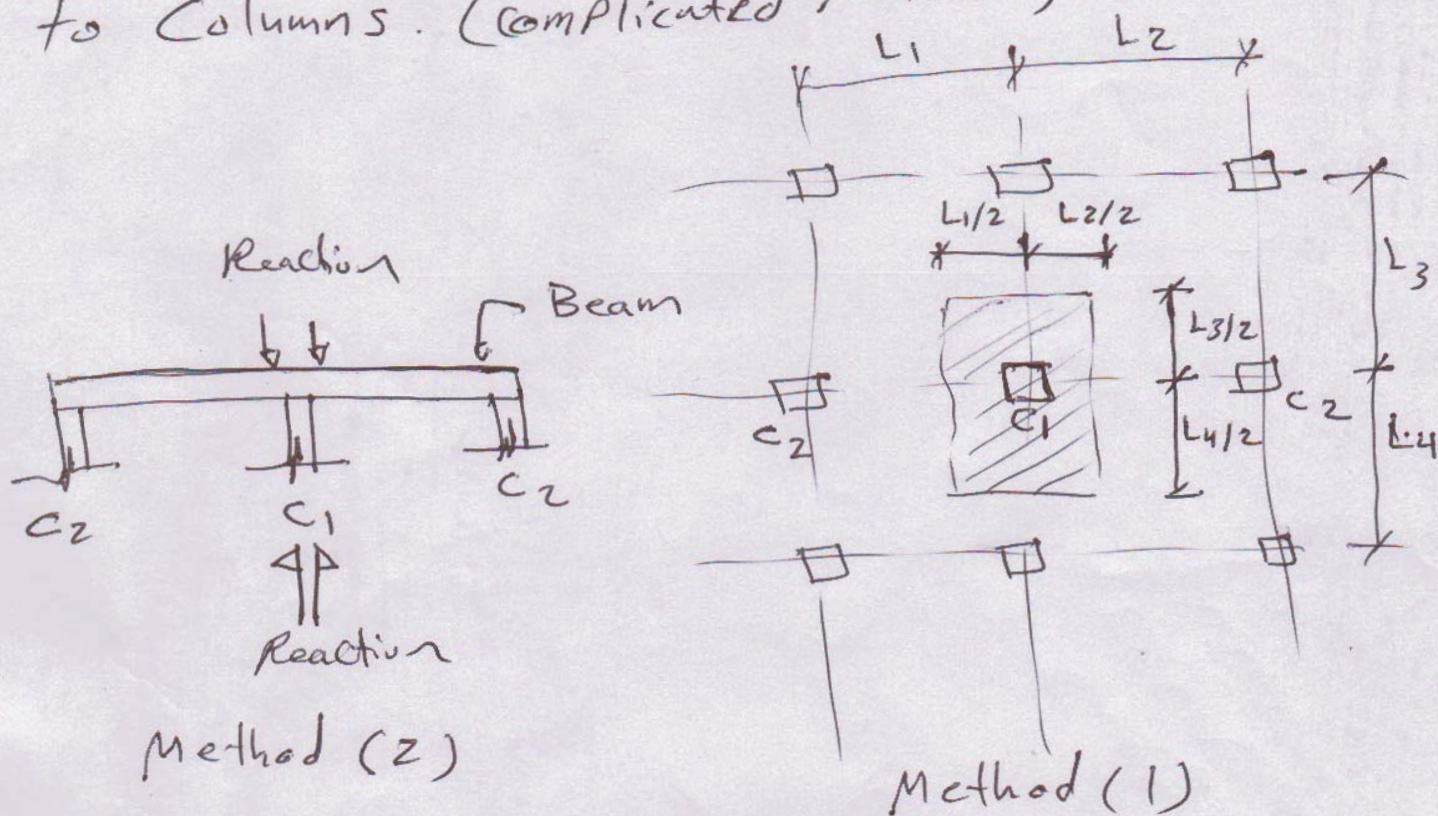


Loads on columns calculations :-

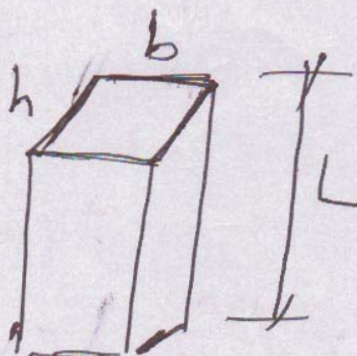
1. Method of calculation of area ^{which} applied on column.
2. Method of calculation of reaction from Beams to Columns. (Complicated method)



Columns specifications :-

Columns are compressive structural elements, ⁱⁿ which the height is greater than five times the smallest dimension of cross sectioned area.

if $L > 5 * b$ (column)



~~if $L < 5 * b$ (column)~~

* Short columns & slender columns :- ⁴

Check the following:-

$$\lambda_b = \frac{H_e}{b} \quad , \quad \lambda_i = \frac{H_e}{i}$$

$i = 0.3b$ (rectangular section)

$i = 0.25D$ (circular section)

$H_e =$ Effective height of column.

