ANALYSIS AND DESIGN OF MULTI-STOREY RESIDENTIAL BUILDING G+2 USING STAADPRO.

A MINI PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

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CERTIFICATE

This is to certify that the Project Report entitled "ANALYSIS AND DESIGN OF MULTI-STOREY RESIDENTIAL BUILDING G+2 USING STAADPRO" that is being submitted by

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in partial fulfillment of the requirement for the award of B.Tech in Civil Engineering to the **RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)**, Nandyal (Affiliated to J.N.T University, Anantapur) is a bonafide record of confide work carried out by them under our guidance and supervision. The results embodied in this project report have not been submitted to any other university or institute for the award of any Degree.

Signature of Guide

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Examiner:
Date:

Dedicated to my beloved parents, and teachers who have worked hard throughout my education.

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ABSTRACT

Structural Analysis is a branch which involves in the determination of behaviour of structures in order to predict the Responses of real structures such as buildings, bridges, trusses etc.Increasing of expected loading and external environment during the service life of structures. The principle objective of this project is the comparative study on analysis and design of Multi-storey Residential building by using STAAD Pro. software. STAAD Pro. is one of the leading softwares for the design of Structures. In this project, we have done Analysis and Design for the residential building to find the shear forces, bending moments, deflections and reinforcement details for the structural components of building (such as Beams, Columns and Slabs) to develop the economic design.

KEYWORDS: AUTOCAD, STAAD PRO.

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Chapter 1

INTRODUCTION

1.1 GENERAL

A Building is a structure with a roof and walls standing more or less permanently in one place, such as a House or Factory. Buildings constructed in a variety of sizes, shapes and functions from building materials available. Buildings serve several societal needs primarily as shelter from weather, security, living space, privacy, to store belongings, and to comfortably live and work).

There are several types of buildings based on their purpose of use.

1.1.1 Residential Buildings

These building include any building in which sleeping accommodation provide for normal residential purposes, with or without cooking and dining facilities. It includes single or multi-family dwellings, apartment houses, lodgings or rooming houses, restaurants, hostels, dormitories and residential hostels.

1.1.2 Educational Buildings

These include any building used for school, college or day-care purposes involving assembly for instruction, education or recreation and which is not covered by assembly buildings.,

1.1.3 Institutional Buildings

These buildings are used for different purposes, such as medical or other treatment or care of persons suffering from physical or mental illness, diseases or infirmity, care of infants, convalescents or aged persons and for penal detention in which the liberty of the inmates is restricted. Institutional buildings ordinarily provide sleeping accommodation

for the occupants..

1.1.4 Assembly Buildings

These are the buildings where groups of people meet or gather for amusement, recreation, social, religious, assembly halls, city halls, marriage halls, exhibition halls, museums, places of work ship, etc.

1.1.5 Business Buildings

These buildings are used for transaction of business, for keeping of accounts and records and for similar purposes, offices, banks, professional establishments, courts houses, libraries. The principal function of these buildings is transaction of public business and keeping of books and records.

1.1.6 Marcantile Buildings

These buildings are used as shops, stores, market, for display a sale of merchandise either wholesale or retail, office, shops, storage service facilities incidental to the sale of merchandise and located in the same building.

1.1.7 Industrial Buildings

These are buildings where products or materials of all kinds and properties are fabrication, assembled, manufactured or processed, as assembly plant, laboratories, dry cleaning plants, power plants, pumping stations, smoke houses, laundries etc.

1.1.8 Storage Buildings

These buildings are used primarily for the storage or sheltering of goods, wares or merchandise vehicles and animals, as ware houses, cold storage, garages, trucks.
In this Project a Residential building is designed. Residential Buildings are can be constructed based on the size of the site and Economy of the people such as High class, Middle class and Low-class people. In this project a Residential Building facilitated with all required rooms such as living room, Kitchenetc with required plot size is designed.

1.2 Vastu Shastra

Vastu shastra is a traditional Hindu system of architecture which literally translates to science of architecture. These are texts found on the Indian subcontinent that describe principles of design, layout, measurements, ground preparations, space arrangements a spatial geometry. Vastu shastras incorporate traditional Hindu and in some cases Buddhist beliefs. The designs are intended to integrate architecture with nature the relative functions of various parts of the structure, and ancient beliefs utilizing geometric patterns, symmetry and directional alignments.

1.2.1 Vastu Parameters

The following are the vastu parameters considered for the placements of rooms in different positions.

- Main Door entrance facing in North, North East, East or West.
- Pooja Room in North East or East direction.
- Kitchen should be in South East.
- Store Room should be placed in South.
- Bed Rooms should be placed in South, South West or West.
- Bathrooms should be placed in West, South or North West.
- Water Closet should be placed facing North or South direction.

1.3 Softwares Used

The following software are used for the design of residential building in this project.

- AUTOCAD Software
- STAAD PRO Software

1.3.1 AUTOCAD

AUTOCAD is a commercial computer-aided design (CAD) and drafting software application. Developed and marketedby AutoCAD was first released in December 1982 as a desktop app running on microcomputers with internal graphics controllers. Before AutoCAD was introduced, most commercial CAD programs ran on mainframe computers or minicomputers, with each CAD operator (user) working at a separate graphics terminal.AutoCAD is used across a wide range of industries, by architects, project managers,

engineers, graphic designers, and many other professionals.The main use of AUTOCAD software is to draw or drafting the plan, elevation and sections of structures in 2D or 3D view.For the present project AUTOCAD is used for representing the plan of considered Residential Building.

1.3.2 STAADPRO

STAAD or (STAAD. Pro) is a structural analysis and design computer program originally developed by Research Engineers International at Yorba Linda, CA in 1997. In late 2005, Research Engineers International was bought by Bentley Systems. The commercial version, STAAD .PRO, is one of the most widely used structural analysis and design software products worldwide. It supports several steels, concrete and timber design codes. The design of considered Residential Building design is done with the help of STAADPRO software.

Chapter 2

LITERATURE REVIEW

- M. Mallikarjun, Dr. P.V. Surya Prakash (2016): Carried study on analysis and design of a multi-storeyed Residential Building of using G+10 by using most economical column method and the dead load and live load was applied on the various structural component like slabs, beams and found that as the study is carried using most economical column method this was achieved by reducing the size of columns at top floors as load was more at the bottom floor. The economizing was done by means of column orientation in longer span in longer direction as it will reduce the amount of bending and the area of steel was also reduced.

- P. Chandurkar et al (2013): Had presented study of G+9 building having 3 meters height for each storey. The whole building design had carried out according to IS code for seismic resistance design and the building had considered fixed at base. Structural element for design had assumed as square or rectangular in section. The had done modelling of building using ETABS software in that four different models were studied with different positioning of shear walls.

- Ismail sab, Prof.S.M. Hashmi (2014): Generated 3D analytical model of twelve storeyed buildings for different buildings models and analysed using structural analysis tool ETABS. To study the effect of in fill, ground soft, bare frame and models with ground soft having concrete core wall and shear walls and concrete bracings at different positions during earthquakes; seismic analysis using both linear static, linear dynamic (response spectrum method) has been performed the analytical model of the building includes all important components that influence the mass, strength, stiffness and deformability of the structure.

By referring these Reviews, the Residential Building is designed accordingly and presented using STAAD .PRO software.

