Seismic Response of R.C. Structures with Different Steel Bracing Systems Considering Soil - Structure Interaction

K. S. Patil[1]* Ajit K. Kakade[2]

[1] Assistant Professor, Civil Engineering Department, JSPM's, ICOER, Wagholi, Pune

[2] PG Research Scholar, Civil Engineering Department, JSPM's, ICOER, Wagholi, Pune

Abstract – In this study the seismic response of reinforced concrete structure using steel bracing considering soil structure interaction to increase the horizontal stability of structure and rigidity of the structure. In which it is assumed that the building is fixed at it bases, but in reality the soil medium allows movement to some extent due to its property to deform. Therefore, this may decrease the stiffness of the structure and hence may increase the natural periods of the system. Thus, the process in which soil influences the movement of the structure and further this movement of structure influence the response of the soil is termed as Soil-Structure Interaction. Using different bracing X, V, Chevron bracings in different positions and with effect of SSI and without of SSI to strengthening the R.C. structure.

Keywords: Soil Structure Interaction, Lateral Forces, Stiffness

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1. INTRODUCTION

The purpose of the structure is to transfer vertical loads safely. vertical loads include dead load, live load, beside these loads building is also affected due to lateral loads formed because wind and seismic forces. Lateral load produces high stresses, results in movement and vibration of the structure. Therefore necessitate improving the stiffness along the lateral direction to resist the horizontal forces. Steel bracings are most economical method for resting the lateral forces and increasing the rigidity of the structure. Steel bracing has used to stabilise world's tallest buildings against the lateral loads and stiffness. Bracing is effective because it provides rigidity and strength against lateral shear.

The seismic force transfer compressive and tensile forces in the bracings. a choice of bracing used along the height of frame. X, V bracing reduce the bending movement of frame. Earthquake is natural method in which there is movement. These produces surface waves produce surface vibration on which the structure stands. Therefore study is considered on soil structure soil.

2. LITERATURE REVIEW

A) Mohamed M. Ahmed (2015) [1]: Author has consider moment resisting frame carried out three different methods of seismic analysis i.e response spectrum analysis, and nonlinear time method with nine different time history inputs recorded during earthquake.

B) Dhanaraj M. Patil (2015)[2] : This study find out the seismic behavior of different bracings of steel frame used: MRFs, braced frame (CBFs), (VBFs),(XBFs)

C) S. A. Halkude, S. M. Barelikar et al. (2014)[3]:

The author has studied the seismic response for R.C.C frame. Soil is modeled using elastic continuum approach dynamic analysis is carried out using response spectrum given in IS 1893 – 2002 in SAP 2000 software. Three buildings having 2 storeys, 5 storeys, and 8 storeys are considered

D) S.H. Kalyani et al (2014) [4] :

The author has considered the seismic response for R.C. frames with isolated footing Soil is modeled

using elastic continuum approach. Three buildings having 2 storeys, 5 storeys, are considered

E) Dr.Abhay Sharma et.al. (2014)[5]:

In this study, seismic analysis for high rise RC building frames considering different types of bracing systems.In proposed problem G+10 story building frame is analysed for varying bracing system under seismic loading.

F) Dhiraj raj, Bharathi M.(2013)[6]

"Among all position and orientation of bracings, the buildings with inverted mid bracing has the least storey drift in Zones IV and V"

G) H.R.Naseri et al. (2011)[7] :

This author investigates the different steel braced structures placed on various types of soil with varying hardness.

3. METHODOLOGY

a) Selecting type of frame structure with different type of bracings and plan of building and height of building as shown in fig 1

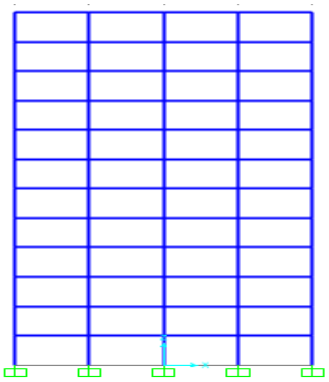

Fig 1

b) Isolated type of footing is considered with different soil strata.

c) Different position of bracings and structure including and excluding soil structure interaction are considered. As shown in fig 2

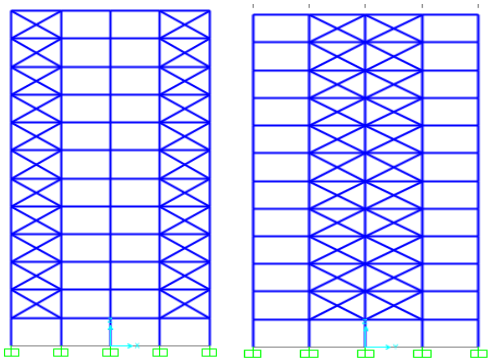

Fig 2

d) Properties of soil are taken through the IS 1893:2002.

4. CONCLUSION

1) According to this study, the position of braces to the middle of the frame reduces the drift much more than adding them to the ends

2) The stiffness characteristics depending on the dynamic soil properties and the dimensions of foundation.

3) Roof displacement increasing due to incorporation of SSI. For soft soil roof displacement is higher than fixed support condition. It increases up to 29%.

4) The performance quantities like displacements, acceleration and base shear are affected due to soil structure interaction.

5) Among all position of bracings the building with X bracing has minimum roof displacement. Therefore X bracing gives better performance during earthquake

5. REFERENCES

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Corresponding Author

K. S. Patil*

Assistant Professor, Civil Engineering Department, JSPM's, ICOER, Wagholi, Pune

E-Mail – kuldeepseti@gmail.com