Static Seismic Analysis of RCC Building as per IS 1893:2002 by Using STAAD-Pro Software

Hiteshkumar D. Mishra¹, Prof. D.L.Budhlani², Prof.B.N.Ramteke³

¹M.Tech-Student Appearing (Structural Engineering),^{2,3}Assistant Professor, Guru Nanak Institute Of Technology, Dahegaon, Nagpur, India, 441501

Abstract – In this paper seismic response of (G+7)R.C.framed building is analyses for different load cases by using STAAD-Pro software as per IS1893:2002 part-1.This paper consider different seismic parameter like seismic zone, response reduction factor, importance factor & other parameters like rock/soil type, structure type, damping ratio etc. This paper provides complete guidelines for STAAD-Pro software analysis & STAAD – Pro gives the results after run analysis in the STAAD output viewer which shows joint displacements, support reactions, member forces base shear and lateral load.

Keywords- Static analysis, IS 1893:2002, reinforced structure, Earthquake, STAAD-Pro, Seismic loads, multistory building, RCC building.

INTRODUCTION

From the history of earth, Earthquake is sudden violent shaking or Vibrations of the ground. Earthquake caused by tectonic movement in earth Crust and also caused by sudden slip on a fault or rupture of geological faults, But also by other events (natural & artificial causes) such as volcanic activity, Landslides, mine blasts and nuclear tests. In recent studies geologist claim that global warming is one of the Reason for seismic activity. According to these studies melting glaciers and Rising sea level disturb the balance of pressure on earth tectonic plates thus causing increase in frequency and intensity of earthquakes results in Damages structure & property of nation. Hence, earthquake is a major problem by development of nation & great Challenge for structural engineer to construct building in seismic region (Zones). Hence, structure should be analyzed for earthquake forces to avoid the damages.Generally Structure having two types of loading that is static loading and dynamic loading. Static loads are Constant and dynamic loads are change with time. In maximum civil buildings or structures only static loads are considered and dynamic loads are not calculated because of more complications in calculation. In this paper complete static analysis is performed by using STAAD-Pro software.

METHODOLOGY

Consider (G+7) storey building located in new Delhi zone IV, the soil conditions is medium stiff soil, entire building is supported on raft foundation, RC frame infill with brick masonry, lumped weight due to dead load is 12kN/m² on floors and 10kN/m² on roof, floors carry live load of 4kN/m² on floors and 1.5kN/m² on roof, span of building 5m in X and Z direction, Floor to floor height is 3.1m, bottom floor height is 4.2m, size of beam is assume to be as 0.35X0.45m And size of column as 0.35X0.5m, material assume to be concrete. All the supports are assigning as fixed supports,

- Lumped Weight:-A lumped mass is a load that can be applied to a node in a static stress, natural frequency (modal) or modal superposition analysis. A lumped mass can be used to resist the translation or rotation of a node.
- Seismic parameter:-
 - 1) Seismic zone IV, zone factor Z is 0.24 (Table no. 2 of IS1893:2002 Part-1)
 - 2) Response reduction factor, R is 5 (Table no. 7 of IS1893:2002 Part-1)

Impact Factor Value 4.046 International Journal of Innovations in Engineering and Science, Vol. 3, No.7, 2018 www.ijies.net

Here, I explain how to define IS1893:2002 Seismic loading definitions. Further we will apply that all loads to the buildings and analyses the building by using STAAD-Pro software.



Fig. 1- fig shows the Structural model of building in STAAD-Pro software.



Fig. 2- fig shows the seismic definition

The natural vibration characteristics of a structure play a significant role in estimation of seismic behavior of a structure. The design guidelines of different countries also provide some estimate of the natural period by prescribing empirical expressions.

Since our building is made of moment resisting frame with break in fill panels, we should use empirical expression the fundamental natural period is as follows:

T=0.09h/sqrt (d)

..... (Clause 7.6.2 of IS 1893:2002)

By default STAAD-Pro calculates the fundamental natural period by using the expression. We will have to calculate natural period manually for this building using following equation:

$T=0.075h^{(0.75)}$

..... (Clause 7.6.1 of IS 1893:2002)

Hence approximate fundamental natural period in both X and Z direction is as follows:

T = 0.09(25.9) / sqrt (20)

T = 0.5212 sec... (Since X and Z direction value D = 20) Add Damping Ratio as 0 to get the accurate result. In engineering, the damping is dimensionless measure describing how oscillations in a system decay after a disturbance.



