



Dynamic Response Characteristics of RC Buildings with Irregularities

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Abstract

In today's world, it is observed that many modern structures contain structural irregularities such as irregularities in mass, stiffness, or structural form. Buildings with stories in the range of 7 to 15 are prevalent; these buildings often have structural irregularities for different purposes such as economy, aesthetics, space consideration, and such other. The performance of any building under the action of dynamic forces primarily depends on its configuration. [5] Former studies suggest that buildings with irregularities behave very differently as compared to the buildings with regular configurations. [4] One of the main reasons for RC building failure recognized from precedent earthquakes is structural irregularities in plan (horizontal irregularity) and elevation (vertical irregularity).

In the present research work, a seismically-excited 12-story building with different configurations and irregularities is analyzed using ETABS software. For study of horizontal irregularities, different plan configurations such as L-shape, C-shape, I-shape and plus shape are analyzed. The dynamic analysis is performed using response spectrum method and time history analysis, considering time histories of five Indian earthquakes, which occurred in zone V. The building parameters studied are story displacement, story drift, base shear, time period and modal frequencies. The results by both methods are presented. The performance of a regular rectangular shaped building is compared with that of the buildings of horizontal and vertical irregularities, to study the influence of horizontal and vertical irregularities.

The research work provides insight into the behavior of irregular structures under dynamic loading. It is found that the floor plan of the buildings has a significant impact on their seismic behaviour. Compared to regular shaped buildings more displacement, story drift and story shears are detected in buildings with severe plan and vertical geometric irregularities. In the vertical irregularity analysis, the vertical set-backs cause a sudden decrease in stiffness. Also, in buildings with soft stories due to parking or refugee areas, the stiffness decreases causing an increase in story drift and displacement. Most critical irregularity has been identified from the different irregularities considered for the study. The study will assist in identifying the suitable configurations, from seismic considerations.

Keywords: ETABS, Dynamic analysis, Response spectrum, Irregularities