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# DRIFT ANALYSIS IN MULTISTORIED BUILDING

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## ABSTRACT
In Multistoried building design, lateral load ((i.e. wind or earthquake loads) are mainly responsible for drift which very often dictates in selection of structural system for high rid. To bring the maximum drift down to allowable limits, cross sectional of beams and columns have to increase in many case. For buildings having small number of storey, lateral load rarely affect of the building increase, the increase in size of structural members and possible rearrangements of the structure to account for lateral load. The lateral displacement in moment frames is the greatest among the other lateral load resisting systems investigated; the lateral displacement in dual frames is the least while the lateral displacement in shear wall systems is slightly higher than that of the dual system

**KEYWORDS**: Drift Analysis, Interstorey drift, Shear Wall System, Dual Frame wall system.

## INTRODUCTION
In general, as the height of a building increases, with simultaneously lateral load (such as wind and earthquake) increases. When such response becomes sufficiently great such that the effect of lateral load must be explicitly taken into consideration in design, a multi story building is called as a tall. Tall buildings are mostly displacements, necessitating the introduction of special measures to contain these displacements. The lateral load effects on multistoried buildings can be resisted by using this three method i.e. Frame action, Shear Walls, or Dual System. There are two methods are used for assessing the lateral stability and stiffness of lateral force resisting systems of tall buildings i.e. Peak inter storey drift and lateral displacement (sway) .In seismic design, lateral displacement and drift can affect on both the structural elements that are part of the lateral force resisting system and structural elements that are not part of the lateral force resisting system. In terms of the lateral force resisting system, due to lateral force on the structure the structure is moves due to those forces. Consequently, there is a relationship between the lateral force resisting system and movement due to lateral loads; this relationship can be analyzed by hand or by computer. Using the results of this analysis, estimates of other design criteria, such as rotations of joints in eccentric braced frames and in special moment resisting frames can be obtained. Similarly, the lateral analysis can also be used to estimate the effect of lateral movements on structural elements that are not part of the lateral force resisting system, such as beams and columns that are not explicitly considered as being part of the lateral force resisting system. Design provisions for moment frame and eccentric braced frame structures have requirements to ensure the ability of the structure to sustain inelastic rotations resulting from deformation and drift. In addition, Structural elements and connections not part of the lateral force resisting system if the lateral deflections of any structure become too large,. need to be detailed the expected maximum displacement and drifts. during an earthquake, meaning that they experience deflections and rotations similar to those of the lateral force resisting system.
Drift has been defined in terms of *total drift* (the total lateral displacement at the top of the building) and interstorey drift is defined as the relative lateral displacement occurring between two consecutive building levels.. The drift index is a simple estimate of the lateral stiffness of the building and is used almost exclusively to limit damage to nonstructural components. Interstorey drift ratio (IDR), defined as the relative translational displacement between two consecutive floors divided by the story height,
Equation defines the drift index.

Drift Index = displacement/height

Total Drift Index = Total drift/Building height = $\Delta/H$ (2.2)

Interstorey drift index = Interstorey drift/story height= $\delta/h$

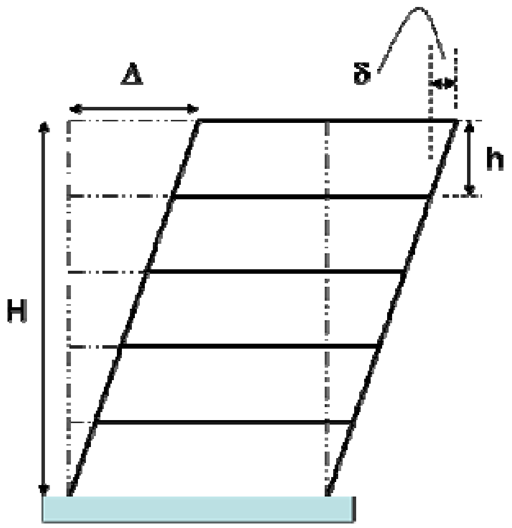


***Fig 1 Drift measurement***

To limit nonstructural damage, these drift indices are limited to certain values. Using drift indices is a straightforward, simple way to limit damage. However, three ways are using drift indices as a measure of building damageability: One, is oversimplifies the structural performance by considering the entire building on a single value of lateral drift. Two, any torsional component of deflection and material damage is ignored. Three, drift as a accounts for horizontal movement or horizontal racking and vertical racking is ignored. The true measure of damage in a material is the shear strain which is a combination of horizontal and vertical racking. If one considers that the shear strain in the damageable material is the realistic parameter to limit, then it is seen that drift indices are not always sufficient. In this work pointed out that the efficiency of lateral load resisting system or the amount of materials required for multi-storey buildings heavily depends on drift limits. The difficulties faced by Structural Engineers in selecting strong and stiff enough deformation resisting systems that will curtail the drift within acceptable code limits. Multi-storey buildings to sway under lateral wind loading and therefore advocated the need for good understanding of the nature of wind load and estimation of interstorey drift. The importance of the knowledge of lateral displacements at the top of multi storey buildings because of its usefulness in assessing the stability and stiffness of multi-storey buildings. Multistoried building subjected to lateral load experience excessive displacement and this is affects on structural behavior. It is essential to study in view of structure for different types of frame drift. It is necessary to minimize drift and inter story drift for different frame by increasing stiffness of beam and column. For analysis of drift various methods are used and some techniques are observed

## METHODS

In Multistoried building excessive displacement developed by lateral load, lateral load resisting system are usually provided to curtail the load effect. The resistance may be offered by frame action, shear walls, and combined walls and frames (also known as dual system).There are three method which is used for drift analysis of given building.

**Moment Frame System**

Moment frame is the box type structure which is consists of special moment connection or joints that help in resisting lateral load . Moment Frame is economical up to twenty stories are economical for buildings up to twenty-five stories, above which their behavior is costly to control. This is a frame system of rigid beams subjected to lateral loads where the developed moments in the middle of the columns are not existent. And the shear forces will be distributed proportionally with the moment of inertia of the columns and the lateral displacements will be proportional to these forces.

