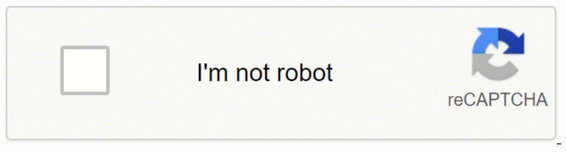

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How to calculate structural column

The total Load Calculation on Columns, Beam, Slab we must know about various loads coming on the column. Generally, the Column, Beam, and Slab arrangement are seen in a frame type of structure. In the frame structure, the load is transferred slab to beam, beam to column and ultimately it reached the foundation of the building. For load calculation of building, loads on the following elements are to be calculated, What Is Column Column length is generally 3 times their least lateral cross-sectional dimension. The Strength of any column mainly depends on its shape and size of cross–section, length, location, and position of the column. A Column is a vertical component in a building structure, which is mainly designed to carry the compressive and buckling load. The column is one of the important structural members of the building structure. As per Load coming on the column, size is increased or decreased. Frame Structure Load Calculation on Column What Is Beam The Beam is a horizontal structural member in building construction, which is designed to carry shear force, bending moment, and transfer the load to columns on both ends of it. Beam's bottom portion experiences tension force and upper portion compression force. Therefore, More steel reinforcement is provided at the bottom compared to the top of the beam. What Is Slab The slab is a level structural element of the building which provided to create a flat hard surface. These flat surfaces of slabs are utilized for making floors, roofs, and ceilings. It is a horizontal structural member whose size may vary depending upon the structure size and area and its thickness also may vary. But slab minimum thickness is specified for normal construction around 125 mm. Generally, every slab is supported by a beam, column, and wall around it. Load On Column, Beam & Slab 1) Column Self Weight X Number of floors 2) Beams Self Weight per running meter 3) A load of walls per running meter 4) The total load on Slab (Dead load + Live load + Self-weight) Besides this above loading, the columns are also subjected to bending moments that have to be considered in the final design. The most effective method for designing structure is to use advanced structural design software like ETABS or STAAD Pro. These tools are reduced laborious and consuming methods of manual calculations for structural design, this is highly recommended nowadays in the field. for professional structural design practice, there are some basic assumptions we use for structural loading calculations. Read More: Steel Quantity Calculation Excel Sheet Column Design Calculation 1. Load Calculation on Column we know that the Self–weight of Concrete is around 2400 kg/m3, which is equivalent to 240 kN and the Self–weight of Steel is around 8000 kg/m3. So, if we assume a column size of 230 mm x 600 mm with 1% steel and 3 meters standard height, the self–weight of the column is around 1000 kg per floor, which is equal to 10 kN. Volume of Concrete = 0.23 x 0.60 x 3 =0.414m³Weight of Concrete = 0.414 x 2400 = 993.6 kgWeight of Steel (1%) in Concrete = 0.414x 0.01 x 8000 = 33 kg Total Weight of Column = 994 + 33 = 1026 kg = 10KN While doing column design calculations, we assume the self–weight of columns is between 10 to 15 kN per floor. 2. Beam Load Calculation We adopt the same method of calculations for beams also. we assume each meter of the beam has dimensions of 230 mm x 450 mm excluding slab thickness. Assume each (1m) meter of the beam has dimension 230 mm x 450 mm excluding slab.Volume of Concrete = 0.23 x 0.60 x 1 =0.138m³Weight of Concrete = 0.138 x 2400 = 333 kgWeight of Steel (2%) in Concrete = 0.138 x 0.02 x 8000 = 22 kgTotal Weight of Column = 333 + 22 = 355 kg/m = 3.5 KN/m So, the self-weight will be around 3.5 kN per running meter. 3. Wall Load Calculation we know that the Density of bricks varies between 1500 to 2000 kg per cubic meter. For a 6 inch thick Brick wall of 3–meter height and a length of 1 meter, The load / running meter to be equal to 0.150 x 1 x 3 x 2000 = 900 kg, which is equivalent to 9 kN/meter. This method can be adopted for load calculations of Brick per running meter for any brick type using this technique. For aerated concrete blocks and autoclaved concrete blocks, like Aerocon or Siporex, the weight per cubic meter is between 550 to 700 kg per cubic meter. if you are using these blocks for construction, the wall loads per running meter can be as low as 4 kN/meter, use of this block can significantly reduce the cost of the project. 4. Slab Load Calculation Let, Assume the slab has a thickness of 125 mm. So, the Self–weight of each square meter of the slab would be = 0.125 x 1 x 2400 = 300 kg which is equivalent to 3 kN. Now, If we consider the Finishing load to be 1 kN per meter and superimposed live load to be 2 kN per meter. So, from the above data, we can estimate the slab load to be around 6 to 7 kN per square meter. 