IJCRT.ORG ISSN : 2320-2882
INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

"PERFORMANCE BEHAVIOUR OF BUILDING STRUCTURES AGAINST BLAST EFFECTS"

Mr. Rishabh Kumar[1], Mr. Mahendra Saini[2]
[1]M. Tech. Scholar, Department of civil engineering (Structural Engineering), Regional College for Education Research & Technology, Jaipur
[2]Asst. Professor, Department of civil engineering, Regional College for Education Research & Technology, Jaipur

ABSTRACT

Since there have been more terrorist attacks in recent years due to technological improvement, it is necessary to take into account the dynamic effects of blast loading, such as wind and seismic load. The primary goal of this dissertation is to analyse different types of building system response against blast effects and blast loads that a structure might be exposed to, assess its vulnerability, and offer recommendations to the structural engineers on how to economically reduce the impact of blast on a structure while still protecting people and infrastructure from explosion. Total nine different models have been analysed as per IS 4991:1968 code provisions along with other lateral forces. Conventional RCC system, inverted V-type bracings and shear wall performance have been studied through Etabs models to check behaviour against blast loadings, an analysis of a 30-story building is conducted, and the impact of blast loading and standoff distance on the displacement and storey drift is explored. First, a basic explanation of explosives and different types of explosions. To further explain the effects of explosives on buildings, the general aspects of the explosion process have been provided. Understanding explosives and explosion characteristics better will help us create blast-resistant building designs much more effectively. Both an architectural and a structural approach is used to highlight key methods for enhancing a building's capacity to protect against explosive consequences.

Keywords: R.C.C., braced frame and shear wall, Etabs Software, Dynamic analysis.

INTRODUCTION

Due to the significant long-term environmental effects of the 2022 Russian invasion of Ukraine, both the environment and human health are in danger. Buildings that have been destroyed continue to generate cancerous dust. More than 4 million people are already without access to clean drinking water due to the destruction of civil infrastructure. Because plants absorb and accumulate contaminants, soils in places of armed conflict are no longer suitable for cultivation.

1.2 Explosion process for high explosives

The blast wave is created close to the explosion's source, where severe loads caused by extremely heated and expanding gases are difficult to correctly measure. When the blast wave has formed and is moving away from the source, it is easy to distinguish between the various kinds of loading that the nearby objects have been subjected to. In three categories, three effects have been found. The term "air shock wave" refers to the phenomenon that rapidly compresses the surrounding air. Dynamic pressure and ground shock waves are terms used to describe the quick compression of the ground caused by the effect of air pressure and air movement caused by the concentration of gases from explosive chemical reactions.

1.3 Types of analysis

As per IS 1893 (Part-1): 2016 analysis for earthquake resistant structures is bifurcated in two classes:
a) Static analysis
b) Dynamic analysis

Linear and Nonlinear analysis: A relation has been found in between stress & strain and when remaining material properties should be fixed in linear analysis and deformations are covered by small deflection. And nonlinear analysis can be utilized for analysing the structures when linear analysis is prohibited.

Dynamic analysis shall perform for obtaining these design seismic forces and its distribution not at same levels of building along with the height of building and to various lateral loads resisting elements for following buildings.

LITRATURE REVIEW

M. Meghanadh, T. Reshma (2017) evaluated the impact of blast loads on a fivestory R.C.C. building in 2017 [1]. The impact of a blast source containing 100 kg of trinitrotoluene (TNT), located 40 metres from the building, is taken into account. Using IS: 4991-1968, side on over pressures and blast loading are computed. STAAD Pro is used to analyse the force time history of the structure. It is calculated the maximum displacement, velocity, and how they change over time. The building is safe from the perspective of the resonance effect because its natural frequency does not coincide with any mode form frequency.

Gautham T N, Dr. M N Hegde (2017) look into the impact of blast loading standoff distance. Blast loading is necessary to comprehend its occurrence and analyze the responses of structural members, and in order to do this, a number of steps must be taken, including assessing threats, computing blast-induced loadings, selecting an appropriate structural system, and observing how the behavior of the building is affected. The study analyses a G+5 building, with loadings computed in accordance with IS4991-1968. ETABS is used to take into account and analyze 16 different scenarios.

P. S. Ramesh, Dr. Devraj et. al. (2017) examine how well a G+4 RCC building performs when exposed to explosive (RDX) of 100 kg. The explosive's positive phase parameters are calculated for various standoff distances using UFC 3-340-02 and ETAB 2015, respectively. He looked into the meaning of standoff distance. Responses in beams and columns are calculated using drift, displacement, and force. At an 80-meter standoff distance, the structure is deemed to be secure. Explosion loads and blast wave interactions with structures are discussed. Axial load vs storey, drift versus storey, displacement versus storey, SF versus storey, and BM versus storey graphs are obtained.

