Design of A G+3 Reinforced Concrete Building

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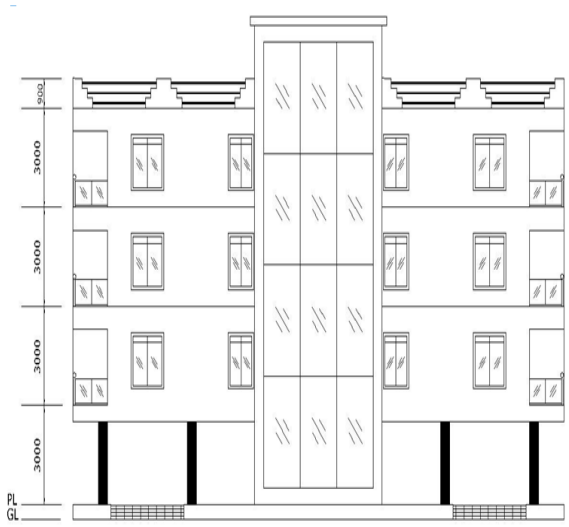
***Abstract*— Building for different purposes is created by humans since the beginning of the civilization. With the drastic development of science and technology there is a huge change occur in process of designing and constructing of a building. A Building needs to with stand all the loads acting into it by successfully transferring them to the soil so that it can be said serviceable and remain stable. Dead load that is self-weight of the building and the imposed loads are generally one of the vital loads. So a structure needs to be designed in such a manner that it can bear the vertical loads. Here we have designed a G+3 Residential Building to carry gravity loads. The design has been done as per IS 456: 2000. Reference of IS 875 part ii is taken for imposed loads.**

***Index Terms:* Civilization, Development**

1.INTRODUCTION

Building for different purposes is created by humans since the beginning of the civilization. With the drastic development of science and technology there is a huge change occur in process of designing and constructing of a building. A Building needs to with stand all the loads acting into it by successfully transferring them to the soil so that it can be said serviceable and remain stable. Dead load that is self-weight of the building and the imposed loads are generally one of the vital loads. So a structure needs to be designed in such a manner that it can bear the vertical loads. Here we have to design a G+3 Building to carry loads. The design will be done as per IS 456:2000. Reference of IS 875 Part I & II is taken for Dead & Imposed loads.

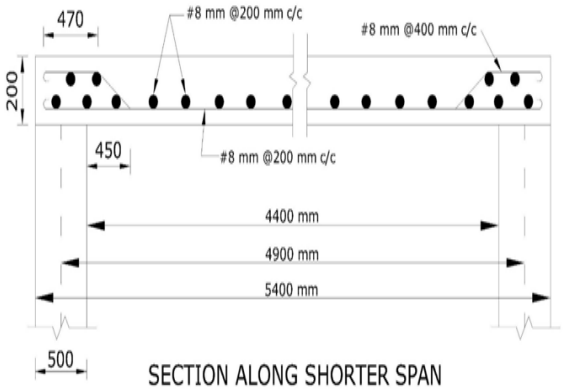
A four storied building of RCC frame need to be designed. The building is located at zone II. The Safe bearing Capacity of the soil at 2 m depth is 200 KN/m2. Considering M25 concrete and bars of Fe500grade.



FRONT ELEVATION
SCALE: 1:100
ALL DIMENSION ARE IN MM

2. DESIGN OF SLAB

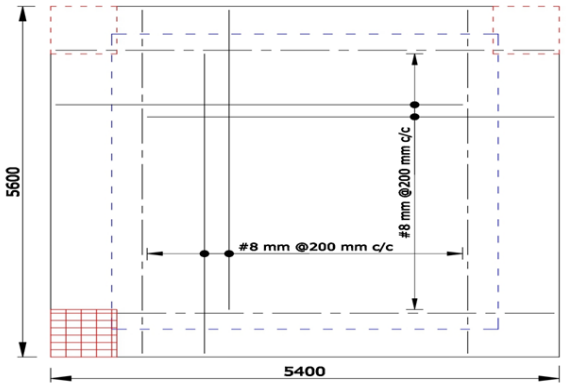
Slabs are the part of structure that provides the serviceable area. Slabs are subjected to impose loads that are the load acting on slab during utilization of the slab area. Slabs carry the entire load and transfer it to the beams. As per Is 875 part II Imposed load on slab is taken as 3 kN/m², imposed load on Balcony and Staircase is taken as 3 kN/m², For Mumty roof it is considered 0.75 kN/m². In plinth level the slabs are resting on ground so no need for design. As there are similar slabs that's why only one of similar slabs has been designed. As floors are typical that's why only one floor is designed and the same design need to apply on the typical floors. The slab panels are shown below need to be followed for design.