Chapter 3

Surveying

3.1 General

This article is about measuring positions on Earth. Surveyor, work with an infrared reflector used for distance measurement. Surveying or land surveying is the technique, profession, and science of determining the terrestrial or three-dimensional position of points and the distances and angles between them. A land surveying professional is called a land surveyor. These points are usually on the surface of the earth, and they are often used to establish land maps and boundaries for ownership, locations like building corners or the surface location of subsurface features, or other purposes required by government or civil law, such as property sales. Surveyors work with elements of geometry, trigonometry, regression analysis, physics, engineering, metrology, programming languages and the law. They use equipment like total stations, robotic total stations, GPS receivers, retroreflectors, 3D scanners, radios, hand held tablets, digital levels, drones, GIS and surveying software. Surveying has been an element in the development of the human environment since the beginning of recorded history. The planning and execution of most forms of construction require it. It is also used in transport, communications, mapping, and the definition of legal 9 boundaries for land ownership. It is an important tool for research in many other scientific disciplines. The most used type of surveying is Reconnaissance survey.

3.2 Reconnaissance Survey

Reconnaissance survey is defined as an examination of all or part of an area accomplished in sufficient detail to make generalizations about the types and distributions of historic properties that may be present within a given project area. Reconnaissance surveys represent a type of field survey that is often used to gather initial information regarding the presence or absence of historic properties within a project area. Reconnaissance surveys generally include limited shovel testing in areas that

are likely to contain archaeological resources.
For this project the site is considered as it satisfies all the Reconnaissance survey rules.

Chapter 4

Planning of a Building

Planning is a projected course of action and through planning we can achieve goal. Planning is deciding in advance what to do, how to do it, when to do it and who to do it.

4.1 Stages in structural planning

Once the type of structure is finalized and planned, design of structure involves the corresponding stages in the planning. This is the main stage which decides the total.

(a) Column positioning

(b) Orientation of columns

(c) Beam location

(d) Spanning of slabs

(e) Lay out and planning of stairs and

(f) Type of footing

4.1.1 Column positioning

There are some principles which help in deciding the positioning of columns, are:

- A column or pillar is a structural element that transmits the weight of the structure through compression from above to other structural elements below. For the purpose of wind or earthquake engineering, column design plays a crucial role to resist lateral forces.
- These should preferably locate at or near the corner of building and at intersections of walls, because basically the function of the column is to support beams, which are normally placed under the walls to support them.

- Columns should be avoided inside a big hall as it mars the functional utility and the appearance and obstructs the clear view and usable space too. ?When the centre distance between the intersection of walls is large or where there are not cross wall, the spacing between the two columns is governed by limitations on span of the beam. As the span of the beam increases. Therefore, large spans of beam should be avoided for economy reasons and from the considerations of controlling the deflection and cracking.
- Large spacing of column not only increases the span and the cost of the beams but it increases the load on the column at each floor posing problem of stocky column in lower multi-storeyed building.

4.1.2 Orientation of columns

Generally, columns provided in a building are rectangular with width of column not less than the width of the supported beam for effective load transfer. The following guidelines can be useful for deciding the orientation of columns.

- According to requirements of utility, projection of column outside the wall, in the room should be avoided as they not only give bad appearance but also obstruct the usage of corners and create the problems in placing furniture flush with the wall. The depth of column shall be in the plane of the wall to avoid such offsets.
- When a column is rigidly connected to beams at right angles. Columns are required to carry moments in addition to axial load in such cases, the column should be so oriented that the depth of column perpendicular to the major axis of building so as to get moment resisting capacity.
- Also, when the effective length of the column in one place is greater than that in other plane at right angles, the greater dimension shall be in the plane having larger effective length.

As the buildings get deformed in longer direction due to wind loads and earthquake loads, for the considered plan column is oriented as the columns less width is provided in longer direction of building and vice versa.

4.1.3 Positions of beams

- Beams shall normally be provided under the walls or below a heavy concentrated load to avoid these loads directly coming from slabs to columns.
- Since beams are primarily provided to support slabs, its spacing shall be decided by the maximum spans of slabs.

By considering above explained note the beams are provided where the walls to be supported and designed for safe.

4.1.4 Spanning of slabs

This is decided by the positions of supporting beams or walls. When the supports are only opposite sides or only one direction, when the slab act as a one way supported slab. However, the two-way action of slab does not depend only on the manner in which it is supported but also on the aspect ratio or reinforcement in two directions and boundary conditions. For, the considered building One-way slab and Two-way slabs are provided according their span lengths.

4.1.5 Layout of stairs

The type of stair and its layout is governed by the available size of staircase room and positions of beams and column along the boundary of staircase.

Chapter 5

Dimensions and aspects of residential building

5.1 Different Rooms Provided in the Buildings

(a) LIVING ROOMS: This is the areas in Sor general se. Hence the Dining and drawing should be plated near the entrance south cast aspects. During cold day tie sus towards the south and will receive sunshine which is a welcoming feature During tumor shine it the northern side and entry of an from southern or south east aspects do not arise.

(b) KITCHEN: Eastern aspects to admit morning sun to refresh ad purify the air.

(c) READING ROOM CLASS ROOM North airports this mal sore suitable since there will be no sun from north side for most part of the year.

(d) BED ROOM: Bed room may abo be provided with attached suitable their size depends upon the number of beds, they should be located so as to give privacy and should accommodate beds, chair, cupboard, etc., and they should have north or west south west aspect.

(e) BATH and W.C.: Bath and care sally combined in one room and attached to the bed room and should be well finished. This should be Led with bath tub, shower, wash-hand basin, we, shelves, towels, racks brackets, etc., all of white glazed tiles. Floor should be mosaic or white glazed files. Instead of providing all bed room with attached bath and WC separated baths and latrines may also be provided.

(f) VERANDAH: There should verandah in the front as well as in the rear. The front verandah serves setting place for male members and weighting place for visitors. The back verandah serves a ladies apartment for their sitting, working controlling, kitchen works etc., verandah project the room against direct sun, rain and weather effect They used as sleeping place during the summer and rainy season and are used to keep various things verandah also give appearance to the building. The area of a building may vary from 10% to 20% of the building.

5.1.1 Standard dimensions of a residential building

The minimum size of the different rooms for Residential building according to National Building Code

- Standard size of drawing room ranges from: 1200mm (14ft) X 1800 mm (16ft) to 5400mm (18ftX 7200mm (24ft)
- Standard size of bedrooms may range from: 3000mm (10ft) X 3600mm (12ft) to 4200mm (14ft) X 4800mm (16ft)
- Standard size of kitchen rooms may range from: 2500mm (8ft) X 3900mm (13ft) to 3000mm (10ft) X 3600mm (12ft)
- Size of dining rooms may range from: 3600mm (12ft) X 4200mm (14ft) to 4200mm (14ft) X4800mm (16ft)
- Standard size of store room may range from 2500mm (8ft) X 2500mm (8ft) to 3000mm (10ft) X 3000nm (10ft)

Common sizes of bathroom and water closet may be

- Bath and WC (combined): 1800mm X 1800mm to 1800mm X 2500mm
- Bathroom (separate): 1200mm X 1800mm WC (separate): 1200mm X 1200mm
- Doors 3ft x 6ft
- Windows - 3ft x 4ft
- Ventilator 3ft x 2ft

5.1.2 Sizes Adopted for different types of Considered Rooms

The sizes of the different types of rooms Provided for the considered Residential Building are

- Size of Bed Rooms is 10.5 ft x 11.5 ft
- Size of Kitchen Room is 10 ft x 12 ft
- Size of Dinning Room is 12 ft x 14 ft
- Size of Living Room is 18 ft x 22 ft
- Size of Pooja Room is 6 ft x 8 ft
- Size of Bath and Water closet (combined) is 6 ft x 8 ft

