STATIC AND DYNAMIC ANALYSIS OF HIGH RISE STRUCTURE

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Abstract: *Today is the time where many ways are adopted in Sesmic Plan of the structure to thrive for the stability of the structure. Both Dynamic & Static examination of structure is performed by structural Incharge Engineer for the subjective ground motion plan arrangements. In any case, given that seismic expectation is still a long way from turning into a reality at the same time, it is imperative for the building structures to assess the forecast of sesmic activity. It is this reason for the motivation behind the investigations of vulnerabilities of buildings due to which the tremors have been created in various kind of structures to asses the normal harm. For investigating a multi celebrated structure one needs to think about all the conceivable burden blends and see that the structure is protected against all or not. The point to examine the structure utilizing the software STAAD.pro both statically and dynamically in which the structure is a multistory (B+G+8) venture. Despite the fact that there are a few strategies to investigate a structure yet STAAD.pro has end up being the most proficient, point by point and exact programming. These examinations are done to decide greatest displacements, focus of mass, base shear and story displacements.*

Index Terms **– STAAD Pro, Static Analysis, Dynamic Analysis, RCC Buildings, Displacement.**

I. INTRODUCTION

Auxiliary structure exam is performed to discover when subjected to any action regarding the behavior of a system. For example, which involves heavy items like the loads due to snow, for example the movables of individuals. The structure's self load and all other heaps or loads are dynamic and so it is tested or evaluated wheather the action being applied has sufficient impact to significantly speed up its connection with respect to structures.

Differentiation between Static and Dynamic analysis is made paying particular attention to whether the action applied has adequate acceleration relative to the natural frequency of structure.Basic plan of structure for seismic loads is critical for basic security during significant ground movements. Specifically, the seismic recovery of solid structures in high seismicity zones involves developing concern, so harm capability of a structure must be resolved and a satisfactory degree of well being must be resolved. Building can possibly "wave" to and fro during a seismic tremor. This often referred to as the essential mode and is that the least recurrence of building reaction. Most structures, be that because it may, have higher methods of reaction, which are exceptionally actuated during seismic tremors. By and by, the primary and second modes will generally reason the foremost harm by and enormous.The results acquired from static analysis are compared with the results acquired from Response Spectrum analysis.

The level rules adopted by the codes for fixing the degree of seismic loading nature are as follows for the most part Without failure the minor seismic tremors mors (MCE) should be resisted by the structure.

Without significant structural damage but with some non-structural dysfunction, structures should be able to refute tremors (DBE).

Structures should be able to hold up to severe tremors (MCE) without collapse.

Design Base earthquake (DBE)" is defined as the maximum quake which can be counted on to affect the site once during the structure 's lifetime.The tremor of the absolute safety requirements is frequently referred to as " Maximum Considered Earthquake (MCE)."Generally," The (DBE) is half of (MCE).'

II. METHODOLOGY

Using STAAD Pro Software for Analysis:

STAAD Pro or STAAD is a computer program for structural analysis and design originally developed at Yorba Linda, CA in 1997 by Research Engineers International. It encourages structural designers to lessen their repetitive work on long system of manual techniques. Essentially this product lessens manual count and time. This product is utilized by different development organizations, specialists and government offices. In late 2005, Exploration Designers Universal was purchased by Bentley Frameworks. STAAD represents Basic Examination and Plan. Any article which is steady under a given stacking can be considered as a structure.

Response Spectrum Method:

During seismic tremor ground movements, the representation of the maximum response of romanticized single- degree device having some duration and damping. The maximum response plotted against undamped natural time and for different damping values and can be communicated as far as absolute maximum acceleration, relative maximum speed or relative maximum displacement.

Equivalent Static Analysis:

All seismic load designs have to believe in the dynamic nature of the load. Be that as it may, analyzing comparable linear static techniques is usually adequate for easy regular structures. In many codes of practice this is often permitted for normal, low to medium-ascension structures. It begins with an estimation of the base shear load and its transmission on each storey, determined by using recipes given in the code.

