REVIEW PAPER ON COMPARATIVE STUDY OF SEISMIC BEHAVIOUR OF RCC BUILDING FRAMES WITH AND WITHOUT MASONRY INFILL WALLS

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***ABSTRACT*: In building construction, RC framed structures are frequently used due to ease of construction and rapid progress of work, and generally these frames are filled by masonry infill panels (or) concrete blocks in many of the countries situated in seismic regions. Infill panels significantly enhance both stiffness and strength of frame, it behaves like compression strut between column and beam and compression forces are transferred from one node to another. Performance of building in earthquakes (like Bhuj Earthquake) clearly illustrates that the presence of infill walls has significant structural implications. This study gives the overview of performance of RC frame buildings with and with-out infill walls. Here analyzed and design the masonry infill walls using equivalent diagonal strut concept in-order to assess their involvement in seismic resistance of regular reinforced concrete buildings.. Comparing results obtained from the computerized model analysis for with and without infill structures. We check the results for base shear, lateral floor displacement, story drift, and beam and column reactions by buildings for the comparison of results.**

***KEYWORDS*: Bare, Infill, Story drift, Lateral displacement, Base shear, Time period.**

INTRODUCTION -

Reinforced concrete (RC) frame buildings with masonry infill walls have been widely constructed for commercial, industrial and multi-family residential uses in seismic-prone regions worldwide. Masonry infill typically consists of brick masonry or concrete block walls, constructed between columns and beams of a RC frame. These panels are generally not considered in the design process and treated as non-structural components. In country like India, Brick masonry infill panels have been widely used as interior and exterior partition walls for aesthetic reasons and functional needs. Though the brick masonry infill is considered to be a non-structural element, but it has its own strength and stiffness. Hence if the effect of brick masonry is considered in analysis and design, considerable increase in strength and stiffness of overall structure may be observed. Present code, IS 1893(Part-I): 2000 of practice does not include provision of taking into consideration the effect of infill. It can be understood that if the effect of infill is taken into account in the analysis and design of frame, the resulting structure may be significantly different.. Moreover, infill, if present in all stories gives a significant contribution to the energy dissipation capacity, decreasing significantly the maximum displacements. Therefore the contribution of masonry is of great importance, even though strongly depending on the characteristics of the ground motion, especially for frames which has been designed without considering the seismic forces. When sudden change in stiffness takes place along the building height, the story at which this drastic change of stiffness occurs is called a soft story. According to IS 1893(Part-I): 2000, a soft story is the one in which the lateral stiffness is less than 50% of the story above or below. In this paper the strength and stiffness of the brick masonry infill is considered and the brick masonry infill is modeled using diagonal strut. The main parameters considered in the study to compare the seismic performance are time period, base shear, natural frequency, story drift and lateral displacement.

OBJECTIVES –

The silent objectives of the present study have been identified as follows:

i. To study the effects of building analysis with and without infill walls.

ii. To study the effect of brick infill on the stiffness of the structure.

iii. To study the effects of three different models to find which will gives the good performance in analysis of structure w.r.t stiffness, base shear, story drift, and lateral displacement.

iv. To study the behavior of the beams in without infill and with infill frames.

v. To study the behavior of the columns in without infill and with infill frames.

LITERATURE REVIEW –

Past studies also carried out on the behavior of RC frame with in-fills and the modeling, analysis of the RC frame with and without in-fills.

Stafford-Smith B (1962) used an elastic theory to propose the effective width of the equivalent strut and concluded that this width should be a function of the stiffness of the in-fill with respect to that of bounding frame. By analogy to a beam on elastic foundation, he defined the dimensionless relative parameters to determine the degree of frame in-fill interaction and thereby, the effective width of the strut. Also defined the formulation of empirical equations for the calculation of infill wall parameter as strut model like contact length of strut, effective width of the strut.

Homes studied experimentally on steel frames infilled with brick masonry and reinforcedConcrete walls and developed semi-empirical design method for laterally loaded infilled Frames based on equivalent strut concept. His tests suggested that reinforced concrete walls increase the strength of frame by 400% whereas the brick masonry infills increase around 100%. He indicated that the presence of vertical load increased the strength by about 15% and that openings in walls might reduce strength up to 40% based on the composite behavior. The infill was considered to fail in compression. The load carried by infill at failure was calculated by multiplying the compressive strength of material by the area of equivalent strut. He states that the width of equivalent strut to be one third of the diagonal length of infill, which resulted in the infill strength being independent of frame stiffness. The load carried by the frame was then calculated by assuming that the strut was shortened by an amount which was its length multiplied by the strain at failure in the infill material. Subsequently, many investigators developed the strut width value related to the length of contact between wall and the columns and between the wall and the beams.

