

Shantilal Shah Engineering College, Bhavnagar
Applied Mechanics Department
B.E. 7th Civil (Design of Reinforced Concrete Structures)

Tutorial:1: RCC Detailing

Draw RCC detailing of different structural members as given in Tutorial classroom in your sketchbook.

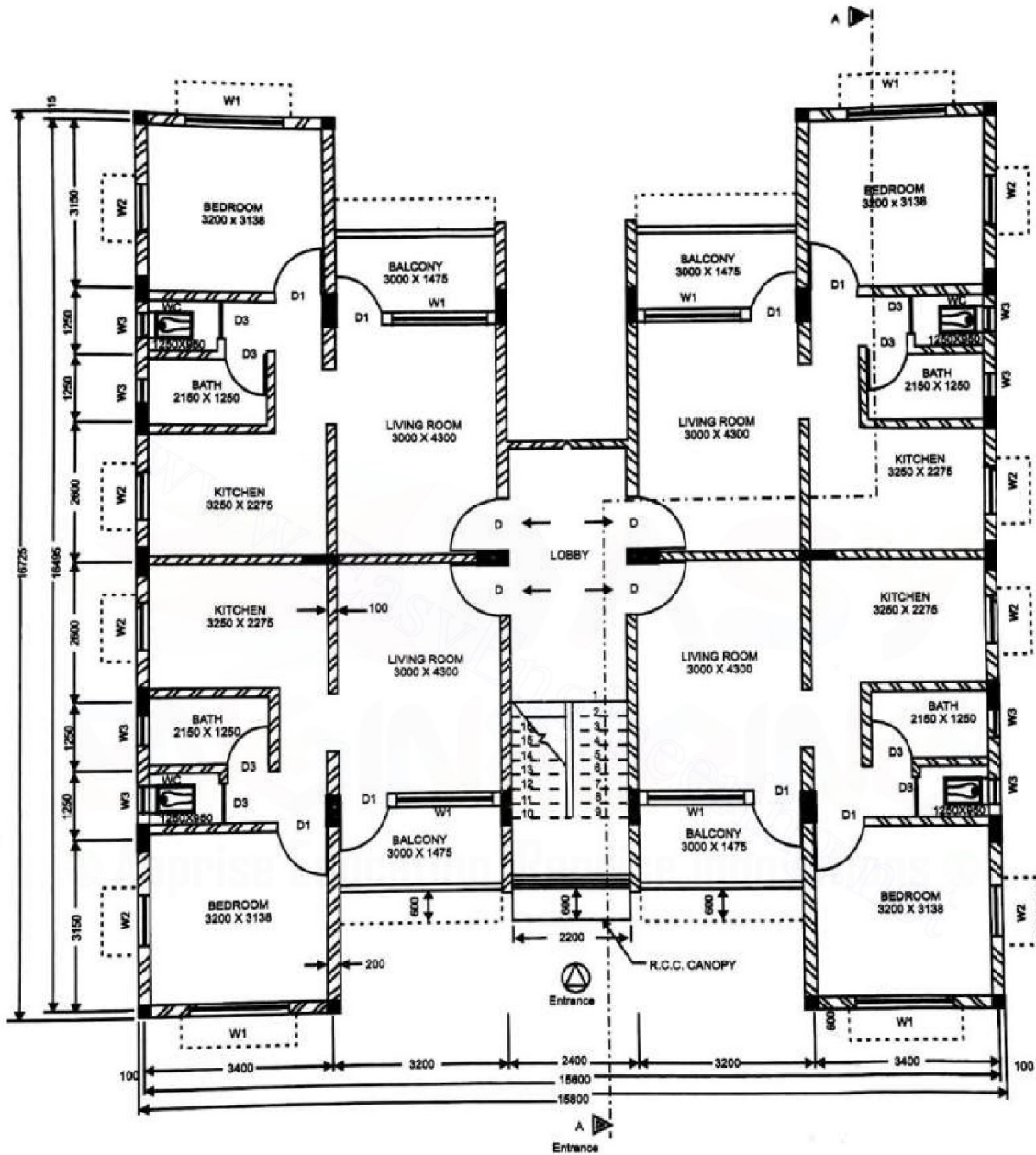
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Tutorial:2: RC Building

Q.1 Design G+3 storey residential RC building as shown in Fig.1.1 to Fig. 1.3. Assume SBC of soil is 250 kN/m^2 at depth of 1.5m from ground level.

