Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 12 Issue 09, September-2023

# Comparative Evaluation for RCC Structures Altered Heights by Undertaking Linear Dynamic Analysis

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***Abstract*** : Being fascinated with height has persisted throughout human history. We've always tried to strive for the stars symbolically. From the old pyramids to the contemporary skyscraper, a civilization's riches and power have frequently been displayed via magnificent and gigantic constructions. The skyscraper is today's representation of economic might and leadership. Mankind's competitiveness to claim ownership of the highest structure in the globe has been clearly seen. Numerous structural and aesthetically unique shapes have been made possible by the most current developments in finite element technology and structural analysis and design software. Increased dependence on computer analysis, however, is not the answer to the issues that the field will face in the future. The factors that will transform the way buildings are planned and constructed are a fundamental knowledge of structural behavior and the use of computational technologies. The key objectives of the current work are to use the ETABS version 18 software to perform reaction spectrum analysis (RSA) for G+4, G+9, and G+15 story, 3D RC framed buildings and to investigate the impact of various heights in multi-story constructions and to study various types of reactions, including roof displacement, time, storey shears, and building overturning The models are analysed using both Equivalent static analysis & Response spectrum analysis techniques using ETABS v18 software. It is observed that the storey displacements, base shear and natural time periods increases with increase in the height of building for both equivalent static and response spectrum analysis. The results obtained from manual calculations were similar to the results obtained from software.

**Key Words: Linear Seismic Analysis, Static Analysis, Response Spectrum analysis, ETABS.**

## 1. INTRODUCTION

Mankind has always had a fascination for height and throughout our history. We have constantly sought to metaphorically reach for the stars. From the ancient pyramids to today’s modern skyscraper, a civilization’s power and wealth has been repeatedly expressed through spectacular and monumental structures. Today, the symbol of economicpower and leadership is the skyscraper. There has been a demonstrated competitiveness that exists in mankind to proclaim to have the tallest building in the world.This undying quest for height has laid out incredible opportunities for the building profession. From the early moment frames to today’s ultra-efficient mega-braced structures, the structural engineering profession has come a long way. The recent development of structural analysis and design software coupled with advances in the finiteelement method has allowed the creation of many structural and architecturally innovative forms. However, increased reliance on computer analysis is not the solution to the challenges that lie ahead in the profession. The basic understanding of structural behaviorwhile leveraging on computing tools are the elements that will change the way structures are designed and built. Earthquake is the most disastrous and unpredictable natural phenomenon which causes huge destruction to human lives as well as infrastructure. Seismic forces generated duringearthquake leads to severe damage to structural elements and sometimes structural failure.Therefore, analysis and design of the buildings considering the effect of lateral forces is a very essential aspect. The loads acting on a structure are mainly the vertical and lateral loads. The vertical loads mainly consist of dead load and the imposed loads and the behavior of the structure whensubjected to various vertical loads are the same. The lateral loads mainly consist of seismicforces, blast load, wind load, mooring load, tsunami etc., amongst which the seismic forceand the wind force are the common ones. The application of these forces and the behavior of the structure vary.

Seismic response spectrum analysis is the most popular tool in the seismic analysis of structures. Linear dynamic analysis methods are commonly associated with earthquakedesign and are based on procedures that employ the idea of modal superposition.As tall buildings frequently exhibit considerable higher mode effects and the impacts of torsion are large, linear dynamic analysis is typically used instead of linear static analysisfor seismic design of tall buildings, even in low seismicity areas.Major methods involved in Seismic analysis:

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International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 12 Issue 09, September-2023

- Linear Static Analysis – Equivalent Static method
- Linear Dynamic Analysis – Response Spectrum Method & Time HistoryAnalysis
- Non-Linear Static Analysis – Push Over Analysis
- Non-Linear Dynamic Analysis – Time History Method

### *1.1.* Objectives of study

The major objectives of the present work are:

- To carry out Equivalent static analysis & Response spectrum analysis (RSA) forG+4, G+9 &G+15 storey, 3D RC framed building using ETABS version 18 software.
- To study the effect of different heights in multi storied structures.
- To study various responses such as Roof displacement, Time period, Storey Shears, Overturning moments of buildings.
- To find the difference between the results obtained from manual calculation to the ones obtained from ETABS.

