"Comperative Study Of S.M.R.F. Building Over O.M.R.F. Building With Seismic And Wind Effect"

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ABSTARCT

Seismic evaluation will provide a general idea about the building performance during an earthquake. The criteria of evaluation of building will depend on materials, strength and ductility of structural components and detailing of reinforcement. In this report Special Moment Resisting Frame (Ductile Detailing) and Ordinary Moment Resisting Frame are considering as structural frame and Comparison are made for seismic load. Detailing of reinforcement and design in case of Ordinary Moment-Resisting Frame are made by using IS 456 Provision's, while in case of Special Moment-Resisting Frame detailing of reinforcement and design are made by using IS 456:2000, as well as detailing done by IS 13920:1993. Hence OMRF Structure are to be designed for relatively very higher equivalent forces that of SMRF Structures. This helps in to why use of IS 1390:1993 is very effective for detailing the structure, hence it is economical. Thus the performance of SMRF structure in Earthquake is quiet good as compare to OMRF structure.

I. INTRODUCTION

Design of structures for earthquakes is different from that for any other natural phenomenon, like wind and wave. An earthquake imposes displacement on the structure, while winds and waves apply force on it. The displacement imposed at the base of the structure during an earthquake causes inertia forces to be generated in it, which are responsible for damage in the structure. As a consequence of this, the mass of the structure being designed assumes importance; the more the mass, the higher is the inertia force. After a whole gamut of earthquake experiences collected during the 20th century from across the world, today the earthquake engineering community believes that there are four virtues of an earthquake-resistant structure. These are:

- Sufficient strength – capacity to resist earthquake forces,
- Adequate stiffness – capacity to not deform too much,
- Large ductility –capacity to stay stable even after a damaging earthquake, and
- Good configuration – features of building size, shape and structural system that are not detrimental to favorable seismic behavior.

Aim of this study:

This study aims to Special Moment Resisting Frame (Ductile Detailing) and Ordinary Moment Resisting Frame are considering as structural frame and Comparison are made for seismic load and wind load.

Objectives of this study:

- To study Provisions of IS 1893 – 2002 (Part-I) for Earthquake
- To study Provisions of IS 13920-1993 for Ductile Detailing
- Analysis of OMRF and SMRF
- Design and Detailing of OMRF and SMRF

- **Moment- Resisting Frame:** It is frame in which members and joints are capable of resisting forces primarily by flexure.
- **Ordinary Moment-Resisting Frame(OMRF):**It is a moment-resisting frame not meeting special detailing requirement for ductile behavior.
- **Special Moment-Resisting Frame (SMRF):** It is a moment-resisting frame specially detailed to provide ductile behavior and comply with the requirements given in IS 4326 or IS 13920 or SP 6 (6).

II. LITERATURE REVIEW:

Engr. Najif Ismail

All structural systems are not treated equal when response to earthquake-induced forces is ofconcern. Aspects of structural configuration, symmetry, mass distribution, and vertical regularity must be considered. The importance of strength, stiffness, and ductility in relationto acceptable response must also be appreciated. While considering the lateral force resistingsystems we come up with so many options to have structural systems like Bearing wall systems, Moment Resisting frames, Lateral Bracing systems, designing the moment resisting concrete frame structures we have option to use IMRF, OMRF or SMRF.The basic step in conceptual design is to find the best suitable framing system and than lateralload resisting mechanism, while designing structures in the field mostly engineers faceproblem about the decision of Response Modification Factor R which is a measure of ductilityand over strength of the structures. It is used to find the base shear which is distributed ondifferent stories. SMRF and IMRF being emphasized in the research and a detailed computersimulation of the different RCC structures in zone 2 B with different R values i.e., 5.5 and 8.5given in UBC-1997 are used. Total 04 Structures with different heights of stories, Plans andNo. of stories are modelled in software which uses the advanced finite element method toanalyse the structure. The conclusions are drawn from the research for the approximation ofthe most suitable R values and to check the reliability of the values given in UBC.

