# Comparative Analysis of RCC And Steel Structure Using Pushover Analysis Method For Various Seismic Zones

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***Abstract-*** *The seismic behavior of multi-storied building frame during an earthquake motion depends upon the distribution of strength, mass and stiffness in both horizontal and vertical planes. The structural damage of the building frame is occurs due to the discontinuity in the stiffness mass and strength between the adjacent stories. The common type of discontinuity is vertical geometric irregularity which is due to the irregular building configuration in vertical plane. So there is need to study the seismic response of building frames under different structural irregularities .Pushover analysis is one of the analysis method which is adopted for the present study. This work shows that the comparison seismic performance and behavior of building frame with and without vertical irregularity in terms of parameter base shear, storey displacement, storey drift,, spectral acceleration and spectral displacement. Five types of geometry are taken for present study-one regular building frame and four building frames with variation in percentage of vertical irregularities. All building frames are analyzed by using design and analysis softwareETABSanddesignasperIS456-2000, IS800-2007, IS 1893-2002 and 2005 for Part 4, IS 808-1989, IS 13920-1993 and SP-16.*

***Keywords***- pushover analysis, vertical geometric irregularity, story drift, base shear, lateral displacement, spectral acceleration, spectral displacement.

## I. INTRODUCTION

Steel industries is growing rapidly in almost all parts of the world. Time is most important parameter from the construction point of view and steel structure is built in a short period. Steel structures are more advantageous than that of RCC structure, because they have better response during earthquake. In the present work, comparative study of in fill frameofRCandsteelstructureisincluded.Thecomparativestudyin cludesbaseshear, maximum point displacement, axial forces and bending moments in the column, material consumption and cost comparisons of RCC and steel structures.

A steel building is a metal structure fabricated with steel for the internal support and for exterior cladding, as opposed to steel framed buildings which generally uses other materials for floors, walls and external envelope. Steel buildings Are used for a variety of purposes including storage, work spaces and living accommodation.

## II. RESEARCHOBJECTIVE

The purpose of this work is to introduce the steel concrete members in high rise building construction.

1. Inelastic (Pushover) analysis of both RCC and building frame are carried out using E-Tab.
2. The beams are made up from RCC and rolled steel section.
3. Suggest the suitability of composite construction as compare with RCC.

## III. METHODOLOGY

**Step1: Design of beam and column sections**

The frame is analyzed with dead and live loads for RCC sections for beams and columns in E-TABS.

The maximum forces in columns and beams are determined from output file.

The sections are designed manually for these maximum forces as RCC, Steel and sections for the three types of frame separately.

The codes IS 456-2000, IS 800-2007, IS 1893-2002 and 2005 for Part 4, IS 808-1989, IS 13920-1993 and SP-16

are used for RCC, Steel and column section design. The steel beam designed for steel frame is provided in frame too.

**Step 2: Analysis**

Each type of frame is analyzed separately by using Equivalent Static Load Method and Response Spectrum Method by using E-Tab.

**Step 3: Comparison of results**

a. The results obtained are compared in terms of base story deflections, story drifts, modal participation factor etc. and cost effectiveness with respect to material quantities are determined.
b. Review the existing literature and Indian design code provision for designing the structure.
c. Selection of model for the case study.
d. Modeling the selected structures in different seismic zones of India as per zoning map of India.
e. Design the structure as per IS code, Steel table.
f. Linear analysis of the selected structure model and a comparative study on the results obtained from the analysis.
g. Finally compare the result and observation.

## IV. NEED OF STUDY

a. To achieve speed of construction by preferring steel structures rather than RCC structures.
b. Steel structures are built in very short period of time.
c. Steel structures have better response during earthquake.

## V. MODELING ANDANALYSIS

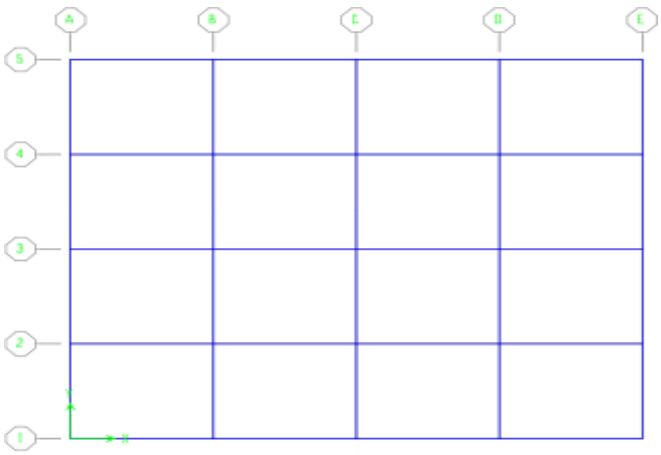
The RCC structures are modeled as three dimensional finite element using analysis software ETABS 2016. The structures considered as G+20 storeys building symmetric in both directions. The structures are analyzed for equivalent static method, response spectrum method. pushover analysis.

