Design and Analysis of Multi Story (G+4) Parking using Staad-pro Software

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Abstract - *Day by day population increase in the world. Expansion of town, city and public Transportation system. An average 5 lack automobile sell in last few year's. Reduce stress of parking Required Parking space which covered less ground coverage area and give efficient service to maintain traffic flow. Smart city's required multi storey building like structure to maintain parking with other facilities structure in the city. Raipur is a capital of Chhattisgarh and traffic load increased day by day and lack of parking sense leads to traffic jam and also less space for parking in the market or other place. For capital city its important multi story parking building*

The principle objective of this project is to analysis and design a multi-storey parking building using STAAD Pro. Our building (G+4) floor. The design based on the condition and location The analysis and design multi story parking building using code IS 456:2000 , RULES THE CHHATTISGARH BHUMI VIKAS RULES, 1984 civil software like AutoCAD and STAAD-pro and design calculation checked manually and through software also.

Key Words: STAAD-pro, Analysis, Design

1. INTRODUCTION

1.1 Parking

Day by day a increase within the number of vehicles on road. It's very easy to park vehicle on road or when vehicle are moving. When the vehicle stops due to work or ay region, we cannot leave vehicle on road or unsafe place. for correct storage of auto when not in use parking lot is required. For a person or cargo occupation a vehicle, a terminal facility is important both at the origin and therefore the destination. When the person has got to stop on the way for a few purpose aside from traffic related, the vehicle needs some halting facility, without disturbing traffic flow otherwise on the road. Such a facility is named parking. it's also noteworthy that a private vehicle is on the move hardly for two to three hours during a day, while for the remaining period it's parked at the residence or destination and sometimes on the way Even commercial vehicles are going to be found to be parked for about 60% of your time on a mean. With the increased ownership and usage of personal vehicles within the sort of automobiles and motorized two-wheelers, parking has become an important fact of this age, particularly in urban areas Thus, thanks to increase in

population there's increase in vehicle demand and that we require more parking lot thus on top of things by constructing multi parking building or road street.

Parking building is employed for safe guarding the user vehicle. Successful parking structures meet the user demands. It includes feeling safe and also knowing that their cars are during a secure environment. In provision of parking lot is unplanned so there's a requirement to form an improvement within the parking lot. Every vehicle owner would really like to park his vehicle as close as possible to his destination, so on minimized walking distance.

The acceptable walking distance is 50 to 150 m and also depends on pedestrian side walk facility available. Parking structures became important elements in today"s urban and suburban environments. Owners have realized that parking services represent the primary and last impression a visitor receives of the power which are often a pivotal factor when consumers decide where to try to to business.

Even more, owners and designers both are acknowledging that parking structures must be designed specifically for the kinds of tourists that structure will serve, supported the facilities they support and therefore the flow of daily traffic.

The need to make a parking structure that precisely fits the requirements of the users can't be stressed enough. Unless the power is user-friendly, projecting a secure, secure, and straightforward to use environment, parkers will find other options.

These needs became too vital to their peace of mind to be left unmet by the owner and designer. As a result, creating the simplest parking structure for the location, users, and budget requires a careful balance of all elements and a logical plan from start to end.

1.2 Types of Parking

There are two types of parking static parking and automated parking.

1 static parking – static parking define as stable structure where we can park vehicles. In static parking there are three type of parking according to arrangement of parking space parallel parking, perpendicular parking, and angle parking in

the angle parking their four types of parking arrangement 30 Degree angle parking,45 degree angle parking, degree angle parking,90 degree angle parking.

Fig -1: Static Parking

2 automated parking- in automated parking we used special type of equipment to parking like jack, hydraulic system etc

Fig -2: Automated Parking

1.3 Software Introduction

This project is mostly based on software and it is essential to know the details about these software's. List of software's used

1 Staad-pro- Staad is powerful design software licensed by Bentley .Staad stands for structural analysis and design Any object which is stable under a given loading can be considered as structure. So first find the outline of the structure, where as analysis is the estimation of what are the type of loads that acts on the beam and calculation of shear force and bending moment comes under analysis stage. Design phase is designing the type of materials and its dimensions to resist the load. This we do after the analysis. To calculate s.f.d and b.m.d of a complex loading beam it takes about an hour. So when it comes into the building with several members it will take a week. Staad pro is a very powerful tool which does this job in just an hour's staad is a best alternative for high rise buildings. Now a days most of the high rise buildings are designed by staad which makes a

compulsion for a civil engineer to know about this software. These software can be used to carry rcc, steel, bridge, truss etc according to various country codes.

