A REVIEW ON DESIGN AND ANALYSIS OF MULTI-STOREY BUILDINGS USING STAAD.PRO

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Abstract: The aim of this paper is analyses and design all seismic zones in India using software called staad.pro. Manual estimation for structural design and analysis is a difficult and time-consuming task that is not always the right solution. It is possible to use a computer-aided programmed called Staad.Pro to plan and evaluate a concrete building easily and effectively prior to its completion. These analyses are carried out by taking into account various seismic zones, and the behavior of each zone is evaluated using the Soft Soil Index. Staad.Pro will apply both static and dynamic loads, as well as variations of the two in a straightforward manner Staad.Pro can be used to design and analyze buildings made of diverse materials such as concrete, steel, and wood.

Keywords: **Staad.Pro, computer-aided programmed, design and analyses, seismic zones.**

I.INTRODUCTION

In today's world, the population is rapidly increasing, and people need more space to live. The structure should be constructed in an effective manner to support citizens while also saving money. To put it another way, a building is an empty space enclosed by walls and roofs that provides shelter for people. People used to live in caves to defend themselves from wild animals, storms, and other natural disasters. As people progressed, so did the types of structures that they built. Buildings also come in a variety of shapes and sizes, including low-rise and high-rise structures. Buildings are necessary markers of a country's social development. Many types of construction technology have been created in recent years so that buildings can be constructed economically and quickly to meet people's needs. Columns, pillars, and slabs make up a building's foundation. Buildings often come in a variety of sizes, forms, and functions. Buildings should be built to meet the needs of the people, not to make money. As the environment changes, so does the need for advanced technology.

II. LITERATURE REVIEW

Since the earthquake is not predictable and cause many damages on environmental, capital and human fatalities so, to prevent the consequences of these risks we have to analyse any construction work before executing it.
In a study based on seismic zones as per (IS 1893(Part I):2002), Sayyed O.et al. (2017) observed and focused by the influence of infill and mass inconsistency on several floor in buildings. This resulted that block infill promotes the seismic implementation on the RCC buildings and unfortunate seismic responses on mass sporadic structures. Another study, Khan et al. (2016) was Aimed by the effect of mass variation on different floors in RCC buildings using staad.pro. Reddy A. et al. (2015) Conducted and Focused analytical investigation on customary and sporadic buildings to analyse the reaction of buildings on seismic Zone V as per IS 1893-2002. On the other hand, Akash Panchal and Ravi Dwivedi committed Seismic analysis on the basis of lateral force supposed to act along with the gravity forces. This project is a housing building (G+6) and is committed for different seismic zones using Staad.Pro. Another study done by Narla Mohan and A. Mounika Vardhan aims how the seismic assessment of a building should be committed. To study the behaviour of a building under the action of seismic loads and wind loads in different zones. Tiriveedhi Sai Krishna and V. Srinivasa Rao study a multistorey building is analysed in different zones and explained in 2-ways i.e., with earth quake and without earthquake as per IS 1893- 2002.

III. METHODOLOGY

A Model of G+7storeyed is developed, analysis and design using Staad.Pro software. plan size of the building is (20 x 15) m2 the building is provided as a input to the staad.pro software for drawing, analysis and designing purposes. Following specification are given to the structure

- ✓ Live Load: 2.5 KN/Sq.m
- ✓ Thickness of slab: 120 mm
- ✓ Location of the site: all seismic zones India Type of Soil: Medium Soil, (Type-II as per IS: 1893 (Part-1))
- ✓ Total height of the building (24m)
- ✓ Each Storey Height: 3 m
- ✓ No of Floors: Ground+7
- ✓ Column 1 size (40 x 40) cm2 [for the ground floor up to 1st floor]
- ✓ Column 2 size (30 x 30) cm2 [from 2nd up to 7th floor]
- ✓ Beam 1 size (23 x 30) cm2 [from ground floor up to 7th floor]
- ✓ Beam 2 size (23 x 23) cm2 [for roof floor]
- ✓ Slab 1 thickness (15 x 15) cm2 [for the ground floor up to 3rd floor]
- ✓ Slab 2 thickness (12.5 x 12.5) cm2 [from 4th floor up to roof floor]

Load properties:

- ✓ Self-weight [Self-weight contains the weight of beams, columns and slab of the building.]
- ✓ Live load (2500 N/m2)
- ✓ Floor load (1000 N/m2)
- ✓ Seismic loads (All Zones as per **IS 1893:2002**)
- ✓ Dead load (3125 N/m2)

We used IS Code 456 2000 for the analysis and modeling G+7.