Sizes Adopted for Doors and Windows

- Doors 3ft x 6ft
- Windows - 3ft x 4ft
- Ventilator 3ft x 2ft

PLINTH AREA OF RESIDENTIAL BUILDING : 169.1818 m^2

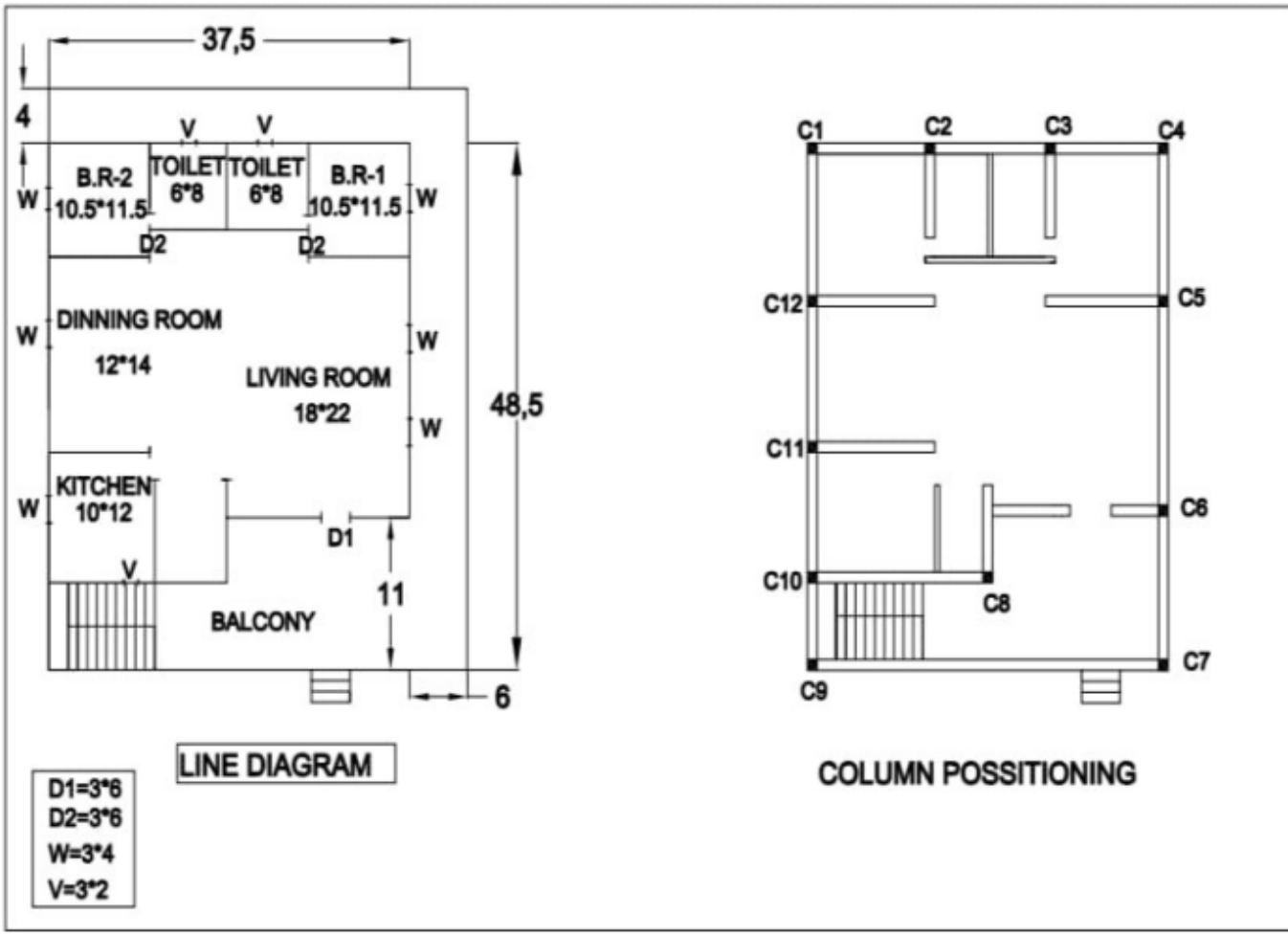

Figure 5.1: Line diagram and column positioning of residential building

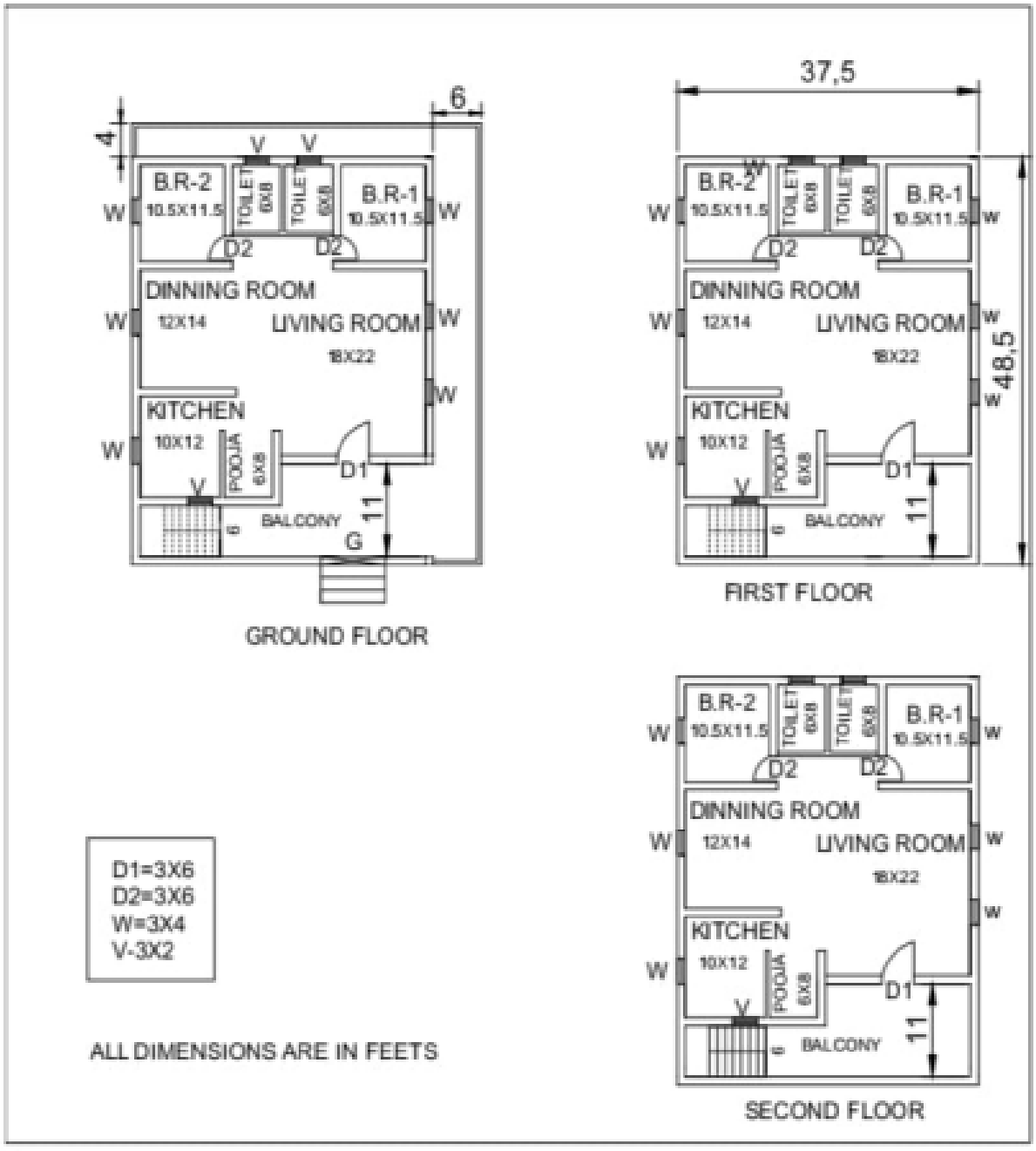

Figure 5.2: Plan of residential building

Chapter 6

Design of Residential Building using STAAD PRO Software

6.1 Procedure for Analysing the Residential Building using STAAD PRO software

- Double click on STAAD PRO software select new project → select space and change the file name and location and give units Meters kilo Newton next add beam → finish
- Click on geometry run structural wizard → select frame models → bay frame.
- Length 11m → Height 5m → number of bays along length and edit distances in dialog box as required apply transfer models-yes-ok.