Q.2. A multi-storeyed frame building as shown in Fig.1.4. Spacing of frame is 6m along the length. Assume building is located in Mumbai with terrain category 3. The topography is flat that is upwind slope $< 3^\circ$. The life of the structure is 50 years. Calculate the wind load at different floor levels using IS 875 part-3:2015.

Q.3. Estimate wind forces for a water tank for the following data. Total height of tank=30 m. which includes height the supporting shaft = 22m, height of the bottom conical portion = 3 m, height of cylindrical portion = 4 m and rise of top dome =1m, diameter of supporting portion = 5 m and diameter of cylindrical portion =12m, location is Bhavnagar, Terrain category = 2 and ground plane with upwind slope less than 3° , Design life year 100 years.

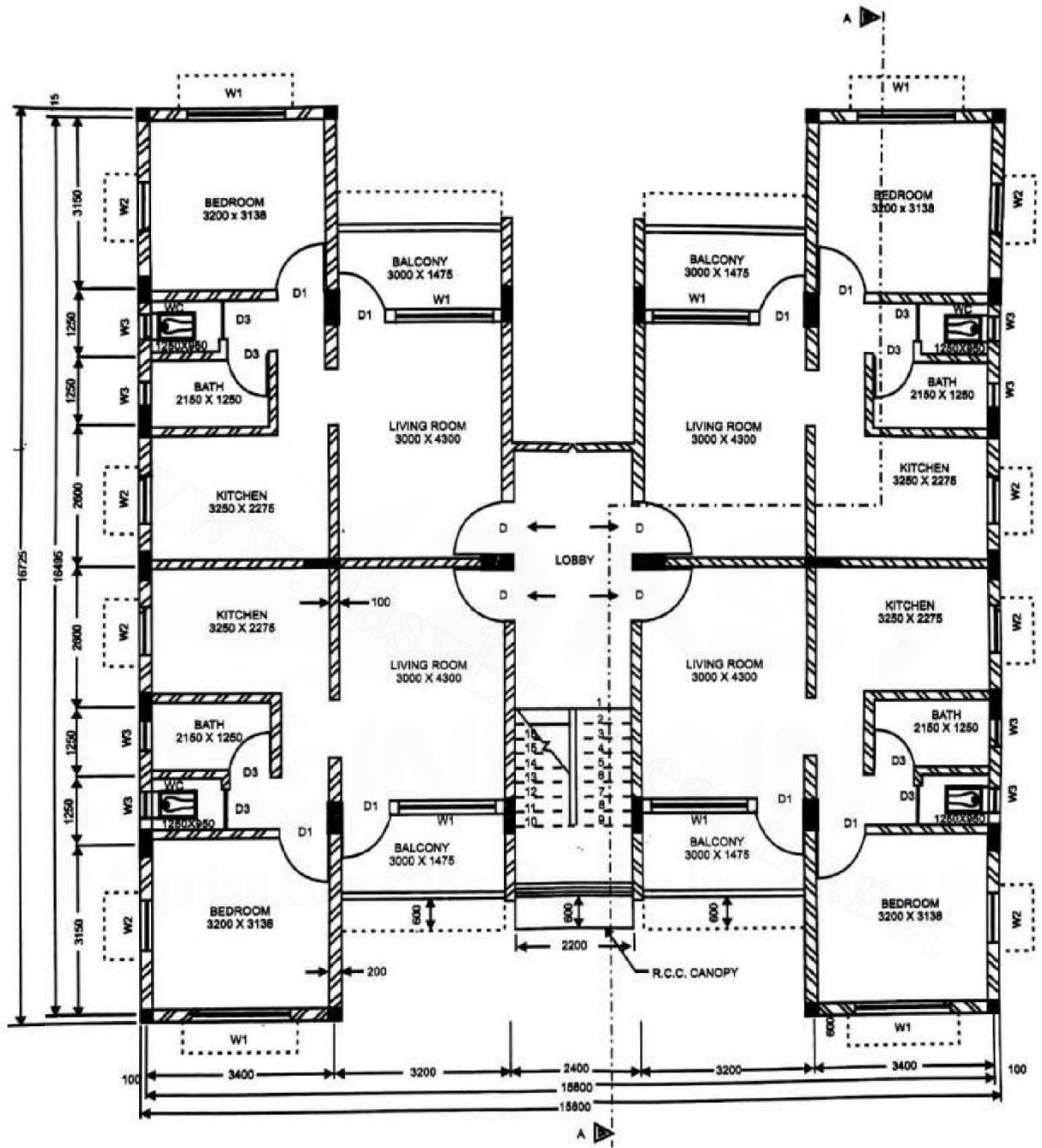


GROUND FLOOR PLAN

SCHEDULE OF DOORS :

TYPE	SIZE	DESCRIPTION
D	1000 X 2400	T. W. FRAME/COMMERCIAL BLOCK BOARD WITH GLAZED FAN LIGHT
D1	900 X 2100	T. W. FRAME/COMMERCIAL BLOCK BOARD SHUTTER
D2	900 X 2000	T. W. FRAME/COMMERCIAL BLOCK BOARD SHUTTER
D3	800 X 1900	T. W. PANELLED SHUTTER

Fig.-1.1 Ground Floor



TYPICAL FLOOR PLAN

SCHEDULE OF WINDOW :

TYPE	SIZE	DESCRIPTION
W1	1800 X 1200	ALUMINIUM SLIDING GLAZED WINDOW (Three Shutters)
W2	900 X 1200	ALUMINIUM SLIDING GLAZED WINDOW (Two Shutters)
W3	450 X 650	ALUMINIUM LOUVERED WINDOW