5. The Factor of Safety In the end, after calculating the entire load on a column, do not forget to add in the factor of safety, which is most important for any building design for the safe and convenient performance of the building during its design life duration. This is important when Load Calculation on Column is done. As Per IS 456:2000, the factor of safety is 1.5. how to calculate the load of a building pdf download How to Calculate Column Size For Building A column is one of the important elements of any building structure. The column size for the building is calculated as per load coming on the column from the superstructure. For buildings with heavy loading conditions, the column size is increased. The column size is an important factor while designing any building structure. Difference column sizes used in building design, 9″ x 9″9″ x 12″12″ x 12″ 12″ x 15″15″ x 18″18″ x 18″20″ x 24″As per Structural load more size can be used. For Column size calculation we required the following data, Grade of SteelGrade of ConcreteFactored Load on Column (Note: Minimum size of the column should not be less than 9″ x 9″ (230 mm x 230 mm) The following are column design calculations steps to decide the size of the column for the building. Pu = 0.4 fck Ac + 0.67 fy Asc (Clause No: 39.3 Page No: 71 IS 456:2000) Pu = Axial Load on Column fck = Characteristics compressive strength of concrete Ac = Area of Concrete fy = Characteristics Tensile strength of concrete Asc = Area of Steel Reinforcement Ac = Ag – Asc Asc = 0.01 Ag Ac = 0.99 Ag Where Ag = Gross Area of Column Consider 1% of Steel in Column, Ac = Ag – Asc Example: Design an RCC square short column subjected to an axial compressive load of 600 KN. The grade of concrete is M -20 and the Grade of steel is Fe -500. Take Steel 1% and Factor of safety = 1.5. Pu = 600 KN, fck = 20 N/mm2, fy = 500 N/mm2, Steel = 1%, Factor of Safety = 1.5 RCC Column Pu = Axial Compressive Load on Column = 600 KN Factored load on column = Pu = 600 x 1.5 = 900 KN Pu = 0.4 fck Ac + 0.67 fy Asc 900 x 103 = 0.4 x 20 x (0.99 Ag) + 0.67 x 500 x (0.01 Ag) 900 x 103 = 7.92 Ag + 3.35 Ag 900 x 103 = 11.27 Ag Ag = 79858 mm2 For Square Column, Size of Column = √79858 Size of Column = 282.59 mm Provide square column size 285 mm x 285 mm Ag = Provided = 81225 mm2 Asc = 0.01 Ag = 0.01 x 81225 Asc = 812.25 mm2 RCC Column Design Section Provide 8 Nos of 12 mm Dia steel with an area of steel = 905 mm2 The size of the column for 600 KN load is 285 mm x 285 mm (12″ x12″) Watch Video: Load Calculation on Column Factors contributing to the total load of the beam are the Weight of Concrete and the Weight of Steel (2%) in Concrete. Hence the Total Weight of the beam = Weight of Concrete + Weight of Steel.The Approximate load of a beam of size 230mm x 450mm is around 3.5 KN/m. Generally, the slab has a thickness of 125 mm. So, the Self-weight of each square meter of the slab would be the product of the thickness of the slab and per meter square load of concrete which is estimated at around 3KN. Consider the Finishing load and superimposed live load, The total slab load will be around 6 to 7 kN per square meter. Wall Load Calculation:1. The density of brick walls with mortar is in the range of 1600-2200 kg/m3. So we will consider the self-weight of the brick wall as 2200 kg/m3 2. We will consider dimensions of brick wall as Length = 1 meter, Width = 0.152 mm, and Height of = 2.5 meter, Hence Volume of wall = 1m× 0.152 m× 2.5 m = 0.38 m33. Calculate the dead load of brick wall, which will be equal to, Weight = volume × density, Dead load = 0.38 m3 × 2200 kg/m3 = 836 kg/m4. Which is equal to 8.36 kN/m is the dead of the brick wall. A Column is a vertical component in a building structure, which is mainly designed to carry the compressive and buckling load. The column is one of the important structural members of the building structure. As per Load coming on the column, size is increased or decreased. Calculation of Dead load for Building= Volume of member x Unit weight of materials.It is done by simply calculating the accurate volume of each member and multiplying by the unit weight of the respective materials from which it is composed, and dead load can be determined for each component. Volume of Concrete = 0.23 x 0.60 x 3 =0.414m³Weight of Concrete = 0.414 x 2400 = 993.6 kgWeight of Steel (1%) in Concrete = 0.414x 0.01 x 8000 = 33 kgTotal Weight of Column = 994 + 33 = 1026 kg = 10KN 300 mm x 600 mm excluding slab thickness.Volume of Concrete = 0.30 x 0.60 x 1 =0.18 m³Weight of Concrete = 0.18 x 2400 = 432 kgWeight of Steel (2%) in Concrete = 0.18 x 2% x 7850 = 28.26 kgTotal Weight of Column = 432 + 28.26 = 460.26 kg/m = 4.51 KN/m A Column is a vertical component in a building structure, which is mainly designed to carry the compressive and buckling load. Column length is generally 3 times their least lateral cross-sectional dimension. The Strength of any column mainly depends on its shape and size of cross-section, length, location, and position of the column. Dead load = volume of member x unit weight of materials.By calculating the volume of each member and multiplying by the unit weight of the materials from which it is composed, an accurate dead load can be determined for each component. For Live Load calculation, you have to follow the permissible Live load values in IS-875. Generally, for residential building purposes, we take it 3 KN/m2. The value of LIVE LOAD is changed as a type of structure & for that, you have to see IS-875 Building Load is a summation of dead load, live load, wind load, and snow load if building location in snowfall area. Dead loads are static forces that remain the same for an extended time. They can be in tension or compression. Live loads are mostly variable or moving loads. These loads can have a significant dynamic element and may involve considerations such as impact, momentum, vibration, slosh dynamics of fluids, etc. You Might Also like:

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