TECHNICAL DATA SHEET

Concrete Waterproofing & Durability Enhancing Admixture

SMART CONCRETE®

Krystol Internal Membrane™ (KIM®)

The Original and Only Crystalline Waterproofing Admixture With More Than 40 Years of Demonstrated Success.

DESCRIPTION

Krystol Internal Membrane (KIM) is a hydrophilic crystalline admixture internationally known for making exceptionally durable and watertight concrete. KIM contains advanced Krystol® technology, which drives a catalytic reaction using cement and water to grow a protective crystalline network throughout the concrete's pores, capillaries, cracks, and micro-cracks. Long-term reactivity provides adaptive self-sealing and self-healing properties that counteract deterioration and allow concrete to maintain its integrity. KIM is non-toxic and meets all requirements of ACI 212.3R as a Permeability Reducing Admixture for Hydrostatic Conditions (PRAH).

BENEFITS

- Unsurpassed permeability reducing and durability enhancing performance
- Effective against 140 meters (460 feet) of hydrostatic head pressure
- Proven protection against:
    - Water penetration
    - Salts/Chlorides and Corrosion
    - Sulfate attack
    - Aggressive Chemicals
    - Freezing-thawing cycles
    - Alkali Silica Reaction (ASR)
- Reliably self-seals hairline cracks up to 0.5 mm (0.02 inches) and effectively self-heals micro-cracks
- Reduced concrete shrinkage and cracking
- Permanent integral protection - impervious to physical damage and UV rays
- Allows concrete to breathe

COST SAVINGS

- Extends service life and reduces costs for maintenance and repairs
- Use KIM concrete with the Krystol Waterstop System to build watertight structures without surface-applied membranes
- Lowers overall waterproofing costs
- Easily added to ready-mix truck or central mixer - no added site labor
- Simplifies and improves construction scheduling
- Consistently outperforms other crystalline admixtures on an equal weight basis (kg for kg, lb for lb)

HEALTH AND ENVIRONMENTAL BENEFITS

- Zero VOC - Non-toxic – Certified to NSF/CAN/ANSI No. 61
- Contributes to LEED points. Compatible with "end of life" recyclability

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RECOMMENDED USES

- Water and Wastewater Structures
- Transportation Infrastructure
- Dams, spillways and power stations
- Marine Structures
- Tunnels
- Pipes, manholes and pump stations
- Parking Structures
- Foundations, basements
- Elevator pits
- Pre-cast and shotcrete
- Secondary containment
- Pools and fountains

PROPERTIES

PHYSICAL PROPERTIES		
Appearance		Grey Powder
Specific Gravity		~2.8
Bulk Density		~1.4 g/cm^3 (88 lb/ft^3)
Chloride Ion Content		< 0.1% by weight
VOC		None
EFFECTS ON PLASTIC PROPERTIES		
Slump, ASTM C143		Negligible effect
Setting Time, ASTM C403		Negligible effect
Entrained Air Content and Stability, ASTM C231		Negligible effect
EFFECTS ON HARDENED PROPERTIES		
Permeability	USACE CRD C48 1.38 MPa (200 psi) for 14 days	97% reduction in the coefficient of permeability. *- Nelson Testing Laboratories, USA*
		No leakage through any of the 7 or 28 day cured KIM treated concrete while control failed at 10 and 45 hours respectively. *- University of British Columbia, Canada*
	DIN 1048-5 0.5 MPa (72.5 psi) for 3 days	90% reduction in permeability over the same untreated concrete, 3.7 mm (0.15 in) vs 36.7 mm (1.45 in). *- Kuwait University Civil Engineering Testing Center, Kuwait*
	NCH 2262 0.5 MPa (72.5 psi) for 3 days	Average depth of water penetration of 0 mm while control samples were 44 mm (1.73 in). *- Ingeneria Dictuc, Chile*
Crack Sealing	Direct Flow Method	Self-sealed a 0.6 mm (0.024 in) leaking crack. *- The Cement and Concrete Institute, Sweden*
	Self-Sealing Method US Patent 9,038,477	Stopped water flow from crack sizes of 0.6 and 0.7mm (0.028 in). *- British Columbia Institute of Technology, Canada*
		KIM treated concrete showed self-sealing while controls with the same crack width continued to leak. *- University of Victoria*

