PAGES: 81-99
9/4/23
JOURNAL OF SCIENTIFIC RESEARCH AND TECHNOLOGY(JSRT) VOLUME-1 ISSUE-6 SEPTEMBER
Registered under MSME Government of India ISSN: 2583-8660

Comparison Between Tall Structure With Intermediate Storey And Void Storey

Vinit V Patil[1], Hrishikesh[2]

[1]Mtech Student, Department Civil Engineering Sharnbasva University, Kalaburagi, India, vinitpatil504@gmail.com

[2]Assistant Professor, Department Civil Engineering Sharnbasva University, Kalaburagi, India

ABSTRACT

This research provides a thorough evaluation of the advantages and disadvantages of using intermediate storeys vs void storeys in tall structures. The choice of design features has a major influence on the functioning and sustainability of tall buildings, which have become ubiquitous in contemporary urban landscapes. In this study, we compare and contrast two different design methodologies by exploring their structural contexts and aesthetic qualities. Contrarily, void floors provide open space inside the structure, which may serve a variety of functions including increasing natural ventilation and serving as leisure places. Our research takes a holistic look of tall structures with these design features, taking into account things like structural displacement, drift, and base shear. The purpose of this article is to provide guidance to professionals as they decide between an intermediate level and a void level for a certain project. The structure is modeled in ETABS, loads are applied, and the structural behavior is analyzed.

Keywords: Tall Structures, Intermediate Storey, Void Storey.

INTRODUCTION

1.1 GENERAL

One or more floors of a multi-story structure may be considered "soft storeys" if they are structurally weaker than the other stories in the building as a whole. As it pertains to the relationship between a storey's stiffness and its capacity to endure seismic forces and wind load, this feature is critical in earthquake-resistant design.

There are various scenarios in which a soft storey can manifest:

1. **Open Floor Design**: The words "soft storey" and "open floor" are both used in architecture to describe circumstances in which one level of a structure has much less stiffness and resistance than the other floors. This is common when the bottom floor has no functional use (like parking) and has no or few walls.
2. **Stilt Building**: Stilt buildings are a subset of multistory structures in which the first floor serves primarily as parking. The "soft storey," in this case, refers to the level below ground level and contains the parking garage.
3. **Sudden Stiffness Change**: When the building's rigidity decreases noticeably at one point in the building's height, a soft story may develop. A soft story has a sudden shift in rigidity like this.

II. LITERATURE REVIEW

- **Achyut S. Naphade, et al (2018):** To meet the needs of a growing and more dense population, architects have made major adjustments to building design. Engineers and architects are always looking for new ways to make structures more reliable, secure, and aesthetically pleasing for their clients. Tall structures with intermediate soft floors and tall buildings with void storeys are two trendy architectural trends right now. To aid in decision-making, this research compares and contrasts two architectural approaches, emphasizing key differences and similarities between them.

- **Rahiman G. K han,et al (2017)** Buildings with a significant height need meticulous planning and design. The usage of a soft storey, or movable floor level, at mid-height is one such novel solution. In order to better disperse lateral loads and seismic stresses, this floor is less rigid than the levels above and below it. This method not only strengthens the structure's resistance to wind and earthquakes, but it also frees up room for other uses in the building's layout. A void storey is another option; it is a floor level with an open area that may improve the practicality and attractiveness of the structure.

- **Pramod M Gajbe, et al (2016)** Titled "Analysis of Soft Stories in Multi-Storey Steel Structure Buildings," the research looked at these types of buildings in detail. The small scope of the research attempted to draw broad and narrow findings. According to the results, soft-storey floors have a major impact on the building's structural performance and lateral load-bearing capability on a floor-by-floor basis. There is also a significant effect on relative storey displacements and drift, especially at the top storey, when structural imperfections are present.

- **Vipin V Halde, et al (2016)** Researching the effect of soft stories on the structural response of high-rise buildings is his current focus. The authors of this research set out to determine what factors—including the building's stiffness, mass, and the lateral force acting on it—contribute to the lateral displacement of a story. It is well-known that the mass and stiffness characteristics of each floor contribute significantly to the distribution of lateral forces over the height of a structure. Therefore, the study shows that deflection is more prominent in this region, and the research confirms that soft tales display greater degrees of displacement.

III. OBJECTIVES

- Examining a Building's Soft Story Loading induced vertical movement or drift between floors (using Etabs).
- In order to measure how different heights of fluffy tales affect the reader.
- The purpose of this study is to compare the structural effectiveness of buildings with and without soft stories in the middle.

IV. METHODLOGY

Modeling the structure: Building a 3D model in ETABS is the first order of business. All of the building's dimensions, floor heights, and grid size must be specified at this stage.

Geometry Modeling:

- Construct the building's outline by sketching in its various structural components.
- Putting in extra effort to model accurately by focusing on coordinates and grid lines

Loads and Load Combinations:

- Subjecting structure to the necessary loads, such as dead load, live load, and wind load
- Specify the loads in accordance with the design code (IS 456:2000 or IS 875:2015 PART 3).

