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# Seismic Analysis and Design of G+5 Storied Residential Building Using Stadd Pro

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**ABSTRACT**: From past earthquakes it is proved that many of structure are totally or partially damaged due to earthquake. So, it is necessary to determine seismic responses of such buildings. There are different techniques of seismic analysis of structure. Time history analysis is one of the important techniques for structural seismic analysis generally the evaluated structural response is non-linear in nature. For such type of analysis, a representative earthquake time history is required. In this project work seismic analysis of RCC buildings with mass irregularity at different floor level are carried out. Here for analysis different time histories have been used. This paper highlights the effect of mass irregularity on different floor in RCC buildings with time history and analysis is done by using STAAD Pro software.

**KEYWORDS**: SEISMIC ANALYSIS, HIGH-RISE BUILDING, RESPONSE SPECTRUM METHOD, ZONE FACTOR, WIND LOADS, DESIGN LOADS, HIGH RISE BUILDINGS, BASE SHEAR, STOREY SHEAR, STORY DISPLACEMENT. STAAD PRO.

## I. INTRODUCTION

The earthquake causes vibratory ground motions at the base of the structure, and the structure actively responds to these motions. In design system, it is customary to assume the structure as a fixed base system acted upon by inertia forces. Seismic design involves two distinct steps. Determining or estimating the structure forces that will act on the structure.Designing the structure to provide adequate strength, stiffness, and energy dissipation capabilities to withstand these forces. Day to day variations in the designing of the structures we were motivated to deal with this project. As civil engineering is much concerned with different designs to meet the necessity of human life we took this project.

## **II. OBJECTIVES**

To analyse and design G+5 storied residential building by using STAAD Pro,

- Analysis of G+5 Storied RCC Framed Structure without Seismic Load
- Analysis of G+5 Storied RCC Framed Structure with Seismic Load
- ➢ Design of G+5 Storied RCC Framed Structure with and without Seismic Load
- > To Compare benefits of Analysis and Design of Building Considering Seismic Effect.

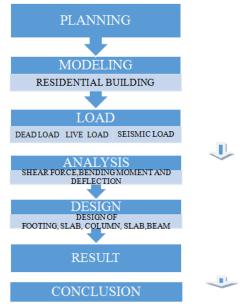
# III. METHODOLOGY



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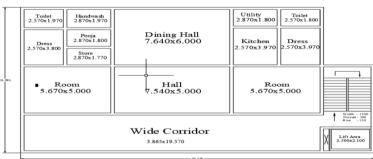
The process carried out by following steps



This Method is step by step analysis of the seismic responses of a structure to a specified loading that may change with time.

## **STEP 1: PLANNING**

Planning is the pre-production activity in Civil Engineering and it involves drawing up construction plans using AUTOCAD Software.



PLAN

ALL DIMENSIONS ARE IN " METER "

Column	0.5 m x0.5 m
Beam	0.45 m x0.45 m
Slabs	0.15 m
parapet wall	0.1 m
Grade of concrete	M 25
Grade of steel	Fe 500
No. of storey	G+5
Total height	18 m
Height of floor to floor	3 m



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#### **STEP 2: MODELING**

Using residential building

# **STEP 3: LOAD**

Dead Load: In accordance with IS:875 Part 1

 $\begin{array}{l} Self \ weight = -1 \ kN/m^2 \\ Slab \ load = 0.15x25 = 3.75 \ kN/m^2 \\ Wall \ load \\ Outer \ Wall = 0.23x3x20 = 13.8 \ kN/m^2 \\ Inner \ Wall = 0.115x3x20 = 6.9 \ kN/m^2 \\ Parapet \ Wall = 0.115x20x1 = 2.3 \ kN/m^2 \\ \end{array}$ 

Live load: In accordance with IS:875 Part Il

Live load of slabs - 3 KN/m<sup>2</sup>(1-5<sup>th</sup> Floor) Live load of Roof - 1.5 kN/m<sup>2</sup>

Seismic load: In accordance with IS:1893

Include 1893 Part 4	~~	Generate	
Parameters	Value	Unit	- A
Zone	0.075		
sponse reduction Factor (RF)	1		
Importance factor (I)	1		
Rock and soil site factor (SS)	1		=
* Type of structure (ST)			
Damping ratio (DM)	0.05		
* Period in X Direction (PX)		seconds	
* Period in Z Direction (PZ)		seconds	
* Depth of foundation (DT)		m	
* Ground Level (GL)		m	
*Spectral Acceleration (SA)	0		
* Multiplving Factor for SA (DF)	0	1	-

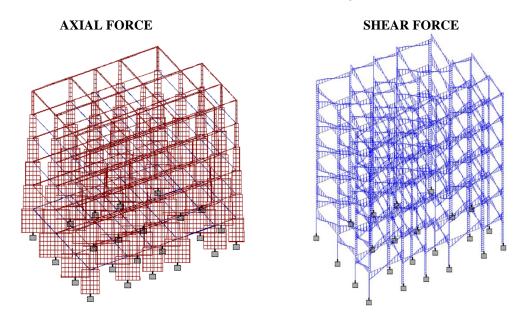
# **STEP 4: ANALYSIS**

**AXIAL FORCE:** The forceacting along the axis of the component Ex:- Building Column **SHEAR FORCE:** Movement of one surface of a substances over another parallel surface

