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A Case Study on Repair & Rehabilitation of RCC Structure

Er. Krishan Murari¹, Er. Javed Ul Islam², Jeetendra Singh³, Dhiraj Kumar⁴ Chetram meena⁵,
Lokesh Kumawat⁶

Assistant Professor, Department of Civil Engineering, Vivekananda Institute of Technology, Jaipur, Rajasthan, India¹⁻²

UG Student, Department of Civil Engineering, Vivekananda Institute of Technology, Jaipur, Rajasthan, India³⁻⁶

ABSTRACT- The purpose of the project is to increase fundamental and practical knowledge on repair and rehabilitation of the rcc structures. Large number of reinforced concrete structure are deteriorating and need to reinstate their safety and serviceability. While costs respective with repair of deteriorating concrete structures can be substantial, costs resulting from poorly designed or executed repairs may be even higher. During the research for the project relevant repair methods for damaged concrete structures will be discussed on various design methods. Then repair techniques will be studied and classified into cracks, efflorescence, corrosion of concrete reinforcement, seepage and deterioration of surface coating. With the help of journals and publications, a detailed study will be done on the repair and a suitable rehabilitation method with pictures, referred case studies and other references.

KEYWORDS: Cracks, Repair, Rehabilitation, Concrete, Corrosion, Shotcrete.

LINTRODUCTION

There are different strategies accessible for fix and recovery of substantial design for deformities and disappointment. concrete is the most generally utilized as development material. a few deformities are as breaks, spalling of cement, flowering, openness of support, extreme avoidances and consumption in the construction.

1.1 Repair is the technical aspects of rehabilitation. It refers to the modifications of the concrete structure and it is the process of restoring something that is damaged or deteriorated or broken to good condition. Repairs are performed on damaged building's structure to restore the structural strength after disaster.

1.2 Rehabilitation is the process of returning a building structure or an area to its previous good condition to make serviceable structure, which component of the structure should be repaired or restored based on all future requirement of the structure. Need for repair and rehabilitation of structures:

- Faulty plan of the design Ill-advised and awful workmanship
- Extreme enduring and natural conditions
- Ageing of designs.
- High level of substance assault
- Defective development
- Lack of upkeep, quality control and management
- Lack of legitimate assurance, safeguard and prevention
-

1.3 CRACKS Breaks in building structure are of normal event. A structure part creates breaks when stress surpasses strength of the materials. Breaks are ordered into two sorts.



(a) STRUCTURAL:

Structural cracks are due to faulty design, faulty construction or overloading which may endanger safety or buildings.

(b) NON-STRUCTURAL:

The non-underlying breaks are because of inside decreased pressure. Contingent upon width of break they are characterized into Dainty (<1mm), MEDIUM (1mm to 2mm), WIDE (>2mm).

1.3.1 How do Cracks Develop?

Breaks demonstrate the decay of cement because of uncoverable climate around substantial constructions. Climate establishes PHYSICAL, CHEMICAL AND MECHANICAL AGENTS.

Actual specialists causing breaks are temperature, ice activity, substantial cover, porosity of cement.

Mechanical specialists causing breaks are scraped area, vibration, sway loads.

1.3.2 Repair work for Cracks in Beams and Columns

- Firstly, identify the harmed region by hitting with hammer, emptiness sound demonstrates the harmed region shoring to disseminated load.
- Remove consumed space of concrete.
- According to IS code the thickness of cover for segments and pillars ought to be 40mm.
- The synthetic compounds utilized are ARMATECH-108 an enemy of eroding substance is to be applied on steel support and SIKALATHEX to guarantee appropriate holding with old and new concrete.
- Plasticizer is added to diminish porousness and expansion in strength.

II. LITERATURE VIEW

(a) Recovery of RCC Overhead Supply at Siliguri, West Bengal, India.

An examination was done in Spring April 96 for an overhead tank of 50,000 gallons limit laying on getting sorted out of 16 RCC segments upheld together at different levels. The tank is arranged in North Bengal, India.

(b) G+3 Private Structure, Basant Nagar, Tamil Nadu.

The Structure was built in vicinity to the coastline and presented to saline climate. The structure was given a few indications of pain in agreement to different cases, For example, spalling, erosion of support, breaks .



