

Krystol Internal Membrane™ (KIM®)

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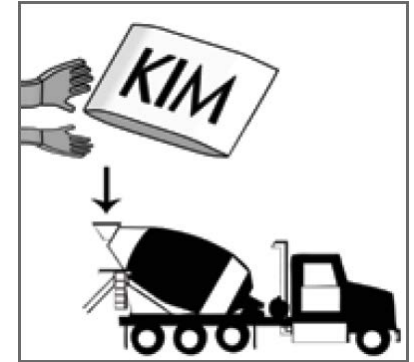
DESCRIPTION

Krystol Internal Membrane (KIM) is a hydrophilic crystalline admixture used to create permanently waterproof concrete.

KIM lowers the permeability of concrete and is used in place of surface applied waterproofing membranes. By stopping the transmission of water through concrete, KIM adds durability and longevity to concrete by protecting it against chemical attack and corrosion of reinforcing steel.

Drawings and Specifications:

For section drawings, CAD details and specification language related to this product, visit www.kryton.com/technical-info/ or contact your authorized Kryton representative.



IMPORTANT OVERVIEW

You are making a waterproof membrane out of the concrete. This is different from traditional construction where the concrete just forms the structure. The KIM concrete you are placing will be the only barrier to water penetration. This means that common defects found in typical concrete cannot be tolerated. Poor consolidation, unplanned cold joints, cracks, penetrations, contaminations, etc. will all result in a leaking structure. To avoid leakage and to achieve success, you must follow the critical instructions outlined in this document. Furthermore, you must properly record all relevant data in order for the manufacturer's warranty to be valid.

MIX DESIGN CONSIDERATIONS AND COMPATIBILITY

The properties of concrete materials and admixtures vary from region to region. Trial batches are required to assess the local plastic and hardened properties and determine appropriate mix designs.

- Proportion your mix to minimize shrinkage. Water to cementing materials (w/cm) ratio must follow the guidelines given by ACI 318 (or equivalent code) for the applicable exposure class.
- The w/cm ratio should be 0.45 or lower and must not exceed 0.50.
- The recommended minimum design strength is 28 MPa (4000 psi).
- KIM is compatible with all cement types, supplementary cementing materials (SCMs), blended cements and all common concrete admixtures.
- KIM may delay the setting time of concrete. Normal-Set Type-A (water reducing) and Type-F (high range water reducing) admixtures are preferred with KIM under most conditions. Reduce or remove Type B (set retarding) or Type D (water reducing and set retarding) admixtures unless trial batches show they are beneficial.
- High volumes of fly ash or GGBS (slag) may extend the setting time of concrete. When used with KIM and admixtures that delay the setting time, first test for acceptable setting behavior. After initial trials, some modifications may be made to optimize the setting time.
- Accelerating admixtures are known to increase the risk of cracking and should be avoided when possible. If an accelerating admixture is used, then use only the minimum level necessary.
- KIM will have a minimal effect on air content and will increase air less than 1.0%. Dose air entraining admixtures as normal.
- Admixtures should be added to the concrete separately and must not be mixed together prior to addition. The timing and order of different admixtures may affect the overall slump and setting performance. The properties of concrete containing more than one admixture should be assessed by trial mixes.
- Recycled water should meet the requirements of ASTM C1602 (or equivalent standard) and its performance verified through trial batches.

APPLICATION INSTRUCTION

Cast-In-Place-Concrete

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PRE-POUR SITE MEETINGS

The Site Superintendent must arrange and attend a meeting that includes a Kryton representative, the concrete supplier and applicable representatives of the forming, placing and finishing contractors. The meeting needs to be scheduled well in advance of the initial concrete placement in order to communicate any modifications required for a successful concrete project. Discussion will include the following:

- Questions regarding KIM Application Instructions (this document) and the KIM Best Practices Guide.
- Importance of controlling water content and workability of the concrete.
- Importance of proper placement and consolidation of the concrete.
- Importance of proper curing procedures.
- Delayed setting times of KIM concrete, particularly in cold weather.
- Review of how set delay may affect form pressure, stripping schedules and slab finishing.
- Construction joint details using the Krystol Waterstop System.
- Tie hole and penetration details using the Krystol Waterstop System.
- Spacing and treatment of shrinkage control joints.
- Use of Krystol Leak Repair System for repair of deficiencies.
- Review of Krystol Assurance Program documents (if applicable).

CONSTRUCTION JOINTS & DETAILS

Construction Joints and Details need to be treated using the Krystol Waterstop System to create a watertight structure. The following Application Instructions need to be referenced based on the selected detail:

- Cast-in-Place: Application Instruction 4.11, 4.12*, 4.15 or 4.16*.
- Control Joints: Application Instruction 4.14.
- Shrinkage control joints should be spaced to ACI requirements or closer to control random cracking. Typical wall sections should have shrinkage control joints spaced to prevent random cracking, usually every 3-5 m (10-16 feet).
- Suspended Slabs: Application Instruction 4.31.
- Tie holes and penetrations: Application Instruction 4.17*.