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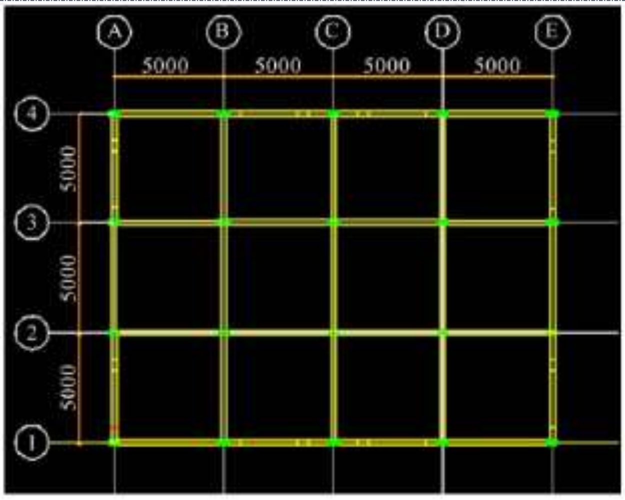


*Fig 2 General arrangement drawing for a typical floor for the moment frame*

**Shear Wall System**

This is the structural member which is used to resisting lateral load i.e parallel to the plane of the wall. shear walls provide adequate strength and stiffness to control lateral displacements. Shear walls perform dual action that is they as lateral as well as gravity load-bearing elements.

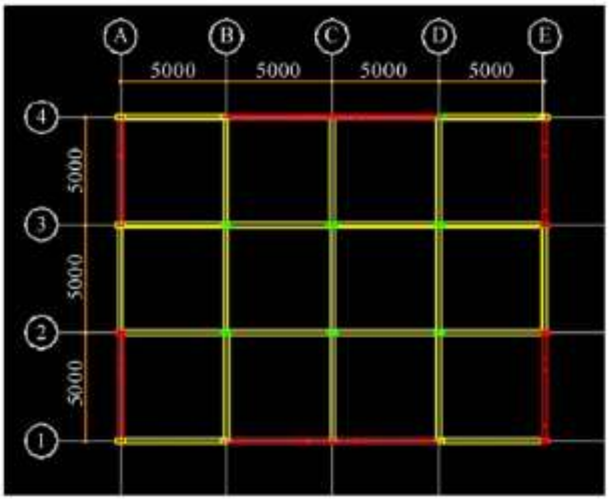


*Fig 3 General arrangement drawing for a typical floor for the shear wall system*

**Dual Frame-Wall System**

It is a structural system which provides support for gravity loads, and resistance to lateral loads is provided by a specially detailed moment-resisting frame and shear walls or braced frames.. In the dual system, both frames and shear walls resisting the lateral loads. The frame is combination of beams and columns connected with each other by rigid joints, and the frames bend in accordance with shear mode, whereas the deflection of the shear walls is like the cantilever walls. As a result of the difference in deflection properties between frames and walls, in the frame the shear walls in the top of building will try to pull , while in the bottom, they will try to push the walls. So the frames will resist the lateral loads in the upper part of the building, while the shear walls will resist most of the vertical loads in the lower part of the building

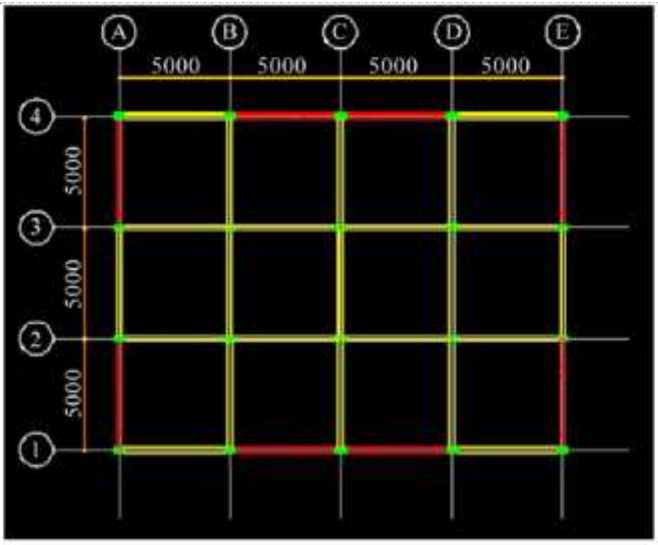


*Fig 4 General arrangement drawing for a typical Dual system*

In present work analysis of multi-storied building frame subjected to wind load is consider. Various lateral load resisting systems are verified for drift calculation like moment frame system, shear wall system and dual frame wall system.

Analysis is done for

1. Comparisons of lateral displacements and Interstorey drift for 15 storey building with different lateral load resisting system.
2. Comparisons of lateral displacement and Interstorey drift for 15 storey building with different lateral load resisting system.
3. Comparisons of lateral displacements and Interstorey drift for 15 storey building with different lateral load resisting system. And analysis is done with STADD-Pro.

**System Performance**

STAAD is basic software for analysis. STAAD.Pro is the most popular structural engineering software product for 3D model generation, analysis and multi-material design

**Structural analysis**

**Assume Beam column sizes** For analysis purpose assumed some beam column sizes. The beams are 300 mm wide & 500 mm deep. Columns are 400mm X 700 mm.

**Limits for Building drift** As per IS 1893 Part I, the drift limit is = 0.004 * H  H = Height of building

**Frames:** For analysis purpose are considered assumed 15 storied 25 storied & 33 storied framed buildings. In that there are 3 lateral load resisting systems are considered. 1)Moment Frame System 2)Shear Wall System 3)Dual Frame Wall System

**Modeling Assumptions**

The following assumptions apply in this work:

1) Static or equivalent static loads as recommended by IS 875 Part III are considered.
2) Dead loads are assumed to be invariant with changes in member sizes.
3) The material of concrete is assumed to be linearly elastic and P-Δ effects are not considered.
4) Structural members are straight and prismatic.
5) In order to reflect actual behavior of structures, all frames are assumed to be rigid in plane; hence they constrain the horizontal shear deflection of all vertical bents at floor levels to be related by the horizontal translations and floor slab rotations.
6) All connections between members of all building models are assumed rigid while the buildings are fixed at the base.
7) The buildings are assumed to be residential complex type meant for general use.

