International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 4, Issue 6, June-2018

SEISMIC ANALYSIS OF RCC FRAMED REGULAR AND VERTICAL GEOMETRIC IRREGULAR BUILDING

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Abstract – The performance of the multi-storey framed building during the sturdy earthquake motions depends on distribution of mass, stiffness, and strength in the both horizontal and vertical planes of the building. In multi-storey framed buildings, smash up from earthquake ground motion generally initiates at the locations of structural weaknesses present in lateral load resisting frame. In the some cases, these weaknesses may be produced by the discontinuities in stiffness, strength or mass between adjoining storey. Such discontinuities between the storeys are often allied with the sudden variations in frame geometry along height. A common type of the discontinuity is a vertical geometrically irregularity arising from rapid drop of height. This work shows performance & behavior of the regular & vertical geometrically irregular RCC framed structure under seismic motion. Five types of building geometry are taken in this project: one regular frame & four irregular frames. A comparative study is made between all these building configurations ht wise and bay wise. All building frame are modeled & analyzed in software Etabs 2016. Various seismic responses like shear force, bending moment, storey drift & storey displacement is obtained. The seismic analysis is done according to IS 1893: 2002 part (1). Seismic zone IV & medium soil strata are taken for all the cases. The change in the different seismic response is observed along different height.

Key Words: Regular building, Vertical Geometric Irregular building, Seismic response parameters etc.

1. INTRODUCTION

Earthquake is utilized to express any of the seismic event whether it is regular or caused by the people that can deliver the tremor impact around the specific region. Quakes are caused for the most part by crack of topographical blames inside the earth, yet in addition by different occasions, for example, volcanic development, avalanches, mine impacts, & nuclear test.Vertical inconsistencies are described by the vertical discontinuities in geometry, circulation of a mass, unbending nature & quality. Mishap structures are subset of the vertically sporadic structures where there are discontinuities regarding geometry. Be that as it may, geometric inconsistency likewise presents brokenness in the circulation of mass, firmness & quality along the vertical heading. Lion's share of the investigations on difficulty structures have concentrated on the flexible reaction.

The conduct of these kinds of building is something other than what's expected. There is a need of more work that is to be done in such a manner. So in this examination work is to be endeavor to reach on a more precise conclusion so as to diminish there impact on a structure. We watch that genuine structures are every now & again unpredictable as flawless consistency is a romanticizing that once in a while happens in the training. Concerning, for down to earth purposes, major seismic codes over the globe separate between anomaly in design & in height, however it must be understood that abnormality in the structure is the result of a mix of the two kinds. It is seen that unpredictable auxiliary setups either in design or in rise were regularly perceived as one of the significant reasons for fall amid point of reference quakes.

2. OBJECTIVES

In that capacity, the objective of this exploration is to examine different seismic reactions of RC regular & vertical geometrically irregular structures.A correlation between the different types of seismic parameters would enable us propose best reasonable buildings design on current condition. All the more particularly, the striking targets of this exploration are:

1) To play out a relative investigation of the different seismic parameters of various kinds of R.C resisting frames (MRF) with bays varying, confi, & sorts of abnormality.

2) Comparison amongst regular & vertical irregular edge frames on story drift, story displacement, base reaction & time period & so forth

3) To think about the change in various seismic reaction parameters along the bays increasing.

4) Best reasonable building setup on the current condition to be proposed.

3. METHODOLOGY & STRUCTURAL PLANNING:

By the means embraced in present investigation to achieve previously mention targets are as followed:

- Select a thorough arrangement of the regular & irregular buildings outline model with G+7, accepting equivalent bay width of 4 m both flat way & distinctive abnormalities.
- Perform the static examination for all of the 10 building models taken in this investigation.
- Analysing & examination of aftereffect of the seismic investigation.
- Presentation of the results as diagrams & tables.
- Detailed discourse on outcomes with assistance of diagrams & tables thinking about all included parameters.

The building considered is regular & vertical geometric irregular G+7 normal RC Building of dimension of plan with 20mX20m & 40mx40m, the building are considered to be located in Zone 4 as per Indian code IS 1893-2002.The Table shows structural data of the building.