Fig. 3- fig shows the seismic parameter.



Fig. 4- fig shows the seismic parameter can be defined only once in STAAD model.

Seismic definition is generated to help STAAD-Pro to obtain the value for Ah

International Journal of Innovations in Engineering and Science, Vol. 3, No.7, 2018 www.ijies.net

VB = Ah*W

Where,

VB = Seismic base shear,

Ah= Horizontal acceleration spectrum value as per 6.4.2 of IS 1893:2002

W = Seismic weight of building.

To help STAAD-Pro to calculate W (Seismic weight)

We will define floor weight in the building



Fig. 5- fig shows the seismic floor weight of building for dead load.

For roof only

R0	Mo	deling	Postprocessing	Steel Design	Concrete Design	Foundation Design	RAM Connection	Bridge
2 × 28 88 28 × 5 5 5 4 5 4 10 10 10 14 14 10	🕒 Anahysis/Print [🔅 General 🛣 Geometry 😽 Setup 🛛	F Load & Definition - Support S spec H Property	Postprocessing Trial - Whole Stru Add New : Seismic D Sef Weight Jont Weights Member Weights Reference Weights Reference Structure Reference Structu	Steel Design cture lefinitions	Concrete Design r Weights Range Group aad essure 10 kN/m Define Y Range Minimum 22.8 n Maximum 25.9 n One Way Distribution wards	Foundation Design Foundation Design Range Define X Rang Define X Rang Minimum O Define Z Rang n Minimum O Define Z Rang Ninimum O Maximum O Maximum O	e m m m m m	×
	🕇 H Design	🗱 Material				Add	Close	Help

Fig. 6- fig shows the seismic floor weight of building for dead load.

Now floor carry a live load 4 KN/m². Since the value of live load is more then 4kN/m², 50% of live load will be lumped on floors, hence 50% of live load that will be 2kN/m²



Fig. 7- fig shows the seismic weight of building for live load.

This completes the seismic definition as per IS 1893-2002.

Defining Dead Load Case- First of all we will have to define earth quake load case.

Dead load cases: - For floors shown in fig.



Fig. 8- fig shows the D.L. case for floors.

Live Load case: -for Floors



Fig. 9- fig shows the L.L. case for floors.

Impact Factor Value 4.046 e-ISSN: International Journal of Innovations in Engineering and Science, Vol. 3, No.7, 2018 www.ijies.net

Before applying auto load combinations we will have to define analysis and print data command between load case 1 and 2 and then load case 2 and 3.

This will help STAAD-Pro to calculate loads for load cases 1 and 2 in x direction and z direction before doing the combinations. After Perform analysis- we will use the "Change" command to reset Stiffness Matrix.



Fig. 10- fig shows perform analysis.

Partial safety factors for limit state design of reinforced concrete structures, the following load combinations shall be accounted for:

- 1) 1.5(DL + LL)
- 2) 1.2(DL + IL +_ EL)
- 3) 1.5(DL +_EL)
- 4) 0.9 DL +_ 1.5 E

..... (clause 6.3.1.2 of IS1893:2002Part-1)



Fig. 11- fig shows the auto load combination as per IS 1893:2002

By check in "Create Repeat load cases" it will create auto load combinations with repeat command, which help STAAD-Pro to analyze building with simultaneous effects of all load cases.

Now again apply command "Perform Analysis" then Click "Post print" from Analysis Toolbar. Now Click "Define command" Add load cases from 5 to 12.So STAAD-Pro consider only this load cases to print data.



Fig. 12- fig shows the add load list 5-12

Likewise add "Joint displacement", Support reactions" and Member forces" also

Assign Joint displacement command to "Assign to view"

Assign Support reactions command to "Assign to view"



Fig. 13- fig shows adding joint displacement, support reaction and member forces for assigning.

Assign Member forces command to Columns at bottom only shown in fig:-



g. 14- fig shows the Assign member forces

Now "Run Analysis".

