EFFECT OF CONCENTRIC BRACING SYSTEMS ON LATERAL BEHAVIOUR OF IRREGULAR BASE ISOLATED STEEL STRUCTURE

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Abstract - Engineers must design buildings so that the frequency range of the building's response to ground motion was away from the frequency content of earthquakes. might be thought that structures can be protected from the destructive forces of earthquakes by increasing the strength of the structures so that they do not collapse. more rigid attachment of a building to its foundation will result in less damage in an earthquake. However, if the foundation is rigidly attached to the building or any other structure, all of the earthquake forces will be transferred directly and without a change in frequency to the rest of the building. Providing a base isolation device between the building and the ground can minimize the level of earthquake force transmitted to the buildings.

In the present study a 25 storied building is considered, having overall plan dimension of 40 m x 40 m along X and Y direction. Two type of structure are considered, one is plan regular and plan irregular. Both types of structures are studied with fixed base and with base isolation. Plan irregular considered is L shape geometric configuration. Conclusions are made from modal, equivalent static and dynamic time history analysis of regular and irregular frame with and without base isolation in presence of concentric bracings.

***Key Words*: Base isolation(B.I.), Fixed base(F.B.), Built-up section, Concentric bracing, Lead rubber bearing, Steel moment resisting frame**.

1.INTRODUCTION

Modern methods of seismic design (since the 1970s) allow structural engineers to design new buildings with the aim of predictable and ductile behaviour in severe earthquakes, in order to prevent collapse and loss of life. However some controlled damage is expected, which may result in the building being damaged beyond economic repair after severe shaking.

In a decades ago steel structure assumes a vital part in the development business. It is important to plan a structure to perform well under seismic burdens. steel bracings can build the vitality assimilation of structures and diminishing the request constrained by seismic loads. base isolation is a piece of capacity all together diminish the vibration powers. It is broadly used to shield structures from tremor harming impacts. The base isolation framework need to perform three capacities, they are horizontal adaptability, energy dissemination and unbending nature. Type of base isolator used is Lead Rubber Bearing. which stiffness and yield strength has calculated based on the structural consideration. It is discovered that day and age of base confined structures is relatively higher than working under settled condition and with the lessened base shear at the base of structure.

2 OBJECTIVE OF WORK

Comparative study of concentric bracings with and without base isolation for plan irregular steel moment resisting frames. to response of structure such as displacement, base shear, drifts etc. by considering equivalent static and time history analysis.

2.1 METHODOLOGY

- In the present investigation a 25 storied building is considered, having general arrangement measurement of 40 m x 40 m along X and Y course.
- Two kind of structure are viewed as, one is design customary and design sporadic. The two sorts of structures are considered with settled base and with base confinement. Plan sporadic considered is L shape geometric design.
- Type of base isolator utilized is Lead Rubber Bearing.
- For both sort of structure, the impact of concentric bracings are examined.
- For customary square in design assembling a focal opening of 10m x 10m is give, though for L shape, 5m x 5m opening is given.

3. MODELING AND ANALYSIS

Demonstrating of steel minute opposing casing is finished utilizing ETABS Ver. 2015, which is 3D demonstrating and investigation programming bundle. Equivalent Static analysis and Time History analysis are carried out.

3.1 MODELS CONSIDERED

Following sorts of models are considered in this investigation. Add up to eight models are made with for settled base and segregated structures.

a. Fixed Base Plan regular
b. Fixed base Plan regular with concentric Bracing
c. Fixed Base Plan Irregular
d. Fixed base Plan Irregular with concentric Bracing
e. Base isolated with Plan regular
f. Base isolated Plan regular with concentric Bracing
g. Base isolated Plan Irregular
h. Base isolated Plan Irregular with concentric Bracing