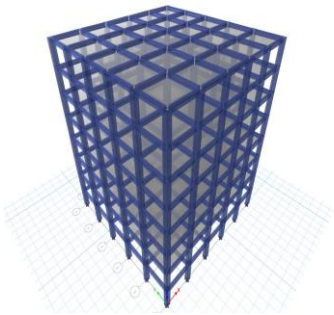
I)Material Data	
1 Grade of concrete	M30
2 Grade of Steel	Fe500
3 Unit weight of RCC	25kN/m2
II) Structural Data	
1 Type of structure	SMRF
2 Type of soil	Medium soil
3 Size of beam	300mm X450mm
4 Size of column	450mmX600mm
5 Depth of slab	150mm
6 Thickness of exterior wall	230mm
7 Thickness of interior wall	230mm
III) Architectural Data	
1 Number of stories	G+7
2 Floor height	3m
3 Dimension of plan	20mX20m & 40mx40m
IV)Seismic Data	
1 Siesmic Zone	4
2 Response reduction factor	5
3 Importance factor	1
4 Damping ratio	5%
V) Loads	
1 Live load	3kN/m2
2 Floor finish	1kN/m2
3 Wall load on exterior frame	10.5kN/m
4 Wall load on interior frame	10.5kN/m

4. STRUCTURAL MODELLING

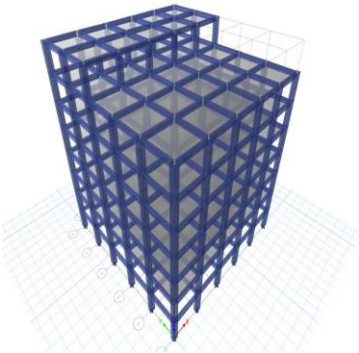
The technique utilized as a part of this examination is Seismic Coefficient Method which is a proportional static investigation & reaction range strategy considering an outline seismic coefficient. In proportional sidelong strategy dynamic impacts are the approximated by the even static powers connected to structure. This work depends on the 3 dimensional fortified solid working with the fluctuating statures & the widths. Different buildings geometrical are taken for examination. These buildings setups speak to various level of vertical inconsistency or measure of setback. A similar straight width of 4m taken in the both level heading .Two cases are to be considered for the sounds. In the first case, no. of bays is five & in the second case, these are ten.

Uniform story tallness of the 3m is to be considered in every one of case. The normal regular frame is assigned as R. The grouping of structures considered are communicated as VXY, where V speaks to the sort of anomaly (i.e. v1 to v4 or r). X speaks to quantity of the stories & y speaks to quantity of the narrows in both even course. Add up to five diverse building geometries, one consistent & four unpredictable are to be considered in present investigation. Figure given beneath present rise of every one of the five distinct geometries of a run of the mill four story buildings. Structures are 3 dimensional, with vertical abnormality toward difficulty i.e., x, & in other flat heading building are simply rehashing its geometrically design. Similar buildings setups are rehashed in every one of the cases are considered in this examination. Vertical unpredictable casings are named as v1, v2, v3 & v4.

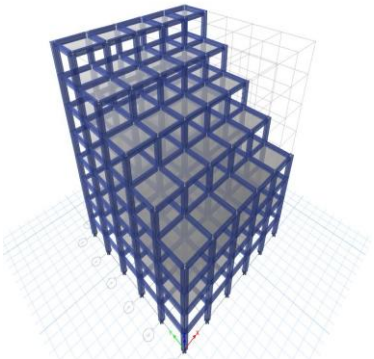
CASE: 1



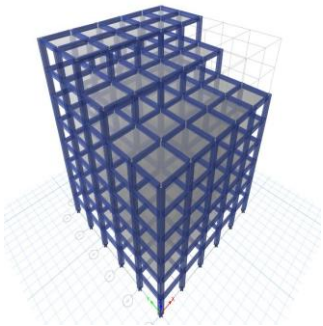
Model 1: Type R (Regular Balding)