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8) Member sizes are assumed.

10) Major axis is taken to be the axis about which the section has the larger second moment of area.

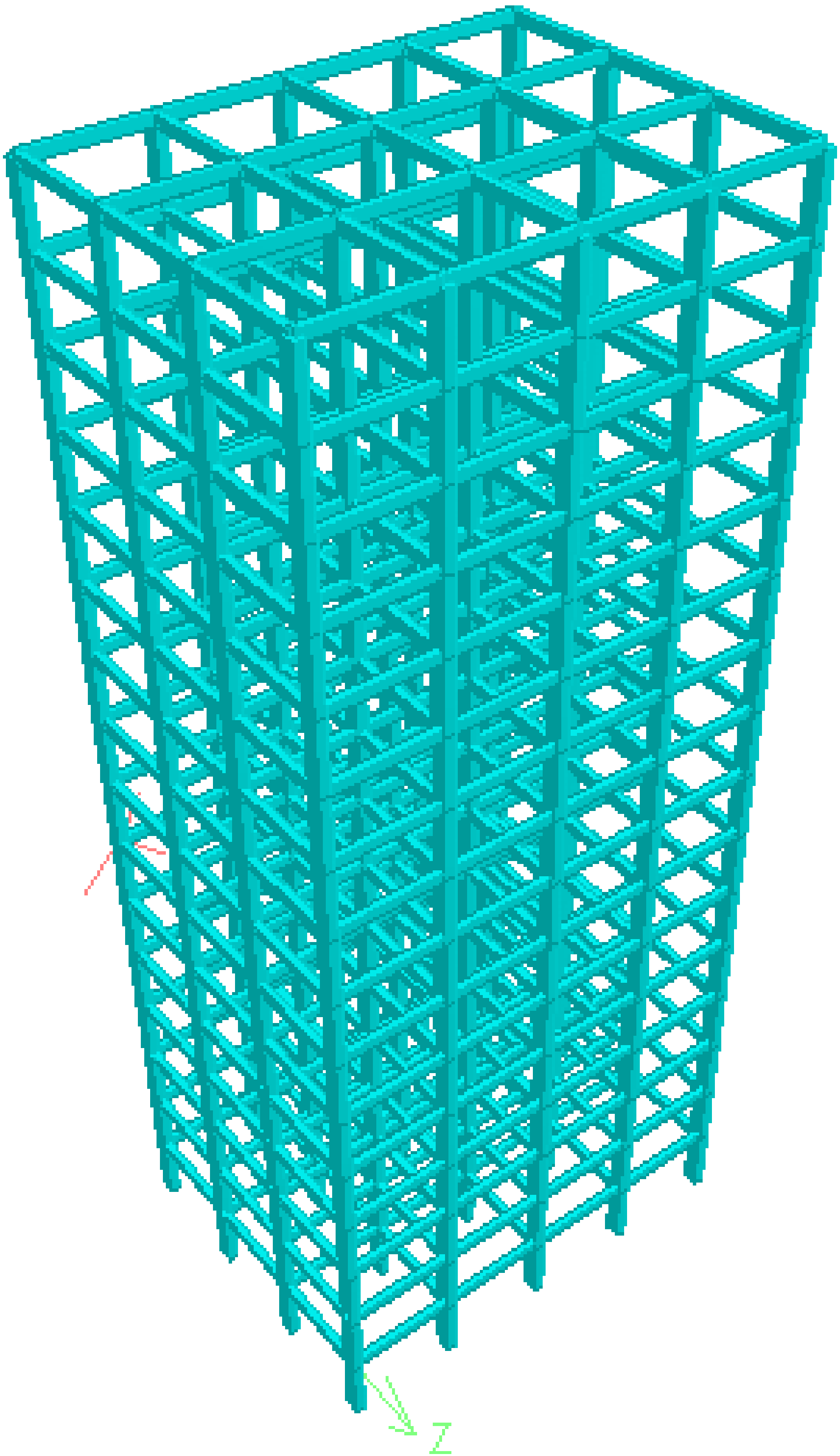


***Fig 5 3-D model of Moment resisting frame for 15th storey***

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***Fig 6 3-D model of Shear Wall System for 15th storey***

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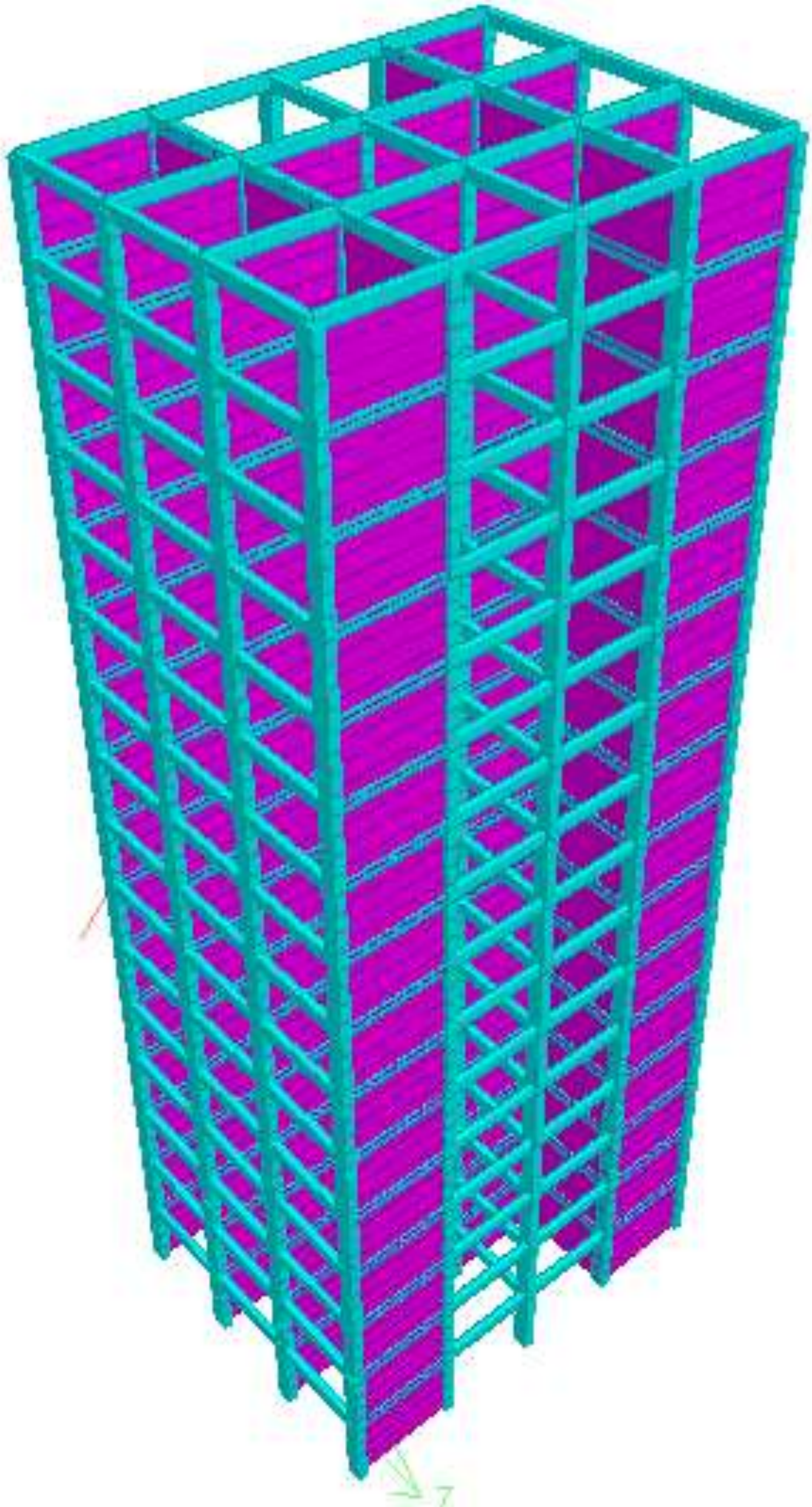

