

Krytol Internal Membrane™ (KIM®)

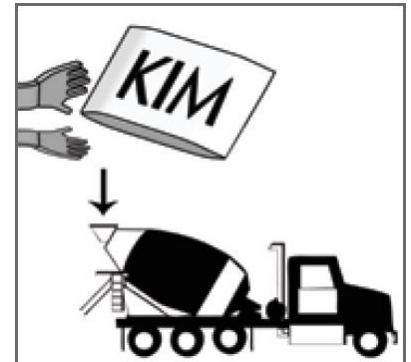
DESCRIPTION

Krytol 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

- Proportion your mix to minimize shrinkage. Water to cementing materials (w/cm) ratio must follow the guidelines given by ACI 318 for the applicable exposure class. For best results, the w/cm ratio should be 0.45 or lower and must not exceed 0.50.
- Total Cementing Materials should not be less than 300 kg/m³ (500 lb/yd³). Of that, Ordinary Portland Cement (OPC) content should not be less than 150 kg/m³ (250 lb/yd³).
- Minimum 28-day design strength is 28 MPa (4000 psi).
- KIM will have minimal effect on air content and will increase air less than 1.0%.
- KIM is compatible with other concrete admixtures, such as accelerators, air-entrainers and plasticizers. However, care must be taken when using water reducers or plasticizers that may delay the setting time.
 - Type A (water reducing) and Type F (high range water reducing) admixtures are preferred for slump control.
 - KIM, Type B admixtures (set retarding), Type D admixtures (water reducing and set retarding), fly ash and slag may all retard the setting time of concrete. Avoid using all of these materials in the same mix design without first testing for acceptable setting time at the expected concrete placement temperature. In many cases, Type B or D admixtures can be used at a lower dose or eliminated when using KIM.
 - 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.
- The use of recycled aggregates or recycled water is not recommended unless test batches show acceptable results.
- Aggregates, cements and supplementary cementing materials vary in properties from region to region. Test batches are required to assess the local plastic and hardened properties to determine appropriate mix designs.

EFFECTS ON PLASTIC CONCRETE

KIM has been specially formulated to meet the requirements of projects in different climate conditions as follows:

- KIM-HS: This version of KIM is used for most applications. KIM-HS is compatible with common admixtures, such as plasticizers, accelerators, retarders and air-entrainers.
- KIM-ES: This version of KIM is specially designed for use in hot climates and mass concrete. KIM-ES will prolong the slump retention of the concrete and delay the initial setting time. Adjust or remove set retarding admixtures accordingly.

Typical influence of KIM at maximum dosage on concrete plastic properties in standard laboratory conditions:

Concrete	Plastic Properties	
	Initial Setting Time*(HH:MM)	Air Content* (%)
Plain	3:00	1.5
Treated w/ KIM-HS	4:30	1.6
Treated w/ KIM-ES	6:00	1.6

*Actual setting times and air content will vary in the field depending on temperature, mix design, dosage and the influence of other chemical admixtures. Perform trial batches.

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.

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.

CURING AND PROTECTION

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. Protect from rain, excessive wind, and sun. Take protective measures in hot weather (see ACI 305R) and cold weather (ACI 306R) as applicable.