ARCHITECTURAL AND STRUCTURAL ASPECT OF BLAST RESISTANT BUILDING DESIGN

3.1 Architectural aspects:

Minimizing the effects of an explosion on the building and its occupants is the goal of blast resistant building design philosophy. Preventing catastrophic breakdown of the entire structure or significant portions of it is a key need. Additionally, it's important to lessen the impact of projectiles on building occupants as well as the impact of blast waves that enter a structure through openings. However, there are times when aesthetic considerations, accessibility issues, firefighting standards, and budgetary constraints collide with blastresistant building design techniques.

3.1.1 Planning and layout

A lot may be done during the planning stages of a new structure to lessen potential dangers and the risks of harm and destruction that go along with them. Considerations include the possibility of a terrorist attack, the need for blast protection for both structural and non-structural members, and the proper placement of shelter places within a building. The goal should be to put as much space between an external bomb and the building as possible in the event of an external threat.

Figure 3.1. Schematic layout of site for protection against bombs

3.2 Structural aspect of blast resistant building design:

Peak overpressures are caused by the reflection of an external blast wave on a building's front face. The peak overpressure decays to zero when the initial blast wave has passed the building's reflecting surface. Blast overpressure exerts a relieving effect on the front face as it is subjected to overpressures on the sides and top faces of the building (which have no reflections and are lower than the reflected overpressures on the front face).

3.3 Types of explosives:

The full-scale invasion of Ukraine by Russia has created a pressing need for aid with conventional weapons destruction. Large portions of Ukraine's territory, including its population centres, have been attacked and shelled by Russia. Important civilian infrastructure has been damaged or destroyed, including apartment buildings, schools, hospitals, food storage facilities, power plants, highways, and bridges. Russian munitions may have a dud rate of between 10 and 30 percent, according to international demining specialists, which means that a sizable amount of unexploded ordnance will stay in the ground for years to come.

ORDNANCE SUB-CATEGORY	Aerial Bomb - Carrier
EXPLOSIVE FILL (g)	N/A
AUW (g)	250000-275000g
DIMENSIONS (mm)	2150x325
COUNTRY OF ORIGIN	Russia
FUZE	ATK-ET

Figure 3.5. RBK-250/275 aerial explosive used by Russia

METHODOLOGY

4.1 Method of analysis

In this study, analysis was carried out for the behaviour of 30 storey building for a charge of 100 kg and for three building categories i.e., residential, community buildings and commercial buildings as defined in IS 4991:1968. For comparison of various features of structures results they are also categorised in total of 9 models i.e. normal RCC frame building, RCC building with inverted V type bracings and RCC building with shear walls. Base floor height and typical floor height was kept 3 m and plan of 45 m x 25 m was taken for all structures. All three types of models were analysed in Etabs software. The structural modelling of building was done according to codes IS 1893 (Part-1):2016 and IS875 (part-3):2015. Analysis method was carried out in Etabs software by dynamic analysis. The conclusions were presented in the graphs and tables which were obtained from results of analysis.

4.2 Response spectrum method

The response spectrum is an important tool for seismic analysis and design of structures. It describes the maximum response of the damp single degree of freedom system to a particular input speed at different natural periods. Analysis has an advantage in the response spectrum method as it considers the frequency effect and provides a single suitable horizontal force for the design of the structure.

1. Two basic methods are widely used for methods of dynamic seismic analysis, response spectrum and time history.
2. Response Spectrum method-
3. This method allows determination of the maximum modal response of a single supported structural system or more than one supported system where all supports receive the same stimulus.
4. Time History method-

4.3 IS Code method

In IS 1893 (Part-1): 2016, the simplest method of seismic analysis and easy to understand was lateral force method. In this method of analysis, the design base shear (VB) calculated first and then distributed along the height of building by simple formula (Qi) with regular distribution of mass and stiffness.

Wind analysis procedure

In this study a thirty-storey building was considered at wind zone V where basic wind speed has been considered 50 m/sec. The wind pressure was also calculated for each storey according as per IS 875 (Part-3): 2015 and various factors of wind analysis were taken for wind zone V was considered in this analysis.

FORMULATION OF PROBLEM

5.1 General

Plan used for all models presented in Figure 5.1. Dynamic analysis method has been adopted for all models and comparison between them has been done. Data used in analysis was mentioned in previous chapter. Analysis was done in Etabs software with theoretical approach given in previous chapter. Material property data and properties of structural members were described in tabular form in this chapter. Various parameters were compared for all models and graphs were plotted in chapter-6 results section. Complete procedure of dynamic analysis which was used in software defined in this chapter.

