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Calculations of loadings in a (G + 5) Residential Building

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Abstract
A (G + 5) residential building is considered in the present study. Dead Load, Live Load and Seismic Load are calculated. IS: 875 (Part 1 & Part 2) and IS: 1893 are considered in the calculation of dead load, live load and seismic load.

Key words: Residential building (G+5), Dead Load, Live Load, Seismic Load, IS: 875 (Part 1 and Part 2), IS 1893:2002.

I Problem statement

A (G+5) Residential Building has been considered in the present study. Each bay in X – direction as well as in Z – direction is 4 m. Each storey height is 3.2 m. The building is situated in New Delhi. There are 3 bays in X – direction and 3 bays in Z – direction. Dead Load, Live Load and Seismic Forces are to be calculated.

II Calculation of loadings

A. Dead Load

All beams are of c/s size (230 mm X 400 mm) and all columns are of c/s size (350 mm X 350 mm). Considering the deflection criteria, the overall depth of floor slab as well as roof slab is taken as 140 mm.

DL on floor slab:
Self-weight of slab = $0.14 \times 25 = 3.5$ kN/m^2
Weight of floor finish = 1.2 kN/m^2
Total Dead Load on floor slab = 4.7 kN/m^2

DL on roof slab:
Self-weight of slab = $0.14 \times 25 = 3.5$ kN/m^2
Weight of 100 mm thick brick bat coba = $20 \times 0.100 = 2$ kN/m^2
Weight of ceiling plaster = 0.3 kN/m^2
Total Dead Load on roof slab = 5.8 kN/m^2

Weight of wall:
Taking 35 mm thick plaster, weight of 230 mm thick main wall = $20 \times (0.23 + 0.035) (3.2 – 0.4) = 14.84$ kN/m

Self weight:
Self weight of beam and self weight of columns are calculated.

B. Live Load
Live Load on floor slab = 2 kN/m^2
Live Load on roof slab = 1.5 kN/m^2

C. Calculation of Seismic Loads (SL) at different floor levels
Seismic loads for the building at different floor levels in X - direction & Z – direction will be calculated with the help of IS: 1893. The building is situated in New Delhi. Zone factor is 0.16. Importance factor is taken as 1. All joints of the building frame are rigid. Response reduction factor is taken as 5. Hard soil is considered here. Now the base shear and the lateral seismic forces at different storey levels will have to be calculated.

D. Load Combinations
The following load combinations are to be considered in the design of the building.
Load Combination 1: DL + LL
Load Combination 2: DL + SL in (+)ve X – direction
Load Combination 3: DL + SL in (+)ve Z – direction
Load Combination 4: DL + LL + SL in (+)ve X – direction
Load Combination 5: DL + LL + SL in (+)ve Z – direction
Load Combination 6: DL + SL in (-)ve X – direction
Load Combination 7: DL + SL in (-)ve Z – direction

III Conclusion

A (G + 5) residential building has been considered in the present study. Dead Load, Live Load and Seismic Load for the design of the building are calculated.

REFERENCES

1. IS: 1893, “Criteria for Earthquake Resistant Design of Structures (Part1) General Provisions and Buildings (Fifth Revision)”, Bureau of Indian Standards, 2002.

2. IS: 456, “Plain and Reinforced Concrete-Code of Practice”, Bureau of Indian Standards, 2000.

3. IS: 875 (Part 1) – Dead Loads

4. IS: 875 (Part 2) – Imposed Loads