International Journal of Combined Research & Development (IJCRD)
eISSN:2321-225X;pISSN:2321-2241 Volume: 11; Issue: 4; April -2022

# SEISMIC ANALYSIS OF TALL STRUCTURE WITH OPTIMUM LOCATION OF SHEAR WALL

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**Abstract:**

Shear wall are structural members used to increase the strength of RCC structure. Nowadays building with shear wall is obtaining more popularity than building without shear wall in earthquake prone areas due to its ability to the resistance during earthquake. The purpose of carrying heavy loads and provides resistance against earthquake forces.

In this study, Dynamic Analysis of R.C. Buildings has been carried out by considering bare frame model and models with shear wall at different location. ETABS 2018 software is used for the analysis purpose. Linear dynamic (response spectrum analysis) methods of analysis have been used following IS: 1893 (Part l)-2016 for the Analysis of 20 Storey Framed Building. Comparative study is done between bare frame model and models with different location of shear wall and results are obtained in terms of Base shear, Modal Periods, Modal Frequencies, Story Displacement, Story Drift and Story Stiffness for Seismic Zones viz V, IV and III.

**Keywords**: *Shear Wall, ETABS 2018, Response Spectrum method, etc.,*

## 1. INTRODUCTION

### 1.1 General

Earthquakes area unit among the foremost random natural hazards. Whenever rocks or formations within the planet are all of a fulminate get disturbed, an oversized quantity of energy is discharged, this energy would have developed over drawn out stretches of your time thanks to tectonic activities within the planet. The following vibrations result from the discharge of this energy detached each that manner from the supply wherever disturbance occurred. An earthquake is that the passage of those vibrations. Earthquakes happen with no warning. Earthquakes might cause loss of life and property destruction.
Seismic method has picked up force and is that the center of attention of thought for structural analysts. Giving earthquake safe structure is one among the very important obligations of a structural designer. Analysis is being done all over throughout the globe for creating earthquake safe style techniques.

### 1.2 Shear wall

It is a vertical component of an unstable strength resist system that's designed for the resistance in-plane lateral forces, usually wind and unstable masses. Ferroconcrete shear walls square measure designed for buildings placed within the unstable areas, thanks to their high bearing capability, high malleability, stiffness etc.

In present days the high rise building, beam and column size calculate massive and significant reinforcement at the beam-column joins square measure moderately significant, with the intention of, preventive at these joints; it's troublesome to position and shake concrete at these areas that doesn't give the protection of the building. These sensible difficulty require the beginning in High rise buildings of shear walls. Building designed by structural walls square measure nearly all times stiff and so frame structure, dropping the likelihood of the extreme buckle and therefore injury. RC multi storied buildings square measure sufficient to that resist each upright and parallel load.

### 1.3 Shapes of Shear Walls

In a construction field the shape and size of shear wall contain important impact on the structural actions beneath lateral masses. Lateral masses be scattered throughout the construction acting because the parallel diaphragm, toward the shear walls, similar to the force of the act. The center unconventionally placed by reference to structure shapes must perform torsion still as bending and direct shear. As a results of their heavy firmness as deep beams, react toward flexure with shear besides an overturn to resist the horizontal forces in these shear wall. But the torsion may additionally grow within the structure regular that includes of shear wall preparations once wind acts on the facades of the straight plane texture or else once wind doesn't be active throughout the centre of buildings mass. Shear walls are parallelogram in cross section, i.e. 1-D be far bigger than the alternative. Whereas rectangular cross-sectional be common, L- and formed sections too been used. Skinny walled void RC shafts about a lift core of formation additionally work like shear walls, and will be full benefit to oppose the seismic activity.

## 2. OBJECTIVES

Shear wall has become common in multi-storey structure to oppose lateral forces. It's terribly needed to work out useful, economical and perfect position of shear walls. 0nce shear walls be located in very useful locations in the structure; they'll be very economical in resist lateral hundreds originate from earthquakes or wind.

The major aim of the present study is to work out a perfect position of a shear walls by dynamical totally different positions of shear walls in multiple models. Totally different models are being created during this study and also the call of choosing a best model is predicated on the unstable parameters like level drift, level displacement. The first objective is to attain a configuration wherever the level displacement and level drift are minimum.

## 3. LITERATURE REVIEW

**3.1 Syed Abrar Hussaaini et al.,2018-** He has given a study on 3D model of G+15 storied structure for symmetrical structure Models and examined. The analysis of structure incorporates vastly imperative sector to control a mass, value, stiffness and deformation for multi-storey construction. The conclusion was created that most storey displacement of the building enhanced once shear walls

is provided on
edges. once shear wall were provided on edge construction drift is enhanced. Building with shear wall established to be the higher different technique for RC frame building in earthquake space.

**3.2 Donthireddy Raja Shekar Reddy et al.,2019**- He has given a study of dissimilar shape for shear walls in very tall construction. The multistorey structure with G+14 storey's be analyze for story displacement, storey drift and base shear by ETABS software. To analyse a structure for seismic load by all Zones (Zone-V, IV, III and II) is considered. Conclusion created was, an effort to try and made to the learn of seismic behaviour for the structure by shear wall for 4 completely unusual shapes altogether zone examination. The base shear, story drift and story displacement are obtain & relative study values of those outcome of every shape of shear wall has been given and additionally similarity shape of shear wall up completely dissimilar zone like zone-II, III, IV, V has been executed.

**3.3 Wadmare Aniket et al.,2018-** In this they studied of G+10 storey with a 3 different types of structures are taken into account, from that one is frame structure with out shear wall and for left over other 2 structure with shear wall is taken into description at corners and at center. After the completion of analysis of these 3structures, the obtained results are compared with relevancy natural period, story shear and story displacement of all 3 models so by examination the results best possible arrangement of shear wall is decided. last that the bottom shear and construction shear for building with shear wall on corner be bigger than the opposite 2 structure, natural period and construction displacement for arrangement with shear wall at corner is a smaller amount and finally construction with core wall at corner offers higher outcome as just of other than different 2 structures.

**3.4 A Ravi Kumar et al.,2017-** For this model, they thought-about G+9 with 40m height and results are considered & study for a useful position of shear wall. the look they created is confirmed for that very same construction using ETABS package. By conclusion that planning of building shear wall structure if we have a tendency to use ETABS package then it examine the building simply and provides the quick results with correct information. From the shear wall method of a structure in a very tiny space they will raise the floor height and rising a speed of livelihood. Therefore for the developing country like a India core wall creation is taken into account to be a support for manufacturing.