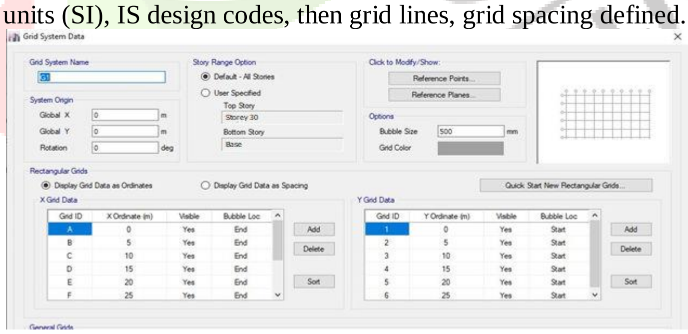
5.2 Structural modelling

A symmetrical floor plan of 45 m x 25 m shown in figure 5.1 of 30 storeys were considered for the modelling of all structures. A bare charge of 100 kg explosives for different types of building with various distances as per table-7 of IS 4991:1968 was taken into account. Hence models are: -

Model 01 is Residential RCC framed structure with explosive distance of 40 m.
Model 02 is Residential RCC structure with braced frame with explosive distance of 40 m.
Model 03 is Residential RCC structure with shear wall system with distance of 40 m.
Model 04 is Community RCC framed structure with explosive distance of 30 m.
Model 05 is Community RCC structure with braced frame with explosive distance of 30 m.
Model 06 is Community RCC structure with shear wall system with distance of 30 m.
Model 07 is Service building of RCC framed structure with explosive distance of 20 m.
Model 08 is Service building of RCC with braced frame with explosive distance of 20 m.
Model 09 is Service building of RCC structure with shear wall system with distance of 20 m.

5.3 Geometry

First initialize model with metric units (SI), IS design codes, then grid lines, grid spacing defined.



Defining material properties

Material properties were defined for concrete, masonry and rebar materials in define menu. Material properties are defined as per table 4.1.

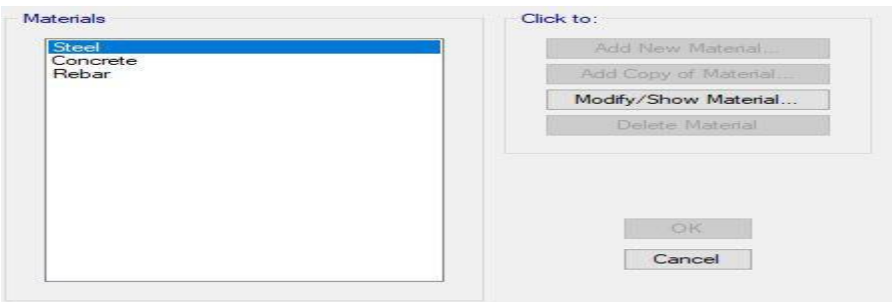
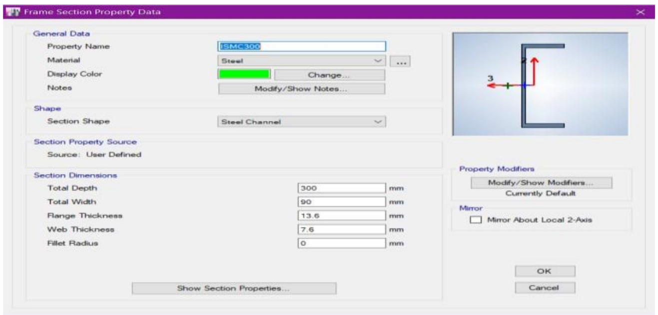


Fig. 5.3 Define materials used.

5.2.3 Defining member properties

After defining properties of materials, these properties should be defined for members. Concrete properties for slabs, beams and columns, rebar property for steel bars, and steel properties for ISMC300 channel sections. In figure 5.4, channel section properties were defined.



Defining loads

After completing member properties, different types of loads should be defined. First load patterns are defined as per figure 5.5. In which dead, live, finishes load were defined.

For earthquake loads, EQX and EQY are defined and seismic load patterns were defined as per IS 1893(Part-1):2016 shown in figure 5.6. Wind load was defined as per IS 875 (Part-
3):2015 shown in figure 5.7.

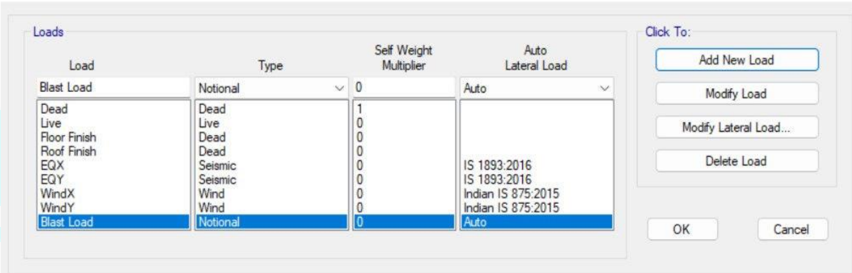


Fig. 5.5 Define load patterns

Fig. 5.6 Define lateral load as per IS 1893(Part-1): 2016[1].

6. RESULTS AND DISCUSSION

In this study, total nine models were analyzed in Etabs software and results were summarized by graphs and tables described in this chapter. For residential, community and service buildings graphs are plotted separately because of intensity of pressure are different for each type. And comparison between them is tabulated and graphically shown. Table 6.1 represents maximum displacements on each storey for all residential models for load case “Blast Load” in both x and y directions. Similarly, table 6.2 and 6.3 for community and service buildings. Table 6.4 to 6.6 represents maximum storey drifts on eachstorey for all models in both x and y directions. Table 6.7 to 6.9 represents storey shear forces for all models and table 6.10 to 6.12 represents overturning moments in both x and y directions.