STAAD-Pro gives the results after run analysis in STAAD output viewer which shows the joint

International Journal of Innovations in Engineering and Science, Vol. 3, No.7, 2018 www.ijies.net

displacement, support reactions and member forces as shown in fig.

10770								
NULES								
RESOLIS		INT DISP	LACEMENT (C	M MADIAN	5) 5100	CIORS TIPE	- SPACE	
OINT DISPLACE ALL								
NEMBER EORCES LIST 33	TOTAL	1000	V-TO MAR	V-TO AND	T-TDAME	V-DORAH	V-DOTAN	R-DORAH
and the reacts con as	JOIN	DOND	2-16663	1-110005	6 INANS	2-ROINS	1-ROTAN	5-NOTAN
		1 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		10	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		11	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		12	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		2 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		6	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		7	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		9	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		10	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		11	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		12	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		3 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		6	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		7	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		9	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		10	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
		11	0.0000	0.0000	0.0000	0.0000	0.0000	0.000

Fig. 15- fig shows the Joint displacement of first 5 joint

	3	5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NOTES		6	0.0000	0.0000	0,0000	0,0000	0.0000	0,0000
RESULTS		7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JOINT DISPLACE ALL		8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUPPORT REACTION LIST 1			0,0000	0.0000	0,0000	0,0000	0,0000	0,0000
MEMBER FORCES LIST 33		10	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000
		11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		12	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000
	4	5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	5	5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	6	5	-0.0061	-0.1411	-0.0057	0.0007	0.0000	-0.0004
		6	-0.0049	-0.1129	-0.0045	0.0005	0.0000	-0.0003
		7	1.9125	-0.0478	-0.0042	0.0005	0.0001	-0.0045
		8	-0.0045	-0.0441	3,1060	0.0061	-0.0001	-0.0003
		9	-1.9222	-0.1779	-0.0049	0.0005	-0.0001	0.0043
		10	-0.0052	-0.1816	-3.1151	-0.0051	0.0001	-0.0003
					PAGE 16 En	ds Here >		
								81.58 MO
_			_			_	_	
Encode the make and Miledows			(17)			(m)		

Fig. 16- fig shows the Joint displacement of first 5 joint

NOTES	JOINT	LOAD	Z-TRANS	Y-TRANS	Z-TRANS	Z-ROTAN	Y-ROTAN	Z-ROTAN
RESULTS								
DINT DISPLACE ALL								
UPPORT REACTION LIST 1		9	-3.7446	-0.6546	0.0000	0.0000	0.0000	0.0039
MEMBER FORCES LIST 33		10	0.0007	-0.6540	-5.4173	-0.0037	-0.0001	0.0001
		11	0.0007	-0.6227	0.0000	0.0000	0.0000	0.0001
		12	4.6824	-0.6219	0.0000	0.0000	0.0000	-0.0047
	105	5	0.0009	-0.4494	0.0000	0.0000	0.0000	0.0006
		6	0.0007	-0.3595	0.0000	0.0000	0.0000	0.0005
		7	3.7468	-0.4714	0.0000	0.0000	0.0000	-0.0041
		8	0.0007	-0.3595	5.3149	0.0036	0.0001	0.0005
		9	-3.7454	-0.2476	0.0000	0.0000	0.0000	0.0051
		10	0.0007	-0.3595	-5.3149	-0.0036	-0.0001	0.0005
		11	0.0007	-0.3424	0.0000	0.0000	0.0000	0.0005
		12	4.6833	-0.4823	0.0000	0.0000	0.0000	-0.0053
	106	5	-0.0017	-0.6008	0.0000	0.0000	0.0000	-0.0007
		6	-0.0014	-0.4806	0.0000	0.0000	0.0000	-0.0005
		7	5.4680	-0.3352	0.0000	0.0000	0.0000	-0.0051
		8	-0.0014	-0.4806	7.4129	0.0034	-0.0001	-0.0005
		9	-5.4708	-0.6260	0.0000	0.0000	0.0000	0.0040
		10	-0.0014	-0.4806	-7.4129	-0.0034	0.0001	-0.0005
		11	-0.0013	-0.4582	0.0000	0.0000	0.0000	-0.0005
		12	6.8354	-0.2764	0.0000	0.0000	0.0000	-0.0062
	107	5	-0.0011	-1.0884	0.0000	0.0000	0.0000	-0.0001
		6	-0.0009	-0.8707	0.0000	0.0000	0.0000	-0.0001
		7	5.4688	-0.8707	0.0000	0.0000	0.0000	-0.0038
		8	-0.0009	-0.8707	7.5809	0.0035	-0.0001	-0.0001
		9	-5.4705	-0.8707	0.0000	0.0000	0.0000	0.0036
		10	-0.0009	-0.8707	-7.5809	-0.0035	0.0001	-0.0001
		11	-0.0008	-0.8300	0.0000	0.0000	0.0000	-0.0001