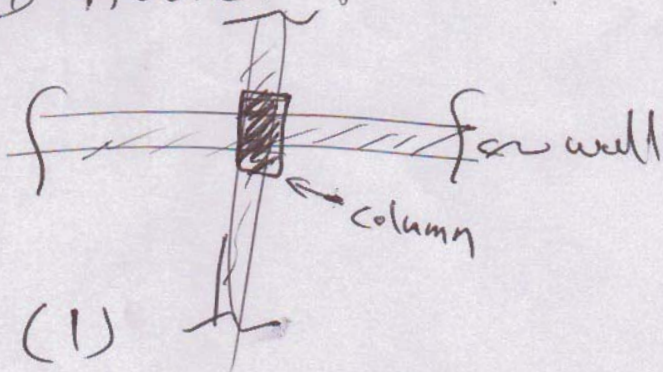
$b =$ width of column cross-section.

$D =$ Diameter of circular column.

<u>Case of column</u>	λ_b	λ_i
Braced	15	50
un braced	10	35

* Columns Placing in drawings :-

- ① Put in intersection of walls
- ② Begining with repeated floors.
- ③ note ~~ceet~~ orientation of columns.
- ④ Avoided of cantilever columns.



6

Notes on Columns :-

- 1 - Minimum longitudinal reinforcement ratio is 1%.
- 2 - Maximum longitudinal reinforcement ratio 6%.
- 3 - The column should be contained on bar in each corner.
- 4 - Minimum bar diameter 12 mm as longitudinal reinforcement -
- 5 - Minimum dimension of cross-sectional area of rectangular column is (200 mm) -
- 6 - Maximum distance between longitudinal bars at corners (30 cm). If the distance greater than 30 cm intermediate bars shall be put with distances not more than 25 cm -
- 7 - The column of circular cross-sectional area min. steel bars ~~number~~ number is (6).
- 8 - The ~~distance~~ ^{spacing} between longitudinal bars shall be not more than 15 cm without ties; if more than 15 cm, ~~the~~ ties shall be used -
- 9 - The distance between ties should be not more than the following :-

a - Fifteen times the smallest bar diameter of longitudinal bars.

b - Minimum dimension of column, but not more than 20 cm.

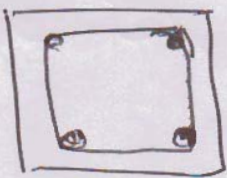
10 - Minimum diameter of tied bars is one fourth of maximum bar diameter of longitudinal bars, but not less than 8 mm.

11 - The ties shall be continue to beams connected with columns.

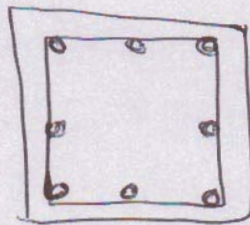
12 - For spiral column the spacing between 3-8 cm.

13 - The development length for lap splices of columns shall be not less than 40ϕ .

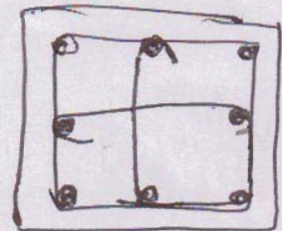
14 - The column has ~~smallest diameter~~ $h < 5b$;
if $h > 5b$ considered RC wall.



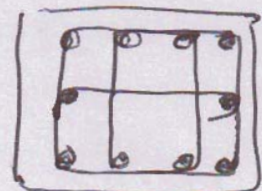
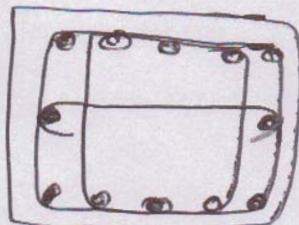
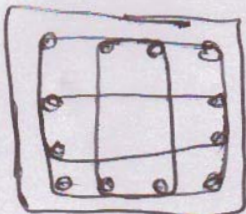
Spacing $< 30\text{cm}$