SECTION ALONG SHORTER SPAN

SCALE:- 1:100

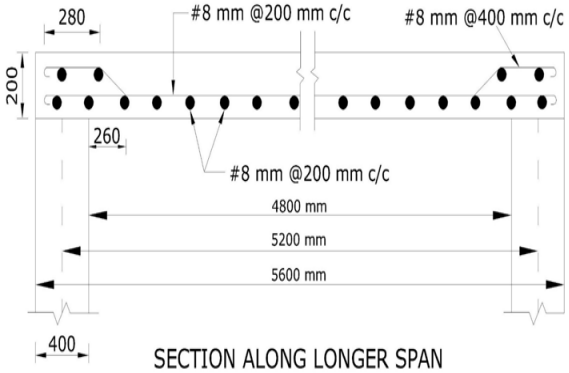
ALL DIMENSIONS ARE IN MM



BOTTOM REINFORCEMENT PLAN OF SLAB

SCALE:- 1:100

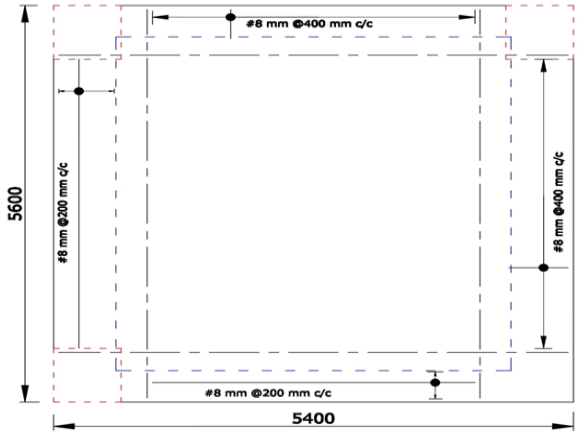
ALL DIMENSIONS ARE IN MM



SECTION ALONG LONGER SPAN

SCALE:- 1:100

ALL DIMENSIONS ARE IN MM



TOP REINFORCEMENT PLAN OF SLAB

SCALE:- 1:100

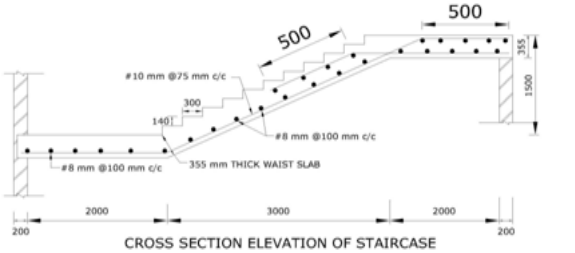
ALL DIMENSIONS ARE IN MM

Slab Reinforcement					
Slab No	Bar in X Direction at Bottom	Bar in Y Direction at Bottom	Bar in X Direction intermediate at top	Bar in Y Direction at top	Min. Reinforcement at Edge strip
Slab 1	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Slab 2	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Slab 3	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Slab 4	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Slab 5	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Slab 6	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Slab 7	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Slab 8	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @200mm c/c
Mumty Slab	8 mm ø bar @150mm c/c	8 mm ø bar @150mm c/c			8 mm ø bar @200mm c/c
Slab 10	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c		
Slab 11	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c	8 mm ø bar @400mm c/c	
Slab 12	8 mm ø bar @200mm c/c	8 mm ø bar @200mm c/c	8 mm ø bar @400mm c/c		

