Banha University
Faculty of Engineering - Shoubra
Civil Engineering Department

REINFORCED CONCRETE 1 - B

For 2nd Year Civil – 2nd Term

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Assignments

BANHA UNIVERSITY
FACULTY OF ENGINEERING (SHOUBRA) **SECOND YEAR CIVIL**
DEPARTEMENT OF CIVIL ENGINEERING **R.C. STRUCTURES 2nd term**

***Systematic arrangement of calculations and clear neat sketches are essential.**
***Any data not given is to be reasonably assumed according to Egyptian Code of Practice such that economical design can be achieved.**
*** Take f_{cu} = 25MPa, f_y = 240MPa (for $\Phi \leq$ 8 mm), f_y = 400MPa (for $\Phi \geq$10 mm), $\Phi \leq$ 25 mm.**

Assignment 1- Load Distribution and Internal Forces Diagrams

The structural systems of the buildings shown in the attached Figures are subjected to the given service loads under each Figure. It is required to determine the following:

1- The equivalent loads and loads distribution for shear and moment for secondary beams and main girders.
2- The absolute max.-max. normal force, shearing force, and moments diagrams for the secondary beams and main girders under ultimate loading conditions.
3- The maximum loads of the supporting columns under ultimate loading conditions.

Assignment 2- Design of R.C. Secondary Beams, Main Girders, and Columns

For the secondary beams, main girders, and columns mentioned above, it is required to:

1- Design the various critical sections for flexure and/or eccentric forces (if any).
2- Check for shear and torsion (if any) then choose the suitable web reinforcement and longitudinal steel for both secondary beams and main girders.
3- Design the R.C. columns at the foundation level as tied short columns with 15% eccentricity ratio using uniform distributed steel with ratio 1.0% < μ_{total} < 1.5%.

Assignment 3 Detailing of R.C. Beams and Columns

For the secondary beams, main girders, and columns mentioned above, it is required to:

1- Draw each secondary beams, main girders, and columns showing all concrete dimensions and steel arrangement in both elevations (scale 1:25) and cross sections (scale 1:25).

Assignment 4- Deflection Check of R.C. Beams and Columns

2- For the main girders only, check immediate and maximum long term deflection due to D.L. and 40% sustained load.

Important: In each figure, consider only beams B1, B2 & B3, and columns C

For Group 1- Structural plans of buildings (2 plans)

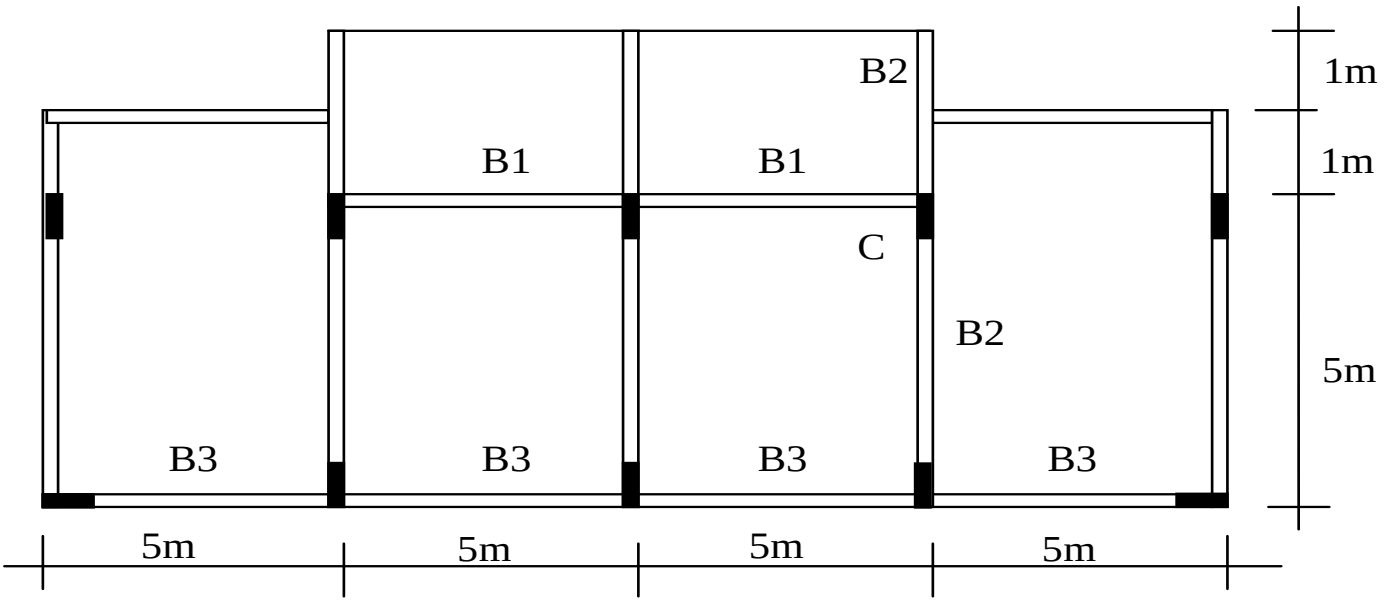
* Number of floors	= 8 stories
* Story height	= 3.5 m
* Live load on the slabs	= 3.0 KN/m^2 (assume permanent loads)
* Flooring Cover	= 1.5 KN/m^2
* Slab thickness	= 150 mm
* O.W. of wall / m^3	= 16 KN/m^3
* Thickness of walls	= 120 mm (assume walls on all beams and girders)
* Walls on cantilever slabs have height	= 1.2 m
* Try total depth of secondary beams	= 400 mm
* Try total depth of main girders	= 800 mm
* Breadth of secondary beams	= 250 mm
* Breadth of main girders and columns	= 400 mm

