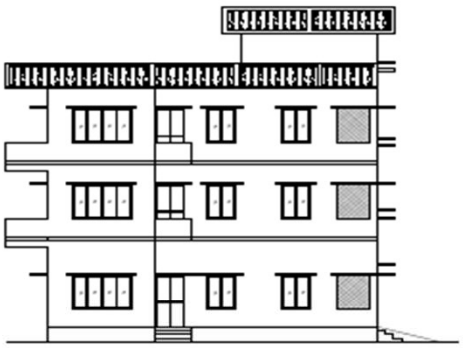
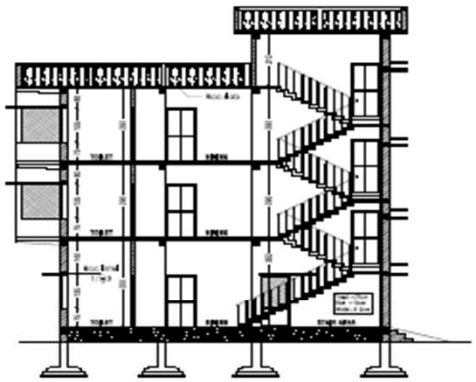
Column Design:

Typical Building Plan

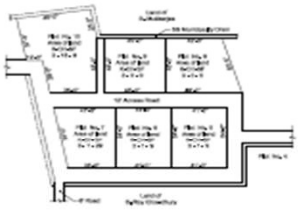
FRONT ELEVATION



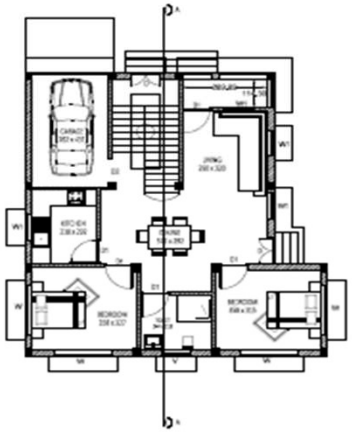
RIGHT SIDE ELEVATION



SECTION AA

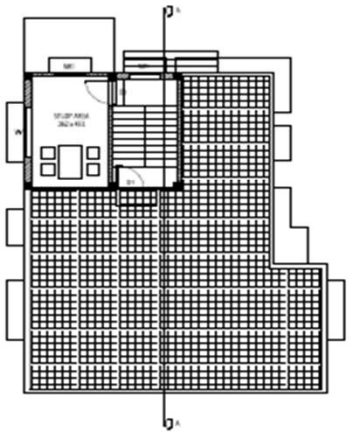


Site Layout

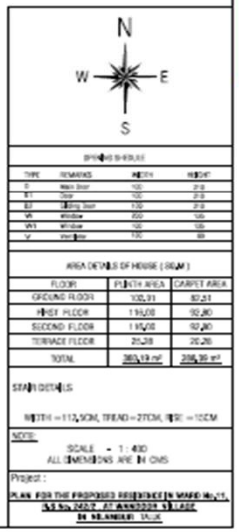


GROUND FLOOR PLAN

TYPICAL FLOOR PLAN



TERRACE FLOOR PLAN

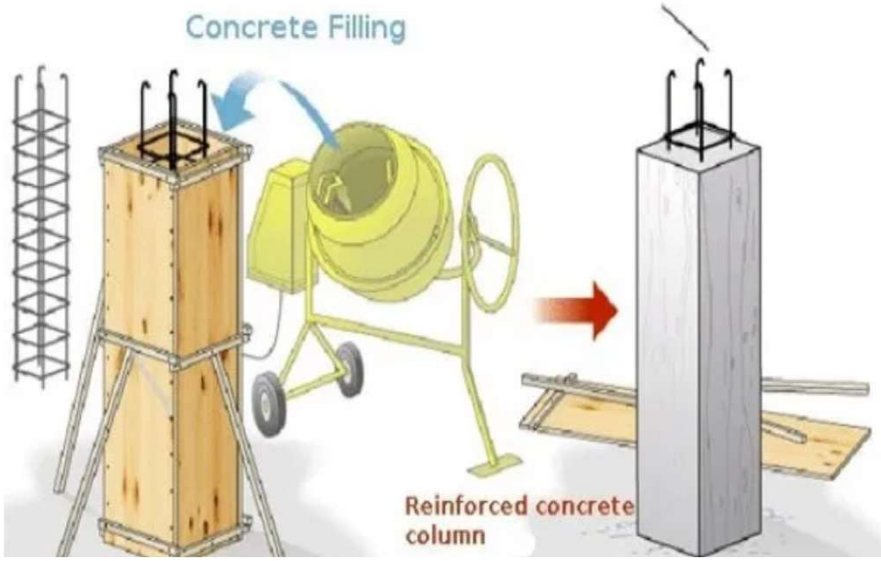


Caution: Don't copy this plan for your project.

Important Points for Column Design:

Compression member, also subjected to bending and shear

- Definition of Column/Strut as per IS 456 Clause 25.1.1 - Column or strut is a compression member, the effective length of which exceeds three times the least lateral dimension.
- Slenderness Ratio = $\frac{Effective\ length}{Least\ Lateral\ Dimension}$