**3.5 C.Jasmine et al.,2018-** Construction area from shear walls measure high in strength, they majorly resist the seismal force, wind force and even is depend on soils of weak bases by adopting numerous ground improvement techniques. Not only the quickness in construction method however the strength parameters and effectiveness up-to-date horizontal masses is incredibly high. They conclude that the results and comparisons square measure drawn Placement of shear wall within middle greatly resisted by lateral masses aside from shear wall. All the kinds of buildings whose length is similar in X and Y path, inserting the shear wall would offer the simplest immune to lateral masses.

## 4. METHODOLOGY

The methodology adopted within the study for this research work. A 20 storey framed building is taken for the analysis purpose and Response spectrum method of dynamic analysis are carried out by taking into consideration of the seismic zones III, IV and V by using Etabs 2018.1.1 software to carry out the analysis. 6 models with dissimilar position of the shear wall is considered.

The present study was carried out to check parameters like

- Time period
- Frequency
- Stiffness
- Displacement,
- Drift to realize the ideal position and
- Configuration of shear walls in the structure.

**5. Model Description**

| | |
|---|---|
| **Geometric Properties** | |
| Plan size | 17m x 11 m |
| No. of stories | 20 |
| Height of each storey | 3m |
| Column size upto 10 storey | 500mm x 500mm |
| Column size above 10 storey | 400mm x 400mm |
| Beam size upto 10 storey | 230mm x 500mm |
| Beam size above 10 storey | 230mm x 400mm |
| Slab thickness | 150mm |
| **Material Properties** | |
| Grade of Concrete | |
| For columns | M40 |
| For beams | M30 |
| For Slabs | M25 |
| Grade of Steel | |
| Longitudinal reinforcement | Fe500 |
| Confinement reinforcement (Stirrups/Ties) | Fe415 |
| Density of concrete | 25 $kN/m^3$ |
| **Loading Details** | |

| | |
|---|---|
| Live load | 3 kN/m$^2$ |
| Floor finish | 1 kN/m$^2$ |
| **Earthquake Load Details** | |
| Importance Factor (I) | 1.5 |
| Response reduction factor (R) | 5 |
| Soil type | Medium (Type - II) |
| Seismic zone | V, IV and III |
| Seismic zone factor | 0.36, 0.24, 0.16 |
| % of live load considered | 25 |
| Time period ($T_a$) = 0.075 $h^{0.75}$ | 1.6168 sec |
| **Analysis Methods used** | Response spectrum method (dynamic analysis). |
| **Software used for the Analysis** | Etabs 2018 |

