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RETROFITTING

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ABSTRACT

The introduction of concrete in construction purpose has taken civil engineering limits to higher advancements. Concrete being versatile material : it is plastic and malleable when newly mixed yet, strong and durable when hardened. RCC structures have a limited life span due to deterioration of concrete and corrosion of steel eventually. RCC structures become prone to weather attacks, earthquakes, floods, and other factors. Due to ageing structure various defects occur in the structure. Excessive cracking, deflection, weakening of members, etc occur. In such cases if the defects are ignored there is possibility of accident or collapse of structure. In such cases Retrofitting methods are used to retain the structure strength and increase its life by proper repair methods. Rather than complete destruction of structure retrofitting provides an excellent option for maintenance of structure. It alters costly repairs by proper application of retrofitting strategies. In everyday practice , structural engineers are most frequently facing the need to elaborate a project for repair of structures or to design strengthening of structures having inadequate strength. Multiple problems arises and have to be solved when designing strengthening of structures and here appropriate use of retrofit strategies plays an important role.IS codes and national codes are followed while application of retrofitting methods. Strength, ductility, structural behaviour control, are strengthening demands. Retrofitting aims to strengthen a structure to satisfy the requirements of current codes of design. It aims at effective repair solutions to structure rather than complete replacement.

OBJECTIVES:

- Eliminating features that are sources of weakness or that produce concentrations of stresses in some members
- Increasing the lateral strength and stiffness of the building.
- Increasing the ductility and enhancing the energy dissipation capacity.
- Giving unity to the structure.
- Eliminating sources of weakness or those that produce concentration of stresses.
- Enhancement of redundancy in the number of lateral load resisting elements.
- The retrofit scheme should be cost effective.
- Each retrofit strategy should consistently achieve the performance objective.
- Giving unity to the structure by providing a proper connection between its elements.

METHODOLOGY

Start with NDT tests on structure first

Rebound Hammer Test

When the plunger of rebound hammer is pressed against the surface of the concrete, the spring-controlled mass rebounds and the extent of such rebound depends upon the surface hardness of concrete. The surface hardness and therefore the rebound is

taken to be related to the compressive strength of the concrete.
The rebound is read off along a graduated scale and is
designated as the rebound number or rebound index.

Ultrasonic Pulse Velocity test-

The ultrasonic pulse is generated by an electro-acoustical transducer.
When the pulse is induced into the concrete from a transducer, it undergoes multiple reflections at the boundaries of the different material phases within the concrete. A complex system of stress waves is developed which includes longitudinal compressional), shear transverse and surface rayleigh waves. The receiving transducer detects the onset of the longitudinal waves, which is the fastest. Because the velocity of the pulses is almost independent of the geometry of the material through which they pass and depends only on its elastic properties, pulse velocity method is a convenient technique for investigating structural concrete.

- Identify the performance requirements for the existing structure to be retrofitted and draft an overall plan from inspection through selection of retrofitting method, design of retrofitting structure and implementation of retrofitting work.
- Inspect the existing structure to be retrofitted.
- Based on the results of the inspection, evaluate the performance of the structure and verify that it fulfil performance requirements.
- If the structure does not fulfil performance requirements, and if continued use of the structure through retrofitting is desired, proceed with design of the retrofitting structure.
- Select an appropriate retrofitting method and establish the materials to be used, structural specifications and construction method.
- Evaluate the performance of the structure after retrofitting and verify that it will fulfil performance requirements.
- If it is determined that the retrofitting structure will be capable of fulfilling performance requirements with the selected retrofitting and construction methods, implement the retrofitting work.

DISCUSSION:-

In developing countries the number of concrete constructions is increasing day by day. Along with increase in number of ageing structures. The ageing structures become dangerous to residents as the

concrete deteriorates along with passing time. Also faulty constructions and following of safety guidelines is not done properly. Such faulty constructions for usage of bad materials create problems in structures after period of time and it is prior to loss of strength or collapse. In everyday practice structural engineers are most frequently facing the need for repair of structures of damaged or to strengthen old structures.

Retrofitting has come to prominence in recent years as a part of the drive, to increase life of building and sustainability. Retrofitting proves to be a better economic consideration and quick and effective methods to structural problems rather than replacement.