2 Auto Cad- AutoCAD is powerful software licensed by auto desk. The word auto came from auto desk company and cad stands for computer aided design. AutoCAD is used for drawing different layouts, details, plans, elevations, sections and different sections can be shown in auto cad. It is very useful software for civil, mechanical and also electrical engineer. The importance of this software makes every engineer a compulsion to learn this software's. We used AutoCAD for drawing the plan, elevation of a residential building. We also used AutoCAD to show the reinforcement details and design details of a stair case. AutoCAD is a very easy software to learn and much user friendly for anyone to handle and can be learn quickly Learning of certain commands is required to draw in AutoCAD.

1.3 Objective of Work

1. To analysis and design a multi level parking.
2. To estimate the load and cost for construction
3. To provide safe and easily accessible area for parking
4. To minimize the traffic load due to parking of vehicle in no parking zone
5. Upgrading the infrastructure of the town using this type of structure
6. To give a technical solution for the traffic congestion problem and proper plan and design of multi storey parking.

2. METHODOLOGY

2.1 Methodology Introduction

A structure can be defined as a body which can resist the applied loads without appreciable deformations. Civil engineering structures are created to serve some specific functions like human habitation transportation, bridges, storage etc. in a safe and economical way. A structure is an assemblage of individual elements like pinned elements (truss elements), beam element, column, shear wall slab cable or arch. Structural engineering is concerned with the planning, designing and the construction of structures.

The objective of the design is
1. Foundation design
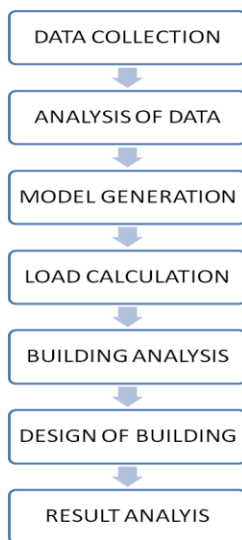2. Column design
3. Beam design
4. Slab design

Chart -1: Flow chart of Methodology

2.2 Building Data for Analysis

The proposed building considered for the project is of multi story parking building (G + 4) . The considered building data is furnished below:

Building information:

1. Number of stories= (G+4), 5 story parking building.
2. Building importance category: All other buildings = 1.5
3. Length of the building in X direction: 20.0m
4. Length of the building in Y direction: 20.0m
5. Inter storey height of the building: 3m (storey height to storey height)
6. Floor load: Dead load considered for the building is 5.0 kn.
7. Live load considered for the building is 6.5 kn.
8. Grade of Concrete M20
9. Grade of Reinforcement HYSD Fe415
10. Density of Concrete 25kn/m^3
11. Seismic zone : zone 5
12. Basic wind Speed: 55m/s
13. Bearing capacity of soil: 150kn/m^2
14. Structure in both X direction and in Y direction the resisting systems are considered and are then subjected to earthquake load and identification of safety conditions are made.
15. Structure in X direction: Reinforced concrete shear wall / reinforced masonry shear wall.

16. Structure in Y direction: Reinforced concrete shear wall / reinforced masonry shear wall.
17. Terrain category of the building is built up towns.
18. Site shape is flat in conditions and not hill slopes.

The results obtained for the analysis of the building are given in the next section.

