



“RETROFITTING OF REINFORCED CONCRETE BEAM COLUMN JOINTS”

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INTRODUCTION

- Retrofitting is Upgradation of certain building system (existing) to make them more resistant to seismic activity.
- Structure can be- Earthquake damaged.
 - Earthquake vulnerable.
- Proves to be better economic and immediate shelter to problems rather than replacement.

INTRODUCTION

- There are considerable members of RC structures in India that do not meet the requirement of current design standards because of inadequate design or construction errors which need structural upgradation specially to meet seismic design requirement
- In recent earthquakes all over the world has highlighted the consequences of poor performance of beam-column joints.
- Failure is because of shear failure in beams, bar slip and shear failure of beam-column joints.

INTRODUCTION

- Retrofitting of RC structure
 1. Strengthening existing member
 - RC Jacketing
 - Steel Plate Bonding and Jacketing, Steel section caging : FRP
 - Plate Bonding And Jacketing

INTRODUCTION

2. Adding new member.

- Shear walls.
- Frames (moment resisting frames and braced frames)
- Bracing.
- Buttresses.



RETROFITTING TECHNIQUES

Global

1. Addition of shear wall

2. Addition of infill

3. Addition of bracing

4. Addition of wing wall / buttresses

5. Wall thick ceiling

6. Mass reduction

7. Supplemental damping and base isolation

Local

1. Jacketing of beams

2. Jacketing of columns

3. Jacketing of beam column joint

4. Strengthening individual bldg

BEAM COLUMN JOINT

- Since construction materials have limited strength , the joint have limited force caring capacity
- When force larger than this are applied during earthquake , joints are severely damaged.
- Repairing damaged joint is difficult , so the damaged must be avoided. Thus the beam column joint must be design to resist earthquake effect.

OBJECTIVE

- The beam-column joint rehabilitation is to-
 1. Strengthen the shear and bond-slip resistance in order to eliminate the brittle failure.
 2. To ensure that the ductile flexural hinging will take place in the beam.
- A joint should maintain its integrity and must be designed stronger than the members framing to it.

JACKETING

- Most popular method for strengthening of building columns.
- Purpose of jacketing-
 1. To increase concrete confinement.
 2. To increase shear strength.
 3. To increase flexural strength.