Material Properties:

- Define materials properties for concrete, steel, slab and other materials used for structure
- Beam size 230x570mm
- Column size 900x1000mm from base storey to storey 7
- Column size 750x900mm from storey 8 to storey 50
- Slab 150 mm thickness
- M25 Grade Concrete
- Diaphgram 230mm (Rigid)

Analysis:

- After defining all the loads to the structure RUN ANALYSIS is performed
-

Design:

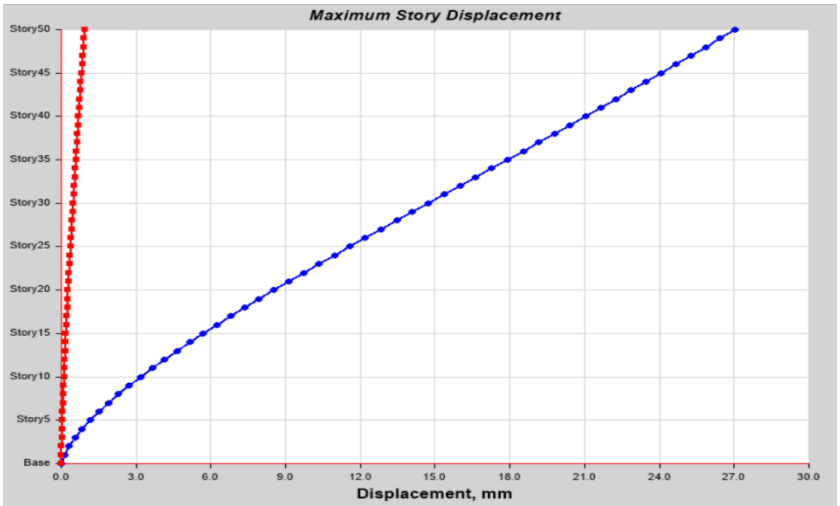
- Click Design after running analysis, then choose Concrete Frame Design, then start Check.
- When the test is complete, it reveals whether or not the structure's constituent parts meet the criteria. If the test is successful, the structure is stable; otherwise, adjustments are necessary..

MAX STOREY DISPLACEMENT OF WIND LOAD IN X DIRECTION

TABLE.1

Storey	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Storey50	150	Top	27.015	0.928
Storey49	147	Top	26.434	0.906
Storey48	144	Top	25.85	0.884
Storey47	141	Top	25.262	0.862
Storey46	138	Top	24.67	0.84
Storey45	135	Top	24.074	0.818
Storey44	132	Top	23.473	0.795
Storey43	129	Top	22.868	0.773
Storey42	126	Top	22.259	0.75
Storey41	123	Top	21.646	0.727
Storey40	120	Top	21.029	0.704
Storey39	117	Top	20.409	0.682
Storey38	114	Top	19.785	0.659
Storey37	111	Top	19.159	0.636
Storey36	108	Top	18.529	0.613
Storey35	105	Top	17.898	0.591
Storey34	102	Top	17.265	0.568
Storey33	99	Top	16.631	0.546
Storey32	96	Top	15.996	0.524
Storey31	93	Top	15.361	0.502
Storey30	90	Top	14.725	0.48
Storey29	87	Top	14.091	0.458
Storey28	84	Top	13.458	0.437
Storey27	81	Top	12.828	0.416
Storey26	78	Top	12.199	0.395
Storey25	75	Top	11.575	0.375
Storey24	72	Top	10.954	0.354
Storey23	69	Top	10.339	0.335
Storey22	66	Top	9.729	0.315
Storey21	63	Top	9.125	0.296
Storey20	60	Top	8.529	0.277
Storey19	57	Top	7.941	0.259
Storey18	54	Top	7.362	0.241
Storey17	51	Top	6.792	0.224
Storey16	48	Top	6.234	0.207
Storey15	45	Top	5.688	0.19
Storey14	42	Top	5.154	0.174
Storey13	39	Top	4.635	0.158
Storey12	36	Top	4.131	0.143
Storey11	33	Top	3.643	0.128
Storey10	30	Top	3.174	0.114
Storey9	27	Top	2.723	0.1

Storey	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Storey8	24	Top	2.294	0.086
Storey7	21	Top	1.888	0.072
Storey6	18	Top	1.507	0.059
Storey5	15	Top	1.154	0.046
Storey4	12	Top	0.832	0.034
Storey3	9	Top	0.546	0.023
Storey2	6	Top	0.301	0.013
Storey1	3	Top	0.108	0.005
Base	0	Top	0	0

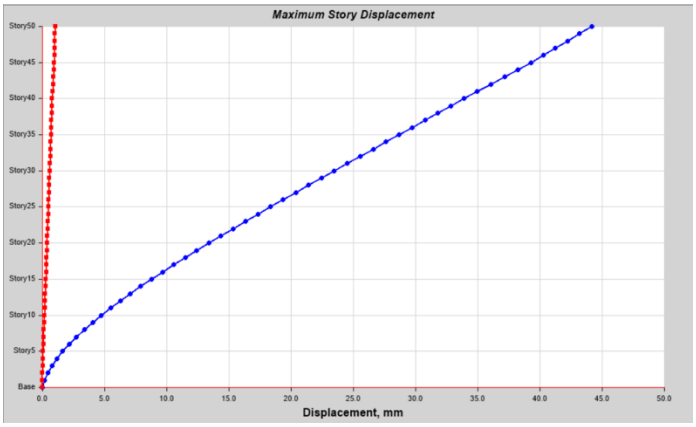


GRAPH 1 TALL BUILDING WITH INTERMEDIATE STOREY

TABLE.2

Storey	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Storey50	150	Top	44.151	1.038
Storey49	147	Top	43.191	1.024
Storey48	144	Top	42.224	1.009
Storey47	141	Top	41.247	0.993
Storey46	138	Top	40.259	0.976
Storey45	135	Top	39.257	0.956
Storey44	132	Top	38.211	0.929
Storey43	129	Top	37.139	0.899
Storey42	126	Top	36.052	0.866
Storey41	123	Top	34.959	0.832
Storey40	120	Top	33.875	0.802
Storey39	117	Top	32.831	0.78
Storey38	114	Top	31.79	0.759
Storey37	111	Top	30.751	0.738
Storey36	108	Top	29.711	0.719
Storey35	105	Top	28.671	0.699
Storey34	102	Top	27.631	0.679