Keywords: Beams, IMRF, SMRF, Response modification factor, Computer simulation.

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This study focuses on the comparison of the Indian Code (IS) and InternationalBuilding Codes (IBC) in relation to the seismic design and analysis of Ordinary RC momentresistingframe (OMRF), Intermediate RC moment-resisting frame (IMRF) and Special RCmoment-resting frame (SMRF). The analytical results of the model buildings are then comparedand analyzed taking note of any significant differences. This study explores variations in theresults obtained using the two codes, particularly design base shear, lateral loads, drifts and area
of steel for structural members for all RC buildings in both the codes.The discussion in this study will be confined to monolithically cast reinforced concretebuildings. Specific provisions for design of seismic resistant reinforced members are presented indetail. Provisions of Indian and International Buildings Codes are identified.Target deflection of the building is achieved at a lower lateral force in SMRF IBC i.e, theconcept of lesser force and more deflection is followed. However in OMRF, IMRF and SMRF ofIndian Code lateral force applied in higher as a result the deflection on the top of the buildingexceeds the target deflection. To keep the deflection within the permissible limits we thenincrease the column and beam sizes to make the building stiffer and maintain deflection withinthe permissible limits.This work aims at the comparison of various provisions for earthquake analysis as givenin building codes of Indian Code and International Building Codes.

Key words:*Equivalent Static Method, Indian (IS-1893-2002) Code, International Building (IBC-2006)*

F. Zareian1, D. G. Lignos2 and H. Krawinkler3 (2010)

This paper summarizes a study focused on evaluating the design modification factors (i.e., R, Cd, Ω)for Steel Special Moment-resisting Frames (SSMFs) by application of the FEMA P695 methodology.In this study, archetype design that comprise 3-bay special SMFs that serve as lateral load resistingsystem of steel buildings ranging from 1 to 20 stories are designed using ASCE 7-05 and AISC 341-05design provisions. Nonlinear models are developed using latest advances in structural componentmodeling. Parameters for these models are extracted from a steel component database for modeling ofcomponent deterioration. The numerical models are analyzed to predict the collapse capacities of eachdesign, and the adjusted collapse margin ratios (ACMR) are evaluated and compared to acceptancecriteria. It was found that SMFs designed in accordance with present seismic provisions provide anacceptable margin of safety with the exception of a performance group that contains tall momentresisting frames designed for high seismic zones using the response spectrum analysis procedure. Itwas also found that increasing the Column-Beam Moment ratio from the minimum code requirementof 1.0 to a larger value can significantly improve long period SMFs behavior leading to an acceptableACMR values.

Aviram1, B. Stojadinovic2, and A. Der Kiureghian3 (2008)

Many steel moment-resisting frame buildings suffered failure at their column base connections during the 1995Kobe, 1994 Northridge and 1989 Loma Prieta earthquakes. System reliability analysis of an exposedmoment-resisting base plate connection designed for a low-rise steel special moment resisting frame is carriedout using a structural reliability analysis software. Modes of failure of the column base are defined using alimit-state formulation based on the AISC Design Guide No. 1-2005. The predominant failure modes of theexposed column base include: yielding of the base plate on the compression side, crushing of concrete, and shearfailure due to sliding of the base plate and bearing failure of the shear lugs against the adjacent concrete.Sensitivity analysis is carried out to determine the influences of limit-state and distribution parameters on thereliability of the system. On the demand side, the cantilever length of the base plate extending beyond the columncross section and the bending moment at the column base are found to be the main parameters influencing thefailure of the column base connection. On the capacity side, the thickness of the base plate and the strength ofsteel are the main parameters influencing the reliability of the connection. Fragility curves are developed for eachfailure mode of the column base plate as well as for the connection as a system. These are expressed as a functionof the spectral acceleration at the first mode period of the building.

III. Conclusion

- The forces on OMRF structure are comparatively much higher than that of SMRF structure
- It is more safe to design a ductile detailing structure than the non ductile detailing structure
- The quantity of steel is found to be more in case of SMRF than that of OMRF.

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