Spacing $< 15\text{cm}$

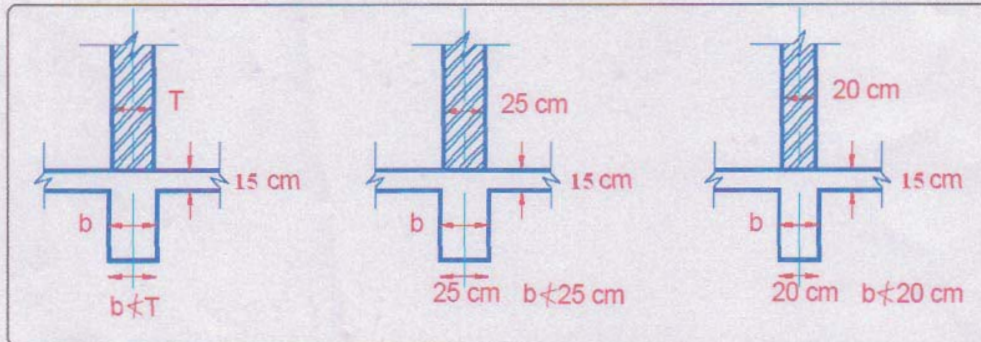


Spacing $> 15\text{cm}$



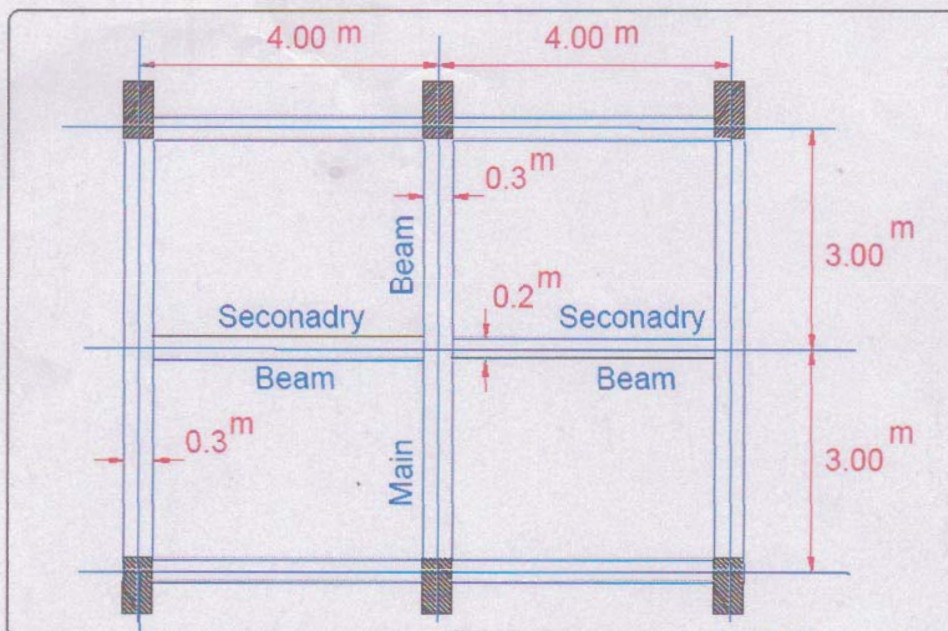
Functionality of Beams:

- 1- Placing under the walls to avoid excessive deflections .
- 2- Placing over the walls for supporting and linteling.
- 3- Divided the reinforced concrete slabs of large area to be in a suitable thickness.
- 4- Connect the columns together to get best moment distribution.
- 5- Reduce the buckling length of columns.



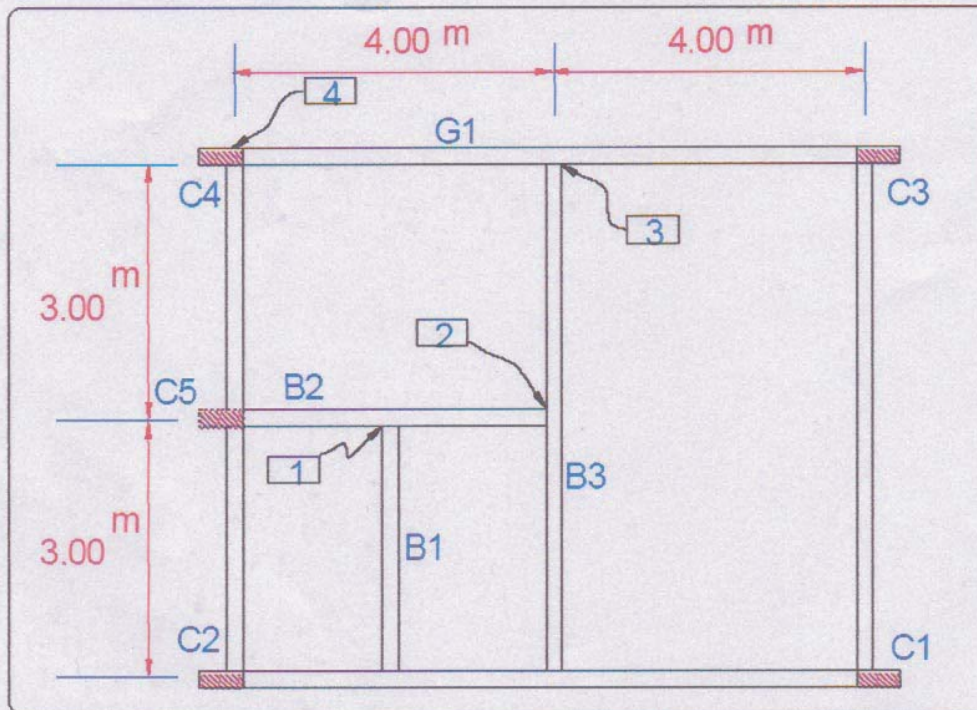
Types of Beams:

- 1- Main girders.(load carrier)
- 2- Secondary beams.(load transferor)



Beams distribution:

- 1- The following figure showed a wrong distribution of secondary beams, because there are three secondary beams loaded on each other (B1 & B2 & B3), then the load transmit to the main beam.



- 2- Circumference columns (Corners and edges) must be connected to each other by beams.
- 3- Avoid the loop of loading, or interior cantilever in beams distribution.