Storey	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Storey33	99	Top	26.59	0.659
Storey32	96	Top	25.549	0.639
Storey31	93	Top	24.508	0.619
Storey30	90	Top	23.469	0.599
Storey29	87	Top	22.432	0.578
Storey28	84	Top	21.398	0.557
Storey27	81	Top	20.368	0.537
Storey26	78	Top	19.343	0.516
Storey25	75	Top	18.324	0.495
Storey24	72	Top	17.313	0.474
Storey23	69	Top	16.311	0.453
Storey22	66	Top	15.318	0.433
Storey21	63	Top	14.337	0.412
Storey20	60	Top	13.368	0.391
Storey19	57	Top	12.414	0.37
Storey18	54	Top	11.475	0.35
Storey17	51	Top	10.554	0.329
Storey16	48	Top	9.652	0.308
Storey15	45	Top	8.77	0.288
Storey14	42	Top	7.911	0.267
Storey13	39	Top	7.077	0.246
Storey12	36	Top	6.269	0.224
Storey11	33	Top	5.491	0.203
Storey10	30	Top	4.744	0.181
Storey9	27	Top	4.036	0.16
Storey8	24	Top	3.365	0.139
Storey7	21	Top	2.735	0.115
Storey6	18	Top	2.151	0.092
Storey5	15	Top	1.622	0.071
Storey4	12	Top	1.169	0.053
Storey3	9	Top	0.77	0.036
Storey2	6	Top	0.433	0.021
Storey1	3	Top	0.167	0.009
Base	0	Top	0	0



GRAPH 2 TALL BUILDING WITH VOID STOREY

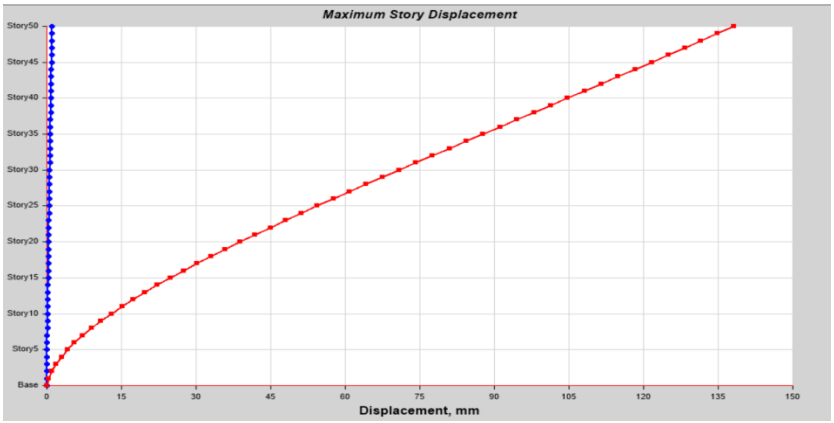
MAX STOREY DISPLACEMENT OF WIND LOAD IN Y DIRECTION

TABLE.3

Storey	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Storey50	150	Top	1.157	86.354
Storey49	147	Top	1.123	84.352
Storey48	144	Top	1.09	82.343
Storey47	141	Top	1.056	80.326
Storey46	138	Top	1.022	78.301
Storey45	135	Top	0.989	76.267
Storey44	132	Top	0.955	74.224
Storey43	129	Top	0.922	72.172
Storey42	126	Top	0.889	70.112
Storey41	123	Top	0.856	68.045
Storey40	120	Top	0.823	65.971
Storey39	117	Top	0.79	63.891
Storey38	114	Top	0.758	61.806
Storey37	111	Top	0.726	59.716
Storey36	108	Top	0.694	57.625
Storey35	105	Top	0.663	55.532
Storey34	102	Top	0.632	53.439
Storey33	99	Top	0.602	51.347
Storey32	96	Top	0.571	49.259
Storey31	93	Top	0.542	47.176
Storey30	90	Top	0.513	45.1
Storey29	87	Top	0.484	43.033
Storey28	84	Top	0.456	40.976
Storey27	81	Top	0.429	38.933
Storey26	78	Top	0.402	36.904
Storey25	75	Top	0.376	34.894
Storey24	72	Top	0.351	32.903
Storey23	69	Top	0.326	30.935
Storey22	66	Top	0.302	28.992
Storey21	63	Top	0.279	27.078
Storey20	60	Top	0.257	25.194
Storey19	57	Top	0.236	23.343
Storey18	54	Top	0.215	21.53
Storey17	51	Top	0.196	19.756
Storey16	48	Top	0.177	18.026
Storey15	45	Top	0.159	16.343
Storey14	42	Top	0.142	14.71
Storey13	39	Top	0.127	13.131
Storey12	36	Top	0.112	11.61
Storey11	33	Top	0.097	10.151
Storey10	30	Top	0.084	8.759
Storey9	27	Top	0.072	7.439
Storey8	24	Top	0.06	6.195
Storey7	21	Top	0.049	5.033
Storey6	18	Top	0.039	3.96
Storey5	15	Top	0.03	2.983

Storey	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Storey4	12	Top	0.022	2.111
Storey3	9	Top	0.015	1.355
Storey2	6	Top	0.008	0.729
Storey1	3	Top	0.003	0.255
Base	0	Top	0	0