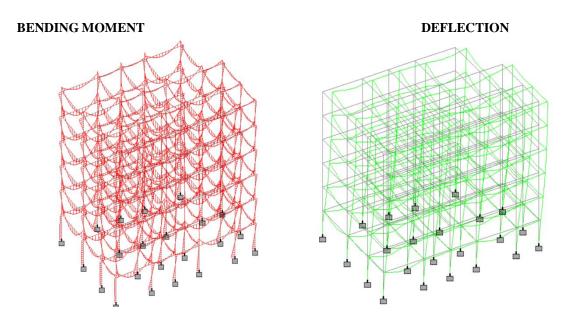


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**BENDING MOMENT:** It is reaction external force or moment is applied to the Structural elements **DEFLECTION:** The degree to which a structural element is displaced under load (Turing side)



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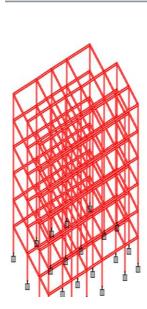


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#### **STEP 5: DESIGN**

Design of Slab, Column and Beam



Current Co	ode: 15455	į	n i i	<u>,</u> /	ourninary/	LINCOPE	1					
3 🔒 🗋 LOAD C 3 🔒 🗋 LOAD C	XMB 35 GENERATE XMB 36 GENERATE XMB 37 GENERATE Rin Analysis Print	D INDIAN CI D INDIAN CI		Beam	L/C	Node	Fx N	Fy N	Fz N	Mx kNm	My kNm	Mz kNm
E 🗃 START CONCRETE DESIGN		Max Fx	53	91.5(D.L+L.L	17	2.80300E6	18220.394	-11437.885	-0.027	11.708	17.792	
		Min Fx	47	8 WL-Z	11	-97377.411	-192.546	33198.441	0.028	-73.296	-0.357	
		Max Fy	323	91.5(D.L+L.L	117	-7382.995	148.00699E	-396.889	-0.593	1.193	174.738	
	44IN 500		Min Fy	87	91.5(D.L+L.L	40	-23587.610	-147.98405E	134.370	-0.309	0.432	173.200
-V DES	SIGN BEAM Sign Column		Max Fz	40	28 GENERAT	4	1.76804E6	-11850.761	68421.021	0.023	-128.011	-11.904
		Min Fz	116	24 GENERAT	44	1.46140E6	-21330.126	-68041.847	-0.155	101.888	-33.179	
-√ FINSH			Max Mx	64	26 GENERAT	28	-16865.788	113.37511E	-217.463	2.166	0.505	118.272
< ☑ Highlight, Assi	aned Geonetry	>	Min Mx	65	29 GENERAT	29	-5268.254	52419.453	1486.302	-6.483	-2.592	30.780
Toggle Kosign			Max My	57	29 GENERAT	21	1.76970E6	-11297.074	-67475.830	-0.066	127.096	-10.899
Select Parameters.	Defre Paraneters.	Connands	Min My	40	28 GENERAT	4	1.76804E6	-11850.761	68421.021	0.023	-128.011	-11.904
Assignment Net	fod o Selected Bears		Max Mz	93	12 GENERAT	42	796.083	-134.77242E	27.669	0.374	0.123	187.769
) Asign To Other Com	o View		Min Mz	101	27 GENERAT	52	1.58801E6	63714.718	-15360.189	0.678	-22.205	-97.005

#### **STEP 6: RESULT**

++ Read/Check Data in Load Cases	11:50:11		
++ Read/Check Data in Load Cases ++ Using Out-of-Core Basic Solver	11:50:11		
++ Processing and setting up Load Vector.	11:50:11		
++ Processing Element Stiffness Matrix.	11.50.11		
++ Processing Global Stiffness Matrix.	11:50:11		
++ Finished Processing Global Stiffness Matrix.	0 ms		
++ Processing Triangular Factorization.	11:50:11		
++ Finished Triangular Factorization.	20 mm		
++ Calculating Joint Displacement.	11:50:11		
++ Finished Joint Displacement Calculation.	30 ms		
++ Calculating Member Forces.	11:50:11		
++ Analysis Successfully Completed ++			
++ Performing Concrete Design	11:50:11		
++ Calculating Section Forces1.	11:50:11		
++ Calculating Section Forces2.	11:50:11		
++ Calculating Section Forces3.	11:50:11		
++ Start Concrete Design	11:50:12		
++ Start Concrete Design	11:50:12		
++ Creating Displacement File (DSP)	11:50:13		
++ Creating Reaction File (REA)	11:50:13		
++ Calculating Section Forces1-110.	11:50:13		
++ Calculating Section Forces2.	11:50:13		
++ Calculating Section Forces3	11:50:13		
++ Creating Section Force File (BMD)	11:50:13		
++ Creating Section Displace File (SCN)	11:50:13		
++ Creating Design information File (DGN)	11:50:13		
++ Done.	11:50:13		
D Error(s), 1 Warning(s), 2 Note(s)			
++ End STAAD.Pro Run Elapsed Time = 2 Secs			
C:\SProV8i SS6\STAAD\Plugins\pr	oject.anl		
<			>
View Output File			
Go to Post Processing Mode			

## **STEP 6: CONCLUSION**

- 1. Accuracy is Important by Using software
- 2. Designing using Software's like Staad reduces lot of time in design work.
- 3. Details of each and every member can be obtained using staadpro.



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4. All the list of failed beams can be Obtained and also Better Section is given by the software

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IS 456-2000 code book for design of beams, columns and slabs

[5] Sp-16 for design of Columns