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PLANNING, SEISMIC ANALYSIS AND DESIGN OF A HOSPIITAL BUILDING (G+5) BY USING AUTO CAD, STAAD.PRO AND E-TABS

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ABSRTACT: ***The main aim of paper is to analyze the plan of hospital building by using software techniques. The design of hospital building should be developed with following disciplinary activities. The design was followed up by using IS (Indian standard) codes for better output of design considerations. Here the hospital building was designed and analyzed for G+5 storey structure. Structural engineering is a field of engineering dealing with the analysis and design of structures. These days, the software techniques were highly involved in a construction field for quick and better accuracy of an analysis report to execute the given project successfully. In this paper, STAAD.PRO V8i and ETABS has been used for designing and analysis purposes mainly for the result of shear force and maximum bending moment. RCC detailing is important for clear in executing the reinforcement work on the site without any complexity. The building was initially designed as per IS code 456 :2000 with earthquake loads using Staad.pro software & E-Tabs software. Here, the seismic analysis of the structure is designed using software as per IS code. The seismic analysis and design of the building done according to the IS 1893–2002.The footing are designed on the loading from column and also the soil bearing capacity value for that particular area.***

KEY WORDS: hospital building, seismic analysis, detailing, reinforcement.

I.INTRODUCTION

We will propose to construct a hospital building in Ongole (near pernamitta). The safe bearing capacity of the soil is found as 200 KN/m^2. The depth of the footing is taken to 1.5 m, the rectangular footing is to be designed. Depending upon the size of town or city the type of hospital is decided Hospital and dispensaries come under health buildings. The people are treated for various diseases and given advice in respect of health. They are also advised how to keep environment clean to avoid the slaughter of various diseases. For clarification, the building for health may be termed as dispensaries, clinics, maternity homes, nursing homes, laboratories, child welfare centers and general hospital. It is not necessarily a single room but consists of doctor's room, pharmacy room, dressing room and waiting room. In Maternity homes and nursing homes both cares for special treatments. Here the patients can stay for short duration. The design is made using software on structural analysis design (staad.pro). The building subjected to both the vertical loads as well as horizontal loads. The vertical load consists of dead load of structural components such as beams, columns, slabs etc., and live loads. The horizontal load consists of the wind forces thus building is designed for dead load, live load and wind load as per IS 875. The building is designed as two dimensional vertical frames and analyzed for the maximum and minimum bending moments and shear forces by trial and error methods as per IS456-2000.

II-PLANNING OF A HOSPITAL BUILDING

For the planning of the hospital building in this project we used the AUTO CAD software. . Nowadays, the software techniques were highly involved in a construction field for quick and better accuracy of an analysis report to execute the given project successfully. Hospitals must meet two basic fundamental needs Must meet the needs of the patients it is going to serve adequately It must be in size and proportion which the owner or promoters will be able to build and operate. Planning the Design and Construction of Healthcare facilities is a very specialized field that has begun getting its due only in the last few years in India. Currently, AutoCAD has a multitude of specialized auxiliary tools which cover every kind of industrial fields related to 2D design and 3D modeling. It was in 1982 when a group of programmers, led by John Walker, developed the first version of AutoCAD, the software that Michael Riddle. The term CAD (Computer Aided Design) applies to a wide range of programs that allow the user to created drawings, plans, and designs electronically. AutoCAD is one such program and it main claim to fame is that it is relatively easy to use, it is very comprehensive in its ability to create 2D and some 3D drawings, and it is very popular. Seventy percent of the CAD users in the world use AutoCAD.

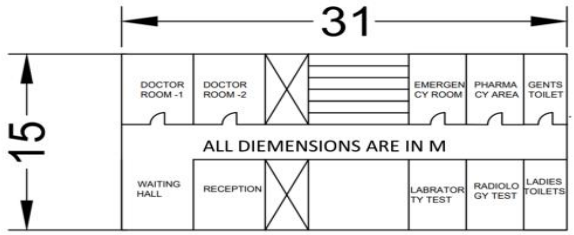
Advantages of AutoCAD:

- Easy Layout and Viewing. ...
- Draw Accurately. ...
- Make Changes Easily and Reduce Risk of Error. ...
- Identify Design Problems. ...
- Calculate Material Quantities for Production. ...