IS codes

IS 456-2000 is an Indian Standard code for Plain and Reinforced Concrete of practice for common structural use of plain and reinforced concrete.

Software

Staad.Pro is originally design software application and structural analysis developed by research engineers international in 1997

Zones

India has many seismic zones and they divided into four seismic zones (II, III, IV, and V) 1893 (Part I), 2002, related of scientific inputs of seismicity tectonic setup of the region earthquakes occurred in the past.

33 m/s for Zone II
39 m/s for Zone III
46 m/s for Zone IV
50 m/s for Zone V

IV. RESULT AND DISCUSSION

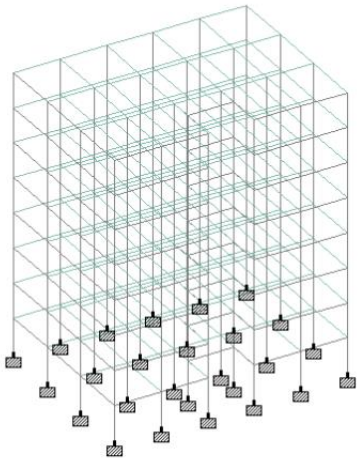

fig.1 plan 3d view

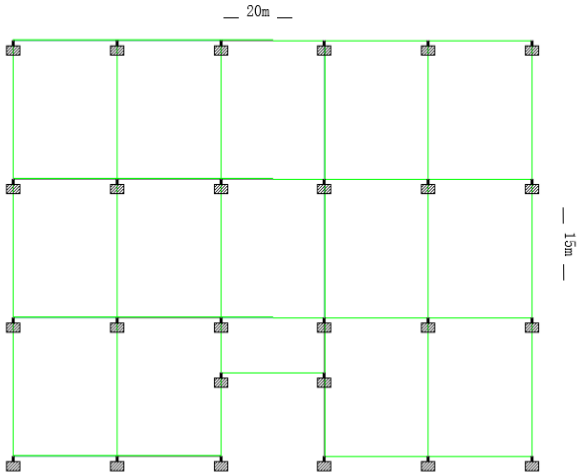

fig.2 plan top view

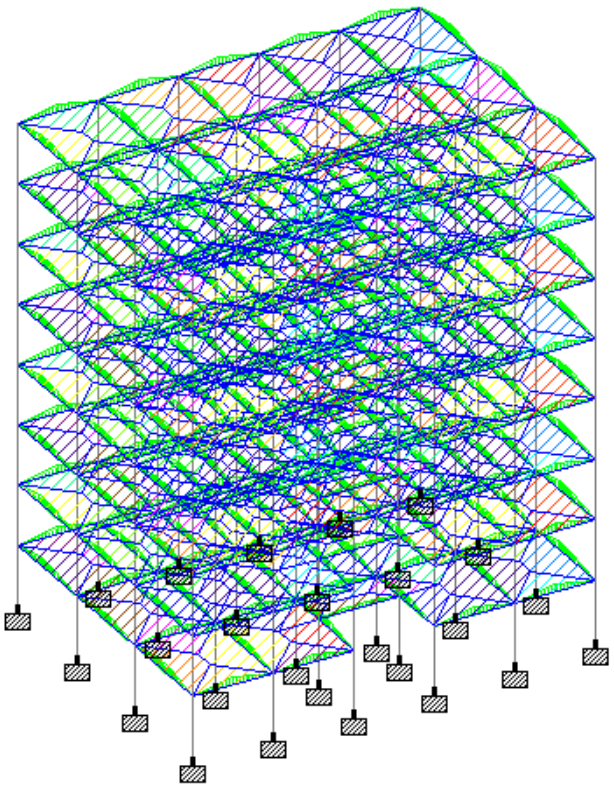

Fig.3 Load projection (Live load and floor loads)