- For Short Column: $\frac{L_{ex}}{D} < 12\ and\ \frac{L_{ey}}{b} < 12$
- For Long Column: $\frac{L_{ex}}{D} > 12\ or\ \frac{L_{ey}}{b} > 12$



- Stress of Steel In compression :

Mild Steel=130N/mm^2 Fe415/Fe500 =190N/mm^2

Important Points for Column Design:

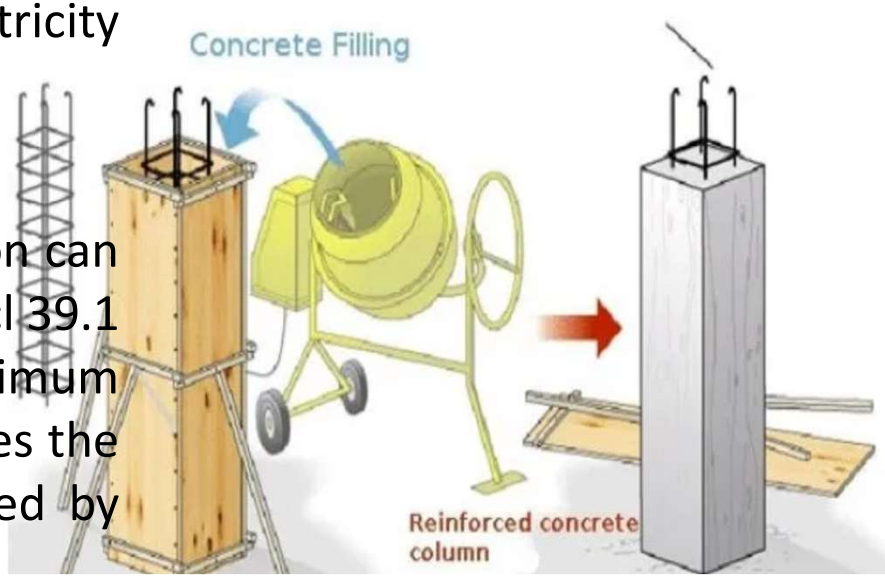
Compression member, also subjected to bending and shear

- Clause 25.5: All columns shall be designed for minimum eccentricity, equal to the unsupported length of column/500 plus lateral dimensions/30, subject to a minimum of 20mm. Where bi-axial bending is considered, it is sufficient to ensure that eccentricity exceeds the minimum about one axis at a time.

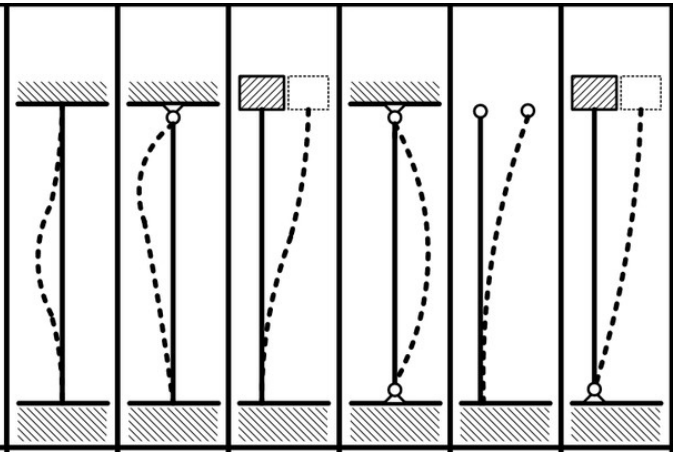
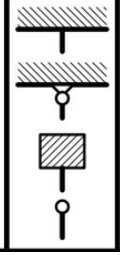
  $e_{min} = \frac{l_{uns}}{500} + \frac{b}{30}$ or 20mm which ever is higher.