GRAPH 3 TALL BUILDING WITH INTERMEDIATE STOREY



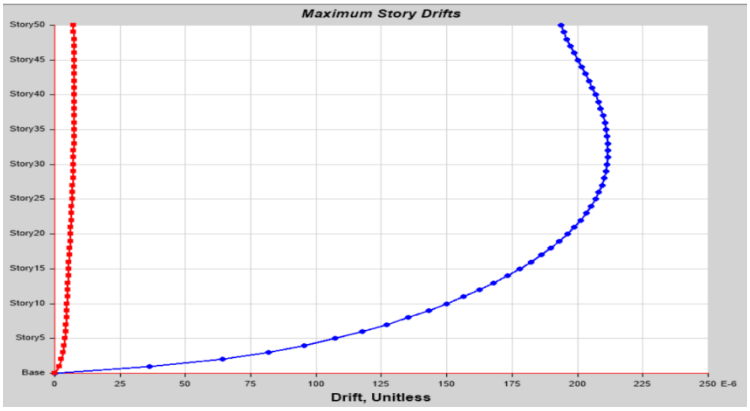
GRAPH 4 TALL BUILDING WITH VOID STOREY

MAX STOREY DRIFT OF WIND LOAD IN X DIRECTION

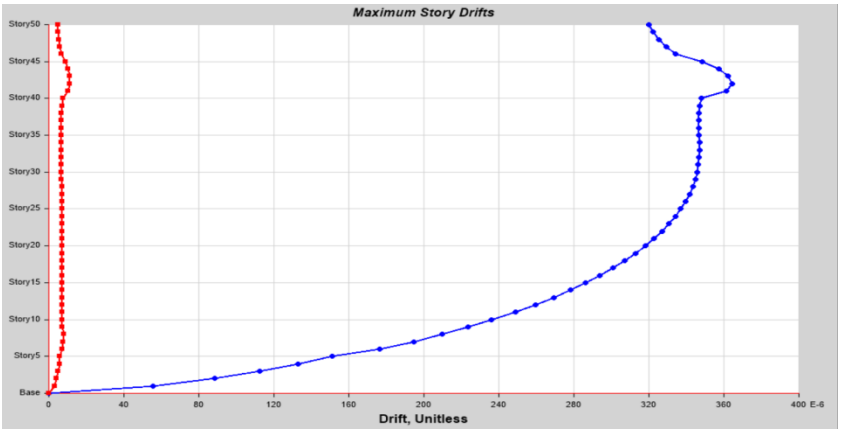
TABLE.4

Storey	Elevation	Location	X-Dir	Y-Dir
	m			
Storey50	150	Top	0.000194	0.000007
Storey49	147	Top	0.000195	0.000007
Storey48	144	Top	0.000196	0.000007
Storey47	141	Top	0.000197	0.000007
Storey46	138	Top	0.000199	0.000007
Storey45	135	Top	0.0002	0.000008
Storey44	132	Top	0.000202	0.000008
Storey43	129	Top	0.000203	0.000008
Storey42	126	Top	0.000204	0.000008
Storey41	123	Top	0.000206	0.000008
Storey40	120	Top	0.000207	0.000008
Storey39	117	Top	0.000208	0.000008
Storey38	114	Top	0.000209	0.000008
Storey37	111	Top	0.00021	0.000008
Storey36	108	Top	0.00021	0.000008
Storey35	105	Top	0.000211	0.000007
Storey34	102	Top	0.000211	0.000007
Storey33	99	Top	0.000212	0.000007
Storey32	96	Top	0.000212	0.000007
Storey31	93	Top	0.000212	0.000007
Storey30	90	Top	0.000211	0.000007
Storey29	87	Top	0.000211	0.000007
Storey28	84	Top	0.00021	0.000007
Storey27	81	Top	0.000209	0.000007
Storey26	78	Top	0.000208	0.000007
Storey25	75	Top	0.000207	0.000007
Storey24	72	Top	0.000205	0.000007
Storey23	69	Top	0.000203	0.000006
Storey22	66	Top	0.000201	0.000006
Storey21	63	Top	0.000199	0.000006
Storey20	60	Top	0.000196	0.000006
Storey19	57	Top	0.000193	0.000006
Storey18	54	Top	0.00019	0.000006
Storey17	51	Top	0.000186	0.000006
Storey16	48	Top	0.000182	0.000006
Storey15	45	Top	0.000178	0.000005
Storey14	42	Top	0.000173	0.000005
Storey13	39	Top	0.000168	0.000005
Storey12	36	Top	0.000163	0.000005
Storey11	33	Top	0.000157	0.000005
Storey10	30	Top	0.00015	0.000005
Storey9	27	Top	0.000143	0.000005
Storey8	24	Top	0.000135	0.000005
Storey7	21	Top	0.000127	0.000004
Storey6	18	Top	0.000118	0.000004
Storey5	15	Top	0.000107	0.000004
Storey4	12	Top	0.000095	0.000004

Storey	Elevation	Location	X-Dir	Y-Dir
	m			
Storey3	9	Top	0.000082	0.000003
Storey2	6	Top	0.000064	0.000003
Storey1	3	Top	0.000036	0.000002



