SEISMIC PERFORMANCE OF RC FRAME MULTI STOREY BUILDING WITH AND WITHOUT INFILL WALL

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ABSTRACT

Many low-rise and medium rise framed buildings have been constructed in the recent past, without proper attention paid in their design for wind or earthquake loads. This serious shortcoming in structural design and detailing has been exposed by failure that has occurred in the recent earthquakes in various parts of the country. It is the failure of the column during an earthquake which is more severe than the failure of the slabs or beams. The failure of the columns can lead to collapse of the stores one over the other. The columns can fail either in shear or in bending. Shear failure occurs mainly because the column sizes provided are in adequate to resist the seismic loads and inadequate lateral ties. Bending (flexural) failure occur because of steel bars provided vertically in the columns, particularly near the beam-column joints or column-foundation junctions, and may also occur due to poor quality of concrete. In this dissertation work a parametric study is performed on two existing multistoried RC buildings with soft storey, located in seismic zone III. The buildings are used for the purpose of shopping and hostel building. The study is carried out on the buildings with the help of different mathematical model by using different retrofitting techniques for improving seismic performance of the building with soft storey. Analysis and design is carried out on all mathematical 3D models using the software Etabs. Comparison of this models are presented in terms displacement, storey drift , axial force , bending moment, area of steel and quantity and cost for steel and concrete is calculated.

INTRODUCTION

Most affected multi-storey buildings are 5 storeys high (Ground+4 storeys), and many up to 11 storeys (Ground+10 storeys); In most of the buildings, the ground storey is left open to accommodate the parking. Some of the buildings have partially filled ground storeys. In contrast to the infilled upper storeys, the open ground storey may cause: (a) soft storey effect: the open ground storey may have smaller stiffness and cause increased deformation demand in the frame members of that storey; and (b) weak storey effect: the open ground storey may have lower lateral strength and cause a discontinuity in flow of lateral seismic shear in that storey.

Seismic regions is required a frame building to overcome the seismic deficiency.

LITERATURE REVIEW

Kaustubh Dasgupta and C.V.R. Murty [1] presented the seismic retrofitting measures for open ground storey RC frame building. The objective of this study was to identify the efficient retrofitting method for existing open ground storey RC frame building. A two dimensional RC frame designed with non ductile detailing and was subjected to non linear static pushover analysis with code specified design shear distribution. The RC frame was retrofitted by 3 methods.

- Concrete jacking of column in the ground storey.
- Brick masonry infill in the ground storey.
- RC structural wall in the ground storey panel.

MODELING AND ANALYSIS OF BUILDING

3.2 BUILDING DISCRIPTION

The study is carried out on two existing reinforce concrete moment resisting frame buildings with open first storey situated in zone III .The building considered is the residential building having G+6 storeys, of which the ground storey is intended for parking. After analyzing the building with the help of software given sizes of columns and beam are failed hence we provide infill wall at different lacations at parking.

The existing buildings are modeled by using the software Etabs. and different infill wall locatins are used for improving seismic performance of the building. Walls are modelled by equivalent strut approach and wall load is uniformly distributed over beams. The diagonal length of strut is same as the brick wall diagonal length with the same thickness of strut as brick wall, only width of strut is derived. Walls are considered to be rigidly connected to the columns and beams.

Model the existing building is modeled as a bare frame, and analysis is carried out by using IS 13920.

