SEISMIC ANALYSIS OF RCC BUILDING WITH MASS IRREGULARITY

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Abstract Irregularities are unavoidable in construction of buildings,the behaviour of the structures with these irregularities during earthquake needs to be studied.Adequate precaution can be taken.A detailed study of structural behaviour of the buildings is essential for design and behaviour. Generally the effect of dynamic loads acting on structure is not considered. This feature of neglecting the dynamic forces sometimes becomes the cause of disaster, Over the last two decades, seismic engineering has increasingly focused on the modest low rise and high rise structures, since much of the damage and financial loss associated with extreme wind events happens to these minimally engineered buildings like low rise buildings and also huge loss if encountered by the high rise buildings. As some of these model- and full – scale seismic engineering data filters into the design codes and standards, one may expect to see reduced damage. However, when one combines the more rapid increase in population with a generally unacceptably low standard of new building construction inspection, it seems quite likely that loss of life, as well as insured and uninsured property losses will continue to be the norm in the foreseeable future. The seismic engineering community needs to be more responsible in forcefully transferring our technical knowledge to the designer and builder.In this present work analysis for G+9 building have a mass irregularity in 9^{th} floor and building without mass irregularity are analysed.This paper highlights the effects on floor which has different loads(mass irregularity) in multistory building.

*KEYWORDS:*Massirregularity,seismicanalysis,bending moment,shear force,displacement

I. INTRODUCTION

The weakness of structure arises due to discontinuity in mass, stiffness and geometry of structure. Such structures having discontinutity are known as Irregular structures. Height-wise changes in stiffness and mass render the dynamic characteristics of these buildings different from the 'regular' building. The irregularity in the building structures may be due to irregular distributions in their mass, strength and stiffness along the height of building.

There are two types of irregularities-
1. Plan Irregularities
2. Vertical Irregularities.

Vertical Irregularities are mainly of three types:
1) Stiffness Irregularity :
Soft Storey – A soft storey is the on in which the lateral stiffness is less than 70% of that in the storey immediately above , or less than 80% of the combined stiffness of the three stories above.
2) Mass Irregularity-Mass irregularities are considered to exist where the effective mass of any storey is more than 200% of the effective mass of an adjacent storey.
3) Vertical Geometric Irregularity-A vertical setback is a geometrical irregularity in a vertical plane. It is considered when horizontal dimension of the lateral force resisting system in any storey is more than 15% of that in an adjacent storey.

II. OBJECTIVES OF WORK

The objectives of the thesis are as follows:

1. Mass irregularity is created in form of swimming pool.
2. To carryout analysis for structure with mass irregularity and without mass irregularity, according to IS code provisions for considered seismic zone.
3. Analysis is carried out using STAAD PRO.
4. To investigate about Shear Force, Bending Moment and Deflection of the beams and columns of regular and mass irregular structure.

III. STRUCTURAL SPECIFICATIONS

S.NO	PARTICULARS	DIMENSION/SIZE/VALUE
1	MODEL	G+9
2	SEISMIC ZONE	III
3	FLOOR HEIGHT	3 m
4	PLAN SIZE	24m×24m
5	SIZE OF COLUMNS	0.45m x 0.6 m

6	SIZE OF BEAMS	0.45m x 0.45 m
7	WALLS	EXTERNAL WALLS - 0.23 m INTERNAL WALLS – 0.115m
8	THICKNESS OF SLAB	150 mm
9	TYPE OF SOIL	TYPE-II,MEDIUM SOIL AS PER IS-1893
10	MATERIAL USED	CONCRETE M-25 AND REINFORCEMENT FE-415
11	STATIC ANALYSIS	EQUIVALENT LATERAL FORCE METHOD
12	TOTAL HEIGHT OF BUILDING	30m
13	EARTHQUAKE LAOD	AS PER IS-1893-2002
14	SPECIFIC WEIGHT OF RCC	25 KN/m^2
15	SPECIFIC WEIGHT OF INFILL	20 KN/m^2
16	SOFTWARE USED	**STAAD.PRO**