- Select on column → click on geometry → translational repeat → select required direction with distances and number click on link steps → ok
- Repeat the translational repeat option and project the entire structure.

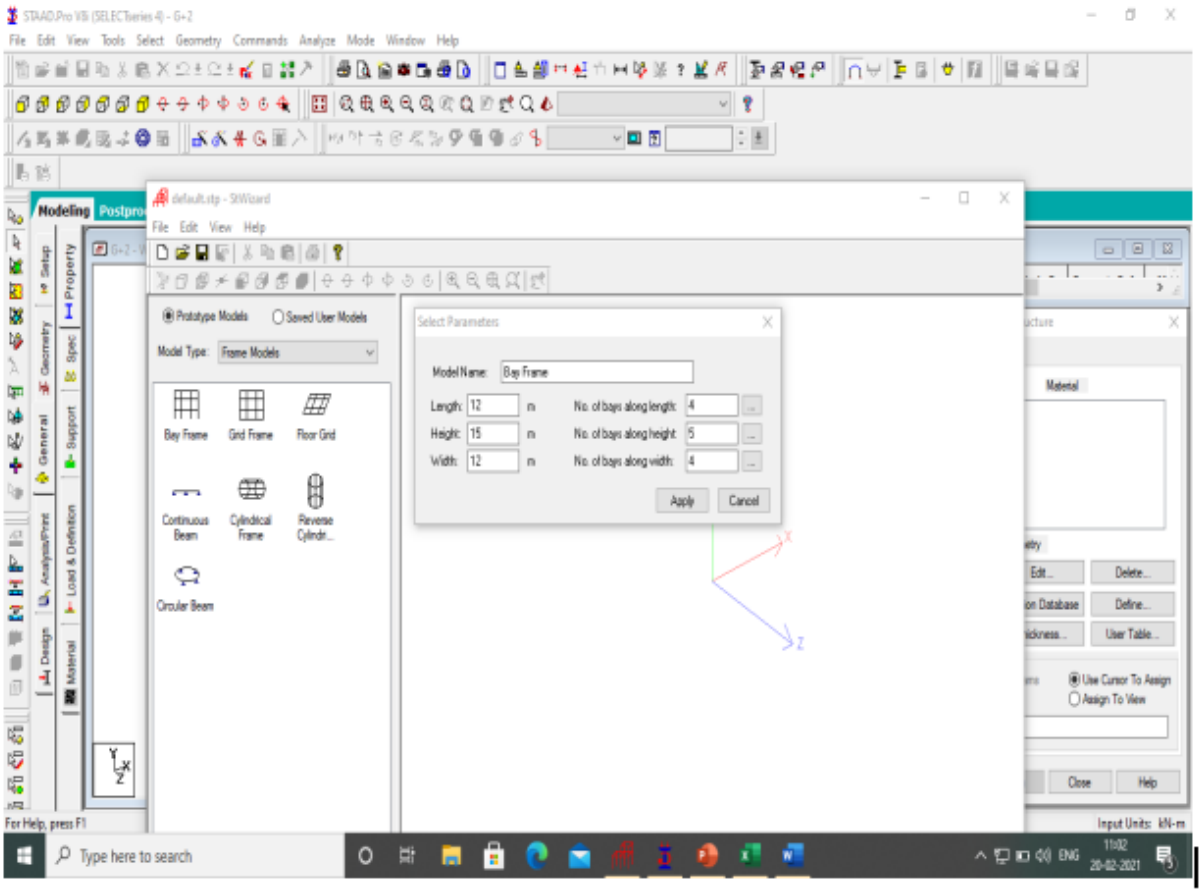

Figure 6.1: Bay Frame Model

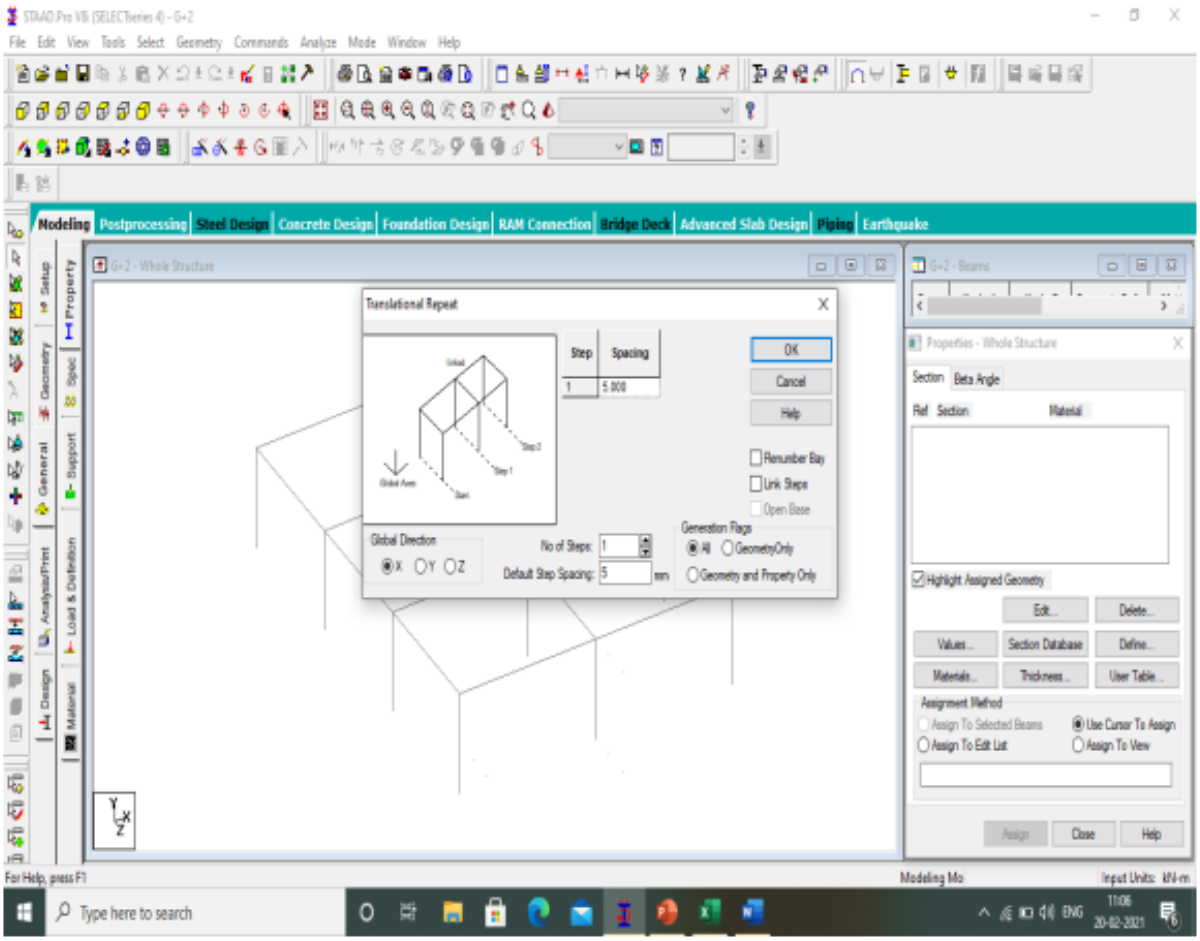

Figure 6.2: Translational Repeat

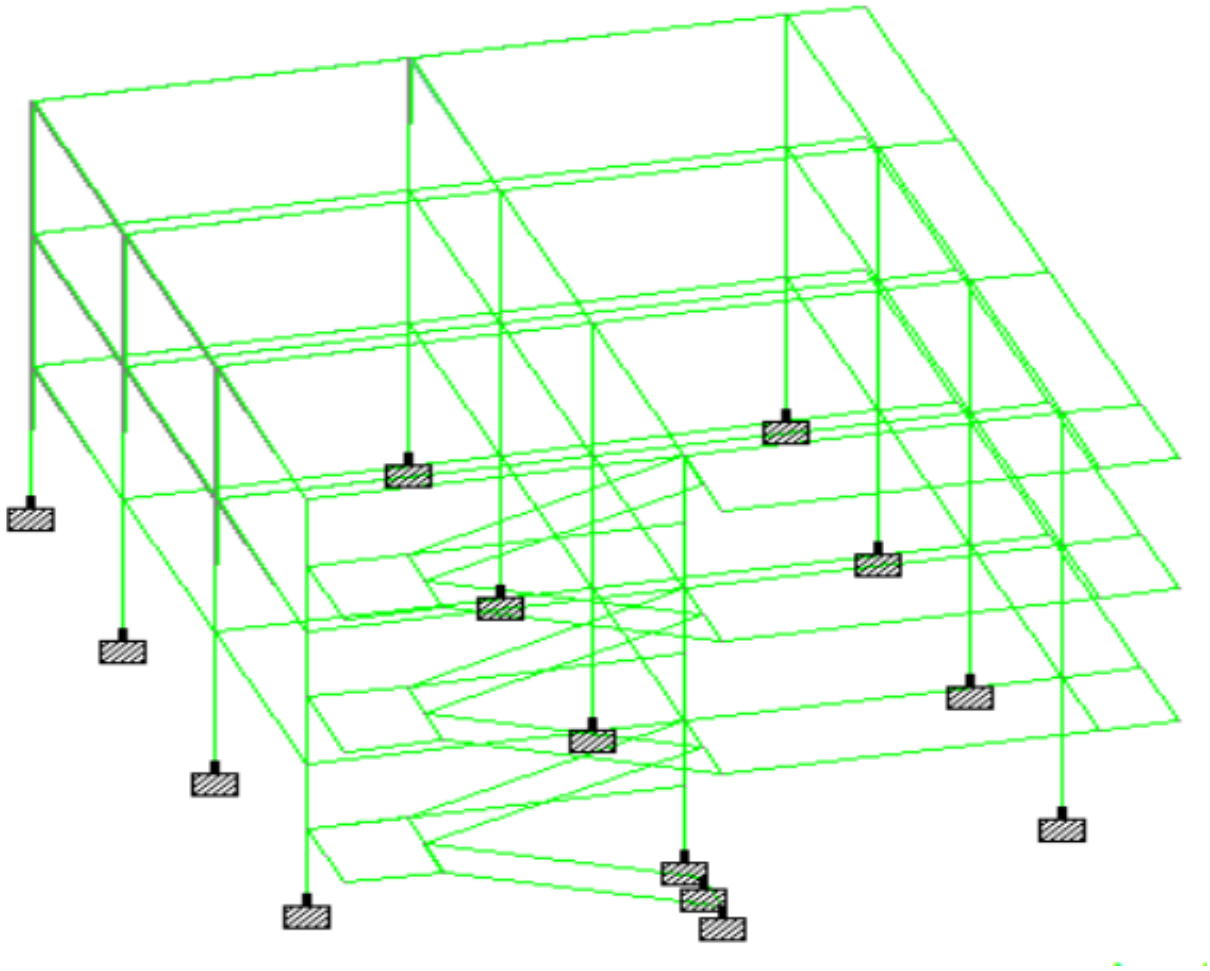

Figure 6.3: Structure of Residential Building

- Click on general → property define → rectangle → yd = 0.3m, zd=0.3m → add close.
- Select the rectangle 0.3x0.3 → assign to view → assign → yes.
- Click on support → fixed → add → select support → use cursor to assign → place supports on required positions.
- Click on the load and deflection → load case details → add change title as dead load → loading type as dead → add → title as live load → type as live → add → close.
- Click on dead load option add differ types of loads and assign them on required positions.
- Click on live load option add differ types of loads and assign them on required positions.
- Analyze → run analyze → save go to post processing → done. ?Click on results view value beam results select maximum and mid points, annotate.
- Click on SFD BMD options to view SFD BMD

6.2 Procedure for Design of the Residential Building using STAAD PRO

- Click on Design → concrete current code IS456 → click on the design define parameters → select Fck, Fymain, Fymin, Maxmain, Maxsec, Minmain, Minsec, ok-select define parameters values → add → close→ select each of them-assign to view → assign → yes
- Select commands → select design beam → add → select design slab element → add → select take off → add → close
- Select design beam → selectbeams parallel to X directions →beams parallel to Z direction → assign to selected beams → assign → yes
- Select design column → selectbeams parallel to Y direction → assign to selected beams → assign → yes
- Select design column → selectbeams parallel to Y direction-assign to selected beams → assign → yes
- Select design slab element → assign to view → yes
- Go to analysis print → add →close
- Go to analyze → run analysis → save
- Check concrete design information of each beam and find the critical section