Time History Method:

It is an analysis of the structure 's dynamic reaction at each time increase, when its base is exposed to a specific time history of ground motion. Recorded ground motion information base structure past characteristic seismic tremors can be a reliable hotspot for analysis of the time history.

Modelling

Table 1: Table Representing RC Frame Structure Data:

S.No	Particulars	Dimension/Size/Value
1	Number of stories	B + G + 8
2	Eq. Zone	IV
3	Storey range	3m
4	Plinth area	22.9 × 15.6 mt.
5	Column Dimension	0.9 × 0.83 mt.
6	Beam Dimensions	0.500 × 0.60 mt
7	Walls	External Wall = 9 in Internal Wall = 4.5 in
8	Slab Depth	6 inch
9	Soil Form	Type-II, Medium soil
10	Material	Con. M-30 and R/F Fe-415
11	Static Design	Equivalent Lateral Force
12	Dynamic Design	Response Spectrum Method
13	EQ load	as per IS-1893-2002
14	Sp. Wt. of RCC	25 KN/m^2
15	Sp. Wt. of infill	20.5 KN/m^2
16	Software	STAAD –Pro

Model of the structure

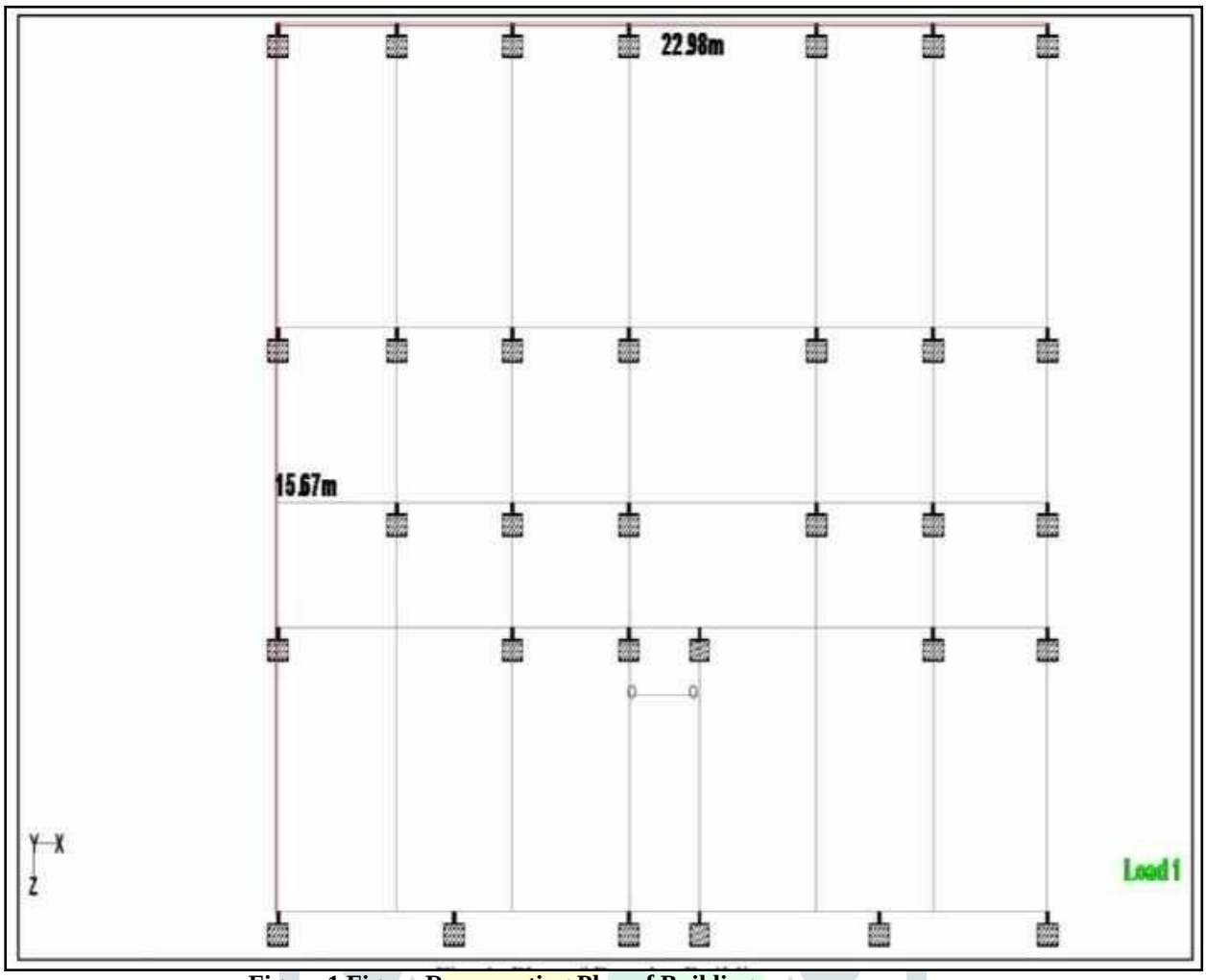

Figure 1 Figure Representing Plan of Building

SelfWeight:

In the Loadcase we have a choice called self-weight which naturally calculates loads using material properties i.e. thickness and the skeletal structure looks red in shading after task of dead load .

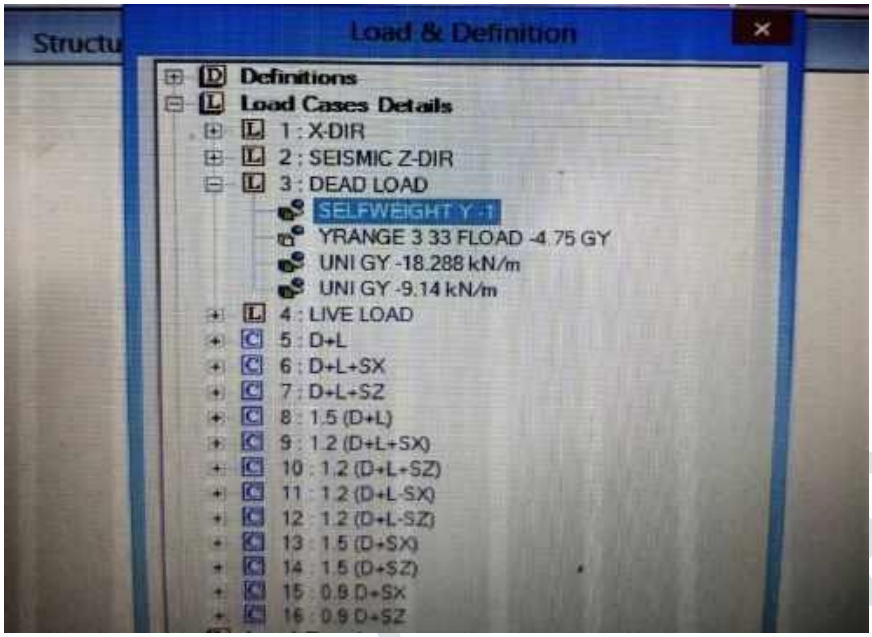

Figure 2: Figure Representing Self weight Load Case Details Wall Load

The wall loads are determined in three classes as per the thickness and tallness of the wall.