*Fig 7 3-D model for Dual System for 15th storey*

**Calculation**

**Loads** **Before** a structure can be analyzed, the nature & magnitude of loads must be known.
Following are the important type of loads.
**Dead Load:** This can be precisely known. Weight of the structure & components permanently attached to the structure contribute to the dead load. IS: 875-1978 list unit weights of materials required to evaluate dead load.
**Live Load:** From IS: 875 – 1978 we get the live load values for different types of buildings.
**Wind force:** These loads are often of such short of cyclic variation so as to cause inertial forces in the structure. In addition to the applied loads there are effects that cause dimensional changes in the structure. If these changes are prevented by the support condition's of a structure, internal stresses that must to be calculated.
**Dead Loads :** I have considered dead load as per follows.

Beam depth = 500 mm

Floor to floor ht = 3200 mm

Brick wall width = 200 mm

Plaster th = 25 mm each side

Density of brick = 22 kN/$m^3$

Unit wt of concrete = 25 kN/$m^3$

Wt of wall = (3.2-0.5) * 0.2 * 22 = 11.88 = 11.9 kN/m

Wt of plaster = (3.2-0.5) * (0.025*2) * 25 = 3.375 = 3.4 kN/m

Total load = 11.9 + 3.4 = 15.3 kN/m

UDL of wall on outer beam = 15.3 kN/m

For inside wall = 100 mm th

UDL of wall on inner beam = 7.7 kN/m

**Live Loads :**Live loads are as per IS 875 PART II
On floor = 3 kN/$m^2$

On roof = 1.5 kN/$m^2$

**Wind Load :**Wind loads are considered as per IS 875 PART III
$Vz = Vb * k_1 * k_2 * k_3$

Basic wind speed = Vb = 50 m/s

Risk factor = $k_1$ = 1.06

Terrain height & structure size factor = $k_2$ = 1.15

Topography factor = $k_3$ = 1

$Vz = V_b * k_1 * k_2 * k_3 = 50 * 1.06 * 1.15 * 1 = 61$ m/s

Design wind pressure = $Pz = 0.6 * Vz^2$

$Pz = 0.6 * Vz^2 = 0.6 * 61^2 = 2232.6$ N/$m^2$

= 2232.6/1000 = 2.3 kN/$m^2$

Force coefficient = 2 ----- table 24

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Gust factor g = 0.92 ----- table 33

Vertical ht = 3.2 ms

Width = 5 m

Wind load = 2.3 * 3.2 * 5 * 2 * 0.92 = 67.8 kN

**Load Combinations :**Load combinations are as per IS 456

DL+LL

DL+LL+WLX

DL+LL+WLZ

1.5DL+1.5LL

1.5DL+1.5WLX

1.5DL+1.5WLZ

DL = DEAD LOAD

LL = LIVE LOAD, WL = WIND LOAD

*Table 1 Comparisons of Lateral displacements for 15 storey building with different lateral loads resisting system*

| Storey no | Moment frame (mm) | Shear wall (mm) | Dual system (mm) |
|---|---|---|---|
| 15 | 271.067 | 64.133 | 14.521 |
| 14 | 266.964 | 64.132 | 13.911 |
| 13 | 261.073 | 63.991 | 13.313 |
| 12 | 253.299 | 63.551 | 12.593 |
| 11 | 243.498 | 62.78 | 11.787 |
| 10 | 231.655 | 61.666 | 10.936 |
| 9 | 217.787 | 60.179 | 10.06 |
| 8 | 201.914 | 58.26 | 9.175 |
| 7 | 184.058 | 55.805 | 8.291 |
| 6 | 164.239 | 52.665 | 7.417 |
| 5 | 142.481 | 48.625 | 6.554 |
| 4 | 118.817 | 43.401 | 5.692 |
| 3 | 93.334 | 36.65 | 4.786 |
| 2 | 66.309 | 28.048 | 3.744 |
| 1 | 38.662 | 17.587 | 2.438 |