## 2.0. MODELING

The structural models consists of Five, Ten and Fifteen storey's (G+4, G+9 & G+14) with plan dimensions of 30 m X 30 m which are intended to serve commercial office purposes.The floor diaphragms are assumed to be rigid.Preliminary sizes of structural components are calculated for gravity loads only.Seismic loads are considered to be acting in the horizontal direction along one of the positive principal directions and not along the vertical direction.Considering the horizontal ground motion for Linear Dynamic Analysis i.e., Response Spectrum For structural elements, for columns, beams and slabs Fe500 grade steel and M25 grade Concrete is used.The height of typical floor height was considered as 3.60m.The Fig 1 represent the plan in Ground and typical floor plan of the building. The models considered were:

- MODEL1 - G+4 Building
- MODEL2 - G+9 Building &
- MODEL3 - G+14 Building

All the models are provided with Beam 600 x 300mm size and Column 600 x600mm size.


Fig.1: Ground Floor and Typical Floor Plan

### 2.1.PREMILINARY DATA

2.1.1DEAD LOAD

Dead load was taken as per IS 875 (Part I)-1987 At any floor level

Assuming thickness of Slab = 125 mm

Load from Concrete = 3.125 Kn/m2

Floor finishes = 1.5 KN/ m2

Total = 4.625 KN/m2

2.1.2. LIVE LOAD

International Journal of Engineering Research & Technology (IJERT)
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Live load was taken as per IS : 875 (Part II)-1987
Live load was found to be 4.00 KN/m2 for Office Buildings at all typical floor levels.
Live load was found to be 2.00 KN/m2 for Office Buildings at terrace floor level.

2.1.3.LATERAL LOAD CALCULATION

For the analysis purpose, these structures are assumed to be located in Zone III (Zone factor-0.16)on site with medium soil and *Sa/g* value taken from the figure 2A &2B of IS 1893-2016 i.e., Response spectra for and soil sites for 5% damping for equivalent and response spectrum analysis respectively. These structures are taken as commercial buildings and hence importance factor is taken as 1.2 and the frames are proposed to have special RC moment resisting frames(SMRF) and hence the Reduction factor is taken as 5.

2.1.4.SEISMIC LOAD CALCULATIONS

*Table 4.1: Vertical Distribution of Base Shear for G+4 Building*

| Floor level | hi | Wi (kN) | $W_ih_i^2$ | Qi | Vj |
|---|---|---|---|---|---|
| G floor | 3.6 | 12855.9 | 166612.7 | 63.323 | 2831.33 |
| 1st floor | 7.2 | 12855.9 | 666450.8 | 253.2919 | 2768.01 |
| 2nd floor | 10.8 | 12855.9 | 1499514.5 | 569.9068 | 2514.98 |
| 3rd floor | 14.4 | 12855.9 | 2665803.5 | 931.9059 | 1945.07 |
| 4th floor | 18 | 7567.87 | 2451989.8 | 1013.1677 | 1013.16 |
| | | | 7450371.5 | | |

*Table 4.2: Vertical Distribution of Base Shear for G+9 Building*

| Floor level | hi | Wi | $W_ih_i^2$ | Qi | Vj |
|---|---|---|---|---|---|
| G floor | 3.6 | 12855.9 | 166612.7 | 15.84 | 5446.4 |
| 1st floor | 7.2 | 12855.9 | 666450.893 | 63.36 | 5430.6 |
| 2nd floor | 10.8 | 12855.9 | 1499514.51 | 142.55 | 5367.2 |
| 3rd floor | 14.4 | 12855.9 | 2665803.57 | 253.42 | 5224.7 |
| 4th floor | 18 | 12855.9 | 4165318.1 | 395.97 | 4971.2 |
| 5th floor | 21.6 | 12855.9 | 5998058.04 | 570.19 | 4575.3 |
| 6th floor | 25.2 | 12855.9 | 8164023.44 | 776.10 | 4005.1 |
| 7th floor | 28.8 | 12855.9 | 10663214.3 | 1013.69 | 3229.0 |
| 8th floor | 32.4 | 12855.9 | 13495630.6 | 1282.95 | 2215.3 |
| 9th floor | 36 | 7567.87 | 9807959.52 | 932.38 | 932.3 |
| | | | 57292585.70 | | |

