Shantilal Shah Engineering College, Bhavnagar

Applied Mechanics Department

B.E. 6th Civil (Design of Reinforced Concrete Structures)

Tutorial:1: Building Layout and Design

Q.1 Design G+3 storey laboratory & Office block RC building as shown in Fig.1 to Fig. 2. For below given data:

General Loading Condition	Roof -Imposed=1.5kN/m^2 -Water Proofing = 1.5 kN/m^2 Floor – Imposed (3.0) and partitions (1.0)= 4.0 kN/m^2 Stairs – Imposed = 4.0 kN/m^2 - Finishes to Floors an Stairs = 0.5 kN/m^2
Wind Load Condition	Building is located in Bhavnagar City and upwind slope is less than 3°.
Exposure condition	Moderate
Subsoil condition	Allowable bearing pressure 200 kN/m^2 at 1.5m depth.
Material data	M25 concrete with maximum size of 20mm aggregate and Fe 500 steel. All walls are brick masonry 230mm thick.
Notes:	1. Assume suitable data whenever required. 2. Design at least one slab panel, one stair flight, one beam element, one column element and one foundation below the column. 3. Prepare design drawing in A2 size drawing sheet.

Analyse the building for gravity load, wind load as per IS 875 (Part-III):2015 and for earthquake load IS 1893 (Part-1) :2016. Use the substitute frame method for vertical load and portal method for lateral load analysis. Support your design with RCC detailing of Slab, staircase, Beam, Column and Footing. Use IS 456:2000, SP34, SP16, IS 13920:2016 codes.

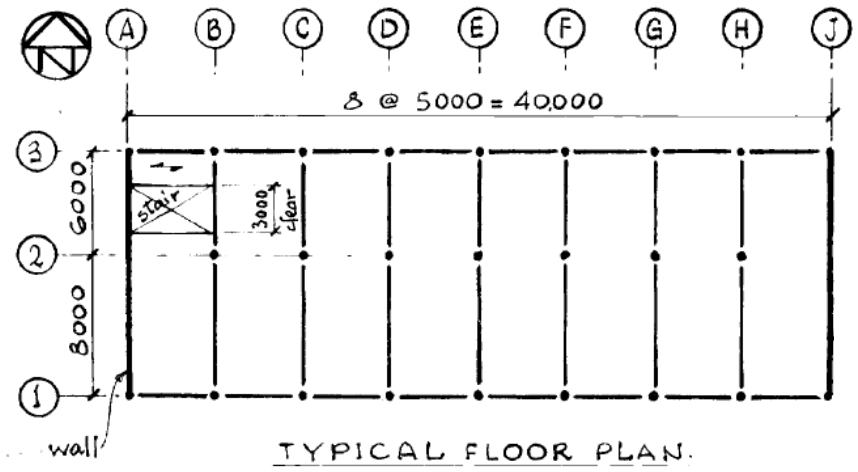

Fig.-1 Typical Floor Plan

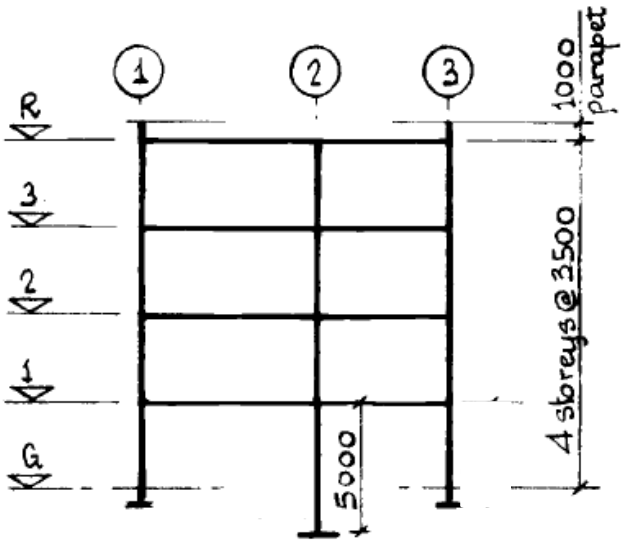

Fig.-2

Tutorial:2: Design of Retaining Wall

Q.1. A cantilever-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 10 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, assuming M20 concrete and Fe 415 steel. Prepare design drawing in A2 size drawing sheet.

