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Comparative Analysis of Single Column Square, Rectangular, Circular Shape Structure

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Abstract: Due to increasing urbanization and rapid infrastructural development, scarcity of land is a problem. Multi-story structures have been constructed to eliminate this problem. But for the requirement of large service spaces and good aesthetic appearances, the mono column structural system achieved popularity. They require less area for providing foundation and gives more space for parking. The design and analysis of RCC structure supported on a single column is done in this project. This project presents effects of three different plan configurations i.e., Square, Circular, rectangular, with same plan area. Mono column structure withdifferent plan geometry reacts adversely in contrast to earthquake loads.
Modeling, analysis and design of Multi storey mono column structure is done by using staad pro software. Seismic analysishas been done and maximum values of Storey displacement, Storey shear, overturning moment, Storey stiffness results are manifest in form of figures. The purpose of this analysis is to determine the most effective and vulnerable shape of structure in areas
Keywords: Staad pro, Single column, seismic analysis.

I. INTRODUCTION

Mono column building is the structure supported on a single column which provides large serviceable area as compare to RCC and steel frame structure. Mono column building supported on a single column has more aesthetic view compared to other frame structures. The requires less area for providing foundation and gives more space for parking. They are also unique. Mono column structures are constructed with RCC or Steel. Mono column structures are complicated one, compare with the other framed structures, mono column supports entire structure, all other members will act as cantilevers. These structures provide more proper spaces for offices and parking. Mono column provides maximum serviceability. They are also good at the place where flood occurs. Mono column buildings decrease the excavation area of the land and saving money. This project describes planning, structural analysis, design and drawings with various components of the whole building.

Primary aim of all structural design is to ensure that the structure will perform satisfactorily during its design life. Specifically, the designer must check that the structure is capable of carrying the loads safely and that it will not deform excessively due to the applied loads. This requires the designer to make realistic estimates of the strengths of the materials composing the structure and the loading to which it may be subject during its design life.

Earlier, modelling and structural analysis of buildings were carried out using hand calculation method based on simplified assumptions and understanding the whole behavior of the structure. But it seems to be time consuming and complicated for high rise buildings. at present, computer hardware's and software's for modelling and analysis of structure is widely available. We need to know how the knowledge secured in the class room is applied in these practical sides of work. When we got this project, we come into practical field to collect construction techniques and to meet the various difficulties in the construction. Also it is necessary to have sufficient knowledge regarding various software's currently used in planning analysis and design of and are not included during the design process of the primary structure. Since the 1990s specialist software.

II. LITERATURE REVIEW

A. MRS. SHILPA VALSAKUMAR, THEJUS SREEHARI (2022)

From literature review, it is found that Mono column buildings has unique structure. They have good aesthetic view. Mono column structure can withstand all loads including earthquake loads and wind loads. Mono column building save ground space as requires less area for proving foundations and providing more space for parking. A rectangular mono column (1.8 m x1.8 m) building analyzed. The maximum displacement is 54.58 mm in Y direction and 36 mm in X direction. The maximum shear force in X direction is 1260.5 kn and 1308.9 kn in Y direction.

A circular mono column (d = 2.03m) building also analyzed. The maximum displacement is 57.6 mm in Y direction and 37.3 mm in X direction. The maximumshear force in X direction is 1223 kn and 1223 kn in Y direction. The study shows that the rectangular mono column structure has less deformation than circular mono column structure.

B. *SIJIN JOHNSON, INDU SUSAN RAJ (2022)*

Mono column structures are tree like structure that the whole building is supported on single column. Since the whole structure is supported on single column all other members will act as cantilever. Eccentric loading can twist the building in any direction and causes failure. Mono column structure showed high deflection in members, high story displacement and high story drift. The maximum shear force and maximum bending moment in the members are more in seismic analysis than in the non-seismic analysis. Mono column structure are costlier than the conventional type of structure. These mono column structures are vulnerable to seismic loading. The plan configuration also plays an important role in the seismic performance of the building and it is proved that asymmetric plan shaped structure is prone to severe damage due to excessive torsional responses and stress concentration. Plan asymmetry also changes the lateral deformation in the structure. The studies showed that diagrid structural system improves the seismic performance of the structure and it provides good aesthetic appearance. It made the structure stiffer and lighter than the conventional type of structure. It reduces the number of structural elements and reduces the possibility of failure due to the lateral loading such as seismic load and wind load. The diagrid structure provides the efficiency due to its triangular configuration. Diagrid structural system decreases the story displacement, story drift and the base shear than the conventional structures.

C. *AMBATI VENU BABU, DR. DUMPA VENKATESWARLU (2016)*

This paper studied about the single column is supporting whole structure; all other members will act as cantilevers. To reduce the cantilever span for the structural beams converting two-third of the length as simply supported by providing the two ring beams and inclined beams. The structure is analyzed and designed using Staad pro (structural analysis package), which is based on stiffness matrix method. The above structure has been analyzed for various possible loading conditions and the critical has been selected for design purpose.

From this paper it was concluded that the project Office Building with Mono Column (single supported building) is analyzed and designed with special attention and it is completed. Maximum space utilization is considered while planning and designing and we assure it will serve its maximum serviceability

D. *MADIREDDY SATYANARAYANA (2016)*

He studied to analyze and design of multi-storey building resting on the single column by using different code provisions. A lay out plan of the proposed building is drawn by using AUTO CADD 2010.The structure consist of ground floor plus five floors, each floor having the one house. Staircase must be providing separately. The planning is done as per Indian standard code provisions. The building frames are analyzed using the various text books. Using this so many standard books analysis of bending moment, shear force, deflection, end moments and foundation reactions are calculated. Detailed structural drawings for critical and typical R.C.C. members are also drawn. Co-ordinates for all structural members are tabulated for ready reference.

From his research it was concluded that the limit state method of design is adopted. He had done the design aspects of the structure manually and software. In our project He also used the code provision of the SP 16 and SP 34 (the design aids for concrete and detailing). Finally learn detailing of various structural members by using SP 34 design aids.

E. *ANUPAM RAJMANI (2015)*

Studied a tall building, whose shape is unsuitable, often requires a great deal of steel or a special damping mechanism to reduce its dynamic displacement within the limits of the criterion level for the design wind speed. Understandably, an appropriate choice of building shape and architectural modifications are also extremely important and effective design approaches to reduce wind and earthquake induced motion by altering the flow pattern around the building, hence for this research work four different shaped buildings are generally studied namely circular, rectangular, square and triangular. To achieve these purposes, firstly, a literature survey, which includes the definition, design parameters, and lateral load considerations of tall buildings, is presented. Then the results are interpreted for different shaped buildings and of different stories thereby concluding as to which shaped high rise buildingis most stable for different conditions. Researchers conclude that,

F. E K MOHANRAJ (2002)

Analyzed a single column is supporting structure, in which all other members are acting as cantilevers. To reduce the cantilever span for the structural beams converting two-third of the length as simply supported by providing the two ring beams and inclined beams. The structure is analyses and designed using strap (structural analysis package), which is based on stiffness matrix method. Conclude that if maximum space utilization is considered while planning and designing then it will surely serve its maximum serviceability.

G. BADIKALA SRAVANTHI (2016)

Design and analysis of RCC structure supported on a single column is done in this project (figure 1). Cost Comparison is done between RCC single column and RCC multi column structure. This paper presents structural modelling, stress, bending moment, shear force and displacement design considerations for a structure and it is analyzed using STAAD Pro. Various steps involved in designing of RCC structure supported on a single column using STAAD pro and comparison of RCC single column and RCC multi column Structure. Single column structure has been designed successfully to withstand all loads including earthquake and wind load.. Single column structure provides better architectural view and free ground space even though it costs bit more than multi column structure.

H. ARIF SARWO WIBOWO AND SHIRO SASANO (2016)

The structural system that employs a wooden single column to support a roof structure is assigned only to four mosques on Java Island. Though at a glance displaying similarities in their scheme, they are classified into two distinctive types under a combinationof building components.

The Saka Tunggal Mosque of Banyumas is distinguished from the other three, regarding not only a primitive style that contrasts with the others employing four consoles that must have likely yielded a certain structural advantage, but also to an unrefined ceiling style without a decorated, stepwise ceiling, known as tumpangsari.

Consequently, the system employed in the other three mosques may well be said to be more elaborate and refined if notice is taken of their architectural evolution, despite the humble appearance of the mosque in Kebumen. In this sense, the style of Banyumas's might allude to a certain primordial stage in the evolution of Java's mosques by applying the single column system, regardless of what is inscribed on the column concerning its construction date. As far as the historical data on Kebumen's mosque is reliable to some extent, the system of the single column in Banyumas's mosque, as a forerunner of its style, seems to have come into existence at the latest at the beginning of the 19th century.

I. GOMASA RAMESH (2021)

Based on a study of a traditional multi-story building and a single column structural structure, the following conclusions can be drawn. A multi-story building with a single column construction has been successfully engineered to withstand all loads, including earthquake loads. Under static loading conditions, RCC columns have adequate results. STAAD-Pro advanced software, which provides us with a platform for analyzing and designing structures that is fast, reliable, simple to use, and accurate. Ultimate strength and serviceability must be met by the structural design. The planning, study, and construction of framed structures are skills that a civil engineer must-have. As a result, it was suggested that the project work consists of selecting a problem that entailedthe study and design of a commercial framed structure.

J. MR. JAYANT S. RAMTEKE , MR. M. R. NIKHAR , MR. G. D. DHAWALE , MR. S. G. MAKARANDE (2019)

A conventional multi-storey building & a Single column structure has been designed successfully to withstand all loads including earthquake load. Single column structure is 20 % more costly when compared with multi- column structure. We may also check the deflection of various members under the given loading combinations. The Result of deflection obtained from the software for a conventional multi-storey building & a single column building structure.

RCC column give satisfactory result under static loading condition. Study the performance of lateral displacement at II zones when seismic load applied to the structure. Storey drift in highrise structures are subjected to excessive deflection. Deflection obtained by STAAD-Pro is checked by IS Code limitation for serviceability. Base shear gives the base shears for entire structures. STAAD-Pro advanced software which provides us a fast, efficient, easy to use and accurate platform for analyzing and designing structures.

K. G.PRADEEP, DR. H.SUDARSANARAO,DR.VAISHALI.G.GHORPADE(2018)

Single column structure has been designed successfully to withstand all loads including earthquake and wind load. Single column structure is 27.260 % more costly when compared with multi column structure. Using of this software analysis of bending moment, shear force, deflections, end moments and foundation reactions are calculated. Shear force and bending moment values in single column for a single column building are much higher than the Shear force and bending moment values for a column in multi column building. Deflections for single column in single column building are less when compared to a column in multi column building. Support reactions in single column for a single column building are much higher than the Support reactions for a column in multi column building. Details of each and every member can be obtained using Staad Pro. Single column structure provides better architectural view and free ground space even though it costs bit more than multi column references. structure. Maximum space utilization is considered while planning and designing and it assure that it will serve its maximum serviceability.

L. RAJ JOSHI, GAGAN PATIDAR, MAYANK YADAV, PIYUSH NATANI, PRADUMAN DHAKAD (2020):

The course of Single Column Multi Storied Building is nothing different from the journey of any structural design when it comes to the point it was first developed and till now when it is near the edge of being completely adopted in the daily chores. Single Column Multi Storied Building demonstrates how contrasting structural members could also be assimilated into the traditional storied building design to get the design of showing different properties having great impact in terms of environmental, construction management aspect. Flat Slab and Waffle Slab in one form (with or without outer column) have had noticeable effect in the properties of the multi building design, enabling its utilization for different purposes of the building structural, storied with keeping the factor of structural properties high as well.

M. AMOGH, CHIRANJEEVI JOSHI, SHARANABASAPPA, VIKAS PATIL OKALY, RAVIKIRAN S WALI (2021):

Mono-column structure with 5-storeys was planned, analyzed and designed to resist earthquake in zone III areas. The design is based entirely on the relevant Indian Standard Codes. Staad Pro is used for analysis of the structure and manually checked by calculations. Storey drift is within the limits specified in IS codes. More parking area and floor area are available. Mono-column structures with shear wall provide more safety against seismic and lateral forces. It is noted that reinforcement percentage in sectionsis more in case of software design when compared to manual calculations.

N. DR. S. G. MAKARANDE , MR. JAYANT S. RAMTEKE , MR. M. R. NIKHAR , MR. SINGLE G. D. DHAWALE(2019):

A conventional multi-storey building & a Single column structure has been designed successfully to withstand all loads including earthquake load. Single column structure is 20 % more costly when compared with multi- column structure. We may also check the deflection of various members under the given loading combinations. The Result of deflection obtained from the software for a conventional multi-storey building & a single column building structure. RCC column give satisfactory result under static loading condition. Study the performance of lateral displacement at II zones when seismic load applied to the structure. Storey drift in high rise structures are subjected to excessive deflection. Deflection obtained by Staad-Pro is checked by IS Code limitation for serviceability. Base shear gives the base shears for entire structures. Staad-Pro advanced software which provides us a fast, efficient, easy to use and accurate platform for analyzing and designing structures.

III. METHODOLOGY

Seismic analysis of the structure is carried out on the basis of lateral load force assumed to act along with the gravity loads. The base shear which is the horizontal force on the structure is calculated on the basis of structure mass and fundamental period of vibration and corresponding mode of shape. The base shear is distributed along the height of the structure in terms of lateral forces. In this study, a (G+11) storied RC building has been analyzed using linear static analysis method in STAAD pro. The plan and elevation of the building taken for analysis is shown in fig . Three dimensional view of the whole structure subjecting to the vertical loading fig are showing the structure subjected to loading of earthquake in "+X" and "+Z" directions. In earthquake analysis along with earthquake loads, vertical loads are also applied. For the earthquake analysis, IS 1893-2016 code was used.

A. Modeling Description

Planning of G+11 storey square, rectangular and circular shape mono column building structure. with floating column and without floating column. Analysis of G+11 storey square, rectangular and circular shape mono column building structure with floating column and without floating column structure in zone III, having same plan area (400 M). using STADD Pro Comparison of results

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(Axial force, bending moment, Displacement, Storey shear) in square, rectangular, circular shape mono column building with floating column and without floating column.

General data of Building

No of stories = (G+11) (12 stories)

Building height from ground = 48 M

Floor to Floor height = 4 M

Zone factor = zone III (0.16)

Importance factor =1 for commercial building

Response reduction factor = 5 special moment resisting frame (SMRF)

Soil Type = Soil medium

Damping Ratio = 5%

Material Properties

Grade of concrete: M40, Grade of steel: Fe500

Loading on structure

Live Load = 4 kn/m

Floor load = 1 kn/m

Terrace load = 1.5 kn/m

Load Combinations

The following load combinations are used in the seismic analysis, as mentioned in the code IS 1893(part-1):2016, clause no. 6.3.1.2

1) 1.5(DL+LL)
2) 1.2(DL+LL+EQX)
3) 1.2(DL+LL-EQX)
4) 1.2(DL+LL+EQZ)
5) 1.2(DL+LL-EQZ)
6) 1.5(DL+EQX)
7) 1.5(DL-EQX)
8) 1.5(DL+EQZ)
9) 1.5(DL-EQZ)
10) 0.9DL+1.5EQX
11) 0.9DL-1.5EQX
12) 0.9DL+1.5EQZ
13) 0.9DL-1.5EQZ

IV. MODELING

A. Single Column Rectangular Shape Building with Floating Column and without Floating Column

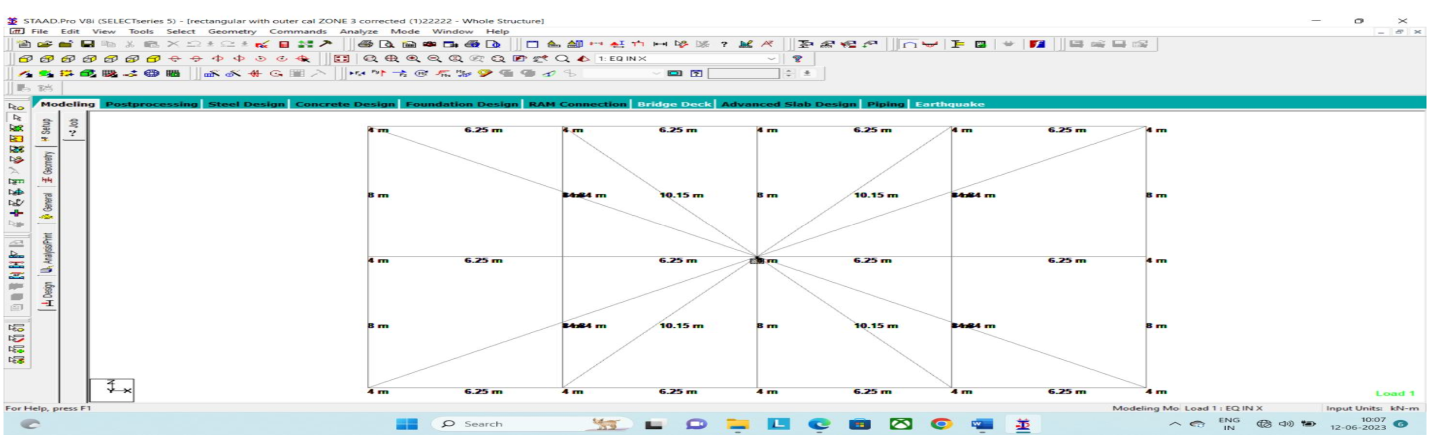

Fig.1 plan of single column rectangular shape building with floating column and without floating column