*Table 4.2: Vertical Distribution of Base Shear for G+14 Building*

| Floor level | $h_i$ | Wi | $W_ih_i^2$ | **Qi** | Vj |
|---|---|---|---|---|---|
| G floor | 3.6 | 12855.9 | 166612.7 | 4.81 | 5521.2 |
| 1st floor | 7.2 | 12855.9 | 666450.8 | 19.25 | 5516.39 |
| 2nd floor | 10.8 | 12855.9 | 1499514.5 | 43.31 | 5497.14 |
| 3rd floor | 14.4 | 12855.9 | 2665803.5 | 76.99 | 5453.83 |
| 4th floor | 18 | 12855.9 | 4165318.0 | 120.29 | 5376.84 |
| 5th floor | 21.6 | 12855.9 | 5998058.04 | 173.22 | 5256.55 |
| 6th floor | 25.2 | 12855.9 | 8164023.4 | 235.77 | 5083.33 |
| 7th floor | 28.8 | 12855.9 | 10663214.3 | 307.95 | 4847.56 |
| 8th floor | 32.4 | 12855.9 | 13495630.6 | 389.75 | 4539.61 |
| 9th floor | 36 | 12855.92 | 16661272.3 | 481.17 | 4149.86 |
| 10th floor | 39.6 | 12855.92 | 20160139.5 | 582.22 | 3668.69 |
| 11th floor | 43.2 | 12855.92 | 23992232.1 | 692.88 | 3086.47 |
| 12th floor | 46.8 | 12855.92 | 28157550.2 | 813.18 | 2393.59 |
| 13th floor | 50.4 | 12855.92 | 32656093.7 | 943.09 | 1580.41 |
| 14th floor | 54 | 7567.87 | 22067908.9 | 637.32 | 637.32 |
| | | | 191179823 | | |

## 3. RESULTS FROM SEISMIC ANALYSIS:

Table6.1: Horizontal Storey Displacements(mm) of G+4 Building

| STOREY | EQX | EQY | RSX | RSY |
|---|---|---|---|---|
| STOREY1 | 3.146 | 3.833 | 2.797 | 3.39 |
| STOREY2 | 8.204 | 10.46 | 7.036 | 8.957 |
| STOREY3 | 13.09 | 17.00 | 10.78 | 14.03 |
| STOREY4 | 16.93 | 22.16 | 13.46 | 17.70 |
| STOREY5 | 19.18 | 25.28 | 14.90 | 19.77 |

Table 6.2: Storey Shears(KN) of G+4 Building

| STOREY | EQX | EQY | RSX | RSY |
|---|---|---|---|---|
| STOREY5 | 931.91 | 931.91 | 691.91 | 750.80 |
| STOREY4 | 1945.07 | 1945.07 | 1528.20 | 1564.96 |
| STOREY3 | 2514.98 | 2514.98 | 2147.80 | 2148.66 |
| STOREY2 | 2768.27 | 2768.27 | 2595.03 | 2585.17 |
| STOREY1 | 2831.60 | 2831.60 | 2831.59 | 2831.60 |

Table 6.3: Lateral Forces On Storeys(KN) of G+4 Building

| LATERAL FORCES ON STOREYS | | |
|---|---|---|
| STOREY | EQX | EQY |
| STOREY1 | 63.32 | 63.32 |
| STOREY2 | 253.29 | 253.29 |
| STOREY3 | 569.91 | 569.91 |
| STOREY4 | 1013.17 | 1013.17 |
| STOREY5 | 931.91 | 931.91 |

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TABLE 6.4: Mode Time period and frequencies of G+4 Building

| Mode | Period | Frequency |
|---|---|---|
| | (sec) | (cyc/sec) |
| 1 | 1.023 | 0.978 |
| 2 | 0.881 | 1.134 |
| 3 | 0.847 | 1.181 |
| 4 | 0.311 | 3.214 |
| 5 | 0.276 | 3.627 |
| 6 | 0.263 | 3.807 |