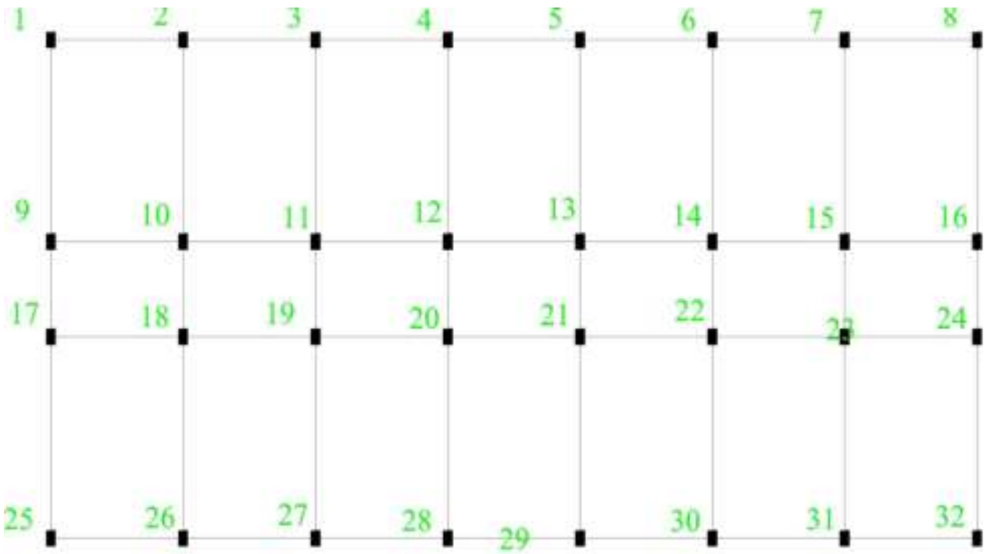


Figure 3.1: Plan of existing building with open ground storey

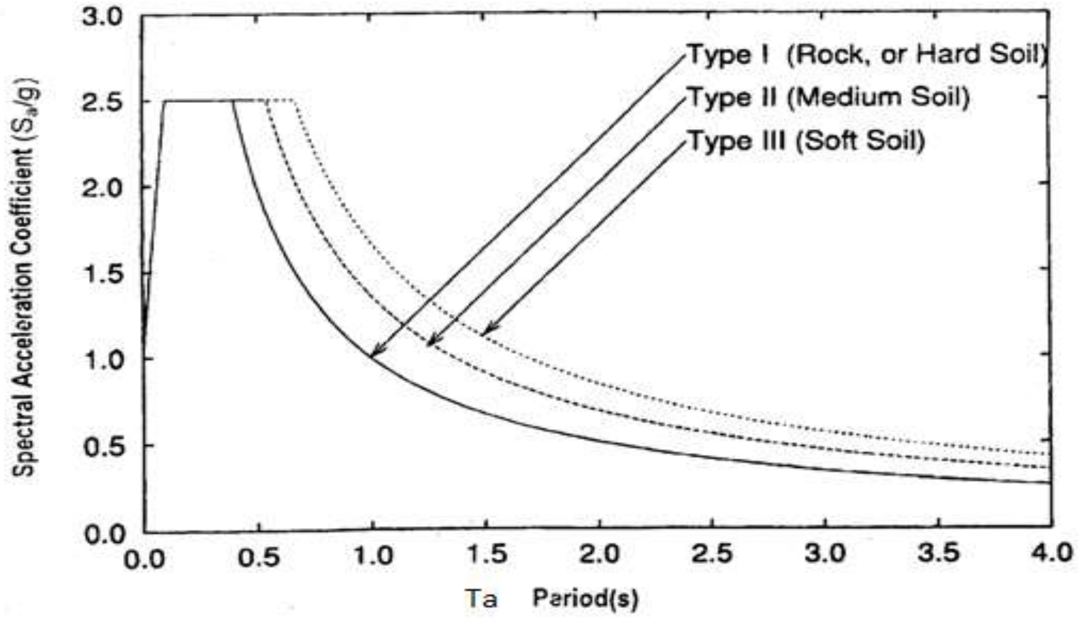
SEISMIC ANALYSIS AND DESIGN OF INFILL WALL

Importance factor (I)

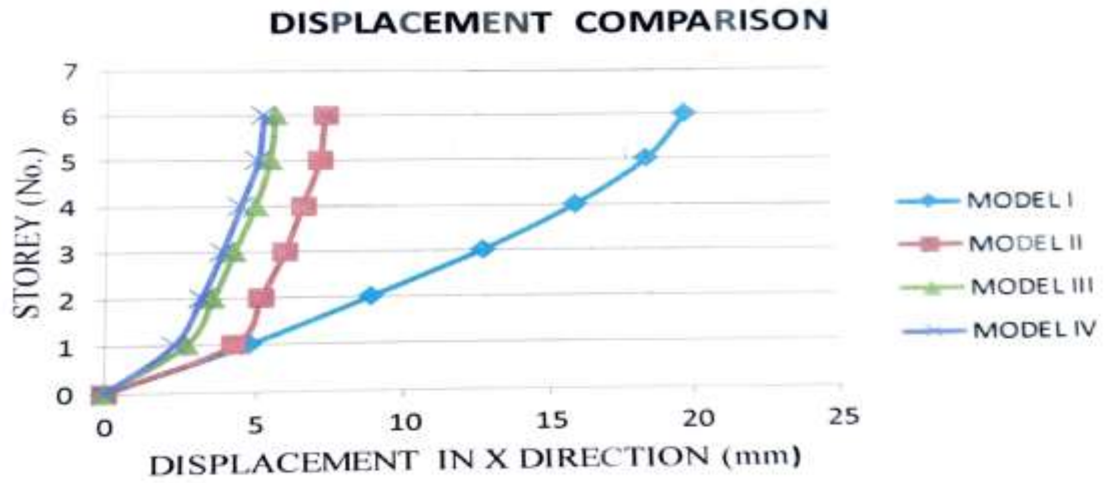
It is a factor use to obtain the design seismic force depending on the functional use of the structure, characterized by hazardous consequences of its failure , its post earthquake functional need , historic value , or economic importance.(clause 3.14 of IS:1893-2002)