External Walls: 9 inch

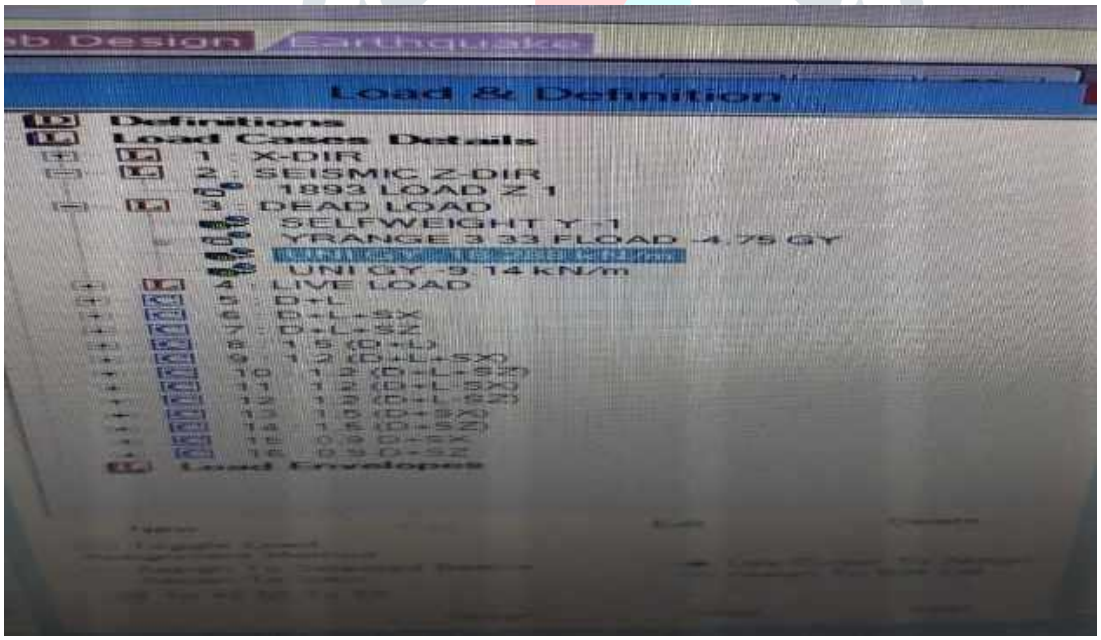

Figure 3: Figure Representing Load Case Details External Brick Load

Internal Walls: 4.5 inch

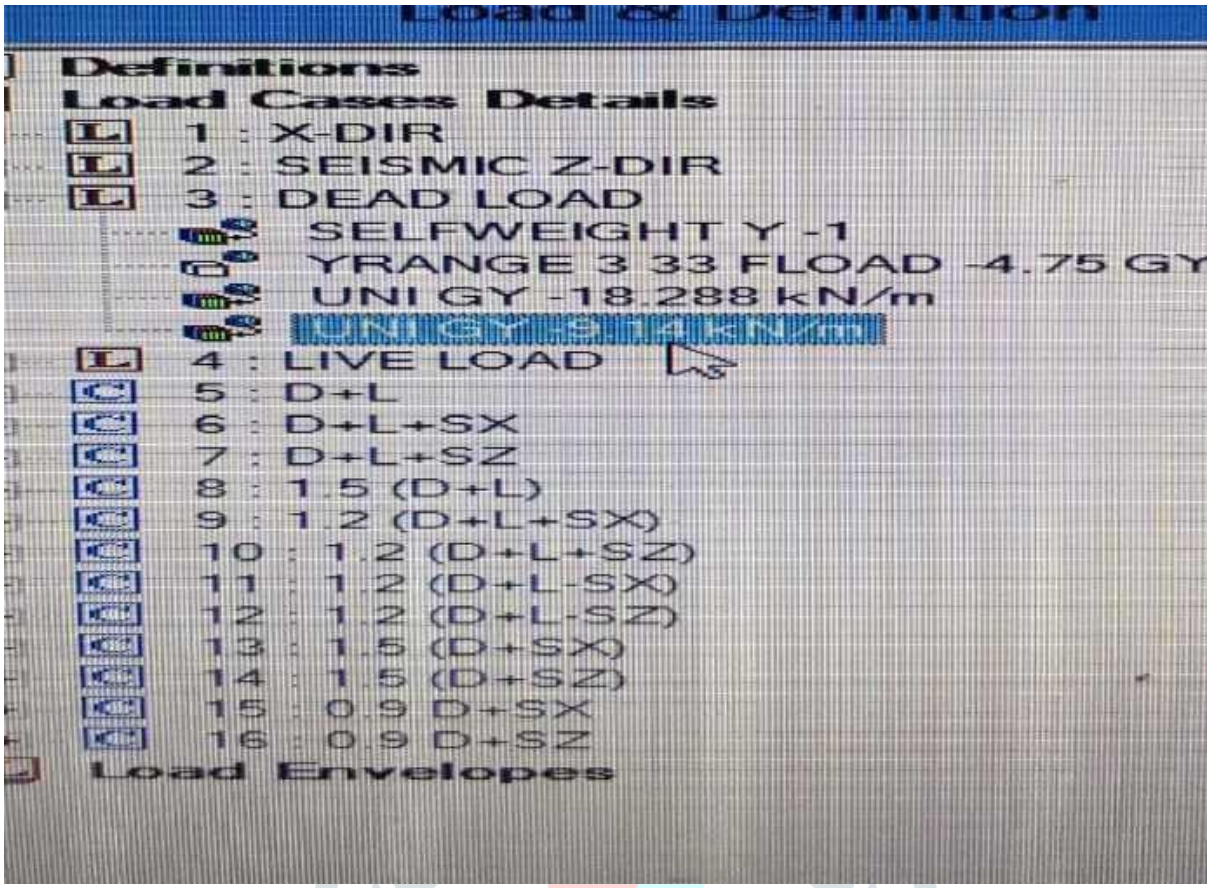

Figure 4: Figure Representing Load Case Details Internal Brick Load Floor Load

The load of the slab and the finishing loads are included in the dead load of the floor.