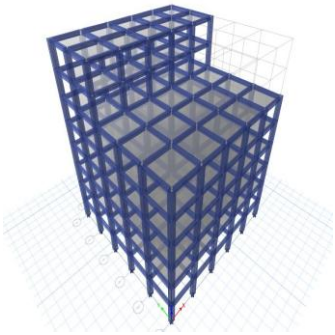
Model 2: Type V1



Model 3: Type V2

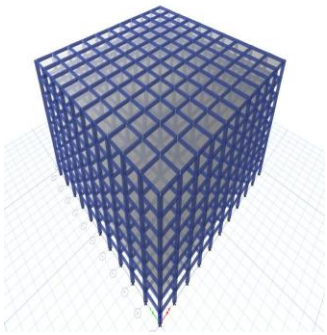


Model 4: Type V3

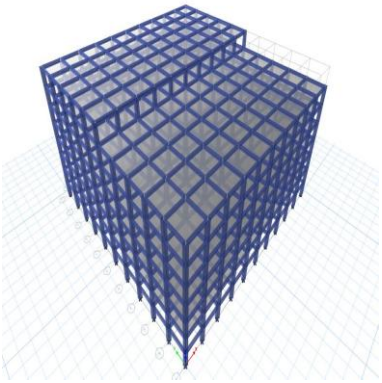


Model 5: Type V4

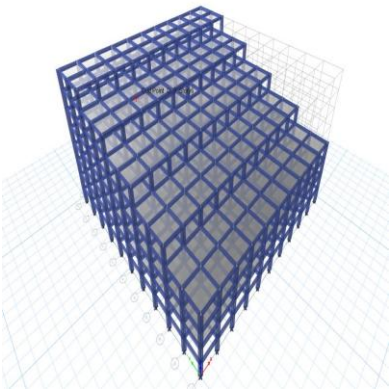
CASE: 2



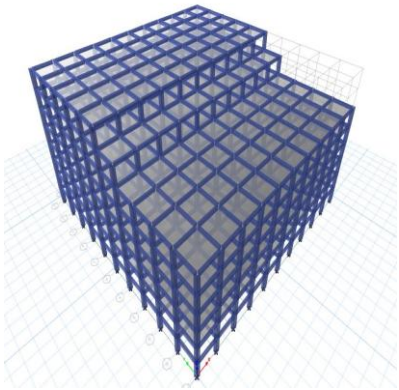
Model 6: Type R (Regular Balding)