GRAPH 5 TALL BUILDING WITH INTERMEDIATE STOREY



GRAPH 6 TALL BUILDING WITH VOID STOREY

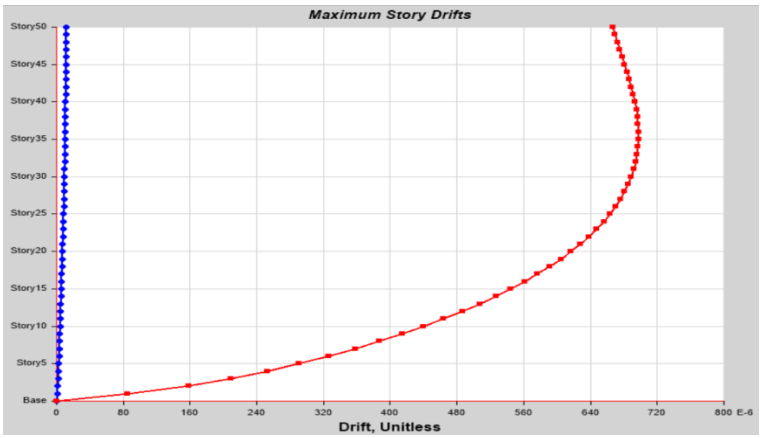
MAX STOREY DRIFT OF WIND LOAD IN Y DIRECTION

TABLE.5

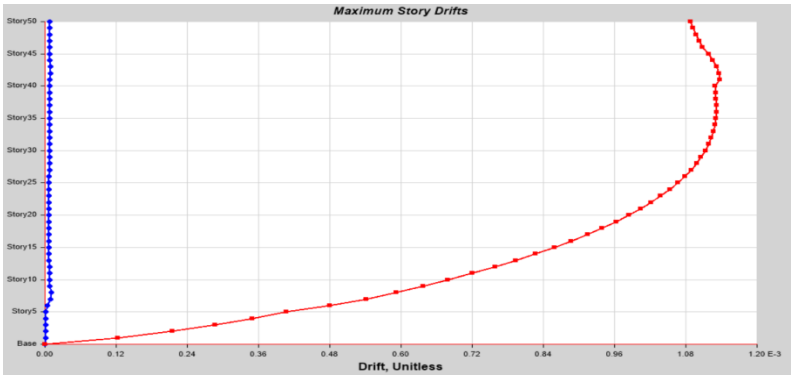
Storey	Elevation	Location	X-Dir	Y-Dir
	m			
Storey50	150	Top	0.000011	0.000667
Storey49	147	Top	0.000011	0.00067
Storey48	144	Top	0.000011	0.000672
Storey47	141	Top	0.000011	0.000675
Storey46	138	Top	0.000011	0.000678
Storey45	135	Top	0.000011	0.000681
Storey44	132	Top	0.000011	0.000684
Storey43	129	Top	0.000011	0.000687
Storey42	126	Top	0.000011	0.000689
Storey41	123	Top	0.000011	0.000691

Storey	Elevation	Location	X-Dir	Y-Dir
	m			
Storey40	120	Top	0.000011	0.000693
Storey39	117	Top	0.000011	0.000695
Storey38	114	Top	0.000011	0.000696
Storey37	111	Top	0.000011	0.000697
Storey36	108	Top	0.00001	0.000698
Storey35	105	Top	0.00001	0.000698
Storey34	102	Top	0.00001	0.000697
Storey33	99	Top	0.00001	0.000696
Storey32	96	Top	0.00001	0.000694
Storey31	93	Top	0.00001	0.000692
Storey30	90	Top	0.00001	0.000689
Storey29	87	Top	0.000009	0.000686
Storey28	84	Top	0.000009	0.000681
Storey27	81	Top	0.000009	0.000676
Storey26	78	Top	0.000009	0.00067
Storey25	75	Top	0.000008	0.000664
Storey24	72	Top	0.000008	0.000656
Storey23	69	Top	0.000008	0.000648
Storey22	66	Top	0.000008	0.000638
Storey21	63	Top	0.000007	0.000628
Storey20	60	Top	0.000007	0.000617
Storey19	57	Top	0.000007	0.000604
Storey18	54	Top	0.000007	0.000591
Storey17	51	Top	0.000006	0.000577
Storey16	48	Top	0.000006	0.000561
Storey15	45	Top	0.000006	0.000544
Storey14	42	Top	0.000005	0.000526
Storey13	39	Top	0.000005	0.000507
Storey12	36	Top	0.000005	0.000486
Storey11	33	Top	0.000004	0.000464
Storey10	30	Top	0.000004	0.00044
Storey9	27	Top	0.000004	0.000415
Storey8	24	Top	0.000004	0.000387
Storey7	21	Top	0.000003	0.000358
Storey6	18	Top	0.000003	0.000326
Storey5	15	Top	0.000003	0.000291
Storey4	12	Top	0.000002	0.000252
Storey3	9	Top	0.000002	0.000209
Storey2	6	Top	0.000002	0.000158
Storey1	3	Top	0.000001	0.000085
Base	0	Top	0	0

PAGES: 81-99
9/4/23
JOURNAL OF SCIENTIFIC RESEARCH AND TECHNOLOGY(JSRT) VOLUME-1 ISSUE-6 SEPTEMBER
Registered under MSME Government of India ISSN: 2583-8660