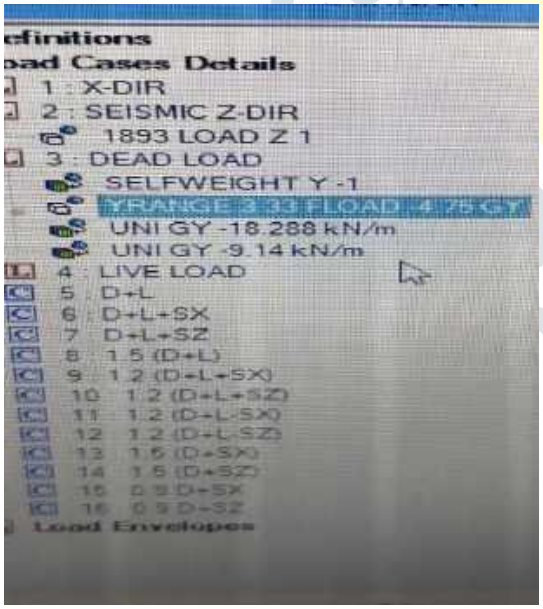

Figure 5: Figure Representing Load Case Details Floor Load

Live Loads

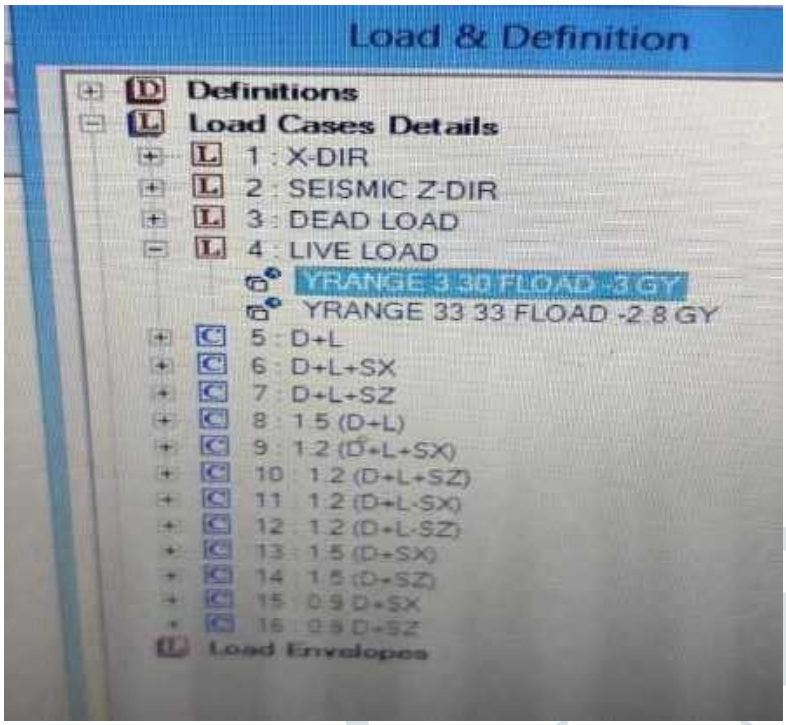

Figure 6: Figure Representing Load Case Details Live Load

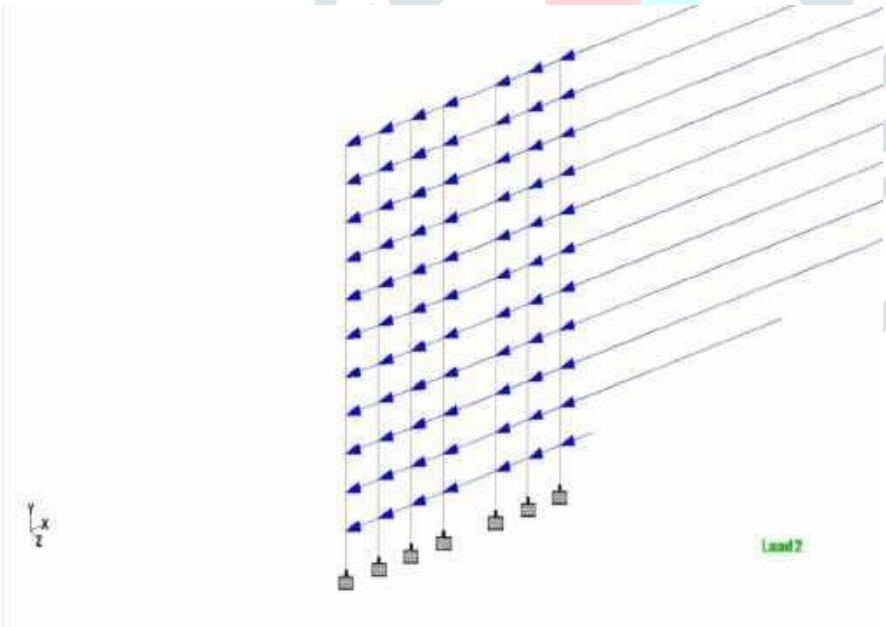

Figure 7: Figure Representing Earthquake Loading

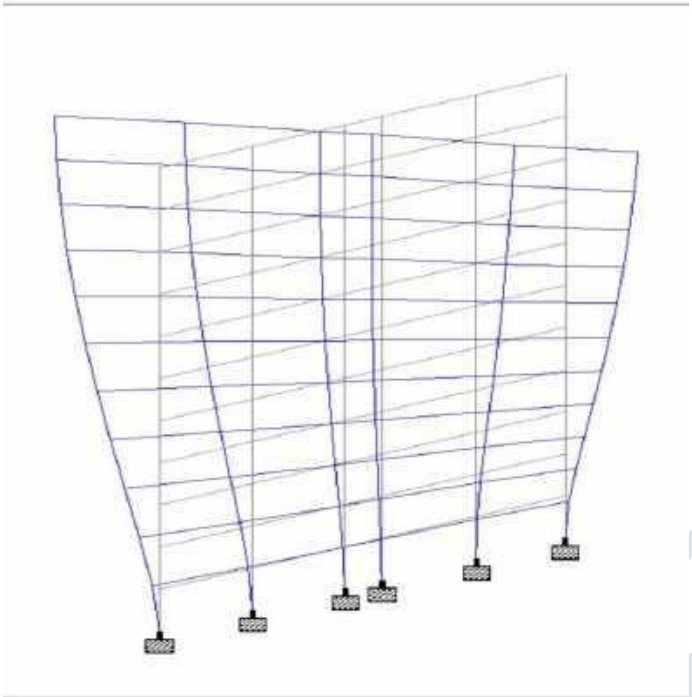

Figure 8: Figure representing Response Spectrum Loading

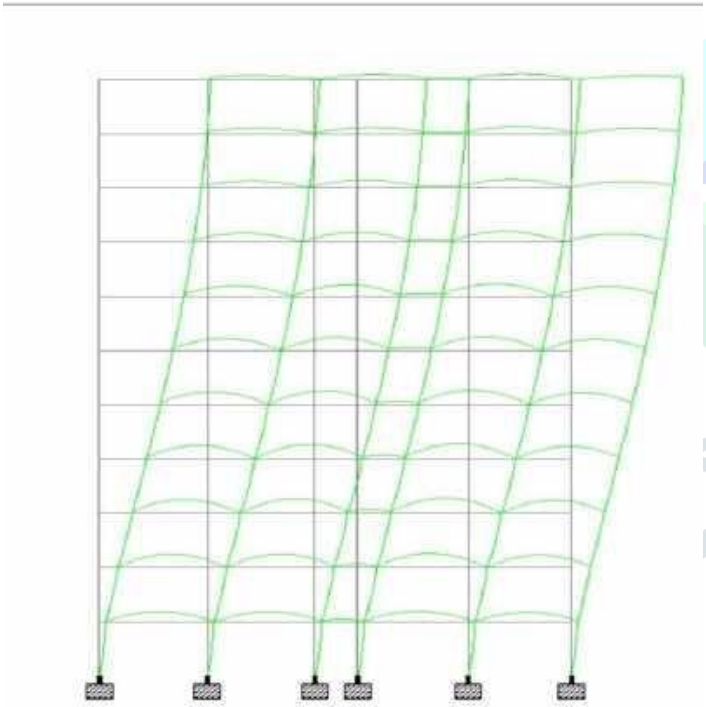

Figure 9: Figure representing Deflection Diagram

III. RESULTS

1. Comparison of Axial Forces for VM

Table 2: Table Representing Comparison of Axial Forces for Vertical Members

COLUMN No.	L/C	STATIC ANALYSIS (KN-M)	L/C	DYNAMIC ANALYSIS (KN-M)
947	9	120.2	10.	127.8