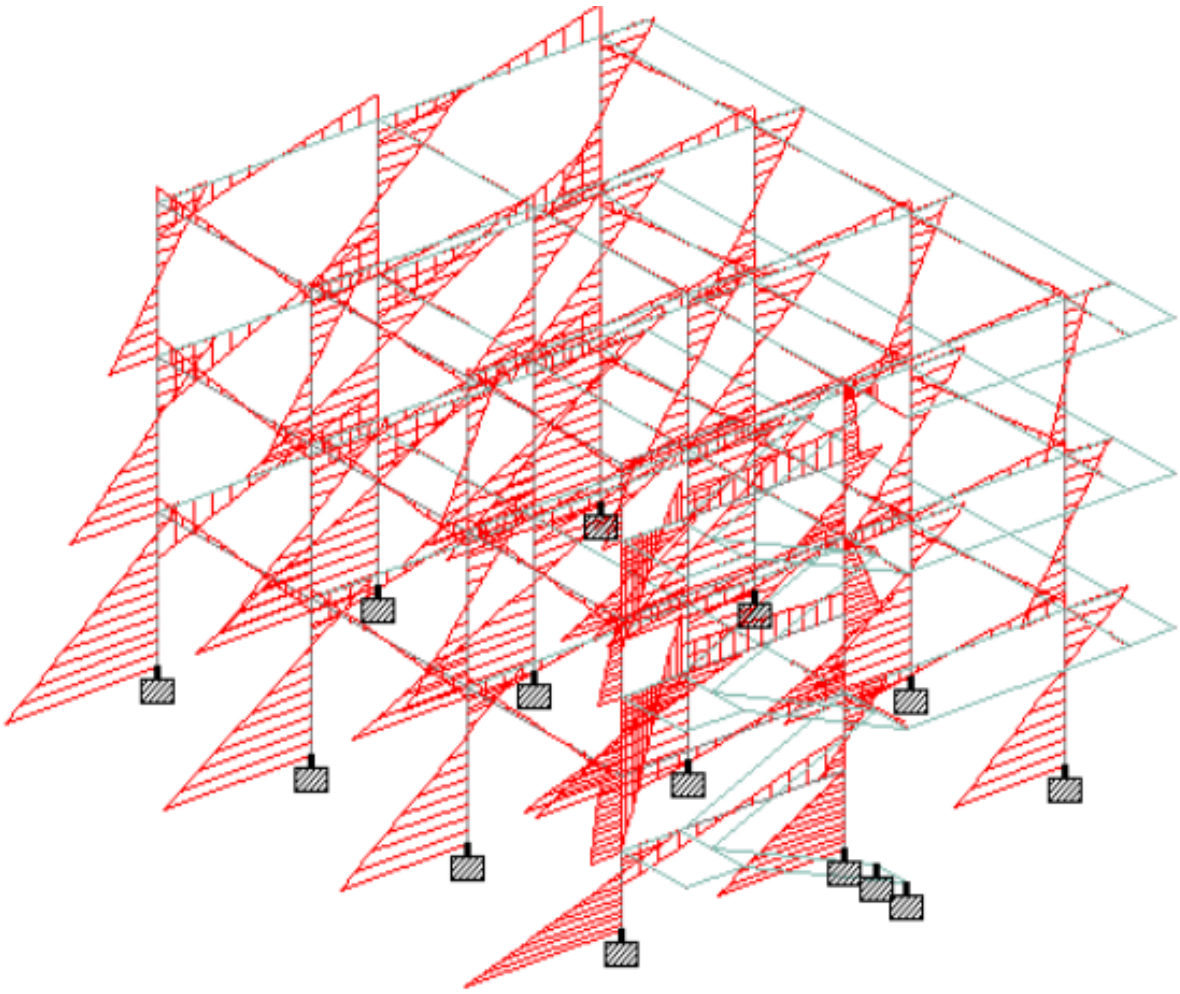

Figure 6.4: BMD for entire section

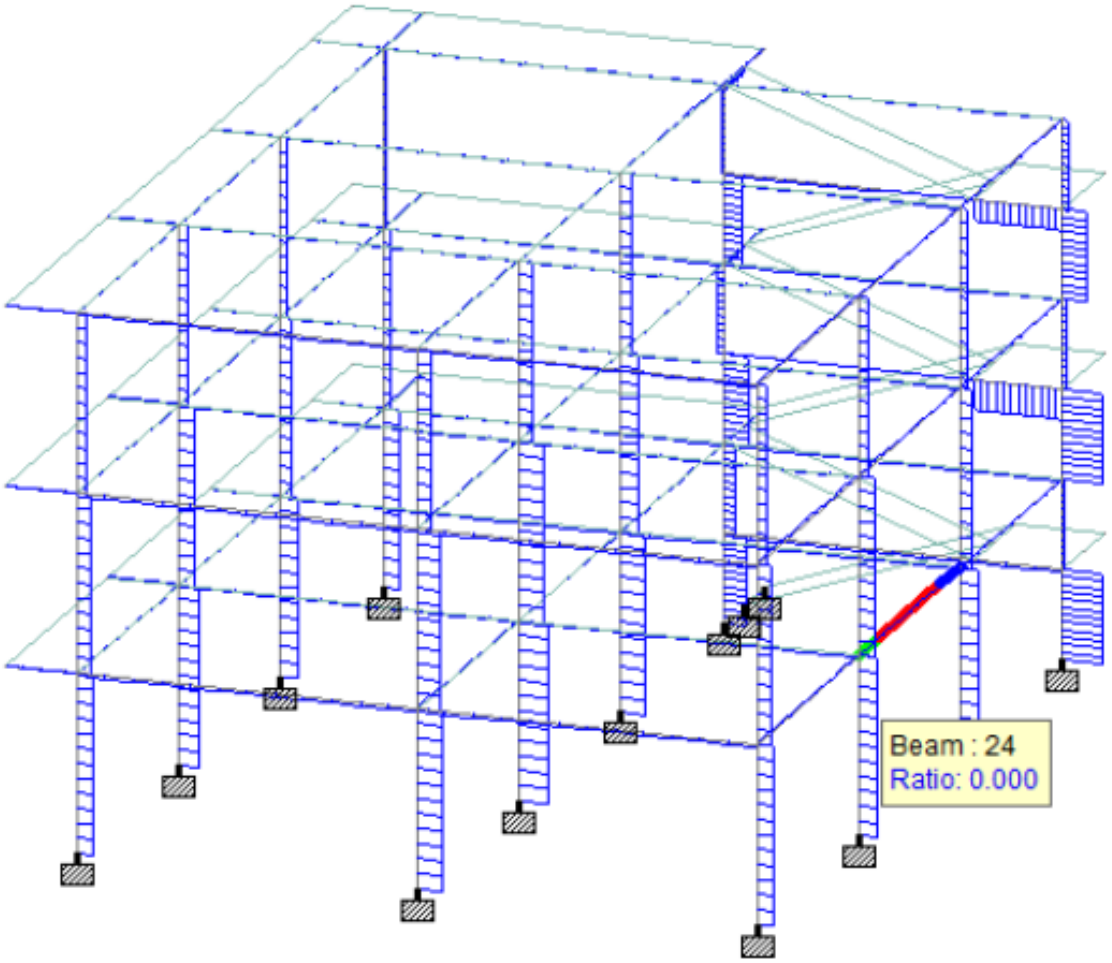

Figure 6.5: SFD for entire section

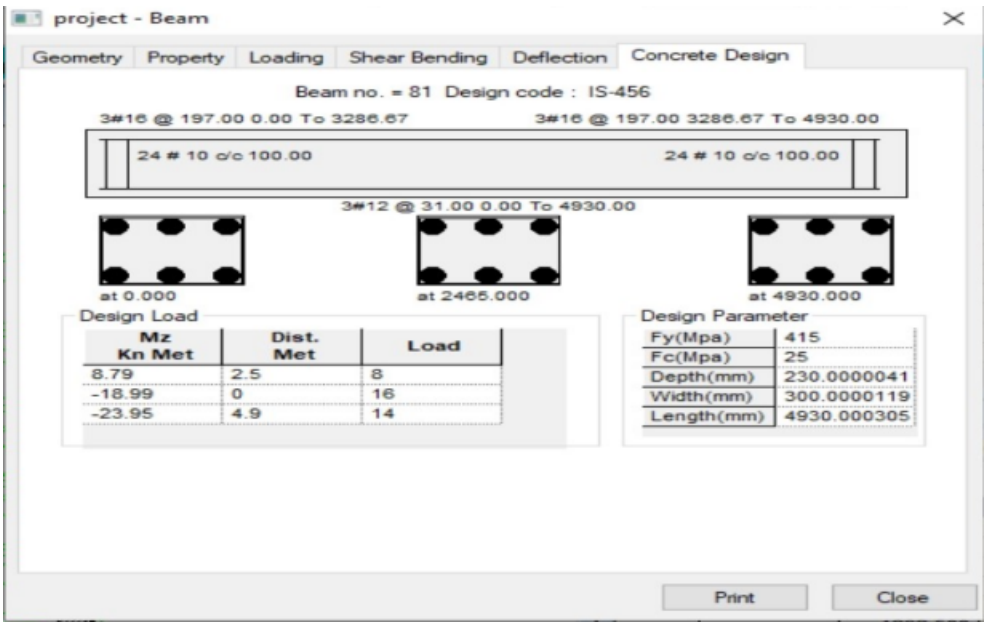

Figure 6.6: Design of beams

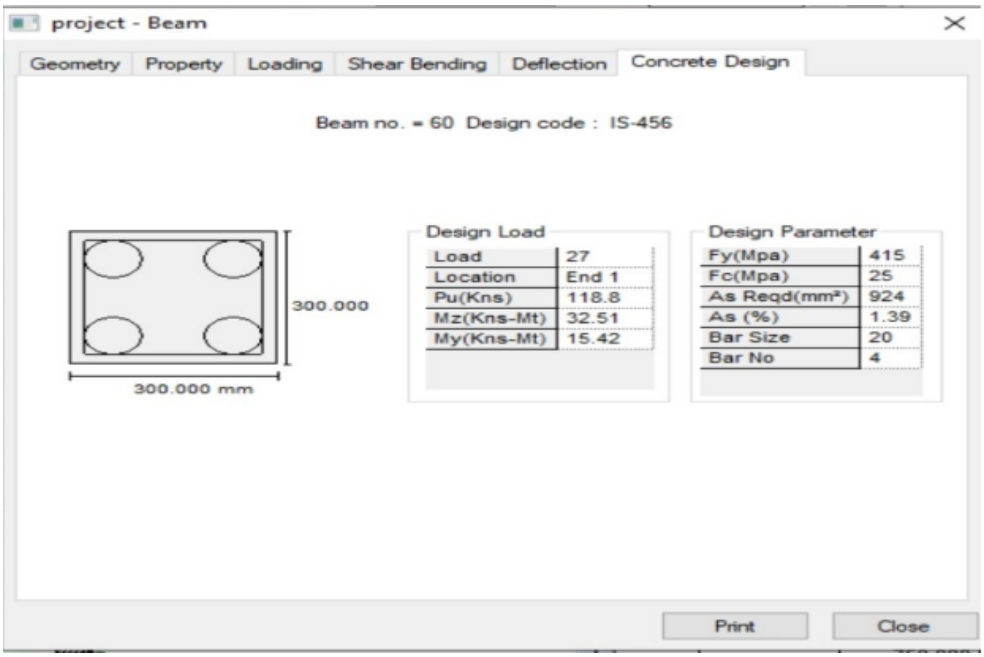

Figure 6.7: Design of columns

Chapter 7

MANUAL CALCULATIONS

7.1 Design of Beam

7.1.1 Beam

A beam is a structural element that primarily resists loads applied laterally to the beams axis. Its mode is deflection is primarily by bending. There are three types of reinforced concrete beams:

(a) Singly reinforced beams: If the reinforcing bars are provided only on tension side in the beam section, it is called as singly reinforced beams.

(b) Doubly reinforced beams: Beams which are reinforced in both compression and tension sides are called as doubly reinforced beam. These beams are generally provided when the dimensions of the beam are restricted and it is required to resist moment higher than the limiting moment of resistance of a singly reinforced section.

(c) Singly or doubly reinforced flange beams.

Design of Beam

(a) Load Calculation
Self weight of beam,
= bxDx25(unit weight of concrete)
= 0.3 x 0.23 x 25
= 1.725 KN / m
Live load = 12 KN/m
Total load (W) = 1.725+12 = 13.725 KN/m
Ultimate load W_u = 1.5 x 13.725 = 20.5875 KN/m
Factored Bending Moment M_u = 67.723 KN-m

(b) Area of steel A_{st}
A_{st} = 1114.194mm^2

use 10mm dia. Bars
No. of bars = 1114.194/201.061
= 5.54
= 6 nos
Provide 6 16mm dia. Bars
Area provided A_{st} = 1206.371mm^2

(c) Design of shear reinforcement
Factored shear forces V_u = 66.64 KN
Nominal shear stress T_v = 1.44 N/mm^2
T_cmax = 2.5 N/mm^2
% of steel = (1206.371/230x300) x100 = 1.74%

From IS code:456 2000 (Table 19)
For M_{25},
T_c = 0.493 N/mm^2 <Tv