In 1961 **Holmes** stated that width of diagonal is given by,

$w = dz/3$

Where, dz = Diagonal length of infill panel

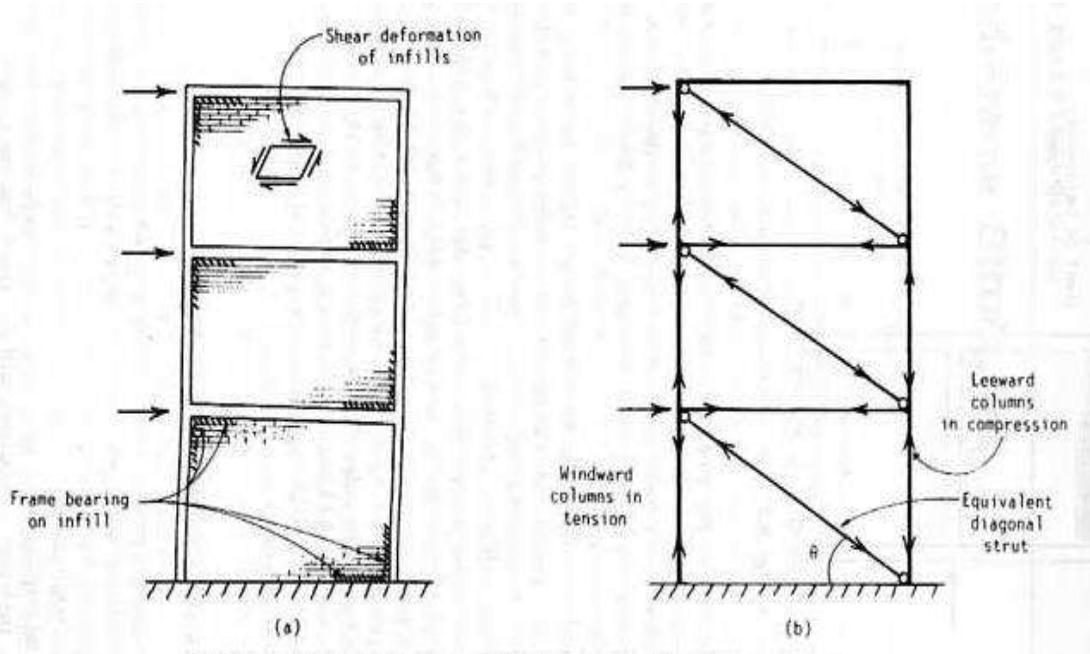
Das and C.V.R. Murty (2004) carried out non-linear pushover analysis on five RC frame buildings with brick masonry in-fills, designed for the same seismic hazard as per Euro-code, Nepal Building Code and Indian and the equivalent braced frame method given in literature. In-fills are found to increase the strength and stiffness of the structure, and reduce the drift capacity and structural damage. In-fills reduce the overall structure ductility, but increase the overall strength. Building designed by the equivalent braced frame method showed better overall performance.

METHODOLOGY–

The methodology worked out to achieve the above-mentioned objectives is as follows:

- Review the existing literature and Indian design code provision for analysis and design the earthquake resistance building.
- Considering three different building G+5, G+10 and G+15 with different parameter for the modeling.
- Model the selected building without infill walls considering infill strength/stiffness.
- Model the selected buildings with infill walls as diagonal strut considering infill strength/stiffness. Model the infill wall as diagonal strut with end conditions as pinned supports.
- Also design the building manually for earthquake load analysis results obtained.
- Observations of results of time period, story drift, lateral displacement and other parameters of models with and without infill.

In the present work it is proposed to carry out seismic analysis of multi-storey RCC buildings using Response spectrum analysis method considering bare and infill frames with the help of STAAD PRO software.



CONCLUSION –

From the analysis seismic performance of RC framed buildings with and with-out infill wall observed the results of change in time period, base shear, Absolute lateral displacement, story drift, column and beam characteristics of the buildings for all the structures of G+5, G+10 & G+15 models. When compared the bare-frame model and equivalent diagonal strut models results for seismic load analysis observed that without considering the stiffness of infill frame in bare model stiffness of the building is very less where are the strut models which considered the stiffness of infill as strut has more stiffness of the building and also economical in section area of steel. Therefore, strut model gives the accurate performance of building during the seismic analysis of buildings.

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