915	9	296.4	10	306.2
883	9	469.3	10	480.1
851	9	639.8	10	649.9
819	9	807.2	10	814.9
787	9	972.42	10	977.1

2. Comparison of Beam Stresses in SA

Table 3: Table Representing Comparison of Stresses in Beams

STATIC ANALYSIS			
BEAM	L/C	MAX COMP. STRESS (N/mm^2)	MAX TENSILE STRESS (N/mm^2)
604	9	6.78	-5.67
548	9	9.17	-9.10
492	9	10.75	-10.76
436	9	12.27	-12.47
380	9	13.16	-13.67
324	9	13.85	-14.06

3. Comparison of Beam Stresses in DA

Table 4: Table Representing Comparison of Stresses in Beams

DYNAMIC ANALYSIS			
BEAM	L/C	MAX COMP. STRESS (N/mm^2)	MAX TENSILE STRESS (N/mm^2)
604	10	10.86	-10.23
548	10	13.97	-13.89
492	10	15.99	-15.93
436	10	18.64	-18.59
380	10	20.46	-20.42
324	10	21.79	-21.74

4. **Comparison of Displacements for VM**

Table 5: Table Representing Comparison of Displacements for Vertical Members

COLUMN No.	L/C	STATIC ANALYSIS (KN-M)	L/C	DYNAMIC ANALYSIS (KN-M)
949	9	40.48	10	71.03
917	9	39.21	10	68.67
885	9	36.98	10	63.86
853	9	34.03	10	60.10
821	9	30.07	10	53.52
786	9	25.18	10	46.76

5. **Comparison of ND In Dir (Z)**

Table 9: Table Representing Nodal Displacements Comparison

COLUMN NUMBER	L/C	STATIC ANALYSIS (KN-M)	L/C	DYNAMIC ANALYSIS (KN-M)
430	9	40.48	10.0	79.12
391	EQ	41.48	EQ	78.14
352	EQ	38.53	EQ	72.98
313	EQ	35.09	EQ	67.94
274	EQ	30.91	EQ	60.47
235	EQ	26.23	EQ	52.32
196	EQ	21.43	EQ	43.13
157	EQ	16.13	EQ	35.03
118	EQ	12.97	EQ	23.78
79	EQ	7.01	EQ	13.23