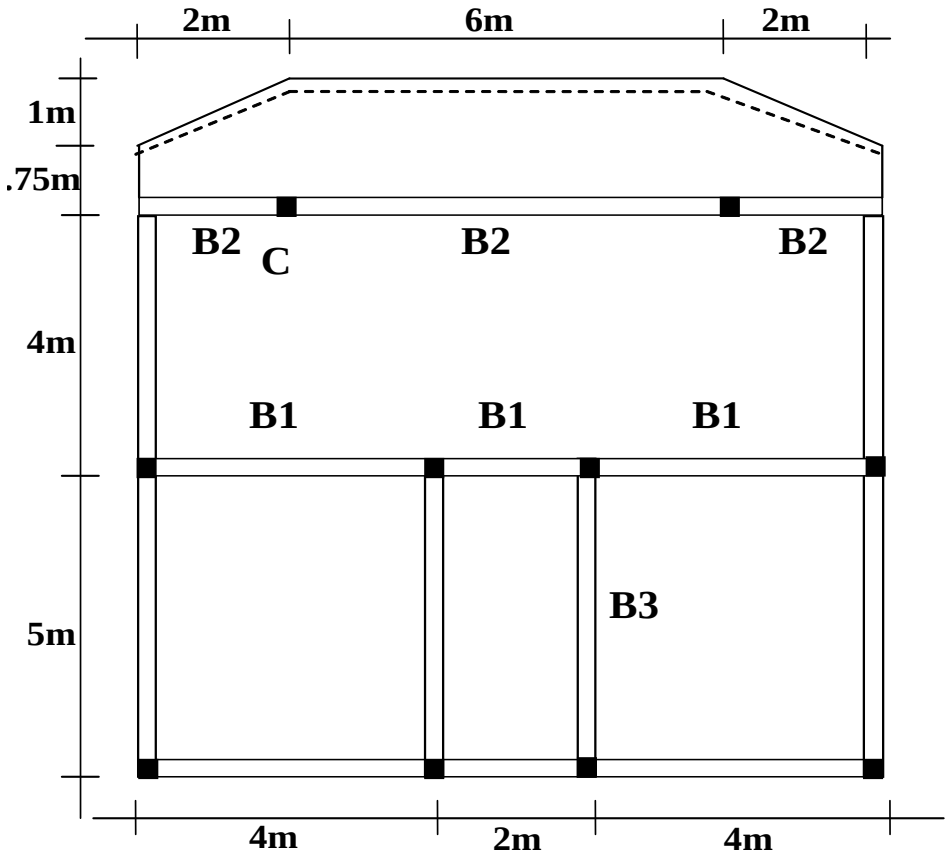
For Group 2- Sectional elevations of girder buildings (2 sections)