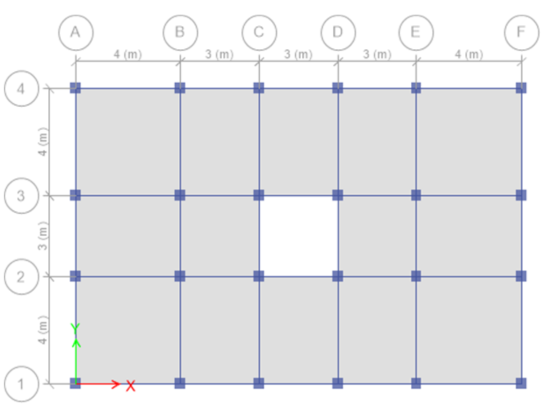


**Fig 5.1: Plan view of the Bare Framed Structure**

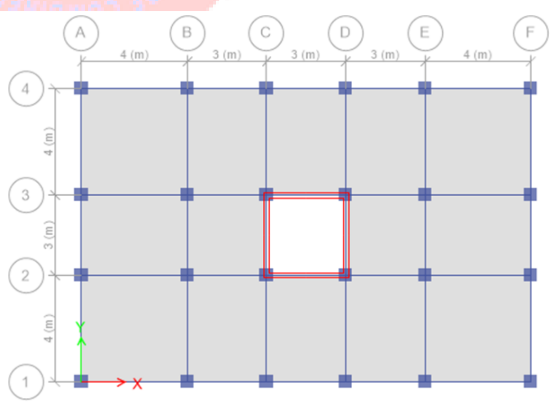


**Fig 5.2: Plan view of the structure with Shear Wall at Center**

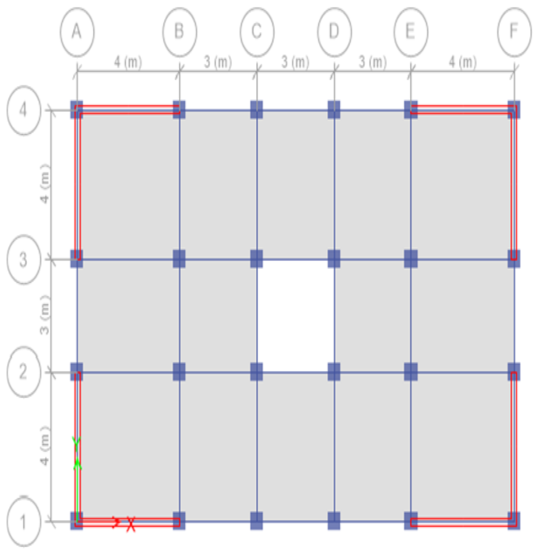


**Fig 5.3: Plan view of the Structure with Shear wall at Corners**

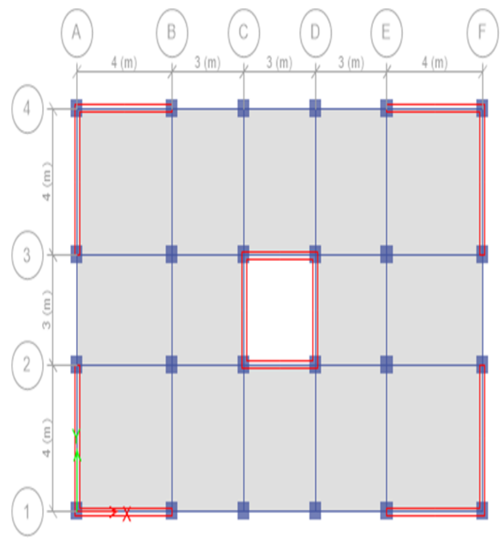


**Fig 5.4: Plan view of the Structure with Shear Wall at Center and corners**

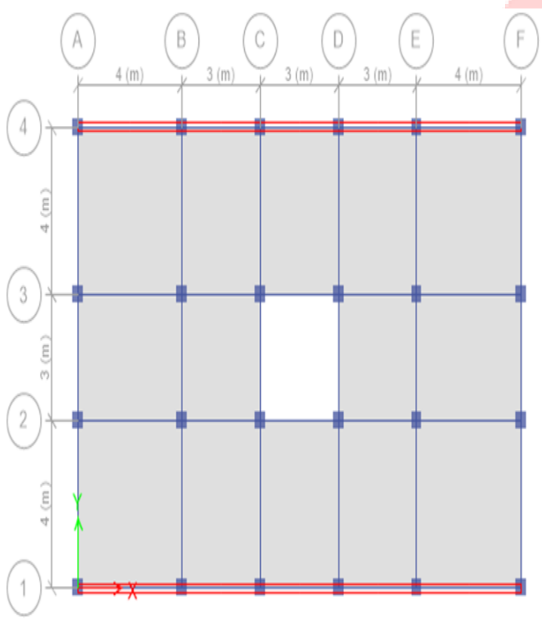


**Fig 5.5: Plan view of the Structure with Shear Wall at X-Direction**

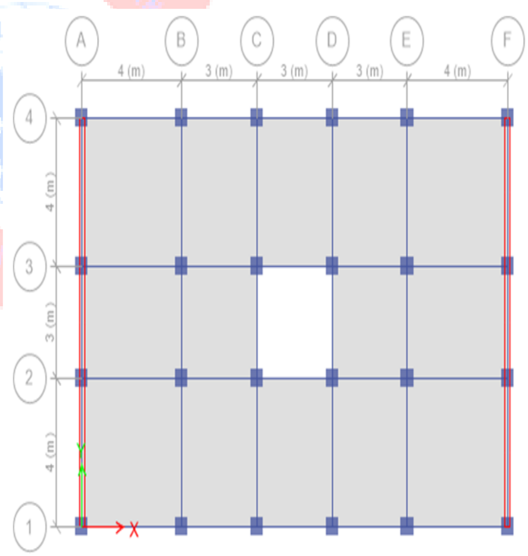


**Fig 5.6: Plan view of the Structure with Shear Wall at Y-Direction**

## 6. RESULTS & DISCUSSION

### Time Periods

| Table 6.1: Time Periods(sec) | | | | | | |
|---|---|---|---|---|---|---|
| **Mode** | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** |
| 1 | 1.99464 | 1.664989 | 1.242547 | 1.18987 | 2.088793 | 1.884843 |
| 2 | 1.812053 | 1.486051 | 1.217484 | 1.156125 | 0.767825 | 1.021761 |
| 3 | 1.604419 | 1.070149 | 0.752676 | 0.677741 | 0.666909 | 0.771837 |
| 4 | 0.716965 | 0.477407 | 0.333166 | 0.306327 | 0.647897 | 0.704547 |
| 5 | 0.669737 | 0.450431 | 0.325074 | 0.305969 | 0.430194 | 0.397293 |
| 6 | 0.615974 | 0.388074 | 0.200463 | 0.189279 | 0.304968 | 0.282245 |
| 7 | 0.395833 | 0.224163 | 0.146841 | 0.134257 | 0.229825 | 0.218137 |
| 8 | 0.374342 | 0.219049 | 0.145108 | 0.13396 | 0.18102 | 0.214589 |
| 9 | 0.348288 | 0.212243 | 0.089152 | 0.086843 | 0.169887 | 0.174545 |
| 10 | 0.280503 | 0.162759 | 0.08635 | 0.078511 | 0.149557 | 0.1694 |
| 11 | 0.265928 | 0.13061 | 0.086066 | 0.078449 | 0.147113 | 0.141208 |
| 12 | 0.247472 | 0.128149 | 0.058728 | 0.05315 | 0.123868 | 0.117325 |

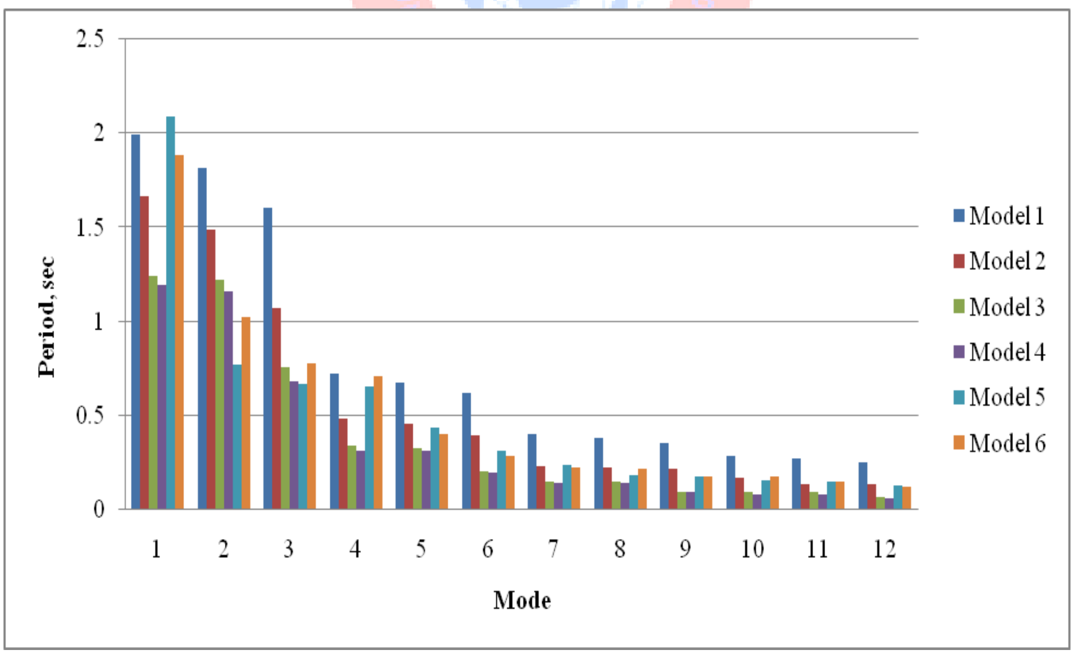


**Fig 6.1: Time Periods**

From the Table it can be observed that the Time Periods are longer for a bare frame structure and shear wall when compared to others models with shear wall and there is a much difference between other models. The Time period is a smaller amount for model with shear wall at all corners and center of the structure.

