Research Article

Seismic Analysis of Regular and Irregular Multi-Story Building By using Staad Pro

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ABSTRACT

The behaviour of the 30 multi-storey building of regular and irregular design under earthquake is problematical, and the variations of wind loads are implicit to act consecutively with earthquake loads. It is not an issue to create a building as it is necessary to design an effective building that serves without failure for many years. "Seismic Analysis of Regular and Irregular Multi-Story Buildings" project seeks to develop better geometry creation techniques, defines column and beam cross sections etc. The loads are then defined by creating specifications and supports (it is fixed or pinned to set support for weather). The model is then analyzed using 'run analysis. 'A material with linear static properties is assumed for dynamic analysis. These analyses are done with regard to various seismic zones and behaviour evaluations by taking the soft soil for each zone. Displacing the base shear and shelf drift in various areas for different soil types might be reported differently. Then, the findings (whether loaded or failed beam column) have been checked. The design is then carried out.

KEYWORDS

Seismic Evaluation, Run Analysis, Reinforced-Concrete Buildings, Regular Multi-Story Buildings, Irregular Multi-Story Buildings, Staad Pro.

1. INTRODUCTION

The construction component that is resistant to seismic forces is known as a side resistant system (L.F.R.S). The building's L.F.R.S may be of several kinds. Special instantaneous frames, shear walls and dual frames wall systems comprise the most often used shapes of these systems in a construction. Due to damage to a structure, the structural weak planes in the building systems usually are located. These deficiencies cause additional degradation of the structure leading to a structural collapse. The structural abnormalities in the rigidity, strength and weight of a structural system are typically the reason of these vulnerabilities. The structural abnormalities can be widely categorised as plane and vertical. If a structure has uneven distribution of mass, strength and steepness along the height of the building, it can be characterised as vertically irregular. According to IS 1893:2002, a building floor is deemed to possess mass irregularities if its mass exceeds 200% of that of the surrounding floor. If a shelf's rigidity is less than 60% of the next shelf, a floor is called the "weak shelf." When a floor's rigidity is under 70 percent or more than that of the neighboring floor, the floor is called a soft shop. Many extant structures in fact have irregularities, some of which were originally meant to carry out irregular roles, e.g. for commercial reasons produced by removing center columns. Reduction in timber size of beams on the higher floors in order to meet practical and commercial needs, such as the storage of heavy mechanical devices, etc . The variation in use of a particular level in relation to adjoining floors leads in uneven weight, steepness and strength distributions across the height of the structure.

2. OBJECTIVE OF VIEW

There is a comparison of two 30-story buildings utilizing a different load combination with the same beam and column size.

Buildings are loaded by seismic criteria and another one is loaded by regular circumstances of loading.

The columns are compared with the area of steel and the % of steel.

The test will be carried out on the STAAD.PRO FEM programme.

Dead load (DL) ,live load (LL), wind load (WL) and seismic load are the kind s of loads that are employed (SL).

Load combination

1. For seismic load analysis of a building the code refers following load combination.
2. 1.5(DL+IL)
3. 1.2(DL+IL±EL)
4. 1.5(DL±EL)
5. 0.9DL±1.5EL

2. For wind load analysis of a building the code refers

following load combination.

1. DL+LL
2. DL+WL
3. DL+0.8LL+0.8WL

It took larger internal size since it always took more charge than the outward one. It took larger internal size since it always took more charge than the outward one.

If larger dimensions are not provided, compression will fail.

3. METHODOLOGY

In general, design activities are carried out. STAAD-PRO is used to achieve the objective in four stages.

• Input files preparation.

• Input files analysis.

• Monitor and verify the outcomes.

• Send the results of the investigation to developing steel or concrete motors.

1. Input file- Prepare

We described the structure first of all. Geometry, materials, cross sections and supporting circumstances are covered in the description section.

2. Input file analysis

We need to make certain that we are syntaxing with STAAD-PRO. So, it's going to be mistaken.

We should be sure that whatever we enter creates a stable framework. It is going to show mistake, otherwise.

Finally, to ensure that the input data are accurately entered we should validate our output data.

3. Look and check the findings.

POST PROCESSING is used to read the results. We first choose the output file (as different loads or load combinations) we wish to examine. Then the results will be shown.

4. Send the results of the analysis to the design engines or concrete design engines for the purpose of design.

If someone wants to create following analysis, he may ask STAAD-PRO to use the findings of the analysis as a design

Through the design beams and design column, data such as Fy main, Fc are allotted to the views.