2.3 Result Analysis
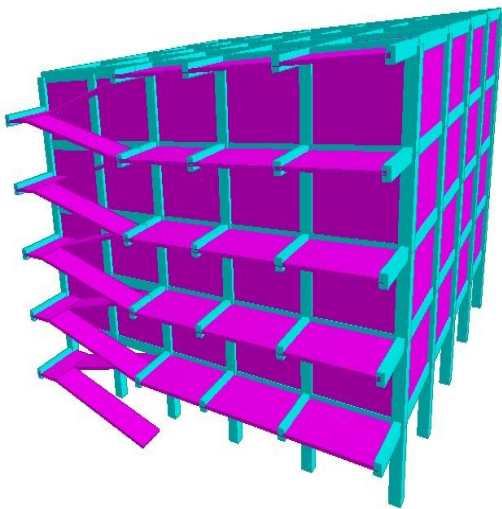

Fig -3: Job Information

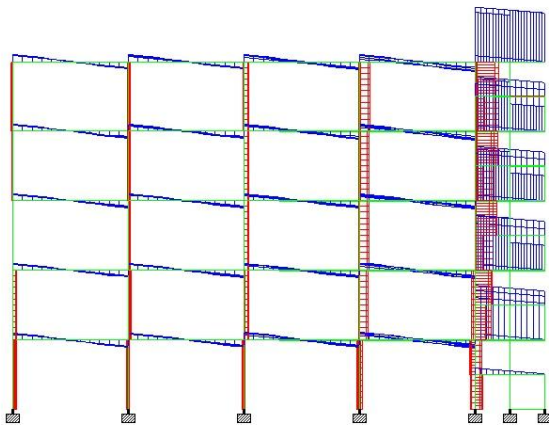**Fig -3**: multi storey parking building (G+4)

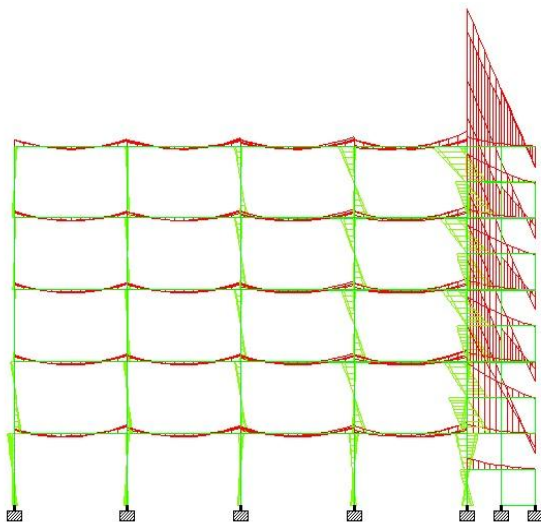**Fig -4**: Shear force on x, y direction

Fig -4: Bending Moment on x, y direction

Concrete design -Calculation of the concrete and reinforcement of the multi story parking (G+4) where we find out the load on the member.

REINFORCING STEEL QUANTITY REPRESENTS REINFORCING STEEL IN BEAMS AND COLUMNS DESIGNED ABOVE.
REINFORCING STEEL IN PLATES IS NOT INCLUDED IN THE REPORTED QUANTITY.
OTAL VOLUME OF CONCRETE = 267.7 CU.METER

BAR DIA (in mm)	WEIGHT (in new)
8	49493
10	52102
12	80547
16	2730
20	2994
25	539
TOTAL	**188404**

Fig -6: Dead Load

STAAD.Pro Query   Concrete Design

Beam no. 348

Design Code: IS-456

4#10 @ 420.00 0.00 To 2666.67   4#10 @ 420.00 2666.67 To 4000.00

12 # 8 c/c 165.00   12 # 8 c/c 165.00

4#10 @ 30.00 0.00 To 4000.00

at 0.000   at 2000.000   at 4000.000

Design Load

Mz(Kn Met)	Dist.et	Load
14.720000	2.000000	3
-25.650000	0.000000	3
-30.000000	4.000000	3