**Frequencies**

**Table 6.2: Frequency(cyc/sec)**

| Mode | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| 1 | 0.501344 | 0.600605 | 0.804799 | 0.840428 | 0.478745 | 0.530548 |
| 2 | 0.55186 | 0.672924 | 0.821366 | 0.864959 | 1.30238 | 0.978703 |
| 3 | 0.623279 | 0.934449 | 1.328593 | 1.475489 | 1.499456 | 1.29561 |
| 4 | 1.394769 | 2.09465 | 3.00151 | 3.264481 | 1.543455 | 1.419352 |
| 5 | 1.493124 | 2.220094 | 3.076218 | 3.2683 | 2.324532 | 2.517031 |
| 6 | 1.623445 | 2.576829 | 4.988445 | 5.283195 | 3.279028 | 3.543022 |
| 7 | 2.526316 | 4.461033 | 6.810099 | 7.448424 | 4.351139 | 4.584267 |
| 8 | 2.671358 | 4.565186 | 6.891405 | 7.464921 | 5.524248 | 4.660071 |
| 9 | 2.87119 | 4.711584 | 11.21686 | 11.51498 | 5.886263 | 5.729173 |
| 10 | 3.565029 | 6.144041 | 11.58078 | 12.7371 | 6.686422 | 5.903194 |
| 11 | 3.760423 | 7.656362 | 11.61895 | 12.74713 | 6.797478 | 7.081776 |
| 12 | 4.040866 | 7.803437 | 17.02763 | 18.81451 | 8.073125 | 8.52332 |

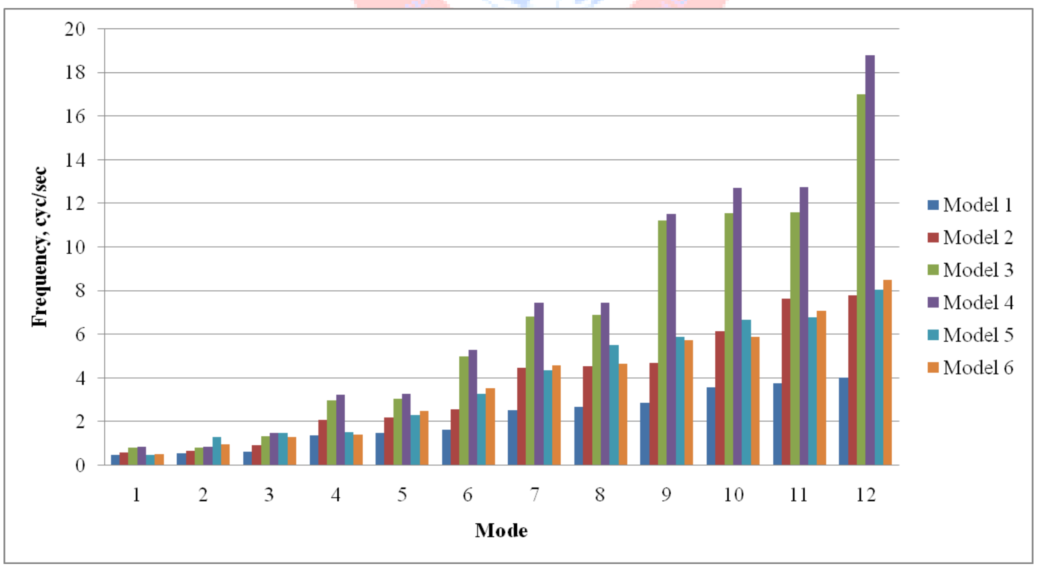


**Fig 6.2: Frequencies**

From the Table it can be observed that the Frequencies be lower for bare frame model as compared to other models and there is a difference between shear walls at other location. The highest frequency value for model with shear wall at all corners and centre of the structure.

**Comparison of Models of Stiffness**

| Table 6.3: Stiffness (kN/m), Zone V, IV and III | | | | | | |
|---|---|---|---|---|---|---|
| Dynamic Analysis | | | | | | |
| Load Case : RS-X | | | | | | |
| **Storey** | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** |
| 20 | 125374.37 | 101776.78 | 128807.95 | 150454.365 | 292163.781 | 165205.18 |
| 19 | 162806.63 | 182345.07 | 248062.108 | 297786.46 | 611165.772 | 202301.33 |
| 18 | 175073.58 | 235065.00 | 333306.70 | 405513.82 | 889751.993 | 209228.83 |
| 17 | 181007.30 | 268838.41 | 393412.39 | 482721.46 | 1133570.51 | 211811.16 |
| 16 | 184593.99 | 291604.72 | 438054.89 | 540514.01 | 1349829.00 | 213104.63 |
| 15 | 187158.84 | 308491.43 | 474384.72 | 588165.3 | 1546551.96 | 214088.28 |
| 14 | 189288.27 | 323158.63 | 507497.98 | 632225.528 | 1732450.02 | 214974.71 |
| 13 | 191561.12 | 338710.19 | 541751.26 | 677358.852 | 1916850.67 | 216465.97 |
| 12 | 196558.95 | 358120.08 | 581348.871 | 727870.648 | 2109839.49 | 221766.94 |
| 11 | 225749.89 | 386126.74 | 631643.361 | 789957.337 | 2323141.02 | 256397.03 |
| 10 | 337178.85 | 435523.39 | 702478.50 | 872054.57 | 2573984.15 | 376538.67 |
| 9 | 350923.73 | 470628.83 | 769497.585 | 954465.032 | 2843631.71 | 391146.42 |
| 8 | 359668.06 | 513537.13 | 851405.54 | 1053325.38 | 3166268.17 | 396555.37 |
| 7 | 367743.12 | 562203.35 | 950532.57 | 1172833.23 | 3559548.87 | 400694.78 |
| 6 | 375527.45 | 620732.86 | 1075510.56 | 1324689.48 | 4056581.30 | 404450.65 |
| 5 | 383172.84 | 696352.1 | 1242146.79 | 1529697.04 | 4714499.12 | 408337.95 |
| 4 | 391236.01 | 804363.37 | 1483545.60 | 1829641.38 | 5644243.49 | 412895.03 |
| 3 | 402889.61 | 981643.76 | 1879492.51 | 2325886.98 | 7093228.43 | 422012.29 |
| 2 | 437845.22 | 1340180.6 | 2682068.71 | 3347054.39 | 9723155.05 | 457598.40 |
| 1 | 728636.75 | 2650468.4 | 5574492.35 | 7094123.31 | 16770227.8 | 770716.43 |
| 0(Base) | 0 | 0 | 0 | 0 | 0 | 0 |