Fig. 17- fig shows the Joint displacement

()								
NOTES	JOIN	T DISP	LACEMENT (C	M RADIAN	IS) STRU	CTURE TYPE	= SPACE	
RESULTS								
JOINT DISPLACE ALL								
MEMBER FORCES LIST 33	JOINT	LOAD	Z-TRANS	Y-TRANS	Z-TRANS	Z-ROTAN	Y-ROTAN	Z-ROTAN
		9	-10.2567	-0.7026	0.0031	-0.0010	0.0003	0.0017
		10	-0.0013	-0.5026	-14.5118	-0.0032	-0.0006	0.0001
		11	0.0014	-0.6774	0.0032	-0.0009	0.0000	0.0001
		12	12.8238	-0.6817	0.0023	-0.0009	-0.0004	-0.0018
	220	5	0.0027	-0.4929	0.0019	-0.0007	0.0000	0.0004
		6	0.0022	-0.3944	0.0015	-0.0005	0.0000	0.0003
		7	10.2590	-0.5813	0.0050	-0.0005	-0.0006	-0.0016
		8	0.0058	-0.5894	13.9207	0.0016	0.0006	0.0003
		9	-10.2547	-0.2074	-0.0019	-0.0005	0.0006	0.0022
		10	-0.0014	-0.1993	-13.9177	-0.0026	-0.0006	0.0003
		11	0.0026	-0.3780	0.0019	-0.0005	0.0000	0.0003
		12	12.8237	-0.6116	0.0063	-0.0005	-0.0008	-0.0021
	221	5	0.0150	-0.5029	-0.0128	-0.0011	0.0000	-0.0007
		6	0.0120	-0.4023	-0.0102	-0.0009	0.0000	-0.0006
		7	10.7528	-0.2142	-0.0136	-0.0008	-0.0006	-0.0016
		8	0.0085	-0.5983	14.4855	0.0002	-0.0006	-0.0006
		9	-10.7288	-0.5904	-0.0068	-0.0009	0.0006	0.0005
		10	0.0155	-0.2063	-14.5060	-0.0019	0.0006	-0.0006
		11	0.0119	-0.3864	-0.0101	-0.0009	0.0000	-0.0006
		12	13.4378	-0.1513	-0.0144	-0.0009	-0.0008	-0.0019
	222	5	0.0085	-0.9002	-0.0227	-0.0019	0.0000	-0.0002
		6	0.0068	-0.7202	-0.0182	-0.0015	0.0000	-0.0002
		7	10.7463	-0.7163	-0.0174	-0.0015	-0.0003	-0.0009
		8	0.0044	-0.9245	15.0746	-0.0005	-0.0007	-0.0002