*May require minor modifications to concrete forms dependent on waterproofing joint detail selected.

BATCHING AND ON SITE DOSING

- Ensure drum is empty of water prior to batching.
- If adding KIM on-site, premeasure the required KIM material and carry on the truck.
- If possible, add only a portion of the specified high range water reducing admixture when batching and send the rest to the jobsite to be added as needed just prior to unloading.
- KIM is kg-for-kg (lb-for-lb) the best crystalline admixture available and dosage may vary based on mix design, project conditions and risk. Dose at the specified rate of addition to a maximum of 8 kg/m³ (13.5 lb/yd³). Consult your Kryton representative for guidance.
- KIM in pulpable bags can be thrown un-opened into the concrete mixer. These bags are designed to disintegrate in the mixer. Before opening KIM pails, loosen compacted material by turning the pail over once or twice. Dispense directly into concrete mixer. Mix concrete at medium to high speed for 1 minute per m³ (yd³) in the batch and a minimum of 3 minutes.
- When using pulpable bags, conduct trials to ensure that your mix design produces sufficient shear to pulp the bags. Generally, lower slumps will provide higher shear. If bags do not fully disintegrate, it is recommended to open, empty and discard the pulpable bags.
- KIM may be added at any time during the batching process. Note that adding KIM as your first admixture will tend to minimize any effects on plastic properties.
- The addition of water without supervision and approval may void the manufacturer's warranty.
- Store any unused portions in an airtight container to prevent moisture contamination.

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HANDLING, PLACEMENT AND FINISHING

- It is very important that there be no water or debris in forms when pouring a joint that must be watertight.
- Under some circumstances, you may observe slump loss at 25 minutes. This is false set and slump will recover with continued mixing. False set normally occurs during transport and is not noticed. Avoid placing concrete during the false set period.
- If the slump is below specification, add a mid or high range water reducer to achieve the required slump. Only add additional water with the approval of the quality control technician (to the maximum of specified w/c ratio). Record all water additions on the batch ticket and do not exceed the specified w/c ratio. The addition of water without supervision and approval may void the manufacturer's warranty.
- Place and finish in accordance with ACI guidelines.
- Proper consolidation of the concrete is essential to achieve the performance and benefits of KIM (see ACI 309R). Ensure walls are vibrated down to the bottom joint. Do not drop concrete through heavily reinforced walls – use a hose or drop chute to deposit concrete in a controlled manner to avoid segregation. Carefully vibrate and level all construction joints that will be treated with a waterstop. Consider using self-consolidating concrete (SCC).
- KIM treated concrete will typically delay the initial and final setting times of the concrete. Adjust your finishing or stripping schedule accordingly. Evaporation retarder may be needed on hot or windy weather.
- Consider monitoring internal temperatures to ensure compliance with specifications.

CONCRETE TESTING

Ensure field sampling and testing is performed by a certified ACI Level 1 Concrete Field Testing Technician or equivalent, and that the testing laboratory is certified to ASTM C1077 or equivalent. All testing procedures should follow ASTM, CAN/CSA, or equivalent. It is recommended to perform field tests at least once for every 115 m³ (150 yd³) of concrete placed. The owner, general contractor, or job specifications may require additional testing from what is called for below, but the following data must be recorded to comply with the manufacturer's product warranty requirements:

- Time of batching, testing and placement
- Slump (or Flow)
- Air content
- Temperature of concrete and ambient air
- Compressive strength

Forward all test results to manufacturer or manufacturer's representative. In cases where concrete loads are accepted that do not conform to specifications, record the name of the person authorizing the acceptance and the location of concrete placement.

PROTECTION OF FRESH CONCRETE

Protect freshly placed concrete from rain, excessive wind, and sun.

In cold weather, follow cold weather concrete practices from ACI 306R for batching and placement. An accelerating admixture may be necessary. Dose accelerators according to their instructions.

Although KIM delays the setting time, KIM is not a substitute for hot weather practices and the procedures in ACI 305R must still be followed. In some cases, a set retarder may still be needed.

CURING

Proper curing is essential to minimize cracking and achieve the performance and benefits of KIM. Cure in accordance with ACI 308.1 guidelines. Wet curing the concrete with a fog mist spray, sprinkler or wet coverings (burlap, curing blankets) for 7 days is recommended.

Alternatively, immediately apply a curing compound conforming to ASTM C309.

All KIM concrete must be properly cured following the practices in ACI 308.1 regardless of the weather or temperature conditions at the time of placement.