

REASONS THAT LEAD TO BUILDING REPAIRS

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ABSTRACT: Building and other structures have certain useful life. The life of the building structures mainly depends upon planning, design specifications along with construction practices & other factors. Concrete structures are expected to give trouble free service for their entire design life span. These expectations are not coming true because of structural deficiency, use of inferior quality material, overloading and physical damage etc. Construction defects are very common and frequently arising in construction project, especially in the project which has poor workmanship, poor project management on the construction site. Construction defect are known as major problem in the construction industry that could cause the damage to the structure. The defect may be minor or major it deteriorates the structure causing damage. Recently buildings in Mumbai, pune and other places have collapsed because of in discriminate alteration and additions therefore the awareness among the occupants of building is must so that tampering with building shall not take pace.

Key words: RCC Building, Structural, Maintenance, Repair, Interior Works, Detoriation, Damage.

INTRODUCTION:

As RCC building grows old, it has to be repaired to increase its service life span. A RCC building cannot be loaded and neglected in maintenance. Users of the of building make additions, alterations and makes random renovations to look it attractive and fancy, in turn actually damage the load carrying members of the structures and reduces durability of the structure. The weakening of structure leads to severe deterioration, damage and even collapse of the building. In the interest of housing societies and public at large it is at most necessary to caution the occupants, that many healthy structures have collapsed due careless and negligent interior works and modifications. Such failure of structure results in loss of innocent people and property worth of millions of rupees.

OBJECTIVE:

The paper aims to study & create awareness about the health problems of the building, which ultimately leads to repairs of the building. The purpose of this study is to review various symptoms & causes of construction defects occurring in building construction project. This paper aims to contribute to knowledge of the defect in residential buildings and hence to find justifying measures to reduce defects. Therefore, eliminating defects and maintaining good quality have an important cost benefit for the society.

DEFECTS IN BUILDING:

1. MACRO LEVEL DEFECTS:

These defects are directly seen by naked eyes. The defects like honey combing or porosity in concrete members & wide crack on concrete wall are the macro defects. If these defects are present in the concrete then the concrete has low strength and because of which the concrete rapidly damages. The porous concrete permit entry of water & also some chemicals inside it. The structure gets severely damaged and requires repairs. Observation of such defect and attending it promptly is at most important. The causes of the defects should be analyzed and the defects are removed before doing any additional treatment to the damaged part or section of the building. The main causes of these defects are in adequacy in design, lack of proper specification and poor construction practices. Unless the complete removal of the defects, no any superficial treatment like waterproofing, sealing of cracks etc. will give the desired result.

2. MICRO LEVEL DEFECTS:

These defects cannot be seen by naked eyes. These are the results of development of large capillary pores which creates very fine voids. The reason for development of large capillary pores in the concrete is use high water cement ratio resulting into

low strength concrete. Fine cracks are commonly present in the concrete, occurs due to many reasons. These may be due to nonstructural defects. Initially these are seen not dangerous with regard to structural point of view, as these are not deep and also discontinuous. With passage of time they may get widened, deepened and also continuous by meeting other cracks. This change in the cracks may takes place because of change in environmental conditions like variation in temperatures, weather conditions and also the loading conditions. These changed cracks will provide passage for entry to moisture, chlorides, sulphates along with other chemicals, causing corrosion of steel and other deleterious reactions.

While mixing concrete air also enters in the concrete. Even after compaction or consolidation of concrete some air remains in the concrete and after the hardening process, air gets evaporated leaving minute isolated void. With passage of time and due to environmental changes these isolated voids get interconnected and provides continuous passage for environmental pollutants to cause corrosion of steel and unwanted reactions.

Macro as well as micro level defects are harmful to the building, both causing damage and deterioration of building. The extent of damage depends upon environmental conditions, extent of presence of defect and repairs done during the life cycle of the building. Macro defects being larger, faster deterioration and r damage to the building takes place.



Detoriation & Damage of Building

REASONS FOR BUILDING DETERIORATION AND DAMAGE:

A) POOR STRUCTURAL DESIGN AND IMPROPER SPECIFICATIONS:

1. Environmental Conditions: It is important that the Engineer and designer must consider the environmental conditions of the site where the building construction has to be carried out.
2. Geotechnical Investigations: Investigations of the soil should be carried out. The suitability of the foundation should be judged based on these investigations. These results of investigations are used to decide grade of concrete, materials to be used .The GWT and subsoil conditions are also ascertained to decide various design parameters.
3. Lack of Competency of The Contractor: The designer and specifier should make sure that the Agency appointed for execution of work should have capability and competency in similar works. Inadequate skill, lack of knowledge and experience of contractor ultimately leads to the deterioration of the building.