Fig. 18- fig shows the Joint displacement

	- SPACE	CTURE TYPE	STE STRU	SUPPORT REACTIONS -UNIT KN METE STRUCTURE TYPE - SPACE												
MOM Z	мом-т	MOM-X	FORCE-Z	FORCE-Y	FORCE-Z	LOAD	JOINT									
-15.19	0.01	12.56	8.88	1276.73	10.67	5	1									
-12.15	0.00	10.04	7.10	1021.38	8.53	6										
320.12	-0.52	9.97	7.06	432.61	-108.13	7										
-12.04	0.53	-291.97	-112.03	399.13	8.48	8										
-344.42	0.53	10.12	7.14	1610.16	125.19	9										
-12.26	-0.52	312.06	126.23	1643.64	8.59	10										
-11.42	0.00	9.44	6.67	972.03	8.02	11										
403.92	-0.65	9.34	6.62	236.07	-137.81	12										
-1.65	-0.02	23.40	16.54	2326.14	0.99	5	2									
-1.32	-0.01	18.72	13.23	1860.91	0.79	6										
370.64	-0.29	18.72	13.24	1868.49	-144.47	7										
-1.22	0.55	-288.31	-107.83	1216.03	0.74	8										
-373.28	0.26	18.71	13.23	1853.33	146.06	9										
-1.42	-0.58	325.74	134.30	2505.79	0.85	10										
-1.26	-0.01	17.58	12.43	1770.56	0.76	11										
463.69	-0.36	17.59	12.43	1780.03	-180.82	12										
0.00	0.00	23.91	16.90	2403.80	0.00	5	3									
0.00	0.00	19.13	13.52	1923.04	0.00	6										
370.13	-0.32	19.13	13.52	1923.04	-143.83	7										
0.00	0.00	-290.30	-108.47	1267.83	0.00	8										
-370.13	0.32	19.13	13.52	1923.04	143.83	9										
0.00	0.00	328.56	135.52	2578.24	0.00	10										
0.00	0.00	17.97	12.70	1829.86	0.00	11										

Fig. 19- fig shows the Support reaction

RESULTS								
IT DIFFE ACT ALL								
IT DISPLACE ALL								
PORT REACTION LIST 1	JOINT	LOAD	FORCE-Z	FORCE-Y	FORCE-Z	NOM-X	MOM-Y	MOM Z
ABER FORCES LIST 33								
		9	152.33	3600.32	0.00	0.00	0.00	-388.94
		10	1.52	3608.03	145.13	340.66	-0.40	-2.53
		11	1.46	3432.41	0.00	0.00	0.00	-2.41
		12	-187.06	3442.04	0.00	0.00	0.00	480.60
	93	5	0.00	4654.89	0.00	0.00	0.00	0.00
		6	0.00	3723.91	0.00	0.00	0.00	0.00
		7	-149.35	3723.91	0.00	0.00	0.00	384.54
		8	0.00	3723.91	-146.26	-343.34	0.00	0.00
		9	149.35	3723.91	0.00	0.00	0.00	-384.54
		10	0.00	3723.91	146.26	343.34	0.00	0.00
		11	0.00	3543.10	0.00	0.00	0.00	0.00
		12	-186.68	3543.10	0.00	0.00	0.00	480.68
	94	5	-1.90	4510.03	0.00	0.00	0.00	3.16
		6	-1.52	3608.03	0.00	0.00	0.00	2.53
		7	-152.33	3600.32	0.00	0.00	0.00	388.94
		8	-1.52	3608.03	-145,13	-340,66	-0.40	2.53
		9	149.29	3615.73	0.00	0.00	0.00	-383.88
		10	-1.52	3608.03	145.13	340.66	0.40	2.53
		11	-1.46	3432.41	0.00	0.00	0.00	2.41
		12	-189 97	3422 78	0.00	0.00	0.00	485.43
	95	5	=20.71	2467.61	0.00	0.00	0.00	29.48
		6	-16 57	1974 09	0.00	0.00	0.00	22 59
			-127 69	2604.09	0.00	0.00	0.00	269.79
		,	-16 57	1974 09	-142 79	-225.09	-0.32	22 59
		0	-10.07	1014.00		-333.08	-0.52	23.35

