CWP
PROOF.SEAL.REPAIR

CRYSTAL LINE WATER PROOFING

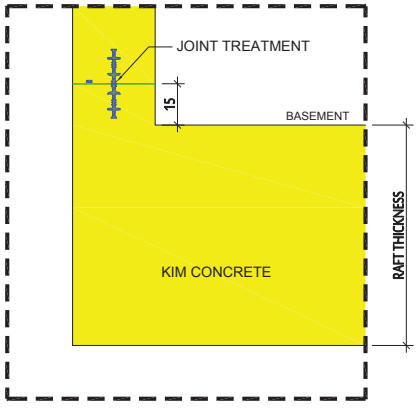
KIM Water Proofing

In order to make the substructure concrete waterproofing by using Crystalline technology with specialized KIM-HS Admixture in the foundation (split application) and keeping wall and Krystol water stop system (KWS) at construction joints as below:
NB: Consecutive steps to manage KIM-HS Mixing procedure for foundation concreting at site / batch plant with total application or separate application. For raft foundation slabs (depends the thickness of the raft slab), KIM admixture will use usually two different ways.

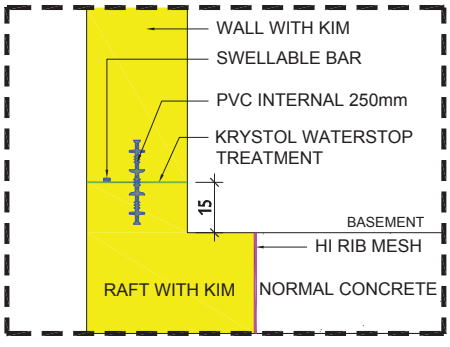
1. Full thickness with KIM

The full thick application means that the KIM concrete will stream entire raft thickness. Our principals for waterproofing to thick slabs has authorized and approved the split application by the manufactural.

- 1. Mobilization:
  - 1.1. A site meeting is necessary 3 days minimum prior to Raft Slab concreting between Consulting engineer, main contractor, CWP representative and Ready-mix supplier in order to discuss the following:
    - 1.1.1. Position of the pumps
    - 1.1.2. All application instructions as attached (Refer attached appendix 1a, 1b, 1c, 1d & 1e)
  - 1.2. In case of KIM mixing at site a platform(s) of minimum size 2.50m x 2.50m x 4.0m to be made by the main contractor for KIM mixing at least one day before the Raft slab concreting. (Refer appendix 4). If concreting is taking place at night, sufficient lighting arrangements should be provided and material (KIM bags or pails) shifting equipment needs to be provided as well.



FULL THICK APPLICATION



JOINT AT RAFT SLAB

2. Split application.

- 2.1 In case of split application, the Metal Lock-Rib Lath (galvanized) 0.40mm thick install by principal contractor and supply by crystalline along the raft slab periphery at the time of steel fixing for raft slab to separate KIM and non KIM concrete (just as it is shown in the sketch below)