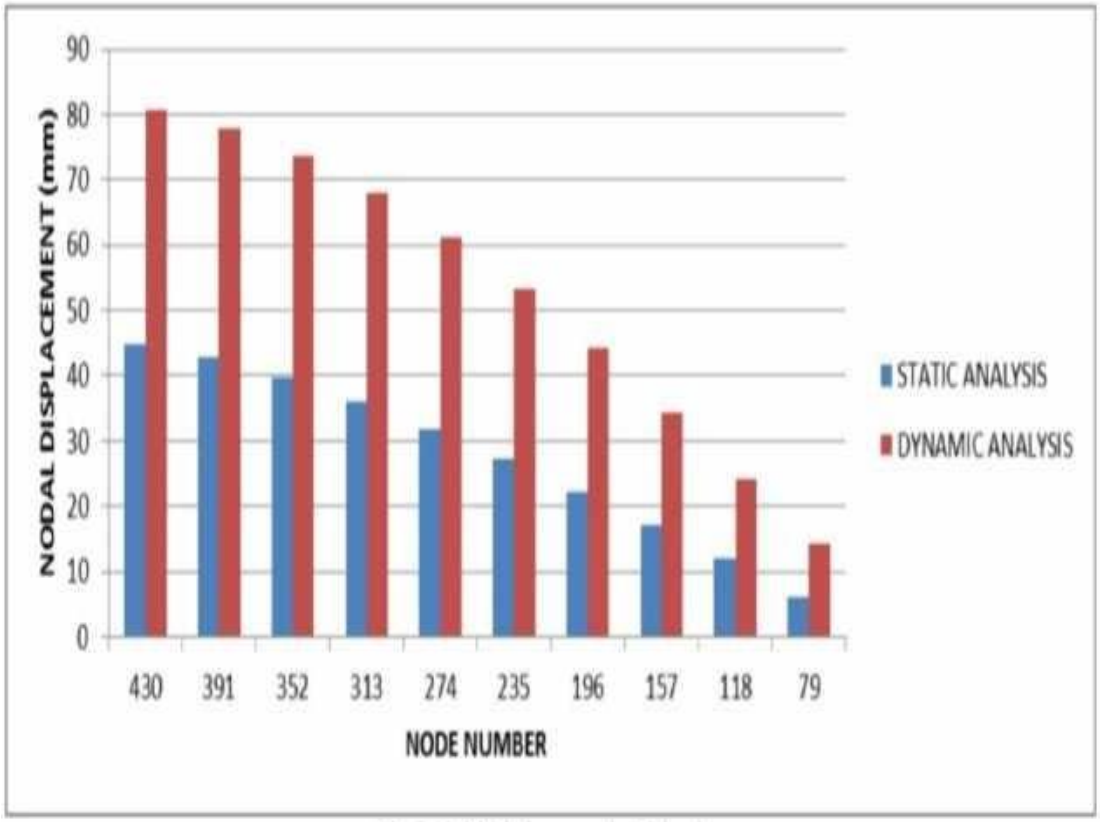

Figure 10: Figure Representing Nodal Displacement In Z-Direction

IV. CONCLUSION

The information as assembled utilizing the product STAAD Pro V8i Series for the static and dynamic analysis is looked at for changed classifications under determined loading conditions

1. According to the results obtained, the stresses that are comp. and tensile were roughly equal in the described beams.
2. Due to seismic excitation, beams and columns indicated much greater nodal displacements and BM in contrast to that due to static loads.
3. Based on the results, the estimates of nodal displacements in Z-heading are 51% higher for dynamic analysis than those obtained for static analysis.
4. The Twist estimates of columns are negative for static analysis as per the results, and the values are positive for Dynamic analysis.
5. The values for column displacements for dynamic analysis are 42 to 46 percent higher as per the results than the values acquired for static analysis.
6. According to the values, there is not much contrast in the values of Axial forces as acquired by the RCC structure's static and dynamic analysis.
7. 33% to 47% is higher the value of Moment for Dynamic analysis based on results than the values acquired for Static analysis

V. REFRENCES

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