Fig. 20- fig shows the Support reaction

JOINT SUPPO MEM8

NOTES	87A	AD SPA	CE				077	PAGE NO.
DISPLACE ALL								
RT REACTION LIST 1								
ER FORCES LIST 33								
	SUPP	ORT RE	ACTIONS -U	NIT KN M	ETE STR	UCTURE TYPE	= SPACE	
	JOINT	LOAD	FORCE-Z	FORCE-Y	FORCE-Z	MOM-X	мом-т	MOM Z
	184	5	-0,99	2326.14	-16.54	-23.40	-0.02	1.65
		6	-0.79	1860.91	-13.23	-18.72	-0.01	1.32
		7	-146.06	1853.33	-13.23	-18.71	0.26	373.28
		8	-0.85	2505.79	-134.30	-325.74	-0.58	1.42
		9	144.47	1868.49	-13.24	-18.72	-0.29	-370.64
		10	-0.74	1216.03	107.83	288.31	0.55	1.22
		11	-0.76	1770.56	-12.43	-17.58	-0.01	1.26
		12	-182.34	1761.08	-12.43	-17.58	0.33	466.21
	185	5	-10.67	1276.73	-8.88	-12.56	0.01	15,19
		6	-8.53	1021.38	-7.10	-10.04	0.00	12.15
		7	-125.19	1610.16	-7.14	-10.12	0.53	344.42
		8	-8.59	1643.64	-126.23	-312.06	-0.52	12.26
		9	108.13	432.61	-7.06	-9.97	-0.52	-320.12
		10	-8.48	399.13	112.03	291.97	0.53	12.04
		11	-8.02	972.03	-6.67	-9.44	0.00	11.42
		12	-153.84	1708.00	-6.72	-9.53	0.66	426.76
		9 10 11 12	108.13 -8.48 -8.02 -153.84	432.61 399.13 972.03 1708.00	-7.06 112.03 -6.67 -6.72	-9.97 291.97 -9.44 -9.53	-0.52 0.53 0.00 0.66	-320 12 11 426

Fig. 21- fig shows the Support reaction

NOTES	221. 1	RINT)	(EMB)	R FORCES LI	187 33 70	37 105 TO	109 177 7	O 181 249 T	0 253 321		
RESULTS					PAGE	60 Ends B	ore >				
ONT DISPLACE ALL UPPORT REACTION LIST 1 REMBER FORCES LIST 33	BTAAT	STAAD SPACE									
	MEMBREI	N KIND I	ORCE	S STRUCT	TURE TYPE	= SPACE					
	ALL UN	ITS A	æ	KN METE	(LOCI	LL)					
	MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORS ION	MOM-T	MOM-Z		
				1075 70	10.77			10.54			
	33	2	- 21	1276.73	-10.67	0.00	0.01	-12.56	-15.19		
		2	•	1021 20	-0.52	7.10	0.01	-10.04	-12.15		
	102	0	- 2	-1021.30	0.53	-7.10	0.00	-10.04	-22 69		
		7		432 61	108 13	7.06	-0.52	-9.97	320 12		
			6	-432.61	-108.13	-7.05	0.52	-19.67	134.01		
		8	1	399,13	-8.48	-112.03	0.53	291.97	-12.04		
			6	-399.13	8.48	112.03	-0.53	178.54	-23.58		
		9	1	1610.16	-125.19	7.14	0.53	-10.12	-344.42		
			6	-1610.16	125.19	-7.14	-0.53	-19,88	-181,39		
		10	1	1643.64	-8.59	126.23	-0.52	-312.06	-12.26		
			6	-1643.64	8.59	-126.23	0.52	-218.10	-23.81		
		11	1	972.03	-8.02	6.67	0.00	-9.44	-11.42		
			6	-972.03	8.02	-6.67	0.00	-18.58	-22.26		
		12	1	236.07	137.81	6.62	-0.65	-9.34	403.92		

Fig.22- fig shows the Member forces

International Journal of Innovations in Engineering and Science, Vol. 3, No.7, 2018 www.ijies.net

NOTES	12								
RESULTS	MEMBER	END	FORCE	S STRUCT	URE TYPE	= SPACE			
JOINT DISPLACE ALL									
SUPPORT REACTION LIST 1 MEMBER FORCES LIST 33	ALL UN	ITS A	RE	KN METE	(LOCA	L)			
	MRMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	NOM-T	MOM-Z
		12	136	1055.67	134.25	-0,17	0.68	0.32	404.46
			141	-1055.67	-134.25	0.17	-0.68	0.40	159.39
	250	5	137	4399.20	-1.84	-0.50	0.00	0.94	-3.07
			142	-4399.20	1.84	0.50	0.00	1.18	-4.67
		6	137	3519.36	-1.47	-0.40	0.00	0.75	-2.45
	18		142	-3519.36	1.47	0.40	0.00	0.95	-3.73
		7	137	3527.03	147.54	-0.40	0.37	0.75	379.30
			142	-3527.03	-147.54	0.40	-0.37	0.95	240.38
		8	137	3469.90	-1.47	-148.28	0.38	345.15	-2.44
			142	-3469.90	1.47	148.28	-0.38	277.61	-3.72
		9	137	3511.68	-150.49	-0.40	-0.37	0.75	-384.21
	13		142	-3511.68	150.49	0.40	0.37	0.94	-247.85
		10	137	3568.81	-1.48	147.47	-0.38	-343.65	-2.46
	10		142	-3568.81	1.48	-147.47	0.38	-275.72	-3.74
		11	137	3347.69	-1.41	-0.40	0.00	0.73	-2.34
	15		142	-3347.69	1.41	0.40	0.00	0.94	-3.58
		12	137	3357.28	184.86	-0.40	0.46	0.74	474.86
	18		142	-3357.28	-184.86	0.40	-0.46	0.94	301.57
	251	5	138	4536.32	0.00	-0.53	0.00	0.98	0.00
			143	-4536.32	0.00	0.53	0.00	1.26	0.00