3.2 MODELING IN ETABS

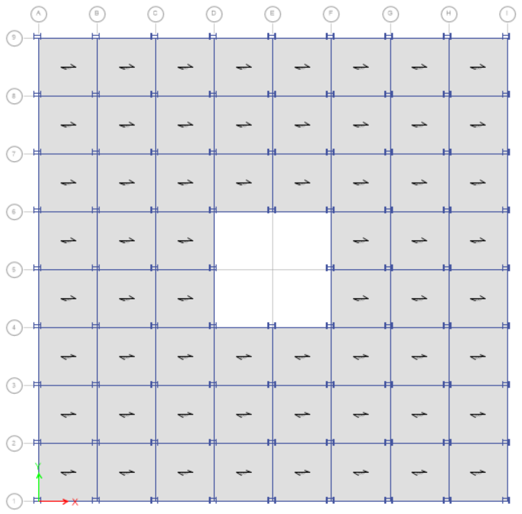

Figure 1: Fixed Base Plan regular

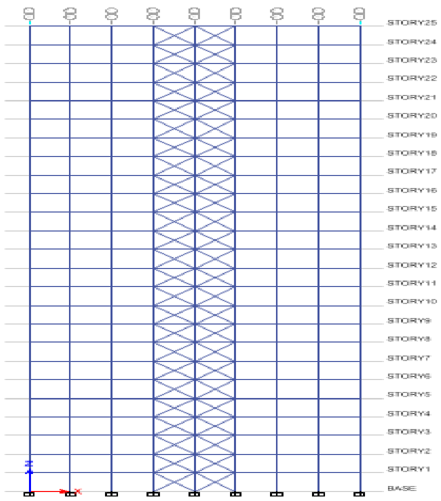

Figure 2: Fixed Base with plan regular concentric bracing elevation

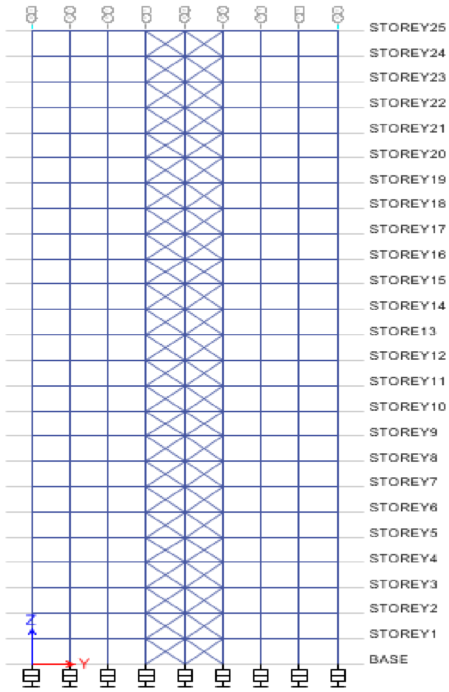

Figure 3: Base isolated Plan regular with concentric Bracing

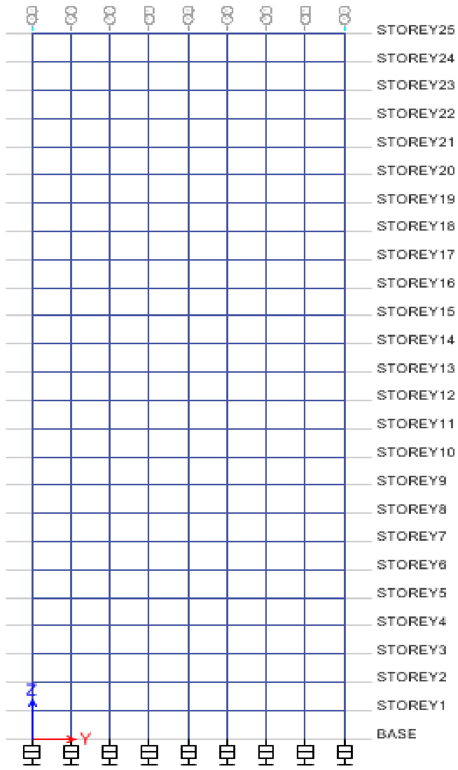

Figure 4: Base Isolation with plan regular

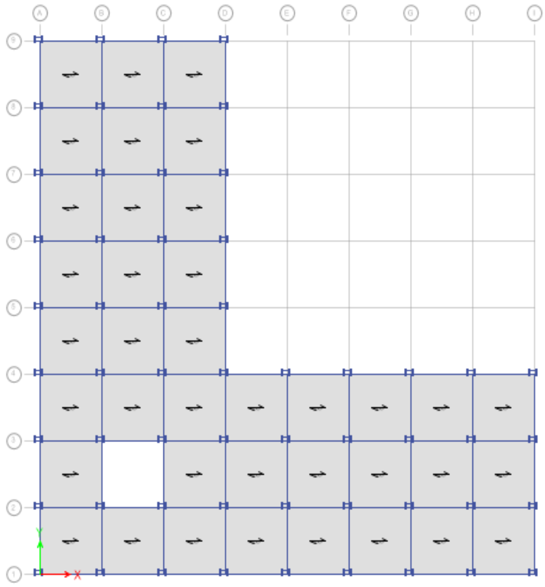

Figure 5: Base isolated Plan Irregular

3.2 FUNDAMENTAL CONSIDERATIONS

No. of storeys	25
Storey height	4m
Deck slab	200mm
Support conditions	Fixed, based
Soil type	Type 2. medium soil
Steel grade	FE360
Grade of concrete	M30
column	Built up section ISWB-600
Structural beam	ISMB-600
Concentric bracings	ISMB-600

3.3 LODING DATA

Live load = 4 kN/m^2
Super dead load = 1.5 kN/m^2
Glazing Load = 1 kN/m

3.4 EARTHQUAKE DATA

Zone(Z) = V (0.36)
Importance factor (I) = 1
Response Reduction Factor (R) = 5
Damping ratio = 10%

3.5 ISOLATOR PROPERTIES

Effective stiffness Linear (U1) = 1279332 kN/m
Effective stiffness Non Linear(U2) = 977897 kN/m
Yield strength (U3) = 36779 kN