Fig-1.2 Typical Floor

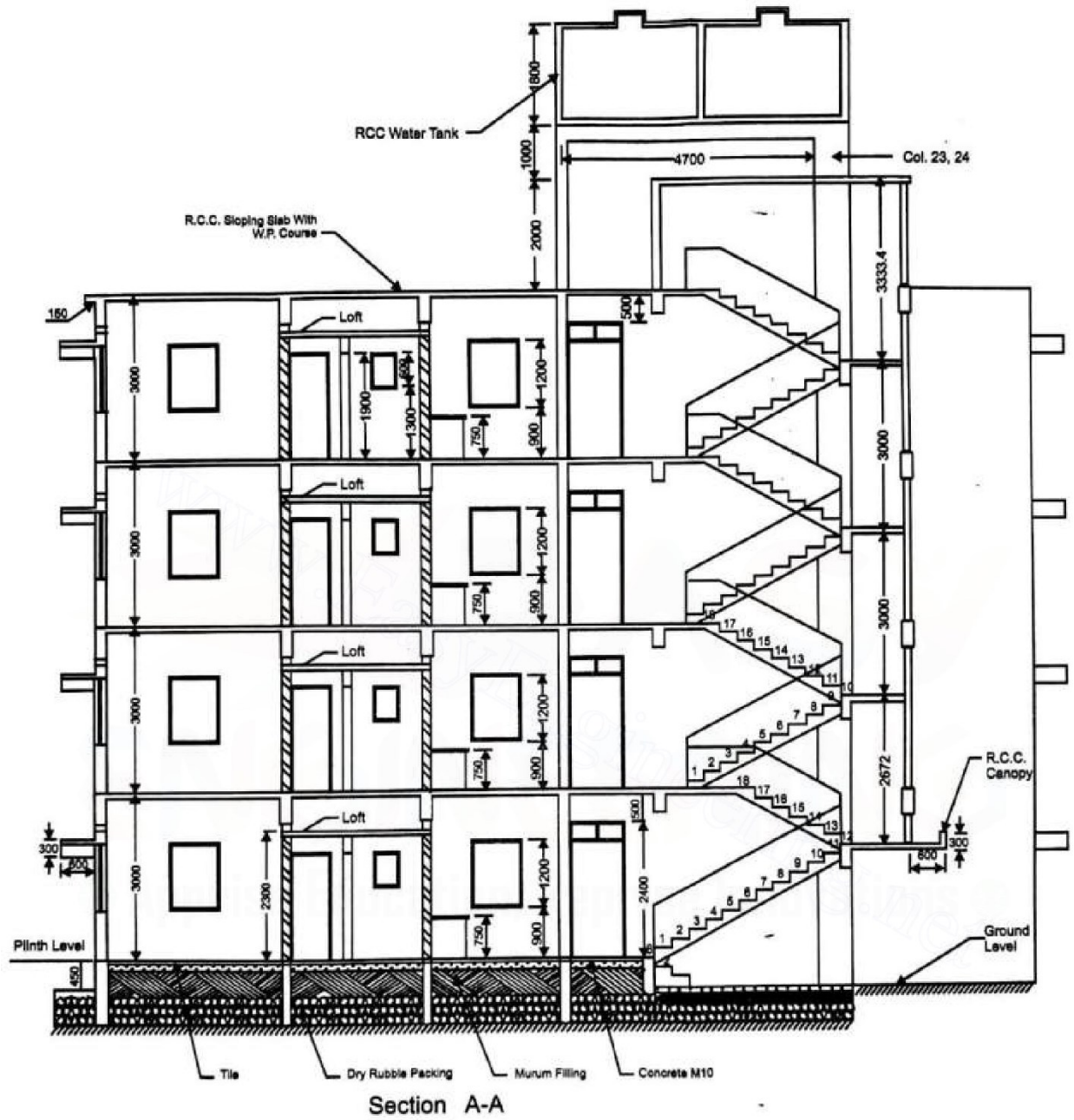


Fig.-1.3 Section A-A

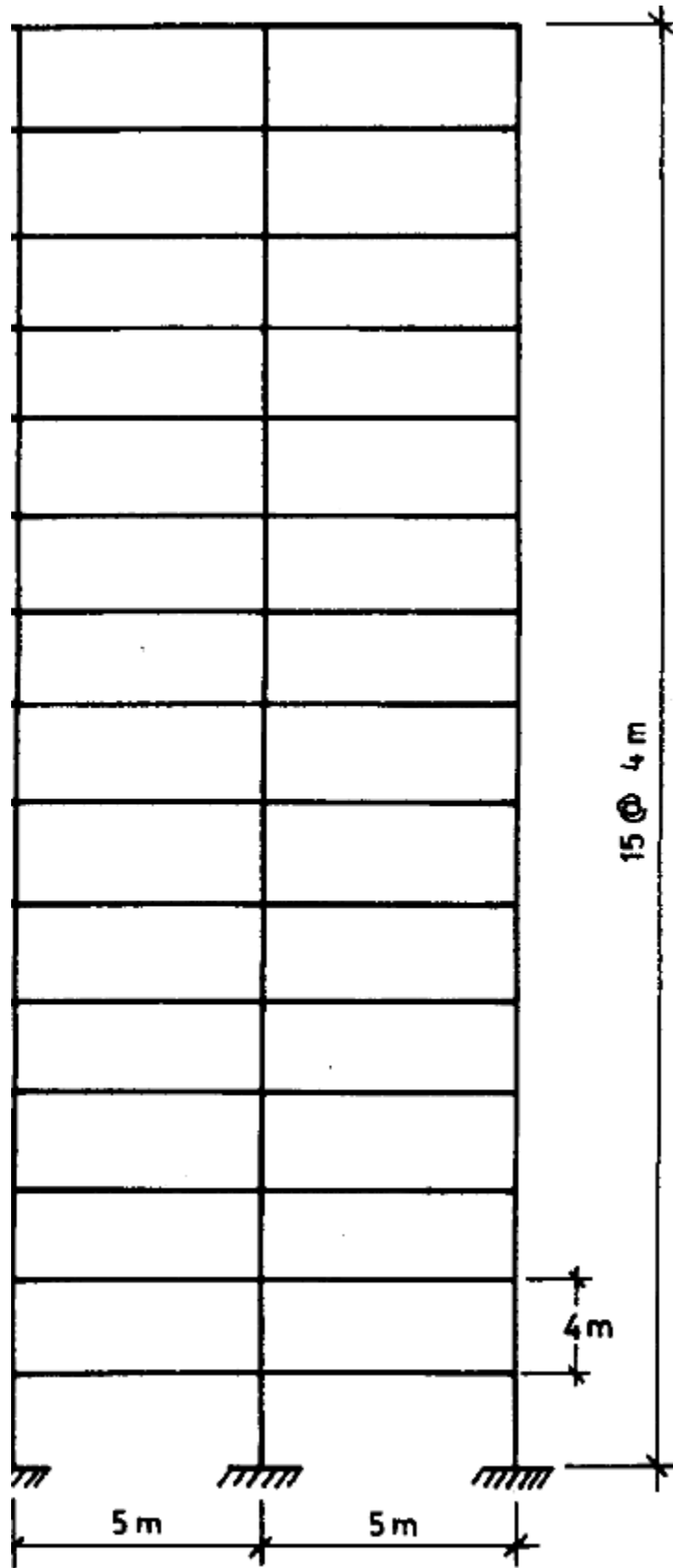


Fig. 1.4 A multi-storeyed building frame

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Tutorial:3: Design of Retaining Wall

- Q.1. Sketch the standard detailing in RC walls as per SP 34.
- Q.2. What is the purpose of a retaining wall? List and sketch the different types of retaining walls encountered in practice.
- Q.3. Why is it important to consider drainage of backfill? What methods are adopted for the effective drainage of backfill?
- Q.4. What is the purpose of shear key? How does it increase the shearing resistance?
- Q.5. List the various steps involved in the design of retaining walls.
- Q.6. Briefly describe the behaviour and design of the various elements of a counterfort-retaining wall.
- Q.7. A retaining wall is required to retain earth 4.0 m high above the ground level. The backfill surface is level but subjected to a surcharge pressure