- Design of axially loaded Member with compression can be designed considering the assumption given in cl 39.1 and the minimum eccentricity. When the minimum eccentricity as per 25.4 does not exceed 0.05 times the lateral dimension, the members may be designed by the following equation.

$$P_u = 0.4 * f_{ck} A_c + 0.67 * f_y A_{sc}$$



Important Points for Column Design:

Buckled shape of column shown by dashed line						
Theoretical K value	0.5	0.7	1.0	1.0	2.0	2.0
Recommended design value K	0.65	0.80	1.2	1.0	2.10	2.0
End condition key		Rotation fixed and translation fixed Rotation free and translation fixed Rotation fixed and translation free Rotation free and translation free				

Permissible stress in compression		
Grade of concrete	**Bending(σ_{cbc})**	**Direct (σ_{cc})**
M20	7	5
M25	8.5	6
M30	10	8
M35	11.5	9
M40	13	10
M45	14.5	11

Euler's Formula $f_{cr} = \frac{\pi^2 EI}{l_{eff}^2}$

Buckling is an instability that must be avoided

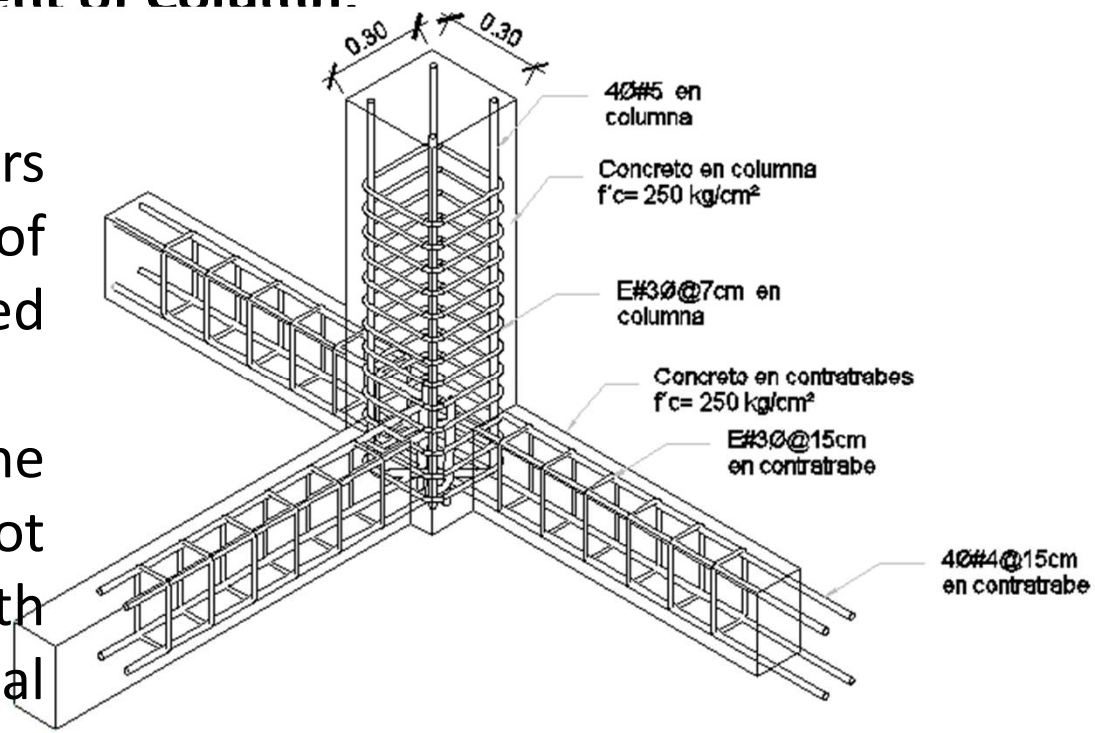
$f_{cr} = \frac{\pi^2 E_T}{\left(\frac{K l_{eff}}{r}\right)^2}$