Design Parameter

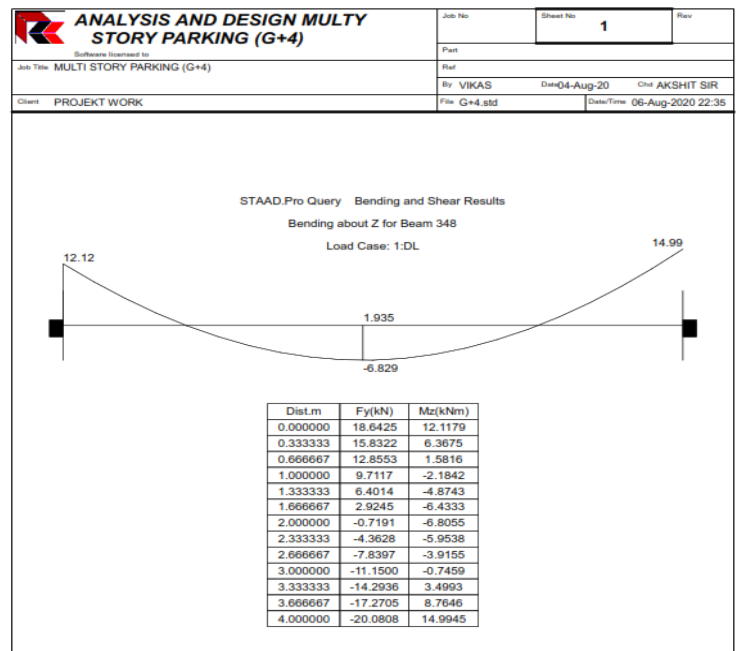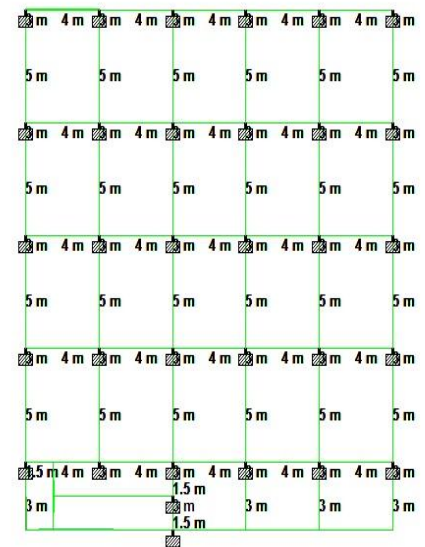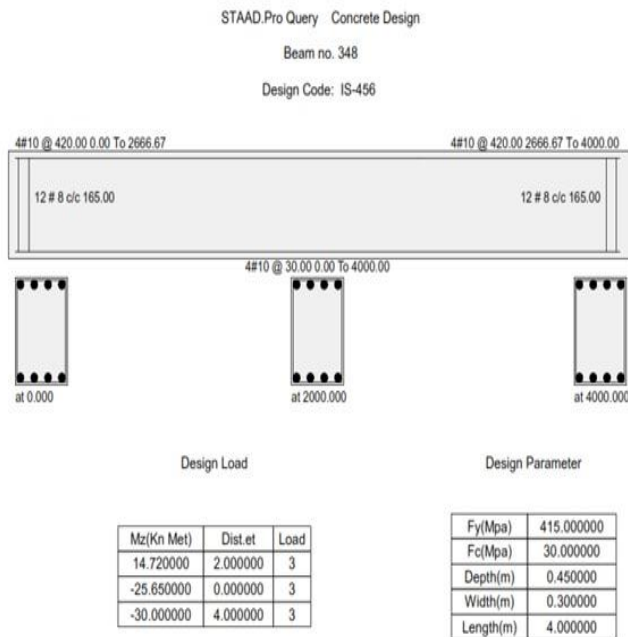|	
Fy(Mpa)	415.000000
Fc(Mpa)	30.000000
Depth(m)	0.450000
Width(m)	0.300000
Length(m)	4.000000

3. CONCLUSIONS

The aim of our project was planning, analysis and design of a multi-storied, Parking building staad-pro software We were able to complete the project in a successful and efficient manner by considering all the relevant features given as nine chapters. Planning of this building has been done based on the space requirements suggested by the prevailing rules stipulated in Bye-laws the Madhya Pradesh Bhumi Vikas Rules, 1984. The design is completely based on relevant Indian Standard Codes. The analysis has been done with the help of STAAD Pro and the drawings have been made with the help of AutoCAD. We have completed this project to the best of our knowledge and ability. As we seen the many problems of parking occurring in our region. It will be causes accident. To prevent this and reduces the problems of parking. We have suggested that multi storied parking system is must important Raipur region they will be provide multi-storied parking system for. Raipur Municipal Corporation uses the multi-parking system. In this paper modeling of multistoried building is done. In accordance with IS1893-2002 for simulation purpose finite element analysis STADD-Pro V 8i is used following conclusions are formed after studying Building

REFERENCES

1 Bye-laws the Madhya Pradesh Bhumi Vikas Rules, 1984.

Design Codes

1 IS 456:2000

2 IS 875 (Part 2):1987 (Reaffirmed 1997)

3 IS 875 (Part 3):1987 (Reaffirmed 1997)

4 IS 1893 (Part I):2002

5 IS 2911 (Part 1-4):1979 (Reaffirmed 1997)

6 IS 4326:1993

7 IS 13920:1993 (Reaffirmed 1998)

8 IS 13935: 1993

Books

1 Design of RCC Structures by B. C. Punmia

2 Limit State Design of Reinforced Concrete by P. C. Varghese

3 Reinforced Concrete Design by S. N. Sinha

4 Reinforced Concrete Limit State Design by Ashok K Jain

5 Basic & Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao

5 Geotechnical Engineering by K. R. Arora

BIOGRAPHIES

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