

Extension and Renovation of Canteen Area and Parking Lot

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Abstract - Due to continuous increase in urbanization in Garden City Bengaluru has hardly few acres of land available for constructional activities, due to which the trend of the people these days have switched to renovate and extend the floor area of the existing structures to lead a comfortable life and accommodate more number of users. In our work, we extend and increase the floor area of canteen and parking lot of "JSSATE-B" for additional space requirement and improve its aesthetical appearance. During our course of work the existing or prevailing conditions of canteen and parking lot was surveyed and the design of the new oncoming structure was done by using AUTO-CAD and E-TABS software. Present canteen area can accommodate 6.8% of the total population of college but after increasing the floor area (i.e. after renovation) about 18% of the total population will be able to utilize it. Similarly the aesthetical appearance of the parking area was improved by providing provision for an additional floor in which an "INDOOR SPORTS COMPLEX" was designed which can be used as a source of recreation for both students as well as staffs.

"110.8m X 9.8m=1085 sq. meters" this area right now consists of steel columns throughout its length and G.I sheets as roofing for this area which provides shelter parking. The staff parking area is an open space measuring "22.4m x 9.8m = 220 sq. meters".



fig.1



fig.2

Key Words: Surveyed, Design, Software.

1. INTRODUCTION

Canteen area and parking lot are such areas of college which is utilized to the maximum extent. During the design of such areas from the point of view of renovation, studying the existing condition of the area is most essential. By Prof. Lanny J Flynn, Prof Abol Hasan and Prof Astaneh titled "NOTES ON DESIGN OF STEEL PARKING STRUCTURES" information regarding the state of art of knowledge of design of parking structure in general was obtained [1]. By "SEISMIC ANALYSIS OF MULTI STOREYED STRUCTURES MADE OF STEEL" which was authored by Prof Mahesh S Patil, Prof Yogesh N and Prof Sonawane gave an idea regarding the seismic resistance of steel structures [2]. Our oncoming structure will not completely be made of steel but it's a composite structure made of both steel and concrete. With reference to the respective code books IS 875 PART 1[3], IS 875 PART II[4], IS 11384-1984[5] the loads required for the design and procedure for the design was done.

The existing canteen area is a 4-walled masonry single stored structure with a roof top made up of sheets. It measures an area of "23.8m X 9.8m= 233.34 sq. meters". The parking lot in JSS is divided for both students and staffs, where the student parking area measures

The first and the foremost thing which is essential in our design is the studying the soil features of the area. Since the institution is a pretty old one, the soil investigation report was not available for us. Hence the prevailing SAFE BEARING CAPACITY (SBC) of soil which is prevailing in Bengaluru was chosen for design. After this the calculation of loads on the structure was calculated, which is as follows:

IS 875-PART 1 gives information about the dead loads.

IS 875-PART 2 gives information about the live loads.

Since the design is for G+1 floor the wind and the seismic loads weren't taken into consideration. After this the calculation of loads on the structure was calculated. Since the design is for G+ 1 floor the wind and the seismic loads weren't taken into consideration. Only the live loads and dead loads were taken into consideration.

1.1. Calculation of live loads

For the calculation of live loads the present population and population of previous 10 years was collected from college office. Using the above details the population forecasting for the next 10 years was done. By doing so, the population for the next 10 years was estimated to be 3200 in approx. taking this number into accounts the load calculation and the required floor area estimation was done.

Table 1. Number of students

Si.No	Academic Year	No. Of Staffs
1	2016-17	2513
2	2015-16	2508
3	2014-15	2504
4	2013-14	2419
5	2012-13	2387
6	2011-12	2311
7	2010-11	2129
8	2009-10	1924
9	2008-09	1967
10	2007-08	1795

Table 2. Number of staffs

Si.No	Academic Year	No. Of Staffs
1	2016-17	251
2	2015-16	227
3	2014-15	215
4	2013-14	210
5	2012-13	201
6	2011-12	197
7	2010-11	191
8	2009-10	188
9	2008-09	179
10	2007-08	169

But the total number of users using the canteen area is not same throughout the day and it varies eventually as per the working hours of college which is from 9 a.m. to 4.45 p.m. during these working hours the strength of canteen would

be maximum during the lunch hour (i.e. from 1 to 1:45 pm) hence this is considered to be the peak hour. Both peak and off peak hours were considered by observing the total number of users using the canteen area during the working hours of college.