4. RESULTS AND DISCUSSION

4.1 Static Analysis Results

4.2 TIME PERIOD

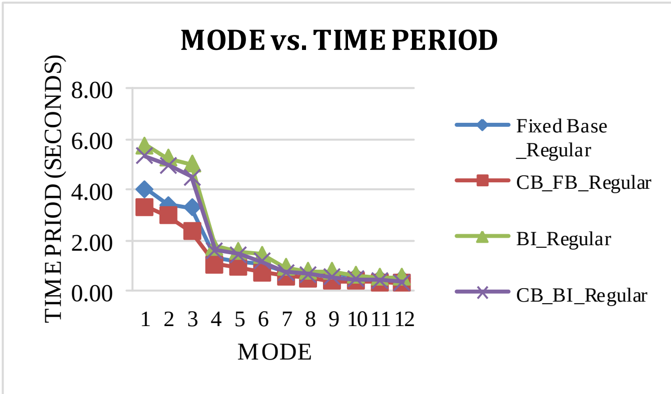

Figure: 6 Mode V/s Mode (time) period: Regular Frame

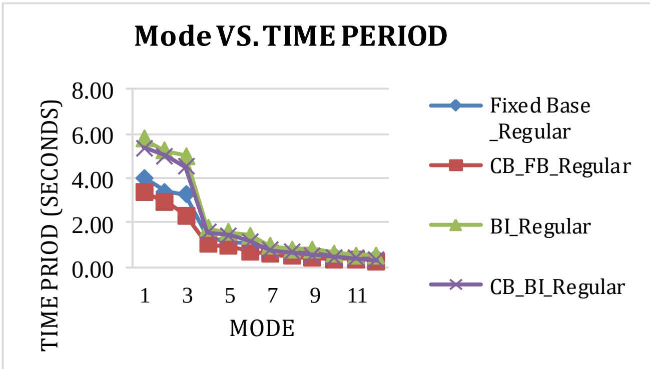

Figure: 7 Mode V/s Time Period: Irregular Frame

4.3 BASE SHEAR

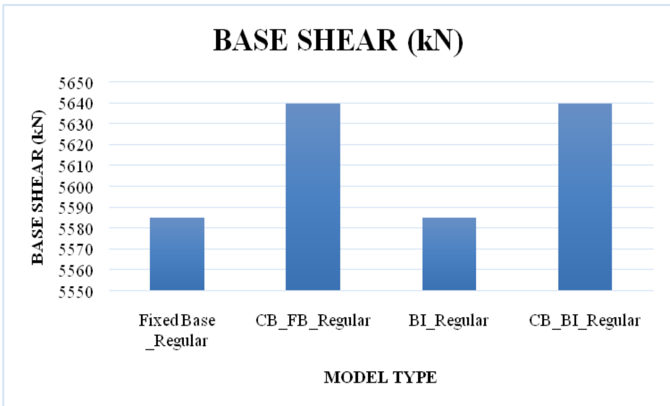

Figure:8 Maximum Base shear: Regular Frame

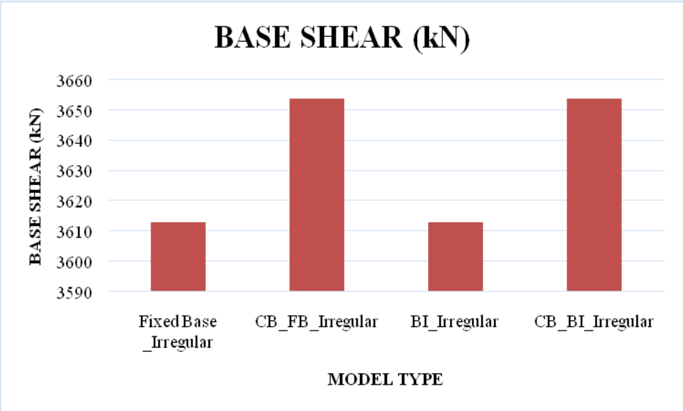

Figure: 9 Maximum Base shear: Irregular Frame

4.4 STOREY DISPLACEMENT

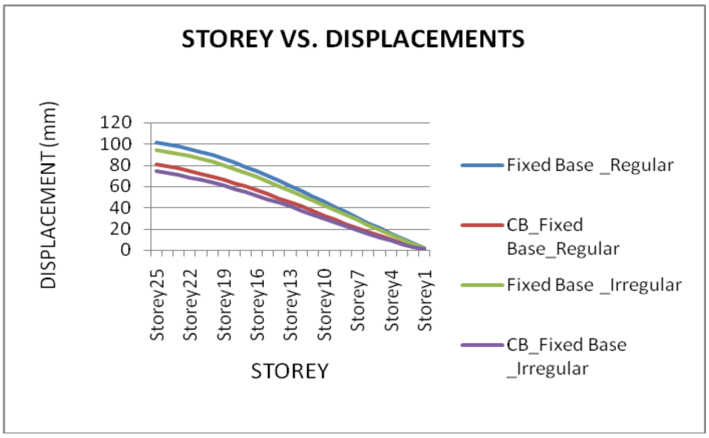

Figure: 10 Storeys vs. Displacements: Regular Frame

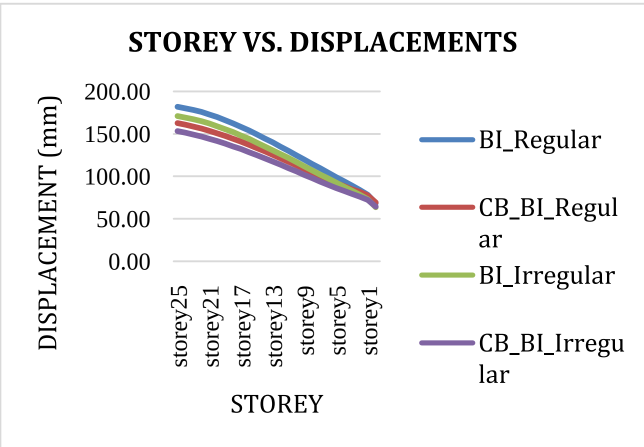

Figure: 11 Storey vs. Displacements Irregular Frame

4.5 STOREY DRIFT

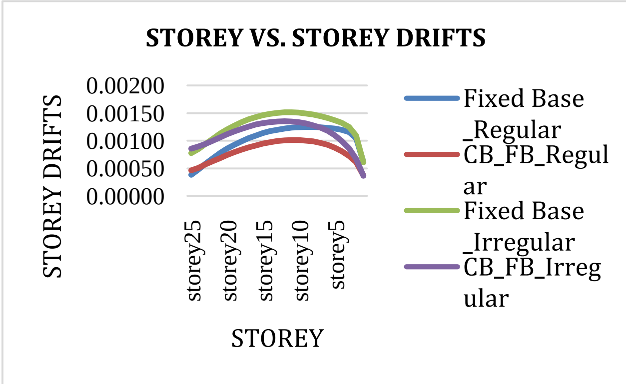

Figure: 12 Storey vs. Storey Drifts

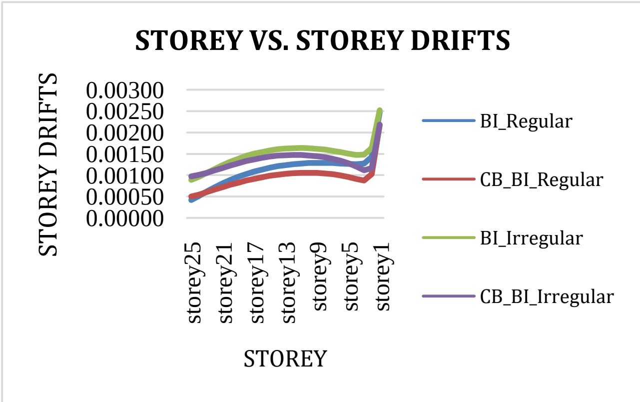

Figure: 13 Storeys vs. Storey Drifts