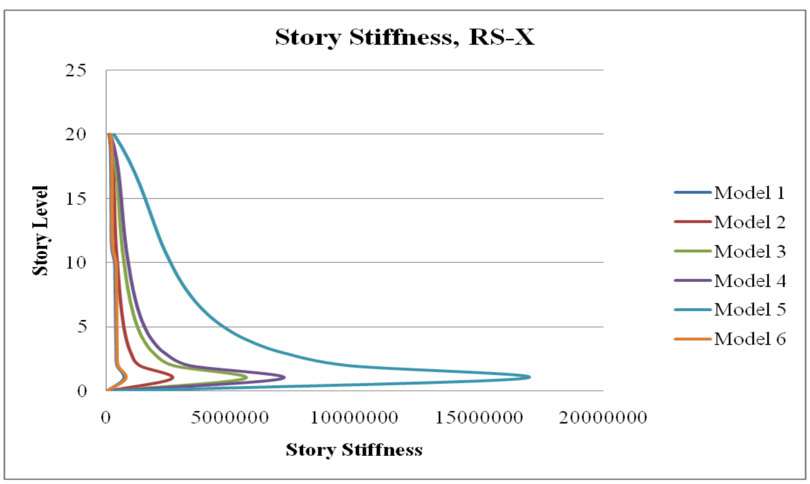


**Fig 6.3: Stiffness, RS-X**

It can be observed that for all the Zones that is Zone – V, IV and III, the Stiffness values of

Dynamic analysis (Response spectrum method) are more for model which is having shear wall at X-direction when compared to other models with shear wall at different locations and bare frame structure and there is a slight different between other models having shear wall at different locations of shear wall

**Displacement**

| Table 6.4: Displacement (mm), Zone V | | | | | | |
|---|---|---|---|---|---|---|
| Dynamic Analysis | | | | | | |
| Load Case : RS-X | | | | | | |
| Storey | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| 20 | 60.624 | 43.877 | 33.05 | 29.289 | 10.52 | 65.04 |
| 19 | 59.348 | 41.781 | 31.218 | 27.678 | 9.862 | 64.053 |
| 18 | 57.551 | 39.593 | 29.344 | 26.031 | 9.195 | 62.479 |
| 17 | 55.251 | 37.308 | 27.428 | 24.344 | 8.523 | 60.317 |
| 16 | 52.511 | 34.919 | 25.467 | 22.616 | 7.846 | 57.627 |
| 15 | 49.395 | 32.434 | 23.466 | 20.851 | 7.168 | 54.473 |
| 14 | 45.964 | 29.867 | 21.435 | 19.055 | 6.493 | 50.916 |
| 13 | 42.267 | 27.242 | 19.388 | 17.242 | 5.826 | 47.011 |
| 12 | 38.355 | 24.586 | 17.341 | 15.427 | 5.17 | 42.815 |
| 11 | 34.316 | 21.933 | 15.316 | 13.627 | 4.531 | 38.445 |
| 10 | 30.6 | 19.331 | 13.342 | 11.869 | 3.915 | 34.432 |
| 9 | 27.916 | 16.877 | 11.457 | 10.179 | 3.327 | 31.481 |
| 8 | 25.125 | 14.447 | 9.628 | 8.541 | 2.767 | 28.41 |
| 7 | 22.18 | 12.061 | 7.874 | 6.97 | 2.24 | 25.144 |
| 6 | 19.076 | 9.73 | 6.211 | 5.484 | 1.752 | 21.68 |
| 5 | 15.822 | 7.485 | 4.663 | 4.104 | 1.31 | 18.023 |
| 4 | 12.433 | 5.373 | 3.261 | 2.857 | 0.918 | 14.189 |
| 3 | 8.935 | 3.461 | 2.042 | 1.778 | 0.584 | 10.207 |
| 2 | 5.395 | 1.838 | 1.051 | 0.907 | 0.314 | 6.154 |
| 1 | 2.042 | 0.622 | 0.343 | 0.292 | 0.116 | 2.31 |
| 0(Base) | 0 | 0 | 0 | 0 | 0 | 0 |

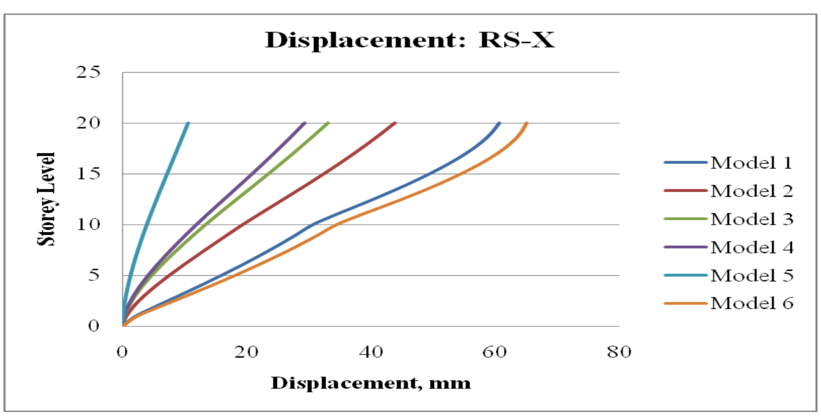


**Fig 6.4: Displacement: RS-X, Zone – V**

| Table 6.5: Displacement(mm), Zone IV | | | | | | |
|---|---|---|---|---|---|---|
| Dynamic Analysis | | | | | | |
| Load Case : RS-X | | | | | | |
| Storey | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| 20 | 40.435 | 29.232 | 22.039 | 19.53 | 7.012 | 43.342 |
| 19 | 39.584 | 27.836 | 20.817 | 18.456 | 6.573 | 42.684 |
| 18 | 38.385 | 26.378 | 19.568 | 17.358 | 6.129 | 41.636 |
| 17 | 36.851 | 24.856 | 18.29 | 16.233 | 5.681 | 40.195 |
| 16 | 35.023 | 23.264 | 16.982 | 15.081 | 5.23 | 38.402 |
| 15 | 32.946 | 21.609 | 15.648 | 13.903 | 4.778 | 36.3 |
| 14 | 30.657 | 19.899 | 14.294 | 12.706 | 4.328 | 33.93 |
| 13 | 28.191 | 18.15 | 12.928 | 11.497 | 3.883 | 31.328 |
| 12 | 25.582 | 16.38 | 11.564 | 10.287 | 3.446 | 28.532 |
| 11 | 22.888 | 14.613 | 10.213 | 9.087 | 3.02 | 25.619 |
| 10 | 20.41 | 12.879 | 8.897 | 7.914 | 2.609 | 22.945 |
| 9 | 18.62 | 11.244 | 7.64 | 6.787 | 2.218 | 20.979 |
| 8 | 16.758 | 9.625 | 6.42 | 5.695 | 1.844 | 18.932 |
| 7 | 14.793 | 8.035 | 5.251 | 4.648 | 1.493 | 16.756 |
| 6 | 12.724 | 6.482 | 4.142 | 3.657 | 1.168 | 14.448 |
| 5 | 10.553 | 4.987 | 3.11 | 2.736 | 0.873 | 12.011 |
| 4 | 8.292 | 3.58 | 2.175 | 1.905 | 0.612 | 9.455 |
| 3 | 5.96 | 2.306 | 1.362 | 1.186 | 0.389 | 6.802 |
| 2 | 3.599 | 1.225 | 0.701 | 0.605 | 0.209 | 4.101 |
| 1 | 1.362 | 0.414 | 0.229 | 0.195 | 0.077 | 1.54 |
| 0(Base) | 0 | 0 | 0 | 0 | 0 | 0 |