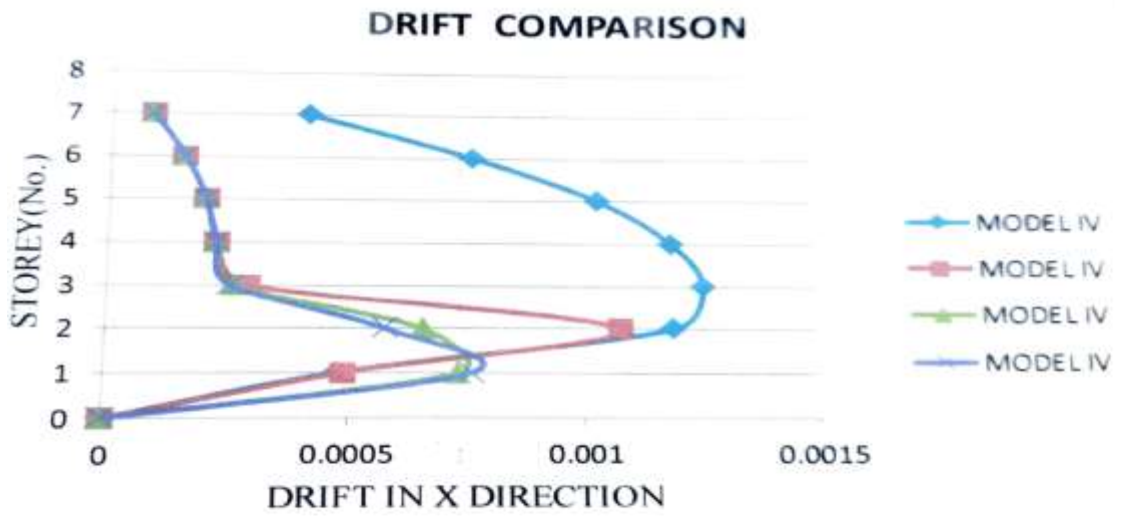
Table 4.1 Importance Factor

STRUCTURE	**IMPORTANCE FACTOR**
Important service and community buildings, such as hospit schools, monumental structures, emergency buildings li telephone exchange television station, radio station, railw station, fire station buildings, large community hall li cinemas, assembly halls and subway stations , power station	1.5
All other buildings	1.0



RESULT & DISCUSSION





CONCLUSIONS

Based on the analysis and design results of both the case studies following conclusions are drawn

- It is observed that displacement of existing building is more as compare to other building models but this displacement is within permissible limit.
- After analysis the actual sizes of columns are inadequate hence the building was unsafe.
- After analyzing the existing building by IS 13920, it was observed that storey drift is large but within permissible limit in both the building.
- There is reduction of storey drift and displacement if we provide infill wall at the parking in both the buildings.
- The displacement and storey drift is reduced drastically by the provision of shear wall and infill wall in both buildings.
- Infill wall walls is found to be very effective in reducing the stiffness irregularity and bending moment in the columns. Increasing the sizes of columns (column jacketing) reduces the drift than existing buildings in both cases.
- After providing the infill wall at selected locations of parking storey drift and displacement is very less as compare to existing building in both cases.
- Bending moment and area of steel is increases for model in both the buildings.
- For model V in both the buildings bending moment is zero for ground because of shear wall and frame interaction.
- In hostel building it is observed that quantity of steel is maximum when shear wall is used and quantity of concrete is maximum when infill wall is used in the building. Cost of steel is less after provision of infill wall at parking.
- Overall cost for retrofitting of building is less when we provide infill wall at parking and its displacement, storey drift is also minimum as compared to existing building.
- In shopping mall cost of concrete and steel is maximum when we provide shear wall in the parking .Overall cost for retrofitting of building is less in model II and more in model V.

FUTURE SCOPE

The various building models which are analyzed in this dissertation work can be further studied by introducing energy dissipation devices. A number of special seismic isolation devices have been developed in the recent years by which the super structure is connected to their foundation through flexible elements. Another approach for controlling seismic damage in soft storey building and improving their performance is by installing seismic dampers in place of structural elements, such as diagonal braces. In this dissertation work comparisons and retrofitting are made on the basis of analysis and design results of building with the help of software STADD PRO V8i, This results are further compared with other software like SAP and ETAB also.

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