4.6 Dynamic Analysis Results

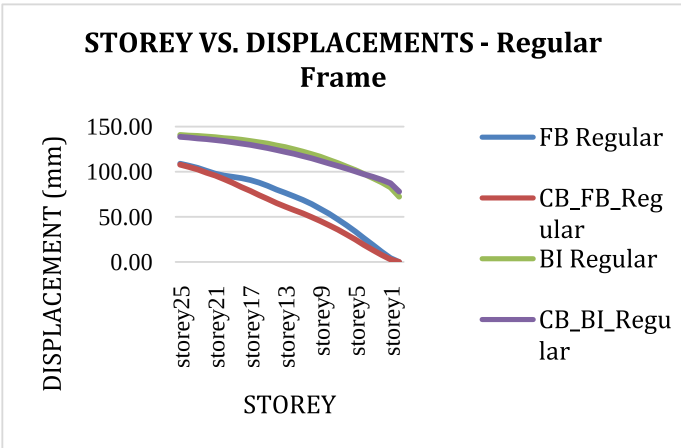

Figure: 14 Storey vs. Storey Displacements: Regular Frame

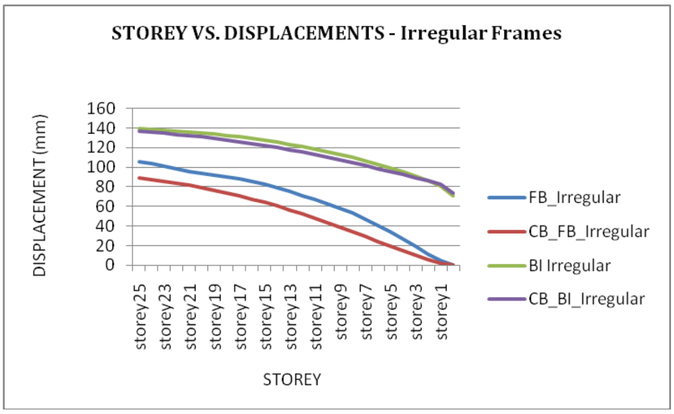

Figure: 15 Storeys vs. Storey Displacements: Irregular Frame

5. CONCLUSIONS

Following conclusions are produced using modular, proportionate static and dynamic time history investigation of normal and unpredictable edge with and without base confinement in nearness of concentric bracings.

- Base separation can diminish the working over all recurrence by delaying the day and age, there by doing minimum harms to the structure.
- Irregular structure will have less deformation because of later loads in correlation with the consistent even if there should be an occurrence of base disengagement aside from now and again.
- Story drifts are more if there should arise an occurrence of base isolation contrasted with settled one at the establishment level, since there is as division of the substructure and super structure by base detachment.
- Base isolation decrease the solidness of the structure essentially at the lower lever when contrasted with settled base.
- Use of concentric bracings is proposed in base disconnected since, the removals and floats are more than that of settled base.
- Displacements results are extracted from time history examination, and from the outcomes unmistakably, for standard structure around 29% expansion in removals if there should be an occurrence of BI structure without CB and 28% with concentric bracings. Yet, there is critical lessening in the event of FB with concentric than that of base segregation in time history examination.

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