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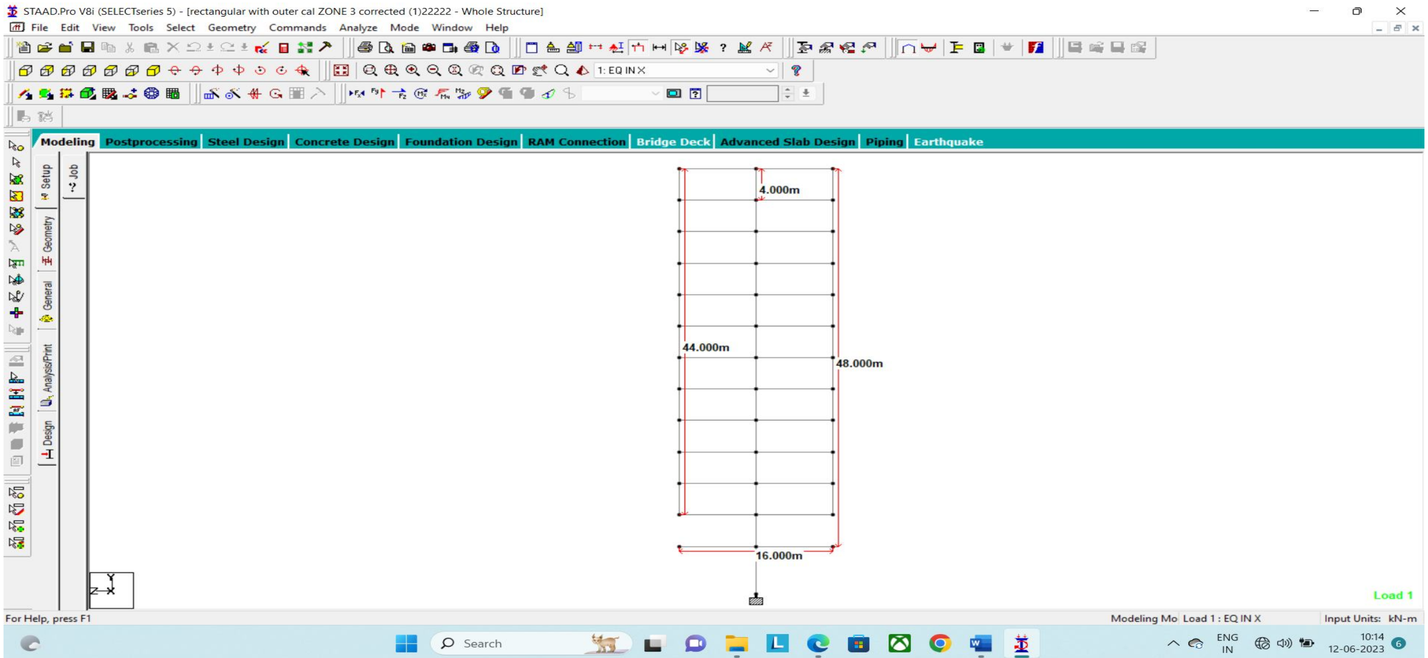

Fig.2 Elevation of single column rectangular shape building with floating column

1) Beam and Column Size

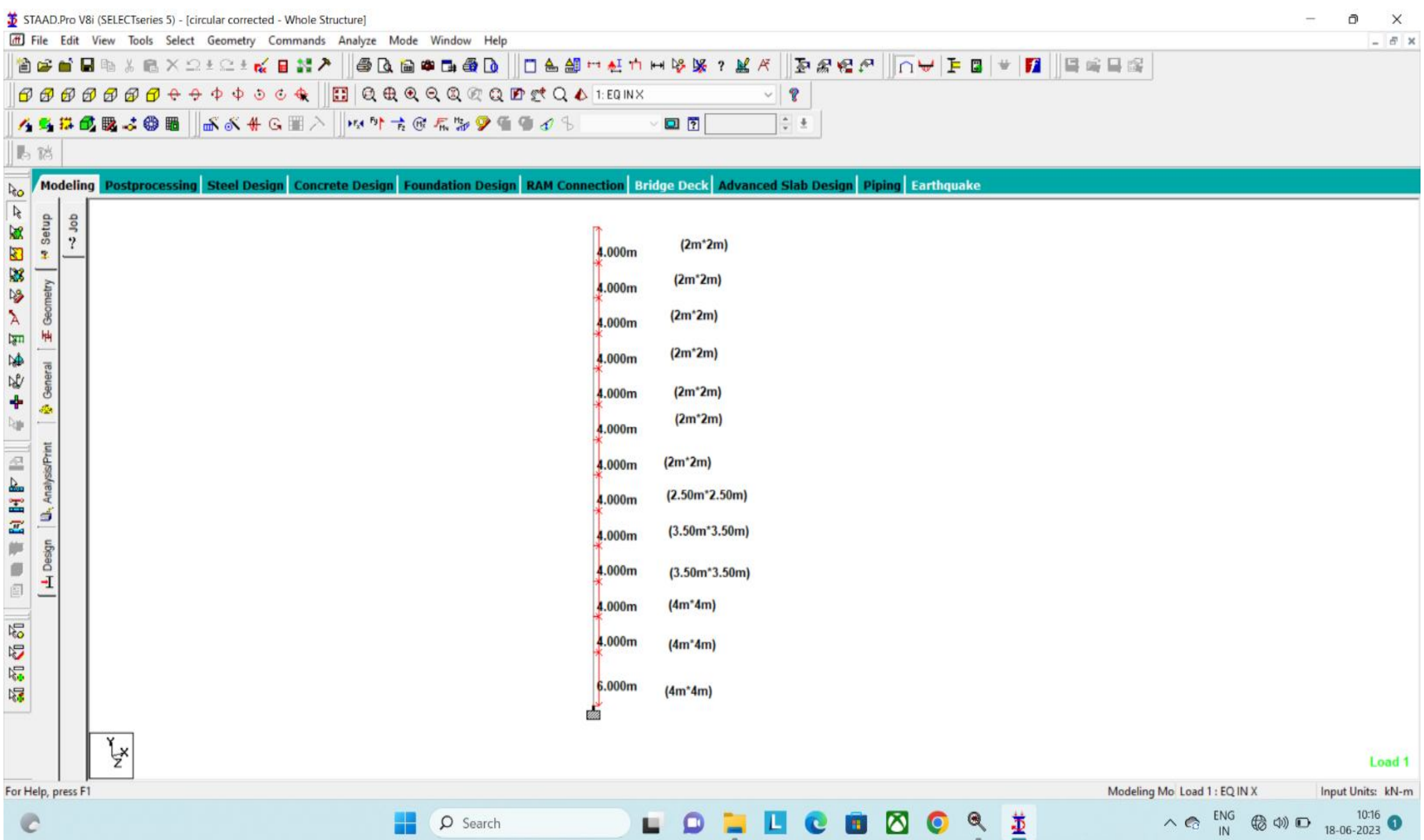

Fig.3 Size of single column (center column)