1.2. Floor area calculation

The existing canteen area measures about “233.24 sq. meters” and by providing an additional floor over it having the same area as that of the one which is in the ground floor. Moreover the first floor in the staff parking area can also be utilized for dining purpose. Hence we get a total area of about 233.24+233.24+220 sq. meters= 686.48 sq. meters.

1.3. Source of water and electricity

JSSATE-B has a primary treatment plant; hence the used water after treatment can be reused for domestic purpose and for drinking clean purified water which is fit for drinking is available. And for electricity provision for lying up of solar panels is given and the same is considered during design. The so used solar panel is a P-V cell which converts solar energy into electrical energy.

2. DESIGN

Initially, the existing area was surveyed and its dimensions were obtained then its layout was prepared using AUTO-CAD software. These drawings were then extracted for 3D’s max and E-TABS. For structural design and analysis E-TABS software was used. The dead loads for the structure was taken automatically by the software but the live load for population and additional things to be laid in sports complex and canteen was considered to be 4KN/m² and 1KN/m² for solar panels as per IS-875 PART 2. Some of the 3d’s max works area as follows:



fig.3



fig.4



fig 5



fig 6

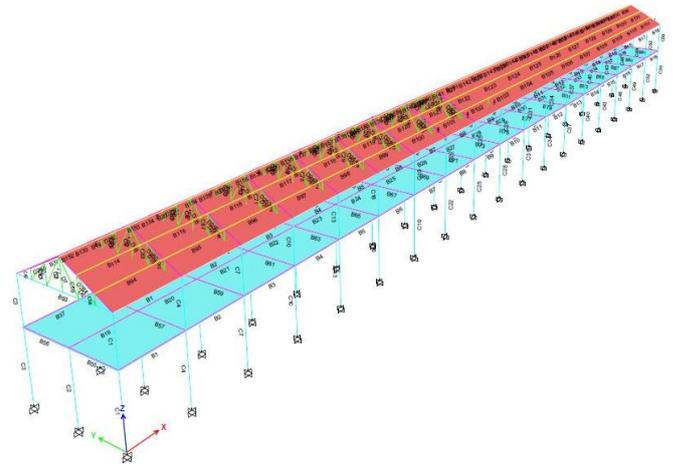


fig 8. 3-D View

Next, the design of both canteen and parking area was done using E-TABS and also its analysis with the same. For the design of parking lot its entire area measuring 110.8m X 9.8m was considered and designed, which is as follows:

2.1. Design of student parking lot

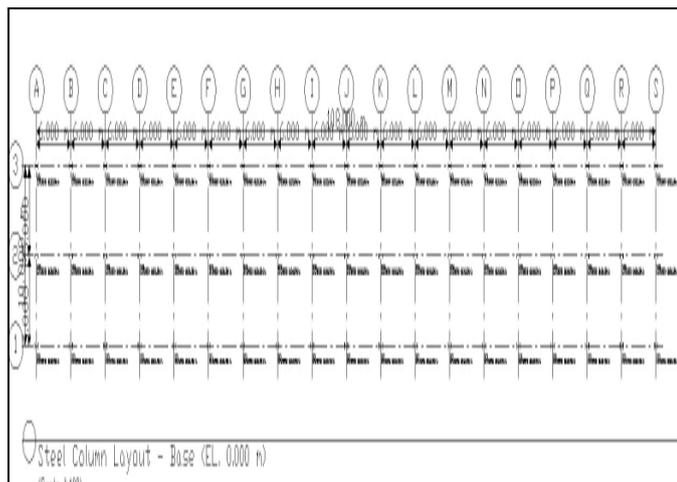


fig 7. Base plan

In the above layout, out of the total length 110m, the effective length considered for design is 108m and for every 6m column footings are to be laid. Across the width, the column footings are laid at a center-to-center spacing of 5m. As per the standards, notations are provided in terms of numbers and alphabets.

