Study On Types Of Cracks On Concrete And Their Causes & Preventive Measures

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ABSTRACT

Development of cracks in building/projects are one of the major problem regularly occurring in any form of concrete shape. It is one of the major problem to get crack free concrete system globally. Engineers and building are facing such undeniable cracks problem from sixties the period of global industrialization. In fact, our need to have structurally safe buildings/ projects, but it is not so simple. The integrity of wall of building/ project will be degraded due to impact of cracks developed in it. Due to wrong steps taken during building /projects construction and some other unavoidable causes of various type of cracks initiate to emerge structural and non- structural failure of a building. So it is prime duty of engineers/developers to identify such cracks in time and adopt the preventive measures to avoid such cracks development. As per kind of cracks developed during construction to be identify carefully and in accordance with such cracks, repairing materials to be selected carefully and preventive measures/repair technique to be adopted immediately. A few type of cracks need more attention because of their hazardous impact on structure of buildings. The selection of proper repairing material and preventive measure are very critical and at the same time a suitable building material to be selected as per the soil condition, water availability & its quality , geographical condition of allocated projects/building to avoid the suspected cracks development from very beginning of projects/buildings.

INTRODUCTION

Incomplete separation of concrete into two or more segments produced by breaking is called cracking. Concrete plays a vital role in the layout and construction of the building/projects of Nation. IN The middle of the 19th century, designers/builders started to use concrete due to low quality of cement though at that time the use of concrete was slow.

The development of production approach followed by computational idea, experimental paintings and the improvement of manufacturing and now it become one of the most widely used building materials inside the modern building/project construction and hence the concrete is most widely used building/project construction material now days.

The cracking concrete is inherent characteristics which is unavoidable but it can be managed and minimized with the help of design, construction carefully as per condition of soil, geographical condition, quality & quantity of water available, electricity intake and size & utility of building/projects followed by selection of cement &building material suited to it.

As we know that concrete forms when a paste of water and cement mixes with an aggregates like sand & rock to harden it .the paste hardens and binds with aggregates through process called hydration. By volume, cement makes up to 10% to 15% of concrete mix. Concrete breaks easily when high pressure due to heavy load beyond the strength of the concrete in the building/project construction. At the stage of pre hardening of concrete may develop positive form of cracks which creates few different type of cracks in up to hardening stage of project/building constructed due to many reasons and such cracks are commonly kwon as protecting cracks.

The old cracks creates leakage and leaks of water cause infiltration of moisture, oxygen, carbon dioxide, chloride,dioxine,NO2, SO2e.t.c known as Green House Gases along with other aggressive chemicals in to the concrete resulting degradation of the shape of projects and causing erosion & corrosion of metallic materials which damage inside the concrete which develop structural failure of the building/project constructed.so the water pipeline layout inside the constructed building/project to be checked with colored water to know the leakages & linkages of water to indicate the cracks and remedial measures to be taken out for safety and integrity of building.

Cracking is a symptom of failure of stricter at early age. The excessive amount of cracks is not more abnormal condition of the structure of building/project which needs to find out the reasons and take the remedial measures at early age to avoid such abnormal failure and at the same time it is necessary to take the preventive methodology & technique for sustainability of building/projects.in the construction and manufacturing industry, rehabilitation strategy and substances are becoming an increasing number of vital cracking is very danger for both, the structural integrity in addition to the sturdiness of concrete.

The leakage &linkage of water causing emission of Green House Gases result in damaging mechanisms which include the corrosion & erosion of steel reinforcement. Hence our mere duty is to repair the cracks developed with suitable and concise preventive maintenance measures/methodology and have a close study and methodology /technological technique to avoid such failures for the high degree of sustainability of building/projects and the provider/user lifestyles. In view of this Anti Rust Treatment of metal rods/bars to be treated with Zinc based rust pacifier which form Zinc Oxide that's acts as coating. This is the primary step of anticorrosion.

Anti termite treatment – (i) pre construction of building/project and (ii) post construction of building/project to be done for safety and integrity of building/project structure. Anti termite cost in India-2023 is about 8rs to 10rs per square feet in case of preconstruction and RS 3 per square feet in case of post construction. Overall expenditure occurs for 1bhk is about RS 1200 to RS 1500 which is so nominal.

