ANALYSIS OF SEISMIC BEHAVIOUR OF RCC AND COMPOSITE STRUCTURE WITH BUCKLING RESTRAINED BRACES

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Abstract-*Buckling restrained braced frames (BRBFs) are one of the newer types of seismic force resisting systems used in modern building designs. BRBFs resist lateral loads as vertical trusses in which the axes of the members are aligned concentrically at the joints. Although the global geometric configuration of a BRBF is very similar to a conventional concentrically braced frame (CBF), the members, connections, and behavior of BRBFs are distinctly different from those of ordinary concentrically braced frames (OCBFs) and special concentrically braced frames (SCBFs). The key difference is the use and behavior of the Buckling restrained brace (BRB) itself. This study focus on the analysis of seismic behavior of RCC and composite structure with conventional and buckling restrained braces using ETABS software.*

INTRODUCTION

Buckling-Restrained Braces (BRBs) are a relatively recent development in the field of seismic resistant steel structures. BRBs can be considered as one of the most efficient structural system for resisting lateral forces due to earthquakes because (i) they provide complete truss action, they exhibit a symmetric load-deformation behaviour (equal response in compression and tension) and large energy absorption capacity. They are basically made of two components, Yielding steel core and an encasing member. The former component takes the axial force while the latter component restrains the brace from buckling in compression. In particular, it is possible to provide this mechanical behaviour enclosing a ductile steel core (rectangular or cruciform plates, circular rods, etc.) either in a continuous concrete filled tube or within a continuous steel tube. In the first case, the brace is called “unbonded” BRB, because the surface between the core and the sleeve is treated with unbonding materials to allow the relative displacement with the sleeve to be developed. In the second case, the steel core is separated by the sleeve by a small gap and it is usually called only steel BRB. In both cases, the assembly is detailed so that the yielding core can deform longitudinally independent from the mechanism that restrains lateral and local buckling.

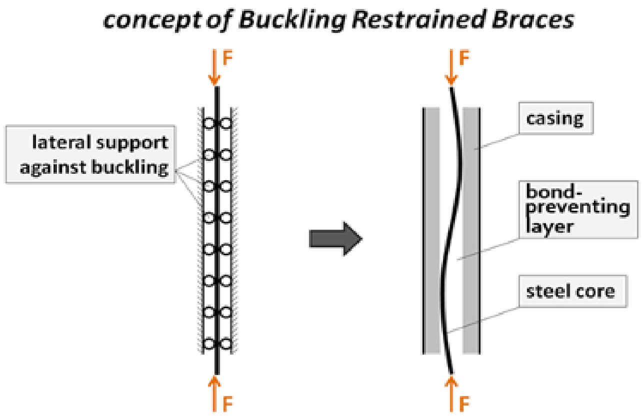

Fig 1. Concept of buckling restrained braces

2. NEED FOR THE STUDY

Based on many research studies, it is proven that in high seismic zones common RCC buildings are failed to perform up to the desired life span of the structure. To get rid over this problem, bracing system is now a day looks better option. It not only stabilizes the structure but also gives more stiffness to it. This modified brace called buckling restrained brace have much more advantages over conventional braces, such as it is very cost effective, higher stiffness value, low maintenance, easy replaceable, and many more. Keeping these points into consideration, this research work leads to study the seismic behaviour of BRB in RCC and composite building for to propose a suitable building model for seismic stability using commercial software ETABS v2013.

3. SCOPE: The present study deals with seismic analysis of RCC and composite frame structure with buckling restrained brace and conventional braces frames inorder to evaluate the effect of seismic load on structure.

4. OBJECTIVES

- To study the seismic behavior of RCC and composite building with buckling restrained braces.
- To compare the seismic behavior of RCC and composite structure with conventional and buckling restrained brace frame.

4. METHODOLOGY

- Validation of ETABS
- Modeling of RCC and composite structure with BRB and conventional braces
- Time history analysis is done
- Comparison of four models considered.

Data of building used for modeling

Type of building	Residential building
No of stories	10
Floor height	3m
Total height of building	60m
Plan area	15x16 m
Beam size	0.3x0.6m
Column size	0.3x0.9m
Slab thickness	0.125m
Steel brace	ISMB 450
Grades	Fe415, M30, Fe250