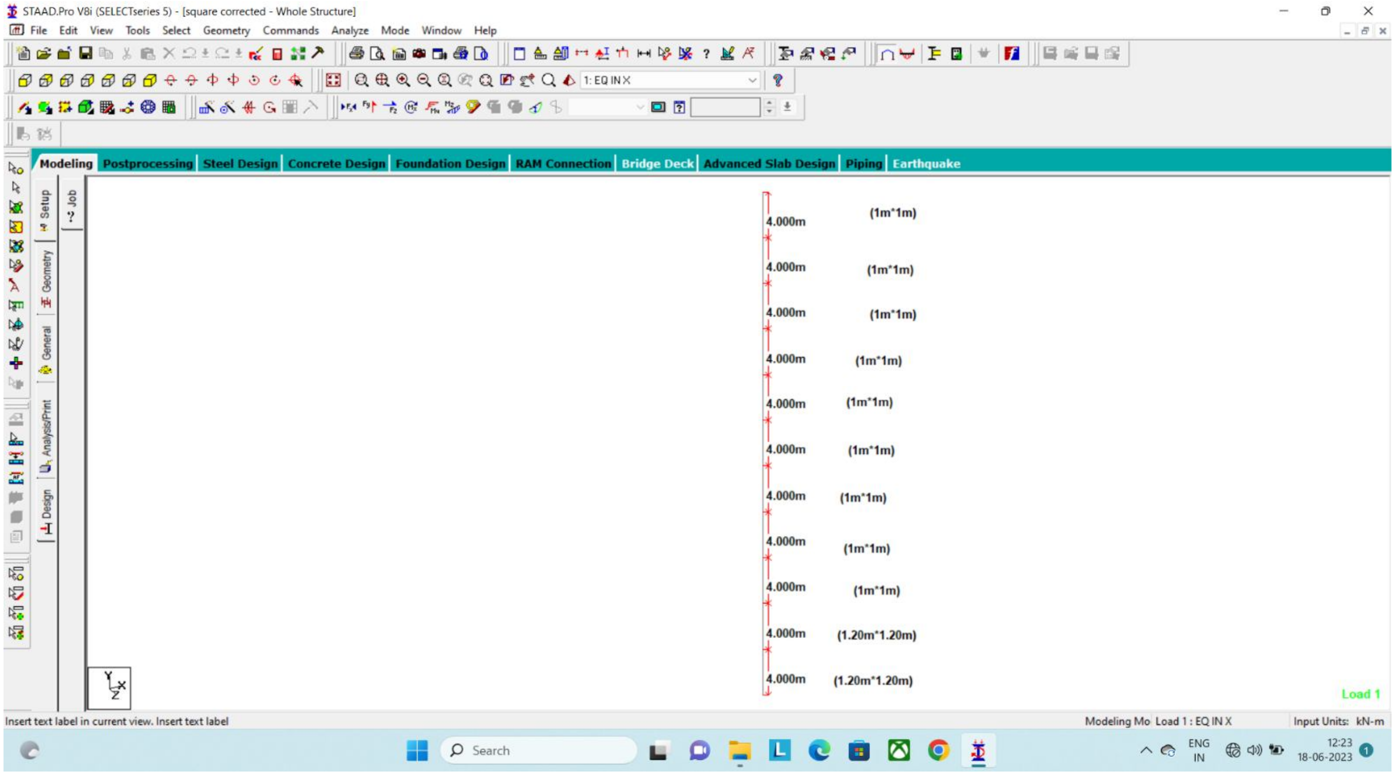

Fig.4 Size of four corner floating column

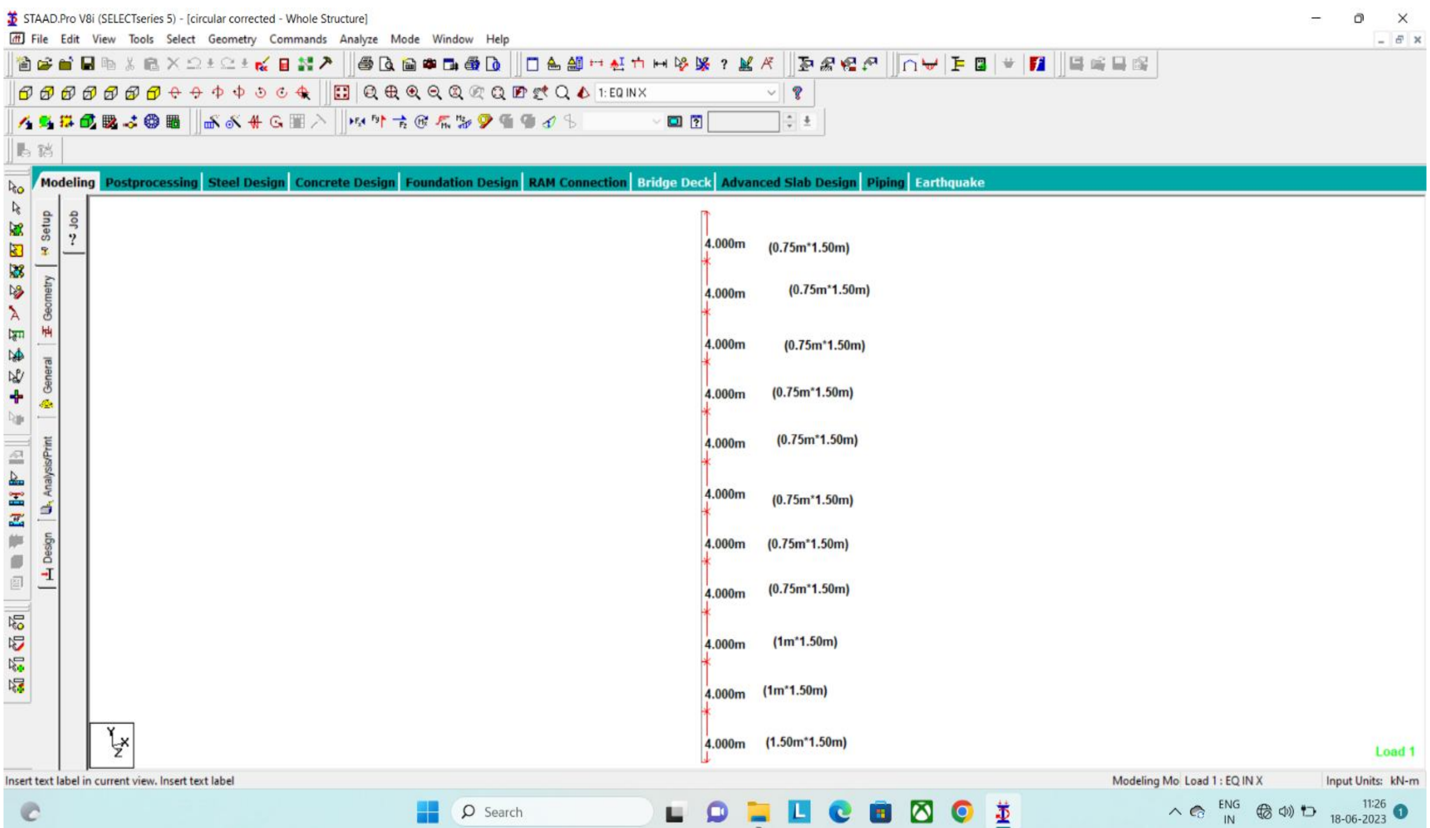

Fig.5 Size of remaining floating column

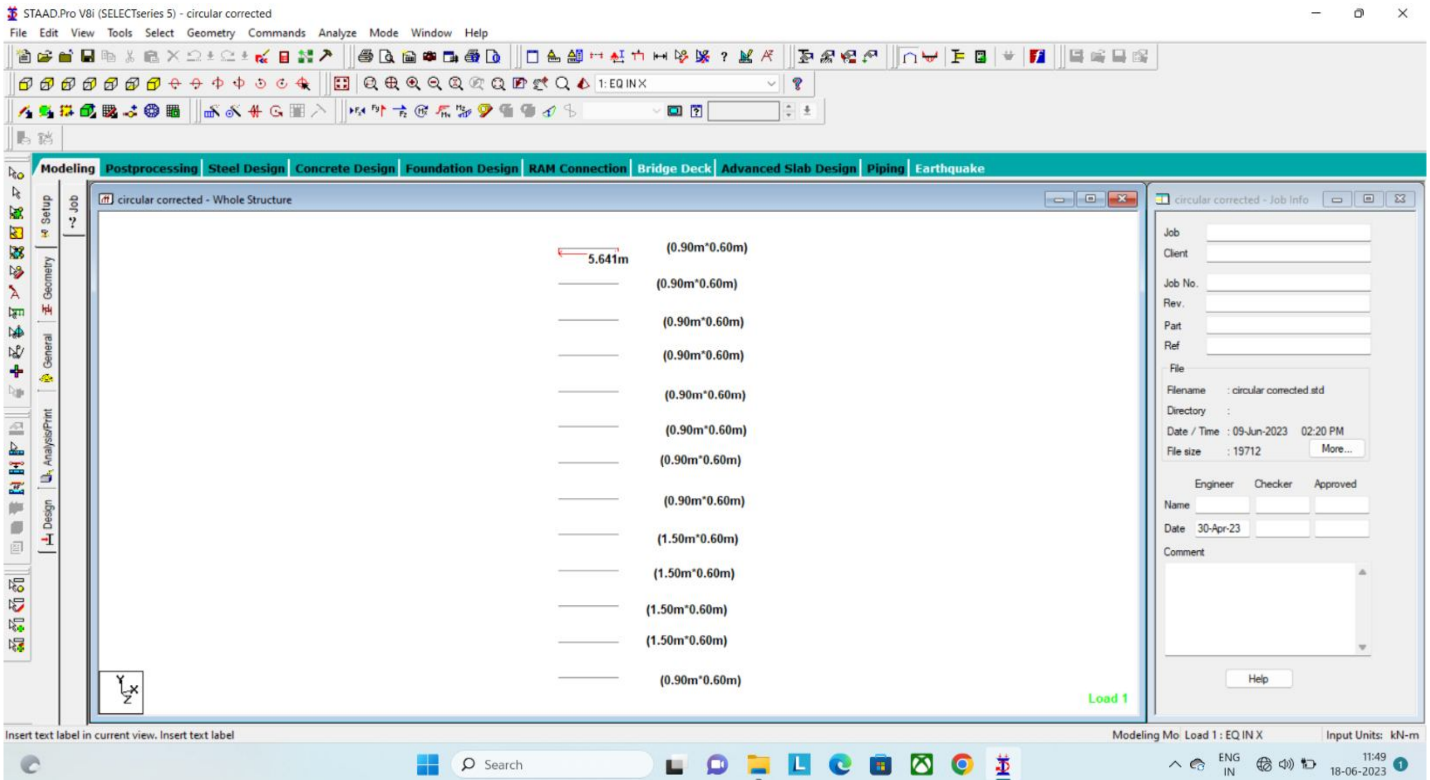

Fig.6 Size of Beam

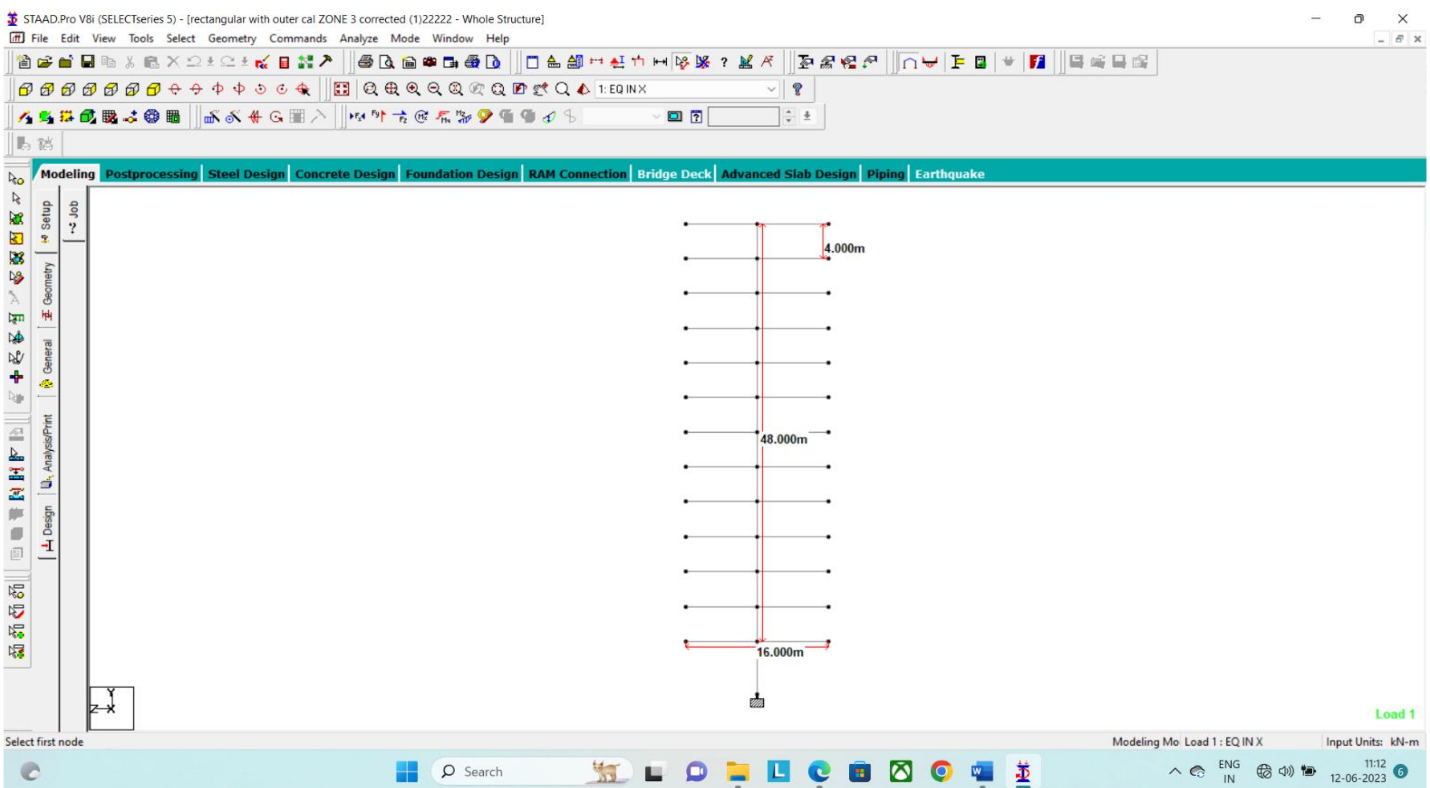

Fig.7 Elevation of single column rectangular shape building without floating column

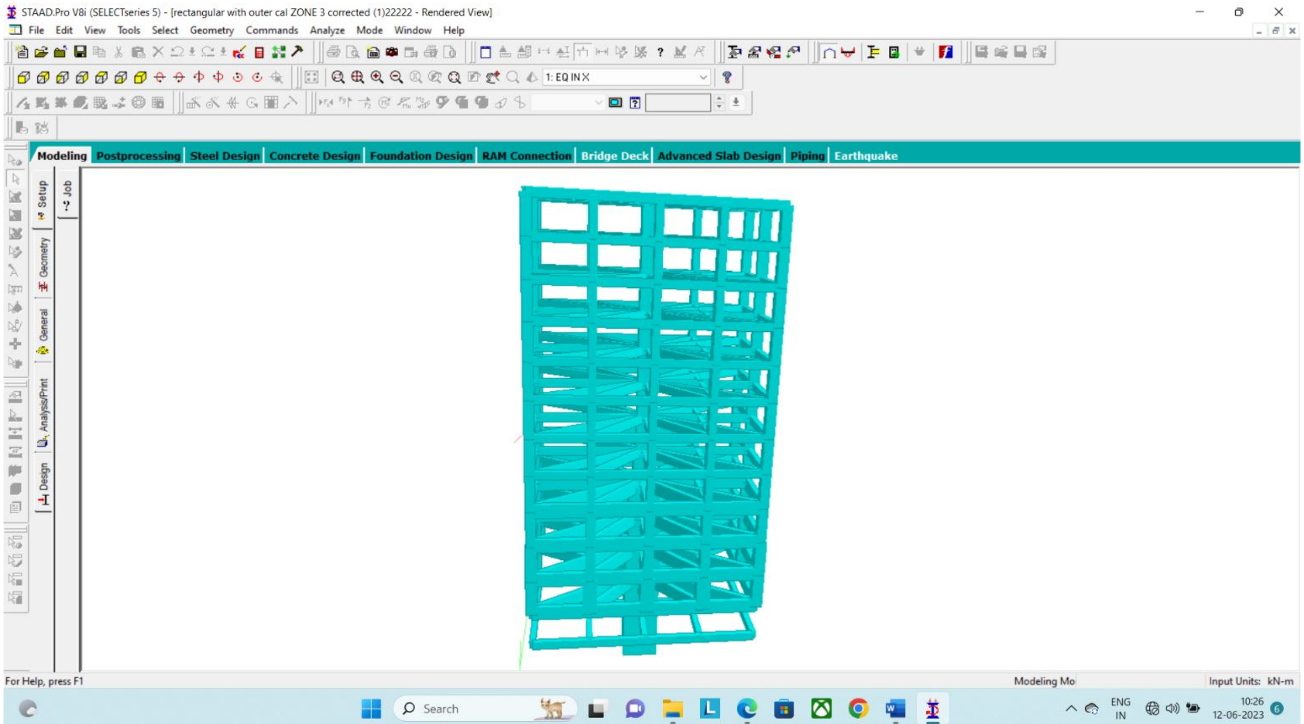

Fig.8 3D Model of single column rectangular shape building with floating column

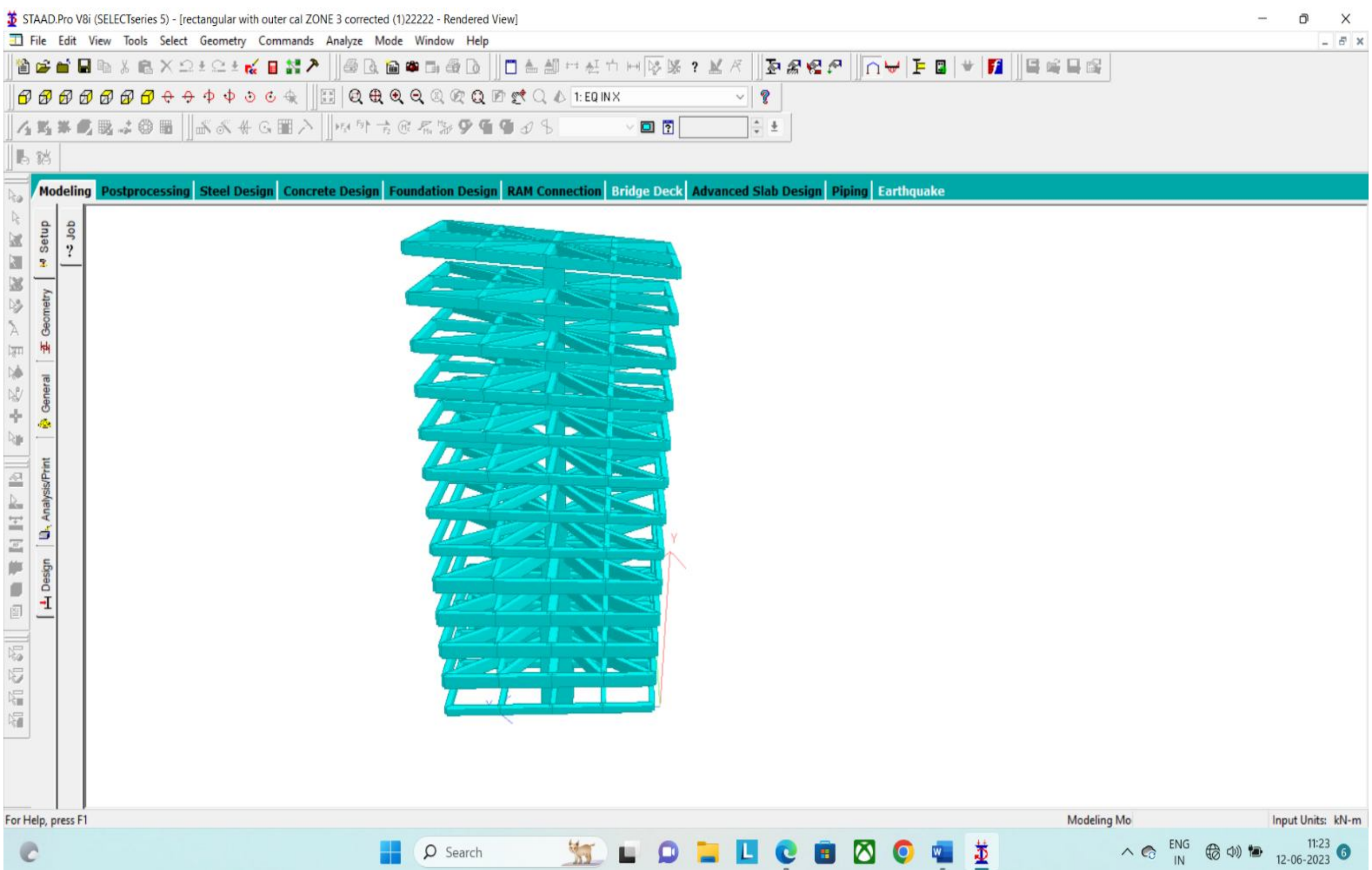

Fig.9 3D Model of single column rectangular shape building without floating column

B. Single Column Circular shape Building with Floating Column and without Floating Column

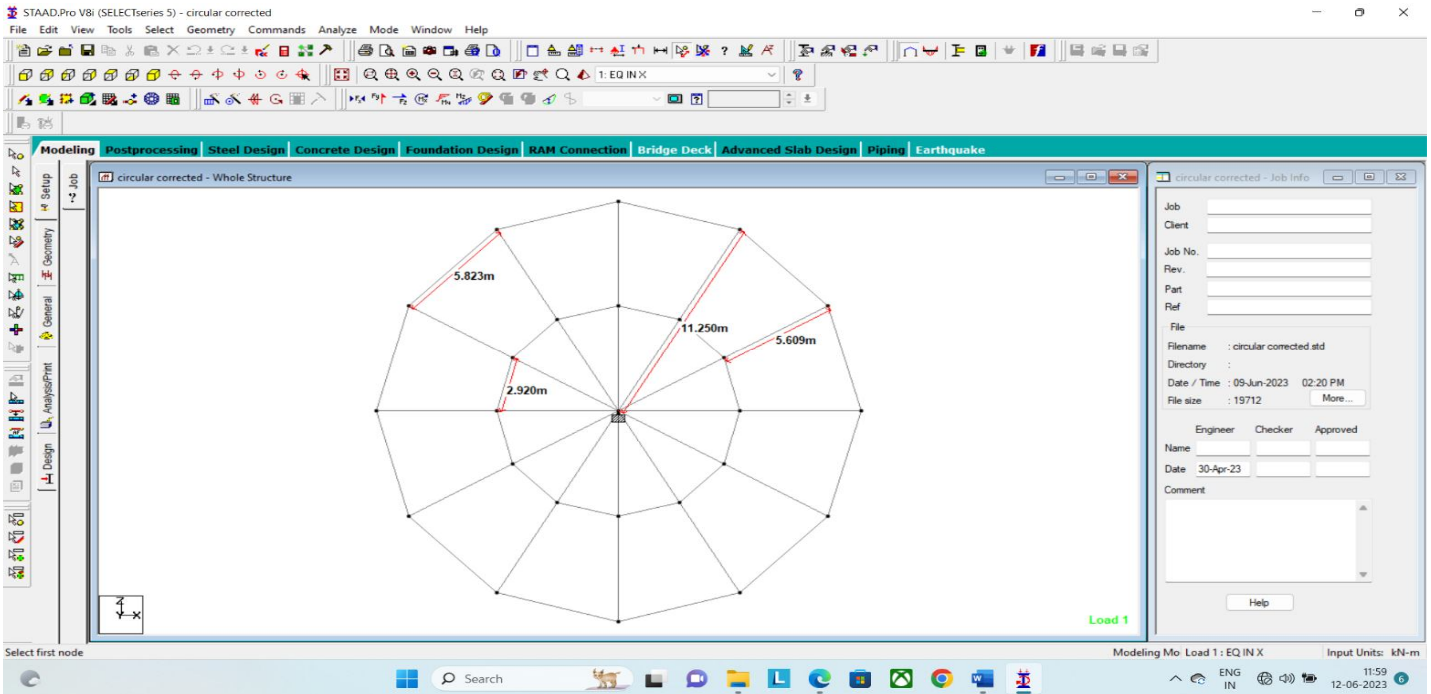

Fig.10 plan of single column circular shape building with floating column and without floating column