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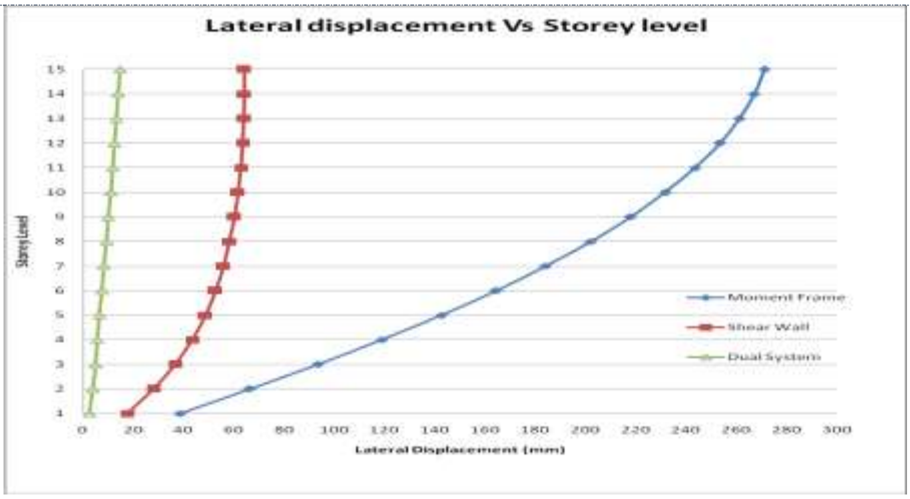


***Fig.8 1 Lateral displacement curve for 15 storey building***

*Table 2 Comparisons of inter storey drifts for 15 storey building with different lateral loads resisting system*

| Storey no | Moment frame | Shear wall | Dual system (mm) |
|---|---|---|---|
| 15 | 4.103 | 0.001 | 0.61 |
| 14 | 5.891 | 0.141 | 0.598 |
| 13 | 7.774 | 0.44 | 0.72 |
| 12 | 9.801 | 0.771 | 0.806 |
| 11 | 11.843 | 1.114 | 0.851 |
| 10 | 13.868 | 1.487 | 0.876 |
| 9 | 15.873 | 1.919 | 0.885 |
| 8 | 17.856 | 2.455 | 0.884 |
| 7 | 19.819 | 3.14 | 0.874 |
| 6 | 21.758 | 4.04 | 0.863 |
| 5 | 23.664 | 5.224 | 0.862 |
| 4 | 25.483 | 6.751 | 0.906 |
| 3 | 27.025 | 8.602 | 1.042 |
| 2 | 27.647 | 10.461 | 1.306 |
| 1 | 25.226 | 11.094 | 1.486 |

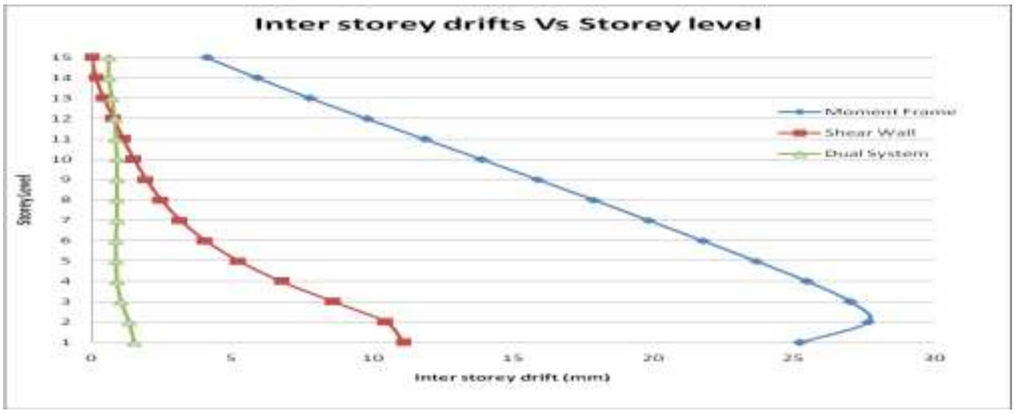


***Fig.9 Inter storey drifts curve for 15 storey building***

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**Results for 25th storey building**

*Table 3 Comparisons of Lateral displacements for 25 storey building with different lateral loads resisting system*

| Storey no | Moment frame (mm) | Shear wall (mm) | Dual system (mm) |
|---|---|---|---|
| 25 | 853.554 | 123.282 | 74.286 |
| 24 | 841.957 | 121.272 | 71.255 |
| 23 | 828.555 | 119.016 | 68.256 |
| 22 | 813.241 | 116.552 | 65.079 |
| 21 | 795.874 | 113.86 | 61.794 |
| 20 | 776.444 | 110.983 | 58.453 |
| 19 | 754.971 | 107.964 | 55.081 |
| 18 | 731.483 | 104.836 | 51.695 |
| 17 | 706.009 | 101.625 | 48.308 |
| 16 | 678.581 | 98.349 | 44.928 |
| 15 | 649.222 | 95.02 | 41.568 |
| 14 | 617.991 | 91.644 | 38.237 |
| 13 | 584.925 | 88.22 | 34.947 |
| 12 | 550.046 | 84.737 | 31.713 |
| 11 | 513.407 | 81.176 | 28.547 |
| 10 | 475.056 | 77.503 | 25.466 |
| 9 | 435.043 | 73.666 | 22.486 |
| 8 | 393.42 | 69.585 | 19.626 |
| 7 | 350.242 | 65.149 | 16.903 |
| 6 | 305.561 | 60.199 | 14.335 |
| 5 | 259.441 | 54.517 | 11.935 |
| 4 | 211.966 | 47.817 | 9.699 |
| 3 | 163.312 | 39.754 | 7.591 |
| 2 | 113.959 | 30.011 | 5.523 |
| 1 | 65.399 | 18.6 | 3.371 |

