY MECHANICAL PROPERTIES	Compressive Strength (ASTM C116 mod ; ASTM C1604)	Flexural Toughness - 28 days (ASTM C1550)	Flexural Toughness - 28 days (ASTM C1550)	Compressive Strength (ASTM C116 mod ; ASTM C1604)	Flexural Toughness - 28 days (ASTM C1550)	Flexural Toughness - 28 days (ASTM C1550)	Compressive Strength - ARMOURGUARD (ASTM C116 mod ; ASTM C1604)	Compressive Strength (ASTM C116 mod ; ASTM C1604)	Flexural Toughness (ASTM C1550)	Flexural Toughness (ASTM C1550)	
	<u>4 hours</u> MS-D3 UG: - MS-D3 UG2: 2 MPa (290 psi) MS-D3 UG3: 7 MPa (1015 psi)	<u>STA</u> Peak applied load: 40 kN (8992 lbf) 5 mm: > 100 J 10 mm: > 215 J 20 mm: > 350 J 30 mm: > 450 J 40 mm: > 500 J	<u>MFC</u> Peak applied load: 20 kN (495 lbf) 10 mm: > 80 J 20 mm: > 125 J 30 mm: > 250 J 40 mm: > 350 J	8 hours: 5 MPa (725 psi) 12 hours: 10 MPa (1500 psi) 1 day: 15 MPa (2175 psi) 3 days: 28 MPa (4060 psi) 7 days: 32 MPa (4640 psi) 28 days: 42 MPa (6000 psi)	<u>STA</u> Peak applied load: 40 kN (8992 lbf) 10 mm: > 100 J 20 mm: > 215 J 30 mm: > 350 J 40 mm: > 450 J 50 mm: > 500 J	<u>MFD</u> Peak applied load: 15 kN (3 370 lbf) 10 mm: > 50 J 20 mm: > 80 J 30 mm: > 150 J 40 mm: > 275 J	4 hours: 2 MPa (290 psi) 8 hours: 8 MPa (1150 psi) 12 hours: 12 MPa (1750 psi) 1 day: 25 MPa (3625 psi) 7 days: 40 MPa (5800 psi) 28 days: 60 MPa (8700 psi)	2 hours: 21 MPa (3000 psi) 1 day: 30 MPa (4350 psi) 7 days: 40 MPa (5800 psi) 28 days: 50 MPa (7250 psi)	<u>STB - 1 day</u> Peak applied load: 17 kN (3821 lbf) 5 mm: > 75 J 10 mm: > 140 J 20 mm: > 230 J 30 mm: > 250 J 40 mm: > 300 J	<u>MFC - 1 day</u> Peak applied load: 15 kN (3370 lbf) 40 mm: > 325 J <u>MFC - 28 days</u> Peak applied load: 20 kN (4485 lbf) 40 mm: > 350 J	
	<u>8 hours</u> MS-D3 UG: 7 MPa (1015 psi) MS-D3 UG2: 8 MPa (1150 psi) MS-D3 UG3: 10 MPa (1500 psi)	<u>STB</u> Peak applied load: 25 kN (5620 lbf) 5 mm: > 100 J 10 mm: > 190 J 20 mm: > 300 J 30 mm: > 375 J 40 mm: > 425 J	<u>MFD</u> Peak applied load: 15 kN (3370 lbf) 10 mm: > 50 J 20 mm: > 80 J 30 mm: > 150 J 40 mm: > 275 J		<u>STB</u> Peak applied load: 25 kN (5620 lbf) 10 mm: > 100 J 20 mm: > 190 J 30 mm: > 300 J 40 mm: > 375 J 50 mm: > 425 J		Compressive Strength - RS ARMOURGUARD (ASTM C116 mod ; ASTM C1604)		<u>STB - 28 days</u> Peak applied load: 27 kN (6070 lbf) 5 mm: > 100 J 10 mm: > 200 J 20 mm: > 300 J 30 mm: > 350 J 40 mm: > 400 J	<u>MFD - 1 day</u> Peak applied load: 10 kN (2245 lbf) 40 mm: > 250 J <u>MFD - 28 days</u> Peak applied load: 15 kN (3370 lbf) 40 mm: > 275 J	
	<u>12 hours</u> MS-D3 UG: 10 MPa (1500 psi) MS-D3 UG2: 12 MPa (1750 psi) MS-D3 UG3: 14 MPa (2030 psi)	<u>STC</u> Peak applied load: 20 kN (4496 lbf) 5 mm: > 100 J 10 mm: > 175 J 20 mm: > 270 J 30 mm: > 325 J 40 mm: > 370 J			<u>STC</u> Peak applied load: 20 kN (4496 lbf) 10 mm: > 100 J 20 mm: > 175 J 30 mm: > 270 J 40 mm: > 325 J 50 mm: > 370 J		Flexural Toughness (ASTM C1550)				
	<u>1 day</u> MS-D3 UG: 21 MPa (3000 psi) MS-D3 UG2: 25 MPa (3625 psi) MS-D3 UG3: 25 MPa (3625 psi)	<u>STD</u> Peak applied load: 20 kN (4496 lbf) 5 mm: > 40 J 10 mm: > 80 J 20 mm: > 125 J 30 mm: > 150 J 40 mm: > 175 J			<u>STD</u> Peak applied load: 20 kN (4496 lbf) 10 mm: > 40 J 20 mm: > 80 J 30 mm: > 125 J 40 mm: > 150 J 50 mm: > 175 J						
	<u>3 days</u> MS-D3 UG, UG2, UG3: 30 MPa (4350 psi)										
	<u>7 days</u> MS-D3 UG, UG2, UG3: 35 MPa (5075 psi)										
	<u>28 days</u> MS-D3 UG, UG2, UG3: 42 MPa (6000 psi)										