III.METHODOLOGY FORREPAIR AND REHABILITATION

3.1 CORROSION IN CONCRETE STRUCTURE:

Steel support, which is utilized in RCC, however on one side supplements the substantial for its shortcoming in strain (malleable pressure), it likewise debilitates the sturdiness and life span of concrete, because of its inclination to consumption. Fixes and restoration of substantial designs, which of late has become a movement similar to development itself around the world, is for the most part since crumbling of cement because of erosion

Steel installed in hydrating concrete glue quickly shapes a dainty inactivity layer of oxide which unequivocally holds fast to the basic steel and gives it complete security from response with oxygen and water, that is from arrangement of rust or consumption. This condition of the steel is known as passivation.

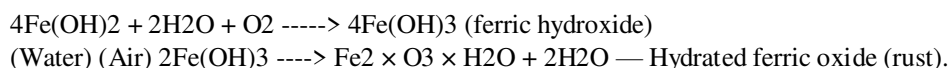
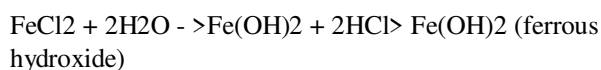
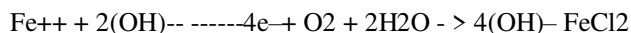
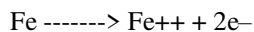
3.1.1 Cause of corrosion of the steel reinforcement in concrete structure:

Erosion of steel in concrete is an electrochemical interaction. The electrochemical possibilities to shape the erodin cells might be produced twoly

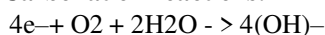
(a) Composition cells might be framed when two unique metals are installed in concrete, for example, steel rebars and aluminium course pipes, or when huge varieties exist in surface attributes of the steel.

(b) Concentration cells might be shaped because of contrasts in convergence of disintegrated particles close to steel, like alkali's, chlorides, and oxygen.

Anodic reactions:



Carbonation reactions:



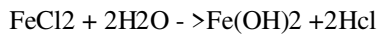
It tends to be seen that oxygen is devoured and water is recovered yet it is required for the interaction to proceed. Consequently, there is no consumption in, dry cement, most likely under an overall mugginess of 60%; nor is there erosion in concrete completely drenched in water, with the exception of when water can entrain air, for instance by wave activity.

The change of metallic iron to rust is joined by an increment in volume, which relying upon the condition of oxidation, might be just about as extensive as 600% of the first metal. This volume increment is accepted to be the chief reason for substantial development and breaking. It ought to be noticed that the anodic response including ionization of metallic iron won't advance far except if the electron stream to the cathode is kept up by utilization of the electrons at the cathode; for this the presence of both air and water at the outside of the cathode is totally vital.

Without chloride particles in the arrangement, the defensive film on steel is accounted for to be steady if the pH of the arrangement stays above 11.5. Regularly there is adequate alkalinity in the framework to keep up the pH over 12. In uncommon conditions



The responses included are as per the following:



3.2 REPAIR MATERIALS:

Concrete and steel are by and large utilized for the maintenance of different kinds of harms. Other than some extraordinary materials and procedures are accessible for best outcomes in the maintenance works.

They are portrayed beneath:

- Shotcrete
- Epoxy pitches
- Epoxy mortar
- Gypsum concrete mortar
- Quick setting concrete mortar

2.1 Shotcrete:

Shotcrete is a methodology for applying a blend of sand and Portland substantial which mixed pneumatically and gave in dry state to the spout of a pressing factor weapon, where water is mixed and hydration happens just before removal. The material bonds magnificently to the masterminded surface of workmanship and steel. In flexibility of utilization to bended or unpredictable surfaces, its top notch after application and incredible actual characteristics, make for an ideal method to achieve remembered assistant limit with respect to dividers and various segments. There are some minor impediments of freedom, thickness, course of utilization, etc.

2.2 Epoxy pitches:

These have high elasticity as these are magnificent restricting specialists. Epoxy pitches are arranged artificially whose syntheses can be changed by the necessities. These are mixed not long before the application. The eventual outcome acquired is of low thickness and can likewise be handily infused in little breaks. While for the filling of big ger breaks, higher consistency epoxy sap might be utilized.