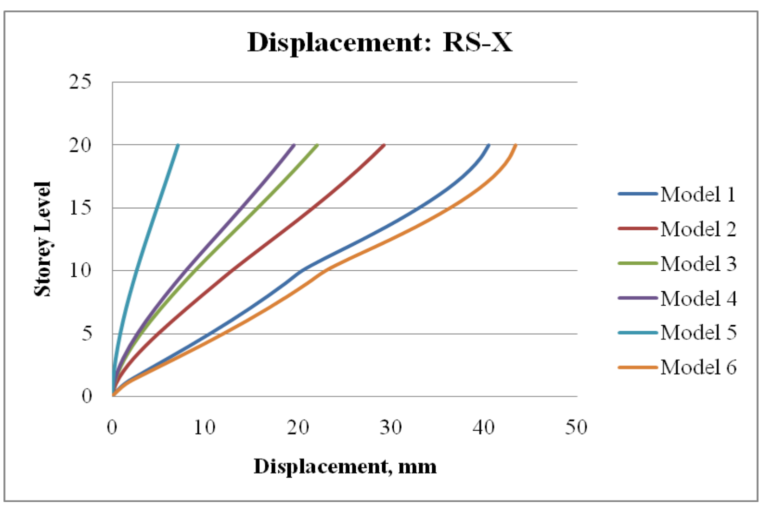


Fig 6.5: Displacement: RS-X, Zone – IV

| Table 6.6:Displacement(mm), Zone III | | | | | | |
|---|---|---|---|---|---|---|
| Dynamic Analysis | | | | | | |
| Load Case : RS-X | | | | | | |
| **Storey** | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** |
| 20 | 26.922 | 19.488 | 14.687 | 13.016 | 4.677 | 28.895 |
| 19 | 26.356 | 18.558 | 13.873 | 12.3 | 4.384 | 28.456 |
| 18 | 25.557 | 17.586 | 13.04 | 11.568 | 4.088 | 27.757 |
| 17 | 24.536 | 16.571 | 12.189 | 10.819 | 3.789 | 26.797 |
| 16 | 23.319 | 15.51 | 11.317 | 10.051 | 3.488 | 25.602 |
| 15 | 21.936 | 14.406 | 10.428 | 9.266 | 3.187 | 24.2 |
| 14 | 20.412 | 13.266 | 9.526 | 8.468 | 2.887 | 22.62 |
| 13 | 18.77 | 12.1 | 8.616 | 7.662 | 2.59 | 20.885 |
| 12 | 17.033 | 10.92 | 7.706 | 6.856 | 2.298 | 19.021 |
| 11 | 15.239 | 9.742 | 6.806 | 6.056 | 2.014 | 17.08 |
| 10 | 13.589 | 8.586 | 5.929 | 5.275 | 1.74 | 15.297 |
| 9 | 12.397 | 7.496 | 5.091 | 4.523 | 1.479 | 13.986 |
| 8 | 11.158 | 6.417 | 4.279 | 3.795 | 1.23 | 12.621 |
| 7 | 9.85 | 5.357 | 3.499 | 3.097 | 0.996 | 11.171 |
| 6 | 8.472 | 4.322 | 2.76 | 2.437 | 0.779 | 9.632 |
| 5 | 7.026 | 3.325 | 2.072 | 1.824 | 0.582 | 8.007 |
| 4 | 5.521 | 2.387 | 1.449 | 1.27 | 0.408 | 6.304 |
| 3 | 3.968 | 1.537 | 0.907 | 0.79 | 0.26 | 4.535 |
| 2 | 2.396 | 0.816 | 0.467 | 0.403 | 0.14 | 2.734 |
| 1 | 0.907 | 0.276 | 0.153 | 0.13 | 0.051 | 1.026 |
| 0(Base) | 0 | 0 | 0 | 0 | 0 | 0 |

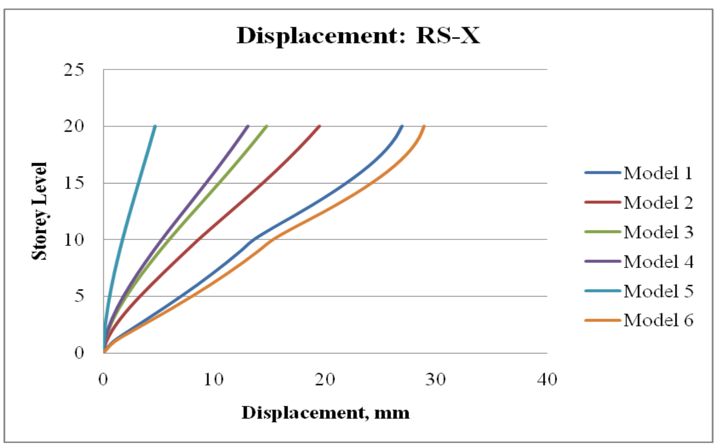


**Fig 6.6: Displacement: RS-X, Zone – III**

It can be observed that for all the Zones that is Zone V, IV and III, the Displacement values of Dynamic analysis (Response spectrum method) are more for model with Shear wall at Y-direction and bare frame structure and very least in shear wall at X-direction and there is a slight difference between other models.