Table 6.1 Maximum displacements for all residential building models

Story	Elevation (m)	X-Direction			Y-Direction		
		Model-01	Model-02	Model-03	Model-01	Model-02	Model-03
		mm	mm	mm	mm	mm	mm
Story30	90	819	566	332	518	240	248
Story29	87	797	559	327	505	239	243
Story28	84	774	552	322	491	238	238
Story27	81	750	544	316	476	236	232
Story26	78	726	535	310	462	234	226
Story25	75	701	524	303	446	231	220
Story24	72	675	513	296	430	228	214
Story23	69	649	501	288	414	225	207
Story22	66	622	488	279	397	220	200
Story21	63	594	474	270	380	216	192
Story20	60	566	459	260	363	210	184
Story19	57	538	443	250	345	205	176
Story18	54	509	426	239	327	198	167
Story17	51	479	408	227	308	192	158
Story16	48	449	390	214	290	184	149
Story15	45	420	370	201	271	176	139
Story14	42	389	350	188	252	168	128
Story13	39	359	329	174	233	159	118
Story12	36	329	307	159	213	150	107
Story11	33	299	284	144	194	140	96
Story10	30	269	260	129	175	129	85
Story9	27	239	236	113	156	118	74
Story8	24	209	211	97	137	107	63
Story7	21	180	186	82	118	95	53
Story6	18	152	160	66	100	83	42
Story5	15	124	133	52	82	70	33
Story4	12	97	107	38	64	57	23
Story3	9	71	79	25	47	43	15
Story2	6	46	52	14	31	29	8
Story1	3	22	24	5	15	14	3
Base	0	0	0	0	0	0	0