- Store and Transfer Data Safely. ...
- Save Time and Money

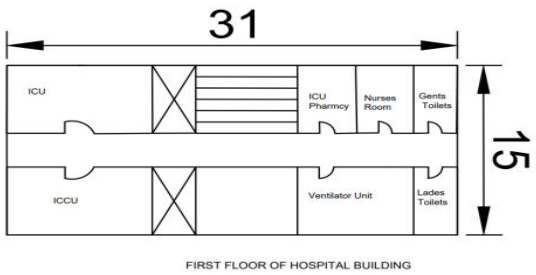
THE FOLLOWING IS THE MODEL OF A HOSPITAL BUILDING OF GROUND FLOOR AND FIRST FLOOR

AUTO CAD PLANNING OF A HOSPITAL BUILDING



GROUND FLOOR OF HOSPITAL BUILDING

ALL DIMENSIONS ARE IN METERS



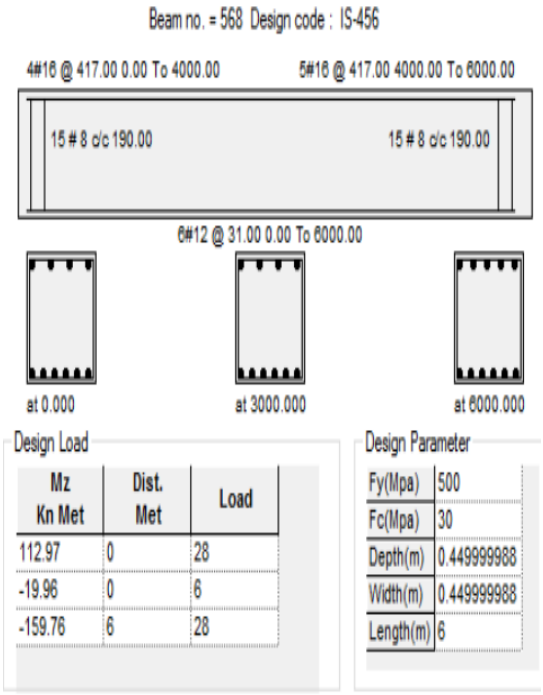
FIRST FLOOR OF HOSPITAL BUILDING

ALL DIMENSIONS ARE IN METERS

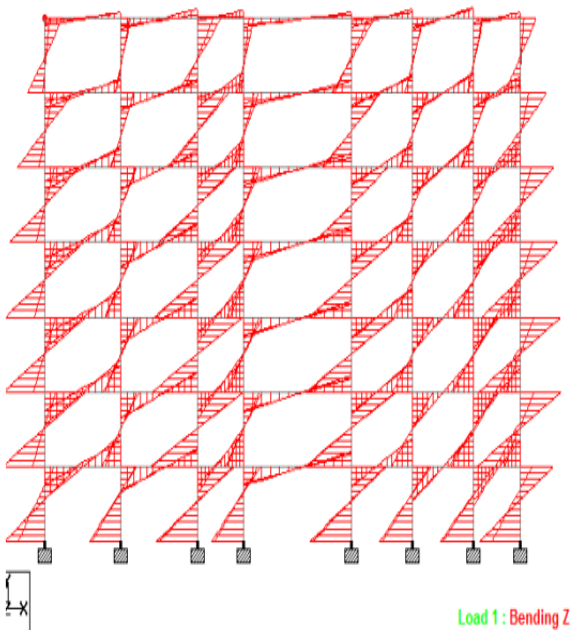
III- ANALYSIS AND DESIGN OF A HOSPITAL BUILDING USING STAAD.PRO

In recent years, STAAD Pro has become an integral part of structural analysis & design solutions mainly using an exposed API called Open STAAD to access and drive the program with the help of Visual Basic macro system included in the application. Also, Open STAAD functionality is used in applications that themselves include suitable programmable macro systems. Additionally, STAAD. Pro also has added direct links to applications such as RAM Connection and STAAD Foundation. It provides help to engineers working with those applications that are handling design post processing which is directly not handled by STAAD.Pro itself. STAAD Pro does schema analysis of the CIM steel Integration Standard, version 2 commonly known as CIS/2, and used by a number modeling and analysis applications. STAAD.Pro was one of the earliest structural analysis and design software that was designed with user-friendly GUI and support for building codes of various nations such as India, the US, the UK, and other developed nations. With the help of STAAD Pro, civil engineers can easily analyze & design civil engineering structures such as buildings, bridges, dams, canals, sewage systems, and plane and space trusses.