**Drift**

| Table 6.7: Drift, Zone V | | | | | | |
|---|---|---|---|---|---|---|
| Dynamic Analysis | | | | | | |
| Load Case : RS-X | | | | | | |
| **Storey** | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** |
| 20 | 0.000498 | 0.000754 | 0.000631 | 0.000552 | 0.00022 | 0.00042 |
| 19 | 0.000739 | 0.000796 | 0.000648 | 0.000566 | 0.000223 | 0.000689 |
| 18 | 0.000959 | 0.000837 | 0.000665 | 0.000581 | 0.000225 | 0.000941 |
| 17 | 0.001141 | 0.000877 | 0.000682 | 0.000597 | 0.000227 | 0.001152 |
| 16 | 0.001288 | 0.000912 | 0.000696 | 0.000609 | 0.000227 | 0.001325 |
| 15 | 0.001404 | 0.000938 | 0.000705 | 0.000619 | 0.000226 | 0.001466 |
| 14 | 0.001494 | 0.000953 | 0.000708 | 0.000623 | 0.000224 | 0.001581 |
| 13 | 0.001558 | 0.000956 | 0.000705 | 0.000622 | 0.00022 | 0.001668 |
| 12 | 0.001584 | 0.000945 | 0.000695 | 0.000614 | 0.000214 | 0.001708 |
| 11 | 0.001429 | 0.000915 | 0.000674 | 0.000597 | 0.000206 | 0.001538 |
| 10 | 0.000996 | 0.000853 | 0.00064 | 0.000572 | 0.000197 | 0.001092 |
| 9 | 0.001006 | 0.000836 | 0.000619 | 0.000553 | 0.000187 | 0.001105 |
| 8 | 0.001037 | 0.000814 | 0.000591 | 0.000528 | 0.000176 | 0.001148 |
| 7 | 0.001073 | 0.000789 | 0.000559 | 0.000499 | 0.000163 | 0.001196 |
| 6 | 0.00111 | 0.000755 | 0.000519 | 0.000462 | 0.000148 | 0.001246 |
| 5 | 0.001144 | 0.000708 | 0.000469 | 0.000417 | 0.000131 | 0.001294 |
| 4 | 0.001173 | 0.00064 | 0.000407 | 0.00036 | 0.000112 | 0.001335 |
| 3 | 0.001183 | 0.000542 | 0.000331 | 0.000291 | 0.00009 | 0.001353 |
| 2 | 0.001118 | 0.000406 | 0.000236 | 0.000205 | 0.000066 | 0.001282 |
| 1 | 0.000681 | 0.000207 | 0.000114 | 0.000097 | 0.000039 | 0.00077 |
| 0(Base) | 0 | 0 | 0 | 0 | 0 | 0 |

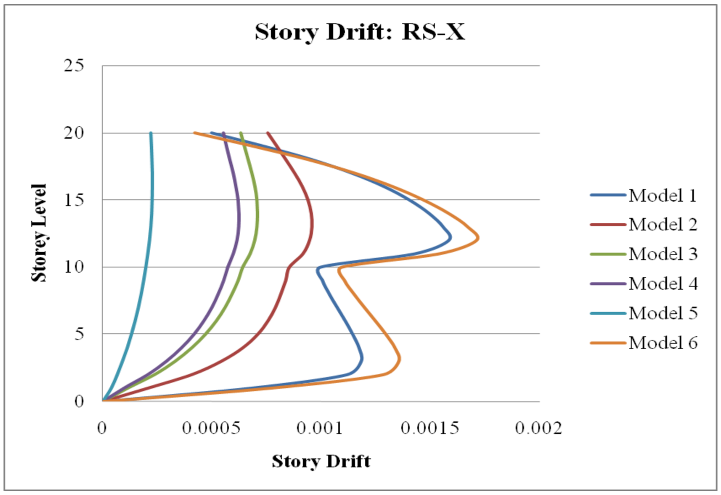


Fig 6.7: Drift: RS-X, Zone – V

| Table 6.8: Drift, Zone IV | | | | | | |
|---|---|---|---|---|---|---|
| Dynamic Analysis | | | | | | |
| Load Case : RS-X | | | | | | |
| Storey | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| 20 | 0.000332 | 0.000502 | 0.000421 | 0.000368 | 0.000147 | 0.00028 |
| 19 | 0.000493 | 0.00053 | 0.000432 | 0.000378 | 0.000149 | 0.000459 |
| 18 | 0.00064 | 0.000557 | 0.000444 | 0.000388 | 0.00015 | 0.000627 |
| 17 | 0.000761 | 0.000584 | 0.000455 | 0.000398 | 0.000151 | 0.000767 |
| 16 | 0.000859 | 0.000607 | 0.000464 | 0.000406 | 0.000151 | 0.000883 |
| 15 | 0.000936 | 0.000625 | 0.00047 | 0.000413 | 0.000151 | 0.000977 |
| 14 | 0.000996 | 0.000635 | 0.000472 | 0.000416 | 0.000149 | 0.001053 |
| 13 | 0.001039 | 0.000637 | 0.00047 | 0.000415 | 0.000146 | 0.001112 |
| 12 | 0.001056 | 0.000629 | 0.000463 | 0.000409 | 0.000143 | 0.001138 |
| 11 | 0.000953 | 0.00061 | 0.000449 | 0.000398 | 0.000137 | 0.001025 |
| 10 | 0.000664 | 0.000568 | 0.000427 | 0.000381 | 0.000131 | 0.000728 |
| 9 | 0.000671 | 0.000557 | 0.000412 | 0.000369 | 0.000125 | 0.000736 |
| 8 | 0.000692 | 0.000542 | 0.000394 | 0.000352 | 0.000117 | 0.000765 |
| 7 | 0.000716 | 0.000525 | 0.000373 | 0.000333 | 0.000109 | 0.000797 |
| 6 | 0.00074 | 0.000503 | 0.000346 | 0.000308 | 0.000099 | 0.00083 |
| 5 | 0.000763 | 0.000472 | 0.000313 | 0.000278 | 0.000087 | 0.000862 |
| 4 | 0.000782 | 0.000426 | 0.000272 | 0.00024 | 0.000074 | 0.00089 |
| 3 | 0.000789 | 0.000361 | 0.000221 | 0.000194 | 0.00006 | 0.000902 |
| 2 | 0.000746 | 0.00027 | 0.000157 | 0.000137 | 0.000044 | 0.000854 |
| 1 | 0.000454 | 0.000138 | 0.000076 | 0.000065 | 0.000026 | 0.000513 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0(Base) | 0 | 0 | 0 | 0 | 0 | 0 |

