

Chembond Construction Chemicals division participated in Cemcon 2011, an international conference and exhibition on construction of high-rise concrete buildings.

Chembond Construction Chemicals division participated as an associate sponsor of Cemcon 2011 an international conference and exhibition held in the fast growing city of Pune.

The event was organized by the Indian Concrete Institute, Pune Chapter at Hotel Sun-n- Sand, Pune, on the 17th and 18th of

June 2011. Chembond had on display in its stand at Cemcon 2011 many of its products for the construction industry. A presentation titled New Generation Concrete for Tall Structures with PCE's and beyond was presented by Mr. Deepak Kanitkar, DGM Technology and Business Development.



New Product Orientation & Sales Training Meet

New product Orientation & Sales Training Meet for Conschem division was held at Dudhwada plant from 19th to 21st Sept 11. The purpose behind the same was to introduce new products which are in the process of getting launched in couple of months.

3 days of training programme covered product technical information, product demo & also informed the team about the production process undertaken at Dudhwada. The event ended with awards distribution for excellent performance & all the team were appreciated for the efforts put throughout the year.



Chembond Chemicals Participates in ET Acetech Exhibition

Chembond Chemicals Limited announces its participation in The Economic Times ACETECH 2011 an international exhibition and symposium on Architecture, Construction and Engineering. The event is being held at The Bombay Exhibition Centre, Mumbai from the 3rd to 6th of November 2011. The past few years have witnessed hectic



Hall No. 1A
Stall No. 18A

activities in the construction field in India. New techniques and materials have been widely adopted by the industry with an expectation of achieving excellence in quality and productivity. Chembond will showcase its range of construction chemicals and demonstrate its capabilities in the field by participating in this event.

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Dear Friends and Associates,

It gives me great pleasure in presenting to you this inaugural issue of Chembond TechConnect - our quarterly technical bulletin highlighting our solutions for the construction industry. The bulletin aims at sharing important information about the industry, practices, products and a little about ourselves with you. Your support has been vital and of singular importance for us.

The construction industry in India has been one of the biggest contributors to our GDP. The industry has been keeping pace with the changing and ever evolving technological advancements made in the civil engineering and design fields. Acceptance of newer materials, techniques, standards and practices in construction is growing. The designers and engineers are at the forefront of driving the shift in purpose of the industry from only providing strength to the construction to also providing durability with aesthetics. The construction chemical industry plays a key role towards achieving this and offers a wide range of solutions for healthy, durable and appealing constructions.

This issue of TechConnect carries an article on Repair of Cracks in Concrete by using Epoxy and Polyurethane Injection Resins. These technologies are recent advances and are now increasingly used in structural repairs in India. The issue also carries updates on some of the new products we have recently introduced and the major events we participated in the recent past.

While we make attempts at adding content that interests you and meets your exacting requirements, I earnestly solicit your feedback, suggestions and questions on this and all subsequent issues. Please do communicate with us on editor.techconnect@chembondindia.com.

With warm regards,

NIRMAL SHAH
Joint Managing Director
Chembond Chemicals Ltd.

Repair of cracks in concrete by using Epoxy and Polyurethane injection resins.

Overview

Concretes based on hydraulic binders such as Ordinary Portland cement have a common tendency to crack. There may be different type of cracks and various reasons for cracking to take place. The main reason is shrinkage in plastic and hardened state. Sometimes these cracks are minimal and may be ignored or treated on the surface itself. But when the cracks tend to penetrate deeper, they start affecting the durability of concrete. Cracks may appear in a floor slab, foundation, basement slab, roof slabs a beam or a column. These cracks may affect structural, aesthetical or environmental performance of the utility.

This creates a need to treat these cracks carefully, with proper materials and techniques. There are a number of methods and techniques which are developed by the construction industry to such cracks. Crack injection using either Epoxy Resin or Polyurethane resin based grouts, is one of the most efficient and effective technique. Although not new, these techniques and materials have been getting refined and innovative for quite some time.

Conditions, Considerations and Materials

In order to decide whether to use crack injection, it is important to understand the cracking in a particular place or structure in detail. There may be different reasons for the cracks to appear. One must know if it is drying shrinkage cracking, cracking due to corroding reinforcements or alkali aggregate reactions are involved. Further need is to understand whether the crack is structural or non-structural i.e. on a non-load bearing element. Some crack may be still developing. Some cracks might have appeared, due to not sufficient movement joints in the structure and may be moving. Some are due to settlement or due to damages during or after curing period. If the crack is subject to subsequent movement, an epoxy repair may not be suitable.

Here we will discuss specifically two types of injection materials. Low Viscosity Epoxy resins and Polyurethane resins. The former being mainly used for structural crack repair and the later mainly finding use in situations, where movement is expected or water leakages have to be stopped quickly. Sometimes a combination of both materials may also be used.

Both Epoxy resins and polyurethanes are sensitive to water. One must understand this aspect, while formulating as well as recommending them. Epoxy resins, have difficulty in setting and developing the desired strength, in presence of water. Some epoxy resin systems, are tolerant to a fair amount of damp and some even are used under water. But handling under water epoxy injection resins, could prove more difficult and costlier than the polyurethane resins. Polyurethane resins on the other hand are available in one, two or three pack systems. One pack resins generally foam in presence of water thus effecting quick stoppage of flowing water through cracks. Two and three pack systems offer either a flexible sealing solution or foam like single pack resins. The foam generated by such systems, are more flexible than the single pack resin.

Structural Crack Repair using Epoxy Resins

The injection procedure will depend on the application and location of the crack(s). Horizontal, vertical, and overhead cracks require different approaches. Size and accessibility of the crack shall also be considered. Depending on the specific requirements of the job, crack repair by epoxy injection can restore structural integrity and reduce moisture penetration through concrete cracks 0.002 in. (0.05 mm) in width and greater. (ACI RAP Bulletin 1). ACI has given a complete procedure for structural crack repair, in ACI RAP Bulletin 1.