Shear reinforcement is necessary.
V_{us} = V_u - T_c x bd
= 43.962 KN
Provide 2- legged 8mm dia. Stirrups = 100.54 mm^2

(d) Spacing of Stirrups:
S_v = 198.96 = 198 mm
0.75d = 0.75 x 200 = 150 mm
300 mm
Take least value = 150 mm,
provide 2-legged-8mm dia. Stirrups at 150mm c/c

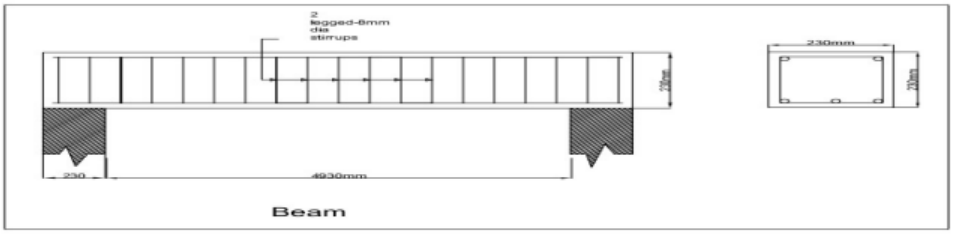

Figure 7.1: Reinforcement details of Beam

7.2 Design of Column

(a) Factored load P_u,
= 1.5 x 1200
= 1800 kN

(b) Area of concrete A_c

Area of steel A_{st} = 804.24 mm^2
Total Area of column (A),
= 300 x 300
= 90000 mm^2
Area of concrete A_c,
= A A_{sc} = 90000 804.24 = 89195.76 mm^2

(c) Lateral ties Spacing
Lateral ties:
1/4 of main bar = 1/4 x16 = 4mm
6 mm
Take greater

Lateral ties = 6 mm

Spacing:
b (or) d = 300 mm 16x main bar = 16 x 16 = 256 mm
300 mm
Provide 4 bars 16mm dia.
Provide lateral ties 6mm dia. Bars at 256 mm c/c.

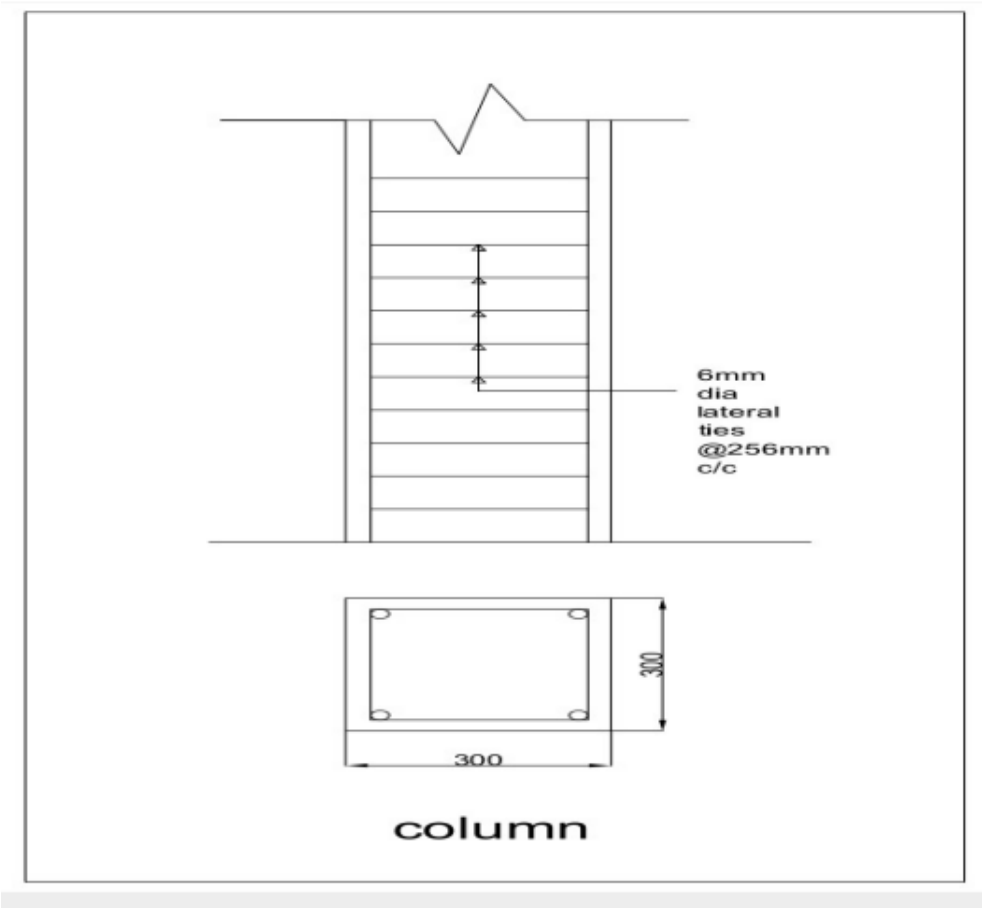

Figure 7.2: Reinforcement details of Column

7.3 Design of Slab

- Load Calculation
  Self weight of slab,
  = l x b x D x 25(unit weight of concrete)
  = 1x1x0.15 x 25
  = 3.75 KN / m^2
  Live load = 5KN / m^2
  Total load (W),
  = 3.75+5= 8.75 KN / m^2
  Ultimate load W_u = 1.5 x 8.75 = 13.125 KN / m2
  Factored Bending Moment M_u = 8.516 KN -m

- Area of steel A_{st}
  A_{st} = 153.87 mm^2

7.4 Design of Footing

Foundation is an important part of the structure which transfers the load of the structure to the foundation soil. The foundation distributes the load over a large area. So that pressure on the soil does not exceed its allowable bearing capacity and restricts the settlement of the structure within the permissible limits. Foundation increases the stability of the structure. The settlement of the structure should be as uniform as possible and it should be within the tolerable limits.

