Structural Engineering Series by Structure Pedia

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Computing Dead Load

Concept and Theory

Dead Load shall be calculated on the basis of unit weights which shall be established taking into consideration the materials specified for construction.

Materials	Unit weight KN/m3
Brick Masonry	19
Reinforced concrete	25
Plain Concrete	23.5
Sand	17-19
Steel	76.5
Plaster	20

Common Loading for Residential Building

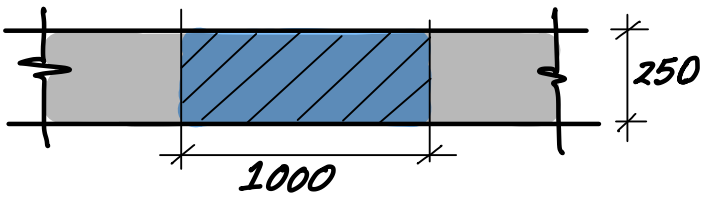
Type	Floor Finish	Live Load
Roof	1.5 KN/m2	1.5 KN/m2
Floor	1.0 KN/m2	2.0 KN/m2
Bathroom	2.5 KN/m2	2.0 KN/m2
Loft	0.75 KN/m2	2.0 KN/m2
Balcony	1.0 KN/m2	3.0 KN/m2
Stair	1.0 KN/m2	3.0 KN/m2
Services	0.25 KN/m2	

Dead Load of Slab is computed based on per unit width. For example, we need to design slab of depth 250 mm. Considering table above unit weight of reinforced concrete is 25 kN/m3.

To calculate dead load of slab, depth would be 250mm and width would be 1000mm.

Dead load of slab = 25 x 0.25 x 1 = 6.25 kN/m

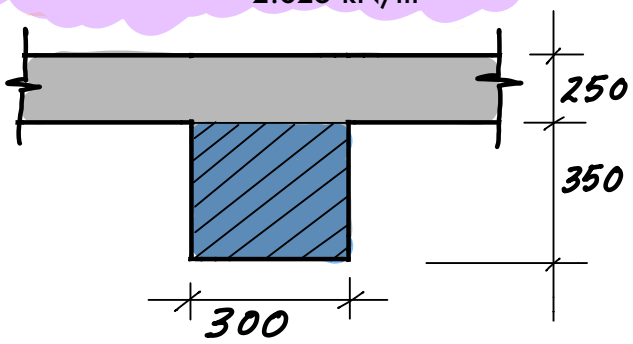
Here slab will be designed as beam having width 1000mm and depth 250mm.



Dead Load of beam is computed based on the cross section of beam but we need to subtract slab depth from the beam depth to avoid double count of slab weight.
For example, we need to design beam of depth 600 mm and width 300 mm. Considering table above unit weight of reinforced concrete is 25 kN/m3.

To calculate dead load of beam , depth would be 350 mm (subtract 250 mm from 600 mm) and width would be 300 mm.

Dead load of beam = 25 x 0.35 x 0.3
= 2.625 kN/m



Dead Load of Column is computed based on the cross section of column and length of column shall be considered from soffit of top floor to top face of bottom floor. Considering table above unit weight of reinforced concrete is 25 kN/m3.

To calculate dead load of column , cross section of column is 230 x 230 mm and length of column is 2800 mm

Dead load of column = 25 x 0.23 x 0.23 x 2.8
= 3.703 kN

Code of practice

IS 456 (2000) : Plain and Reinforced Concrete
IS 875-1 (1987) : Code of practice for design loads - Dead Loads

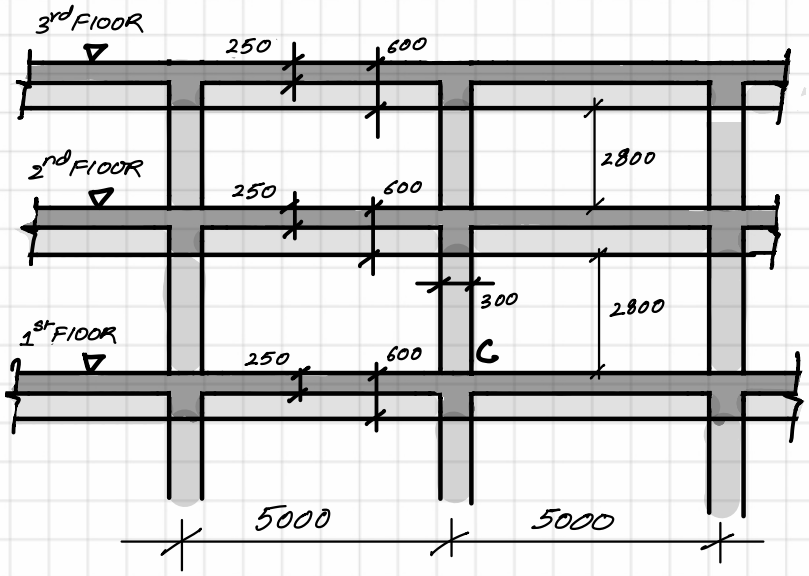
Worked Example

Building on the right has grid size of 5m x 6m. The building is constructed using the column of size 300mm x 300m and beam of size 300mm x 600mm.

Density of reinforced concrete = 25 KN/m3

Calculate the axial force at the point C (just above the 1st floor) due to self weight of the structure.

Note : Finish loading or imposed loading shall not be considered.



Grid size : 5m x 6m
Beam size : 300mm x 600mm
Column size : 300mm x 300mm
Slab depth : 250mm

SLAB DEAD WEIGHT

- Dead load of the slab due to 3rd floor = 25 x 0.25 x 5 x 6 = 187.5 KN
- Dead load of the slab due to 2nd floor = 25 x 0.25 x 5 x 6 = 187.5 KN

BEAM DEAD WEIGHT

- Beam dead load due to 3rd floor along 6m length
= 25 x 0.3 x (0.6-0.25) x (6-0.3) = 14.9625 KN
- Beam dead load due to 3rd floor along 5m length
= 25 x 0.3 x (0.6-0.25) x (5-0.3) = 12.3375 KN

- Beam dead load due to 2nd floor along 6m length
= 25 x 0.3 x (0.6-0.25) x (6-0.3) = 14.9625 KN
- Beam dead load due to 2nd floor along 5m length
= 25 x 0.3 x (0.6-0.25) x (5-0.3) = 12.3375 KN

COLUMN DEAD WEIGHT

Column weight from 2nd to 3rd floor = 25 x 0.3 x 0.3 x 2.8 = 6.3 KN
Column weight from 1st to 2nd floor = 25 x 0.3 x 0.3 x 2.8 = 6.3 KN

TOTAL

Total load at the base of column C just above first floor slab
= 187.5 + 187.5 + 14.9625 + 12.3375 + 14.9625 + 12.3375 + 6.3 + 6.3
= 442.2 KN