Table 6.5: Horizontal Storey Displacements(mm) of G+9 Building

| Storey Displacement | | | | |
|---|---|---|---|---|
| STOREY | EQX | EQY | RSX | RSY |
| STOREY1 | 6.17 | 7.52 | 5.53 | 6.75 |
| STOREY2 | 16.49 | 21.05 | 14.38 | 18.48 |
| STOREY3 | 27.60 | 35.90 | 23.28 | 30.57 |
| STOREY4 | 38.71 | 50.71 | 31.53 | 41.80 |
| STOREY5 | 49.45 | 64.90 | 38.96 | 51.84 |
| STOREY6 | 59.47 | 77.97 | 45.53 | 60.57 |
| STOREY7 | 68.39 | 89.42 | 51.19 | 67.89 |
| STOREY8 | 75.78 | 98.68 | 55.80 | 73.64 |
| STOREY9 | 81.23 | 105.25 | 59.18 | 77.65 |
| STOREY10 | 84.58 | 109.04 | 61.28 | 79.95 |

Table 6.6: Storey Shears(KN) of G+9 Building

| Storey Shear | | | | |
|---|---|---|---|---|
| STOREY | EQX | EQY | RSX | RSY |
| STOREY10 | 927.67 | 927.67 | 888.27 | 939.14 |
| STOREY9 | 2204.1 | 2204.14 | 2030.01 | 2070.63 |
| STOREY8 | 3212.7 | 3212.71 | 2787.49 | 2785.28 |
| STOREY7 | 3984.8 | 3984.89 | 3314.07 | 3305.83 |
| STOREY6 | 4552.2 | 4552.21 | 3699.36 | 3712.00 |
| STOREY5 | 4946.1 | 4946.19 | 4040.09 | 4074.14 |
| STOREY4 | 5198.3 | 5198.33 | 4411.09 | 4440.89 |
| STOREY3 | 5340.1 | 5340.16 | 4806.24 | 4811.31 |
| STOREY2 | 5403.1 | 5403.19 | 5198.34 | 5198.60 |
| STOREY1 | 5418.9 | 5418.95 | 5418.95 | 5418.95 |

Table 6.7: Lateral Forces On Storeys(KN) of G+9 Building

| Lateral Forces On Storeys | | |
|---|---|---|
| STOREY | EQX | EQY |
| STOREY10 | 927.67 | 927.67 |
| STOREY9 | 1276.4 | 1276.4 |
| STOREY8 | 1008.5 | 1008.5 |
| STOREY7 | 772.18 | 772.18 |
| STOREY6 | 567.32 | 567.32 |
| STOREY5 | 393.97 | 393.97 |
| STOREY4 | 252.14 | 252.14 |
| STOREY3 | 141.83 | 141.83 |
| STOREY2 | 63.04 | 63.04 |
| STOREY1 | 15.76 | 15.76 |

TABLE 6.8: Mode Time period and frequencies of G+9 Building

| Mode | Period | Frequency |
|---|---|---|
| | sec | cyc/sec |
| 1 | 2.217 | 0.451 |
| 2 | 1.908 | 0.524 |
| 3 | 1.821 | 0.549 |
| 4 | 0.711 | 1.407 |
| 5 | 0.615 | 1.625 |
| 6 | 0.588 | 1.702 |
| 7 | 0.398 | 2.511 |
| 8 | 0.347 | 2.883 |
| 9 | 0.332 | 3.011 |
| 10 | 0.263 | 3.796 |
| 11 | 0.235 | 4.26 |
| 12 | 0.223 | 4.482 |

Table 6.9: Horizontal Storey Displacements(mm) of G+14 Building

| Storey Displacement | | | | |
|---|---|---|---|---|
| STOREY | EQX | EQY | RSX | RSY |
| STOREY1 | 6.332 | 7.698 | 5.531 | 6.78 |
| STOREY2 | 17.031 | 21.624 | 14.58 | 18.783 |
| STOREY3 | 28.732 | 37.102 | 23.98 | 31.554 |
| STOREY4 | 40.748 | 52.918 | 33.10 | 43.914 |
| STOREY5 | 52.855 | 68.683 | 41.80 | 55.601 |
| STOREY6 | 64.908 | 84.19 | 50.07 | 66.574 |

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| | | | | |
|---|---|---|---|---|
| **STOREY7** | 76.756 | 99.26 | 57.89 | 76.795 |
| **STOREY8** | 88.239 | 113.69 | 65.21 | 86.204 |
| **STOREY9** | 99.178 | 127.28 | 71.99 | 94.744 |
| **STOREY10** | 109.38 | 139.76 | 78.18 | 102.35 |
| **STOREY11** | 118.64 | 150.89 | 83.70 | 108.95 |
| **STOREY12** | 126.74 | 160.36 | 88.51 | 114.46 |
| **STOREY13** | 133.44 | 167.89 | 92.51 | 118.81 |
| **STOREY14** | 138.56 | 173.23 | 95.62 | 121.90 |
| **STOREY15** | 142.10 | 176.49 | 97.83 | 123.81 |

