International Journal of Emerging Technology and Advanced Engineering
Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 7, Issue 7, July 2017)

Behaviour of Stepped and Curtailed Shear Wall for 20 and 30 Multi-Storied Building under Seismic Loading

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***Abstract*— In Latest High-rise buildings, shear walls are generally used as a vertical structural element for resisting the lateral loads that may be prompted by the impact of wind and earthquakes which reason the failure of structure. Shear walls of varying cross sections i.e. rectangular shapes to more irregular cores which include channel, T, L, barbell shape, box and soon may be used. whilst a wall-frame shape is loaded laterally the upper a part of shear wall takes negative role in resisting this loads because of the distinction within the free deflected varieties of the wall and the frames, the optimum level for curtailment the shear wall has been discussed in this research. for this reason, this paper has been described to decide the proper location of shear wall and approach of making use of Shear wall based totally on its elastic and Elasto-Plastic behaviors. This work is compare behavior of 20 & 30 Multi-storied building with Stepped and curtailed shear wall for plan 20X30 m for Seismic zone- III,IV and V. The parametric studies comprise of maximum lateral displacement, storey drift, Contribution of shear wall according to height which is generated in the column of the building on software is STAAD-Pro. V8i.**

***Keywords*- Contribution, Curtailment, Drift, Lateral displacement, Stepped, Storey Drift & STAAD-Pro. V8i**.

I. INTRODUCTION

Generally shear wall can be defined as structural vertical member that is able to resist Combination of shear, moment and axial load induced by lateral load and gravity load Transfer to the wall from other structural member. Reinforced concrete walls, which include lift wells or shear walls, are the usual requirements of Multi Storey Buildings. Design by coinciding centroid and mass center of the building is the ideal for a Structure. An introduction of shear wall represents a structurally efficient solution to stiffen a building structural system because the main function of a shear wall is to increase the rigidity for lateral load resistance. The different free deflected forms of the wall and the frames cause them to interact horizontally through the floor slabs: consequently, the individual distributions of lateral loading on the wall and the frame may be very different from the distribution of the external loading.

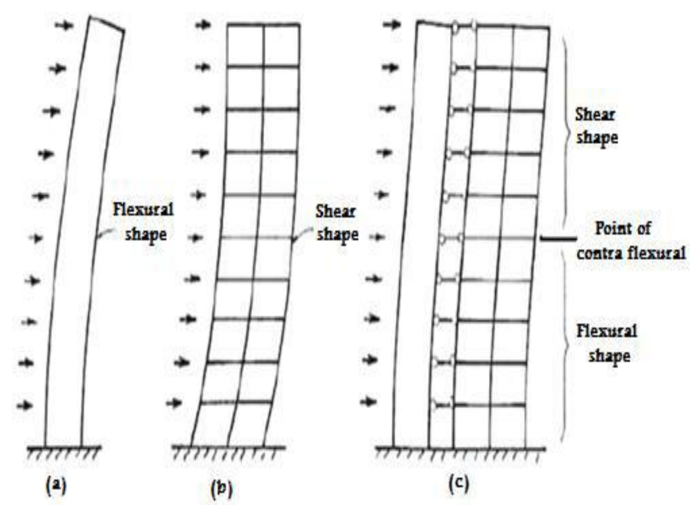
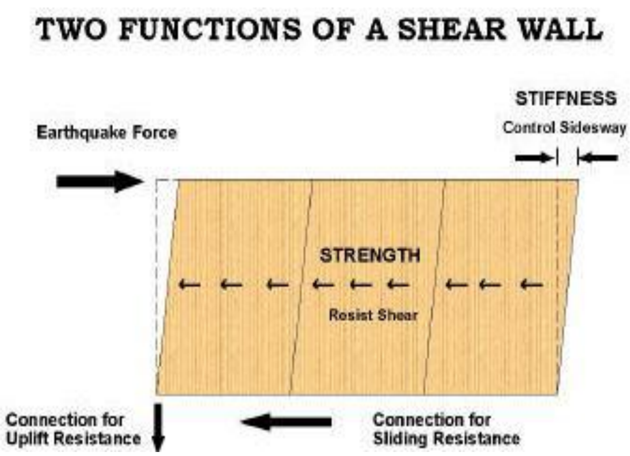


Fig.1 (a) Wall subjected to uniformly distributed horizontal loading; (b) frame subjected to uniformly distributed horizontal loading; (c) Wall-Frame Structure subjected to uniformly distributed horizontal loading

II. FUNCTION OF SHEAR WALL

Shear walls must provide the necessary lateral strength to resist horizontal earthquake forces. When shear walls are strong enough, they will transfer these horizontal forces to the next element in the load path below them. These other components in the load path may be other shear walls, floors, foundation walls, slabs or footings. Shear walls also provide lateral stiffness to prevent the roof or floor above from excessive sideway. When shear walls are stiff enough, they will prevent floor and roof framing members from moving off their supports. Also, buildings that are sufficiently stiff will usually suffer less non-structural damage.