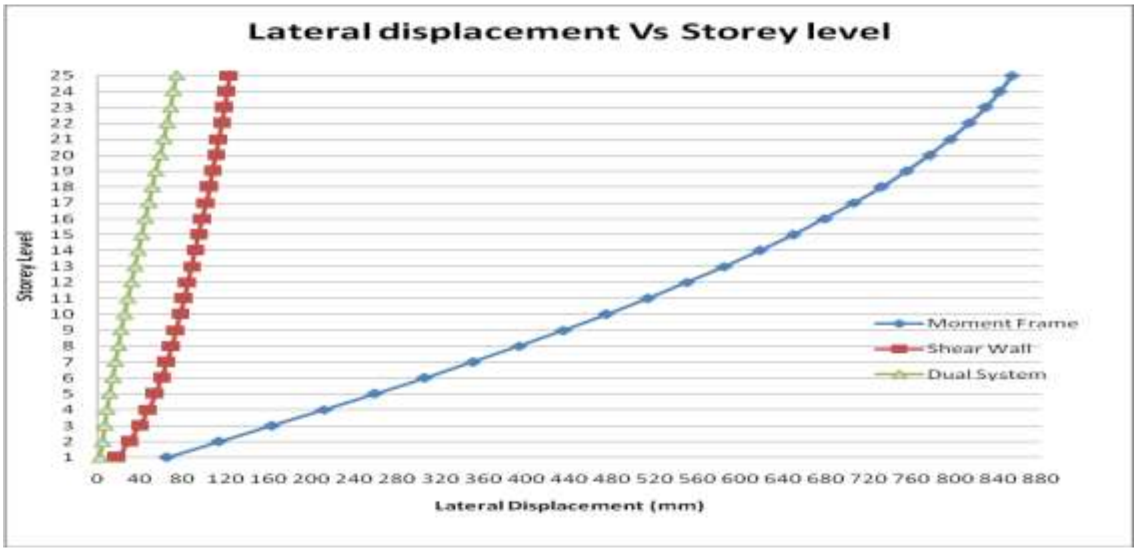


*Fig. 10 Lateral displacement curve for 25 storey building*

*Table 4 Comparisons of Inter storey drifts for 25 storey building with different lateral loads resisting system*

| Storey no | Moment frame | Shear wall (mm) | Dual system |
|---|---|---|---|
| 25 | 11.597 | 2.01 | 3.031 |
| 24 | 13.402 | 2.256 | 2.999 |
| 23 | 15.314 | 2.464 | 3.177 |
| 22 | 17.367 | 2.692 | 3.285 |
| 21 | 19.43 | 2.877 | 3.341 |
| 20 | 21.473 | 3.019 | 3.372 |
| 19 | 23.488 | 3.128 | 3.386 |
| 18 | 25.474 | 3.211 | 3.387 |
| 17 | 27.428 | 3.276 | 3.38 |
| 16 | 29.359 | 3.329 | 3.36 |
| 15 | 31.231 | 3.376 | 3.331 |
| 14 | 33.066 | 3.424 | 3.29 |
| 13 | 34.879 | 3.483 | 3.234 |
| 12 | 36.639 | 3.561 | 3.166 |
| 11 | 38.351 | 3.673 | 3.081 |
| 10 | 40.013 | 3.837 | 2.98 |
| 9 | 41.623 | 4.081 | 2.86 |
| 8 | 43.178 | 4.436 | 2.723 |
| 7 | 44.681 | 4.95 | 2.568 |
| 6 | 46.12 | 5.682 | 2.4 |
| 5 | 47.475 | 6.7 | 2.236 |
| 4 | 48.654 | 8.063 | 2.108 |
| 3 | 49.353 | 9.743 | 2.068 |
| 2 | 48.56 | 11.411 | 2.152 |
| 1 | 42.976 | 11.799 | 2.124 |

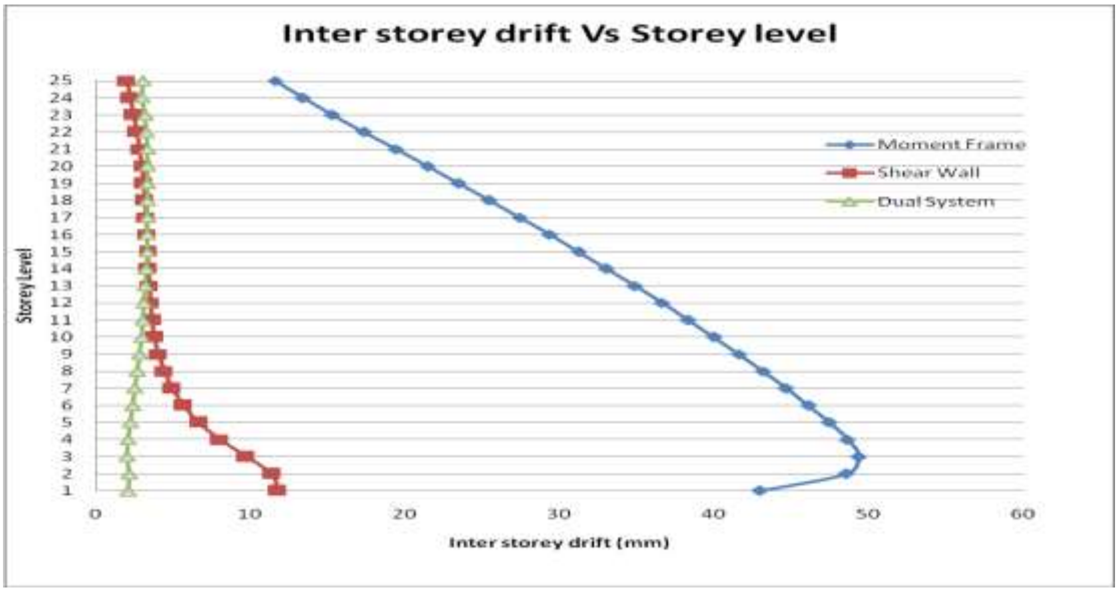


***Fig.11 Inter storey drift curve for 25 storey building***

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**Results for 33th storey building**