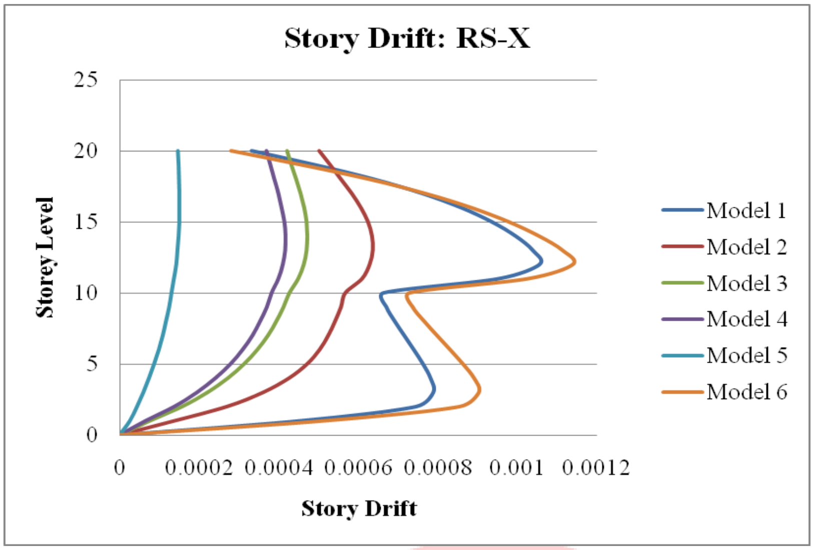


**Fig 6.8: Drift: RS-X, Zone – IV**

| Table 6.9: Drift, Zone III | | | | | | |
|---|---|---|---|---|---|---|
| **Dynamic Analysis** | | | | | | |
| **Load Case : RS-X** | | | | | | |
| **Storey** | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** |
| 20 | 0.000221 | 0.000335 | 0.00028 | 0.000245 | 0.000098 | 0.000187 |
| 19 | 0.000328 | 0.000353 | 0.000288 | 0.000252 | 0.000099 | 0.000306 |
| 18 | 0.000426 | 0.000372 | 0.000296 | 0.000258 | 0.0001 | 0.000418 |
| 17 | 0.000507 | 0.00039 | 0.000303 | 0.000265 | 0.000101 | 0.000512 |
| 16 | 0.000572 | 0.000405 | 0.000309 | 0.000271 | 0.000101 | 0.000588 |
| 15 | 0.000623 | 0.000416 | 0.000313 | 0.000275 | 0.000101 | 0.000651 |
| 14 | 0.000663 | 0.000423 | 0.000315 | 0.000277 | 0.000099 | 0.000702 |
| 13 | 0.000692 | 0.000424 | 0.000313 | 0.000276 | 0.000098 | 0.000741 |
| 12 | 0.000703 | 0.00042 | 0.000309 | 0.000273 | 0.000095 | 0.000759 |
| 11 | 0.000635 | 0.000406 | 0.000299 | 0.000265 | 0.000092 | 0.000683 |
| 10 | 0.000442 | 0.000379 | 0.000284 | 0.000254 | 0.000087 | 0.000485 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | 0.000447 | 0.000371 | 0.000275 | 0.000246 | 0.000083 | 0.000491 |
| 8 | 0.000461 | 0.000361 | 0.000263 | 0.000235 | 0.000078 | 0.00051 |
| 7 | 0.000476 | 0.00035 | 0.000248 | 0.000222 | 0.000072 | 0.000531 |
| 6 | 0.000493 | 0.000336 | 0.000231 | 0.000205 | 0.000066 | 0.000554 |
| 5 | 0.000508 | 0.000314 | 0.000208 | 0.000185 | 0.000058 | 0.000575 |
| 4 | 0.000521 | 0.000284 | 0.000181 | 0.00016 | 0.00005 | 0.000593 |
| 3 | 0.000525 | 0.000241 | 0.000147 | 0.000129 | 0.00004 | 0.000601 |
| 2 | 0.000497 | 0.00018 | 0.000105 | 0.000091 | 0.000029 | 0.000569 |
| 1 | 0.000302 | 0.000092 | 0.000051 | 0.000043 | 0.000017 | 0.000342 |
| 0(Base) | 0 | 0 | 0 | 0 | 0 | 0 |

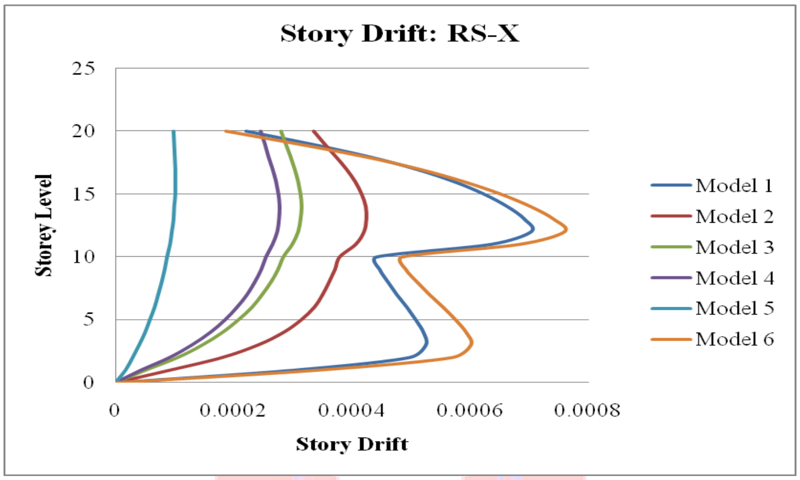


**Fig 6.8: Drift: RS-X, Zone – III**

It can be observed that for all the Zones that is Zone – V, IV and III, the Drift values of Dynamic analysis (Response spectrum method) are more in model having shear wall at center when compared to other model and very least in model having shear at X-direction and there is a slight difference between other models.

## 8. CONCLUSION

In the present analysis it is know the outcome of shear wall on the structure with different location and different earthquake zones using ETABS

1. The shear wall in structure at corners and at the center the base shear is greater in zone-V when compared to dissimilar locations of shear wall. Therefore shear wall is better to give at corners.
2. The Stiffness is more within model 5 ie Shear Wall placed on X-direction as compared to other models and slight difference between other location of shear wall.

3. For Zone-III, IV and V the Story Displacement values of Response spectrum analysis are more for model 6 ie Shear wall at Y-direction as compared to other models.
4. For Zone-III, IV and V the Story Drift values of Response spectrum analysis are more for model 2 ie shear wall at center as compared to other model.

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