III. Classification Of Shear Wall

Shear walls of varying cross sections i.e. rectangular shapes to more irregular cores such as channel, T, L, barbell shape, box etc. can be used. Provision of walls helps to divide an enclose space, whereas of cores to contain and convey services such as elevator. Wall openings are inevitably required for windows in external walls and for doors or corridors in inner walls or in lift cores. The size and location of openings may vary from architectural and functional point of view. The use of shear wall structure has gained popularity in high rise building structure, especially in the construction of service apartment or office/ commercial tower. There are many types of reinforced concrete shear walls-

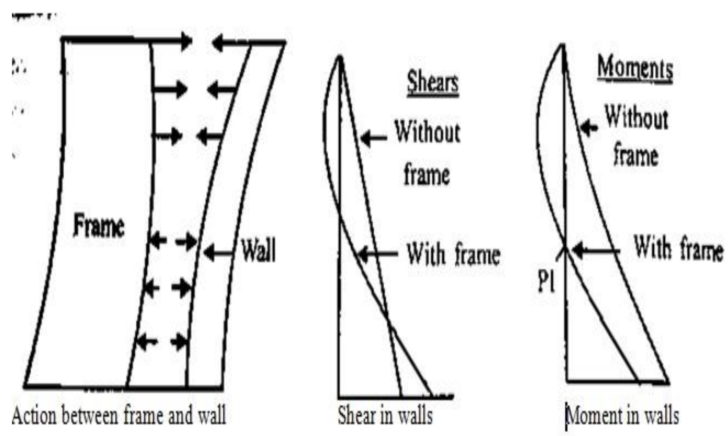
1. Simple rectangular types
2. Coupled shear walls
3. Rigid frame shear walls
4. Framed walls with Infilled frames
5. Column supported shear wall
6. Core type shear walls

IV. Seismic Behaviour Of Shear Wall Frame

The shear wall demonstrate outstanding performance under seismic forces, survey of building after earthquakes have consistently shown that loss of life due complete collapse was minimal in buildings with some sort of reinforced shear wall. Shear wall have good ductility under reversible and repeated overloads. The shear wall meant to resist earthquakes should be planned for ductility and Concrete frame is designed to resist lateral forces.

When a wall-frame structure is loaded laterally the upper part of shear wall play a negative role in resisting this loads because of the difference in the free deflected forms of the wall and the frames so required the optimum level for curtailment in the shear wall. The most important results in this research are: the interruption of the shear walls at the optimum level for which the top deflection of the curtailed wall-frame is a minimum eliminates the reverse force and this level of curtailment always lies between the point of inflection and zero wall shears in the corresponding full-height wall structure.

Interaction between structural frame and shear wall



V. Building Details

The 20 and 30 Multi-Storied Building design for Hard soil Located in seismic zone III, IV & V and for Earthquake loading, the provisions of the IS:1893(Part1)-2002 is considered. The plan of building is shown in figure. The plan dimension of the building is 20 m X 30 m. Height of each storey is 3m. The floor plans were divided into four by six bays in such a way that center to center distance between two grids is 5 meters by 5 meters respectively. Total 24 multi-storey models are prepared for 20 and 30 storied building.

B-S (W) - Bare Frame without Share wall
B-S (1) - Frame having 250 mm thick RC shear wall apply on all both corner of the bare frame throughout full height of Building
B-S (2) - Frame having 250mm, 200mm and 150mm thickness RC Stepped shear wall apply on all both corner of the bare frame throughout full height of Building

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B-S (3) - Frame having 250mm, 200mm, 150mm thickness stepped RC shear wall and Curtailment at upper 5 floors are apply on all both corner of the bare frame.

Detail of the building shown in Table-1

SPECIFICATIONS	30 STOREY BUILDING	20 STOREY BUILDING
Plan dimension	20 m X 30 m	20 m X 30 m
Total Height of Building	90 m	63 m
Height of each storey	3 m	3 m
Thickness of slab	125 mm	125 mm
Grade of reinforcing steel	Fe 500	Fe 500
Density of concrete	25 KN/m³	25 KN/m³
Grade of concrete for Beams, Column and Shear Wall	M 25	M 25
Types of Support	Fixed	
Seismic zone	III, IV, V	
Seismic Zone factor	0.16, 0.24, 0.36	
Soil condition	Hard	
Soil interaction Factor	1	
Response Reduction Factor	5	
Importance factor (I)	1	
Type of Sructure	1	
Damping ratio (DM)	0.05	
Beam size R.C.C.	300 mm X 500 mm	
Thickness of Shear Wall	250 mm, 200 mm, 150 mm	200 mm, 150 mm

