

STRUCTURAL STRENGTHENING WITH POLYMER MODIFIED METHOD

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Abstract – Polymer modified concrete is very suitable for structural repair and strengthening of damage structural elements like column, beam, RCC chajja. Polymer modified concrete having excellent moisture resistance properties and so it is widely use at aggressive and moisture environment. Polymer modified concrete repair treatment is cost effective with improving original strength of structural elements. This paper focuses on step by step approach for structural strengthening of damaged concrete structures with polymer modified concrete.

Key Words: Polymer Modified Concrete, introduction, properties, methodology, repair and retrofits.

INTRODUCTION:

By the age of structure, total lack of periodical repair/maintained and persistent use after the design life of structure, also leads to deterioration of the structure, structural repair are essential.

The structural repair and restoration of damage structural elements like column, beam, chajja are essential at highly aggressive environment, high rainfall, high humidity level, high rate of corrosion, high chloride contacts area.

There are various repair methods available, but Polymer Modified Concrete Treatment is most cost effective method for improving the original strengths of structural elements.

PROPERTIES OF POLYMER MODIFIED METHODS:

1. Modified material widely accepted and most effective.
2. Cost effective
3. Easily available at local market also.
4. Good workability
5. Mix stability
6. Ageing resistance
7. Adequate adhesion
8. Low volatile content.
9. Self-compacting material
10. Minimum water demand.

REPAIR METHODOLOGY –

The step wise approach for repair is given below:

1. Supports:

The R C members have to be properly supported before chipping the spalled / loose concrete. The props provided shall be capable provide sufficient structural support to the load carrying members.

2. Surface Preparation Of Concrete:

All the spalled cracked concrete or the other pre-applied mortar shall be removed by chipping to show the reinforcing bars. The concrete need to be chipped to a minimum depth of 10mm behind the reinforcing bars. The areas to be repaired shall be profiled to get rectangular or square shape with an inward tapering edge.

3. Surface Preparation Of The Reinforcement:

The exposed reinforcing bars should be cleaned neatly to free all traces of rust, scales, etc., with the help of wire brush, sandpaper etc. The lateral ties/stirrups should also be cleaned in the same way. After removal of corroded portion, the diameter of the reinforcement should be checked and compared with the drawings.

4. Provision Of Additional Reinforcement:

Additional reinforcement need to be provided because the diameter of reinforcing bars is reduced substantially (say >20%) additional bars shall be provided as per the planning. This additional reinforcement shall be properly anchored to the prevailing concrete by providing adequate shear connectors. Weld mesh can also be provided if found necessary.

5. Provision Of Shear Connectors:

Shear connectors of 8mm diameter should be inserted in holes of 14mm diameter and 75 mm deep. These should be inserted at every 500 mm c/c on every face of the beams in staggered form. The holes shall be cleaned with compressed gas or water jet to get rid of all the dust etc. and then the

shear connectors shall be fixed within the holes using polyester resin anchor grout. Additional reinforcements and shear connectors provided.

6. Priming of Reinforcement Bars:

The exposed and cleaned reinforcing bar shall be given a coat of Epoxy Zinc Primer such the coated film will have a dry film thickness of 40 microns. The film shall be continuous especially within the regions where pitting, imperfections etc., are present on the surface of the bars. It is important that the rear portion of the bars shouldn't be left without coating. A second coat if needed could also be provided to realize a consistent and continuous film. The extra reinforcement provided and even the shear connectors needs to be coated with Epoxy Zinc Primer. The weld mesh if provided shall even be coated with Epoxy Zinc Primer.

6. Provision Of Epoxy Based Bonding Agent:

The bottom and hardener component of epoxy based bonding agent must be mixed well to urge a consistent grey coloured mix. Apply the fabric to properly cleaned and dry concrete substrate using stiff nylon brush by scrubbing it well into the substrate. The coat should be uniform and well spread on the whole area of the repair patch. The mixed material must be applied before the elapse of its pot life and therefore the new repair mortar must be applied before the elapse of overlay time. As a totally dried epoxy coat acts as debonding layer, the repair material should be applied whilst the bonding coat is tacky. In case the applied epoxy bond coat gets dry, an additional coat should be applied before application of repair mortar.

7. Formwork And Shuttering:

Slurry tight and powerful form work shall be provided. The shuttering for encasement shall be kept ready such the formwork shall be placed in position and glued such the micro concrete are often poured into the formwork within the overlay duration of the bonding agent (5 hours). Adequate supports shall be provided for the formwork. Care should be taken to make sure leak proof shuttering. Under no circumstance the slurry should effuse of the shuttering during pouring of micro concrete.

8. Mixing Of Micro Concrete:

It shall be mixed with the appropriate water powder ratio as mentioned in the product data sheet. The mixing should be completed

mechanically and under no circumstance hand mixing shall be done. Mixing shall be administered for 3 to 5 minutes to make sure that homogeneous mix is obtained with none bleeding or segregation. In hot climate ice cooled water shall be wont to maintain the temperature of mixed material. If the encasing thickness is quite 100 mm, add stone aggregates up to 50 you interested by weight of micro concrete to the mixed micro concrete directly into the mixer hopper. The stone aggregates must be 12 mm and less and should be clean, washed and dried. The mixing should be finished 3 minutes in mixer then pre weighed stone aggregates into the mixer. Mix further for two minutes till lump free mix is obtained.

9. Deshuttering:

The shuttering from the edges of the R C members shall be removed after a period of 24 hours. However, the formwork of the soffit shall be retained and removed after 3 days.

10. Pouring Of Micro Concrete:

The mixer should be poured into the formwork employing a suitable funnel or through a hose pipe. It must be poured from one end only. A suitable hopper / funnel arrangement should be done at site to complete the pouring operations. The pouring operation shall be continuous and it shall not be stopped unless the work is completed. To achieve this, sufficient mixers / drilling machines and work force should be made available at site.

11. Curing:

All the repaired and encased area should be totally cured as per standard concrete practices. Curing compound should be applied for effective curing of sides and soffits of beams. If a curing compound is applied, care shall be taken to make sure that proper surface preparation is administered so on remove any traces of curing compound on the surface. If this is often not done, it's going to cause debonding of any protective coating applied on top.

TESTS FOR EFFECTIVENESS OF REPAIR:

Performance of a concrete repair must be measured in physical terms and other parameters like environmental effects, safety and whole-life costs. The polymeric repair materials fail because of the improper surface making, wrong usable methods,

incompatibility of the repair material with the first concrete etc.

The most of the failure takes place at the interface of the bonding that bond strength is extremely important. All corrosion related cracks need to be tested by corrosion analyzer etc. Structural crack repairs need to be tested for an on-site non-destructive load testing to achieve satisfactory performance under an overload above the planning working value after 28 days.

CONCLUSIONS:

Based on above test results and application, polymer modified concrete may be a free flowing, self-levelling, self-compacting and

high early strength material which is being effectively used for structural strengthening of deteriorated RCC members of column and beam in an uncertain atmosphere. It also can be used for extra load carrying of these structural members by method of jacketing.

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BIOGRAPHIES



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