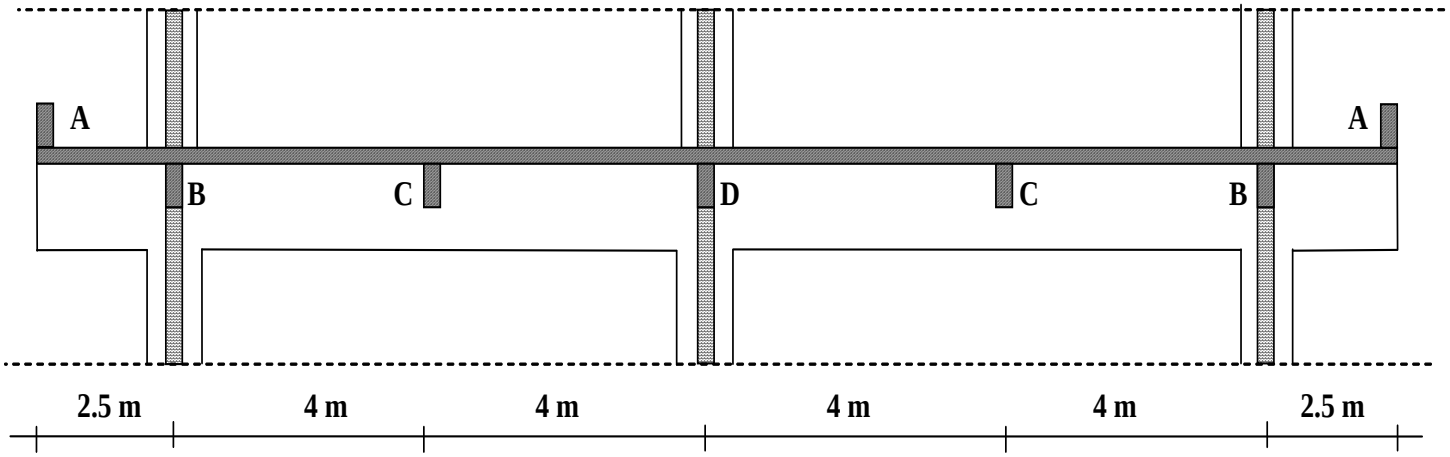
* Spacing of Girders	= 5.0 m
* Number of floors	= 5 story for building1, = one story for building 2
* Story height	= 5 m for building 1 = 3.5 m for building 2
* Live load on the slabs (on H.P.)	= 3.0 KN/m^2 (assume permanent loads)
* Roof Cover	= 2.0 KN/m^2
* Slab thickness	= 120 mm
* Wall load per wall unit area	= 2.0 KN/m^2 (positions as shown in the Figures)
* Trial section of secondary beams (bxt)	= 200 x 500 mm
* Trial section of main girders (bxt)	= 350 x 800 mm
* Min. dimension of column section	= 400 mm