2.3 Epoxy mortar:

Epoxy mortar is a mix of epoxy tars with fine totals which has higher compressive strength, higher rigidity and a lower modulus of flexibility than the Standard Portland Concrete cement. Epoxy can't be utilized alone as it's anything but a flammable material.

2.4 Gypsum concrete mortar:

The underlying utilization of gypsum concrete mortar is restricted as it has most reduced strength at disappointment.

2.5 Speedy setting concrete mortar:

This material is licensed and was initially produced for the utilization as a maintenance material for supported substantial floors nearby steel impact heaters. It is no hydrous magnesium phosphate concrete with two segments, a fluid and a dry, which can be blended in a way like Portland concrete cement.

3.3 METHODS FOR REPAIR AND REHABILITATION :

The approach for fix and restoration are as per the following:

- (a). Grouting
- (b). Guniting
- (c). Routing and fixing



- (d). Stitching
- (e). Drilling and Stopping

(a) Grouting: is the procedure by which the material can be set into pits or openings present in the construction. It is utilized for expanding the heap bearing limit of a construction, making up for shortfalls around precast associations, halting spillages, setting cements and soil adjustment. It's anything but a combination of concrete, water, and some other material like sand, pozzolons and water decreasing admixtures.

Technique of grouting:

- i. A combination of concrete sand grout is set up by utilizing 1:2 alongside the water concrete proportion between 0.6 and 0.8 utilizing a mechanical blender.
- ii. The blend is sent down under tension (of around 120 kg/cm²) through a 30-50 mm breadth pipe ending into steel confines.
- iii. As the grouting proceeds, the channel is raised gradually up to a height of not more than 60 cm over its starting level after which it is pulled back and set into the accompanying enclosure for extra grouting by a comparable philosophy.
- iv. After the way toward grouting for a stature of around 60 cm, this activity is rehashed, if fundamental, for the following layer of 60 cm and rehashed constantly.

(b) Guniting:

It's anything but an interaction which uses dry material from the machine to the surface whichever should be fixed through the spout by applying high speed and packed pressing factor. It is likewise called as the dry-blend shotcrete.

Strategy of Guniting:

- i. The concrete is blended in with soggy sand and a while later required measure of water is added as the admixture comes out from the weapon. Amount of water can be controlled with the assistance of an administrative valve.
- ii. Firstly, the surface on which fix work required should be washed and cleaned. Then, at that point the spout of weapon is avoided at all costs of around 750 mm to 850 mm from the surface to be fixed and the speed of spout
- iii. Sand and concrete are at first dry blended in a blending chamber and the dry combination is taken through a line to a spout, where it is persuasively projected onto the surface to be covered.
- iv. The motivation behind administrative worth is to give a blend of wanted solidness which will hold fast to the surface against which it is anticipated.

(c) Directing and fixing:

It is utilized for treating both bigger and fine example. This treatment lessens the odds of dampness to arrive at the building up steel or pass through the substantial which can cause surface stains or different issues. For floors, the sealant ought to be adequately unbending to help the expected traffic.

Method for Steering and Fixing:

- i. First a notch of profundity going from 6 to 25 mm at the surface is ready.
- ii. Then this notch should be cleaned via air impacting, sandblasting, or water impacting and further it was dried.



iii. On the dry furrow, a sealant is put which is additionally permitted to Directing and Fixing

(d). Stitching:

At the point when the elasticity of any construction needs to restore across the significant breaks, should be utilized. It includes the way toward boring the openings on the two sides of the break and grouting in U-formed metal

(e). Penetrating and plugging or Stopping: Penetrating and stopping a break comprises of boring down the length of the break and grouting it's anything but a key. This method is appropriate just when breaks run in sensible straight lines and are open toward one side. This strategy is regularly used to fix vertical breaks in holding dividers.

IV. CONCLUSION

- Repair and Recovery is important to save unsafe disappointment of designs because of weakening.
- It is suggested for old structures which have a few signs like breaks, erosion of inserted materials, and so on Thusly, ideal upkeep of constructions is required.
- Selection and assessment of right fix material and defensive coatings will set aside tremendous cash and time by diminishing the maintenance expenses of substantial structure

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