Zone II Beam, Column and Deflection of seismic forces (X-axis)

table.1.0.1: (beams in zone ii)

Beam No:	L	D	W	Mz Knmet	Dist. Met	Load	Deflection (Start-End)	Main Bars
B-1	4	0.23	0.30	-9.5	4	13	0.554-0.556	6#12 dia
B-45	5	0.23	0.30	-16.37	5	8	0.554-0.548	6#12 dia
B-479	4	0.23	0.23	-7.35	4	8	8.751-8.751	4#12 dia
B-533	5	0.23	0.23	-15.04	5	8	8.666-8.581	5#12 dia

table.1.0.2: (columns in zone ii)

Column No:	H	B	W	Mz Knmet	My Knmet	Deflection (Start-End)	AsReq mm.2	Main Bars
C-6	3	0.40	0.40	9.9	0.18	0-0.554	1280	12#12 dia
C-484	3	0.30	0.30	0.71	0.48	8.167-8.751	720	4#16 dia

Zone V Beam, Column and Deflection of seismic forces (X-axis)
table.1.0.3: (beams in zone v)

Beam No:	L	D	W	Mz Knmet	Dist. Met	Load	Deflection (Start-End)	Main Bars
B-1	4	0.23	0.30	-15.35	4	13	1.995-2.001	6#12 dia
B-45	5	0.23	0.30	-20.27	5	14	1.995-1.974	6#12 dia
B-479	4	0.23	0.23	-7.71	4	13	31.504-31.504	4#12 dia
B-533	5	0.23	0.23	-15.04	5	8	31.200-30.894	5#12 dia

table.1.0.4: (columns in zone v)

Column No:	H	B	W	Mz Knmet	My Knmet	Deflection (Start-End)	AsReq mm.2	Main Bars
C-6	3	0.40	0.40	35.65	0.64	0-1.995	1280	12#12 dia
C-484	3	0.30	0.30	2.56	1.73	29.403-31.504	720	4#16 dia

Concrete and Steel used

TOTAL VOLUME OF CONCRETE = 158.2 CU.METER

BAR DIA (in mm)	WEIGHT (in New)
12	208287
16	28245
20	1161
*** TOTAL=	237693

Zone II Concrete Volume used and Steel used on Beams and columns

TOTAL VOLUME OF CONCRETE = 158.2 CU.METER

BAR DIA (in mm)	WEIGHT (in New)
12	208891
16	28245
20	1161
*** TOTAL=	238297

Zone III Concrete Volume used and Steel used on Beams and columns

TOTAL VOLUME OF CONCRETE = 158.2 CU.METER

BAR DIA (in mm)	WEIGHT (in New)
12	208855
16	29081
20	1161
*** TOTAL=	239097

Zone IV Concrete Volume used and Steel used on Beams and columns

TOTAL VOLUME OF CONCRETE = 158.2 CU.METER

BAR DIA (in mm)	WEIGHT (in New)
12	211428
16	31090
20	4644
*** TOTAL=	247162

Zone V Concrete Volume used and Steel used on Beams and columns

V. CONCLUSION

calculation for software design, it is found that the percentage of reinforcement in the segment is Staad.Pro is more easy than manual calculation. Staad.Pro is a flexible programme that can measure the reinforcement needed for any concrete segment as well as assess lateral deflection due to earthquake load. By comparing manual higher. This capstone project shows the column, beam design and deflection, the quantity of concrete used, the weight and no of different bars used, seismic loads and other stresses in the structure. In this data we can compare same structure that has same parameter in all zones a see how it responds.

As shown, the concrete consumed is the same in all zones, but steel reinforcements are having different outcomes in both bar size and no of bars used. Using more reinforcement is making the structure weightier and more flexible so that its ability to resist seismic loads or high seismic intensity loads will increase and they become safer and reliable than less reinforced structures.

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