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SEISMIC ASSESSMENT OF STEEL FRAMES USING DIFFERENT BRACING SYSTEMS

[1]Manisha L. Pokharkar, [2]B. Manjula Devi, [3]Samir Bendre

[1]P.G student, Datta Meghe college of Engineering, Airoli.

[2]Assistant Professor, Civil Department, Datta Meghe college of Engineering, Airoli.

[3]Structural Engineer, Tandon Urban solutions Pvt Ltd, CBD Belapur.

Abstract : Structures having sufficient strength and stiffness able to withstand deflection and collapse during earthquake. Strength and stiffness can be increased by adding bracings in the structure. In the present study typical G+6, G+8 and G+ 10 storied steel frames are modeled and analyzed. In the present study bare frame and frames with X bracing, Diagonal bracing, V bracing, and Inverted V bracing are studied. In the present study, R factor is calculated for steel frames. For the analysis non-linear static pushover analysis is used. SAP2000 V19 software is used to carry out pushover analysis. In this study results are compared in terms of base shear, pushover curve and R factor. The factors called over strength factor, ductility factor, redundancy and damping factor affects the R factor. The result of this study shows that the R factor is affected by the type of bracing system and the height of the structure.

Index Terms **- Strength, stiffness, bracings, Response Reduction Factor, Pushover analysis, Pushover curve.**

I. INTRODUCTION

Earthquake resistant structures are designed to resist lateral loads occurred during earthquakes in addition to gravity loads. Many design procedures depend on an elastic analysis of structure which does not consider the nonlinear behavior of structure. Researches have shown that a structural system designed elastically can take larger loads than the design loads. The nonlinear response of structure is not incorporated in design process but its effect is integrated by using a reduction factor called R factor.

The structure will fail only when large amount of plastic hinges are formed in the structure. Even though a plastic hinge is formed at one end, when non-linear behavior of certain structural elements is taken into account it will continue to take load beyond its elastic capacity as the member was designed for deformations greater than demand. For making the structure safer, durable and economic, an engineer has to implement reduction factors in the design to reduce the forces acting on the structure.

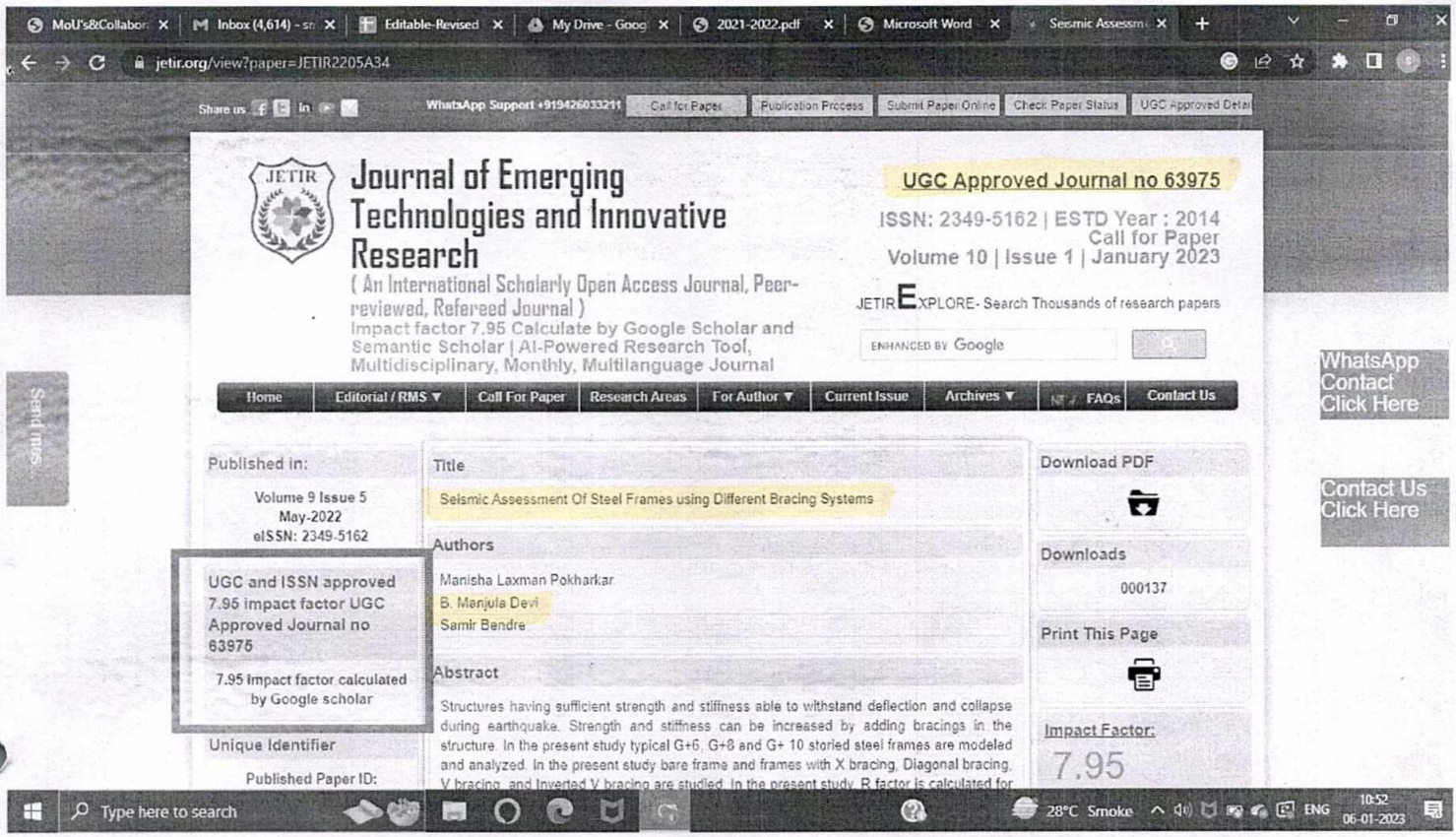
Steel bracing is economical, occupies less space, easy to erect and flexible to attain the required strength and stiffness. Braced systems are effective due to their strength and stiffness. Diagonal members take axial load and give more stiffness against the horizontal shear. Hence Braced frames are most economical lateral load resisting systems used in the building.

There are mainly two types of bracings concentric and eccentric. In this study concentric bracings are used as they form a truss and create a stiff frame.

II. BUILDING MODELLING AND DETAILS

A six, eight and ten storied steel frame structure having four bays in X direction and three bays in Y direction have been considered for the analysis. The building elevation is shown in fig 2.2. for 6, 8 &10 storey. The columns are fixed at the ground. Building is modeled with and without bracings in SAP2000V19. Bracings are used at the corners to increase the stiffness. Different types of bracings are considered such as X bracing, Diagonal bracing, V bracing and Inverted V bracing shown in fig 2.3, fig 2.4 & fig 2.5 for 6, 8 & 10 storey structure respectively.

All the detailing of six, eight and ten storied structure is given below.



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Seismic Assessment Of Steel Frames using Different Bracing Systems

Authors

Manisha Laxman Pokharkar
B. Manjula Devi
Samir Bendre

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