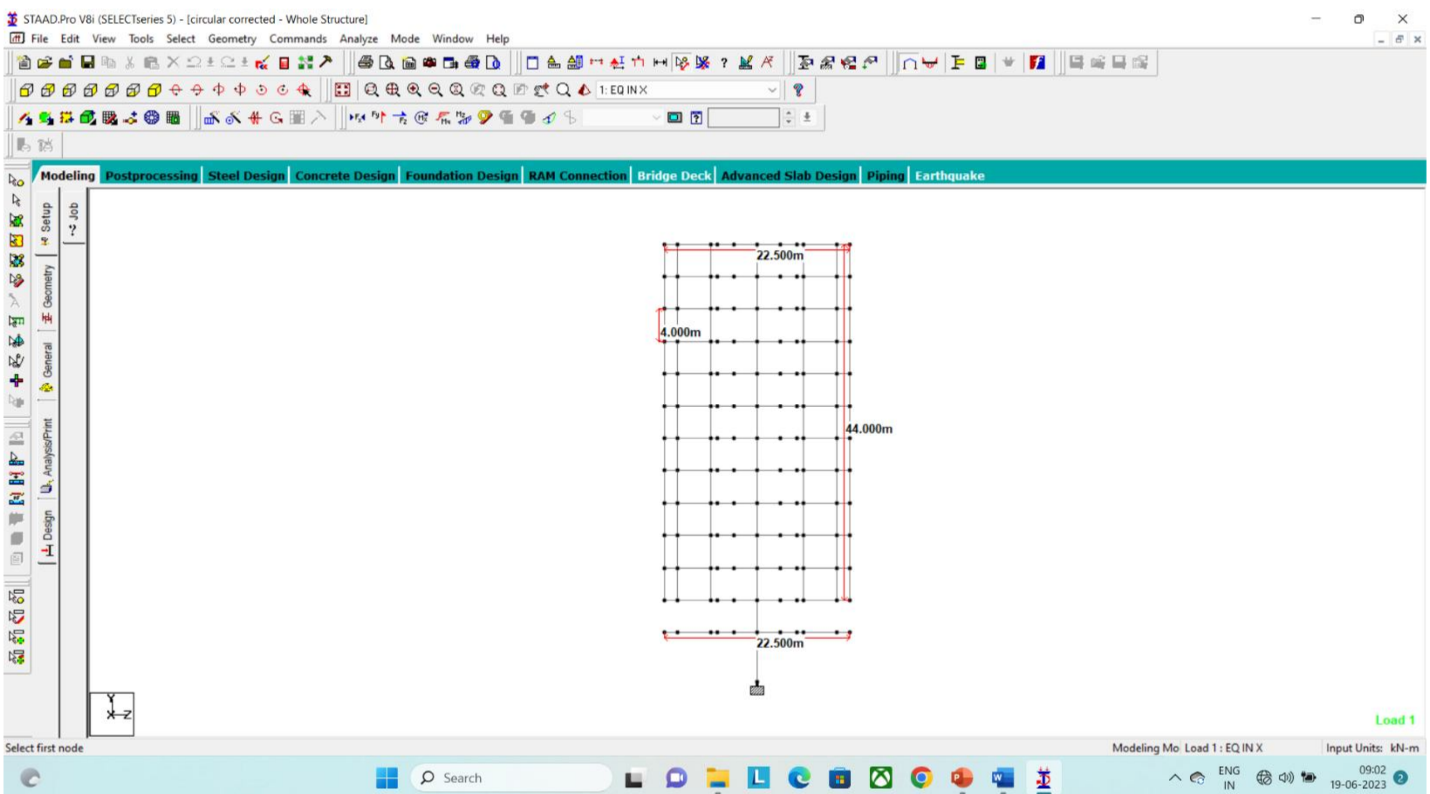

Fig.11 elevation of single column circular shape building with floating column

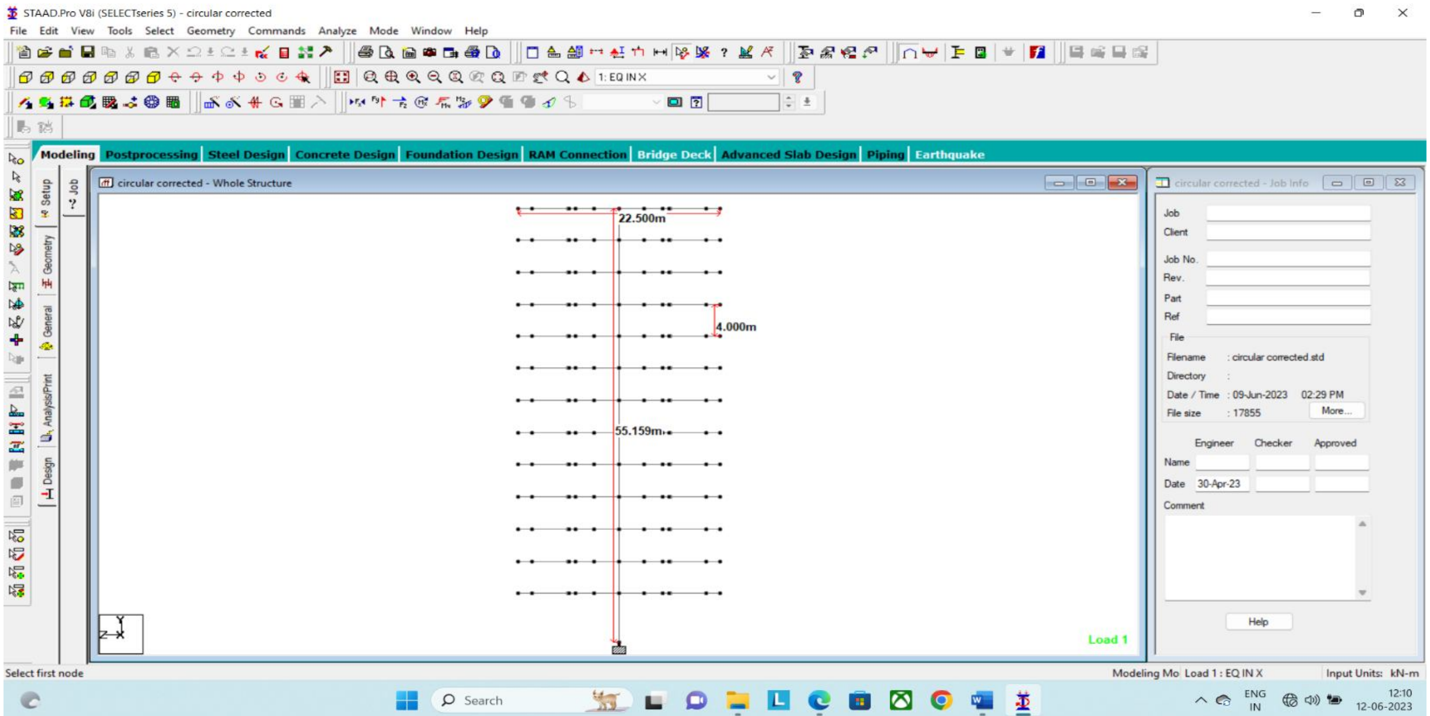

Fig.12 elevation of single column circular shape building without floating column

1) Beam and Column Size

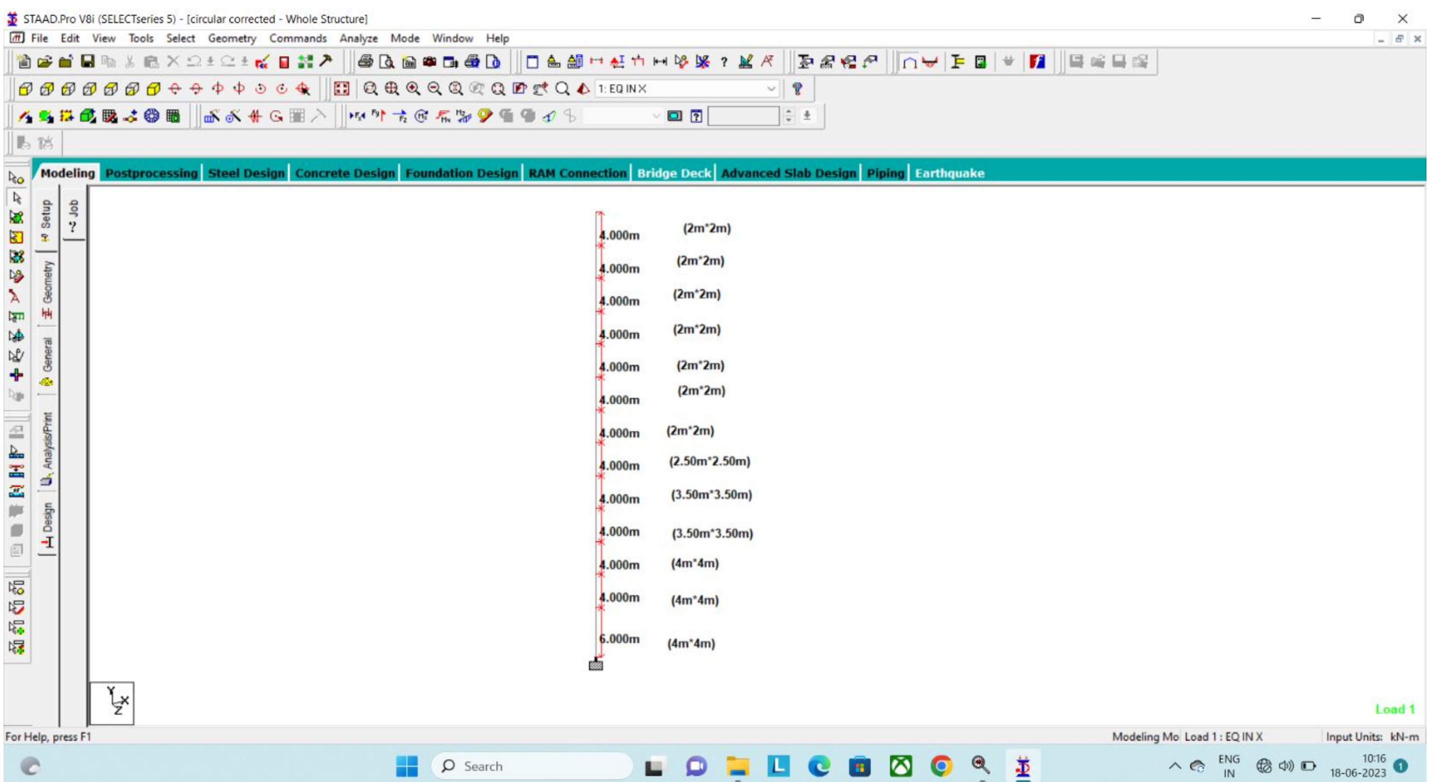

Fig.13 Size of single column (center column)