GRAPH 7 TALL BUILDING WITH INTERMEDIATE STOREY



GRAPH 8 TALL BUILDING WITH VOID STOREY

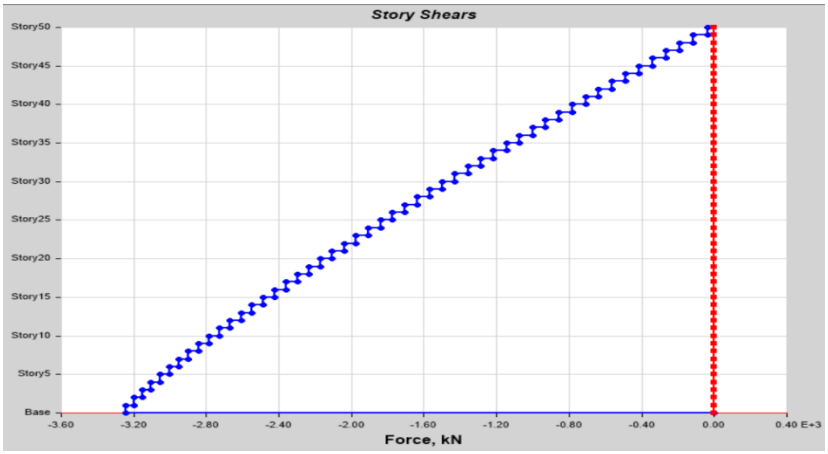
BASE SHEAR FOR WIND LOAD IN X DIRECTION

TABLE.6

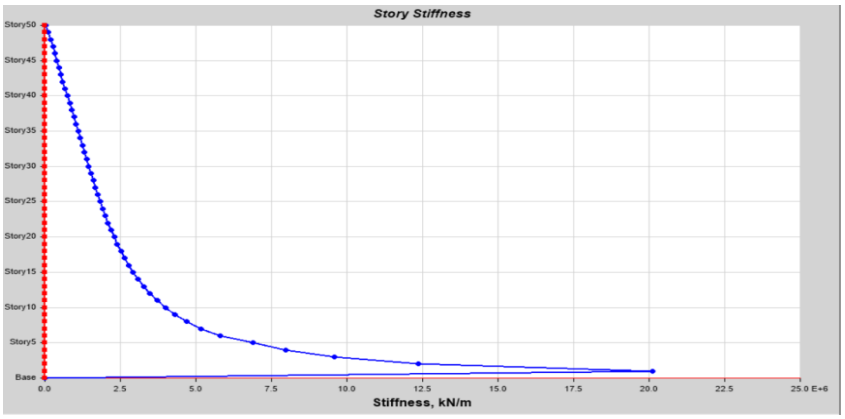
Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Storey50	150	Top	-37.9809	0
		Bottom	-37.9809	0
Storey49	147	Top	-113.753	0
		Bottom	-113.753	0
Storey48	144	Top	-189.2407	0
		Bottom	-189.2407	0
Storey47	141	Top	-264.4445	0
		Bottom	-264.4445	0
Storey46	138	Top	-339.365	0
		Bottom	-339.365	0
Storey45	135	Top	-414.0026	0
		Bottom	-414.0026	0
Storey44	132	Top	-488.358	0
		Bottom	-488.358	0
Storey43	129	Top	-562.4317	0
		Bottom	-562.4317	0
Storey42	126	Top	-636.2241	0
		Bottom	-636.2241	0

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Storey41	123	Top	-709.7359	0
		Bottom	-709.7359	0
Storey40	120	Top	-782.9675	0
		Bottom	-782.9675	0
Storey39	117	Top	-855.9196	0
		Bottom	-855.9196	0
Storey38	114	Top	-928.5926	0
		Bottom	-928.5926	0
Storey37	111	Top	-1000.987	0
		Bottom	-1000.987	0
Storey36	108	Top	-1073.1035	0
		Bottom	-1073.1035	0
Storey35	105	Top	-1144.9425	0
		Bottom	-1144.9425	0
Storey34	102	Top	-1216.5033	0
		Bottom	-1216.5033	0
Storey33	99	Top	-1287.7098	0
		Bottom	-1287.7098	0
Storey32	96	Top	-1358.4444	0
		Bottom	-1358.4444	0
Storey31	93	Top	-1428.6984	0
		Bottom	-1428.6984	0
Storey30	90	Top	-1498.4736	0
		Bottom	-1498.4736	0
Storey29	87	Top	-1567.7716	0
		Bottom	-1567.7716	0
Storey28	84	Top	-1636.5939	0
		Bottom	-1636.5939	0
Storey27	81	Top	-1704.9423	0
		Bottom	-1704.9423	0
Storey26	78	Top	-1772.8183	0
		Bottom	-1772.8183	0
Storey25	75	Top	-1840.2236	0
		Bottom	-1840.2236	0
Storey24	72	Top	-1907.1599	0
		Bottom	-1907.1599	0
Storey23	69	Top	-1973.6287	0
		Bottom	-1973.6287	0
Storey22	66	Top	-2039.6318	0
		Bottom	-2039.6318	0
Storey21	63	Top	-2105.1707	0
		Bottom	-2105.1707	0
Storey20	60	Top	-2170.2471	0
		Bottom	-2170.2471	0
Storey19	57	Top	-2234.8626	0
		Bottom	-2234.8626	0
Storey18	54	Top	-2299.0189	0
		Bottom	-2299.0189	0
Storey17	51	Top	-2362.7	0

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
		Bottom	-2362.7	0
Storey16	48	Top	-2425.7026	0
		Bottom	-2425.7026	0
Storey15	45	Top	-2487.8989	0
		Bottom	-2487.8989	0
Storey14	42	Top	-2549.2917	0
		Bottom	-2549.2917	0
Storey13	39	Top	-2609.8865	0
		Bottom	-2609.8865	0
Storey12	36	Top	-2669.6882	0
		Bottom	-2669.6882	0
Storey11	33	Top	-2728.7023	0
		Bottom	-2728.7023	0
Storey10	30	Top	-2786.8044	0
		Bottom	-2786.8044	0
Storey9	27	Top	-2843.4879	0
		Bottom	-2843.4879	0
Storey8	24	Top	-2898.6431	0
		Bottom	-2898.6431	0
Storey7	21	Top	-2952.3054	0
		Bottom	-2952.3054	0
Storey6	18	Top	-3004.6645	0
		Bottom	-3004.6645	0
Storey5	15	Top	-3055.5555	0
		Bottom	-3055.5555	0
Storey4	12	Top	-3103.8766	0
		Bottom	-3103.8766	0
Storey3	9	Top	-3150.4365	0
		Bottom	-3150.4365	0
Storey2	6	Top	-3196.858	0
		Bottom	-3196.858	0
Storey1	3	Top	-3243.2795	0
		Bottom	-3243.2795	0
Base	0	Top	0	0
		Bottom	0	0