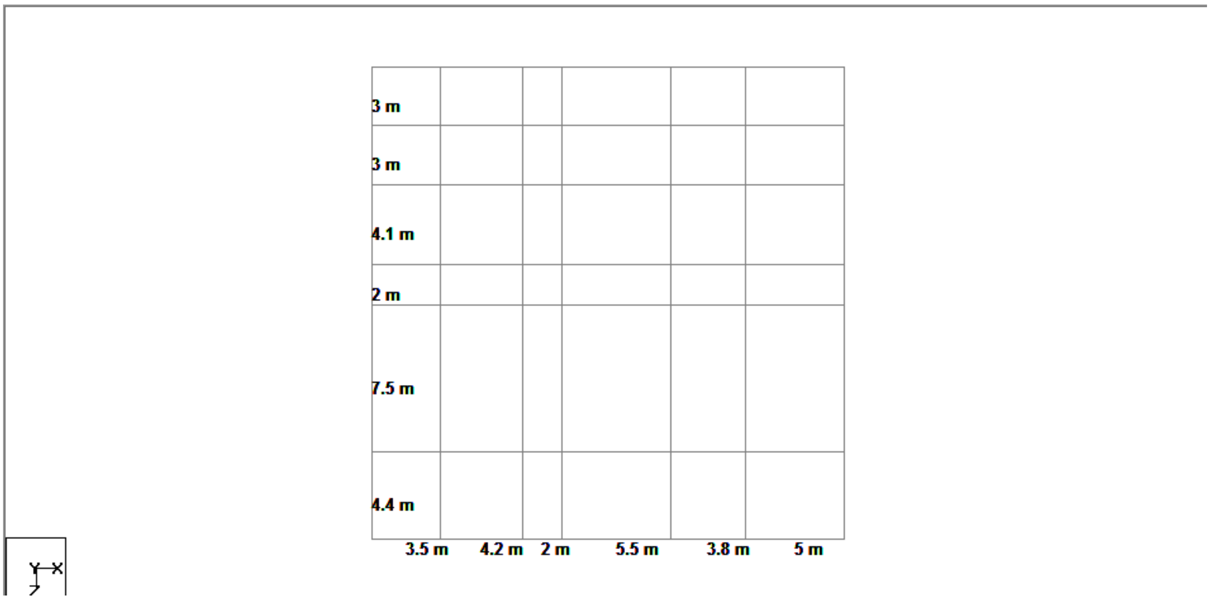


FIG. 1.1: PLAN OF THE STRUCTURE

IV. RESULTS AND GRAPHS

1.1 . Maximum bending moment in beams of a frame for building without mass irregularity and building with mass irregularity is shown in figure below

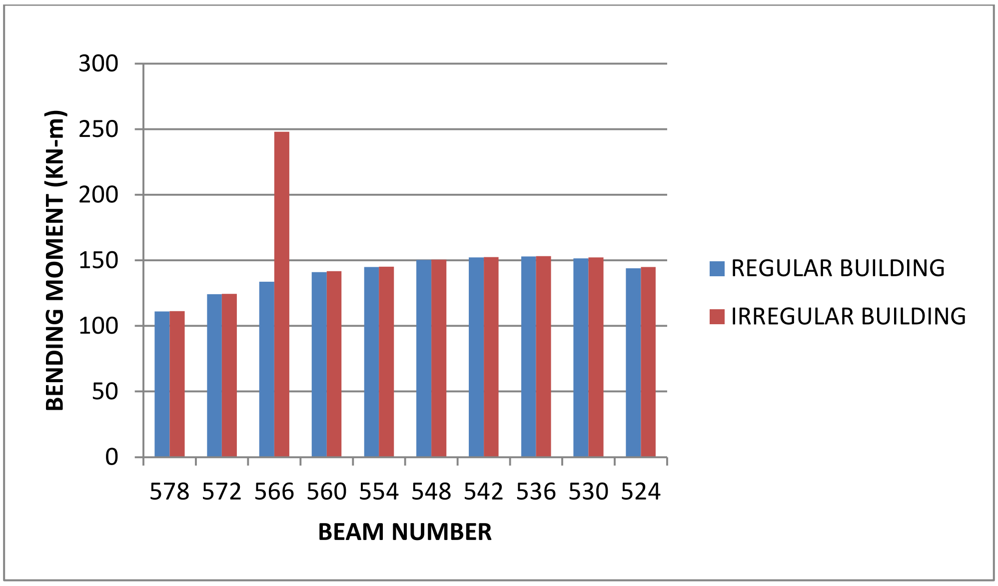


Figure 4.1 : Maximum bending moment in beams

1.2 Maximum shear force in beams of a frame for building without mass irregularity and building with mass irregularity is shown in figure below