Fig. 23- fig shows the Member forces

	MEMBER	END	FORCE	S STRUC	TURE TYPE	- SPACE			
NOTES				-					
RESULTS	ALL UN	ITS A	R8	KN METE	(LOCA	L)			
JOINT DISPLACE ALL									
SUPPORT REACTION LIST 1	MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-X	MOM-Z
MEMBER FORCES LIST 33									
		12	184	1761.08	182.34	-12.43	0.33	17.58	466.21
			189	-1761.08	-182.34	12.43	-0.33	34.62	299.60
	325	5	185	1276.73	10.67	-8.88	0.01	12.56	15.19
			190	-1276.73	-10.67	8.88	-0.01	24.72	29.61
		6	185	1021.38	8.53	-7.10	0.00	10.04	12.15
			190	-1021.38	-8.53	7.10	0.00	19.78	23.69
		7	185	1610.16	125.19	-7.14	0.53	10.12	344.42
			190	-1610.16	-125.19	7.14	-0.53	19.88	181.39
		8	185	1643.64	8.59	-126.23	-0.52	312.06	12.26
			190	-1643.64	-8.59	126.23	0.52	218.10	23.81
		9	185	432.61	-108.13	-7.06	-0.52	9.97	-320.12
			190	-432.61	108.13	7.06	0.52	19.67	-134.01
		10	185	399.13	8.48	112.03	0.53	-291.97	12.04
			190	-399.13	-8.48	-112.03	-0.53	-178.54	23.58
		11	185	972.03	8.02	-6.67	0.00	9.44	11.42
			190	-972.03	-8.02	6.67	0.00	18.58	22.26
		12	185	1708.00	153.84	-6.72	0.66	9.53	426.76
			190	-1708.00	-153.84	6.72	-0.66	18.71	219.38
			*** 2	ND OF LATE:	ST ANALYSI	S RESULT			

Fig. 24- fig shows the Member forces

CONCLUSION

The response of (G+7) storey RC building under seismic load as per IS1893:2002 (Part-1) by using software STAAD -Pro has been studied. The building is modeled as 3D space frame using STAAD-Pro software. The building for different load cases such as DL, LL and Seismic load has been analyzed. This analysis provides complete guidelines for STAAD-Pro software analysis of static method. STAAD-Pro gives result very quickly as compared to manual calculation. Also Base shear, Lateral load, Joint displacement, support reaction and member forces for all the joints of a building has been calculated and printed further.

REFERENCES

- [1] Bureau of Indian standards: IS 875(Part 1):1987,dead load on 7 structures, new Delhi, india
- [2] Paulay T and Priestley M. J. N, Seismic Design of Reinforced Concrete and Masonry Buildings, Willy Interscience, Canada, 1992
- [3] Li Qiusheng, Cao Hong and Li Guiqing, "Static and Dynamic Analysis of Straight Bars with Variable Cross – Section", Computers & Structures, Volume: 59, No: 6. Page: 1185 - 1191, 1996.
- [4] Bureau of Indian standards: IS 1893(Part 1):2002indian standard criteria for earthquake resistant design of

structure part 1 general provisions of building (fifth revisions), new Delhi india