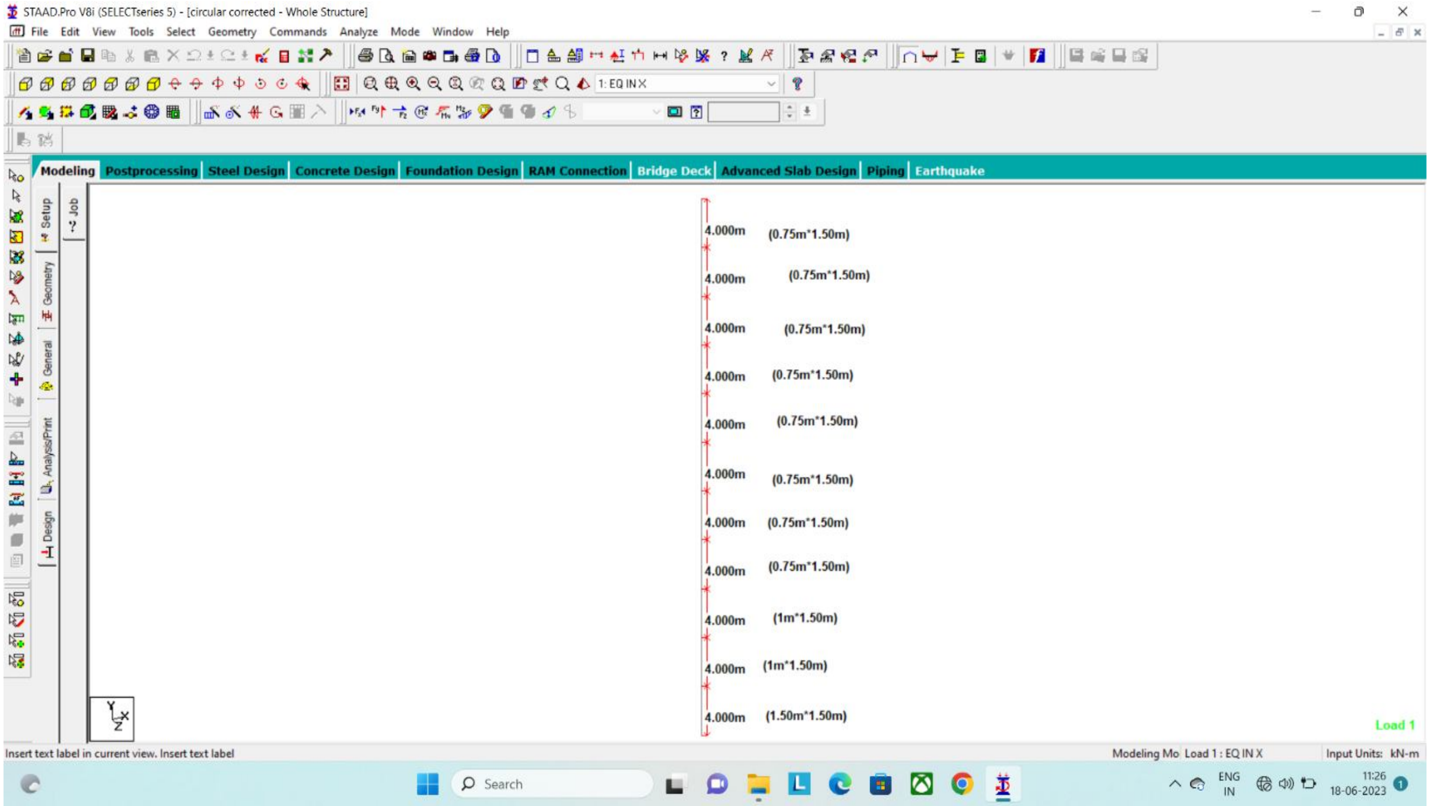

Fig.14 Size of floating column

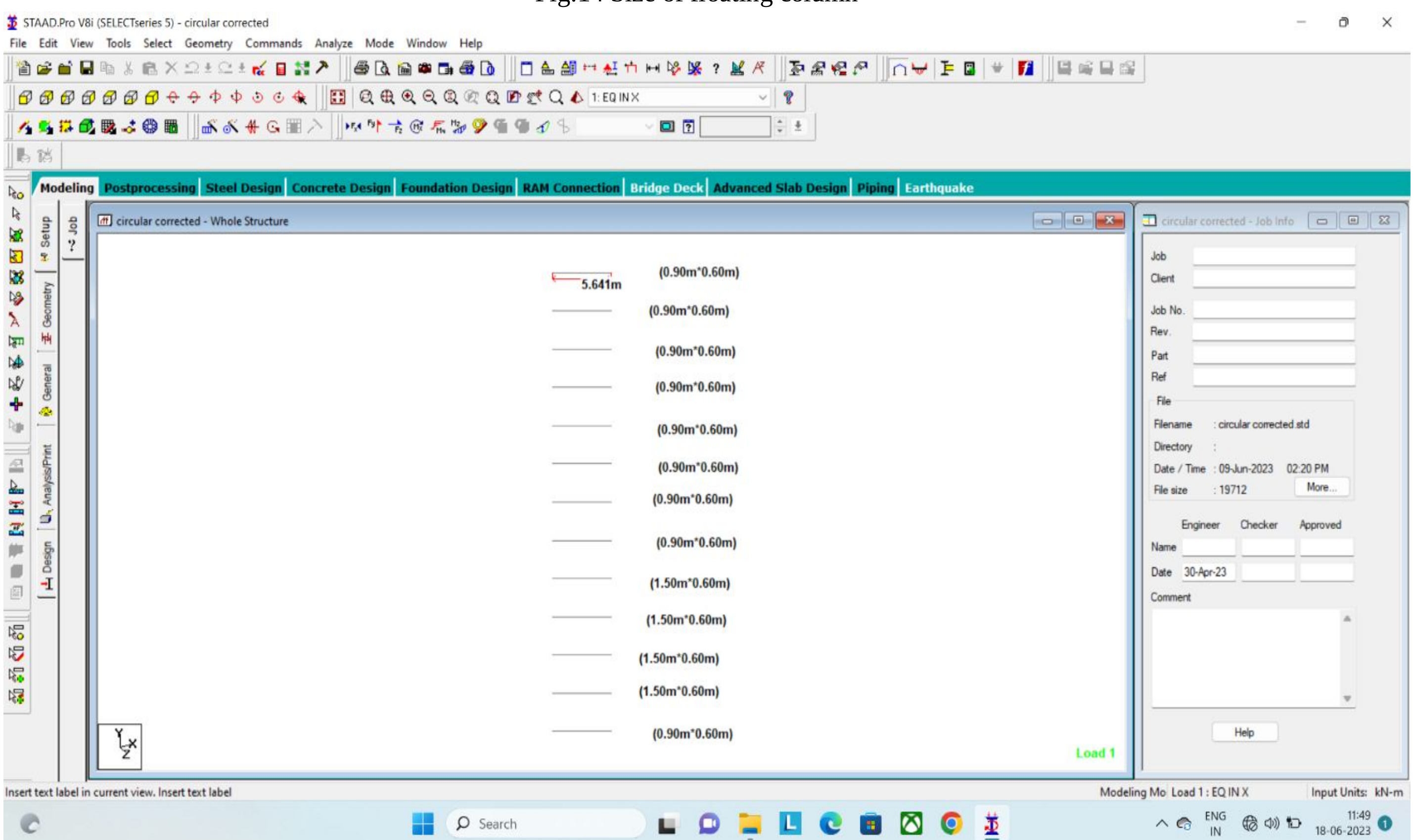

Fig.15 Size of Beam

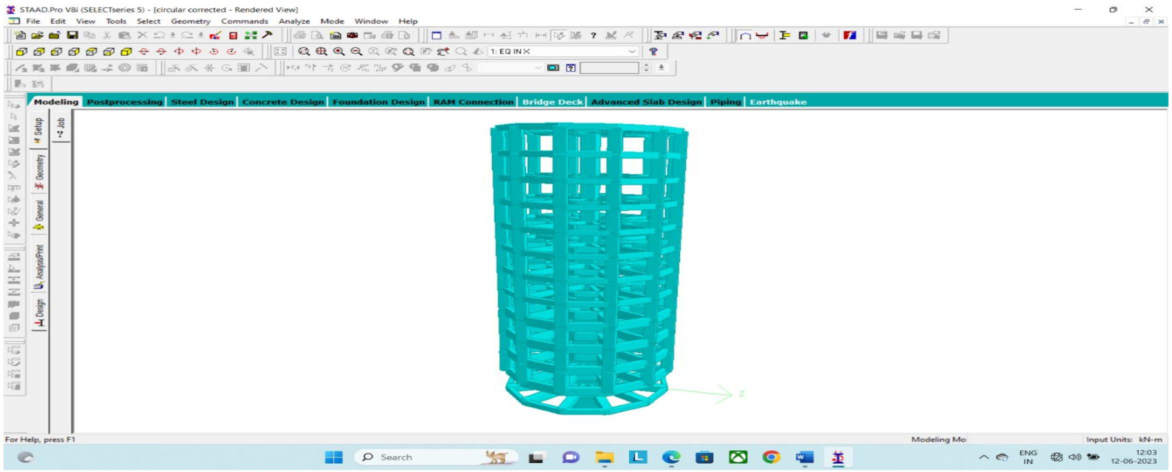

Fig.16 3D plan of single column circular shape building with floating column

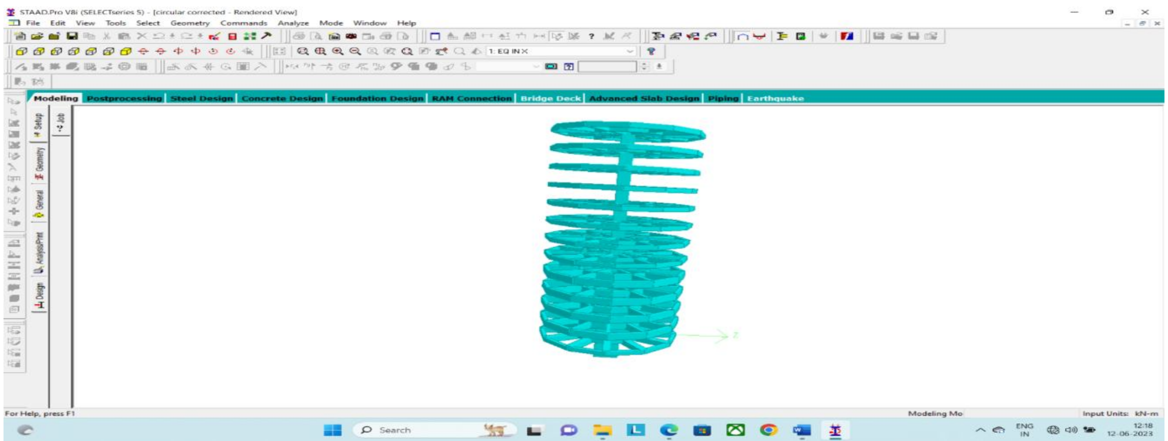

Fig.17 3D model of single column circular shape building without floating column

C. Single Column Square shape Building with Floating Column and without Floating Column

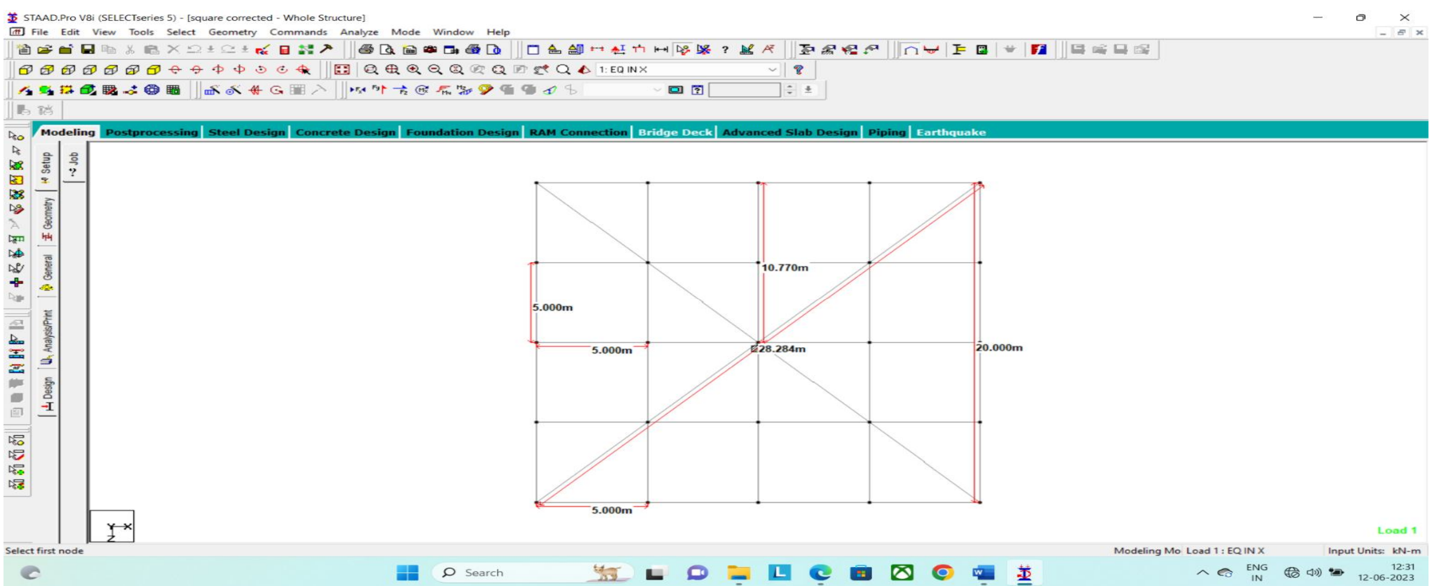

Fig.18 Plan of Single column square shape building with floating column and without floating column

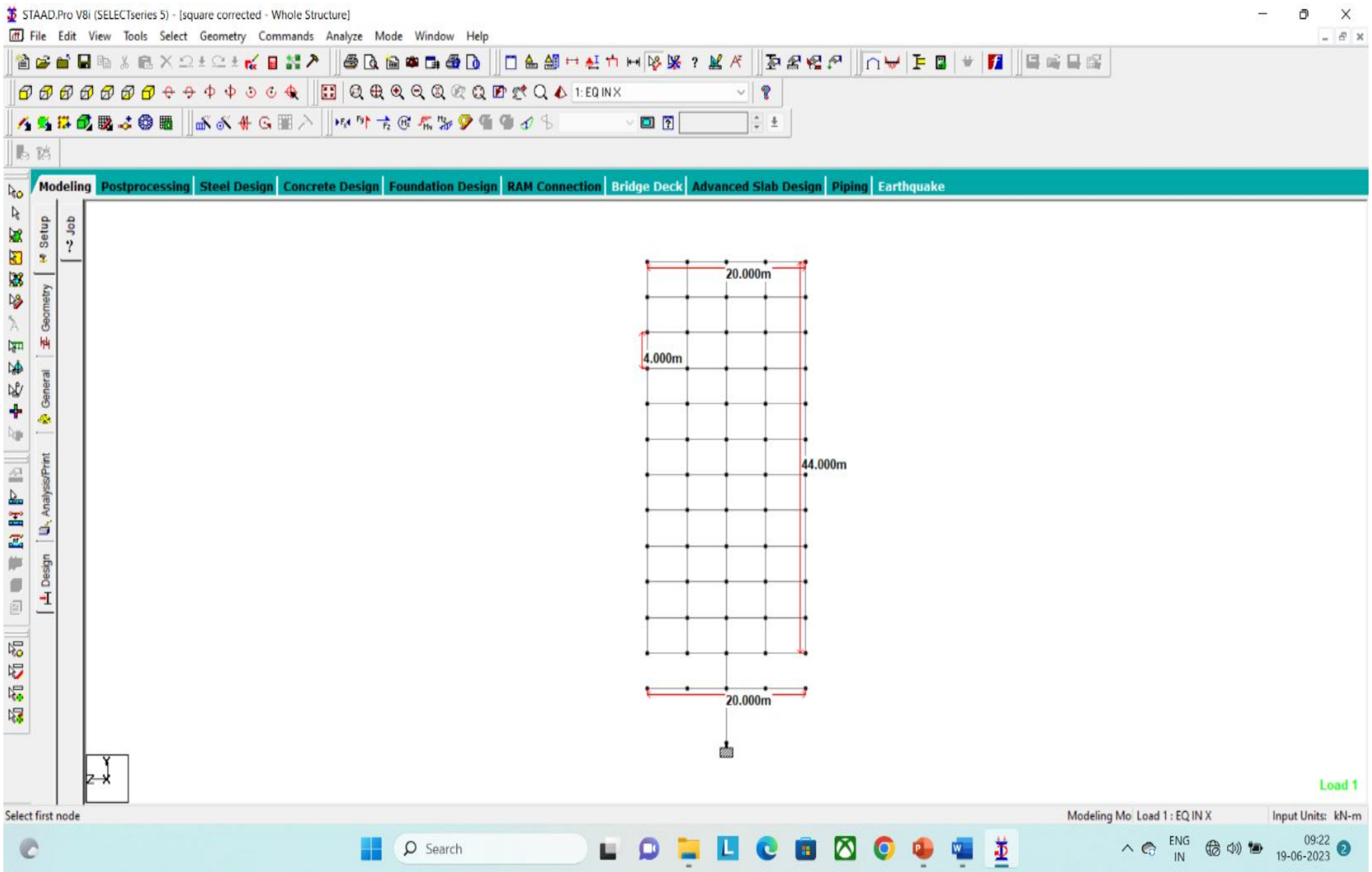

Fig.19 elevation Single column square shape building with floating column

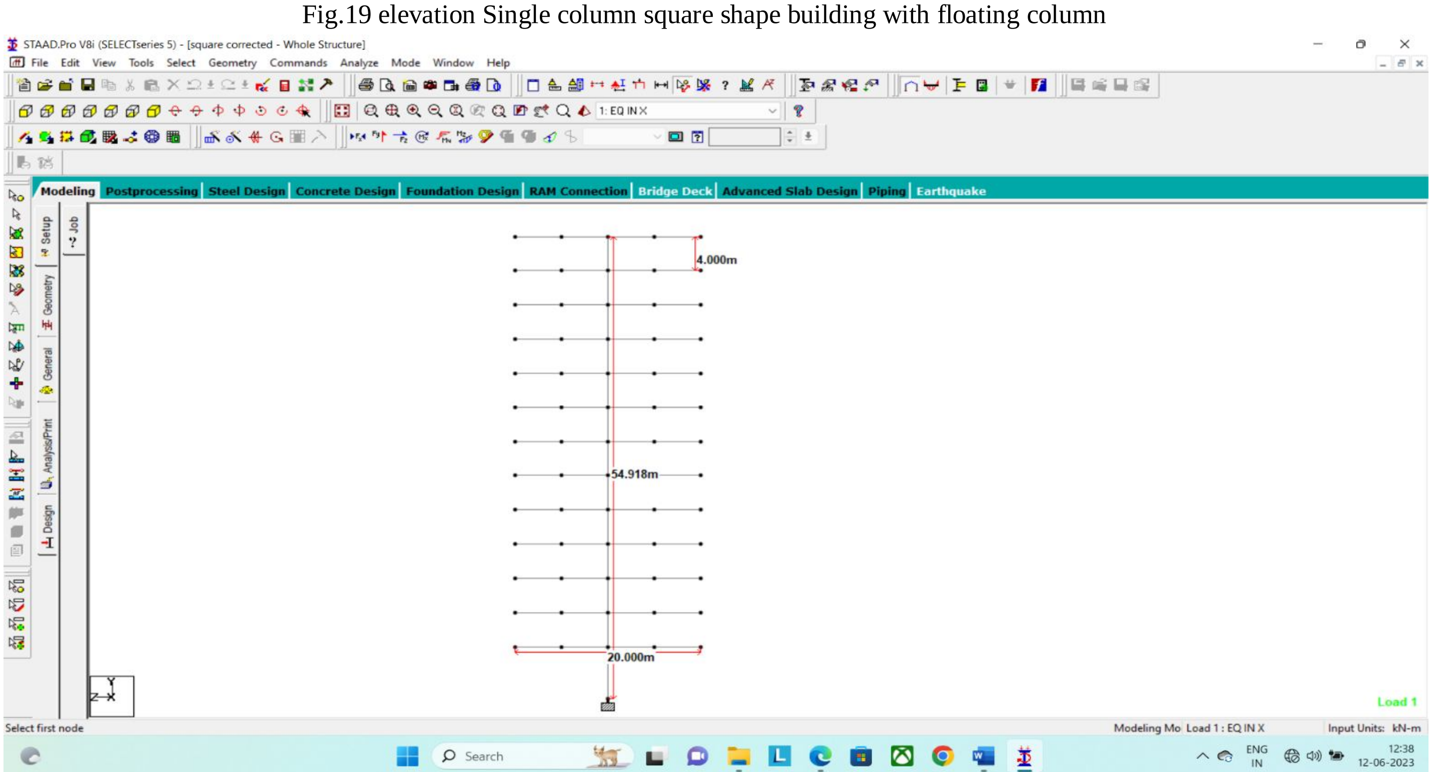

Fig.20 elevation Single column square shape building without floating column

1) Beam and Column Size

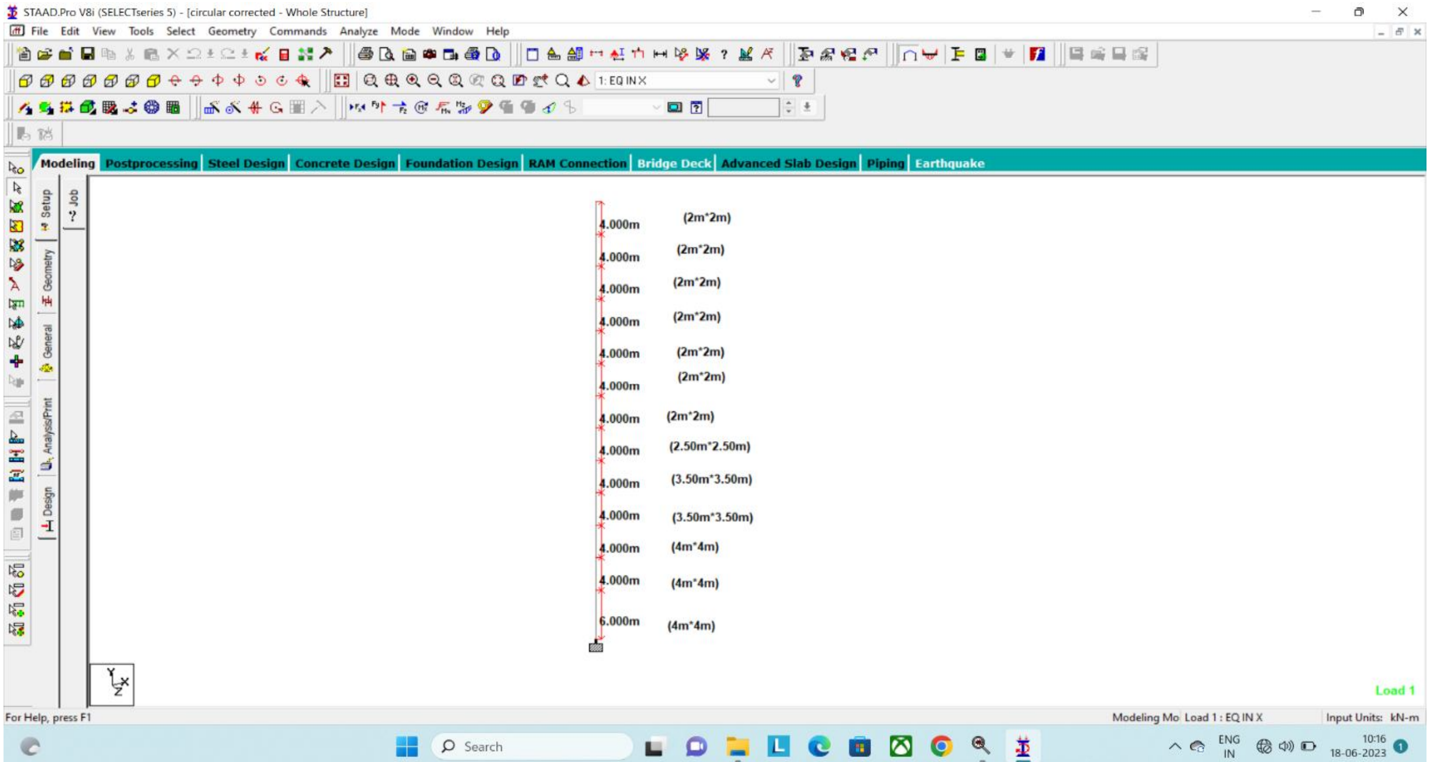

Fig.21 Size of single column (center column)