3. KIM Concrete Mixing and Pouring:

- 3.1. KIM mixing procedure by Crystalline as per confined instructions (Refer appendix 1a, 1b, 1c, 1d & 1e). KIM pouring steps as follows:
  - 3.1.1 In case of full application at the dosage of 6.00 kg/m^3 (dosage may vary due to various site conditions and slab thickness) KIM should be poured full thickness of the raft slab. In case of split, KIM concrete should be poured till 50cms level from the bottom of the raft slab and 50cms wide around the raft slab at dosage of 6.00 kg/m^3 (dosage may vary due to various site conditions) as shown in the sketch above (Split application). Non KIM concrete should be poured in the middle areas, as shown in the sketch. (Please refer and follow clause 3.3, 3.4 and 4.3)
  - 3.1.2 The PVC Waterstop (Internal) should be fixed with steel fixing. Place the PVC Waterstop internal as at the middle of the kicker by half of its width emerged above it as shown in attached drawing.
  - 3.1.3. After finishing the raft slab concreting and 7 days curing apply joint protection treatment – KrystolWaterstop System Treatment™ with PVC Waterstop and swellableWaterstop bar – between raft slab and retaining wall / water tank wall (please refer and follow clause 3.2 and 4).
  - 3.1.4. After applying the joint treatment the retaining wall for lower Basement should be casted with KIM concrete at dosage of 8.00 kg/ m^3 (dosage may vary due to various site conditions) (Please refer and follow clause 3.2 and 4.5)
  - 3.1.5.Once the retaining wall is finished casting should be applied for joint protection treatment at the joint between wall and lower basement top slab (please refer and follow 4.5)
  - 3.1.6. After finishing the Waterstop joint treatment and curing the same procedure will continue to the ground floor. The periphery of each basement will cast 0.50m wide at the dosage of 8.00 kg/ m^3 (dosage may vary due to various site conditions) as shown above
  - 3.1.7. The ground floor slab should be poured with KIM concrete by 0.50m wide at the periphery (please refer and follow clause 5) at dosage of 8.00 kg/m^3 (dosage may vary due to various site conditions).
- 3.2. Retaining wall casting method will be followed by conformably to British Standard approximate 6.00m length (this value can be discussed during the site meeting) in onetime pour. Retaining wall will be divided to different phases (each phase should be approximate 6.00m length). In fact, the all corner phase of wall will cast first and then will cast the remaining area phase by phase alternatively. The intervals between the alternative phases should be minimum 48 hours to avoid possibility of cracks by expansion of concrete. The main contractor prefers other methods, then the main contractor has to provide a crack control joint every 10m otherwise the main contractor will be held responsible for all future cracks or defects may happen.
- 3.3. It is essential to achieve the performance and benefits of KIM through correct consolidation of the concrete (Crystalline recommends self compacting concrete). Even if KIM improves the internal cure of concrete it is not always a replacement for proper curing procedures, curing should be done with project specifications. Repair should be protected from rain, wind and sun.KIM treated concrete will typically delay the initial and final setting times of the concrete, you should adjust your finishing and setting according to that.
- 3.4. Cover KIM concrete with a plastic sheet in order to avoid shrinkage cracks.
- 3.5. Crystalline needs 24 hours for de-shuttering of retaining wall after casting.
- 3.6. KrystolWaterstop Treatment (Slurry) should be applied to all cold joints, that could present an extra cost while concreting

4. Galvanized Metal Lock-Rib Lath fixing at upper basement slabperiphery:

- 4.1. High rib mesh should be installed as per CWP recommendations around the Raft slab (in Split application), each basement and ground floor slab where KIM concrete to be poured. The middle portion of the each basement and ground floor slab will be poured with non KIM concrete.

  Notes:
  High rib mesh to be installed / fixed between top and bottom steel bars of slab only The Main contractor / site in-charge must inform CWP two days prior to the next KIM concreting

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Important: Kindly note that you are making a waterproofing membrane out of the concrete. KIM admixture is not like other traditional admixture, the concrete in this case don't just form the surface. But KIM concrete will be the only barrier to water penetration. This means that common cracks found in typical concrete cannot be tolerated Poor consolidation, unplanned cold joints, cracks, penetrations, contaminations etc will all result in a leakage structure. You should follow the instructions in order to have an impeccable result.

Self-Sealing Analysis for Cracked Concrete

Self-sealing" is used when the concrete has the ability to repair and to close up cracks on its own, without the need to apply any product.

Two important objectives:

- Making a test method in order to replicate and analyze the real-life conditions of the self-sealing process.
- Studying the effects of several chemical and mineral admixtures on the self-sealing

1. Self-sealing
   Through the service life time of a structure, concrete could develop micro cracks that could develop into macro cracks later on. These cracks will allow moisture infiltration that will lead to the reduction of the service life of the structure.
   Self-sealing is a process where the concrete is able to repair small cracks on its own without applying any product or any assistance.

2. Cracking Method
   The first challenge of this study was to induce repeatable cracks in the specimens. In fact, the consistency of the cracks depends on different factors as sample age and loading rate; younger samples will show ductile failure as for older samples, they are more brittle and their failure is harsh and explosive. Also, in order to obtain a consistent crack an optimum loading rate is required.

3. Self-sealing Test Procedure
   - Cast and repair the samples
   - Generate the crack
   - Put the cracked samples into sample jacket
   - Constantly apply head pressure
   - Maintain pressure
   - Measure flow rate

4. Self-sealing and Crystalline Admixture
   Up until now, this technique has been used to test hydrophilic crystalline admixture. Water infiltration into the cracks allows this product to amplify the natural formation of precipitates. We will notice the formation and development of new crystal deposits that will block and fill in the cracks. Based on the results, this admixture can increase self- sealing properties of concrete while making it less permeable and much more durable compared to untreated concrete.