International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 05 | May 2019 www.irjet.net p-ISSN: 2395-0072

A STUDY OF VARIOUS STRUCTURAL FRAMING SYSTEMS SUBJECTED TO SEISMIC LOADS

Mr. Vikas Devidas Borse[1], Dr.D.P. Joshi[2]

[1]*ME Student, Civil Engg. Dept.Late.G.N.Sapkal College of Engg., Nashik*
[2]*Head of Department, Civil Engg. Dept., Late. G.N. Sapkal College of Engg., Nashik*

Abstract - *Moment frames have been widely used for seismic resisting systems due to their superior deformation and energy dissipation capacities. Past experiences revealed that majority failures of the structure at due to faulty design hence proper analysis and design is compulsory to safeguard the loss of life and property. The objective of the study is to investigate the seismic behavior of the structure having various structural configurations like (OMRF) ordinary moment resisting frame and (SMRF) special moment resisting frame. a comparative study of all these types of frames will shed light on the best suited frame to the adopted for seismic loads in Indian scenario. Modeling & Analysis of (G+10) building is done in zone III, IV, V. As results obtained best suited type of framing system will be used to study and analysis using brick masonry and siporex in zone V .*

***Key Words*: lateral loads, SMRF, OMRF, brick masonry, Siporex .**

1. INTRODUCTION :

An earthquake is a natural phenomenon associated with violent shaking of the ground. They are vibrations of the earth's surface caused by sudden movements. Since earthquake forces are random in nature and unpredictable, the engineering tools needs to be sharpened for analyzing structures under the action these forces .A building's framing works in conjunction with its foundation to provide strength and stability for the structure; it is also another critical component of the load path. Properly designed and constructed building framing is important in all locations. however, in earthquake prone areas ensuring proper building framing is critical. Framing must transfer all gravity, uplift, and lateral loads to the foundation.

1.1 R.C. Moment frames:

A fundamental structure in engineering the frame is a two-dimensional series of interconnected members joined together. The members are not necessarily straight and may be free jointed anywhere along their length. In real structures, moment frames in two orthogonal directions are often connected together to form a three-dimensional frame of columns and beams. Moment frames also can be drawn on to provide resistance to horizontal loads out of the plane of the frame.

OMRF(Ordinary Moment Resisting Frame): The ordinary moment resisting frames are designed to carry vertical and horizontal loads in the same plane but may also be drawn on to provide resistance to horizontal loads out of the plane of the frame ordinary moment resisting frames (OMRF) are designated for areas with historically low seismic ground acceleration.

SMRF (SPECIAL MOMENT REISTING FRAMES): Reinforced concrete special moment frames are used as part of seismic force-resisting systems in buildings. Beams, columns, and beam-column joints in moment frames are proportioned and detailed to resist flexural, axial, and shearing actions that result as a building sways through multiple displacement cycles during earthquake. Special proportioning and detailing requirements result in a frame capable of resisting strong earthquake shaking.

2. LITERATURE REVIEW

Sang Whan Han,et al (2005)[1]-Worked on Seismic behaviors of columns in ordinary and intermediate moment resisting concrete frames. In this paper 3 storey office building were designed, IMRF and OMRF building were assumed to be located in seismic zone 1,study attempted to investigate the effect of different reinforcement and different member sizes. Strength of OMRCF and IMRCF columns exceeded ACI-318-02. Change due to lap splices was noticeable in OMRCF.

Nabin Raj .C,et al (2012)[2]-Here steel bracings are incorporated with RC frames. .6,12and 18storey building is analyzed. MathCAD software used to get Eigen values and Eigen vectors. Bracings in bare frame increased stiffness, hence braced frame perform better. bare frame steel demand is reduced to 2.58% from 4%and reduction continues in 12 and 6 storey.

Dr.Valsson Varghese,et al (2013)[3]-Here for seismic loads the comparisons are made of OMRCF & SMRCF, criteria will depend on materials strength and ductility of structural compounds. Ductile detailing structure is safe to design than non-ductile detailing structure.

G.V.Sivaprasad,et al (2013)[4]-In this paper 5th,10th ,15th ,20th storied structures were analyzed and modeled using staad.pro zone2 seismic zone considered, study involves design of alternate shear wall in a structural frame and its orientation. studied in Vishakhapatnam region with & without shear wall. Conclusion: With shear wall SMRF tough gives more safety. SMRF is little bit cost effective. Min% on spacing of lateral ties at beam column joint is different from OMRF & SMRF .Lateral deflections are less.

Mohammad H. Jinya ,et al (2014)[5]-In this case central opening are provided in periphery wall with different percentage i.e. 15% and 25% and brick compressive strength are used as per IS : 1905-1987 i.e. 5.0 and 12.5 N/mm2 and Brick Masonry strength is 0.50 and 1.06N/mm2 .Equivalent diagonal strut (EDS) method is used to find out width. Diagonal strut will change the seismic performance of RC building. Axial force in column increased, story displacement and story drift are decreased and base shear is increase with higher stiffness.

Keerthy Peethambaram,et al (2015)[6]-In this paper we study nonlinear push over analysis was used to evaluate the seismic performance of three buildings with 4 different plans having same area and height and results of effect of plan aspect ratio on seismic response of building have been presented in terms of displacement, base shear. Conclusion: Plan dimensions have been significant effect on seismic behavior of building. Base shear increases with increase in Pan expect ratio.iii.40 % to 108 % of increased base shear. Performance point of building frame in terms of base shear and displacement investigate.

Sheovinay Rai,et al (2015)[7]-In this study different structural configurations such as SMRF & OMRF are studied with different software's such as E Tabs and staad.pro G+6 RCC Regular building are analyzed and seismic zone III&IV are taken in consideration. Average displacement and storey drift in SMRF than OMRF. .

Mohammad Musaib,et al (2016)[8]-Here comparing two code results feature is 1893 2002 part 1 and IBC 2003 American using staad Pro. Structure is analyzed. Base shear value for MRF IS 1893-2002 part 1 is higher than IBC. Storey drift is not satisfying criteria for drip for IES 1893 IBC satisfies Criterion in first case.

Nishant Kumar ,et al (2017)[9]- In this paper axial forces, base shear, bending moment, storey drift, ductility were modeled and analyzed, here G+8 building was analyzed. Conclusion: Storey sway increases with increase in no of stories. Base shear found less in SMRF than OMRF. Required area of steel was less in SMRF than OMRF.

3. SUMMARY

From above literature it can be stated that study is made on various framing systems .different zones have been studied and for this, comparison of OMRF and SMRF in zones 3,4,5 their comparison will provide a detailed structural study to ensure stability of structure and use of lightweight material can also be done in zone v.

4. CONCLUSION

Previous literature shows that the study has been made for comparison of OMRF and SMRF in different earthquake zones, hence comparative study of OMRF and SMRF in Zone 3,4,5 is to be studied and also (light weight infill material) is considered to study the seismic performance of SMRF structure for critical zone V.

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