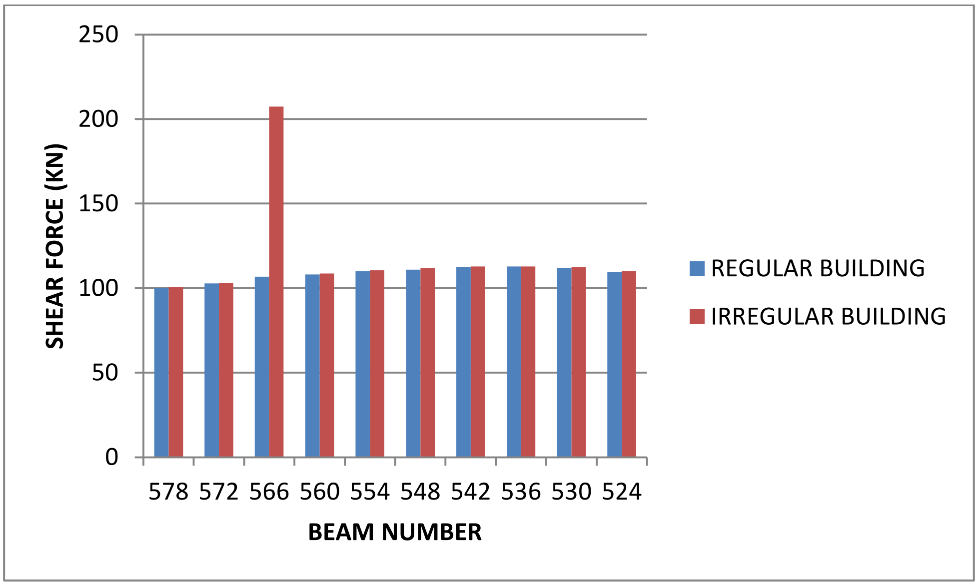


Figure 4.2 Maximum shear force in beams

1.3 Maximum displacement in beams of a frame for building without mass irregularity and building with mass irregularity is shown in figure below

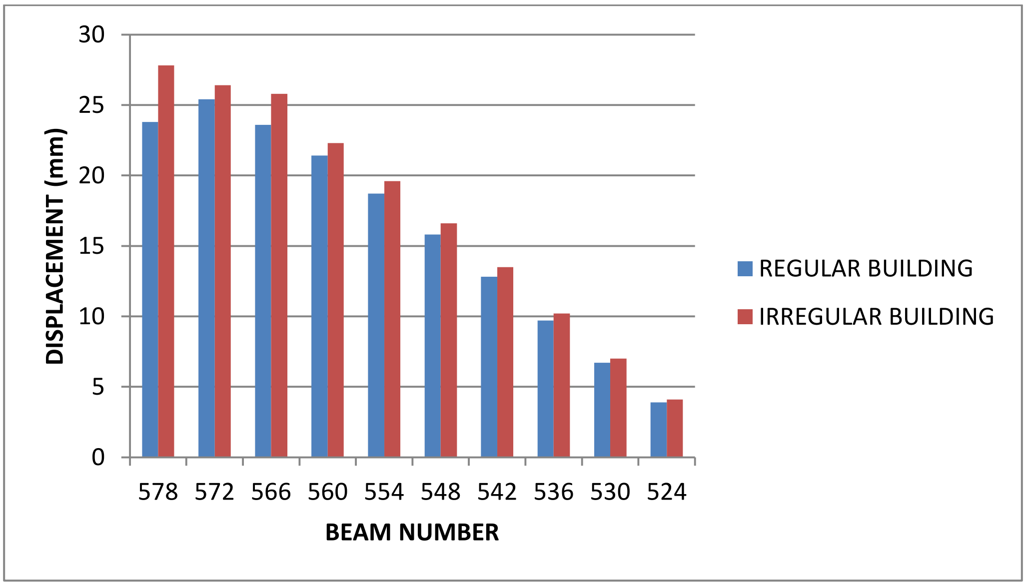


Figure 4.3 Maximum displacement in beams

1.4 Maximum bending moment in columns of a frame for building without mass irregularity and building with mass irregularity is shown in figure below