4. Closely spaced reinforcement: Non availability of detailing of reinforcement and slender concrete shapes leads to segregations . Due to careless placing of concrete in mold especially in congested reinforcement the fine materials of concrete gets sticks to the bar, obstructs the placement. The larger size materials of concrete falls in the mold causing large porosity resulting in to honey combing.

5. Environmental factors: The slender structural members like chajja,s, balcony ,canopies and terrace are always susceptible to attack by aggressive environment agencies.In addition to this the closely spaced reinforcement, improper cover to the concrete, poor detailing also leads to the defects .The structural engineer should provide adequate reinforcement so as to prevent development of larger cracks.

6. Role of designer, architect and, construction agency: Concrete is always of poor quality if design and specifications are deficient. Architects, engineers should plan, design as well as prepare specification of building and appoint competent agency for the construction so that the health and life of building gets significantly increased.



Cracks in Column



Cracking Of Column At Plinth Level

B) POOR CONSTRUCTION PRACTICES:

The lack of proper construction practices like appointing contractor having poor knowledge & experience leads to use of inferior materials, methods and techniques of construction. This may also happens because of carelessness, negligence and ignorance on the part of the contractor.

The causes of poor construction are summarized below.

1. Lack of proper selection of materials
2. Use of poor and cheap materials.
3. Improper proportioning of ingredients of concrete.
4. Improper quality control in concreting processes like batching, transportation, placing, compaction etc.
5. Improper construction joints
6. Inadequate quality concrete in in different stages of concreting.
7. Use extra water in mortar and concrete, producing lean mixes.
8. Use of inferior plumbing and sanitation methods.



Cracks In Masonry



Spalled Concrete In Column

C) GROWING AGE OF BUILDING AND ENVIRONMENTAL FACTORS:

1. Corrosion of Steel: Entry of Moisture and chlorides from environment, GWT and subsoil will cause corrosion and deterioration and ageing of structure. As there is no protective cover to steel used as reinforcement against chemicals, it gets corroded.

2. Effect of age of building: depending on design, specifications and construction some of the building looks ageing. The passage of water and chlorides is prominent reasons in ageing. The deterioration and subsequent damage of the building can be saved by quick repairs. It is seen that some building age faster than others.



Deterioration Of Building Due To Ageing



Damaged Chajja

D) ADDITION AND ALTERATIONS IN BUILDING:

1. Architects, designers and the contractors are the agencies associated with building construction. as Per requirement and amenities usually the planning is done. Designer designs the building by considering various loads acting and also considering statutory bylaws.

2. During the lifetime of building or some flats changes hands several times. The new occupants have their own ideas and they set about doing addition and alteration as per their wish and will. These changes are mostly done without Engineers advice and in doing so the structural members and other parts gets damaged.

3. Usually alterations are done in balconies and canopies, These are having cantilever slab with thinner sections, gets overloaded, deflected with subsequent development of cracks taking place. Since these members are easily exposed to aggressive environment, steel easily gets corroded.

4. Installation of overhead tanks and subsequent increase in moisture because of leakage will further increases corrosion.
5. Parking column, beams are tampered leading to severe structural damage
6. Concealed pipelines in wall and slab also leads to corrosion due to increase in moisture.
7. Columns, Partition walls are completely removed to accommodate more space, due to relocation of load results in deterioration by emergence of cracks.

Effect of Modifications:

- a) Reduction load carrying capacity of columns beams etc.
- b) Leakages may give rise to moisture hence corrosion of steel takes place.
- c) Building gets severely damaged leading to repairs.
- d) Collapse of building may takes place.

Precautions To Avoid Damages Due To Alterations:

Avoid terrace gardens and plotting of plants.

- i) Do not dump waste, used furniture and scrap on terrace.
- ii) Cooking food, eating, heating and playing games on terrace should be avoided.
- iii) Do not encourage leakages from tank and water lines.
- iv) Do not allow vegetation growth due to bird dropping.
- v) Toilet, servant room, Washing places construction should be avoided
- vi) Provide proper slope to the terrace for drainage of rain water.