Table 6.10: Storey Shears(KN) of G+14 Building

| Storey Shear | | | | |
|---|---|---|---|---|
| STOREY | EQX | EQY | **RSX** | **RSY** |
| STOREY15 | 643.68 | 643.68 | 666.29 | 686.29 |
| STOREY14 | 1586.02 | 1586.02 | 1587.6 | 1612.7 |
| STOREY13 | 2398.54 | 2398.54 | 2233.5 | 2238.4 |
| STOREY12 | 3090.87 | 3090.87 | 2650.8 | 2634.9 |
| STOREY11 | 3672.62 | 3672.62 | 2966.5 | 2957.2 |
| STOREY10 | 4153.40 | 4153.40 | 3261.4 | 3277.3 |
| STOREY9 | 4542.83 | 4542.83 | 3537.9 | 3570.8 |
| STOREY8 | 4850.54 | 4850.54 | 3792.9 | 3833.2 |
| STOREY7 | 5086.12 | 5086.12 | 4038.7 | 4091.4 |
| STOREY6 | 5259.20 | 5259.20 | 4267.6 | 4332.9 |
| STOREY5 | 5379.40 | 5379.40 | 4470.5 | 4532.5 |
| STOREY4 | 5456.32 | 5456.32 | 4686.7 | 4732.5 |
| STOREY3 | 5499.59 | 5499.59 | 4956.1 | 4990.8 |
| STOREY2 | 5518.82 | 5518.82 | 5218.5 | 5248.5 |
| STOREY1 | 5523.63 | 5523.63 | 5348.8 | 5372.2 |

Table 6.11: Lateral Forces On Storeys (KN) of G+14 Building

| Lateral Forces On Storeys | | |
|---|---|---|
| STOREY | EQX | EQY |
| STOREY15 | 643.68 | 643.68 |
| STOREY14 | 942.34 | 942.34 |
| STOREY13 | 812.52 | 812.52 |
| STOREY12 | 692.33 | 692.33 |
| STOREY11 | 581.75 | 581.75 |
| STOREY10 | 480.78 | 480.78 |
| STOREY9 | 389.43 | 389.43 |
| STOREY8 | 307.70 | 307.70 |
| STOREY7 | 235.58 | 235.58 |
| STOREY6 | 173.08 | 173.08 |
| STOREY5 | 120.20 | 120.20 |
| STOREY4 | 76.93 | 76.93 |
| STOREY3 | 43.27 | 43.27 |
| STOREY2 | 19.23 | 19.23 |
| STOREY1 | 4.81 | 4.81 |

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TABLE 6.12: Mode Time period and frequencies of G+14 Building

| Mode | Period | Frequency |
|---|---|---|
| | sec | cyc/sec |
| 1 | 3.436 | 0.291 |
| 2 | 2.994 | 0.334 |
| 3 | 2.821 | 0.354 |
| 4 | 1.12 | 0.892 |
| 5 | 0.971 | 1.029 |
| 6 | 0.921 | 1.086 |
| 7 | 0.643 | 1.555 |
| 8 | 0.551 | 1.816 |
| 9 | 0.53 | 1.888 |
| 10 | 0.438 | 2.283 |
| 11 | 0.379 | 2.636 |
| 12 | 0.364 | 2.748 |

TABLE 6.13: Modal Load Participation Factors for G+4

| Case | Item | Static | Dynamic |
|---|---|---|---|
| | | % | % |
| Modal | UX | 99.99 | 99.39 |
| Modal | UY | 99.99 | 99.25 |
| Modal | UZ | 0 | 0 |

TABLE 6.14: Modal Load Participation Factors for G+9

| Case | Item | Static | Dynamic |
|---|---|---|---|
| | | % | % |
| Modal | UX | 99.98 | 96.61 |
| Modal | UY | 99.98 | 96.18 |
| Modal | UZ | 0 | 0 |

TABLE 6.15: Modal Load Participation Factors for G+14

| Case | Item | Static | Dynamic |
|---|---|---|---|
| | | % | % |
| Modal | UX | 99.97 | 95.69 |
| Modal | UY | 99.97 | 95.28 |
| Modal | UZ | 0 | 0 |