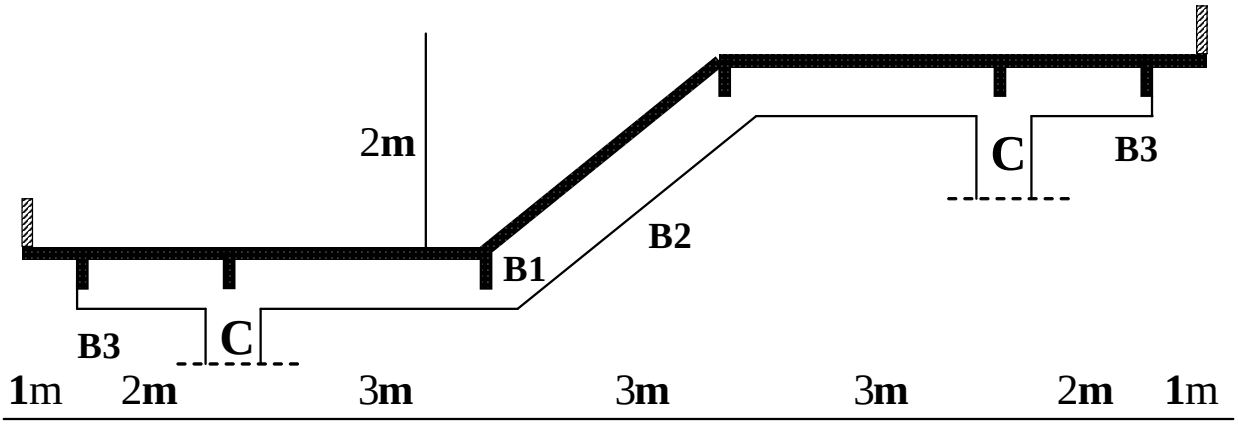
For Group 3- Shed roof

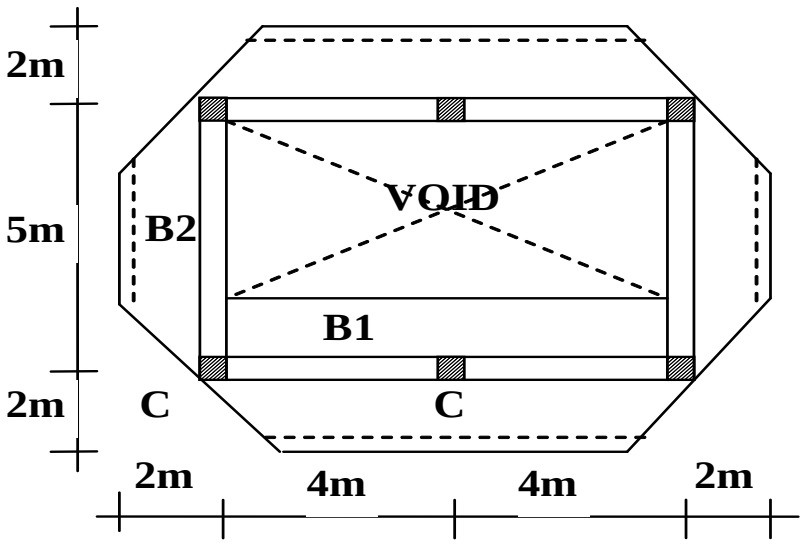
* Number of floors	= one story
* Story height	= 3.6 m
* Live load on the slabs (on H.P.)	= 2.0 KN/m^2 (assume permanent loads)
* Flooring Cover	= 2.0 KN/m^2
* Slab thickness	= 140 mm
* O.W. of wall / m^3	= 16 KN/m^3
* Thickness of walls	= 120 mm (positions as shown in the Figures)
* Walls height	= 1.0 m
* Breadth of main girders and columns	= 400 mm


B2
1m
B1
B1
1m
C
B2
5m
B3
B3
B3
B3
5m
5m
5m
5m


2m
6m
2m
1m
.75m
B2
C
B2
B2
4m
B1
B1
B1
B3
5m
4m
2m
4m


A
A
B
C
D
C
B
2.5 m
4 m
4 m
4 m
4 m
2.5 m


2m
C
B3
B2
B1
B3
C
1m
2m
3m
3m
3m
2m
1m


2m
5m
2m
B2
VOID
B1
C
C
2m
4m
4m
2m

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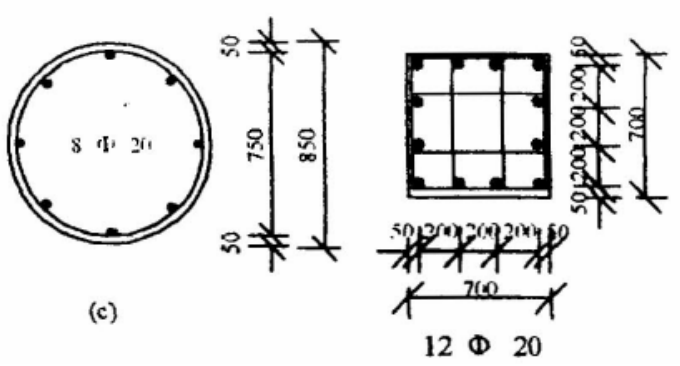
Assignment 5- Column Sections Under Biaxial Bending

[1] Calculate the ultimate load for the column cross section shown in the figure using interaction diagrams, then check your results using first principles and comment on results for $e_x = e_y$ = 400 mm.



[2] Design a square column cross section subjected to the following internal forces: $N_{D.L\ (Comp.)}$ = 2000 kN & $N_{L.L\ (Comp.)}$ = 2500 kN with $M_{x\ D.L}$ = 500 kN.m & $M_{xL.L}$ = 1000 kN.m in addition to $M_{y\ D.L}$ = 250 kN.m & $M_{y\ L.L}$ = 500 kN.m