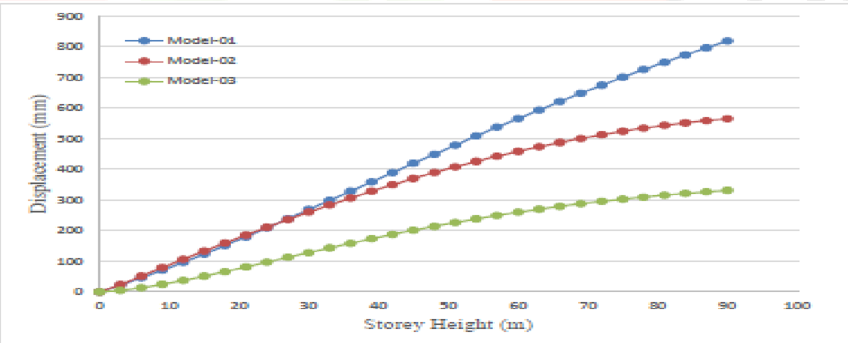


Fig. 6.1 Displacement v/s Storey height in X-direction for residential buildings

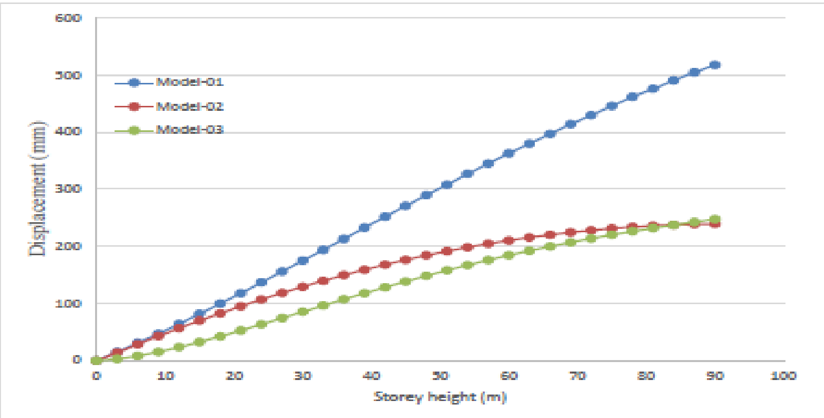


Fig. 6.2 Displacement v/s Storey height in Y-direction for residential buildings

Table 6.2 Maximum displacements for all community building models

Story	Elevation (m)	X-Direction			Y-Direction		
		Model-04	Model-05	Model-06	Model-04	Model-05	Model-06
		mm	mm	mm	mm	mm	mm
Story30	90	1322	633	547	786	473	397
Story29	87	1286	624	539	767	465	389
Story28	84	1249	614	530	746	455	380
Story27	81	1211	603	521	725	445	371
Story26	78	1172	591	510	703	435	362
Story25	75	1132	579	499	680	423	352
Story24	72	1090	565	487	656	411	342
Story23	69	1048	550	474	632	399	331
Story22	66	1005	534	460	607	386	320
Story21	63	960	518	445	581	372	307
Story20	60	915	500	428	555	358	295
Story19	57	869	481	411	529	343	281
Story18	54	822	462	392	501	327	267
Story17	51	775	442	373	474	311	252
Story16	48	727	420	352	445	295	237
Story15	45	679	398	331	417	278	221
Story14	42	630	375	308	388	261	205
Story13	39	581	351	285	359	243	188
Story12	36	532	327	261	330	225	171
Story11	33	484	302	236	300	206	153
Story10	30	435	276	211	271	187	136
Story9	27	387	249	185	242	168	118
Story8	24	339	222	160	213	149	101
Story7	21	292	195	134	184	130	84
Story6	18	246	167	109	155	110	67
Story5	15	201	138	85	127	91	52
Story4	12	157	110	62	100	72	37
Story3	9	115	81	41	74	53	24
Story2	6	75	52	22	48	34	13
Story1	3	36	24	8	23	16	5
Base	0	0	0	0	0	0	0