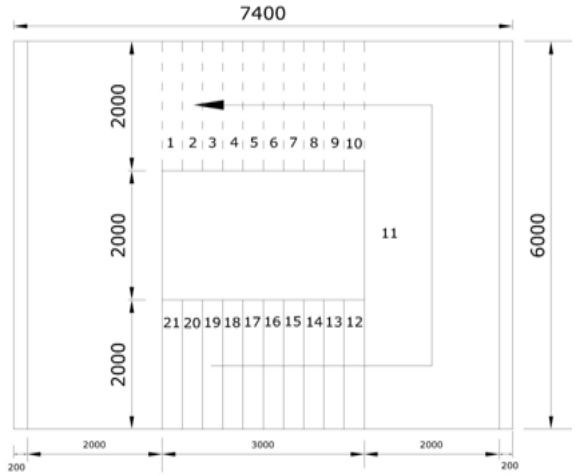
Torsional Reinforcement				
Corner Condition	Slab No	Mesh size	Reinforcement Detailing	
			In X	In Y
Three Adjacent side are discontinuous	S 8	1980×990 mm	8 mm ø bar @ 250mm c/c	8 mm ø bar @ 300 mm c/c
Three Adjacent side are discontinuous	S 1	1840×920 mm	8 mm ø bar @ 175mm c/c	8 mm ø bar @ 300mm c/c
Three Adjacent side are discontinuous	S 4	1340×670 mm	8 mm ø bar @ 180mm c/c	8 mm ø bar @ 300mm c/c
Three Adjacent side are discontinuous	S 6	1360×680 mm	8 mm ø bar @ 240mm c/c	8 mm ø bar @ 300mm c/c
Three Adjacent side are discontinuous	S 7	1840×920 mm	8 mm ø bar @ 240mm c/c	8 mm ø bar @ 300mm c/c
Three Adjacent side are discontinuous	S 3	1832×916 mm	8 mm ø bar @ 240mm c/c	8 mm ø bar @ 300mm c/c
All Four Adjacent side are discontinuous	Mumty Slab	1250×625 mm	8 mm ø bar @ 190mm c/c	8 mm ø bar @ 190mm c/c

3. DESIGN OF STAIRCASE

Staircase plays the vital role to connect a floor to another. There are different types of staircase. In our case dog legged stair case has been used. There is one staircase in our plan. The landing slab and landing beam has not designed separately, the design of floor slab and roof beams will be applicable here. As per IS 875part II live load here considered is 3 kN/m².



CROSS SECTION ELEVATION OF STAIRCASE



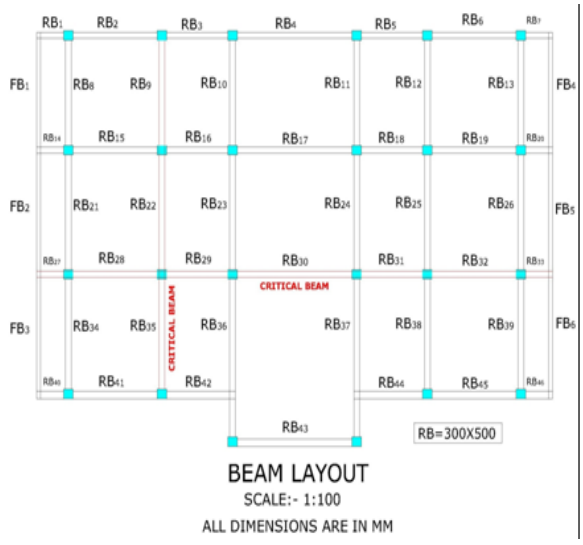
PLAN OF STAIRCASE
SCALE:- 1:100
ALL DIMENSIONS ARE IN MM

4. DESIGN OF BEAM

A horizontal member in a framed structure is known as Beam. Beam carries the load of slab, stair case and other dead loads like walls and transfer to the column. There are different types of beams like continuous, cantilever etc. In our structure only continuous beams are there. Here we have identified the critical beams and designed for that and this design will be applicable for other beams as well. The beam layout is shown here.

REFERENCE:

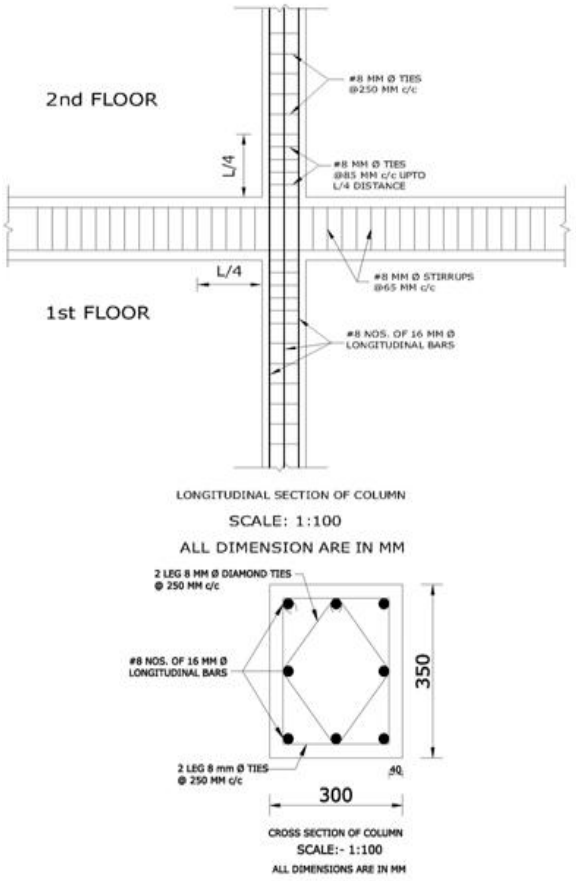
IS 456-2000 – Plain & Reinforced Concrete.
IS 875 Part I – Dead Loads.
IS 875 Part II – Imposed Loads.



BEAM LAYOUT
SCALE:- 1:100
ALL DIMENSIONS ARE IN MM

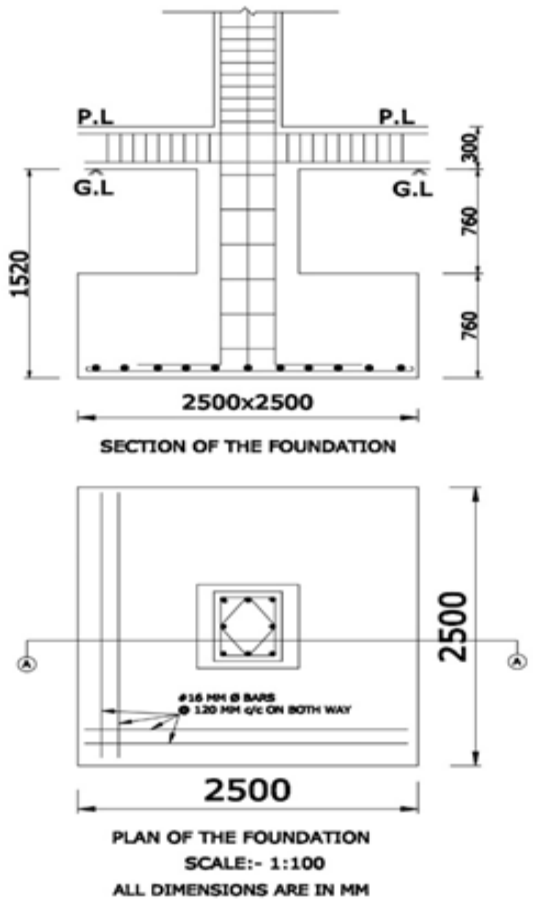
5. DESIGN OF COLUMN

The vertical members of a structure are known as column. The Role of column is to carry all the loads of beam and successfully transfer to foundation. In this project the critical column is identified in which load is maximum and designed for that load. The design of critical column is applied to other columns as well. The column layout is shown below.



6. DESIGN OF FOOTING

In any structure footing plays on of the vital roles as it transfer the load of the super structure into the ground without failing. There are basically two types of foundation shallow and deep foundation. In our case shallow foundation is needed. There is combined footing for the corridor columns and for the rest isolated square footing is used. Depth of Foundation is 2 m from ground level. For footing design the load of critical column is considered here and design is prepared for that. The same is applicable for the rest. The footing layout is shown below.



7.SCOPE OF THE PROJECT

- The scope of this project work is to design a G+3 Reinforced concrete Building.
- Study of design of various elements of building.
- Planning of various components of a building with column positioning.
- Detailing of building and the reinforcement in AutoCAD.
- Analysis and design of various structural components of the model building.
- Detailing of beams, columns and slab with section proportioning and reinforcement.

8.CONCLUSION

Here we would like to conclude the project work. From the project we have learnt many things related to structural design. We get chance to clear our various doubts regarding the work. Thus the project helps usand has significance in our academic career.

The joy of working and the thrill involved while tackling the various problems and challenges added a new dimension.
We enjoyed each and every bit of work.

REFERENCE

Code Books:-
[1] IS 456 : 2000
[2] IS 875 PART I & II
[3] SP 16