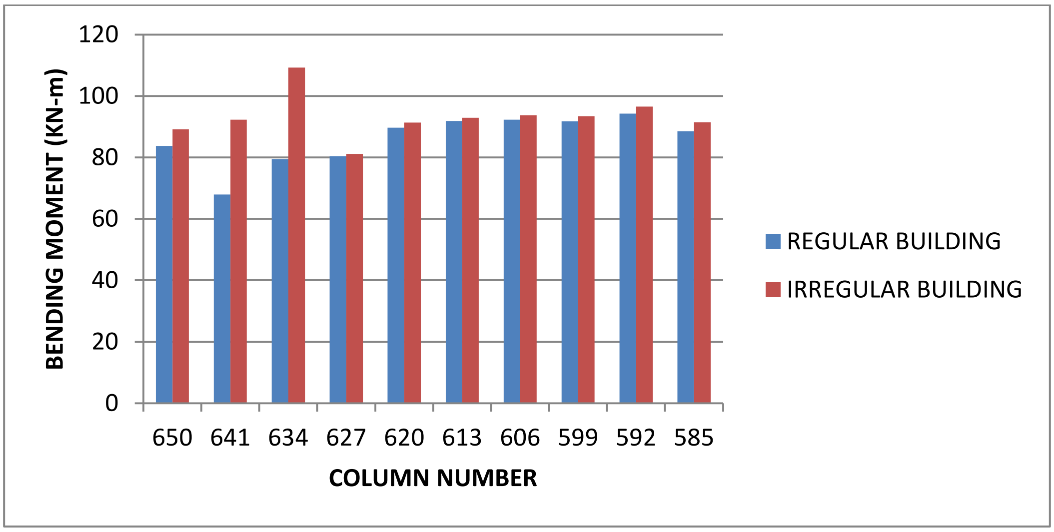


Figure 4.4 Maximum bending moment in columns

1.5 Maximum shear force in columns of a frame for building without mass irregularity and building with mass irregularity is shown in figure below

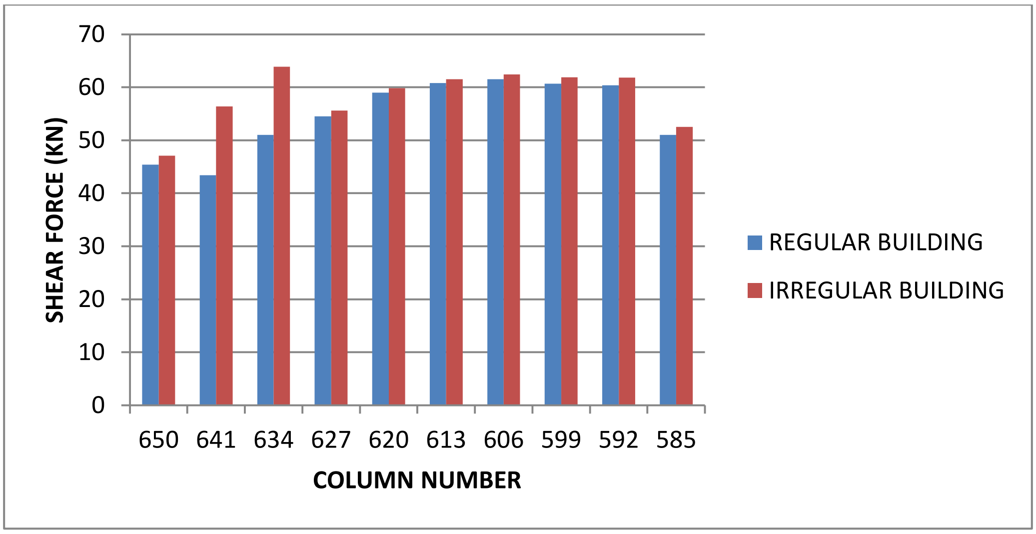
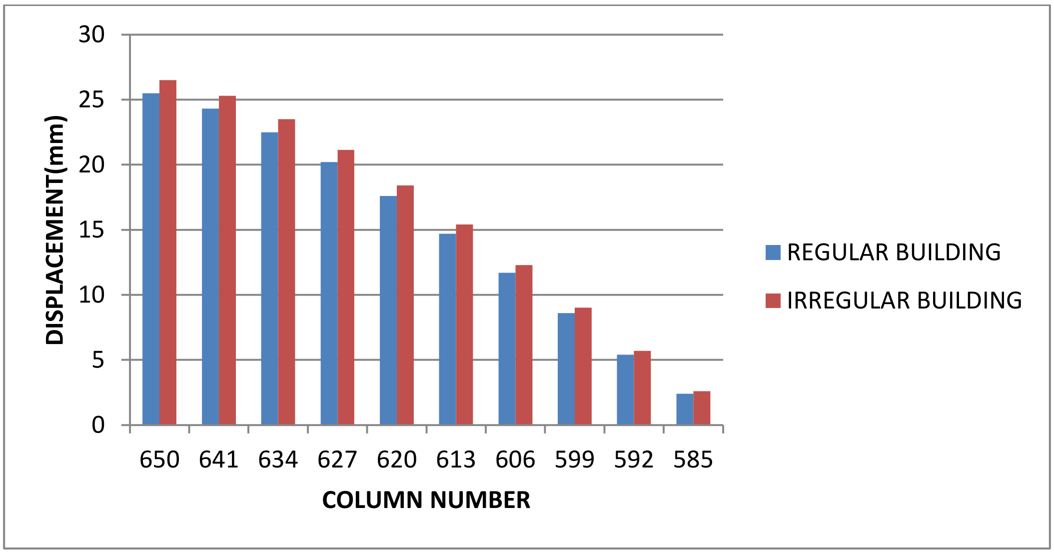