Surface Preparation

As for all repair procedures, surface preparation is the key to crack injection. Depending on the condition and location of cracks it must be cleaned from foreign matter and any loose or damaged concrete shall be removed. The surface where the injection takes place must be strong to take the pressure of the injected resin. Proper sealing of crack surface is necessary to avoid losses during injection. Follow the instructions, given in the manufacturers product literature.

Selecting the right Material

Material selection is critical. Moisture tolerant epoxies are required in damp conditions. Sometimes Initial Polyurethane injection or use of cement based water plugs may be necessary to stop the flow of water. ACI RAP Bulletin 1, ASTM C-881 and manufacturer literature would help, in making correct decision.

Injection Equipment

Air assisted guns, Hand actuated delivery systems, and spring or balloon actuated capsules are suggested by ACI.

Repair Procedure

The procedure begins with the installation of injection ports at proper spacing generally at 40 mm in centre. Wider crack may have longer spacing. Cracks are then sealed through its length with suitable sealing material. If a crack penetrates completely through a section, then both sides need to be sealed for best results. Epoxy, polyester, cement, Silone based materials, may be used for this purpose. Injection is carried out after the cap seal is set. On horizontal places, the injection shall be started at the widest section. Vertical cracks are injected from the bottom up. Generally cracks are injected until the material flows out from the adjacent port or until refusal. Smaller cracks may require higher pressure. After the injection is complete, the ports are removed. The cap seal may be completely removed using suitable procedure such as grinding or left in place, if it is not objectionable. The success of this repair may be verified by taking cores at suitable places or by non-destructive testing such as impact echo, ultrasonic pulse velocity or spectral analysis of surface waves.

Non Structural Crack Repair Using Polyurethane Resins

If the crack does not compromise the structural integrity of the structure, injection with polyurethane grouts or other nonstructural materials may be a more suitable choice to fill the crack. As discussed earlier mainly two types of PU based crack injection resins are being used. One system is used for sealing dry or damp cracks and the other to stop the flowing water. Both single and 2 or 3 component systems may be used for generating foam. The foaming action is very quick mostly in less than few seconds. The dual component and three component resins may require multi component guns depending on the reaction time. Mixing and delivery of mixed materials must be well controlled. The repair procedure mostly remains same like the one used for epoxy injection. When the question of contact with potable water arises, the products shall be tested as per NSF 61 OR WRAS/BS 6920 OR available national standards.

Health and safety

Both Epoxies and polyurethanes are hazardous materials and must be handled with care. Job-site safety practices should include, but not necessarily be limited to, the following:

- Keeping a copy of Material Safety Data Sheets (MSDS) on site.
- Wearing protective clothing and protective eyewear where required.

- Wearing rubber gloves or barrier creams for hand protection.
- Having eye wash facilities available.
- Wearing respirators where needed.
- Providing ventilation of closed spaces.
- Secured storage of hazardous materials.
- Having necessary cleaning materials on hand and
- Notifying occupants of pending repair procedures.

Summary

Epoxy and Polyurethane injection resins are being extensively used for repair of cracks in concrete structures. The selection of method of repair and materials depends on the nature of cracks and site conditions. It is essential to understand the underlying cause of cracking, prior to deciding on a particular repair procedure. All precautions including surface preparation, proper mixing and application, as well as health and safety requirements are essential for successful crack injection. ACI, ASTM and manufacturer literature shall be referred for guidance. Proper training of applicators is mandatory to achieve desired results.

New Products

KEM MIX MS • KEM BOND EP1 • KEM EPOXY TILE GROUT

KEM MIX MS

Description:

KEM MIX MS based concrete has excellent resistance to penetration of chloride ions. This makes it particularly suitable for structures exposed to a chloride environment. It reduces rebound, increases cohesiveness and stickiness, less dust generation, increases layer thickness and reduces need for accelerator

Dosage / Coverage:

Kem Mix MS is dosed between 5 to 10% of cement by weight depending on mix design requirements.



Application Areas:

Shotcrete & underground structures. Offshore & coastal concrete. High rise buildings. Dams and bridges. Heavy duty floors & pavements. Grouts and mortars. SCC and HPC.

KEM BOND EP 1

Description:

(ASTM C-881 Type II, V grade II class B & C.)

KEM BOND EP 1 is a specially formulated non-shrink, solvent free epoxy resin based system blended with fine inert fillers. It is supplied as a two component material in pre weighed quantities ready for on site mixing and use.

Dosage / Coverage:

3kg

Application Areas:

It is primarily intended as a bonder for old concrete to new freshly laid concrete and cementitious repair products.



KEM EPOXY TILE GROUT

Description:

KEM EPOXY TILE GROUT is a solvent free epoxy resin blended with selected fine fillers. It is supplied as a three component system in pre-weighted quantities ready for on-site mixing and use.

Application Areas:

It is a high performance epoxy grout with exceptional chemical resistance for bedding and grouting tiles in heavy duty environments. It is used for a single operation bedding and grouting of tiles on horizontal surfaces. It is used wherever excellent mechanical properties, high chemical resistance combined with a high standard of finish is required such as in swimming pools, hospitals, kitchens, slaughter houses, soft drink factories and steam cleaned areas.

Dosage / Coverage:

Depends on joint width depth and tile size. For a tile size of 200 mm x 100mm x 6 mm and joint width of 5 mm, about 0.480 litre of KEM EPOXY TILE GROUT would be required / square meter i.e. in this case, one pack of KEM EPOXY TILE GROUT would cover about 7M² of tiled surface.

