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A Case Study of Rehabilitation of Building Cracks

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***Abstract*: Cracks are most common type of a problem in any type of building. So, it is very important to understand the cause and the measures to be taken for prevention of cracks. Some faulty steps or improper design during construction and some unavoidable reasons different type of cracks starts to appear on various structural and non- structural parts of the building. So, timely identification of such cracks and adopting preventive measure are essential.**

***Keywords*: crack categorization, causes of cracking, prevention techniques, measurement of cracks.**

1. Introduction

Cracks in a building are the of common occurrence. The first and most common reason of crack development is the stress component exceeding its strength component which can be associated to the externally applied loads (forces) such as dead, live, wind or seismic loads, or foundation settlement or stresses developed internally due to thermal movements, moisture changes and/or chemical action, etc. Most buildings crack are at some time during their service life. The appearance of cracks is a symptom of distress within the structure of the building. Often the cracking is of little consequence and once it is established as static, simple repair by filling or re-pointing is all that is required. However, a crack maybe the first sign of a serious defect which may affect the serviceability or the stability of the building.

2. Literature Review

Cracks are the most common type of problem in every building. It is very necessary to understand the causes and remedial measures required to be undertaken for preventing cracks. As cracks in various types of building structures cannot be eliminated completely but can be prevented and controlled by using adequate materials which enhances the properties of the structure and also adopting required changes in design criteria. Due to some faulty designs and other unavoidable factors cracks start developing on various structural and non-structural parts of the building. Hence, timely measures should be adopted to prevent and control cracks and its formation. Not all the cracks developed are harmful but there are some type of cracks which can be severely structurally hazardous. Our main aim of the project is to know the causes and preventive measures of cracks in buildings.

3. Methodology

The methodology of work will be as follows,

- PHASE 1: CPP project selection by studying area of interest.
- PHASE 2: Finalizing project title after that study the research journal paper regarding our topic, study of literature review & study about causes and Prevention of Building Cracks.
- PHASE 3: Prepare a plan for collecting the information of our project.
- PHASE 4: Collecting the information from IJSRT Research paper.
- PHASE 5: Preparation and completion of reports.

4. Study and Discussion

Necessity of Maintenance:

Any building is required regular maintenance in between its life period. So, therefore the necessity of maintenance can be justified as following:

- Maintenance is necessary to keep the serviceability of building for longer period.
- It is necessary to cop up the defects in its earlier stage.
- Regular maintenance is necessary to keep the building components in working and stable conditions
- It also improves the appearance of the property.
- It identifies and fixes minor problems before they become major
- Building maintenance also increases the safety value of a building which can ensure safety of occupants, visitors and general public and also presenting good appearance

Different types of test carried out for detection of cracks or damages in building

Ultrasonic Pulse Velocity:

- Ultrasonic Pulse Velocity (UPV) testing is used to determine the integrity of structural concrete.

Applicable on:

- Beam
- Column

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- Elevated Slab
- Member with two sided access

Fig. 1. Ultrasonic pulse velocity test

Rebound Hammer test:

Rebound Hammer test is a Non-destructive testing method of concrete which provide a convenient and rapid indication of the compressive strength of the concrete. The rebound hammer is also called as Schmidt hammer that consist of a spring controlled mass that slides on a plunger within a tubular housing.

Applicable on:

- Beam
- Column
- Slab
- Other Concrete members

Fig. 2. Rebound hammer test

Pull Out test:

The test measures the force required to pull out a previously cast in steel insert with an embedded enlarged end in the concrete. In this operation, a cone of concrete is pulled out and the force required is related to the compressive strength of concrete

Principle:

This test is based on the principle that the force required to pull out a cone of steel embedded in concrete is proportional to the strength of concrete.

Limitations:

- Steel rod assembly has to be embedded in concrete during pouring and hence test cannot be undertaken at later ages.
- Repair of damaged concrete is required.

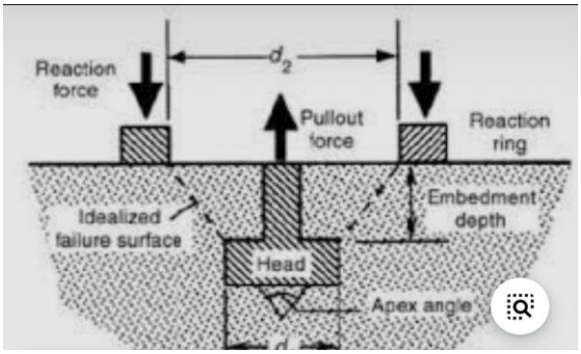

Fig. 3. Pull out test

Cell potential meter test:

Half Cell corrosion mapping offers a rapid, cost-effective and non-destructive way for corrosion assessment. The test provides valuable information on the likelihood of corrosion, and helps in the quality assurance of concrete repair and rehabilitation. Half Cell corrosion mapping offers a rapid, cost-effective and non-destructive way for corrosion assessment. The test provides valuable information on the likelihood of corrosion, and helps in the quality assurance of concrete repair and rehabilitation.

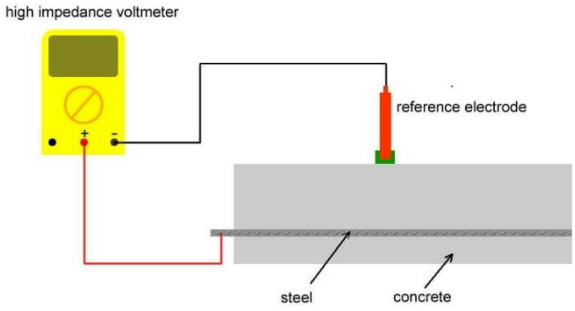

Fig. 4. Cell potential meter test

Efflorescence test:

What is Efflorescence?

Efflorescence is a whitish crystalline deposit on surface of the bricks. Usually magnesium sulphate, calcium sulphate and carbonate of sodium and potassium are found in efflorescence.

Fig. 5. Efflorescence test

Chloride content test:

The alkaline environment is created by the hydration of the cement in concrete. But due to chloride attack on concrete,

reinforcement steel gets corroded. Chloride content test for concrete determines the level of chloride ions and ingress of the chloride ion which destroys the protective layer of steel.

Fig. 6. Chloride content test

Sulphate content test:

Sulphtes are found in concrete either due to ingress into a hardened concrete from an external source or from being cast in from a soluble source during mixing. In either case, the result is a possibly deleterious expansive effect which in turn may cause disintegration of the matrix of the concrete or cracking of the concrete, both leading to a reduction in overall strength of the concrete element.

Fig. 7. Sulphate content test

Main objectives:

Prevent damages and decay:

1. Perishable material
2. Environmental attack

Serviceability preventive:

1. Maintenance
2. Maintainability

Restorability reduced:

1. Cost of repairs
2. Economic viability of repairs

Safety:

1. At any cost

5. Conclusion

a) This study gives insight to types of cracks, causes of cracks and prevention of cracks.
b) Various techniques for treatment of cracks are discussed in this study.
c) We can summarize that though it is not viable to assurance against cracking yet attempts can be made to minimize development of crack.

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