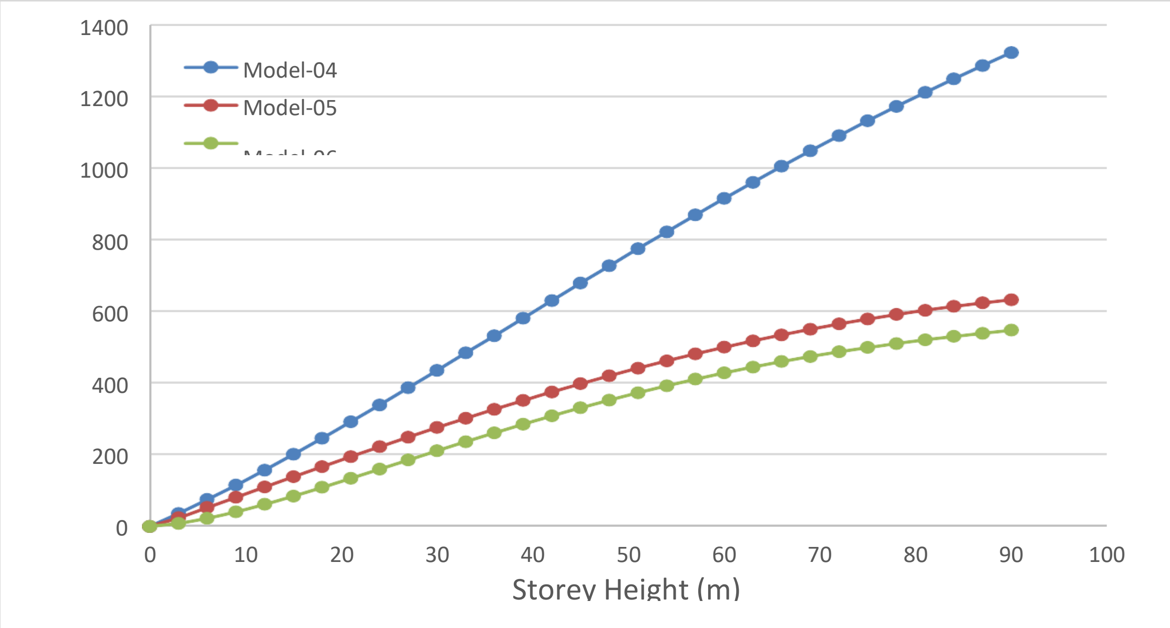


Fig. 6.3 Displacement v/s Storey height in X-direction for community building

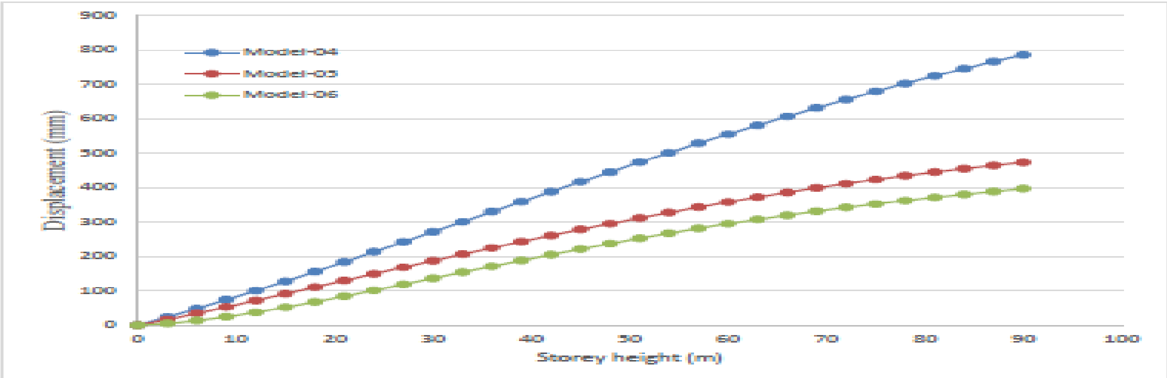


Fig. 6.4 Displacement v/s Storey height in Y-direction for community buildings

Table 6.3 Maximum displacements for all service building models

Story	Elevation (m)	X-Direction			Y-Direction		
		Model-07	Model-08	Model-09	Model-07	Model-08	Model-09
		mm	mm	mm	mm	mm	mm
Story30	90	3067	1948	1300	1695	1311	912
Story29	87	2985	1921	1280	1654	1287	893
Story28	84	2899	1890	1258	1611	1261	874
Story27	81	2812	1857	1235	1567	1233	853
Story26	78	2721	1821	1211	1521	1204	832
Story25	75	2628	1782	1184	1473	1173	809
Story24	72	2532	1739	1155	1423	1140	785
Story23	69	2434	1694	1124	1372	1105	760
Story22	66	2334	1646	1090	1320	1069	733
Story21	63	2231	1594	1054	1265	1031	705
Story20	60	2127	1540	1015	1210	991	676
Story19	57	2020	1483	973	1153	950	645
Story18	54	1912	1423	929	1095	907	612
Story17	51	1802	1360	883	1035	863	578
Story16	48	1691	1294	834	975	817	543
Story15	45	1579	1226	783	914	770	506

Story14	42	1466	1155	730	852	722	468
Story13	39	1353	1082	674	789	673	430
Story12	36	1239	1007	617	726	622	390
Story11	33	1126	929	558	662	571	350
Story10	30	1013	849	498	599	519	310
Story9	27	901	767	438	535	466	270
Story8	24	790	684	377	471	412	230
Story7	21	681	599	316	408	359	191
Story6	18	574	513	257	346	305	153
Story5	15	469	426	199	284	252	117
Story4	12	367	338	145	224	198	84
Story3	9	269	250	96	165	146	55
Story2	6	175	161	53	108	94	30
Story1	3	84	73	19	52	43	11
Base	0	0	0	0	0	0	0

Table 6.4 Maximum storey drifts ratio for all residential building models

Story	Elevation (m)	X-Direction			Y-Direction		
		Model-01	Model-02	Model-03	Model-01	Model-02	Model-03
Story30	90	0.0007	0.0069	0.0017	0.0004	0.0090	0.0017
Story29	87	0.0008	0.0067	0.0018	0.0005	0.0091	0.0017
Story28	84	0.0008	0.0065	0.0019	0.0005	0.0092	0.0018
Story27	81	0.0008	0.0063	0.0021	0.0005	0.0093	0.0019
Story26	78	0.0008	0.0061	0.0022	0.0005	0.0094	0.0020
Story25	75	0.0009	0.0058	0.0024	0.0005	0.0094	0.0021
Story24	72	0.0009	0.0055	0.0026	0.0005	0.0094	0.0023
Story23	69	0.0009	0.0052	0.0028	0.0006	0.0094	0.0024
Story22	66	0.0009	0.0049	0.0031	0.0006	0.0094	0.0025
Story21	63	0.0009	0.0050	0.0033	0.0006	0.0093	0.0027
Story20	60	0.0010	0.0053	0.0035	0.0006	0.0093	0.0028
Story19	57	0.0010	0.0056	0.0037	0.0006	0.0092	0.0029
Story18	54	0.0010	0.0059	0.0039	0.0006	0.0091	0.0031
Story17	51	0.0010	0.0062	0.0041	0.0006	0.0090	0.0032
Story16	48	0.0010	0.0065	0.0043	0.0006	0.0089	0.0033
Story15	45	0.0010	0.0068	0.0045	0.0006	0.0087	0.0034
Story14	42	0.0010	0.0071	0.0047	0.0006	0.0085	0.0035
Story13	39	0.0010	0.0073	0.0049	0.0006	0.0083	0.0036
Story12	36	0.0010	0.0076	0.0050	0.0006	0.0081	0.0036
Story11	33	0.0010	0.0078	0.0051	0.0006	0.0079	0.0037
Story10	30	0.0010	0.0081	0.0052	0.0006	0.0076	0.0037
Story9	27	0.0010	0.0083	0.0052	0.0006	0.0073	0.0036
Story8	24	0.0010	0.0085	0.0052	0.0006	0.0071	0.0036
Story7	21	0.0009	0.0087	0.0051	0.0006	0.0067	0.0035
Story6	18	0.0009	0.0088	0.0049	0.0006	0.0064	0.0033
Story5	15	0.0009	0.0090	0.0047	0.0006	0.0060	0.0031
Story4	12	0.0009	0.0091	0.0043	0.0006	0.0057	0.0027
Story3	9	0.0008	0.0092	0.0037	0.0005	0.0053	0.0023
Story2	6	0.0008	0.0093	0.0029	0.0005	0.0049	0.0018