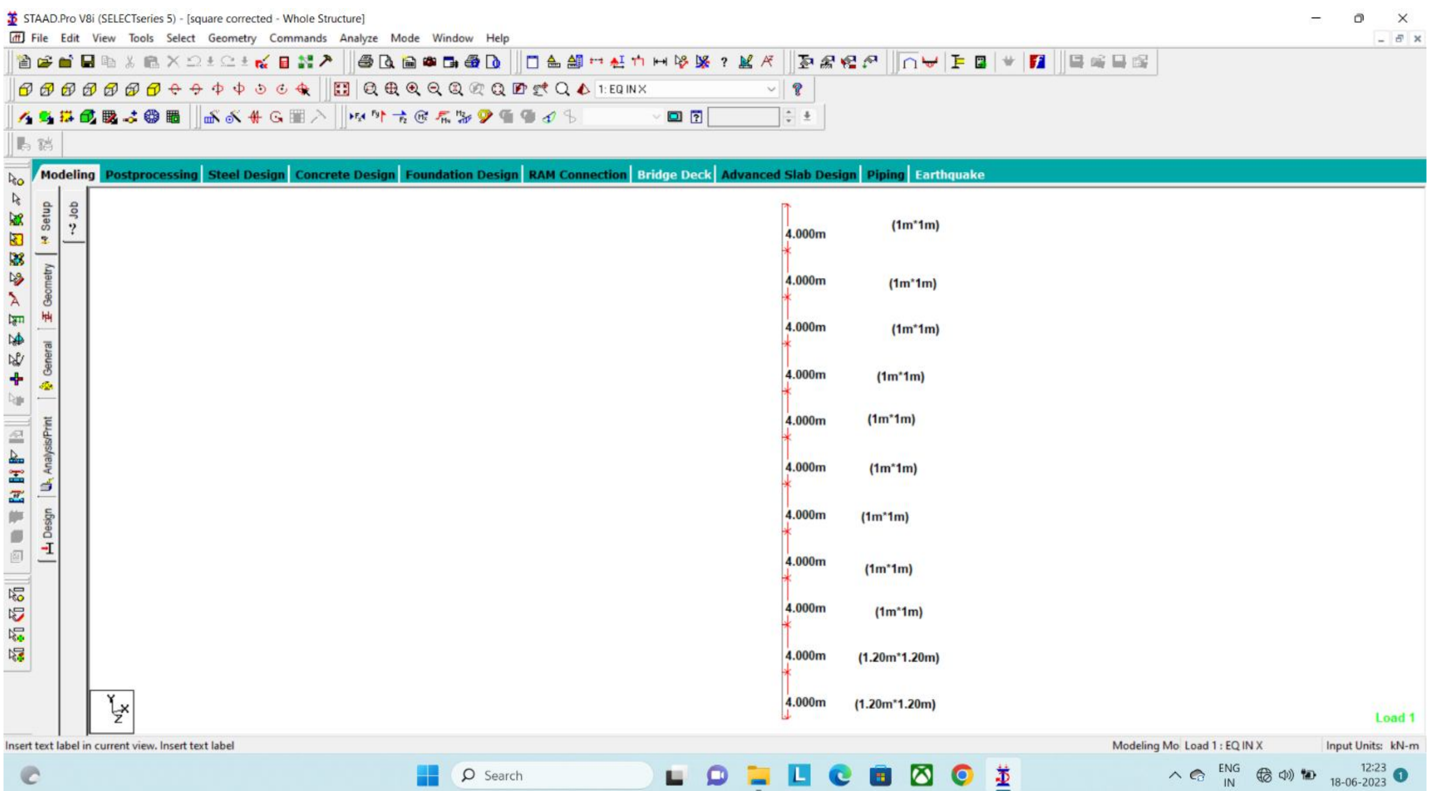

Fig.22 Size of floating column

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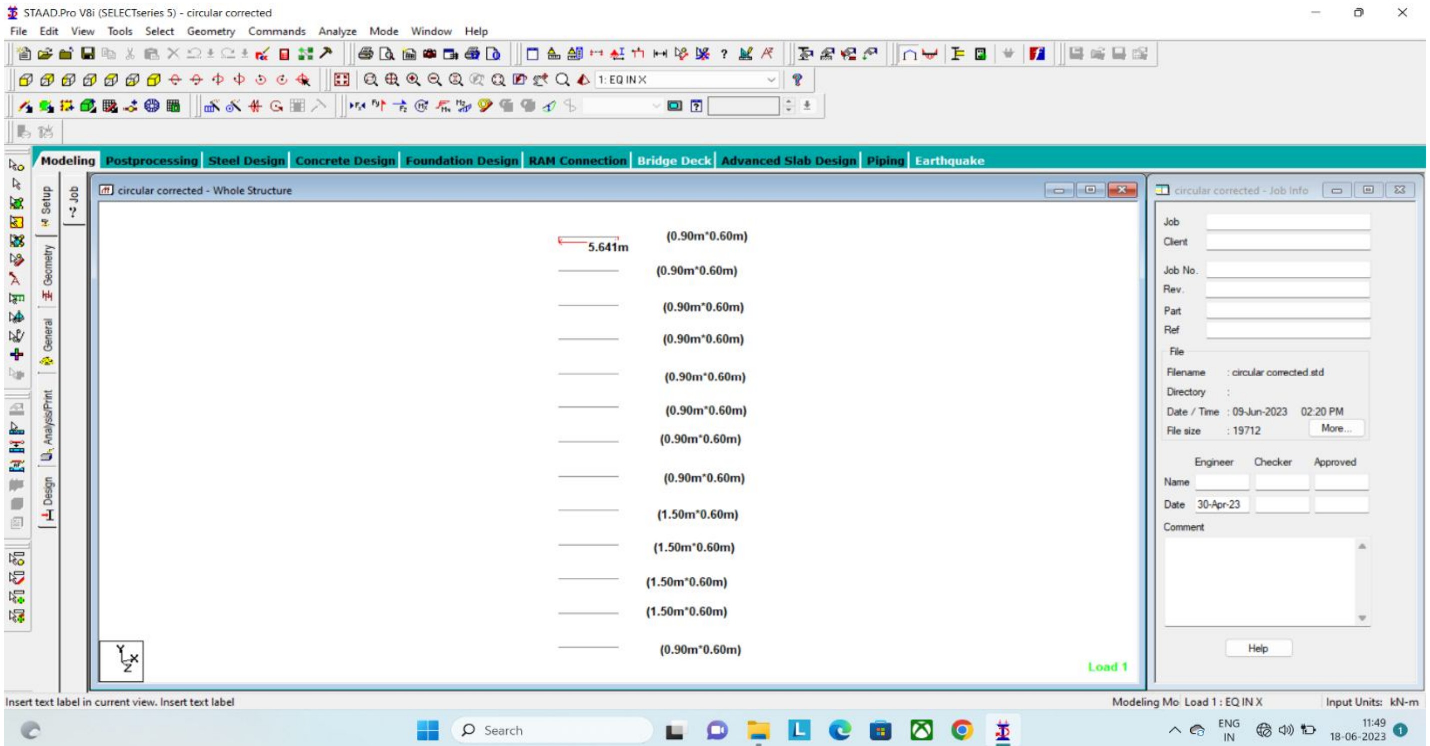

Fig.23 Size of Beam

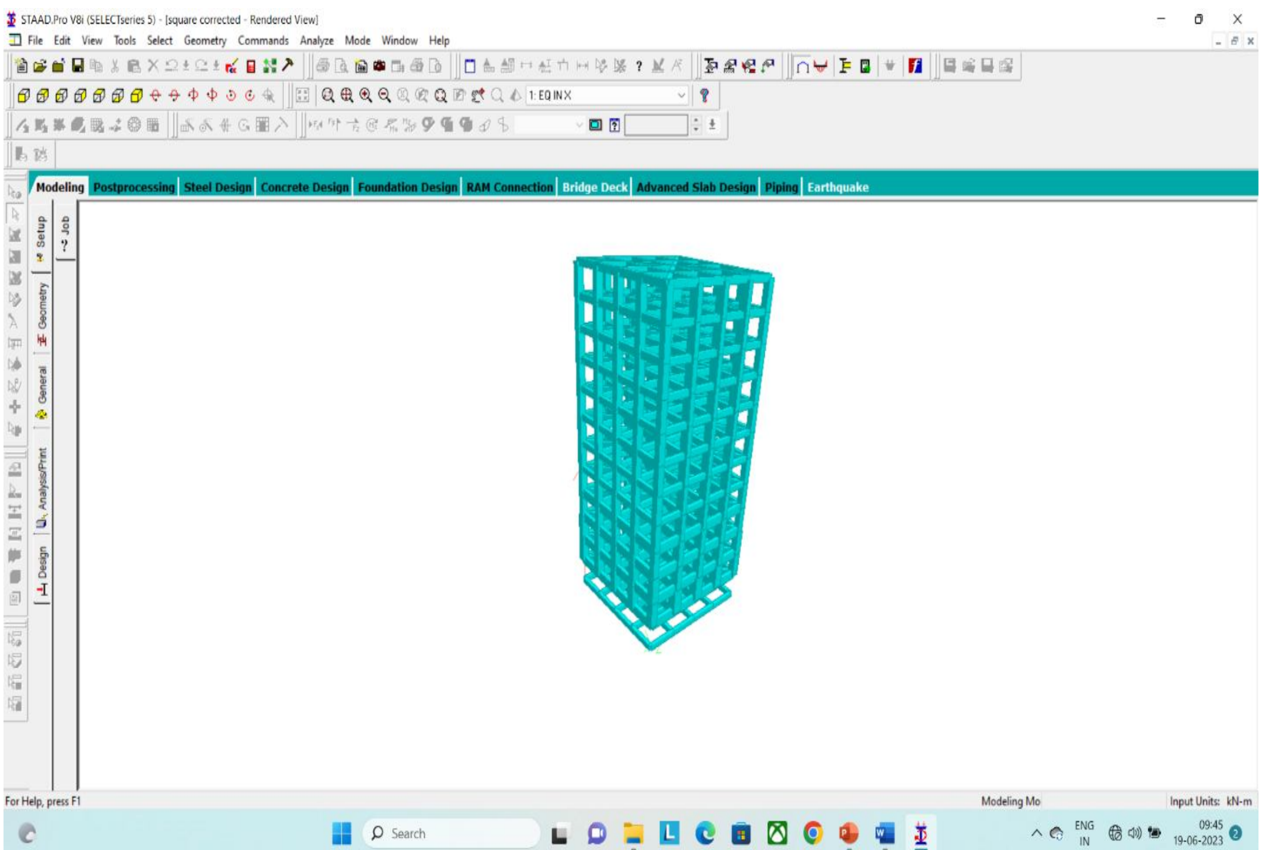

Fig.24 3D view Single column square shape building with floating column

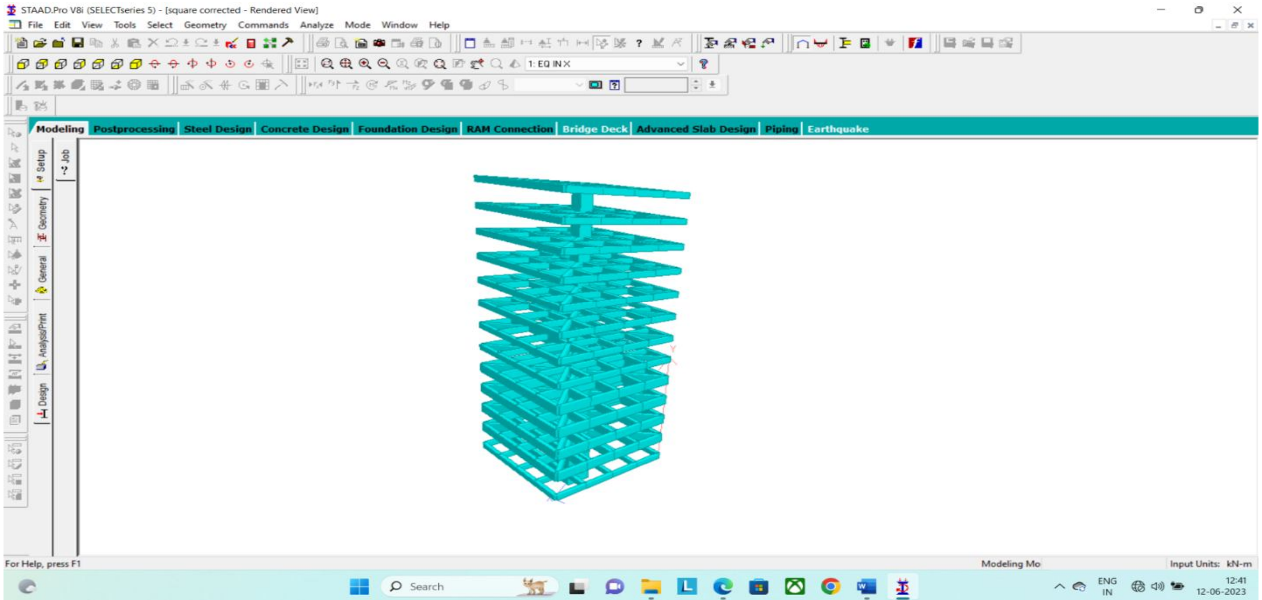

Fig.25 3D view Single column square shape building without floating column

V. RESULT AND DISCUSSION

A G+11 storied RCC structure in seismic zone III is modeled using STAAD pro software and the results are computed.

A. Maximum Lateral Displacement

1) The linear static analysis method had been adopted for seismic analysis in STAAD pro. The table shows maximum lateral displacement in x -direction for all models in seismic zone III:

TABLE I Maximum Lateral Displacement (mm) in x-direction

DISPLACEMENT IN MM IN X DIRECTION		
Building	**with floating column**	**without floating column**
Max displacement	**x**	**X**
rectangular	**255.039**	**1106.593**
square	**177.039**	**572.358**
circular	**171.467**	**544.722**

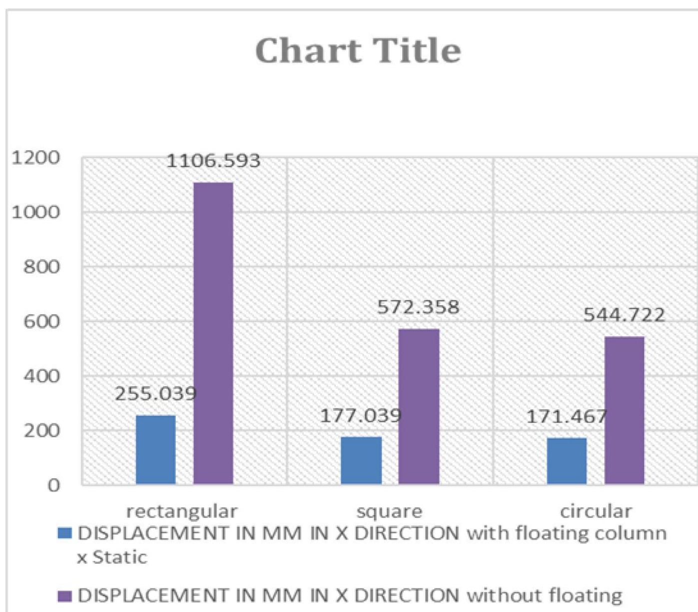

Fig.26 Maximum Lateral Displacement (mm) in x-direction

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2) The linear static analysis method had been adopted for seismic analysis in STAAD pro. The table shows maximum lateral displacement in y -direction for all models in seismic zone III**:**

TABLE II Maximum Lateral Displacement (mm) in y-direction

DISPLACEMENT IN MM IN Y DIRECTION		
Building	**with floating column**	**without floating column**
Max disp	**y**	**y**
rectangular	**19.03**	**324.676**
Square	**0.355**	**109.547**
Circular	**0.737**	**162.119**

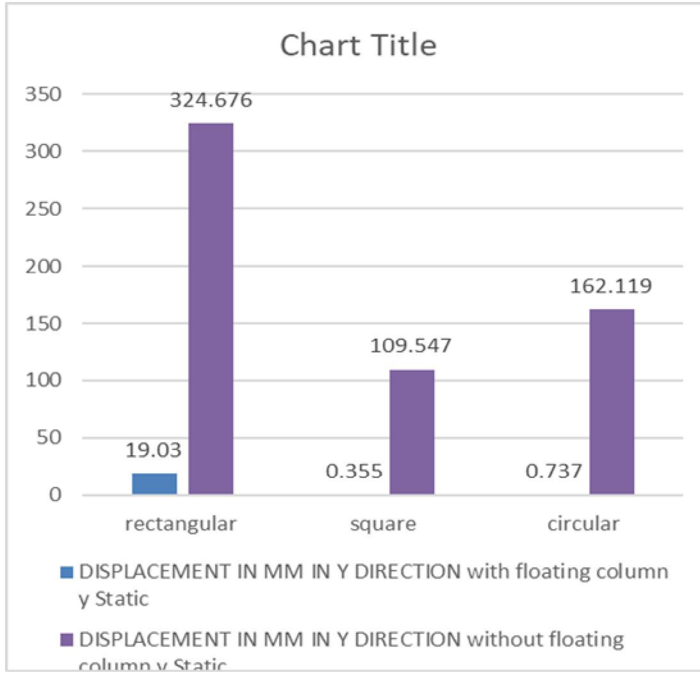

Fig.27 Maximum Lateral Displacement (mm) in y-direction

3) The linear static analysis method had been adopted for seismic analysis in STAAD pro. The table shows maximum lateral displacement in z-direction for all models in seismic zone III:

TABLE III Maximum Lateral Displacement (mm) in z-direction

DISPLACEMENT IN MM IN Z DIRECTION		
Building	**with floating column**	**without floating column**
Max displacement	**z**	**z**
rectangular	**152.676**	**459.122**
square	**190.842**	**572.358**
circular	**162.046**	**543.979**

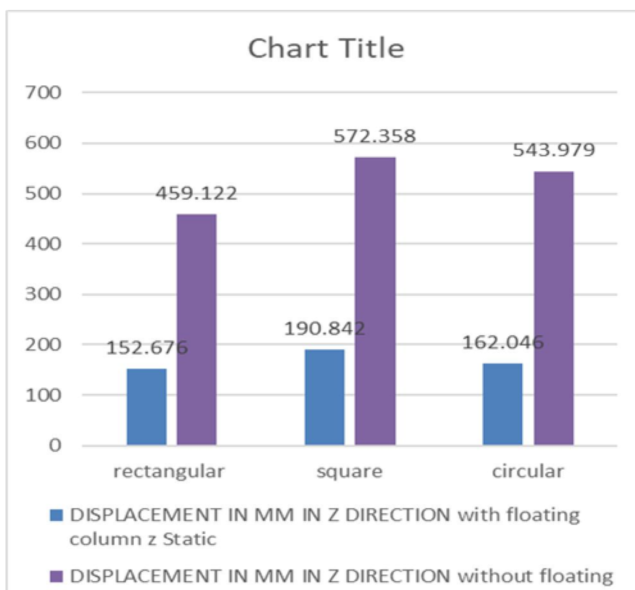

Fig.28 maximum lateral displacement in z-direction

B. Maximum Forces

1) The linear static analysis method has been adopted for seismic analysis in STAAD pro. The table shows shear force for all models.in x direction**:**

TABLE IV Maximum forces in x direction

Maximum forces in x direction		
Building	with floating column	without floating column
	Fx	Fx
rectangular	2996.303	2658.875
square	2980.154	2540.647
circular	2796.695	2416.437

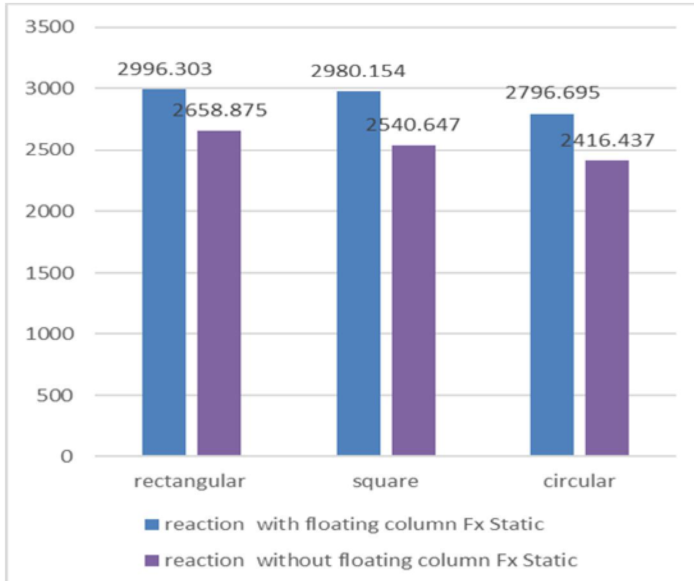

Fig.29 Maximum forces in x direction

2) The linear static analysis method has been adopted for seismic analysis in STAAD pro. The table shows shear force for all models in y direction:

TABLE V Maximum forces in y direction

Maximum forces in y direction		
Building	**with floating column**	**without floating column**
	Fy	**Fy**
rectangular	**205.98141**	**184.52997**
square	**204.90784**	**176.96703**
circular	**190.20561**	**166.03139**

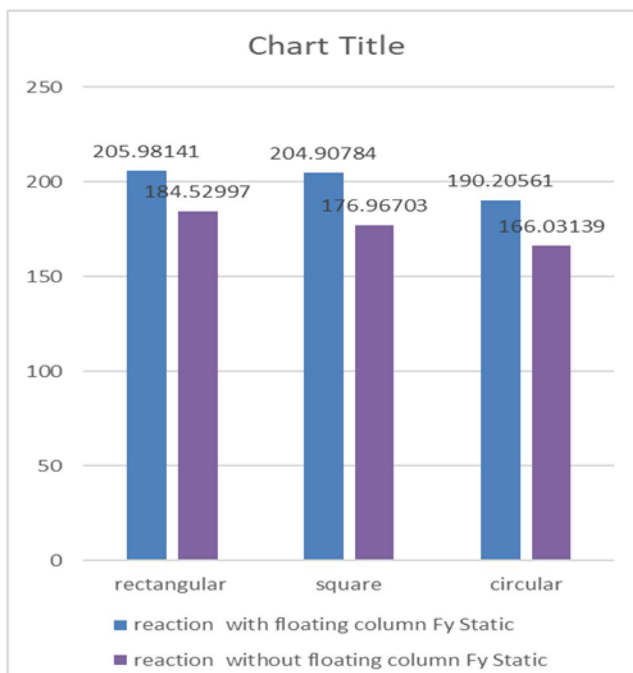

Fig.30 Maximum forces in y direction

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3) The linear static analysis method has been adopted for seismic analysis in STAAD pro. The table shows shear force for all models in z direction:

TABLE VI Maximum forces in z direction

Maximum forces in z direction		
Building	**with floating column**	**without floating column**
	Fz	**Fz**
rectangular	**2996.303**	**2658.875**
square	**2980.154**	**2540.647**
circular	**2796.695**	**2416.437**

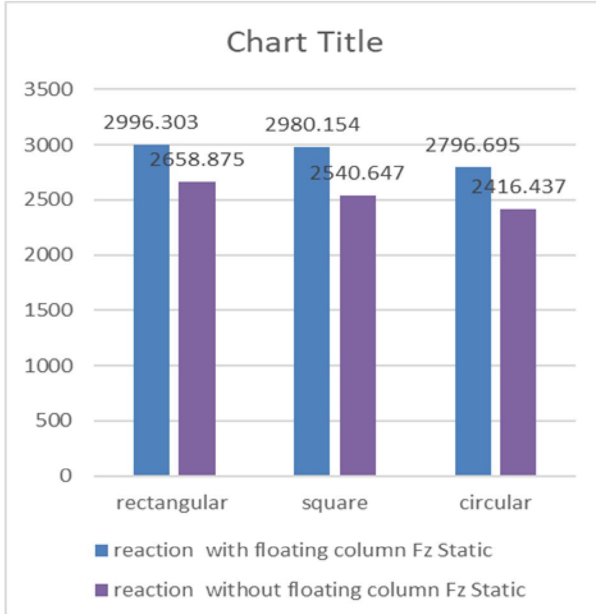

Fig.31 Maximum forces in z direction

C. Maximum Movement in Beam

1) The linear static analysis method has been adopted for seismic analysis in STAAD pro. The table shows movement for all models in x direction

TABLE VII Maximum movement in x direction.

Movement in Beam		
Building	**with floating column**	**without floating column**
	mx	**mx**
rectangular	**141.17333**	**127.6002**
square	**112.0401**	**104.3664**
circular	**114.46442**	**99.2**

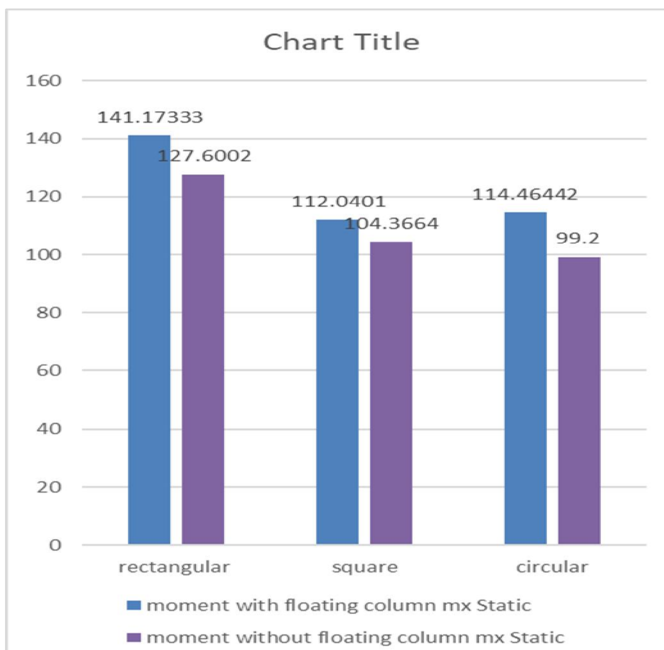

Fig.32 Maximum movement in x direction

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2) The linear static analysis method has been adopted for seismic analysis in STAAD pro. The table shows movement for all models in y direction

TABLE VIII Maximum movement in y direction.

Movement in Beam		
Building	with floating column	without floating column
	my	my
rectangular	1479.754	1487.047
square	119.59	0
circular	0	0

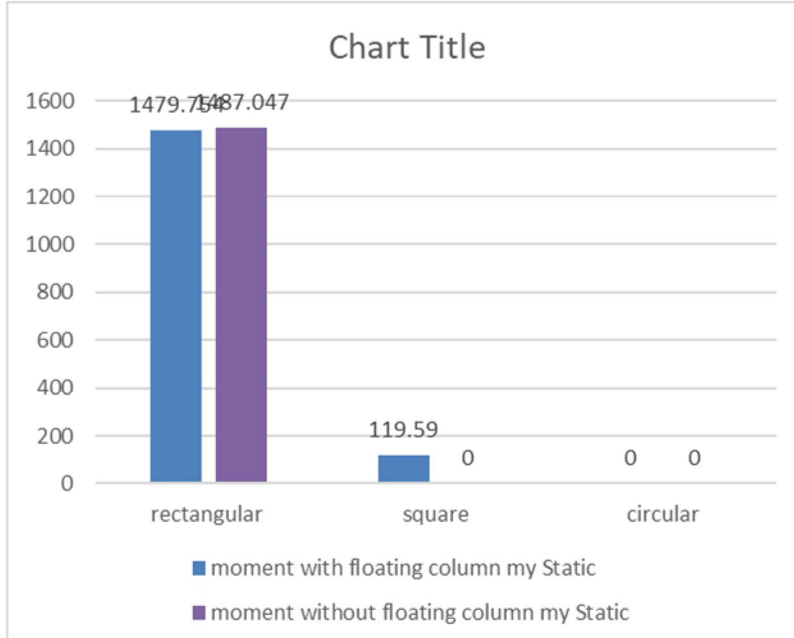

Fig.33 Maximum movement in y direction.

3) The linear static analysis method has been adopted for seismic analysis in STAAD pro. The table shows movement for all models in z direction

TABLE IX Maximum movement in z direction.

Movement in Beam		
Building	**with floating column**	**without floating column**
	mz	**mz**
rectangular	**169.52017**	**155.94705**
square	**122.11461**	**104.36641**
circular	**114.46442**	**99.2**

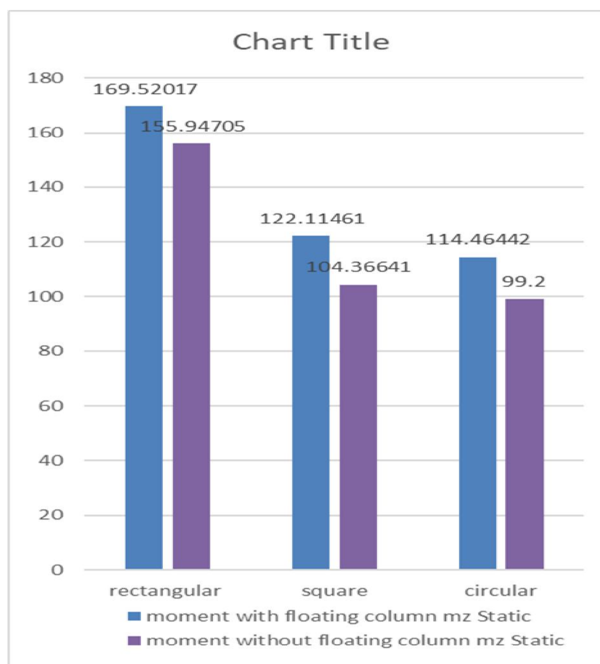

Fig.34 Maximum movement in z direction

D. Peak Storey Shear

1) Storey shear in x direction (building with floating column):

TABLE X Storey shear in x direction (building with floating column)

	PEAK STOREY SHEAR			
STOREY	LEVELS IN METER	RECTANGULAR	SQUARE	CIRCULAR
		X	X	X
13	48	279.47	263.68	241.48
12	44	513.4	493.68	453.58
11	40	637	620.27	559.25
10	36	655.7	644.4	585.47
9	32	597.92	587.03	522.2
8	28	516.63	496.75	433.88
7	24	482.14	450.02	396.49
6	20	546.88	512.39	458.06
5	16	741.56	711.96	621.99
4	12	984.89	963.05	820.17
3	8	1218.42	1212.72	1014.3
2	4	1408.42	1417.51	1180.65
1	0	1450.19	1476.92	1229.07
BASE	-6	1450.19	1476.92	1229.07

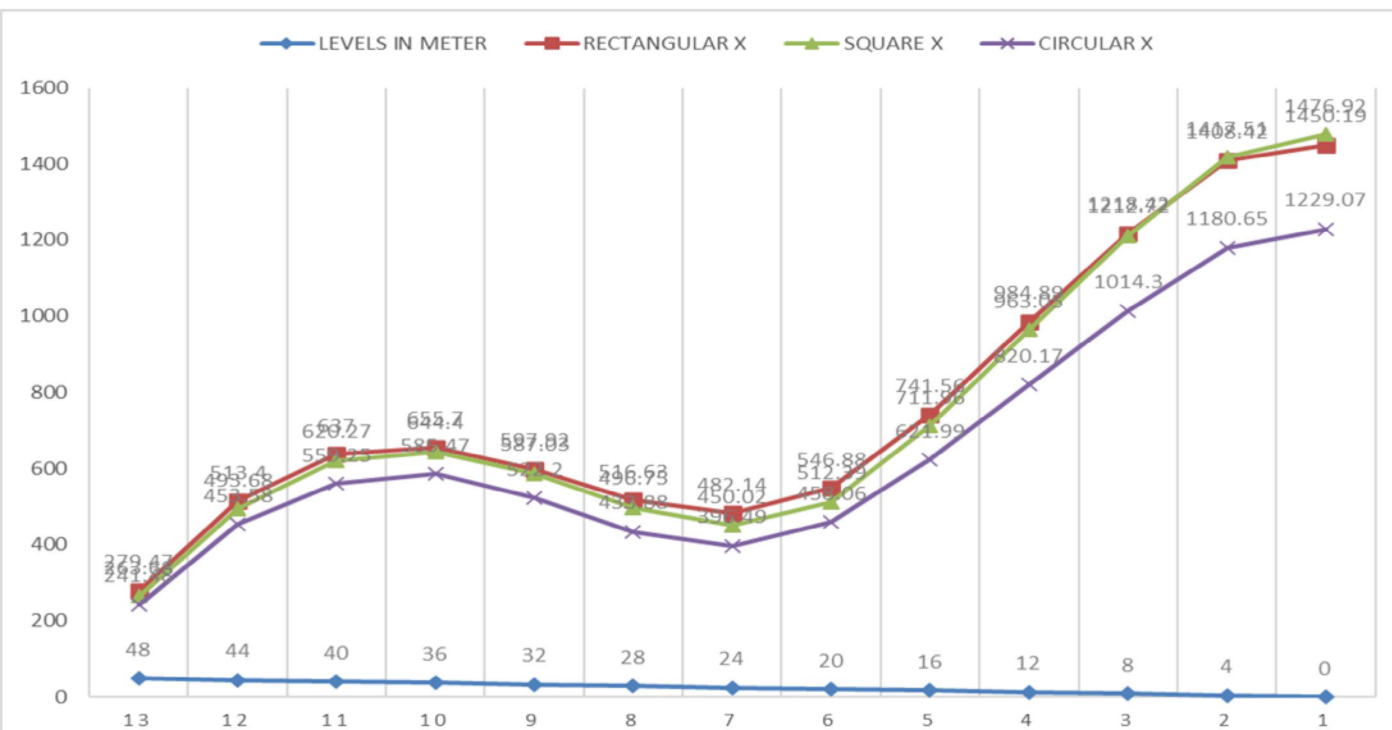

Fig.35 Storey shear in x direction (building with floating column)

2) Storey shear in z direction (building with floating column)

TABLE XI Storey shear in z direction (building with floating column)

	PEAK STOREY SHEAR			
STOREY	LEVELS IN METER	RECTANGULAR	SQUARE	CIRCULAR
		Z	Z	Z
13	48	271.96	262.75	245.53
12	44	509.2	490.99	459.2
11	40	637.76	616.56	572.67
10	36	658.16	642.11	594.36
9	32	593.12	586.98	546.5
8	28	495.47	497.41	470.51
7	24	443.01	450.03	431.04
6	20	495.42	513.62	475.16
5	16	675.16	718.04	630.72
4	12	900.2	973.89	840.73
3	8	1124.12	1228.69	1055.34
2	4	1310.77	1436.69	1236.56
1	0	1365.96	1495.22	1288.83
BASE	-6	1365.96	1495.22	1288.83

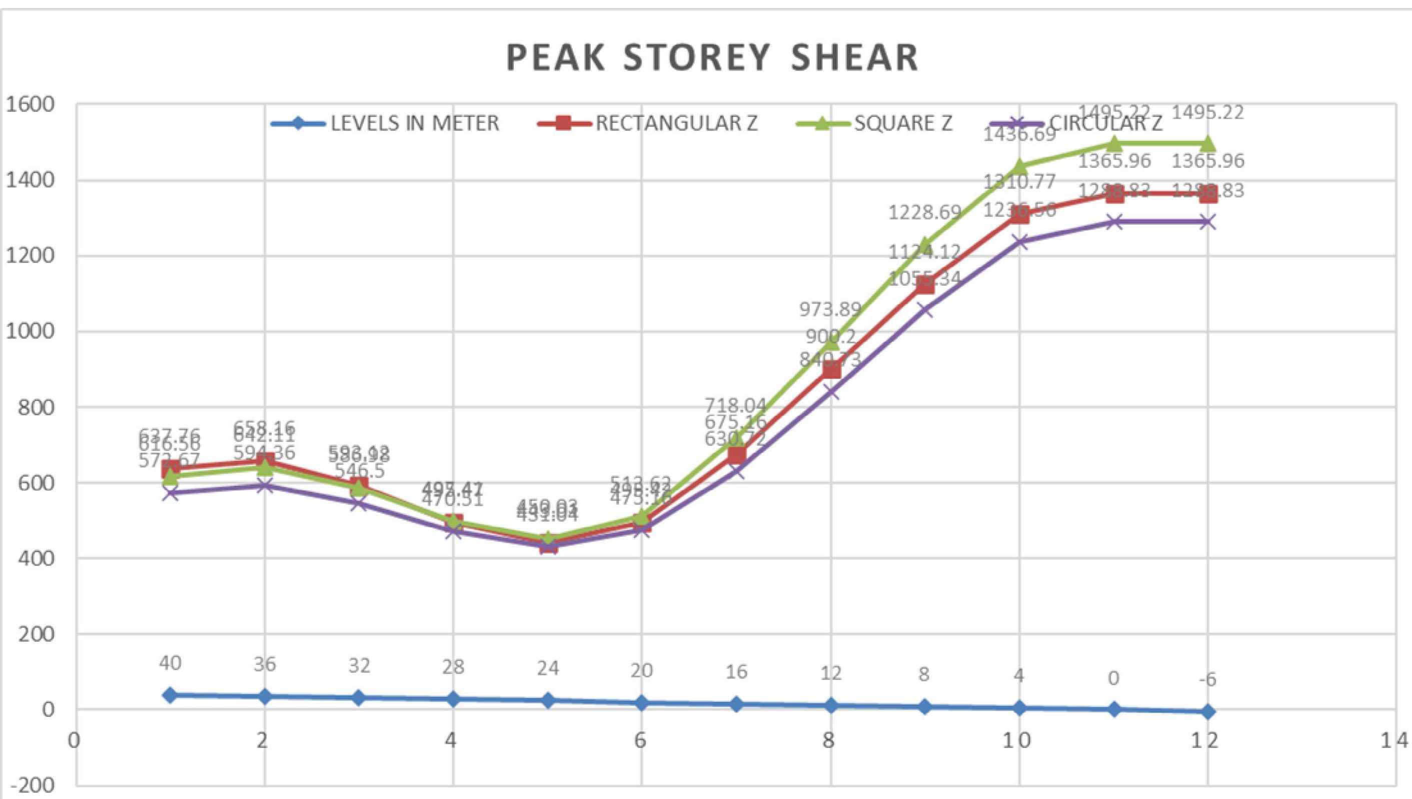

Fig.36 Storey shear in z direction (building with floating column)