*Table 5 Comparisons of Lateral displacements for 33 storey building with different lateral loads resisting system*

| Storey no | Moment frame (mm) | Shear wall (mm) | Dual system (mm) |
|---|---|---|---|
| 33 | 1709.928 | 249.01 | 201.807 |
| 32 | 1686.094 | 243.285 | 194.85 |
| 31 | 1660.428 | 237.187 | 187.917 |
| 30 | 1632.834 | 230.881 | 180.78 |
| 29 | 1603.177 | 224.329 | 173.523 |
| 28 | 1571.446 | 217.582 | 166.204 |
| 27 | 1537.662 | 210.69 | 158.852 |
| 26 | 1501.855 | 203.693 | 151.485 |
| 25 | 1464.054 | 196.624 | 144.114 |
| 24 | 1424.29 | 189.511 | 136.75 |
| 23 | 1382.595 | 182.375 | 129.404 |
| 22 | 1339.005 | 175.238 | 122.086 |
| 21 | 1293.557 | 168.116 | 114.808 |
| 20 | 1246.291 | 161.026 | 107.582 |
| 19 | 1197.251 | 153.983 | 100.423 |
| 18 | 1146.484 | 146.999 | 93.346 |
| 17 | 1094.04 | 140.088 | 86.366 |
| 16 | 1039.974 | 133.261 | 79.5 |
| 15 | 984.336 | 126.525 | 72.769 |
| 14 | 927.208 | 119.887 | 66.189 |
| 13 | 868.658 | 113.346 | 59.784 |
| 12 | 808.733 | 106.897 | 53.574 |
| 11 | 747.517 | 100.525 | 47.583 |
| 10 | 685.085 | 94.201 | 41.834 |
| 9 | 621.519 | 87.879 | 36.355 |
| 8 | 556.899 | 81.485 | 31.172 |
| 7 | 491.309 | 74.914 | 26.311 |
| 6 | 424.834 | 68.012 | 21.8 |
| 5 | 357.571 | 60.566 | 17.659 |
| 4 | 289.648 | 52.292 | 13.891 |
| 3 | 221.313 | 42.852 | 10.469 |
| 2 | 153.209 | 31.935 | 7.304 |
| 1 | 87.286 | 19.57 | 4.278 |

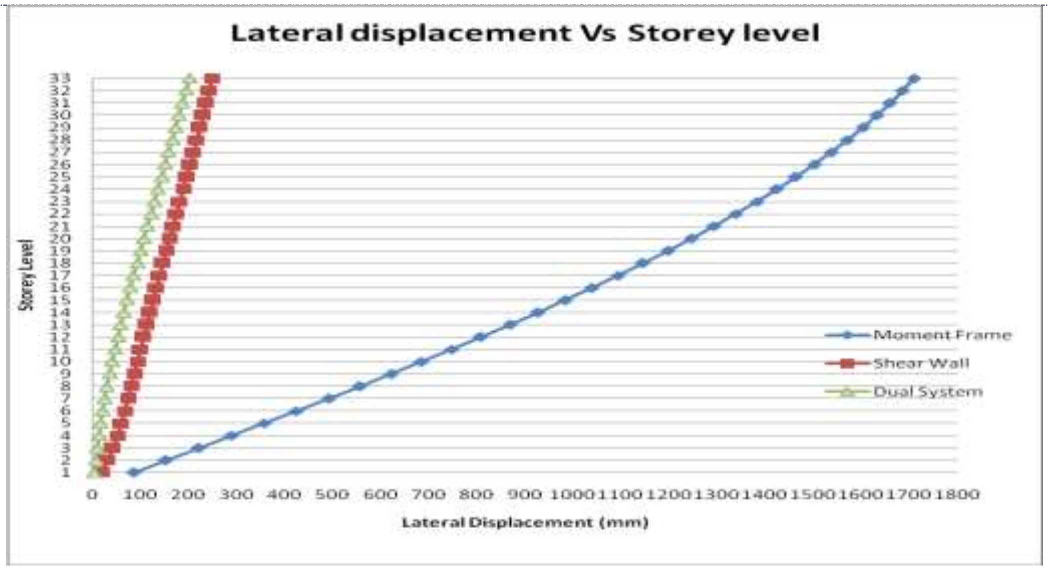


*Fig 12 Lateral displacement curve for 33 storey building*

*Table 6 Comparisons of Inter storey drifts for 33 storey building with different lateral loads resisting system*

| Storey no | Moment frame (mm) | Shear wall (mm) | Dual system (mm) |
|---|---|---|---|
| 33 | 23.834 | 5.725 | 6.957 |
| 32 | 25.666 | 6.098 | 6.933 |
| 31 | 27.594 | 6.306 | 7.137 |
| 30 | 29.657 | 6.552 | 7.257 |
| 29 | 31.731 | 6.747 | 7.319 |
| 28 | 33.784 | 6.892 | 7.352 |
| 27 | 35.807 | 6.997 | 7.367 |
| 26 | 37.801 | 7.069 | 7.371 |
| 25 | 39.764 | 7.113 | 7.364 |
| 24 | 41.695 | 7.136 | 7.346 |
| 23 | 43.59 | 7.137 | 7.318 |
| 22 | 45.448 | 7.122 | 7.278 |
| 21 | 47.266 | 7.09 | 7.226 |
| 20 | 49.04 | 7.043 | 7.159 |
| 19 | 50.767 | 6.984 | 7.077 |
| 18 | 52.444 | 6.911 | 6.98 |
| 17 | 54.066 | 6.827 | 6.866 |
| 16 | 55.638 | 6.736 | 6.731 |
| 15 | 57.128 | 6.638 | 6.58 |
| 14 | 58.55 | 6.541 | 6.405 |
| 13 | 59.925 | 6.449 | 6.21 |
| 12 | 61.216 | 6.372 | 5.991 |
| 11 | 62.432 | 6.324 | 5.749 |
| 10 | 63.566 | 6.322 | 5.479 |

| | | | |
|---|---|---|---|
| 9 | 64.62 | 6.394 | 5.183 |
| 8 | 65.59 | 6.571 | 4.861 |
| 7 | 66.475 | 6.902 | 4.511 |
| 6 | 67.263 | 7.446 | 4.141 |
| 5 | 67.923 | 8.274 | 3.768 |
| 4 | 68.335 | 9.44 | 3.422 |
| 3 | 68.104 | 10.917 | 3.165 |
| 2 | 65.923 | 12.365 | 3.026 |
| 1 | 57.55 | 12.482 | 2.755 |