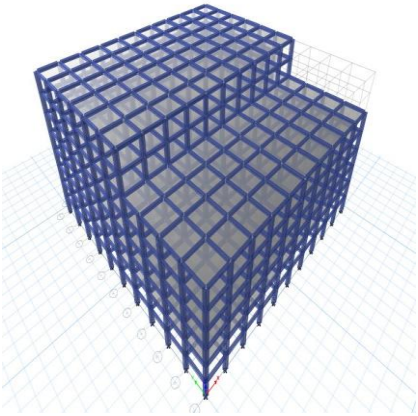
Model 7: Type V1



Model 8: Type V2



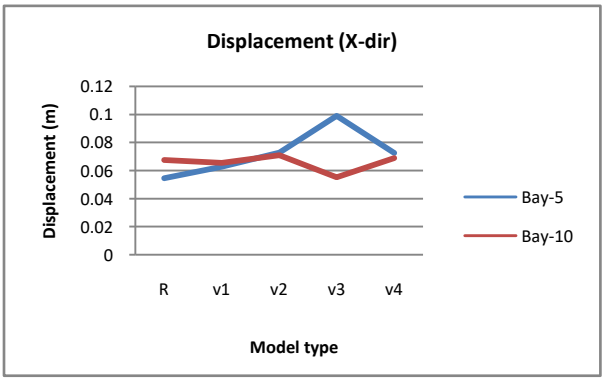
Model 9: Type V3

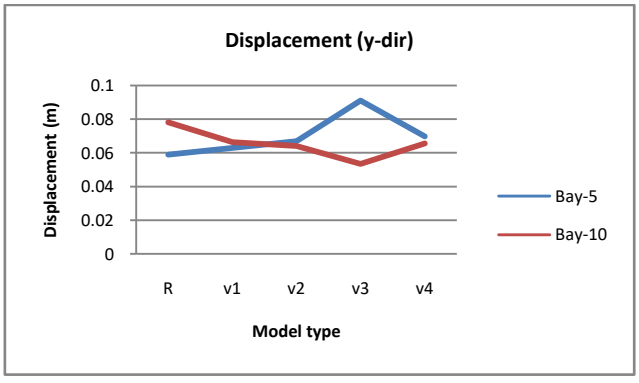


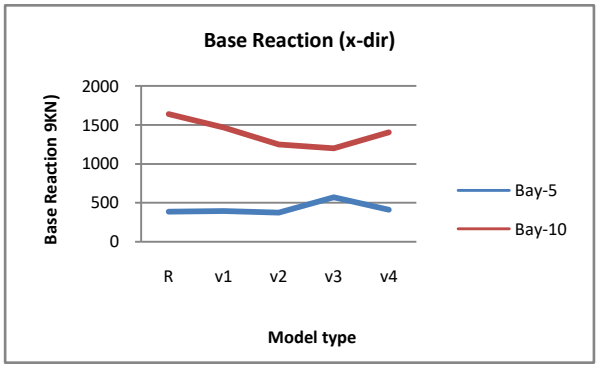
Model 10: Type V4

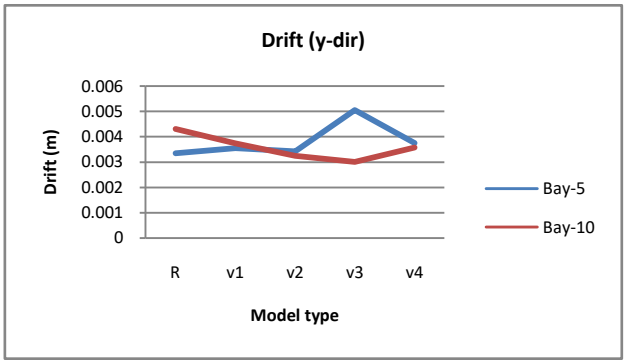
5.COMPARISON CHARTS

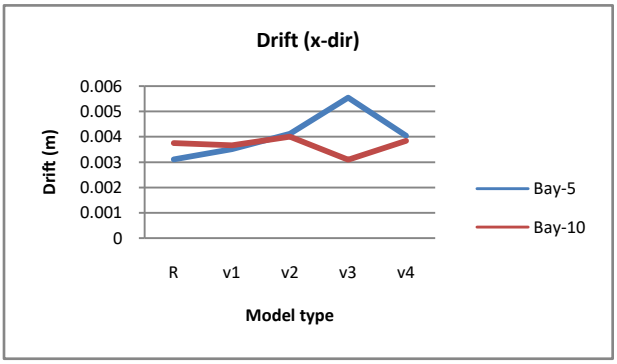
- **Equivalent static method**

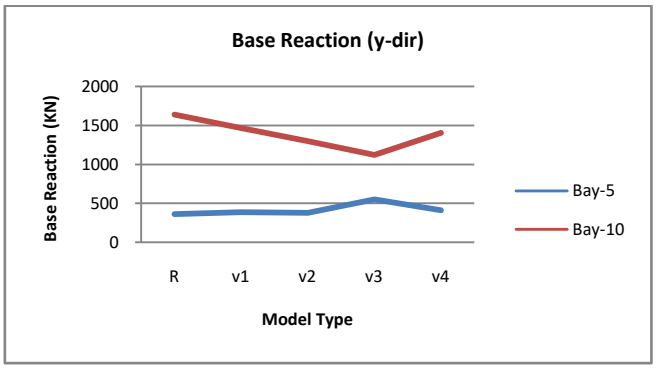




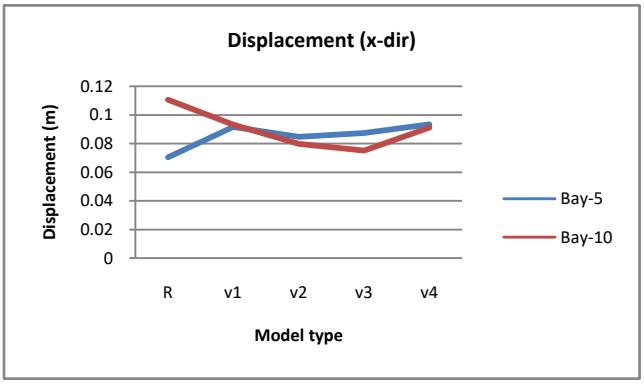


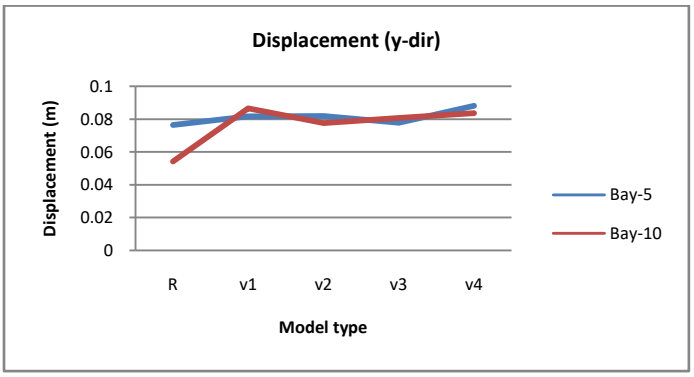


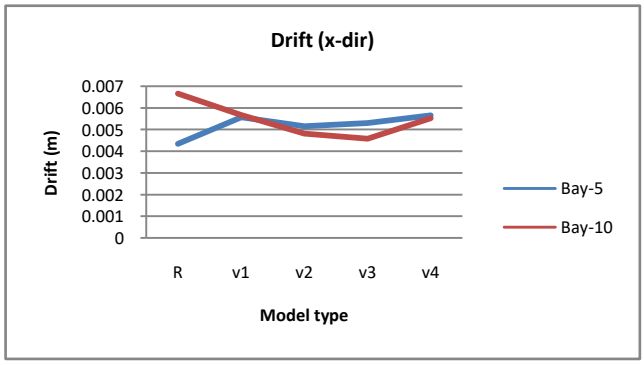


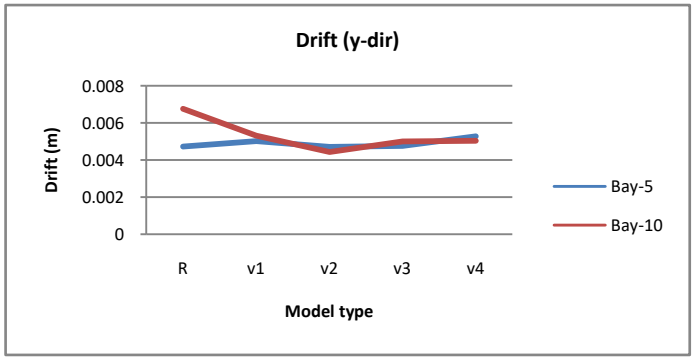


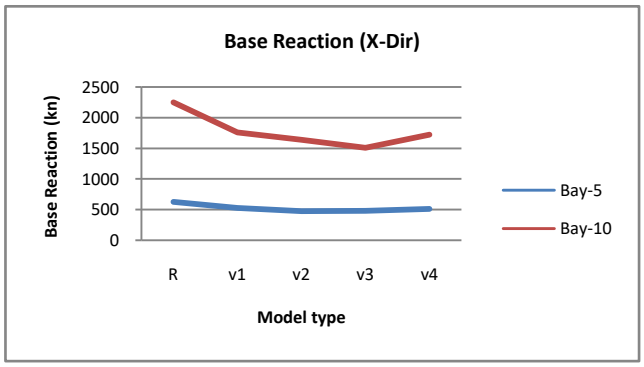
➢ RESPONSE SPECTRUM METHOD

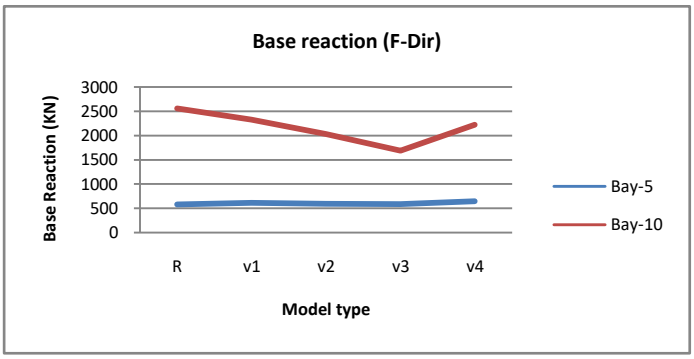




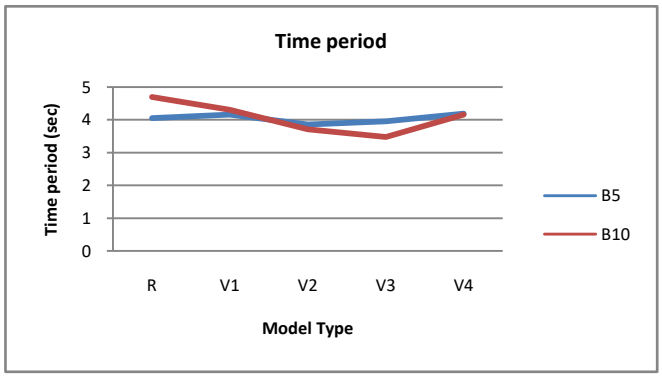


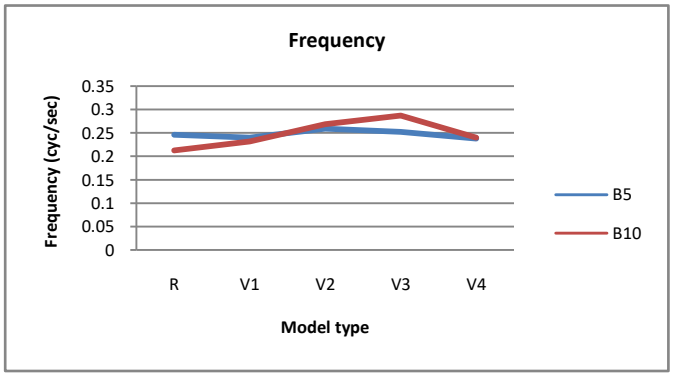






COMPARISON OF TIME PERIOD & FREQUENCY





6.CONCLUSIONS