Figure 4.5 Maximum shear force in columns

1.6 Maximum displacement in columns of a frame for building without mass irregularity and building with mass irregularity is shown in figure below



1.7 Storey wise maximum bending moment in beams of building without mass irregularity and building with mass irregularity is shown in figure below

Figure 4.7 Storey wise maximum bending moment in beams

1.8 Storey wise maximum shear force in beams of building without mass irregularity and building with mass irregularity is shown in figure below

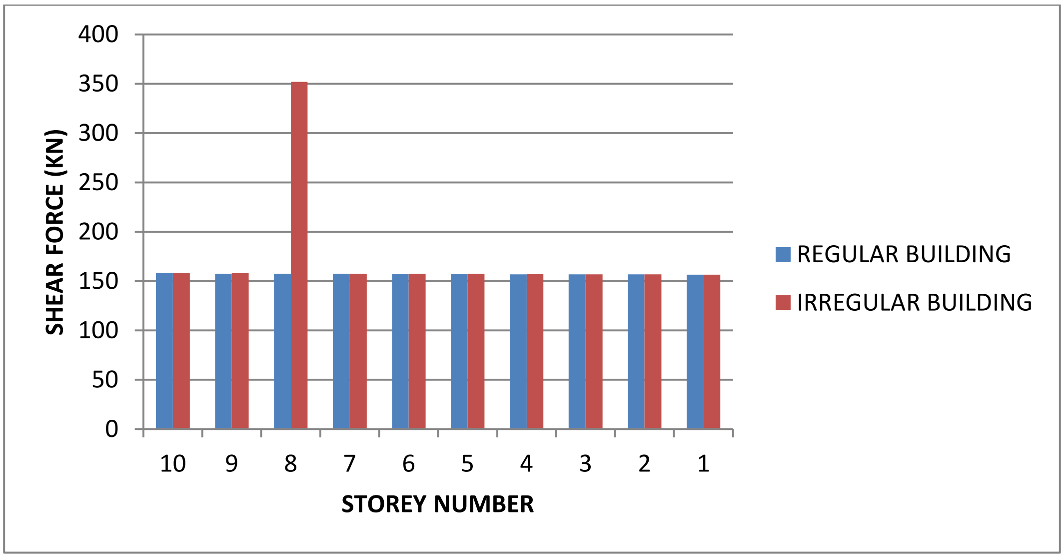


Figure 4.8 Storey wise maximum shear force in beams

1.9 Storey wise maximum displacement in beams of building without mass irregularity and building with mass irregularity is shown in figure below