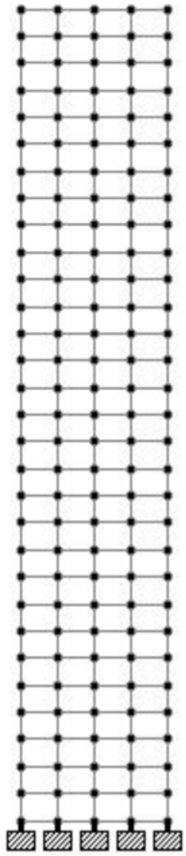
It shows the entire design structure while doing the analysis.

4. RESULTS AND DISCUSSION

COMPARISION OF WO 30-STOREY BUILDING

After the fundamental job has been done . Then two alternative combinations of load were produced. The first 30-story skyscraper with seismic load, live and dead load was constructed. The second 30-story structure has been constructed with wind load, live load and dead load. Both structures have the same beam and column size. The inner size of the column is (0.8m to 0.8m). External column size (0.75m/0.75m) has been taken. This is the size of the beam (0.45m to 3m). It took larger internal size since it always took more charge than the outward one. If larger dimensions are not provided, compression will fail.

Followings are the input data, concrete design, deflection at dead load; seismic load and wind load combination are the input data …



DATA REQUIRED FOR THE ANALYSIS OF THE FRAME.

- Type of structure – multi-storey fixed jointed plane frame.
- Seismic zone II (IS 1893 (part1) : 2002)
- Number of stories 30 (G+29)
- Floor height 3.5m
- No of bay sand bay length 4 nos,5 m each.
- Imposed load 2kN/m2 on each floor and 1.5 kN/m2 on roof.
- Materials Concrete (M35) and Reinforcement (Fe500).
- Size of column 0.8m×0.8m internal column size,0.75m×0.75m external column size.
- Size of beam 0 .45m×0.45m
- Depth of slab 125 mm thick
- Specific weight of RCC 25 kN/m3.
- Specific weight of infill 19.2 kN/m3
- Type of soil Medium soil.

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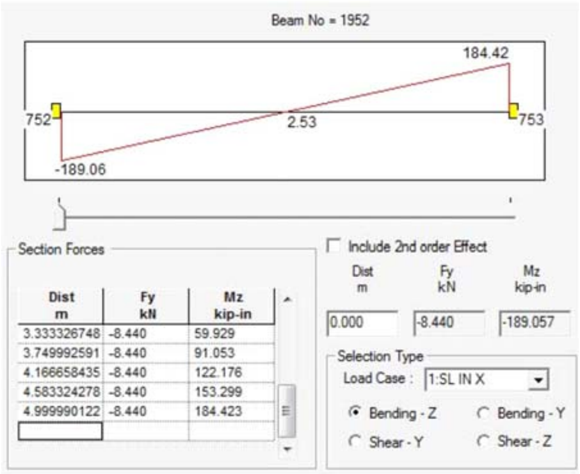
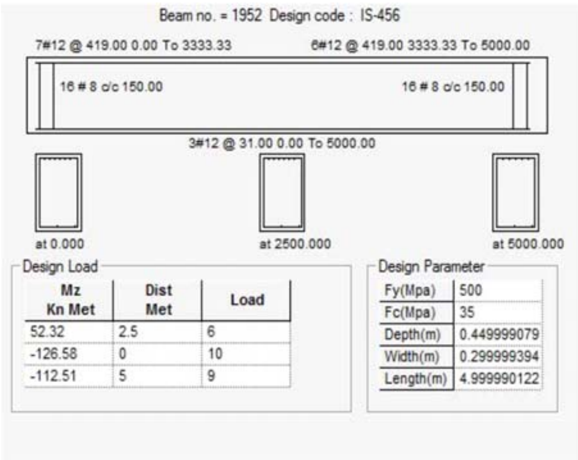
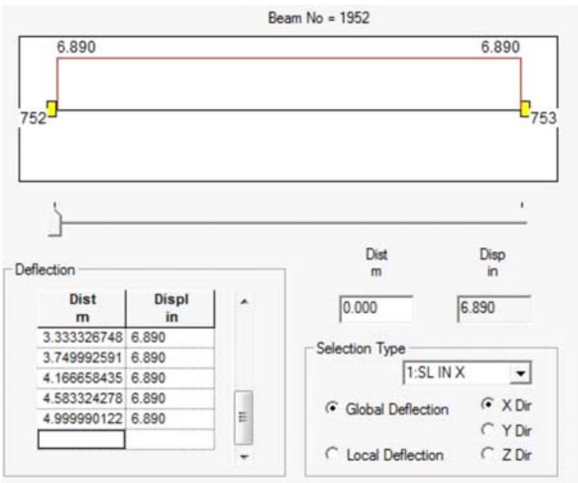
- Response spectra As per IS 1893.