- [5] Bungale S. T, Wind & Earthquake Resistant Buildings Structural Analysis and Design, Monticello, New York 12701, U.S.A, 2005.
- [6] Agarwal Pankaj, Shrikhande Manish, "Earthquake resistant design of structures", PHI learning private limited, New Delhi, 2009.
- [7] BahadornBagheri, Ehsan SaliminFiroozabad, and MohammadrezaYahyaei, "Comparative Study of the Static and Dynamic Analysis of Multi-Storey Irregular Building", International Journal of Civil, Environmental, and Structural, Construction and Architectural Engineering, Volume: 6, No: 11, 2012.
- [8] A.K Chopra "Dynamic of structures theory and Earthquake Engineering" fourth edition, Prentice Hall, 2012
- [9] P.p.Tapkire, S.J.(2013) Comparative study of highrise building using Indian standards and EURO standards under seismic forces. International journal of science and research(IJSR),1-4.
- [10] B. Srikanth, V.Ramesh, "Comparative study of seismic response for seismic coefficient and response spectrum methods" al Int. Journal of Engineering Research and Applications ISSN: 2248-9622, Vol. 3, Issue 5, Sep-Oct2013, pp.1919-1924G.
- [11] E. Pavan Kumar1, A. Naresh2, M. Nagajyothi3, M. Rajasekhar, "Earthquake Analysis of Multi Storied Residential Building - A Case Study", 2014.
- [12] A.K.Chopra, V.S.(2014).Design as per Indian standards and also to determine the effect of providing shear wall to building Mr. Gururaj B. Katti, Dr. Basavraj Balapgol "Seismic Analysis of Multistoried RCC Buildings Due to Mass Irregularity By Time History", IJERT, Vol: 3(7), pg 2278-0181, 2014
- [13] Mr. S.Mahesh, M. D. (NOV-DEC 2014). Comparison of analysis and design of regular and irregular configuration of multi Story building in various seismic zones and various types of soils using ETABS and STAAD. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 1-8.
- [14] AnirudhGottala, Kintali Sai Nanda Kishore and Dr. Shaik Yajdhani "Comparative Study of Static and Dynamic Seismic Analysis of a Multistoried Building" International Journal of Science Technology & Engineering, Volume 2, Issue 01, July 2015
- [15] Vinit Dhanvijay, P>D.(2015). Comparative study of different codes in seismic assessment. International research journal of engineering and technology (IRJET),1-13.
- [16] Mahesh N. Patil, Yogesh N. Sonawane, "Seismic Analysis of Multistoried Building", International Journal of Engineering and Innovative Technology (IJEIT) Volume 4, Issue 9, March 2015.
- [17] Chetan Raj, Vivek Verma, Bhupinder Singh, Abhishek ,"Seismic Analysis of Building with Mass and Vertical Geometric Irregularity by Response Spectrum and Seismic Coefficient Method in Zone V and II", International Journal of Recent Research Aspects ISSN:2349-7688, Vol. 2,Issue 2, June 2015, pp. 204-211.
- [18] Jun Chen, G.I.(2016). Accelaration response spectrum for predicting f;oor vibration due to occupants jumping.
- [19] Kumar C.S. (n.d.). Comparison of seismic vulnerability of building designed for Higher force versus Higher ductility.1-13

- [20] "Comparative Study of the Static and Dynamic Analysis of Multi-Storey Irregular Building" Bahador Bagheri, Ehsan Salimi Firoozabad, and Mohammadreza Yahyaei
- [21] Document No. :: IITK-GSDMA-EQ21-V2.0 Final Report :: A - Earthquake Codes IITK-GSDMA Project on Building Codes.
- [22] Staad. Pro Help Menu & Bentley Student Server.

AUTHOR PROFILE

Sr.	Photo	Details
No		
1		Hiteshkumar D. Mishra received the B. E. (Civil Engineering) in the year 2015 from MGM'S College of Engineering (SRTMNU Nanded University), Maharashtra State, India. Now he is M.tech. – Student appearing (Structural Engineering) from Gurunanak Institute of Management and Technology, kalmeshwar road, Dahegaon, Nagpur (RTM Nagpur University), Maharashtra State, India.
2		Prof.D.L.BudhlaniisworkingasAssistantProfessor, department of civilengineering,GuruNanakinstituteofTechnology,Dahegaon,Nagpur,Nagpur,Maharashtra, IndiaNagpur,
3		Prof.B.N.Ramteke is working as Assistant Professor, department of civil engineering, Guru Nanak institute of Technology, Dahegaon, Nagpur, Maharashtra, India