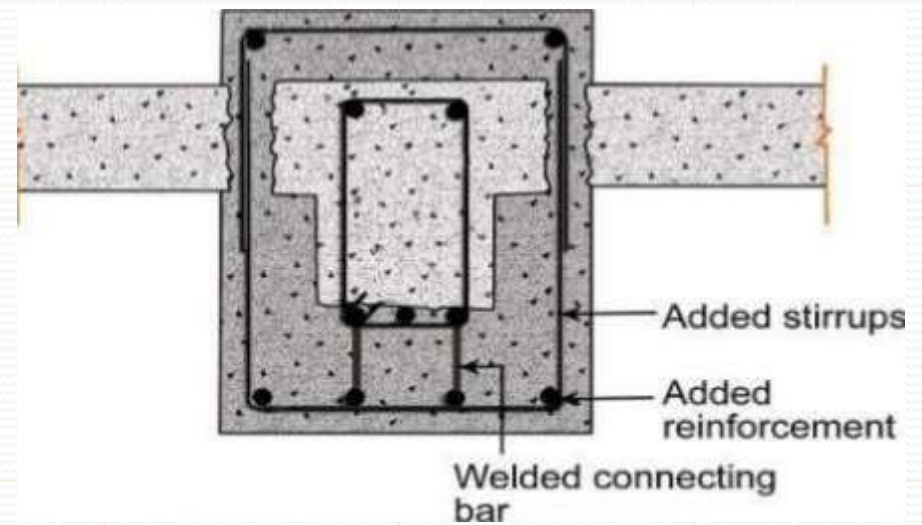
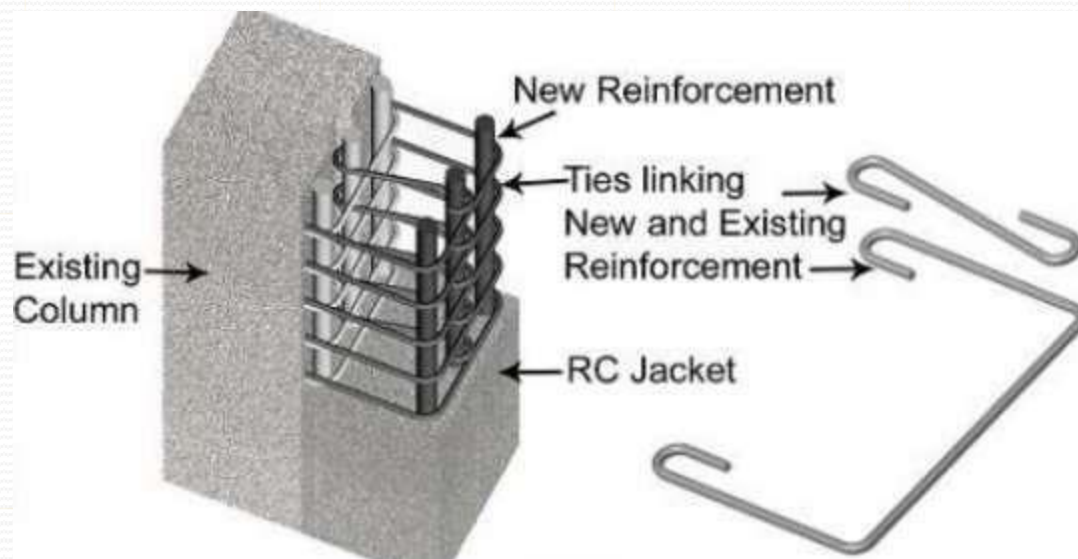
CONCRETE JACKETING

- involves addition of longitudinal bars, closely spaced ties, and a layer of concrete.
- The jacket increases both flexural strength and shear strength of concrete .
- The usual practice consists of first assembling the jacket reinforcement cages, arranging the formwork and then placing the concrete jacket.
- But it is costeffective.

CONCRETE JACKETING

➤ Concrete jacketing disadvantages-

1. Cost effective
2. Requires intensive labour
3. Detailing of steel in the form of digital collars
4. Increases Dimensions of structure
5. Increases weight of structure



STEEL JACKETING

- Steel jacketing refers to encasing the member with steel plates and filling the gap with non-shrink grout.
- The jacket enhances both flexural strength and shear strength of concrete.
- Steel jacketing disadvantages –
 1. Complicated working procedure.
 2. Inner surface corrosion.
 3. Heavy weight.
 4. C/S increases.



FIBER REINFORCED POLYMER(FRP)

- Fiber reinforced polymer (FRP) is a composite material consisting of polymeric resin reinforced with high strength fibers.
- Composite materials are available in the form of sheets, pre-formed shapes and bars.
- The FRP sheets are thin, light and flexible enough to be inserted.

FIBER REINFORCED POLYMER(FRP)

- The fibers can be of glass, carbon, aramid.
- Glass fibers have lower stiffness and cost compared to carbon fibers.
- They are suitable in low cost seismic retrofit applications.

FIBER REINFORCED POLYMER(FRP)

➤ The FRP composites are useful for repair, rehabilitation and retrofit of structures for the following reasons:

1. The FRP sheets are light and which facilitate installation. It does not flexible of concrete or masonry, need drilling
2. The curing time required is less
3. The sheets are thin and hence there is no marginal increase in the size of retrofitted member.

FIBER REINFORCED POLYMER(FRP)

- The material is chemically inert and has resistance against electro-chemical corrosion.
- There is good fatigue strength, which is suitable for fluctuating loads.

**THANK
YOU**