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4) Storey shear in x direction (building without floating column)

TABLE XII Storey shear in x direction (building without floating column)

	PEAK STOREY SHEAR			
STOREY	LEVELS IN METER	RECTANGULAR	SQUARE	CIRCULAR
		X	X	X
13	48	172.07	155.54	62.39
12	44	221.97	196.61	106.18
11	40	185.32	169.09	130.29
10	36	188.48	186.97	147.29
9	32	250.72	240.05	168.71
8	28	306.54	283.23	200.61
7	24	327.2	307.94	241.93
6	20	327.82	321.58	287.07
5	16	376.73	373.84	340.86
4	12	479.77	467.32	386.22
3	8	586.99	564.95	419.02
2	4	665.9	638.52	439.57
1	0	692.16	682.52	445.33
BASE	-6	692.16	682.52	445.33

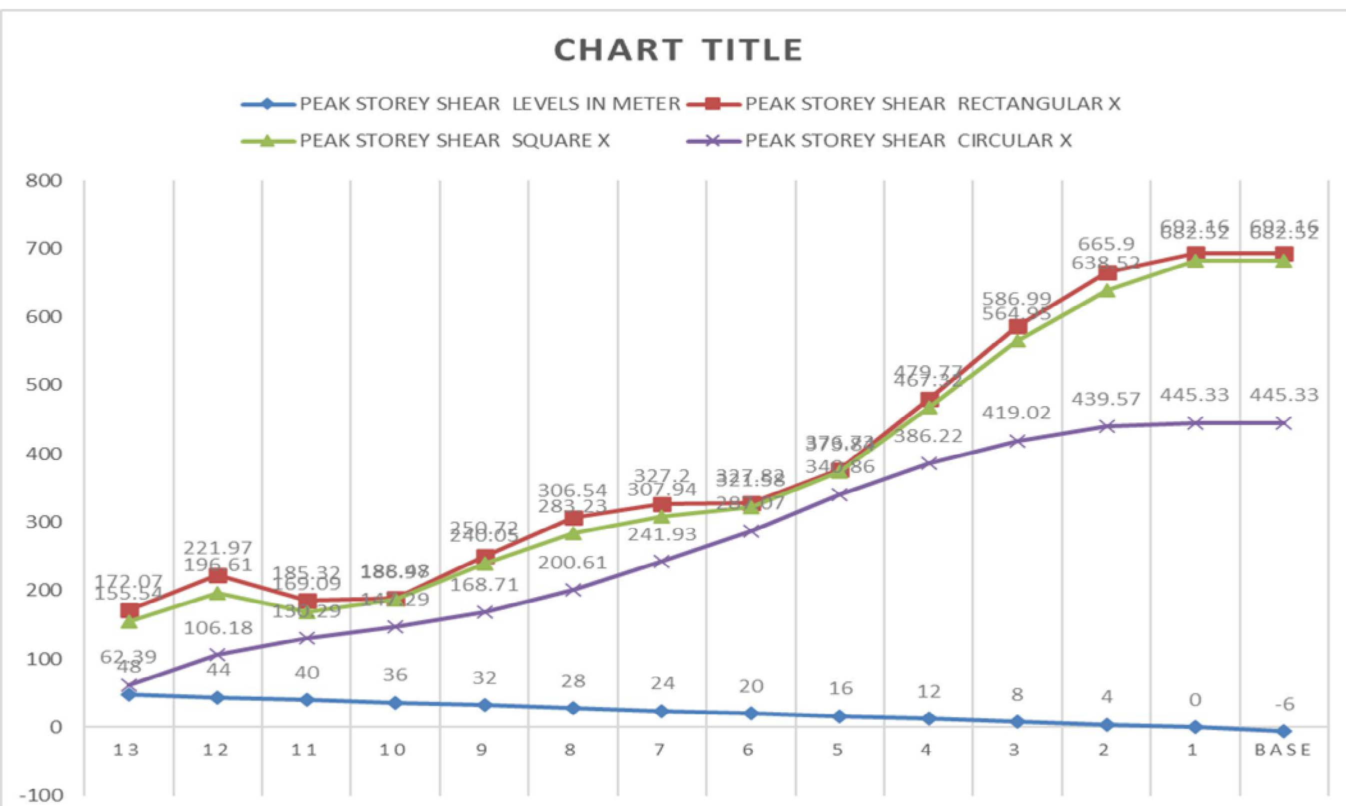

Fig.37 Storey shear in x direction (building without floating column)

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5) Storey shear in z direction (building without floating column)

TABLE XIII Storey shear in z direction (building without floating column)

	PEAK STOREY SHEAR			
STOREY	LEVELS IN METER	RECTANGULAR	SQUARE	CIRCULAR
		Z	Z	Z
13	48	99.34	155.54	60.57
12	44	144.96	196.61	102.16
11	40	148.05	169.09	126.027
10	36	161.95	186.97	145.78
9	32	203.88	240.05	169.84
8	28	244.67	283.23	202.56
7	24	274.59	307.94	243.53
6	20	312.23	321.58	288.5
5	16	386.63	373.84	342.44
4	12	474.86	467.32	387.26
3	8	554.22	564.95	418.88
2	4	610.39	638.52	438.48
1	0	669.61	682.51	443.9
BASE	-6	669.61	682.51	443.9

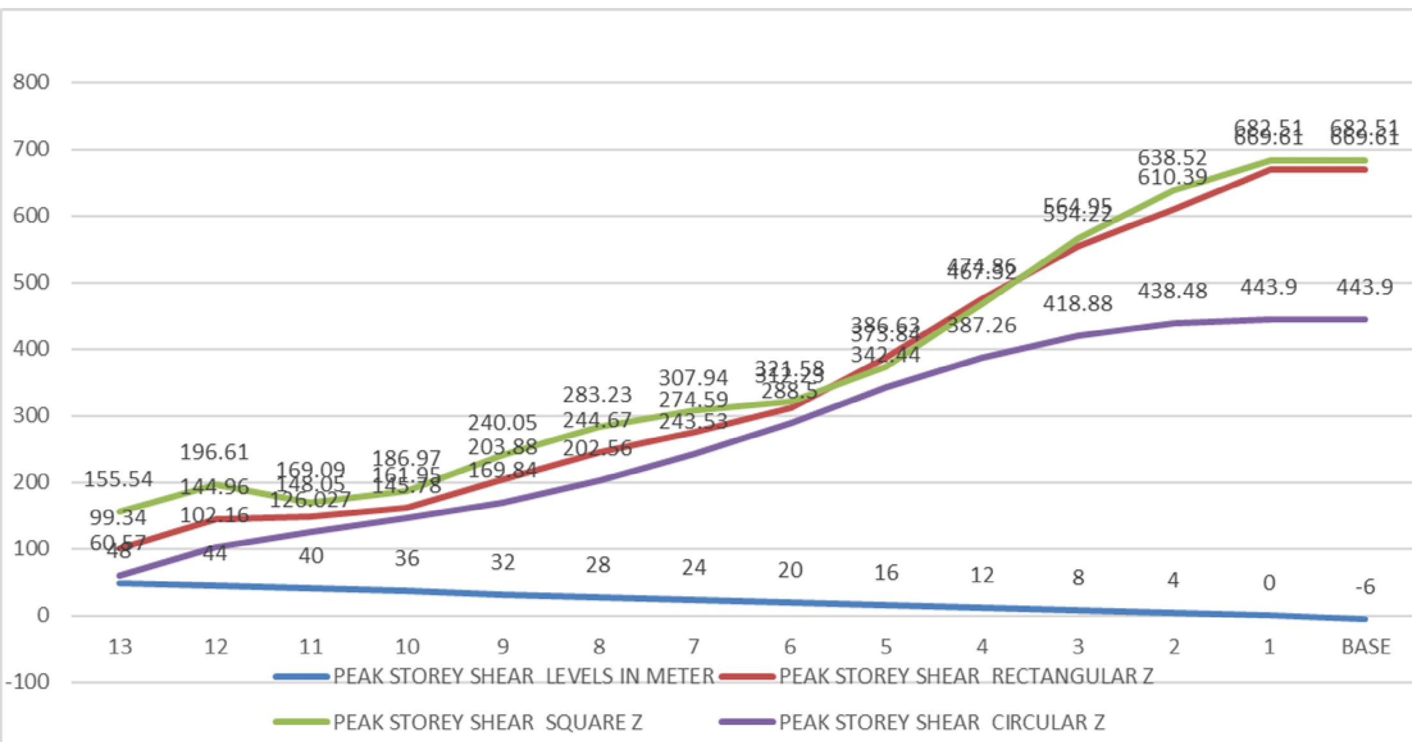


Fig. 38 Storey shear in z direction (building without floating column)

VI. FUTURE SCOPE

1) Same study can be stretched out for the analysis considering irregular shape.
2) Proposed method of analysis can be used for different by varying building height and dimension.
3) Same study can be done on different seismic zones.
4) Analysis can be done by using software SAP, ETAB.

VII. CONCLUSION

1) For static and dynamic analysis, the displacement, maximum forces, maximum movement ,storey shear, of all shape are analysis and compare their result.
2) Displacement in x direction and y direction and z direction is more in rectangular shape with and without floating column and displacement is less in circular shape of building with or without floating column.
3) Maximum forces are compared in x direction y direction and z direction more forces are observed rectangular shape building with and without floating column. Less forces in circular shape building with and without floating column.
4) Maximum movement are compared in x direction y direction and z direction more movement observed in rectangular shape building with and without floating column. Less movement in circular shape building with and without floating column.
5) Storey shear in x direction and z direction are analysis storey shear is more in rectangular shape building with and without column. less in circular shape building with and without floating column.
6) With floating column and without floating column alysis is done. with floating column circular shape structure plan configurations give good performance against seismic load.

REFERENCES

[1] Mrs. Shilpa Valsakumar ,Thejus Sreehari. “Analysis and Design of Mono Column Building”. International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org ICART - 2022 Conference Proceedings.

[2] Sijin Johnson, Indu Susan Raj. “Diagrid Mono Column Structures with Different Geometry in Plan: A Review “.International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 10 Issue VII July 2022- Available at www.ijraset.com

[3] Ambati venu babu1, Dr. Dumpa venkateswarlu2, International Journal for Researchin (2016). “DESIGN OF A STRUCTURE SUPPORTED ON SINGLE COLUMN OFFICE BUILDING”. International Journal of Research sciences and advanced engineering [ijrsae]tm volume 2, issue 15, pp:112 - 123, august’ 2016.

[4] Madireddy satyanarayana1, international journal for research in (2016). “design of multi storey building resting on single column”. International journal of research in engineering and technology eissn: 2319-1163 | pissn: 2321-7308.

[5] Anupam rajmani, international journal for research in (2015). “analysis of wind & earthquake load for different shapes of highrise building”. Onal journal of civil engineering and technology (ijciet), issn 0976 – 6308 (print), issn 0976 – 6316(online), volume 6, issue 2, february (2015), pp. 38-45 © iaeme international journal of civil engineering and technology (ijciet).

[6] E k mohanraj , international journal for research in (2002)

[7] Badikala sravanthi , international journal for research in(2016).“design of a structure supported on single column”. Internationaljournal of computational science, mathematics & engineering volume-3,issue-10,october2016 issn-2349-8439.

[8] Arif sarwo wibowo and shiro sasano (2016). “historical assessment of the saka tunggal mosque in bayamos: study on the singlecolumn mosque on java island, Indonesia”. Journal of Asian architecture and building engineering/September 2016/380.

[9] Gomasa ramesh (2021). “design and analysis of residential building using staad-pro”. Indian journal of engineering.

[10] Mr. Jayant s. Ramteke, mr. M. R. Nikhar, mr.G.D.Dhawale, mr. S.G.Makarande (2019). “a comparative study on analysis of aconventional multi-storey building & a single column building”. International journal for research inapplied science & engineering technology (ijraset) issn: 2321-9653; ic value: 45.98 ; sj impact factor: 7.177 volume issue v, may 2019

[11] G.pradeep,dr.h.sudarsanarao,dr.vaishali.g.g h orpade(2018). “design of a structure supported on a single COLUMN”. International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org.

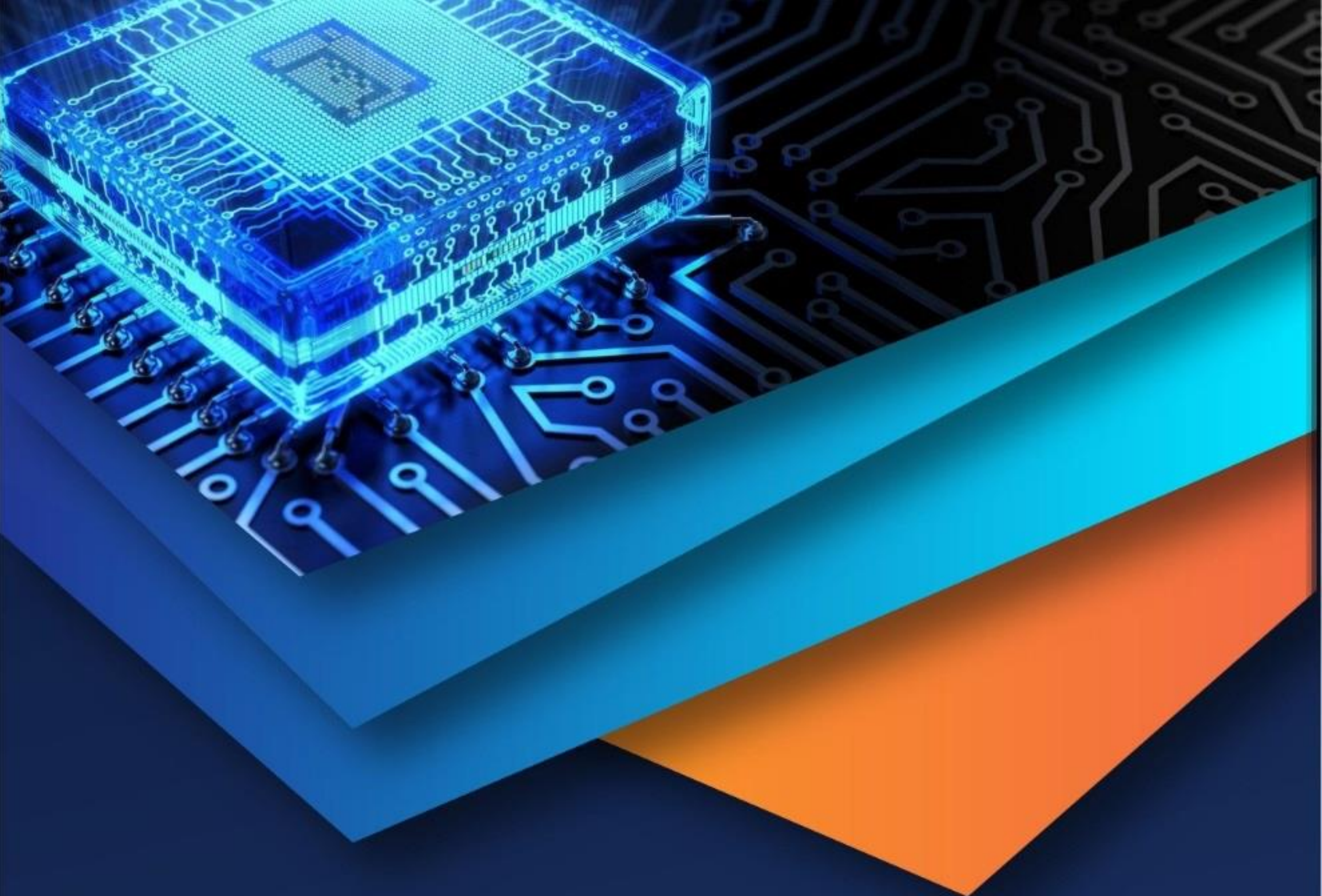
[12] Raj Joshi, Gagan Patidar, Mayank Yadav, Piyush Natani, Praduman Dhakad(2020).” COMPARATIVE ANALYSIS ON BEHAVIOUR OF SINGLE COLUMN STRUCTURE WITH WAFFLE SLAB AND FLAT SLAB”. International Journal of Creative Research Thoughts (IJCRT) uwww.ijcrt.org

[13] Amogh, Chiranjeevi Joshi, Sharanabasappa, Vikas Patil Okaly, Ravikiran S Wali(2021). “Analysis and Design of Mono- Column Building”. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056.

[14] Dr. S. G. Makarande , Mr. Jayant S. Ramteke , Mr. M. R. Nikhar , Mr. Single G. D. Dhawale(2019). “A Review on Conven Comparative Study on Analysis of a single conventional Multi Storey Building & a Column Building

[15] IS 875:1987 (PART 2) code of practice for design loads (other than earth quake loads) for building and structures, new Delhi (India), Bureau of Indian standards.

[16] IS: 456-2000,” Code Of Practice For Plain And Reinforced Concrete”, New Delhi, Bureau Of Indian Standards.



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