Table 6.16: Storey Drifts(mm) for G+4 Building

| Storey Drifts | | |
|---|---|---|
| STOREY | EQX | EQY |
| STOREY1 | 3.15 | 3.83 |
| STOREY2 | 5.06 | 6.63 |
| STOREY3 | 4.89 | 6.55 |
| STOREY4 | 3.84 | 5.16 |
| STOREY5 | 2.25 | 3.11 |

Table 6.17: Storey Drifts(mm) for G+9 Building

| Storey Drift | | |
|---|---|---|
| STOREY | EQX | EQY |
| STOREY1 | 6.17 | 7.52 |
| STOREY2 | 10.32 | 13.53 |
| STOREY3 | 11.11 | 14.85 |
| STOREY4 | 11.11 | 14.82 |
| STOREY5 | 10.74 | 14.19 |
| STOREY6 | 10.02 | 13.07 |
| STOREY7 | 8.92 | 11.45 |
| STOREY8 | 7.39 | 9.26 |
| STOREY9 | 5.45 | 6.57 |
| STOREY10 | 3.35 | 3.79 |

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Table 6.18: Storey Drifts(mm) for G+14 Building

| Storey Drift | | |
|---|---|---|
| STOREY | EQX | EQY |
| STOREY1 | 6.33 | 7.70 |
| STOREY2 | 10.70 | 13.92 |
| STOREY3 | 11.70 | 15.48 |
| STOREY4 | 12.02 | 15.81 |
| STOREY5 | 12.11 | 15.76 |
| STOREY6 | 12.05 | 15.51 |
| STOREY7 | 11.85 | 15.07 |
| STOREY8 | 11.48 | 14.44 |
| STOREY9 | 10.94 | 13.58 |
| STOREY10 | 10.20 | 12.49 |
| STOREY11 | 9.26 | 11.12 |
| STOREY12 | 8.10 | 9.47 |
| STOREY13 | 6.71 | 7.52 |
| STOREY14 | 5.12 | 5.34 |
| STOREY15 | 3.54 | 3.26 |