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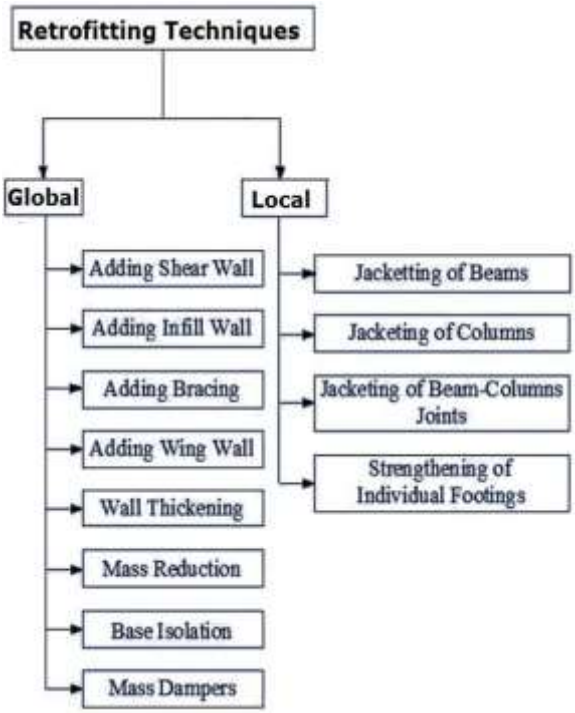


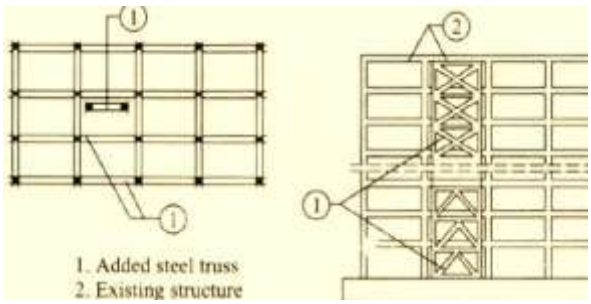
COMMON RETROFITTING METHODS-

Adding New Shear Walls:

- Frequently used for retrofitting of non-ductile reinforced concrete frame buildings.
- The added elements can be either cast in place or precast concrete elements.
- New elements preferably be placed at the exterior of the building.
- Not preferred in the interior of the structure to avoid interior mouldings.

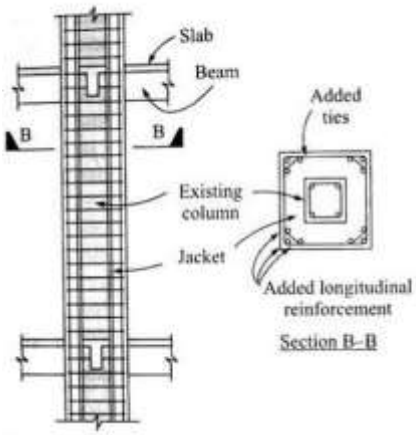
Adding Steel Bracings

- An effective solution when large openings are required.
- Potential advantages due to higher strength and stiffness, opening for natural light can be provided, amount of work is less since foundation cost may be minimized and adds much less weight to the existing structure.



Jacketing

Jacketing is one of most frequently used to strengthen RC structures. With this method axial strength,bending strength and stiffnesss of the original column are increased.



Purpose for jacketing:

- To increase concrete confinement
- To increase shear strength
- To increase flexural strength

Bracing system

Braced frames and moment resisting frames are used in building and other structures subjected to lateral loads to provide stability or collapse will occur. This is particularly obvious for very tall structures where the lateral forces are the most important design consideration. There are many methods available for stabilizing structures.

This method involves constructing very rigid beam-to-column connections that permit moment transfer across the joint. Monolithically-poured reinforced concrete structures inherently have moment-resisting joints, but steel and timber frames do not. A typical moment-

resisting beam-to-column steel-framed connection involves transferring horizontal loads through the beam flanges directly to the column flanges by using angles and column web stiffener plates

Base Isolation

Isolation of superstructure from the foundation is known as base isolation. It is the most powerful tool for passive structural vibration control technique.

ADVANTAGES

- Eliminates sources of weakness in structure.
- Maintains monolithic property of structure.
- Reduces need for costly repairs
- Rather than complete rebuilding it provides an option to maintain structure.
- It increases lifespan of structure.
- Saves time and money
- Tedious works are eliminated in repair works
- Safeguards structure against collapse.
- Prevents extensive repairs by altering defects

CONCLUSION:-

Retrofit strategies have been developed in the past few decades. Retrofitting is the modification of existing structures to make them more resistant, ground motion, or structural failure or collapse. With better understanding of retrofitted structure demand and with our recent experiences with aging buildings and large earthquakes near urban centers, the need of retrofitting is well acknowledge the retrofit techniques outlined here are also applicable for other natural hazards such as tropical cyclones, tornadoes, and severe winds from thunderstorms. With current practice of retrofitting is predominantly concerned with structural improvements to reduce the hazard of using the structures, it is similarly essential to reduce the hazards and losses from non-structural elements. It is also important to keep in mind that there is no such thing as an earthquake-proof structure, although performance can be greatly enhanced through proper initial design or subsequent modification and other measures. Retrofit strategies are different from retrofit techniques, where the former is the basic approach to achieve an overall retrofit performance objective, such as increasing strength, increasing deformability, reducing deformation demands while the latter is the technical methods to achieve that strategy.