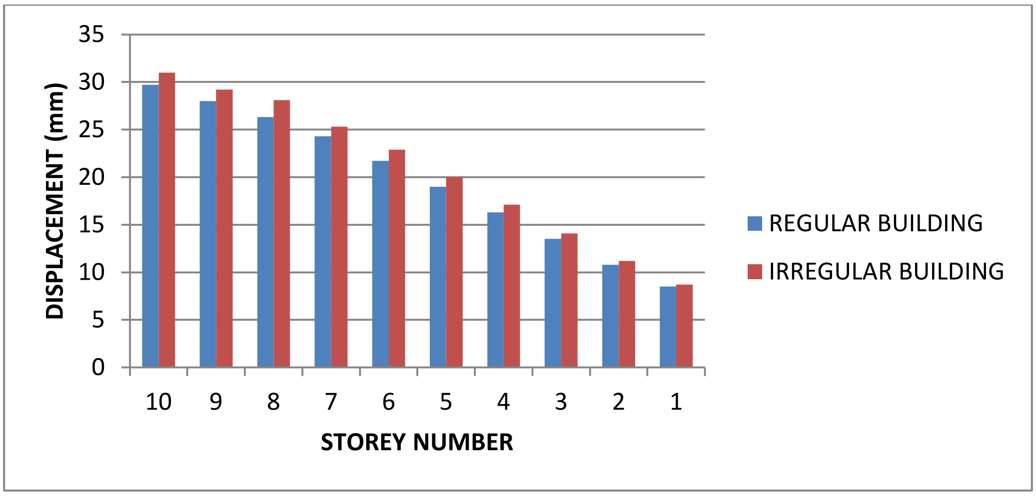


Figure 4.9 Storey wise maximum displacement in beams

1.10 Storey wise maximum bending moment in columns building without mass irregularity and building with mass irregularity is shown in figure below

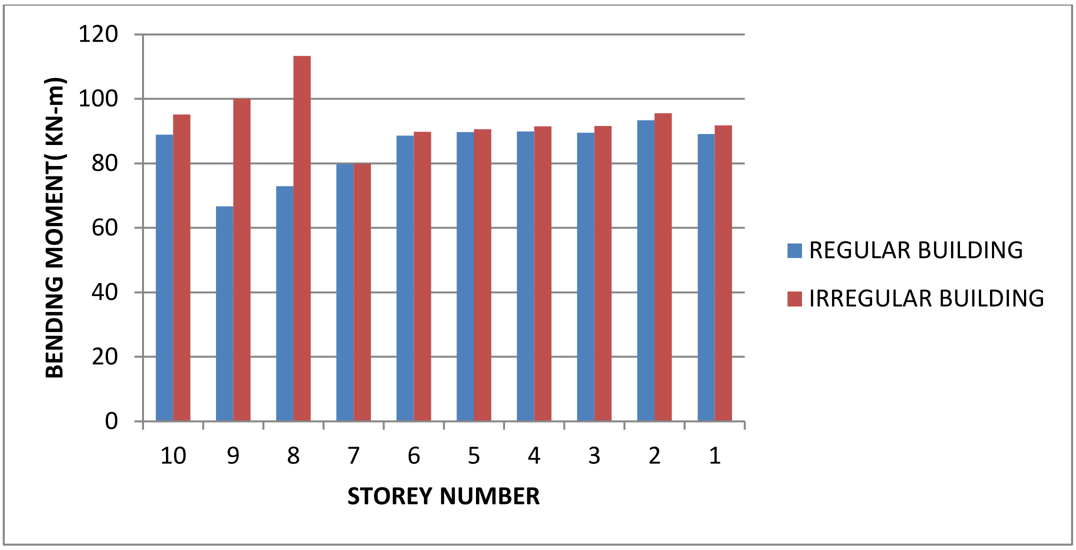


Figure 4.10 Storey wise maximum shear force in beams

1.11 Storey wise shear force in columns of building without mass irregularity and building with mass irregularity is shown in figure below