Size of Column			
For 30 Storey Building		For 20 Storey Building	
Height 0 m to 30 m	700 mm X 700 mm	Height 0 m to 30 m	600 mm X 600 mm
Height 30 m to 60 m	600 mm X 600 mm	Height 30 m to 45 m	500 mm X 500 mm
Height 60 m to 90 m	400 mm X 400 mm	Height 45 m to 60 m	400 mm X 400 mm

Thickness of Shear Wall	
For 30 Storey Building	For 20 Storey Building
250 mm (Ht 0 m to 27 m)	NA
200 mm (Ht 27 m to 60 m)	200 mm (Ht 0 m to 30 m)
150 mm (Ht 60 m to 90 m)	150 mm (Ht 30 m to 60 m)

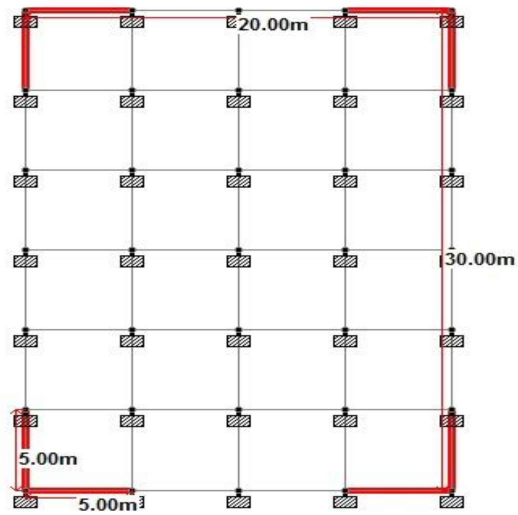

Fig. Plan of Building with Position of Shear Wall

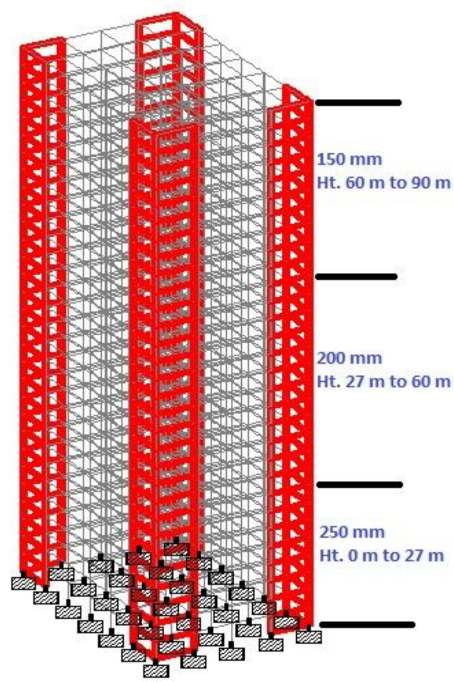

Fig: (A) 3D View of Frame with Position of Stepped Shear wall

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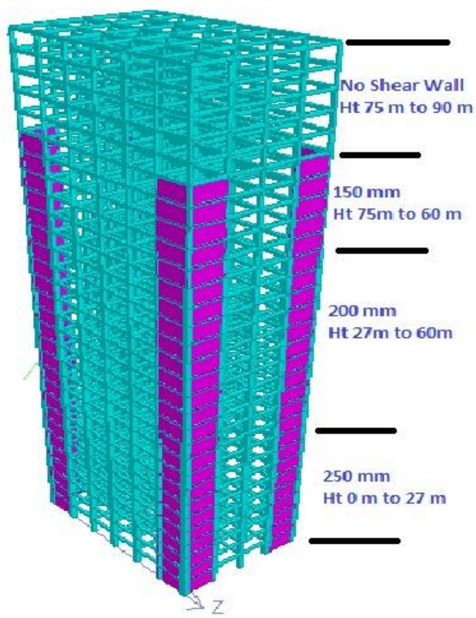


Fig: 3D View of Frame with Position of Stepped Shear wall with curtailment at top stories

VI. LOAD COMBINATIONS

The gravity loads and earthquake loads will be taken for analysis. The basic loads are Dead loads (DL), Imposed load (LL), Earthquake load (EQ) along X and Z in positive and negative direction. As per IS 1893 (Part I): 2002 Clause no. 6.3.1.2, the following Earthquake load cases have to be considered for analysis.

1.5(DL + LL) 0.9DL ± 1.5EQX
0.9DL ± 1.5EQZ 1.5(DL ± EQZ)
1.5(DL ± EQX) 1.2(DL + LL ± EQX)
1.2(DL + LL ± EQZ)

VII. ANALYSIS OF BUILDING

Multi storied G+20 & G+29 building with fixed support base subjected to seismic forces and Gravity force were analyzed under different hard soil condition. The dead load and live load are considered as per IS-875(part 1 &2) and earthquake loading IS: 1893 (Part1)-2002 is used. The buildings were analysis carried out for Zone 3, 4 & 5 using Equivalent Static Method. The software used for analysis is STAAD-Pro. V8i. Different parameters such as Lateral Displacement, Contribution of Shear wall story drift, deflection and base shear are studied for the models.