GRAPH 9 TALL BUILDING WITH INTERMEDIATE STOREY



GRAPH 10 TALL BUILDING WITH VOID STOREY

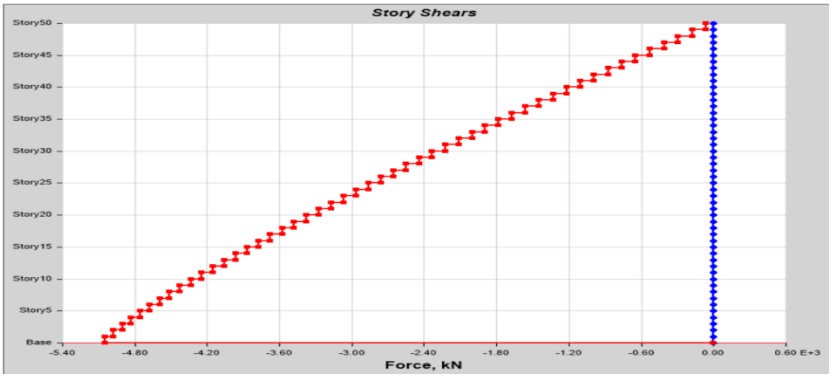
BASE SHEAR FOR WIND LOAD IN Y DIRECTION

TABLE.7

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Storey50	150	Top	-37.9809	0
		Bottom	-37.9809	0
Storey49	147	Top	-113.753	0
		Bottom	-113.753	0
Storey48	144	Top	-189.2407	0
		Bottom	-189.2407	0
Storey47	141	Top	-264.4445	0
		Bottom	-264.4445	0
Storey46	138	Top	-339.365	0
		Bottom	-339.365	0
Storey45	135	Top	-414.0026	0
		Bottom	-414.0026	0
Storey44	132	Top	-488.358	0
		Bottom	-488.358	0
Storey43	129	Top	-562.4317	0
		Bottom	-562.4317	0
Storey42	126	Top	-636.2241	0
		Bottom	-636.2241	0

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Storey41	123	Top	-709.7359	0
		Bottom	-709.7359	0
Storey40	120	Top	-782.9675	0
		Bottom	-782.9675	0
Storey39	117	Top	-855.9196	0
		Bottom	-855.9196	0
Storey38	114	Top	-928.5926	0
		Bottom	-928.5926	0
Storey37	111	Top	-1000.987	0
		Bottom	-1000.987	0
Storey36	108	Top	-1073.1035	0
		Bottom	-1073.1035	0
Storey35	105	Top	-1144.9425	0
		Bottom	-1144.9425	0
Storey34	102	Top	-1216.5033	0
		Bottom	-1216.5033	0
Storey33	99	Top	-1287.7098	0
		Bottom	-1287.7098	0
Storey32	96	Top	-1358.4444	0
		Bottom	-1358.4444	0
Storey31	93	Top	-1428.6984	0
		Bottom	-1428.6984	0
Storey30	90	Top	-1498.4736	0
		Bottom	-1498.4736	0
Storey29	87	Top	-1567.7716	0
		Bottom	-1567.7716	0
Storey28	84	Top	-1636.5939	0
		Bottom	-1636.5939	0
Storey27	81	Top	-1704.9423	0
		Bottom	-1704.9423	0
Storey26	78	Top	-1772.8183	0
		Bottom	-1772.8183	0
Storey25	75	Top	-1840.2236	0
		Bottom	-1840.2236	0
Storey24	72	Top	-1907.1599	0
		Bottom	-1907.1599	0
Storey23	69	Top	-1973.6287	0
		Bottom	-1973.6287	0
Storey22	66	Top	-2039.6318	0
		Bottom	-2039.6318	0
Storey21	63	Top	-2105.1707	0
		Bottom	-2105.1707	0
Storey20	60	Top	-2170.2471	0
		Bottom	-2170.2471	0
Storey19	57	Top	-2234.8626	0
		Bottom	-2234.8626	0
Storey18	54	Top	-2299.0189	0
		Bottom	-2299.0189	0
Storey17	51	Top	-2362.7	0

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
		Bottom	-2362.7	0
Storey16	48	Top	-2425.7026	0
		Bottom	-2425.7026	0
Storey15	45	Top	-2487.8989	0
		Bottom	-2487.8989	0
Storey14	42	Top	-2549.2917	0
		Bottom	-2549.2917	0
Storey13	39	Top	-2609.8865	0
		Bottom	-2609.8865	0
Storey12	36	Top	-2669.6882	0
		Bottom	-2669.6882	0
Storey11	33	Top	-2728.7023	0
		Bottom	-2728.7023	0
Storey10	30	Top	-2786.8044	0
		Bottom	-2786.8044	0
Storey9	27	Top	-2843.4879	0
		Bottom	-2843.4879	0
Storey8	24	Top	-2898.6431	0
		Bottom	-2898.6431	0
Storey7	21	Top	-2952.3054	0
		Bottom	-2952.3054	0
Storey6	18	Top	-3004.6645	0
		Bottom	-3004.6645	0
Storey5	15	Top	-3055.5555	0
		Bottom	-3055.5555	0
Storey4	12	Top	-3103.8766	0
		Bottom	-3103.8766	0
Storey3	9	Top	-3150.4365	0
		Bottom	-3150.4365	0
Storey2	6	Top	-3196.858	0
		Bottom	-3196.858	0
Storey1	3	Top	-3243.2795	0
		Bottom	-3243.2795	0
Base	0	Top	0	0
		Bottom	0	0