Examination of the results has been done story wise for the each bay & after that bay wise for the same buildings ht. It is inferred that as measure of the setback increases shear force additionally increments. Change of the basic shear force from standard to the vertical geometric irregular frame is high based on work introduced in this thesis following point wise conclusion can be drawn:

1) It is presumed that as measure of the setback increase, base reaction additionally increments. The regular building outlines have low base response contrasted with setback irregular frames.

2) It is seen that basic seismic parameters of 5 bay-building structure upto 8 story building is less than the corresponding 10 bay-building outlines . Hence 5 bay- building is best suited for the lower building height.

3) For the higher story buildings 10-bay setups ought to be favored on the grounds that they have for the most part lesser estimations of basic seismic parameters than 5 bays. In this manner this investigation showed that with increase in number of bays, seismic execution of the both regular & vertical geometric irregular building progresses.

4) Seismic performance of the regular building “R” is observed to be superior comparing to irregular frame in almost every one of the cases. In this way it ought to be developed to limit seismic impacts. Among the setbacks frame, Type v1 building arrangement is found to be superior to the others.

ACKNOWLEDGEMENTS

The authors sincerely thank to, Professor Shaik Abdulla, Professor Nadeem Pasha & P.G Co-Ordinator Professor Mohammed. Faisaluddin Department of Civil Engineering,, Khaja Bandanawaz College Of Engineering, Gulbarga for their encouragement and for providing facilities to carry out this research work as a part of M. Tech project.

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