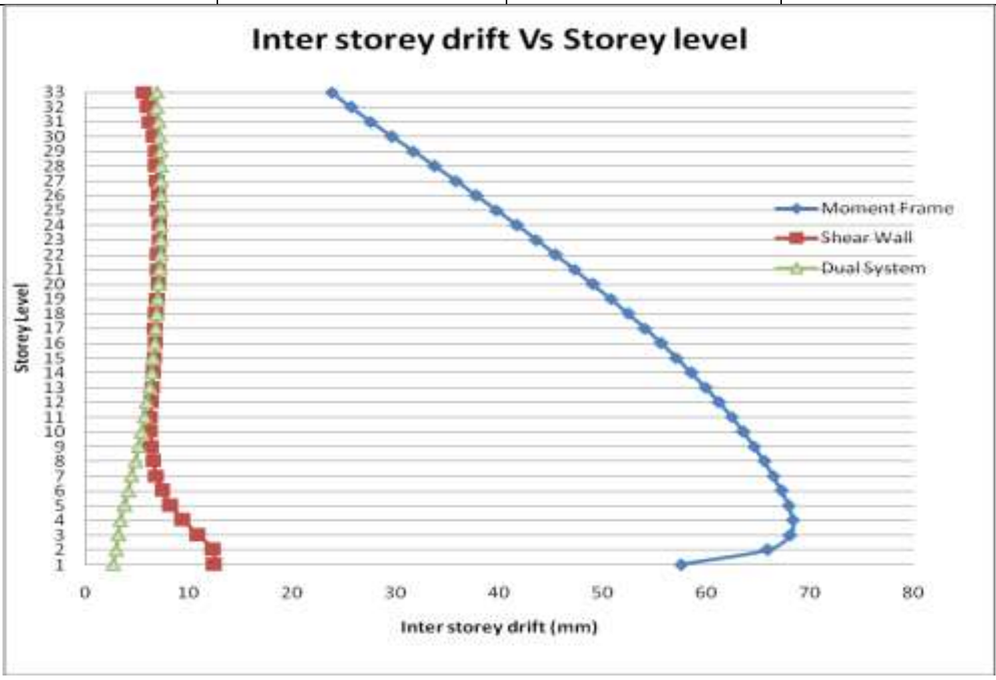


***Fig. 13 Inter storey drift curve for 33 storey building***

## RESULT AND DISCUSSION

A comparison of the values for the lateral displacements as contained in Tables 1, 3 and 5 for 15-storey, 25-storey and 33-storey buildings respectively shows that the lateral displacement is greatest at the top storeys for the three lateral force resisting systems, by observation lateral displacement is maximum in moment resisting frame than other two lateral resisting system . from The lateral displacement of the moment frame at the level of the 1$^{st}$ storey is about 2 times greater than that of the shear wall system and about 15 times that of the dual system. As shown in Tables 2, 4 & 6 for all storey variants considered, the inter-storey drift is greatest for moment frame and least for dual system. Furthermore, for all storey variants, in the moment frame method the greatest inter-storey drifts is occur at the lowest third along the building height, with the exception of the first storey which has about half the drift value of the average value of the storey's located in the lowermost third of the building height.

## CONCLUSION

The lateral displacement in moment resisting frames is the greater than the other lateral load resisting systems investigated; As per above comparison lateral displacement in dual system is very least then shear wall and moment frame method least The drift is occurs greatest within the middle third of the building in case of shear wall and the dual system and the maximum interstorey drift occurred at the bottom third of the moment frames and in dual systems while that of the shear wall system is slightly higher than that of the dual system.

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## REFERENCES

[1] Chinwuba Arum, Akinloye Akinkunmi, "Comparison of Wind-Induced Displacement Characteristics of Buildings with Different Lateral load Resisting Systems" Department of Civil Engineering, The Federal University of Technology, Akure, Nigeria Received December 25, 2010; revised January 5, 2011; accepted January 17, 2011

[2] Cengiz Dundar,Ilker Fatih Kara, "Three dimensional analysis of reinforced concrete frames with cracked beam and column elements" Department of Civil Engineering, Cukurova University, 01330, Adana, Turkey Received 20 July 2006; received in revised form 20 November 2006; accepted 21 November 2006

[3] Derek A. Skolnik, John W. Wallace, "Critical Assessment of Interstorey Drift Measurements" Postdoctoral Scholar, Dept. of Civil and Environmental Engineering,Univ. of California, Los Angeles, Los Angeles the Journal of Structural Engineering, Vol. 136, No. 12, December 1, 2010.

[4] Finley A. Charney, Virginia Tech, Blacksburg, "Analysis and Commentary on the Results of a Nation Wide State-ofthe- Practice Survey on Wind Drift Analysis and Design" Structures Congress: New Horizons and Better Practices ASCE 2007

[5] Finley A. Charney, Virginia Tech, Blacksburg, "Analysis and Commentary on the Results of a Nation Wide State-ofthe- Practice Survey on Wind Drift Analysis and Design" Structures Congress: New Horizons and Better Practices ASCE 2007

[6] IS : 875 ( Part 2 ) – 1987 (Reaffirmed 1997) "Indian Standard code of practice for design loads(other than Earthquake) for building and structures" part 2 Imposed Load (Second Revision) June 1998.

[7] IS:875 (Part 3) – 1987 "Indian Standard code of practice for design Loades (other earthquake) for buildings and structure" Part 3 Wind Loads (Second Edition) November 1998 .

[8] IS 1893 ( Part 1 ) :2002 "Indian Standard Criteria for earthquake resistance design of structure" Part 1 General Provision and Buildings(Fifth Revision ).

[9] IS 456 : 2000 "Plain and Reinforced Concrete Code Of Practice" (Fourth Revision)

[10] LAU HENG NAM, "Damage and drift analysis for 18-storey reinforced concrete building in penang due to sesmic force" March 2008

[11] M.F. Ishac , "Dynamic Response of Asymmetric Shear Wall- Frame Building Structures"Jan1975

[12] Noor Sadiqul Hasan, Shiblee Sayed, "Effect of non sway and sway methods for analysis and design of reinforced concrete frames for multi-storey building" School of Civil Engineering, Linton University College, Legenda Education Group, Malaysia International Journal of the Physical Sciences Vol. 6(17), 2 September, 2011

[13] P. Jayachandran,"Design of Tall Buildings Preliminary Design and Optimization" National Workshop on High-rise and Tall Buildings, University of Hyderabad, Hyderabad, India, May 2009.