From the 3D projection, the arrangement of the columns and beams across the entire length and width and also the arrangement of the tiles on the truss by providing various types of angles can be seen. The slab portion in the first floor is a composite part where concreting is done on the steel decks laid as shown in the above figure.

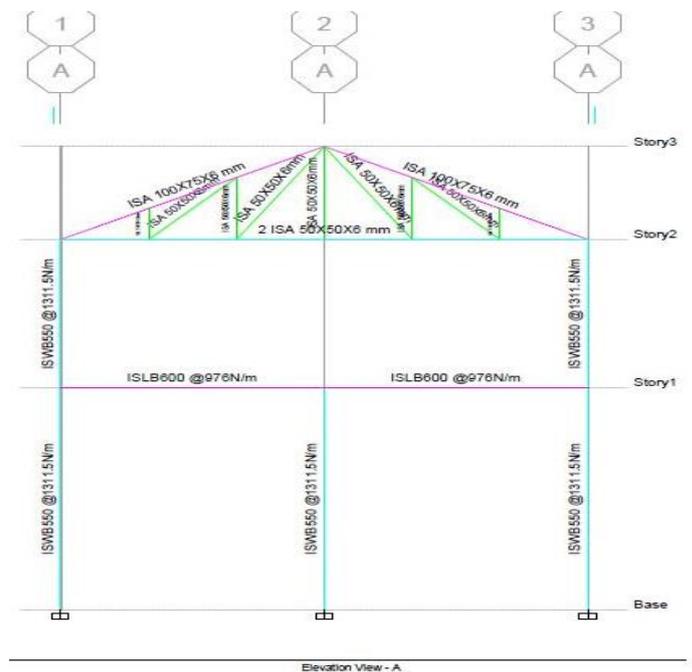
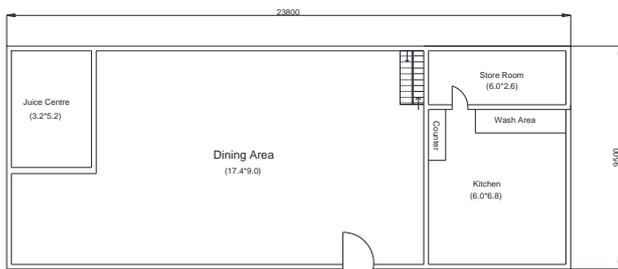


fig 9. Elevation at a cut section

The elevation at the cut section shows the type of column, the type of beam and the connections i.e. angles which are provided for the truss section. The support provided is fixed and it is clearly seen in the above figure.

2.2. Design of canteen area

Our present canteen area consists of four RCC walls with a floor height of 10 feet and a roof top on it. The renovation of this area looks structurally and aesthetically good when the existing walls are demolished and new walls with a proper foundation is laid. The SBC of this soil was considered as 180KN/m². For such a soil and with a proposal of G+1 floor the foundation is very important. Hence during the design time we designed a rigid column base was chosen. Then, its plan was prepared in AUTO-CAD:



CANTEEN - GROUND FLOOR PLAN

Fig10. Canteen ground floor plan

Using this plan its structural design was done by providing framed sections all over, the walls are designed as concrete walls and hence the entire structure can be considered as a “COMPOSITE STRUCTURE”.



fig 11. Base Plan

The total length and width of the canteen area is divided as shown in the base plan. The columns used here are ISWB 550 @ 1311.50N/m everywhere across the length and width of the entire area.