Story1	3	0.0007	0.0079	0.0017	0.0005	0.0046	0.0010
Base	0	0	0	0	0	0	0

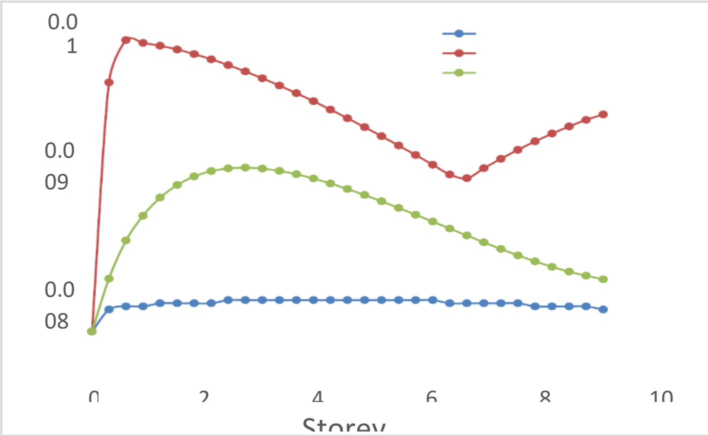


Fig. 6.5 Storey drift v/s Storey height in X-direction for residential buildings

Table 6.5 Shear force for all residential building models (In kN)

Story	X-Direction			Y-Direction		
	Model-01	Model-02	Model-03	Model-01	Model-02	Model-03
Story30	6812.86	3551.73	1520.98	1687.50	667.35	675.00
Story29	13625.72	7102.53	3042.75	3375.00	1301.70	1349.76
Story28	20438.57	10652.91	4563.59	5062.50	1893.77	2024.81
Story27	27251.43	14203.23	6084.34	6750.00	2437.55	2699.80
Story26	34064.29	17753.62	7605.14	8437.50	2931.18	3374.81
Story25	40877.15	21304.05	9125.96	10125.00	3376.51	4049.81
Story24	47690.01	24854.51	10646.80	11812.50	3778.08	4724.81
Story23	54502.86	28405.01	12167.65	13500.00	4141.65	5399.81
Story22	61315.72	31955.52	13688.51	15187.50	4472.87	6074.80
Story21	68128.58	35506.07	15209.38	16875.00	4776.44	6749.80
Story20	74941.44	39056.63	16730.24	18562.50	5056.03	7424.79
Story19	81754.30	42607.22	18251.11	20250.00	5314.75	8099.78
Story18	88567.15	46157.82	19771.98	21937.50	5555.77	8774.78
Story17	95380.01	49708.45	21292.84	23625.00	5782.79	9449.77
Story16	102192.87	53259.09	22813.70	25312.50	5999.93	10124.77
Story15	109005.73	56809.80	24334.55	27000.00	6211.22	10799.77
Story14	115818.59	60360.29	25855.38	28687.50	6419.83	11474.78
Story13	122631.49	63931.13	27377.57	30375.00	6628.52	12150.00
Story12	129444.35	67482.86	28898.55	32062.50	6835.53	12825.00
Story11	136257.21	71034.59	30419.52	33750.00	7041.08	13500.00
Story10	143070.07	74586.31	31940.50	35437.50	7243.90	14175.00
Story9	149882.93	78138.04	33461.48	37125.00	7442.76	14850.00
Story8	156695.79	81689.77	34982.45	38812.50	7636.47	15525.00
Story7	163508.65	85241.50	36503.43	40500.00	7823.34	16200.00
Story6	170321.51	88793.23	38024.41	42187.50	8000.47	16875.00
Story5	177134.37	92344.96	39545.38	43875.00	8163.12	17550.00
Story4	183947.23	95896.69	41066.36	45562.50	8304.78	18225.00
Story3	190760.09	99448.42	42587.33	47250.00	8417.86	18900.00
Story2	197572.95	103000.15	44108.31	48937.50	8495.10	19575.00