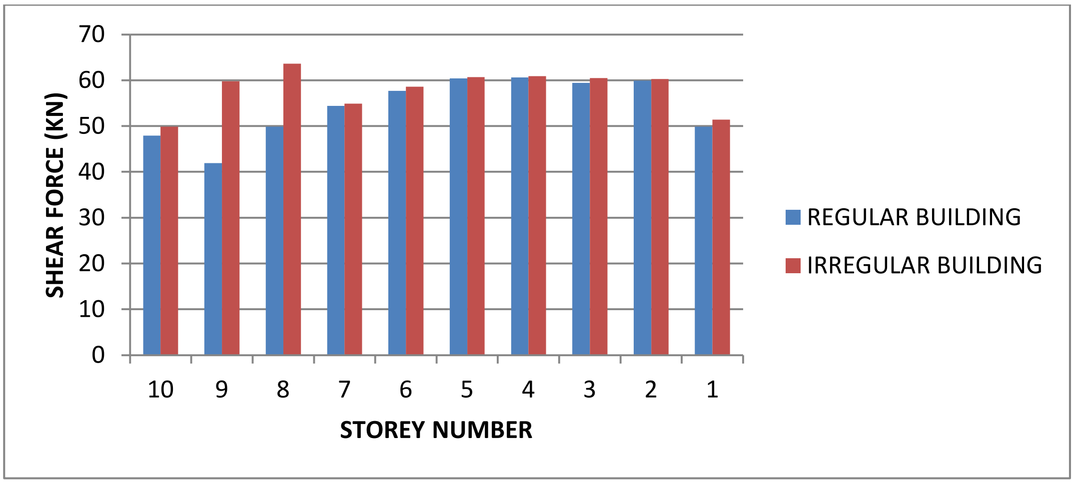


Figure 4.11 Storey wise maximum shear force in columnns

1.12 Storey wise displacement in columns of building without mass irregularity and building with mass irregularity is shown in figure below

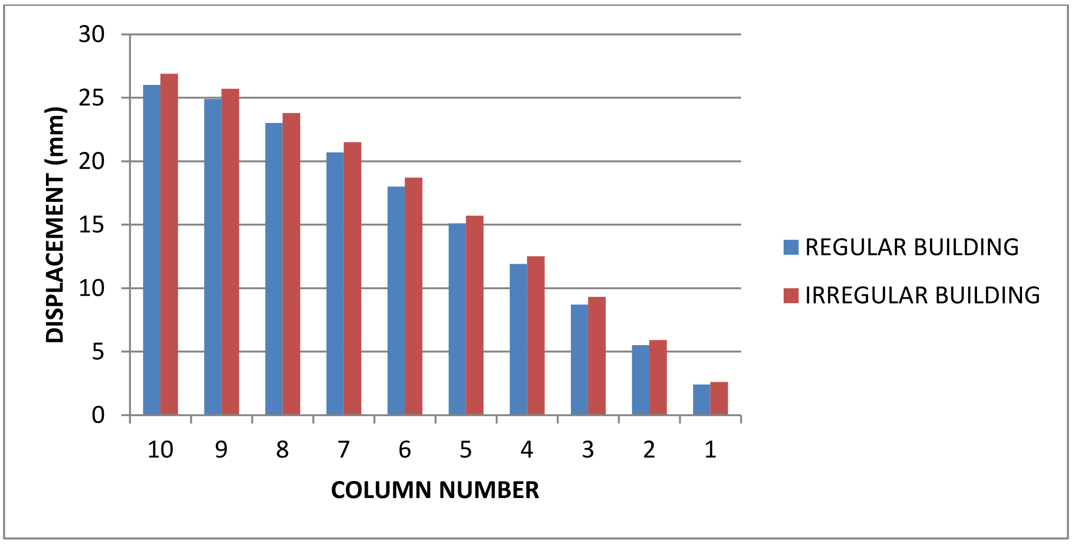


Figure 4.12 Storey wise maximum displacement in columns

V.CONCLUSION

1. From the results it is observed that Bending Moment in beams is comparatively more in building with mass irregularity than the regular building and there is sudden increase in Bending Moment in the floor where mass irregularity is present.
2. Similar to the bending moment phenomena, shear force in beams is comparatively more in irregular building than the regular building.
3. From the results it was observed that displacement in beams is gradually increasing towards the top storey and displacement in irregular building is more while compared to regular building.
4. From the results, Bending Moment and Shear force in columns is more in Irregular building while compared to regular building and there is a steep increase in the values where irregularity is present.
5. In columns, as obsevered there is gradual increase of displacement towards the top storey in both the buildings and the displacement is more in irregular building.
6. Storey wise maximum bending moment and shear force in beams are more in irregular building compared to regular building and there is steep increase in floor where irregularity is considered.
7. Storey wise maximum bending moment and shear force in columns are comparatively more in irregular building than in regular building but there is sudden increase in value where the irregularity is present.
8. Regarding Storey wise maximum displacement for columns, there is gradual increase of towards the top storey in both the buildings and the displacement is more in irregular building.

VI. REFERENCES

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