VIII. RESULTS AND DISCUSSIONS

After Analysis, We are getting Lateral displacement at every storey for all models and with the help of Lateral displacement contribution of Shear wall & Drift according to storey height are calculated for all models in every soil Conditions. After Drift calculation Drift reduction factor are calculated.

Design Base Shear- The design seismic base shear, V_B is distributed to different floor levels along the height of the building as per the clause 7.7.1 of IS 1893 (Part 1): 2002;

Where
Qi = Design lateral force at floor 'i'
Wi = Seismic weight of floor 'i'
hi = Height of floor i measured from base, and
n = Number of stores in the building is the number of levels at which masses are located

$$Q_i = V_B \frac{W_i h_i^2}{\sum_{j=1}^{n} W_j h_j^2}$$

Drift- Calculate the deflection in the Column at every storey, based on more than just flexure. Drift is the deflection of the Colum/wall at story (i) minus the deflection of the wall at story (i-1), divided by the height of the wall at story i.

$$(\Delta i - \Delta i\text{-}1)/hi$$

This is commonly expressed as a fraction of the span (h), such as 1/400*span, or as the drift angle,

$$\arctan((\Delta i - \Delta i\text{-}1)/hi)$$

As the name implies, shear deformation is significant for shear walls and needs to be considered.

Contribution of Shear wall- Contribution of Shear wall is the Lateral Displacement in the RC- Bare frame without shear wall [B-S (W)] minus Lateral Displacement in the RC- Frame with Shear Wall [B-S (1) or B-S (2)] or B-S (3), Divided by the Lateral Displacement in the RC- Bare frame without shear wall [B-S (W)] and multiply by 100 for results shown in Percentage (%). We are denoting Contribution of shear wall by C-1, C-2 & C-3 in Percentage.

Contribution of Shear wall (C-1) due to Frame with shear wall having Homogenous Thickness throughout full height of Building [B-S (1)]

C-1 = 100 X {Lateral Displacement in [B-S (W)] – Lateral Displacement in [B-S (1)] / Lateral Displacement in [B-S (W)]}

Contribution of Shear wall (C-2) due to Frame with Stepped shear wall [B-S (2)]

C-2 = 100 X {Lateral Displacement in [B-S (W)] – Lateral Displacement in [B-S (2)] / Lateral Displacement in [B-S (W)]}

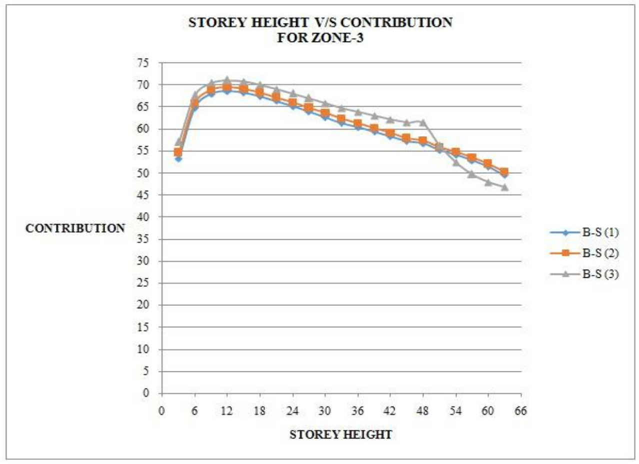
Contribution of Shear wall (C-3) due to Frame with Curtailed and Stepped shear wall [B-S (3)]

C-3 = 100 X {Lateral Displacement in [B-S (W)] – Lateral Displacement in [B-S (3)] / Lateral Displacement in [B-S (W)]}