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EFFECTS ON HARDENED PROPERTIES CONT.		
Micro Crack Sealing/Healing	Microscopic Crack Analysis, Mechanical Property Recovery Rate	KIM considerably improved micro-crack healing and recovery ratio for compressive strength, porosity, resistivity, and ultrasonic pulse velocity, including mixes with SCM's and long-term testing of mature concrete. - *University of Ottawa*
ASR Protection	CSA A23.2-14A	KIM changed the kinetics and distress caused by ASR in concrete made with highly reactive aggregates. KIM treated concrete had reduced expansion and ASR related damage. - *University of Ottawa*
Corrosion Protection	10 Year Field Study	Low half-cell readings and no signs of corrosion after 10 years exposure in Honolulu Harbor. KIM was recommended by name to extend life and protect concrete from corrosion of reinforcing steel. - *University of Hawaii at Manoa, US*
	ASTM G109 Linear Polarization Resistance (LPR) and Half-Cell Potential (HCP)	KIM effectively inhibits reinforcement corrosion by at least double compared to the control set. KIM controls corrosion initiation and reduces the corrosion rate due to its lower porosity and reduced pore interconnectivity, which blocks ions and water pathways inside the concrete matrix. - *University of Victoria*
	AASHTO T277-89	Chloride Ion Resistance (Coulombs) KIM improved resistance over control concrete by 34.5% after 28 days, 36% after 56 days, and 44.8% after 90 days. - *The Port Authority of New York & New Jersey, USA*
	ASTM C1202-97	Reduced Rapid Chloride Permeability over control mix design by 45% after 28 days. - *AMEC Earth and Environmental, Canada*
Shrinkage Reduction	BS 1881-5	25% reduction in drying shrinkage over control concrete. - *British Board of Agrément (BBA) Certification, UK*
	AS 1012.13-1992	20-25% reduction in drying shrinkage over control. - *Boral Materials Testing & Environmental Services, Australia*
Crack Reduction	ASTM C1140 (modified)	80% reduction in restrained shrinkage cracking compared to control. - *AMEC Earth & Environmental Ltd, Canada*
	ASTM C1579 – 06	53% reduction in average crack width over control. - *British Columbia Institute of Technology, Canada*

EFFECTS ON HARDENED PROPERTIES CONT.		
Freeze Thaw Protection	BS 5075-2	*87% reduction in freeze/thaw expansion compared to control.* *- British Board of Agrément (BBA) Certification, UK*
	ASTM C666	KIM enhanced freeze-thaw resistance in air entrained and non-air entrained concrete. *- University of Victoria*
Chemical Resistance	ASTM C267	Considerably reduced weight loss vs. control after exposure to 5% sulfuric acid solution. *- Kryton International Research Center*
	US Bureau of Reclamation Sulfate Resistance Test	Outperformed control specimens after 21 cycles of soaking in Na2SO4 solution then oven drying. Treated samples showed no loss of strength (controls showed 14% strength loss due to internal sulfate attack). *- R. M. Hardy and Associates, USA*
Strength	ASTM C39 BS EN 12390-3	Compressive and flexural strength equal or slightly higher than control. *- British Board of Agrément (UK), Twinning Labs (USA)*

CERTIFICATIONS

Health and Environmental:

- NSF – Certified to NSF/CAN/ANSI Standard 61
- Singapore Green Label
- Hong Kong – Gold Status

Compliance:

- ASTM C494
- EN 934-2
- ACI 212-Chapter 15 – Permeability Reducing Admixture for Hydrostatic Conditions (PRAH)
- REACH and UK REACH Registered