Cement play a vital role in building material which can be selected and used for construction of building as the use, condition of soil /condition of environment, temperature, quality and quantity of water available etc. the Indians Green Building Council (IGB) is established by the Confederation of Indian Industry (CII) in 2001 with the vision/moto to make avoidable" a

sustainable environment for all". In this context USA, ASTM has also divided in five type of cement as per their property & uses.

OBJECTIVE OF WORK

The research of this article is to provide a detailed principle of the design the purpose to provide a detailed set of principle with reference to behavior of reinforced/blast concrete and the construction of stones there made into cracks. Study of factors affecting the formation of cracks due to heavy use of loads or due to drawing & shrinkage of building/project due to atmospheric condition followed by design &construction with mismatch construction materials. The study involves the concise and correct selection of building/project construction material/ mortar mainly concern with selection of cement as per the size of building/project and user load and soil & environmental condition of project allocated area. The quality of brick and sand should be ensured. Anti termite treatment that i.e. pre & post treatment to carried out. Antirust treatment to be adopted.

TYPES OF CRACKS

Cracks in buildings/projects are common now days. Building material develops cracks usually which affects the sustainability/strength of building/project. The external force such as wind or earthquake loads or foundation repairs or heat vibration, humidity changes due to climate changes, chemical action etc. can develop extra pressure on the construction component. The cracks or causes of a spilt can be divided mainly into two categories –

1. Structural cracks
2. Non – structural cracks

1. STRUCTURAL CRACKS

Structural cracks develop due to wrong design, faulty creation or overloading which degrade the sustainability, life and safety of the building/project. The cracks in the structure are developed by beams, columns and slabs due to mismanaged construction and its nonalignment.

1.1 BEAM

THE structural details beam which id capable to bear load commonly by way of resisting in opposition to bending force which triggered into the construction material of beam as a result of the external hundreds of its own way weight , span and external acts to those loads which creates the bending moment .as per profile i.e. shape of move- segment, length construction material and application/uses, beams are normally characterized as cantilever , steel, continues beam concrete , reinforced concrete, I-beam, T-beam, trussed beam, chilled beam, lattice girder, over hanging beam, tapered beam, T selection beam anti liver beam , L beam , hip and c section beam.

1.2 COLUMNS

In architecture and structural engineering, column or pillar is a building material which transfers through compression, the weight of building above the various segment of structural factors. In nut &shell we can say that column is a component of compression circular support (the shaft of the column) is normally used on a large scale with a capital and a base or pedestal. Whereas small supports made of wood or metal referred to as posts and accessories with rectangular or other non- circular shape are called piers.

1.3 SLABS

The concrete slab is common structural member of modern buildings/projects. The horizontal slabs of reinforced steel concrete usually hundred to five hundred mm are commonly used in floor and roof construction. For exterior construction, smaller slabs are normally used. Sometimes these small slabs ranging from 51 to 150 mm are known as mud slabs usually use under large stones or on crawling surface.

2. NON- STRUCTURAL CRACKS

Non- structural cracks might be developed due to development of internal strength in the building materials due to variation of humidity temperature explosion and the effect of Green House Gases emitted and linkages of liquids etc.it may also be developed alkaline- aggregate reactions followed by corrosion & erosion of steel wars used in. in fact, such reason of Non Structural failures are related with building materials and there uses in quantity and quality, and climatic/environmental effect. But one reason for such failure cannot be deny that builders/ developers with their own interest in saving of money they deputed some unskilled mason for construction works who do not have good quality of brick works, due to which non-structural failure occurs. So, continues monitoring and execution along with the selection and preparation of building material are required to avoid/ minimize such type of failure.

CAUSES AND PREVENTIVE MEASURES OF CRACKS

1. ELASTIC DEFORMATION

Elastic deformation took place when a material strains develops stress. Two materials having different elastic properties are being used together as building material, the different shear pressure on these objects under the effect of load be created which develop such cracks in building/projects. There is one of the major cause of elastic deformation in any structural member of building/project is dead and living loads.

PREVENTIVE MEASURES

Slip joints under the guide of concrete slab on walls be created. Provide horizontal moments joints between a top of brick panel and bolstered cement concrete beam/slab.

2. THERMAL MOVEMENT

Most of the building materials are expanded due to heat and compressed under the effect of cold. The expansion and contraction due to change of temperature occur several structure cross-sectional location. It is the most powerful causes for decentralization in building which need attention.