*Modal Analysis*

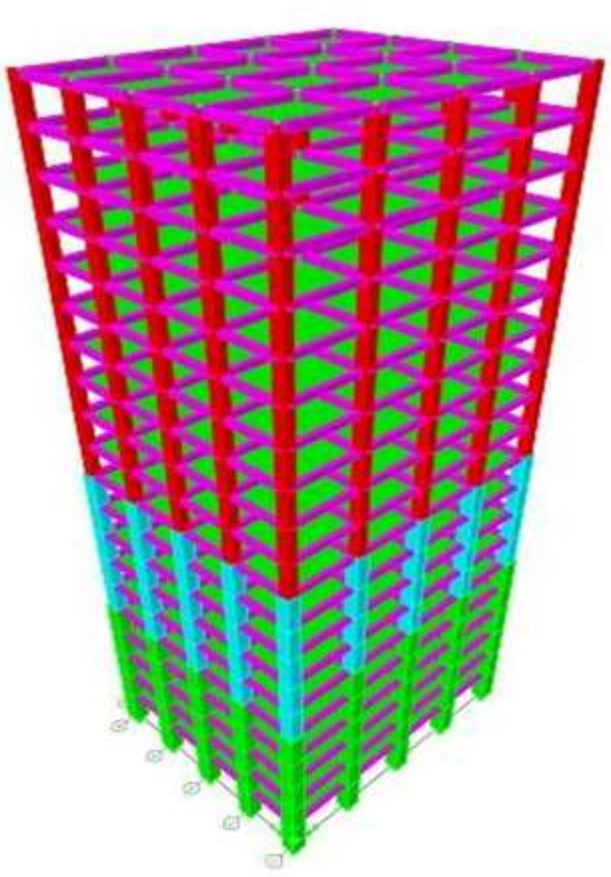
Modal analysis is used to determine the dynamic properties of the structure such as amplitudes, frequency and mode shapes which depends on the overall mass and stiffness of a structure.

## VI. PROPERTIES OF STRUCTURE ANALYSIS DATA

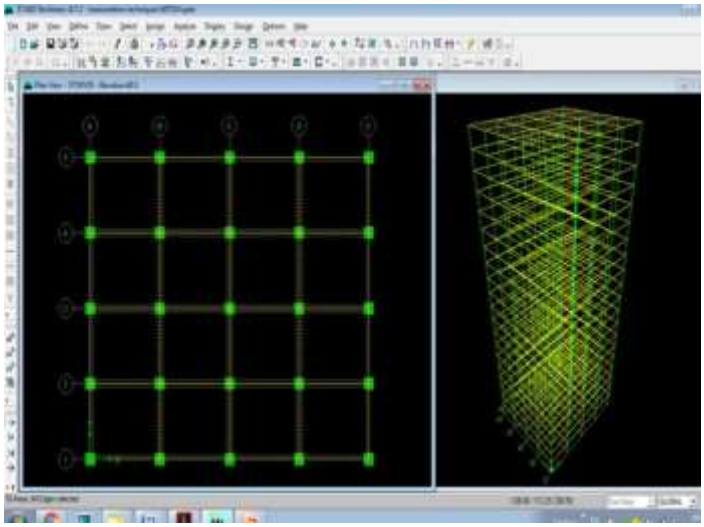
| S. no | Description SDATA | Dimensions |
|---|---|---|
| 1 | Depth of Foundation below ground level. | 1.5m |
| 2 | Height (for ground storey) | 3.5m |
| 3 | Height (for other storey) | 3.0m |
| 4 | Size of beam. | 0.25x0.5m |
| 5 | Size of column (Ground to 4th storey). | 1.2x1.2m |
| 6 | Size of column (5th to 9th storey). | 1.0x1.0m |
| 7 | Size of column (10th to 20th storey). | 0.75x0.75m |
| 8 | Thickness of RCC wall. | 250mm |
| 9 | Thickness of slab. | 130mm |
| 10 | Material properties of concrete. | M20 |
| 11 | HYSD reinforcement of Grade. | Fe 415 |
| 12 | Steel Strut- X type bracing using. | ISA 150x150x6mm |




1. Fig:- BuildingPlan



2. Fig:- 3D Modelling of G+20Building



3. Fig:- BUILDING PLAN & 3-D MODEL INE-TAB

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