of 40 kN/m^2 and the backfilled granular soil is having a unit weight of 16 kN/m^3 , and angle of internal friction of 30° . The exposure condition is moderate. The SBC of soil at 1.25 m below ground level is 160 kN/m^2 and the coefficient of friction between the soil and concrete is 0.5. Design the RC retaining wall (a) as a cantilever retaining wall and (b) as a counterfort retaining wall, assuming M20 concrete and Fe 415 steel.

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Tutorial:4: Design of Reinforced Cement Concrete Water Tank

Notes: 1. Use M30 grade concrete and Fe415 grade steel unless specified otherwise

2. Assume suitable data wherever necessary.

Q.1. Design circular RCC water tank with 5,00,000 litres capacity resting on ground and flexible base. Tank is open at the top. Support your design with drawing.

Q.2. Design circular RCC water tank with 5,00,000 litres capacity resting on ground and fixed base. Tank is open at the top. Support your design with drawing. Use IS 3370- Part-IV.

Q.3. Design and detail RCC rectangular water tank on the ground with dimension of 3.5m x 8.0 m x 4.0m deep with 0.2m free board. Tank is open at top and rigidly connected to the wall and base. Use approximate method.

Q.4. Design and detail RCC rectangular water tank on the ground with dimension of 5.0m x 9.0 m x 5.0m deep with 0.2m free board. Tank is open at top and rigidly connection to the wall and base. Use approximate method.

Q.5. Design and detail RCC rectangular water tank on the ground with dimension of 5.0m x 9.0 m x 5.0m deep with 0.2m free board. Tank is open at top and rigidly connection to the wall and base. Use IS 3370 Part-IV.

Q.6 Design and detail RCC rectangular underground water tank with dimension of 5.0m x 9.0 m x 5.0m deep with 0.2m free board. Tank is open at top and rigidly connection to the wall and base. Use IS 3370 Part-IV. Unit weight of soil is 18kN/m^3 and angle of friction is 30° . Assume water table is at the ground level.