Fig 6.1: Horizontal Storey Displacement Vs Number Of Storeys for G+4 Building

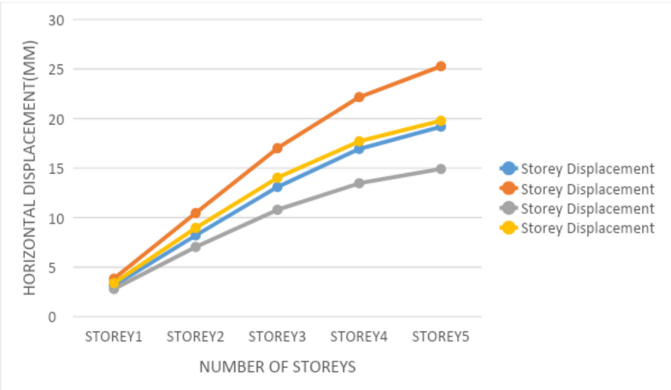


Fig 6.2: Storey Shear Vs Number Of Storeys for G+4 Building

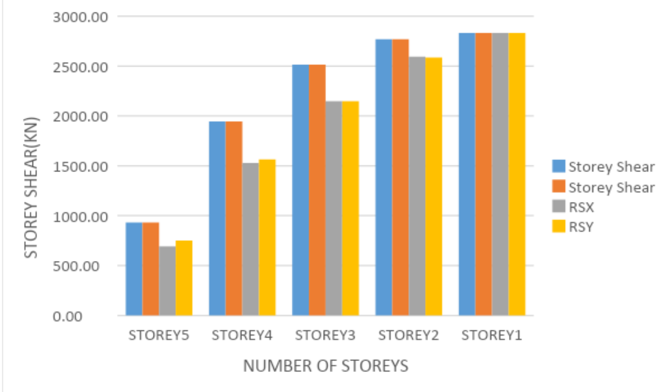


Fig 6.3: Lateral Floors Vs Number Of Storeys of G+4 Building


Fig 6.4: Horizontal Storey DisplacementVs Number Of Storeys for G+9 Building

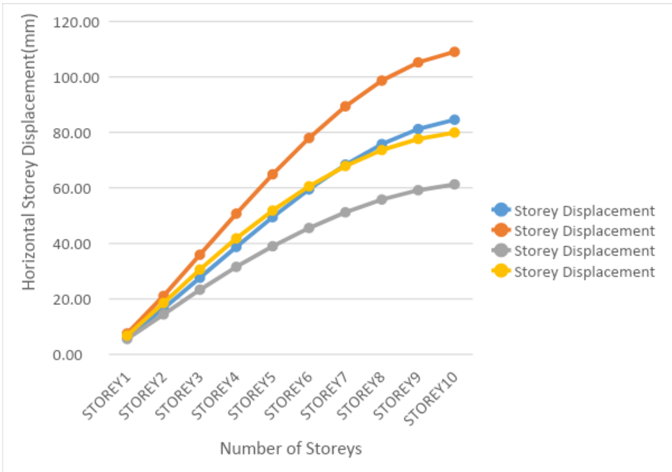

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Fig 6.5: Storey Shear Vs Number Of Storeys for G+9 Building