Story1	204385.82	106551.88	45629.29	50625.00	8531.03	20250.00

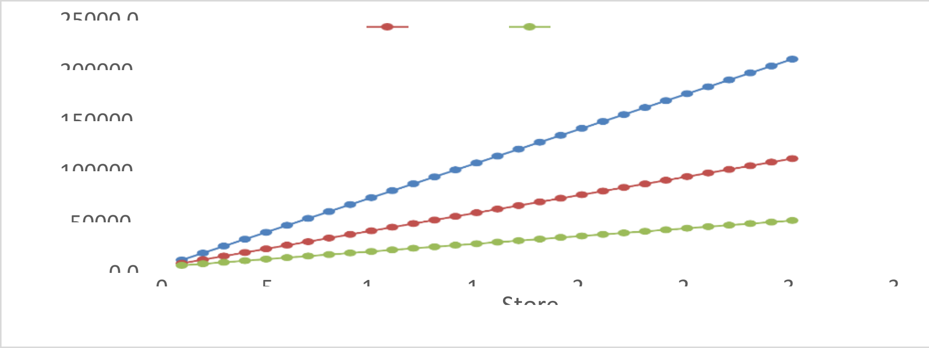


Fig. 6.6 Shear force for residential buildings in x-direction

Table 6.6 Storey Moments for service buildings

Story	Load Case / Combo	Model-07	Model-08	Model-09
		kN-m	kN-m	kN-m
Story30	Blast Load	0.00	0.00	0.00
Story29	Blast Load	37894.08	16040.91	8441.93
Story28	Blast Load	151549.78	63961.12	33739.37
Story27	Blast Load	340967.03	143949.83	75897.28
Story26	Blast Load	606145.87	255907.75	134911.49
Story25	Blast Load	947086.29	399837.10	210782.46
Story24	Blast Load	1363788.00	575738.01	303510.15
Story23	Blast Load	1856252.00	783610.83	413094.64
Story22	Blast Load	2424477.00	1023455.81	539535.93
Story21	Blast Load	3068464.00	1295273.15	682834.07
Story20	Blast Load	3788212.00	1599062.99	842989.06
Story19	Blast Load	4583722.00	1934825.46	1020001.00
Story18	Blast Load	5454993.00	2302560.64	1213870.00
Story17	Blast Load	6402027.00	2702268.60	1424595.00
Story16	Blast Load	7424821.00	3133949.21	1652178.00
Story15	Blast Load	8523377.00	3597603.38	1896617.00
Story14	Blast Load	9697695.00	4093224.00	2157914.00
Story13	Blast Load	10947774.00	4621136.00	2436055.00
Story12	Blast Load	12273615.00	5180732.00	2731065.00
Story11	Blast Load	13675218.00	5772300.00	3042931.00
Story10	Blast Load	15152582.00	6395844.00	3371655.00
Story9	Blast Load	16705708.00	7051360.00	3717236.00
Story8	Blast Load	18334595.00	7738852.00	4079673.00
Story7	Blast Load	20039244.00	8458316.00	4458967.00
Story6	Blast Load	21819654.00	9209756.00	4855119.00
Story5	Blast Load	23675826.00	9993168.00	5268127.00
Story4	Blast Load	25607760.00	10808556.00	5697992.00
Story3	Blast Load	27615455.00	11655916.00	6144714.00
Story2	Blast Load	29698912.00	12535248.00	6608293.00
Story1	Blast Load	31858130.00	13446556.00	7088729.00

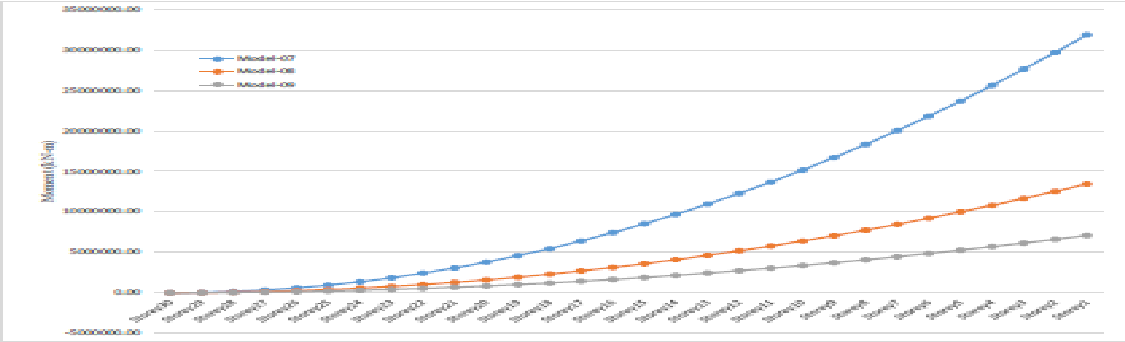


Fig. 6.7 Storey moments for all service building models

CONCLUSIONS

There was considerable difference in each model in the form of above given parameters. The purpose of analysis was to study and determination of better performance of different types of buildings and to identify which system is more effective in such conditions for different building types. The analysis was done by Indian standard code recommendationsand dynamic analysis was performed for better approach in results. Following conclusions have been made from the results:

- The maximum displacement in all models is found less in shear wall system.
- The maximum storey drift of bracing system is good enough in all models.
- Shear force values of bracing system is good but shear wall system performedvery well in this.
- Also for storey moments of all these frame model was found good in shear wallmodels.

REFERENCES

1. IS 456 – 2000 – Code of practice for plain and Reinforced concrete.
2. IS 1893(part 1) – 2002: Criteria for Earthquake resistant Design of structures
3. IS 875(part 1) – 1987 – Code of practice for design loads (Other than earthquake) for buildings and structures – Dead loads.
4. IS 875(part 2) – 1987 – Code of practice for design loads (Other than earthquake) for buildings and structures – Imposed loads
5. IS 875(part 3) – 1987 – Code of practice for design loads (Other than earthquake) for buildings and structures – Wind loads.
6. “The effect of masonry infill's on the seismic response of a four- storey reinforced concrete frame A deterministic assessment”, Journal of Engineering Structure.,168-172.
7. Kasim Armagan Korkmaz, and Mustafa (2007)” Earthquake Assessment of RC Structures with Masonry Infill Walls. International Journal of Science & Technology” Volume 2, No 2, 155-164,2007.