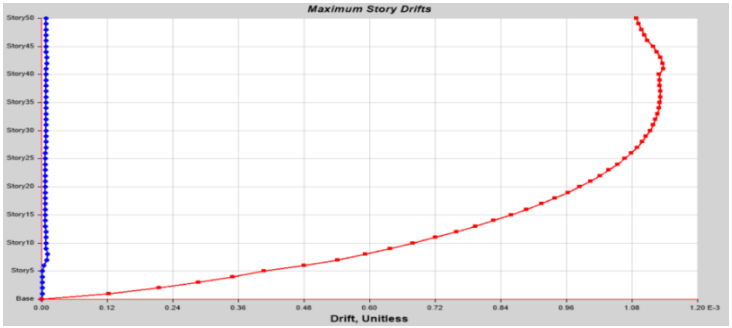
GRAPH 11 TALL BUILDING WITH INTERMEDIATE STOREY

TABLE.8

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Storey50	150	Top	0	-58.8763
		Bottom	0	-58.8763
Storey49	147	Top	0	-176.3343
		Bottom	0	-176.3343
Storey48	144	Top	0	-293.3505
		Bottom	0	-293.3505
Storey47	141	Top	0	-409.9259
		Bottom	0	-409.9259
Storey46	138	Top	0	-526.0612
		Bottom	0	-526.0612
Storey45	135	Top	0	-641.7573
		Bottom	0	-641.7573
Storey44	132	Top	0	-757.0151
		Bottom	0	-757.0151
Storey43	129	Top	0	-871.8352
		Bottom	0	-871.8352
Storey42	126	Top	0	-986.2187
		Bottom	0	-986.2187
Storey41	123	Top	0	-1100.1663
		Bottom	0	-1100.1663
Storey40	120	Top	0	-1213.6788
		Bottom	0	-1213.6788
Storey39	117	Top	0	-1326.7571
		Bottom	0	-1326.7571
Storey38	114	Top	0	-1439.402
		Bottom	0	-1439.402
Storey37	111	Top	0	-1551.6144
		Bottom	0	-1551.6144
Storey36	108	Top	0	-1663.3951
		Bottom	0	-1663.3951
Storey35	105	Top	0	-1774.7428
		Bottom	0	-1774.7428
Storey34	102	Top	0	-1885.5393
		Bottom	0	-1885.5393
Storey33	99	Top	0	-1995.6015
		Bottom	0	-1995.6015
Storey32	96	Top	0	-2104.916
		Bottom	0	-2104.916
Storey31	93	Top	0	-2213.4854
		Bottom	0	-2213.4854
Storey30	90	Top	0	-2321.3122
		Bottom	0	-2321.3122
Storey29	87	Top	0	-2428.3989
		Bottom	0	-2428.3989
Storey28	84	Top	0	-2534.7482
		Bottom	0	-2534.7482
Storey27	81	Top	0	-2640.3625
		Bottom	0	-2640.3625

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Storey26	78	Top	0	-2745.2444
		Bottom	0	-2745.2444
Storey25	75	Top	0	-2849.3964
		Bottom	0	-2849.3964
Storey24	72	Top	0	-2952.8212
		Bottom	0	-2952.8212
Storey23	69	Top	0	-3055.5212
		Bottom	0	-3055.5212
Storey22	66	Top	0	-3157.499
		Bottom	0	-3157.499
Storey21	63	Top	0	-3258.7571
		Bottom	0	-3258.7571
Storey20	60	Top	0	-3359.2981
		Bottom	0	-3359.2981
Storey19	57	Top	0	-3459.1246
		Bottom	0	-3459.1246
Storey18	54	Top	0	-3558.2115
		Bottom	0	-3558.2115
Storey17	51	Top	0	-3656.2428
		Bottom	0	-3656.2428
Storey16	48	Top	0	-3753.0195
		Bottom	0	-3753.0195
Storey15	45	Top	0	-3848.5461
		Bottom	0	-3848.5461
Storey14	42	Top	0	-3942.8308
		Bottom	0	-3942.8308
Storey13	39	Top	0	-4035.8817
		Bottom	0	-4035.8817
Storey12	36	Top	0	-4127.7069
		Bottom	0	-4127.7069
Storey11	33	Top	0	-4218.113
		Bottom	0	-4218.113
Storey10	30	Top	0	-4306.312
		Bottom	0	-4306.312
Storey9	27	Top	0	-4392.1327
		Bottom	0	-4392.1327
Storey8	24	Top	0	-4475.6306
		Bottom	0	-4475.6306
Storey7	21	Top	0	-4557.1009
		Bottom	0	-4557.1009
Storey6	18	Top	0	-4636.2866
		Bottom	0	-4636.2866
Storey5	15	Top	0	-4711.4737
		Bottom	0	-4711.4737
Storey4	12	Top	0	-4783.9203
		Bottom	0	-4783.9203
Storey3	9	Top	0	-4856.1516
		Bottom	0	-4856.1516
Storey2	6	Top	0	-4928.3829

Storey	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
		Bottom	0	-4928.3829
Storey1	3	Top	0	-4964.4986
		Bottom	0	-4964.4986
Base	0	Top	0	0
		Bottom	0	0



GRAPH 12 TALL BUILDING WITH VOID STOREY

Maximum storey displacement (shown above), maximum storey drift (shown above), and base shear of wind load (shown above) in X and Y directions

VI. RESULT

1. Max displacement for tall structure should not be more than 300mm but we have got
   - I. Tall structure with the intermediate storey is 87mm
   - II. Tall structure for the void storey is 136 mm

   Hence both the buildings are safe but the displacement is more for the void storey
2. Max drift for tall structure should not be more the 500
   - III. Tall storey with intermediate storey is 215
   - IV. Tall storey with void storey is 362

VII. CONCULISION

In a head-to-head comparison between a tall structure with an intermediate storey and a tall structure with a void storey, the tall structure with an intermediate storey shows lower maximum displacement and maximum drift. Therefore, the intermediate level is preferable than the empty one.

REFERENCES

[1] **Achyut S. Naphade, G. R. Patil** ; Pushover Analysis Of RCC Building With Soft Storey At Different Levels; IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN :2278-1684, p-ISSN : 2320–334X PP 100-108.

[2] **Rahiman G. Khan, M. R. Vyawahare**; Push Over Analysis of the Tall Building with Soft Stories at Different Levels; International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 Vol. 3, Issue 4, Jul Aug 2013, pp.176- 185.

[3] **Pramod M Gajbe, R. V. R. K. Prasad**; analysis of soft storey multistoried steel structure building; International journal of engineering sciences & Research Technology; ISSN: 2277-9655 Impact Factor: 4.116.

[4] **Vipin V Halde, Aditi H. Deshmukh**; Effect of Soft Storey on Structural Response of HighRise Building; International Journal of Innovative Research in Science, Engineering and Technology Vol.5, Issue1, January 2016.