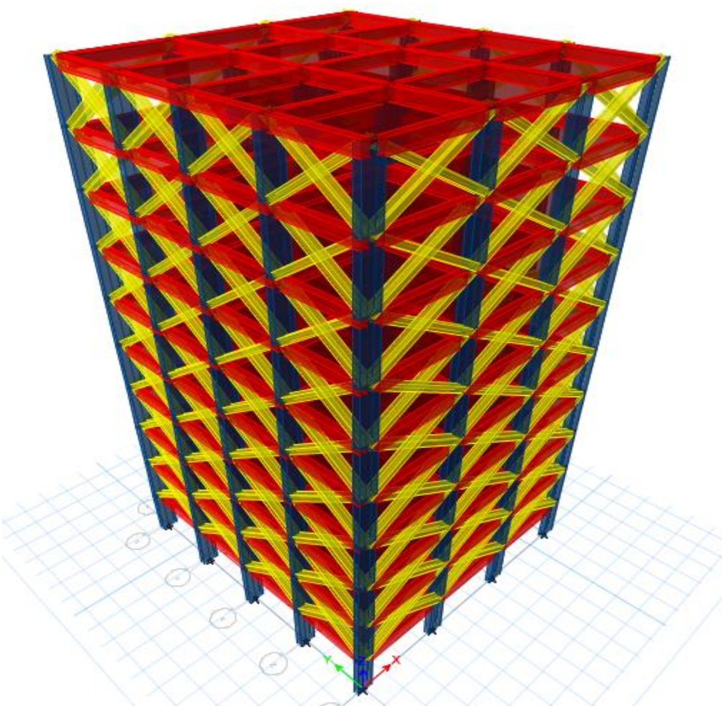

Fig 2.Model of RCC building with BRB

7. RESULT AND DISCUSSSION

TIME HISTORY

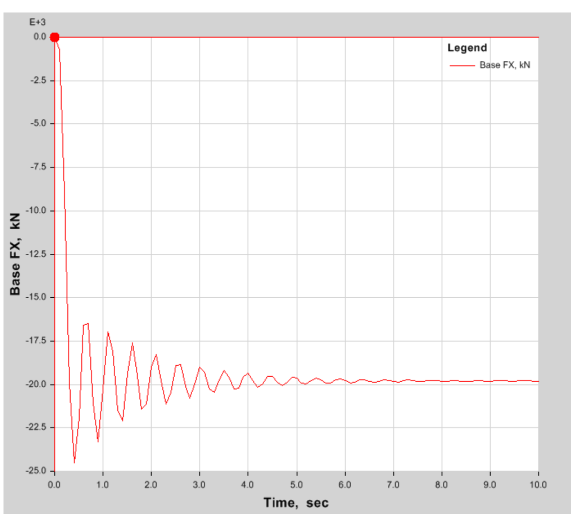

Fig 3.Variation of base shear with time in RCC building

Comparison of base shear

Model	Baseshear (kN)
RCC with BRB	24518.9352
RCC with conventional braces	24554.93
Composite with BRB	23213.211
Composite with conventional braces	24852.3981

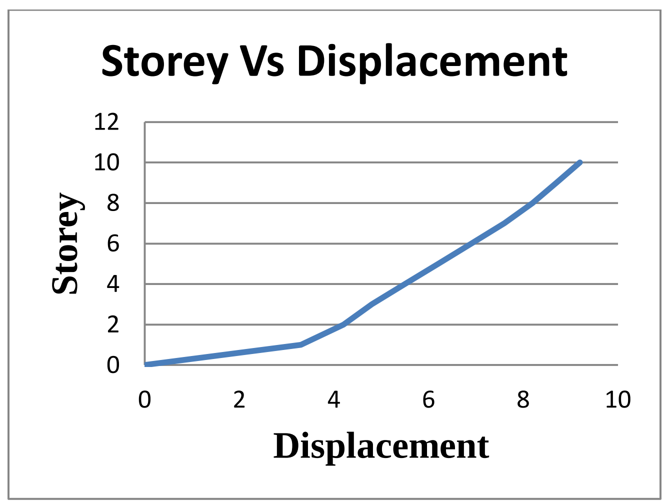

Fig 4.Variation of displacement with respect to number of stories in RCC building with conventional brace

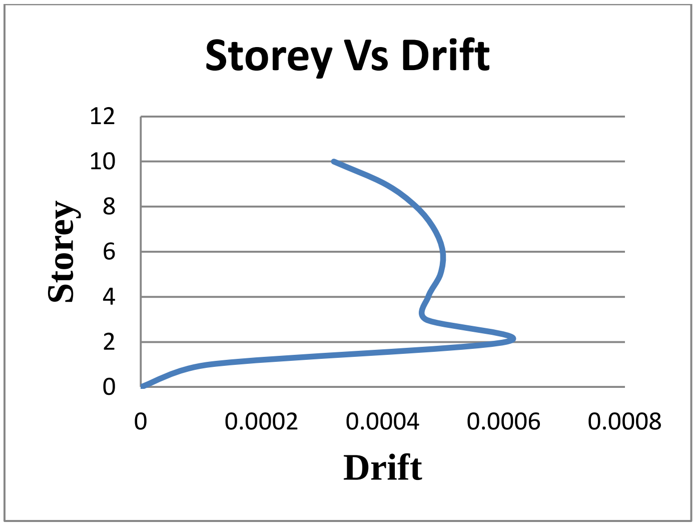

Fig 5. Variation of drift with respect to number of stories in composite building with BRB

Drift obtained for Composite building with BRB

Storey	Drift
Story10	.000319
Story9	.000404
Story8	.000455
Story7	.000485
Story6	.000499
Story5	.000495
Story4	.000475
Story3	.000471
Story2	.000603
Story1	.000114
`Base	0

8. CONCLUSION

By comparing four models, the building modeled with BRB having least base shear. So we can say that composite building with BRB having the greater capacity to resist seismic forces. Also BRB having lower displacement as compared to building modeled with conventional braces. Composite building with BRB has low displacement of 7.6 mm in the top storey as compared to other building models during strong ground motions in the case of time history analysis. The overall results suggested that BRB were excellent seismic control device for composite building.

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