For 20 storey Building-

TABLE-2- 20 STOREY BUILDING- ZONE-3

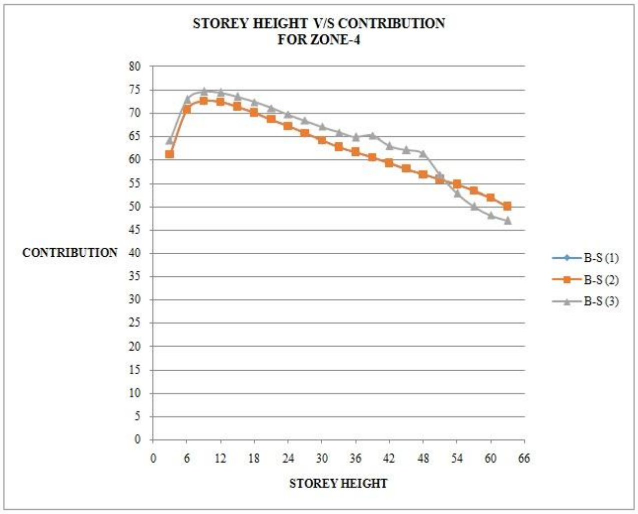
ST. HT.	B-S (W)	B-S (1)		B-S (2)		B-S (3)	
	LD	LD-1	C-1	LD-2	C-2	LD-3	C-3
63	70.23	35.41	49.58	34.91	50.29	37.34	46.83
60	69.28	33.62	51.47	33.16	52.13	36.09	47.91
57	67.57	31.79	52.95	31.36	53.59	33.96	49.74
54	65.27	29.89	54.20	29.48	54.84	31.01	52.49
51	62.41	27.94	55.24	27.53	55.89	27.24	56.36
48	59.98	25.94	56.76	25.54	57.43	23.11	61.47
45	56.02	23.93	57.28	23.54	57.98	21.54	61.54
42	52.71	21.91	58.42	21.52	59.16	19.92	62.21
39	49.13	19.90	59.49	19.51	60.29	18.17	63.02
36	45.32	17.90	60.51	17.50	61.38	16.36	63.89
33	41.27	15.91	61.45	15.51	62.41	14.54	64.77
30	37.55	14.00	62.73	13.64	63.67	12.81	65.89
27	33.70	12.13	64.00	11.83	64.89	11.12	67.00
24	29.75	10.34	65.24	10.08	66.10	9.49	68.09
21	25.72	8.64	66.43	8.42	67.27	7.94	69.14
18	21.64	7.03	67.50	6.85	68.32	6.47	70.10
15	17.52	5.55	68.32	5.40	69.15	5.11	70.84
12	13.38	4.20	68.66	4.08	69.50	3.86	71.15
9	9.30	2.98	67.97	2.89	68.88	2.74	70.53
6	5.40	1.90	64.88	1.84	65.90	1.74	67.70
3	1.99	0.93	53.32	0.90	54.72	0.85	57.09



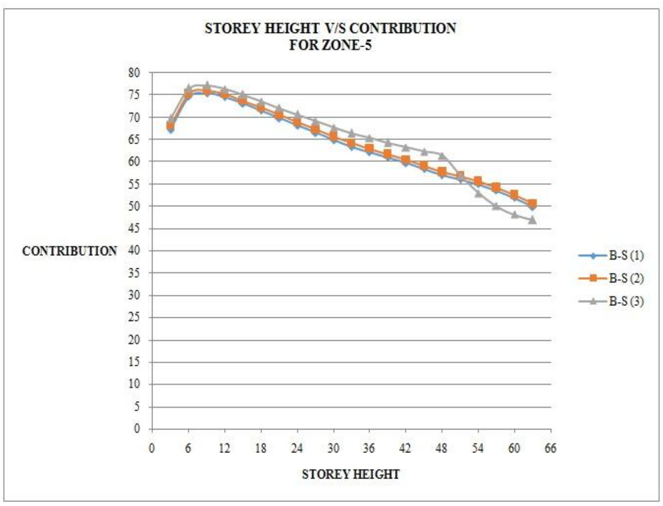
Graph 1. For 20 Storey Building Storey Height V/s Contribition in Zone-3

TABLE-3- 20 STOREY BUILDING- ZONE-4

ST. HT.	B-S (W)	B-S (1)		B-S (2)		B-S (3)	
	LD	LD-1	C-1	LD-2	C-2	LD-3	C-3
63	104.45	52.24	49.98	51.69	49.98	55.42	46.94
60	103.04	49.67	51.79	48.97	51.79	53.48	48.10
57	100.50	46.85	53.38	46.19	53.38	50.28	49.97
54	97.06	43.95	54.72	43.32	54.72	45.84	52.78
51	92.78	40.98	55.83	40.37	55.83	40.15	56.73
48	87.89	37.95	56.82	37.36	56.82	34.03	61.29
45	83.22	34.91	58.05	34.34	58.05	31.55	62.08
42	78.28	31.87	59.29	31.30	59.29	29.01	62.93
39	72.94	28.83	60.48	28.27	60.48	25.35	65.25
36	67.25	25.81	61.62	25.27	61.62	23.63	64.86
33	61.23	22.83	62.72	22.30	62.72	20.91	65.86
30	55.66	19.95	64.16	19.49	64.16	18.30	67.12
27	49.91	17.15	65.64	16.76	65.64	15.77	68.41
24	44.02	14.47	67.13	14.14	67.13	13.33	69.72
21	38.01	11.93	68.62	11.65	68.62	11.00	71.05
18	31.92	9.55	70.07	9.34	70.07	8.83	72.36
15	25.79	7.38	71.39	7.21	71.39	6.82	73.54
12	19.65	5.43	72.36	5.30	72.36	5.02	74.43
9	13.58	3.73	72.55	3.63	72.55	3.45	74.61
6	7.79	2.28	70.72	2.22	70.72	2.11	72.93
3	2.76	1.07	61.14	1.04	61.14	0.99	64.11