Design of Longitudinal Reinforcement of Column:

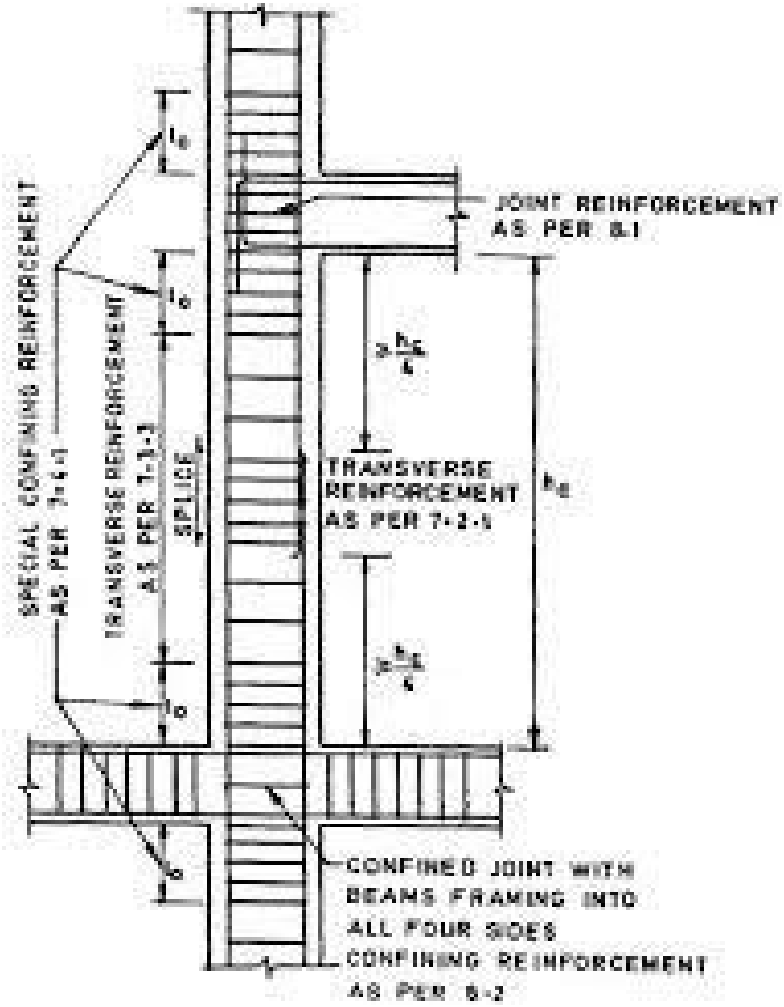
- Cl26.5.3 – The cross-sectional area of longitudinal reinforcement, shall be not less than 0.8% nor more than 6 percent of the gross cross- sectional area of the column.
- In any column that has a larger cross-sectional area than that required to support the load, the minimum percentage of steel shall be based upon the area of concrete required to resist the direct stress and not upon the actual area.
- The minimum number of longitudinal bars provided in column shall be 4 in rectangular columns and 6 in circular columns.
- The bars shall not be less than 12 mm in diameter.
- A reinforced concrete column having helical reinforcement shall have at least six bar of longitudinal reinforcement within the helical reinforcement.

Design of Longitudinal Reinforcement of Column:

- Spacing of longitudinal bars measured along the periphery of the column shall not exceed 300mm.
- In case of pedestals in which the Longitudinal reinforcement is not taken in account in strength calculations, nominal longitudinal reinforcement not less than 0.15 percent of the cross-sectional area shall be provided.



IS13920 for Ductility Design



List of checks:

1. Check foe slenderness ratio (Cl25.1.2, Table 28)
2. Check for minimum eccentricity (Cl25.4)
3. Check against bending capacity (Cl39.3)
4. Check against shear to provide lateral ties (Cl 26.5.3.2)