Damage Due To Leakage In The Building



Isolated And Defective Drainage Line

e) NATURAL CALAMITIES:

1. Earthquake, floods & storms are the natural calamities. These calamities can cause severe destruction and damage to the building. The exact time of happening of calamities cannot be predicted, as they may come any time during the service period of the building. Since it is unpredictable, the architect, designers of the building based on the frequency of occurrence can only make provision in planning; design and use such specifications so that during the calamities, extra ordinary can be safely accommodated with minimum destruction and damage to the building.
2. The use of advanced technology and construction techniques should be made to construct building, which will be provide resistance against earthquake, effects due excessive loads of floods and hurricanes.

3. Planners and designers of the building should always bear in mind that any neglect on their part can cause severe loss of invaluable human life of the occupants and property due to damage & collapse of the building.
4. With spreading of terrorism worldwide, along with human life, the life of the building can be at stake. The recent attacks on buildings have left the Planners and designers thinking. It is difficult make provisions for these calamities. The engineers have to rethink and make certain provision based on importance of the building so that minimum damage and destruction can takes place. Always remember 'Natural calamities do not kill people, but the buildings do'

f) SUBSTANDARD MAINTENANCE WORK:

The maintenance is needed to retain quality of the building and to increase durability. With growing age of the building, Maintenance of the building is must. It is observed that, some structures may sustain for longer time without maintenance and others may not. The extent of maintenance depends upon quality of design and construction.

- Regular painting helps in protecting building from environmental agencies.
- Water proofing and coating to steel are second stage works to protect structure.
- Leakages should be attended at the earliest so that corrosion to steel gets avoided.
- Spalled and deteriorated concrete shall be repaired.

Moisture and chlorides entered in the concrete can cause corrosion of the steel. Steel gets converted to ferrous oxide and later on ferrous hydroxide .These reaction cause the steel to expand, developing tensile stresses resulting in to cracks. The design and construction defects lead to these cracks. There is a tendency in procrastinating over general repairs.it is due to ignorance, conflict among occupants and financial limitations. In may instances the repairs are delayed causing more expenditure.

Engineering inputs are necessarily taken while design, planning and also repairs, rehabilitation. Bylaws should be amended so that compulsory inspection of building by competent personnel should be done.

STEPS FOLLOWED IN REPAIR AND REHABILITATION WORKS:

In general following procedure is followed in repair and rehabilitation works.

1. Collecting salient features of the building.
 - Year of construction.
 - Date of Inspection
 - Type of structure.
 - Location
2. Visual observations
 - Cracks and its depth
 - Cracks in masonry
 - Corrosion in steel
 - Spalling of concrete
 - Drainage lines
 - Leakages
 - Quality of earlier repairs
3. Insitu Evaluations
 - NDT
 - Carbonation Test.
 - Chemical Analysis of concrete
 - Bar diameters
4. Laboratory Test:
 - Core sample test

5. Analysis of test & evaluations.
6. Conclusion
7. Recommended repair methods.

CONCLUSION:

Damaged or deteriorated building needs inevitable repairs to prolong the life of the structure and to prevent collapse of the structure. Ignorance and delay in repairs of the structure lead to increase in cost of repairs and may cause severe damage, even collapse of the structure. The occupants are always worried and in despair about life of the dilapidated building, on one side are financial constraints and on the other safety of their homes. Therefore, eliminating defects and maintaining good quality have an important cost benefit for the society. However it is observed that the defects in a building occur through general wear and tear, due to human errors and/or improper planning and structural design etc. During the construction stage of building precautions in design, specification and use good construction practices will avoid the defects, ultimately increasing strength, stability and durability of the building. Creating awareness among the occupants of building about effects of indiscriminate addition and alteration of building, will help in avoiding defect and improving life span and durability. A well-defined plan and use engineering advice will help in repairs and rehabilitation of damaged building.

REFERENCES:

1. Cheetham, D. _1973_. "Defects in modern buildings." Building,
2. Review Paper on Construction Defects by Miss. Neha.V.Bagdiya¹, Prof. Shruti Wadalkar IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X, Volume 12,
3. A Review on Repair and Rehabilitation of Heritage Buildings S. Raja Subramanian; International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 04 | Apr-2016
4. Cohen, J. S. (2011). Problems in the Repair of Historic Brick Masonry Buildings. Structures Congress 2011
5. Hand book on repairs and rehabilitation of RCC Structures-published by CPWD
6. S.P.Bindra and S.P.Arrora, "The text book of 'Building Construction'"
7. S.C.Rangwala "The text book of 'Building Construction'"
8. I. H. Seeley, "Building Maintenance"
9. www.bd. gov. hk/english/documents/code/bmg Image Sources: <https://www.Constructiononline.com>