Graph 2. For 20 Storey Building Storey Height V/s Contribition in Zone-4



Graph 3. For 20 Storey Building Storey Height V/s Contribition in Zone-5

TABLE-4- 20 STOREY BUILDING- ZONE-5

ST. HT.	B-S (W)	B-S (1)		B-S (2)		B-S (3)	
	LD	LD-1	C-1	LD-2	C-2	LD-3	C-3
63	156.07	78.21	49.89	77.07	50.62	82.72	47.00
60	153.93	73.96	51.95	72.91	52.64	79.74	48.20
57	150.14	69.67	53.60	68.67	54.26	74.93	50.09
54	144.98	65.26	54.99	64.31	55.64	68.25	52.93
51	138.57	60.77	56.15	59.86	56.80	59.69	56.93
48	130.98	56.21	57.09	55.33	57.76	50.59	61.37
45	124.25	51.63	58.45	50.78	59.14	46.77	62.36
42	116.85	47.04	59.75	46.21	60.45	42.86	63.32
39	108.86	42.46	61.00	41.66	61.73	38.82	64.34
36	100.34	37.92	62.21	37.14	62.99	34.73	65.39
33	91.37	33.44	63.40	32.70	64.21	30.65	66.45
30	83.01	29.10	64.94	28.46	65.71	26.74	67.79
27	74.40	24.90	66.53	24.36	67.26	22.93	69.18
24	65.58	20.87	68.18	20.42	68.86	19.26	70.63
21	56.60	17.06	69.86	16.70	70.50	15.78	72.13
18	47.50	13.51	71.55	13.22	72.16	12.52	73.65
15	38.33	10.28	73.19	10.06	73.77	9.53	75.13
12	29.17	7.40	74.62	7.24	75.18	6.87	76.43
9	20.11	4.93	75.47	4.82	76.03	4.58	77.21
6	11.46	2.90	74.70	2.83	75.31	2.69	76.49
3	3.97	1.30	67.31	1.27	68.14	1.21	69.68

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For 30 Storey Building-

TABLE-5- 30 STOREY BUILDING- ZONE-3

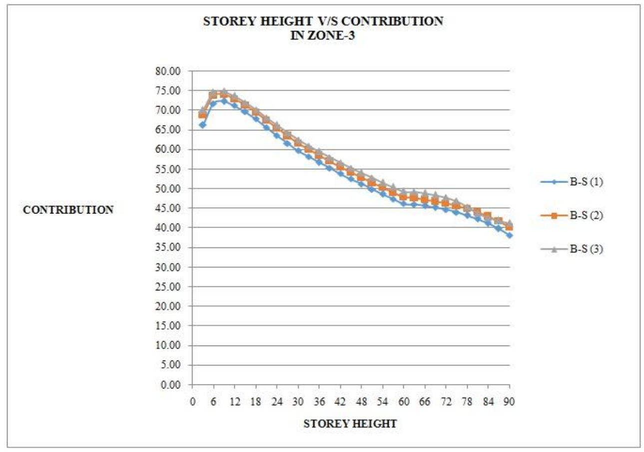
SN	ST. HT.	B-S (W)	BS (1)		BS (2)		BS (3)	
		LD	LD-1	C-1	LD-2	C-2	LD-3	C-3
1	90	116.45	71.99	38.18	69.66	40.18	68.46	41.21
2	87	115.13	69.19	39.90	67.07	41.74	66.92	41.88
3	84	113.17	66.51	41.23	64.52	42.99	64.93	42.63
4	81	110.73	63.83	42.35	61.95	44.05	62.21	43.82
5	78	107.79	61.13	43.29	59.36	44.93	58.80	45.45
6	75	104.40	58.38	44.08	56.70	45.69	55.40	46.93
7	72	100.59	55.59	44.74	53.99	46.33	52.49	47.82
8	69	96.39	52.74	45.29	51.20	46.88	49.68	48.45
9	66	91.83	49.83	45.74	48.35	47.34	46.93	48.90
10	63	86.96	46.89	46.08	45.46	47.73	44.17	49.21
11	60	81.75	43.96	46.23	42.57	47.93	41.40	49.35
12	57	77.99	40.99	47.45	39.67	49.14	38.62	50.49
13	54	74.04	38.01	48.67	36.75	50.36	35.81	51.63
14	51	69.96	35.03	49.93	33.84	51.63	33.00	52.83
15	48	65.75	32.07	51.23	30.94	52.94	30.19	54.08
16	45	61.43	29.15	52.55	28.09	54.28	27.42	55.37
17	42	57.02	26.29	53.89	25.30	55.63	24.70	56.67
18	39	52.53	23.48	55.31	22.55	57.07	22.03	58.06
19	36	47.98	20.75	56.75	19.89	58.54	19.44	59.49
20	33	43.39	18.12	58.24	17.33	60.07	16.93	60.97
21	30	38.76	15.60	59.76	14.87	61.65	14.53	62.50
22	27	34.44	13.22	61.61	12.56	63.52	12.28	64.33
23	24	30.10	10.96	63.60	10.40	65.44	10.17	66.21
24	21	25.76	8.83	65.72	8.38	67.48	8.19	68.22
25	18	21.45	6.89	67.87	6.53	69.56	6.38	70.26
26	15	17.16	5.20	69.68	4.92	71.35	4.80	72.04
27	12	12.94	3.72	71.28	3.50	72.94	3.41	73.65
28	9	8.86	2.45	72.33	2.30	74.07	2.23	74.80
29	6	5.06	1.43	71.78	1.33	73.77	1.29	74.60
30	3	1.91	0.64	66.21	0.59	68.89	0.57	70.04