PREVENTIVE MEASURES

In such case joints to be constructed like creation joint, expiation joint, central joint and slip joint. At the time of lay out/design of building/project, the joints are to be indicated with specific type of joints and to be constructed cautiously under the supervision/execution of engineer concerned with building/project. The best quality of brick having minimum strength about 3.5N/mm and high temperature resistant to be used.

3. CHEMICAL REACTION

A chemical reaction may also occurs due to the material used for preparation of concrete are mortar that comes into contact of atmosphere after it has hardened.

Concrete can also crack at the time of cement hydration, which slowly develop expensive reaction between combination containing silica and alkies property I cement itself.

PREVENTIVE MEASURES

To avoid or to minimize these problem, a very dense concrete to be used when soil of allocated area contains sulphate content material exceeds 0.2% or in floor water exceed 300ppm.

To prevent cracks due to corrosion and erosion in reinforcement, it is more suitable to use concrete of richer mix for thin section in exposed area.

LITERATURE REVIEW

Rishabh Pathak ,Deepak Rastogi concluded their research on" case study on cracks in public building and their" cracks are inherent negative factors of building which needs continuous research to avoid such type of problems and new emerging technology along with the methodology to be developed and used as preventive measures. To recognize the reason and the type of cracks inside the shape is very critical. This article describes in brief the cause and type of cracks and their preventive measures. Civil nondestructive testing technique to be used to find out the energy admitted to the Structure at very beginning instance to know the actual location of the Structure and du which at the same time it is to be decided that deformation in shape of the structure to be repair and be serviceable & viable or to be demolished. Some investigation/ research has been carried out at public house at Gwalior MP & political science, economic and Archeological blocks of Jiwaji University as well as Moti Mahal constructing NITN (Naga Ji institute of technology and management) building. With this testing technique the crack have been detected but they are in suspension to whether or not it is going to be repair/ paintings or have to be demolished. The reason behind this study is to find out the location of shape which may are not it is serviceable/viable and sustainable healthy for long time followed by repair/ preventive remedial measure.

Hongke Pan,Ling Pi has find out from their study on “study on cracks in concrete structures and the database” and come to conclusion that concrete shape has it own properties and shape is undoubtedly to crack and many times the buildings are in operation for a long time with such cracks. A crack database is helpful to find out and summarized the connection &laws among the various type of cracks and its distribution to have a references for quick decision and remedial measures t prevent and repair these cracks and keep up the structure for long time sustainable/stable in service. PV Velumani, K Mukilan, G Varun, S Divakar, R Mhuil Doss and P Ganesh Kumar find out from their study on “analysis of cracks in structures and buildings” that detection of cracks in building/project is very serious matter. The crack detection procedure through manual inspection of building/structure may take time and might be assessed subjectively by way of inspectors. These studies also refer a conceptual base with regards to photograph processing method which may help the automatic identification of cracks. This study also refer the Gray Intensity Correction Method also known as Min Max Gray Level Differentiation (M2GLD) Method for image improvement and the linearization method for concise detection of cracks in structure with the help of cracks defect indicated in digital photo. This technique may be beneficial for designer/developer/ constructing agency/ user of the building /structure and structural maintenance engineers.

CONCLUSION

The study is carrying its four sections. The first section considers knows how about cracks. The second part is about the previous research in context with crack & causes of cracks development and experiences to minimize it the third section is about type of cracks. The last i.e. fourth section contains the reasons behind development of cracks and its remedial measures to be adopted before &during the construction of any type of building/structural project. The study also refer the proper selection of building material suited to size & type of project geographical condition to avoid cracks. The designer/developers must focus on prime cause of cracks and preventive measures to be taken followed by continuous close execution, checking & inspection of building material and construction of building/project.

Anti Termite Treatment i.e. (i) Pre-construction (ii) Post-construction to be done to ensure the structural integrity and safety of the building. Anti-Termite Treatment cost in INDIA-2023 is (i) pre-construction RS 8/ - RS 10/per square feet ii) post-construction RS 3/ per square feet .i.e. for overall treatment cost of 1BHK is about RS 1200-RS 1500/.

Anti Rust treatment is to be done prior to use the metal rods or bars. Bars to be treated with Zinc based rust pacifier. Which is the basic step to anti corrosion. Leakage & linkages of water pipeline layout in buildings to be checked with colored water which will indicate the hair cracks developed and all remedial measures to be ensured for sustainability and safety of building/project.

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