Q.7. Design and detail an intz type water tank to store 15,00,000 litres of water. The height of the tank above ground level is 20m with eight number of columns. The SBC of soil is 200kN/m^2 . Depth of foundation is 1.8m. Assume water tank is located in Bhavnagar city. Analyse tank for wind load and earthquake load.

Q.8. Repeat Q.9 with tank supported by shaft.

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Tutorial:5: Flat Slab

Q.1 Explain direct design method for design of flat slab. State limitations of direct design method.

Q.2 Write short note on equivalent frame method.

Q.3 Design an interior panel of a flat slab of a flat slab of size 6.0 m x 6.0 m without providing drop and column head. Size of column is 550 mm x 550 mm and live load on the panel is 3 kN/m². Take floor finish load as 1.2 kN/m². Use M25 concrete and Fe 500 steel.

Q. 4 Design an interior panel of a flat slab with panel size 5 m x 5 m supported by columns of size 450 mm x 450 mm. provide suitable drop. Take live load as 4.0 kN/m² and floor finish load as 1 kN/m². Use M20 concrete and Fe 415.

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Tutorial:6: Earthquake Resistant Design of Building

Q.1 Explain Earthquake resistant design philosophy.

Q.2 Make critical remarks on “Effect of irregularities on performance of RC building”.

Q.3 Explain in detail (a) Capacity Design method (b) Four virtues of earthquake resistant design (c) Define Torsionally coupled and uncoupled system.

Q.4 Consider a 4-storeyed RCC building having a plan area of 20 m x 15 m. The plan in X-direction comprises of 4 bays each of 5.0 m and in Z-direction has 3 bays each of 5.0 m. The building is located in Ahmedabad. The soil condition is medium stiff and entire building is on raft foundation. RC frames are infilled with brick masonry. The lumped weight due to dead loads is 12 kN/m² on floors and 10 kN/m² on roof. The live load is 4 kN/m² on floors and 1.5 kN/m² on roof. Determine the Design Seismic force and shear at each level. Ground storey height is 4.2 m and other three storeys are each of 3.2 m.

Q.5 Explain the following provisions for ductile detailing as per IS: 13920:2016. (i) Grade of concrete and type of steel (ii) Diameter of stirrups. (iii) Ductile detailing of beam (iv) Ductile detailing of column (v) Confining reinforcement with sketches (vi) Special confining reinforcement (vii) Ductile detailing of longitudinal reinforcement in beam (viii) Requirements of Shear wall (ix) Concept of flanged shear wall

Q.6 If a RCC column of size 300 mm x 550 mm is having a longitudinal reinforcement of 1.8% of the gross cross-sectional area, give reinforcement detailing of the column as per IS:13920. Also find out the special confining hoop reinforcement and express the same through a neat longitudinal section of column. Clear cover to the main steel is 40 mm, clear height of the column is 4.0 m. Use M20 & Fe415 as material for concrete and steel respectively.

Q.7. Determine the approximate axial forces, shears, and moments for all the members of the frames shown in Fig.6.1 using portal method and cantilever method.

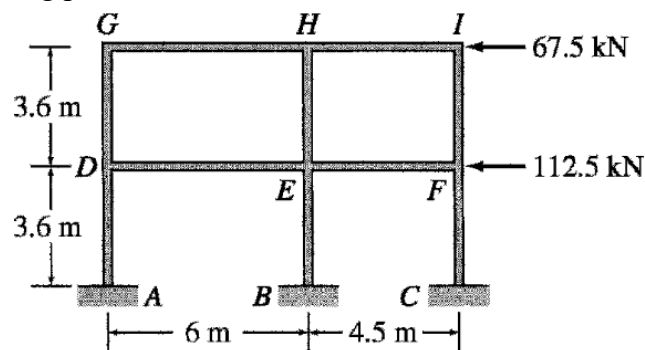


Fig. 6.1 Building frame