



SNS COLLEGE OF TECHNOLOGY
(AN AUTONOMOUS INSTITUTION)
COIMBATORE-35

III YEAR CIVIL ENGINEERING
19CEO304-BUILDING MAINTENANCE



UNIT V

REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES

Strengthening of Structural elements

Strengthening of concrete structures must be considered when the existing structure deteriorates or any alteration to the structure has to be made due to which the structure may fail to serve its purpose. Concerns must be taken to existing materials, often in deteriorated condition, loads during strengthening and to existing geometry. In some cases it can also be difficult to reach the areas that need to be strengthened.

When concrete structural strengthening is to be undertaken all failure modes must be evaluated. Strengthening a structure for flexure may lead to shear failure instead of giving the desired increased load bearing capacity. It should also be noted that not only the failure mode of the strengthened member is important. If a critical member in a structure is strengthened, another member can become the critical one.



Strengthening of Structural elements

Because of changed stiffness in an undetermined structural system the whole structure must be investigated. The strengthening should also designed with consideration to minimize the maintenance and repair needs. When a strengthening is designed the consequences from loss of strengthening effectiveness by fire, vandalism, collision etc. must in addition be considered.





NEED OF STRUCTURAL STRENGTHENING FOR CONCRETE STRUCTURES

Concrete structures need to be strengthened for any of the following reasons:

- Load increases due to higher live loads, increased wheel loads, installations of heavy machinery, or vibrations.
- Damage to structural parts due to aging of construction materials or fire damage, corrosion of steel reinforcement, and/or impact of vehicles.
- Improvements in suitability for use due to limitation of deflections, reduction of stress in steel reinforcement and/or reduction of crack widths.
- Modification of structural system due to elimination of walls/columns and/or openings cut through slabs.
- Errors in planning or construction due to insufficient design dimensions and/or insufficient reinforcing steel.



STRATEGIES FOR STRUCTURAL STRENGTHENING

When a structure is to be strengthened there are several aspects to consider. The figure shows a schematic example of a structure that had inadequate load bearing capacity due to a design fault already present before it was taken into service. It was then strengthened slightly above the desired performance level.

After some time the structure was damaged due to an accident, collision, fire or overload that damaged the system to a level where performance requirements were not fulfilled.

The damages were then repaired to a new satisfactory performance level. Later, the demands on the structure were changed, higher load bearing capacity was required, and the structure needed to be strengthened to a higher performance level to meet these demands. By a third strengthening it was possible to meet the new demands and keep the structure in service.



THANK YOU...