Quality:

- CE and UKCA Marked
- British Board of Agrément (UK): Certificate 05/4217
- British Board of Agrément (UK): Factory Production Control 0836-CRP-14/F086
- KIWA GmbH (Germany): Factory Production Control 0770-CRP-21DE-02410_A
- Dubai: Certificate of Product Conformity CL18020646
- BRANZ (New Zealand) – Appraisal No 661

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APPLICATION

Read and distribute Application Instructions 1.11 (Cast-in-place concrete) or 1.21 (Shotcrete) before using this product. A pre-pour meeting with the general contractor, forming contractor, finisher, concrete supplier and materials testing engineer is strongly recommended. Treat construction joints and penetrations in accordance to Application Instructions 4.11-4.31 (as applicable). Dose KIM up to a maximum of 8 kg/m^3 (13.5 lb/yd^3) in consultation with an authorized Kryton representative. KIM is compatible with all cement types, supplementary cementitious materials (SCM's), admixtures and fibers. Trial batches are required to determine actual plastic properties. Allow KIM to thoroughly mix at medium/high speed for minimum 1 minute per cubic meter/yard in the batch and a minimum of 3 minutes. Place and finish in accordance with ACI guidelines. Cure in accordance with ACI 308.1 guidelines.

SPECIFICATIONS

Drawings, CAD details and specification language: Visit www.kryton.com/technical-info/ or contact your authorized Kryton representative.

LIMITATIONS

Concrete structures must be designed to resist all structural loads including all hydrostatic forces. Self-sealing is effective for static (non-moving) cracks. For dynamic (moving) cracks, use a flexible sealant. For moving joints, use an engineered expansion joint.

DESIGN CONSIDERATIONS

Detail reinforcement and use control joints to minimize and control random cracking. Use concrete mix designs suitable for the exposure class where applicable. Use an appropriate waterstop at construction joints and penetrations. KIM concrete is commonly used with the Krystol Waterstop System to waterproof joints and penetrations, but waterproofing accessories from other sources may also be used. KIM treated concrete is compatible with protective membranes, sealers, paints and tile grouts just like normal concrete.

TECHNICAL SERVICES

Product advice, training and technical support are available from your Authorized Kryton Representative.

SAFETY

Read the Safety Data Sheet (SDS) for this product. For professional use only. Avoid contact with skin or eyes. Avoid breathing dust. Wear a dust mask, long sleeves, safety goggles and impervious gloves.

PACKAGING

KIM is conveniently available in 5 kg (11 lb.) and 25 kg (55 lb.) re-sealable pails as well as pulpable mixer-ready bags in standard and custom sizes to match your mix design.

SHELF LIFE

KIM has a shelf life of at least 5 years when stored in a dry area. Pallets of mixer ready bags must be protected at all times from moisture and condensation. Use within 4 months of opening the original pallet wrapping.

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WARRANTY

Kryton International Inc. (Kryton) warrants that Kryton products are free from manufacturing defects and comply with the specifications given in their respective technical data sheet. Because conditions of use, such as site conditions, surface preparations, workmanship, concrete ingredients, weather, structural issues and other factors are beyond the control of Kryton, no warranty can be given as to the results of use. Purchaser agrees to seek the advice of qualified professionals and to determine for themselves the suitability of the products for their intended purpose and assumes all risks. Purchaser's sole remedy is limited to replacement of any product proven defective or at Kryton's option refund of the purchase price paid. THIS LIMITED WARRANTY CONTAINS THE ENTIRE OBLIGATION OF KRYTON. NO OTHER WARRANTIES, EXPRESS OR IMPLIED, SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANT-ABILITY OR FITNESS FOR A PARTICULAR PURPOSE. KRYTON SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. No representative of Kryton has the authority to make any representations or provision except as stated herein. Kryton reserves the right to change the properties of its products without notice.

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