TABLE-6- 30 STOREY BUILDING- ZONE-4

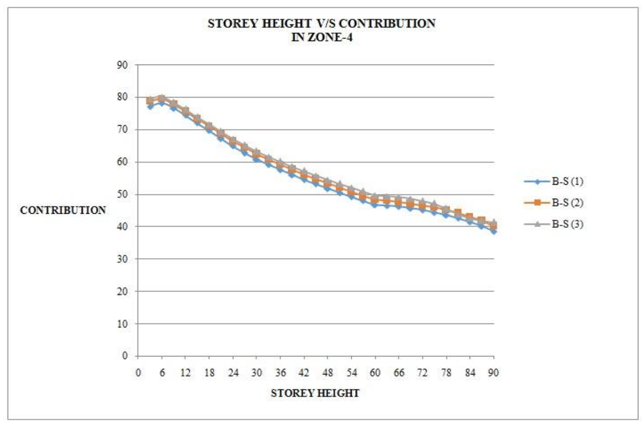
ST. HT.	B-S (W)	B-S (1)		B-S (2)		B-S (3)	
	LD	LD-1	C-1	LD-2	C-2	LD-3	C-3
90	172.67	106.08	38.57	103.02	40.34	101.32	41.32
87	170.67	102.06	40.20	99.17	41.90	99.07	41.95
84	167.75	98.07	41.54	95.34	43.16	96.07	42.73
81	164.09	94.06	42.68	91.49	44.24	91.99	43.94
78	159.70	90.00	43.64	87.58	45.16	86.86	45.61
75	154.64	85.89	44.46	83.59	45.95	81.61	47.23
72	148.96	81.70	45.15	79.51	46.62	77.38	48.05
69	142.70	77.44	45.73	75.34	47.20	73.23	48.68
66	135.93	73.11	46.21	71.09	47.70	69.12	49.15
63	128.69	68.73	46.59	66.77	48.11	64.99	49.50
60	121.01	64.35	46.82	62.47	48.37	60.85	49.72
57	115.35	59.94	48.04	58.14	49.59	56.68	50.86
54	109.45	55.52	49.27	53.81	50.83	52.50	52.03
51	103.36	51.11	50.55	49.49	52.11	48.32	53.25
48	97.09	46.73	51.86	45.20	53.44	44.16	54.52
45	90.66	42.41	53.22	40.97	54.81	40.05	55.83
42	84.10	38.18	54.60	36.83	56.20	36.02	57.17
39	77.44	34.00	56.09	32.75	57.70	32.05	58.61
36	70.69	29.97	57.61	28.81	59.24	28.20	60.10
33	63.89	26.07	59.19	25.02	60.84	24.50	61.65
30	57.04	22.35	60.83	21.40	62.49	20.96	63.26
27	50.60	18.82	62.81	17.99	64.45	17.62	65.17
24	44.16	15.48	64.95	14.79	66.50	14.50	67.17
21	37.73	12.36	67.25	11.81	68.71	11.57	69.33
18	31.32	9.50	69.68	9.07	71.04	8.89	71.62
15	24.98	6.97	72.08	6.66	73.36	6.52	73.90
12	18.74	4.79	74.46	4.56	75.67	4.46	76.19
9	12.72	2.96	76.70	2.81	77.89	2.75	78.39
6	7.13	1.55	78.29	1.46	79.57	1.42	80.09
3	2.53	0.58	77.12	0.53	78.86	0.52	79.61

International Journal of Emerging Technology and Advanced Engineering
Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 7, Issue 7, July 2017)