7.4.1 Main Functions of Foundation:

(a) Distribution of loads
(b) Stability against Sliding and Overturning
(c) Minimize distress against soil movement
(d) Safe against undermining
(e) Provide level surface
(f) Minimize differential settlement

7.4.2 Types of Footing:

The different types of footings used for building construction are described below:
1.Wall footing/ Strip footing
2.Spread Footings
3.Isolated Footings

4.Stepped Footings
5.Combined Footings
6.Sloped Footings
7.Mat or Raft Foundation
8.Strapped Footings
9.Pile Foundation

7.4.3 Strip Footings:

It is a component of shallow foundation which distributes the weight of a load bearing wall across the area of the ground. It is also known as wall footing.

7.4.4 Spread Footings:

As the name suggests, a spread is given under the base of the foundation so that the load of the structure is distributed on wide area of the soil in such a way that the safe bearing capacity of the soil is not exceeded.

7.4.5 Isolated Footing:

It is square, circular or individually rectangular slab of uniform thickness, provided under each column. Footings which are provided under each column independently are called as Isolated footings. They are usually square, rectangle or circular in section. Footing is laid on PCC. Before laying PCC, termite control is done to restrict the termites to damage the footing. These footings are most economical when compared with the other kind of footings. These kinds of footings are provided where the soil bearing capacity is generally high. Isolated footings comprise of a thick slab which may be flat or stepped or sloped.

7.4.6 Stepped footing:

The main purpose of using stepped footing is to keep the metal columns away from direct contact with soil to save them from corrosive effect. They are used to carry the load of metal columns and transmit this load to the below ground.

7.4.7 Combined footing:

When two or more columns are supported by a footing it is called combined footing. This footing may be of rectangular or trapezoidal in plan. Combined

footing is provided under following situations. When columns are close to each other and their individual footings overlap. Soil having low bearing capacity and requires more area under individual footing. The column end is situated near the property line and the footing cannot be extended.

7.4.8 Strap Footing:

In each footing the outer and inner column is connected by a strap beam, does not transfer any load to the soil. The individual footing areas of the columns are so arranged that the C.G of the combined loads of the two columns pass through the C.G of the two footing areas. Once this criterion is achieved, the pressure distribution below each individual footing will be uniform.

7.4.9 Mat foundation:

This foundation covers the entire area under the structure. This foundation has only RCC slab covering the whole area or slab and beam together. Mat foundation is sloped when heavy structures are to be constructed on soft made up ground or marshy sites with uncertain behavior. Mat foundation is also known as raft foundation.

7.4.10 Design Procedure of Foundation:

- Select the loads → click on include → click on run STAAD foundation option
- Select load and factors → generate load combination → give Indian code → click on generate load combinations → ok → close
- Create job → give units as SI units → include all load cases → ok
- Select Design parameters → Concrete rebar → Cover soil → Footing Geometry → Sliding Over turning → Design → Yes.

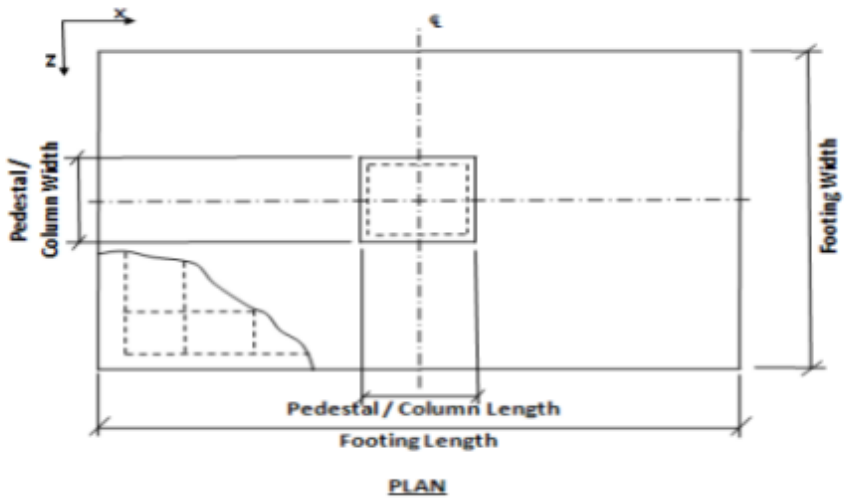

Figure 7.3: Plan of Isolated Footing

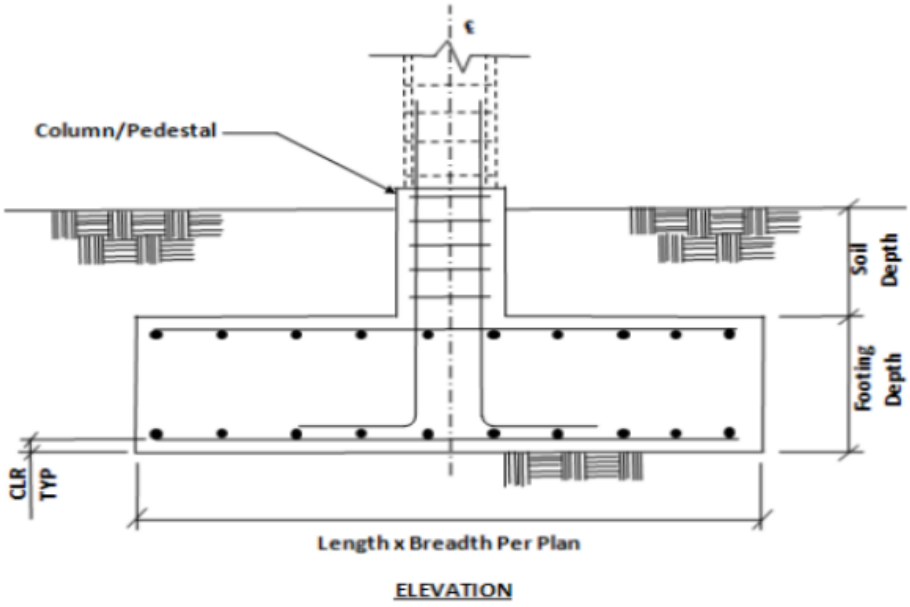

Figure 7.4: Elevation of Isolated Footing

Chapter 8

Conclusion

We have concluded the Analysis and Design of Multi-storey Residential Building by using STAAD PRO. We have calculated Design of Beam, Design of Column by manually. Design of building is more effective with STAAD PRO when compared with a manual calculation as it requires more time to design. We have concluded that there is a difference between the theoretical and practical work done as the scope of understanding will be much more when practical work is done as we get more knowledge in such a situation where we have great experience doing the practical work.

Chapter 9

References

- IS 456 -2000
- IS 875 Part 1 for Dead load
- IS 875 Part 2 for live load
- IS 875 Part 3 for wind load
- SP-16 for Design of columns
- S. Ramamrutham, Design of Reinforced concrete structures