Q.2. Design a counterfort-type retaining wall to retain a filling of 7.5 m height above the ground level. The unit weight and SBC of the soil at site are 18 kN/m^3 and 150 kN/m^2, respectively. The angle of internal friction of soil and coefficient of friction are 30° and 0.5, respectively. The exposure condition is moderate.

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Tutorial:3: Design of Reinforced Cement Concrete Water Tank

Notes: 1. Use M30 grade concrete and Fe 500 grade steel unless specified otherwise

2. Assume suitable data wherever necessary.

3. Assuming limiting the crack width of 0.1mm unless specified otherwise.

Q.1 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 connected to the wall and base. Use IS 3370 (Part-IV) -2021. Unit weight of soil is 18kN/m^3 and angle of friction is 30°. Assume water table is at the ground level. The SBC of soil 160 kN/m^2 and the coefficient of friction between the soil and concrete is 0.5. Prepare design drawing in A2 size drawing sheet.

Q.2 Analyse RC cylindrical under-ground water tank capacity of 7,00,000 litres capacity with a height of 4.5m. Assuming wall is integrally connected with base slab. Tank is covered with dome at top. Design and detail water tank using limit state method as per IS 3370-2021. Assume unit weight of soil is 18kN/m^3 and angle of friction is 30°. Assume water table is at the ground level. The SBC of soil 160 kN/m^2 and the coefficient of friction between the soil and concrete is 0.5.

Q.3. 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.

Tutorial:4: Flat Slab

Q.1 Design flat slab of a typical floor as shown in Fig. -1. It is subjected to live load of 4.0kN/m^2 and surface finish of 1.0kN/m^2. Consider concrete grade M30 and steel of grade Fe 500.

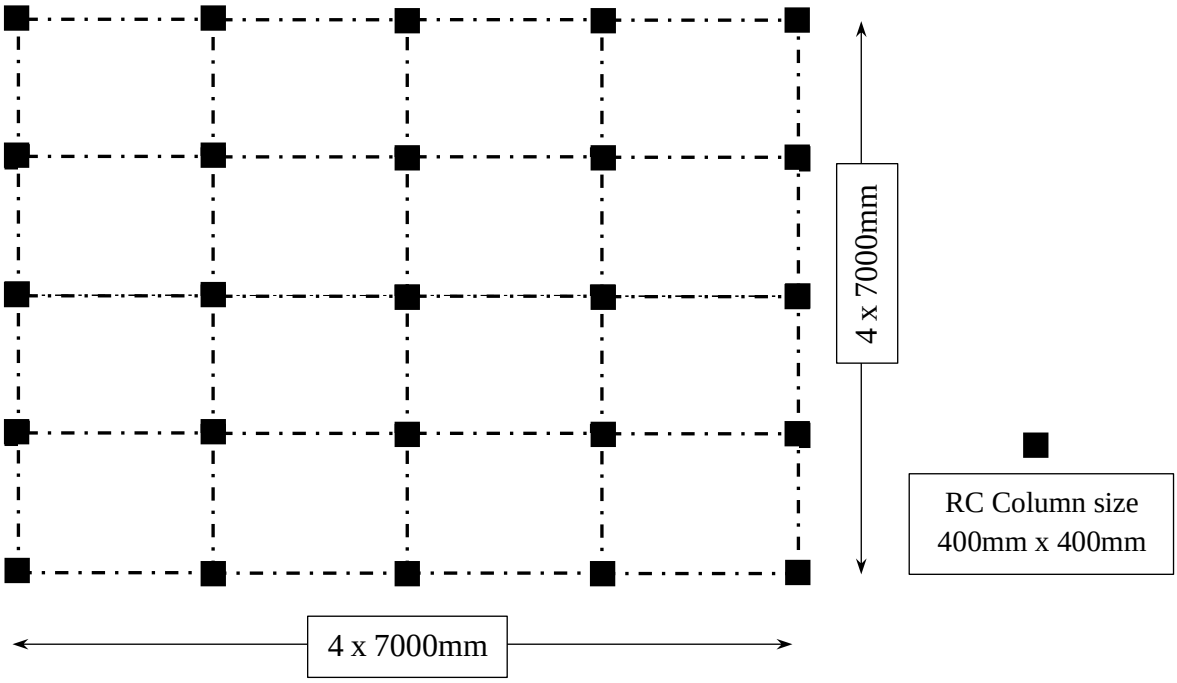

Fig.-1 Typical Flat slab system