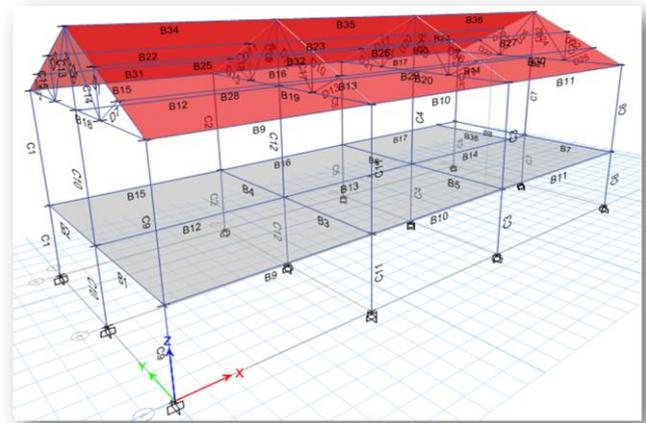


fig 12. 3-D View

The design is similar to that as shown in figure8, But only the spacing between columns differ.

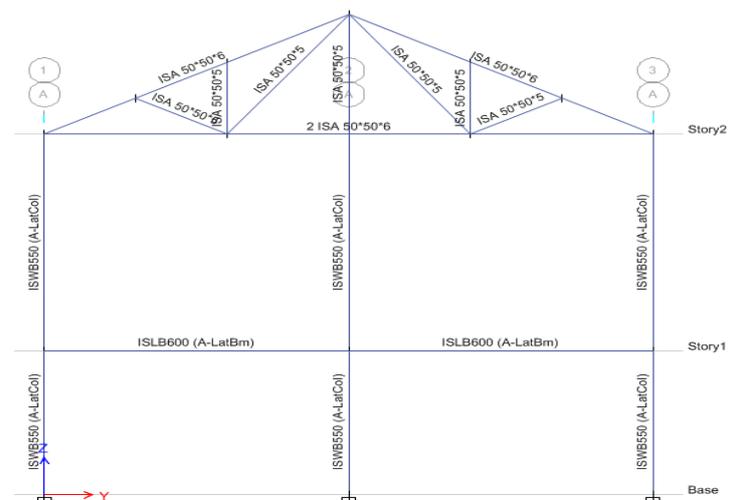


fig13. Elevation at a cut section

The design for the staff parking area was also done in the same manner and the beams which are commonly used here are “ISLB 600 @ 976 N/m” and the commonly used columns are “ISWB 550 @ 1311.50N/m” but the angles used in the connection of truss varies as per the length, connections and the forces acting up on it.

2.3. Floor Heights

The ground floor i.e. the parking area was designed for 6m and the first floor for “INDOOR SPORTS COMPLEX” the height was chosen as 4m as per NBC (National Building Code) and the truss as automatically taken by E-TABS

software as 2.5m and for canteen the floor heights for both ground and first floor was chosen as 4m and truss height of 2.5m. In the design, the Base Plan-3D view-Side View-Connection Details-Footing Details and elements-Elevation at Different sections-Truss Plan-Beam Layout were designed. One span of the structure was taken for analysis and after analysis we found the structure to be safe.

3. ESTIMATION

Based on the quantity of steel and concrete required the cost for the structure was estimated and apart from this since the provision for solar panels was given even its cost was taken into consideration. Hence the overall cost of the entire project will roughly come up to 75, 00,000. (The cost of the extra amenities required for canteen will be taken into consideration in the later stages as per the requirements and usage.)

4. CONCLUSION

Floor area of canteen was increased to accommodate more number of people and the aesthetical appearance of the parking lot was enhanced and also an extra provision for recreation in the form of Indoor Sports Complex has been provided. The above so designed structure will also sound economical since the un-winded equipment's here run from the electricity generated from P-V cells laid above the structure. Hence, a safe-durable-good looking and improved canteen area and parking lot was designed.

5. REFERENCES

[1] Notes on Design of Steel Parking Structures by Prof. Lanny J Flynn, Prof Abol Hasan and Prof Astaneh.

[2] Seismic Analysis of Multi Storied Structures Made Of Steel by Prof Mahesh S Patil, Prof Yogesh N and Prof Sonawane

[3] IS 875-PART 1: Calculation of dead loads

[4] IS 875-PART II: Calculation of live loads

[5] IS 11384-1984: For composite structures