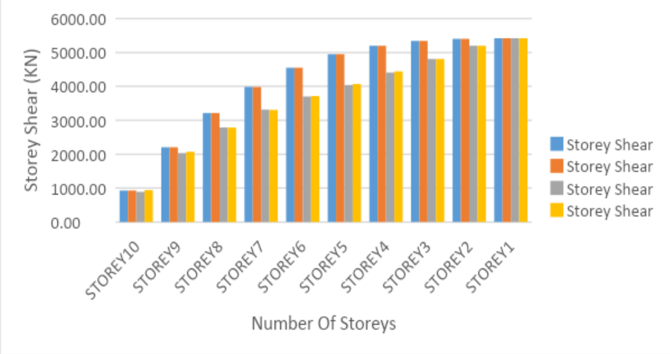



Fig 6.6: Lateral Forces Vs Number Of Storeys for G+9 Building


Fig 6.7: Horizontal Storey Displacement Vs Number Of Storeys for G+14 Building

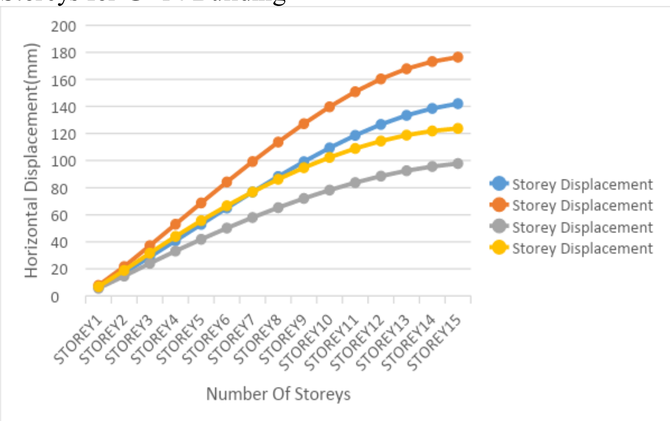



Fig 6.8: Storey Shear Vs Number Of Storeys for G+14 Building

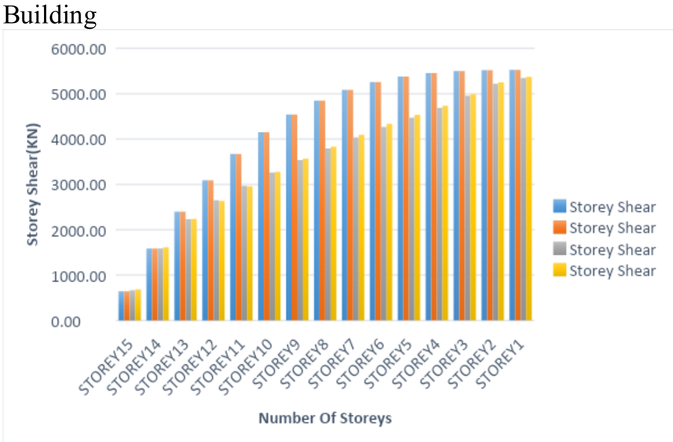



Fig 6.8: Lateral Forces Vs Number Of Storeys for G+14 Building

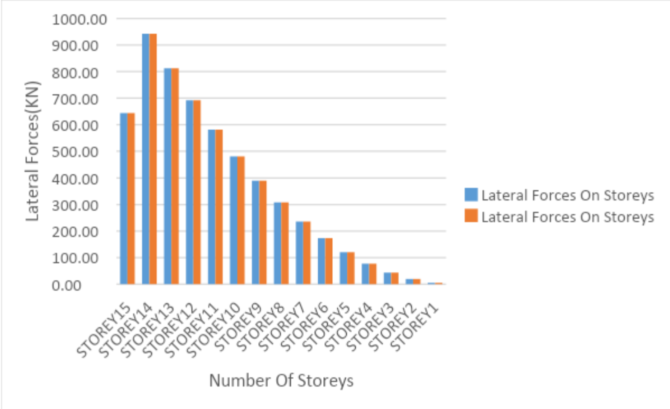



Fig 6.9: Storey Drift For G+4 Building


Fig 6.10: Storey Drift For G+9 Building

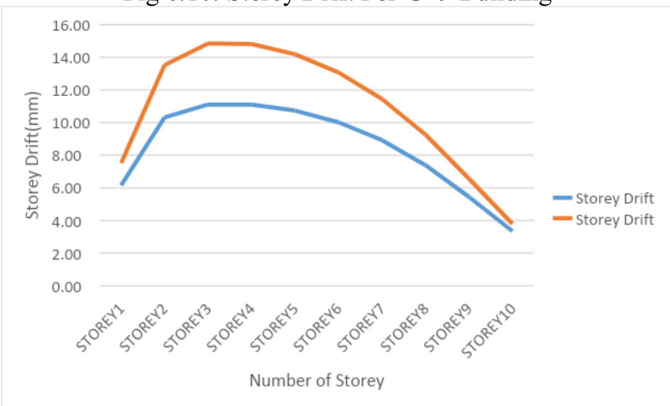
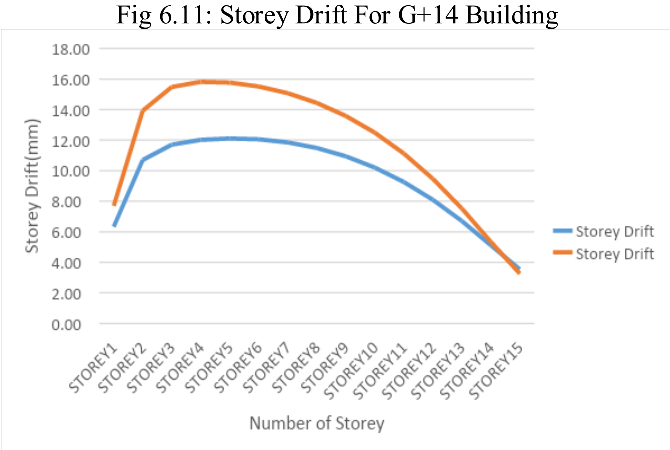



Fig 6.11: Storey Drift For G+14 Building



International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 12 Issue 09, September-2023

## 4.CONCLUSIONS:

The effect of the seismic loading using both static and dynamic analysis methods were studied on R.C.C building with different elevations. On the basis of the results obtained the following conclusions were drawn:

- The maximum storey displacement values obtained from response spectrum analysis at lower stories are lesser when compared with the values at higher storiesin both x and y directions respectively.
- By comparing results of two mentioned analysis, it is observed that the displacements of equivalent static analysis are higher than response spectrum analysis for all the three models considered.
- The results of Response spectrum analysis and static analysis are compared and concluded, that RSA has given lower values for displacement with a reduction of 23%, 28% & 31% were observed when RSA compared with ESA in displacement for G+4,G+9 & G+14 respectively.
- The natural time period was observed to be increased with the increase in the number of stories.
- Base shear also increases with increase in the number of stories i.e., 2831.60 & 5523.63 for G+4 & G+14 respectively.
- From the results obtained from the analysis we can conclude that lateral loads are to be taken while designing the high rise buildings to avoid failure of the structuredue to displacements.
- It was observed that the storey drifts of g+4 building is well within the codal limitsi.e., 0.004h where 'h' is the height of the storey. Whereas, the storey drifts of G+9& G+14 building models exceeds the limits at bottom storey's. Hence, Lateral resisting systems such as shear walls, dampers etc. are to be induced in the structureor the size of the columns & beams are to be increased to reduce the effect of seismic loads.

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