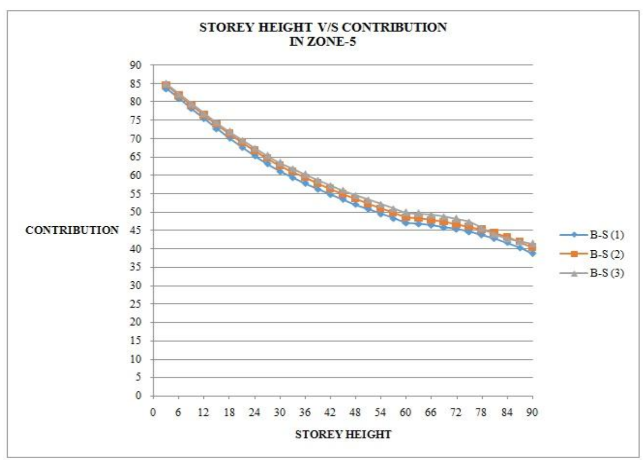
TABLE-7- 30 STOREY BUILDING- ZONE-5							
ST. HT.	B-S (W)	B-S (1)		B-S (2)		B-S (3)	
	LD	LD-1	C-1	LD-2	C-2	LD-3	C-3
90	257.64	157.69	38.79	153.43	40.45	150.95	41.41
87	254.55	151.72	40.40	147.69	41.98	147.63	42.00
84	250.17	145.77	41.73	141.97	43.25	143.13	42.79
81	244.68	139.77	42.88	136.19	44.34	137.01	44.00
78	238.11	133.70	43.85	130.32	45.27	129.30	45.70
75	230.54	127.54	44.68	124.33	46.07	121.26	47.40
72	222.04	121.28	45.38	118.21	46.76	115.08	48.17
69	212.69	114.91	45.97	111.97	47.36	108.93	48.79
66	202.58	108.44	46.47	105.61	47.87	102.78	49.26
63	191.77	101.91	46.86	99.16	48.29	96.59	49.63
60	180.33	95.38	47.11	92.73	48.58	90.39	49.87
57	171.83	88.80	48.32	86.28	49.79	84.17	51.02
54	163.00	82.23	49.55	79.83	51.03	77.93	52.19
51	153.89	75.68	50.82	73.39	52.31	71.70	53.41
48	144.51	69.17	52.13	67.01	53.63	65.50	54.67
45	134.90	62.75	53.48	60.71	54.99	59.38	55.98
42	125.10	56.46	54.87	54.56	56.39	53.39	57.32
39	115.15	50.25	56.36	48.49	57.89	47.48	58.77
36	105.09	44.24	57.90	42.62	59.44	41.75	60.27
33	94.94	38.44	59.51	36.97	61.06	36.23	61.84
30	84.76	32.91	61.18	31.59	62.73	30.97	63.46
27	75.13	27.66	63.19	26.52	64.71	26.00	65.39
24	65.51	22.69	65.36	21.76	66.78	21.35	67.41
21	55.90	18.06	67.70	17.32	69.02	17.00	69.60
18	46.35	13.81	70.20	13.26	71.40	13.01	71.93
15	36.90	10.04	72.80	9.63	73.90	9.46	74.37
12	27.61	6.77	75.49	6.49	76.49	6.37	76.91
9	18.64	4.05	78.26	3.89	79.15	3.81	79.53
6	10.33	1.96	81.00	1.88	81.83	1.84	82.18
3	3.52	0.58	83.64	0.54	84.57	0.53	84.94



Graph 4. For 30 Storey Building Storey Height V/s Contribition in Zone-3



Graph 5. For 30 Storey Building Storey Height V/s Contribition in Zone-4



Graph 6. For 30 Storey Building Storey Height V/s Contribition in Zone-5

International Journal of Emerging Technology and Advanced Engineering
Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 7, Issue 7, July 2017)

IX. CONCLUSIONS

1. In building having no shear wall drift increases in initial 5 or 6 stories there after it remain constant about 3/5 of total height and then it decreases. A twist or bend is observed where column and shear wall sections are changed.
2. Model with shear wall show better drift control.
3. Gradual reduction in thickness of shear wall has better drift control.
4. The contribution of shear wall in lower storey may be about 60 to 70 % for 20 and 30 storied building. As we move in intermediate to upper storey contribution may be reduced to 50 to 60 % or it may be constant. Especially in upper 5 storeys's the shear wall impart negative role due to reversal of earthquake load.
5. In the case where shear wall is curtailed there after drift is less than that in frame having shear wall (in higher stories) though in lower stories it has increased still it does not result in soft storey. Hence investment in shear wall may be saved without impairing the structural strength.
6. Irrespective of type of provision of shear wall. In case of 60m and 90m height building drift increases gradually up to ½ of total height and there after it is almost constant in all the cases. In all the cases it is well within permissible. Removal of top five stories has no significant effect on drift.

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