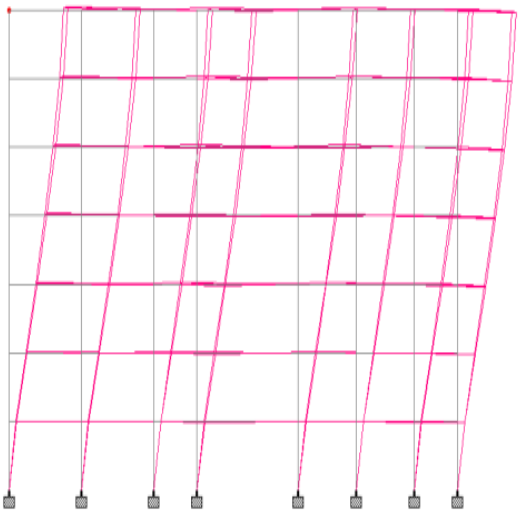
IV- DESIGN RESLUTS OF HOSPITAL BUILDING USING STAAD.PRO



BENDING MOMENT:



DEFLECTION:



V-ANALYSIS AND DESIGN OF A HOSPITAL BUILDING USING ETABS

The building is analyzed by 3D structure modeling through ETABS Version 9.7 program. The aim is to understand the strength and stability of different discussions, such as focusing on the configuration of different analytical structures. The Hospital Building is designed with Five floors, 18 m high with beams and columns as main elements of structures made of conventional concrete. The beam carries the load transversely of its length and transfers the load to the vertical columns that accumulate it. The column is loaded axially by the beam elements and transfers the load to the foundation.

IS1893 2002 Auto Seismic Load Calculation:

This calculation presents the automatically generated lateral seismic loads for load pattern

EQX according to IS1893 2002, as calculated by ETABS.

Direction and Eccentricity

Direction = Multiple

Eccentricity Ratio = 5% for all diaphragms

Structural Period

Period Calculation Method = Program Calculated

Factors and Coefficients

Seismic Zone Factor,

Z [IS Table 2] Z = 0.36

Response Reduction Factor,

R [IS Table 7] R = 5

Importance Factor, I [IS Table 6] I = 1 Site Type [IS Table 1] = II

Seismic Response Spectral Acceleration Coefficient, Sa /g [IS 6.4.5] Sa/g = 1.36/ T Sa/ g = 2.020632

Equivalent Lateral Forces Seismic Coefficient, Ah [IS 6.4.2] Ah = ZI(Sa /g) /2R

Calculated Base Shear:

Direction	Period (sec)	W (kN)	V_b (kN)
X	0.673	20069.788	1459.931
Y	1.741	20069.788	564.4431
X + Ecc. Y	0.673	20069.788	1459.931
Y + Ecc. X	1.741	20069.788	564.4431
X - Ecc. Y	0.673	20069.788	1459.931
Y - Ecc. X	1.741	20069.788	564.4431

CONCLUSION:

This paper analysis various studies carried out over planning, designing and analyzing a structure with the help of different software. All the studies considered above gives a suggestion of adopting STAAD.Pro over other software for analyzing a building structure. Due to its flexibility and its provision for economic sections both in terms of steel and concrete, STAAD.Pro is adopted for further analysis procedure. The New teaching hospital building was designed with the earthquake resistant design consideration. Seismic analysis and design were done by using ETABS software and verified manually as per IS 1893-2002 the provision of shear wall in the staircase and lift region have the ultimate shear resistance, the total base shear produced by the earth quake for that maximum percentage of the shear resistance produced by the shear wall and the remaining shear resistance produced by the columns. The detailing of the structural elements were done as per IS 1893–2002 (Ductile detailing for Earthquake resistant structures). To conclude a complete design involving several parameters so as to result the earthquake has been done.

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