(Concrete design of the beam 1952)



(Shear bending of beam no.1952)

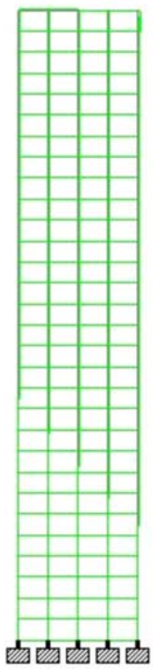


(Deflection of the beam1952)

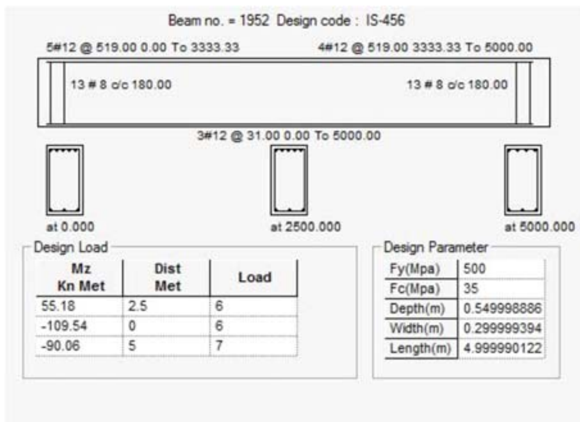
Followings are the Input Data concrete design, deflection and shear bonding for different beam in WIND load, Dead load and Live LOAD Combination

Data required for the analysis of the frame.

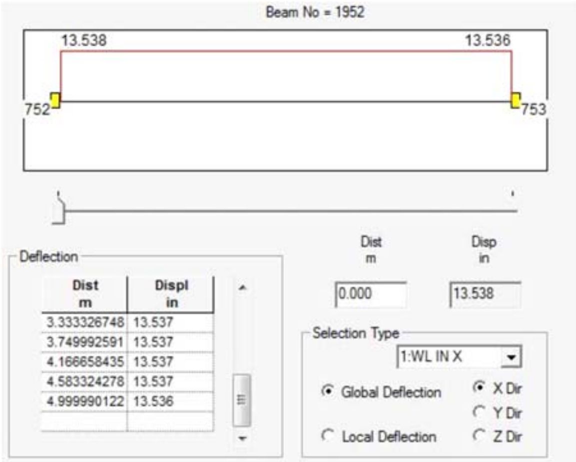
1. Type of structure-->multi-storey fixed jointed plane frame.
1. Number of storey's 30,(G+29) No of bays and bay length 4nos,5m each.
2. Floor height 3.5m
3. No of bay sand bay length 4nos,5m each.
4. Basic wind speed As per IS 875(PART 3),50m/s for CTC.
5. Imposed load 2kn/m2 on each floor and 1.5kn/m2 on roof.
6. Materials Concrete (M35) and Reinforcement (Fe500).
7. Size of column 0.8m×0.8m internal column size 0.75m×0.75m external column size.
8. Size of beam 0.45m×0.45m
9. Depth of slab125mm thick
10. Specific weight of RCC 25kn/m3.
11. Specific weight of infill 19.2kn/m3
12. Wind intensity and height As per IS 875 (PART 3), 1.5kn/m2 at a height 105m in CTC.



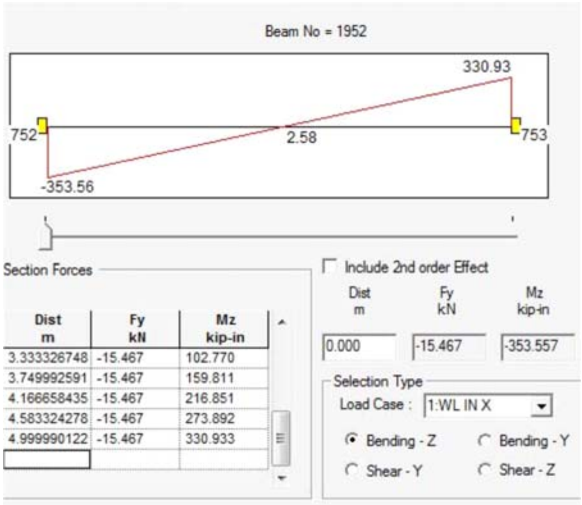
(A 30 storey building under wind, live and dead load combination)



(Concrete design for beam no.1952)



(Deflection for beam no.1952)



(Shear bending for beam no.1952)

5. CONCLUSION

From the above comparison, it was clear that the top beams of a seismic-loft building required more strengthening than the buildings in combination with wind load (for example, for beam 1952, 7 no 12 mm Ø was necessary, whereas for wind load combined it required 7 no of 12 mm Ø and 6 no of 12 mm Ø bars). But in the combination of wind load deflection and shear bending greater than in the seismic one. But for wind load combinations, greater strengthening is needed in lower beams.

For a steel surface and a proportion of steel, the wind load combination always requires more than the seismic load.

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