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Residential Building Design and Analysis with Base Isolation

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Abstract-Buildings now include base isolation (BI) systems to isolate the structure from any potential damage caused by seismic motion and stop the superstructures from absorbing the energy of the earthquake. The base isolator's mechanism expands the overall structure's natural period and reduces its acceleration response to seismic motion.

I INTRODUCTION

Modern Methods for Building Earthquake-Resistant Structures

A)Shape-Memory Alloys

Special characteristics are desired in an earthquake-resistant structure. They have the capacity to absorb large amounts of energy without suffering substantial damage or developing lasting flaws.

B) Base Isolation

It is a commonly accepted and used strategy for shielding the structure against seismic forces. It is a group of structural components that separates the superstructure from the substructure.

C) Seismic Dampers

The diagonal braces were utilised as a reliable lateral load resisting device in a moment-resisting frame.

D) Shear Walls Comprised Of A Steel Plate

Steel is well known for its ductile behaviour, making steel plate shear walls one of the most important parts of lateral load-resisting systems.

Dampers

An earthquake's vibration energy is controlled by a damper, which is carefully positioned in buildings to reduce vibration and building moments

A) Oil Dampers

When a piston goes through an oil-filled cylinder, resistance is experienced at the orifice. The absorbing capacity of oil dampers is approximately inversely proportional to the vibration's speed.

Oil Dampers

B)Friction Dampers

Two stainless steel plates are connected together by bolts and a friction plate is put between these.

Friction Dampers

C)Carbon Fibre

A building made of carbon fabric that is earthquake-resistant and like a huge spider web has been built. This is the very first seismic reinforced structure everbuilt out of carbon fibre

Carbon Fibers

Base Isolation

In this situation, the entire project's foundation pillars are isolated using spherical sliding isolation bearings, Hence, it is just Earthquake Resistant Designs.

Base Isolation

II METHODS AND METHODOLOGY

Column Details

Column Dimension	600mm x230 mm
Grade	M30
Concrete Density	25KN/m^3
Longitudinal Bar	HYSD 500
Consignment Bar	HYSD 415

Beams Details

Beam Dimension	450mm x230 mm
Grade	M30
Concrete Density	25KN/m^3
Longitudinal Bar	HYSD 500
Consignment Bar	HYSD 415

Slab Details

Slab thickness	200mm
Grade	M30
Concrete density	25KN/m^3
Way of slab	2 WAY SLAB

Wind Load Details

Wind Load	As Per Is 875-3 (1987)
Factor for Response Reduction	5
Rate of Damping	0.05
Importance Factor	1
Wind Speed	44
Terrain Category	3
Wind Angle Along the X Axis	0
Angle of Wind Along the YAxis	90

Earthquake Load Conditions Details Between X and Y

Lateral Load	As Per IS 1893-2002
Earthquake Load	Seismic Load
Seisminc Zone	II &V
The kind of soil	II
Factor for Response Reduction	5.0
Ecc.Ratio	0.05
Seismic Zone Factor	0.36
Time Period	0.075

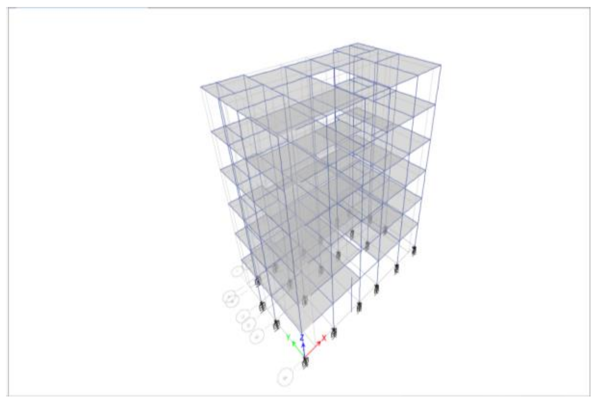

Fig 1.3d Structure of Buiding With Base Isolater

III RESULTS

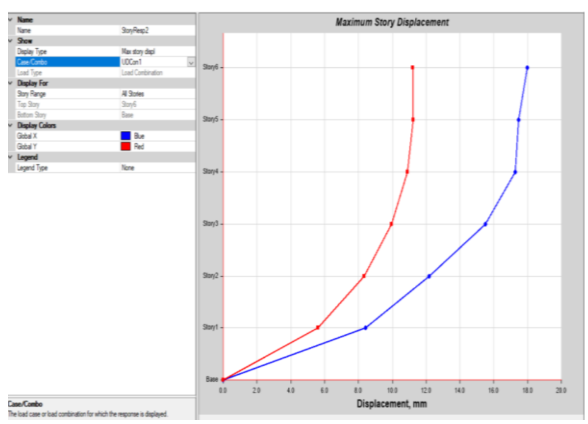

Fig2. Maximum Of Story displacement For Load Combination 1.5*(D.L+L.L+W.L+F.L) With Base Isolation

Storey Displacement (Mm) For Load Combination

levels	Basement	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Along x	0	8.6	12	15.8	17.5	17.8	18
Along y	0	5.8	8.4	10	11	11.2	10.8

Discussion:

1.From the above table and graph, along X at storey 6 shows higher the displacement value than other storey levels.

2.From the above table and graph, along Y at storey 5 shows higher the displacement value than other storey level.

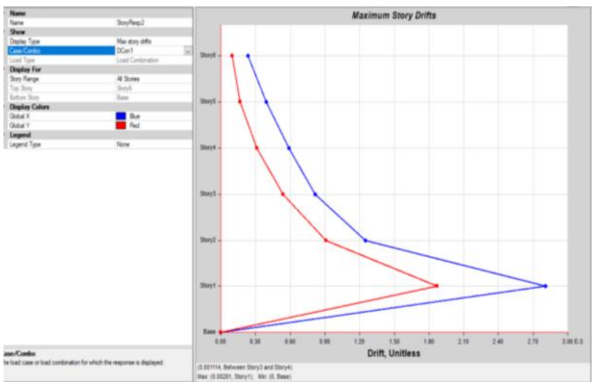

Fig3.Maximum of Story Drift for Load Combination 1.5*(D.L+L.L+W.L+F.L) with Base Isolation

Maximum Story Drift (Mm) for Load Combination.

Levels	Basement	Level 1	Level 2	Level 3	Levels 4	Levels 5	Levels 6
Along x	0	2.8	1.3	0.7	0.6	0.45	0.25
Along y	0	1.9	0.9	0.4	0.3	0.25	0.15

Discussion

1. From the above table and graph, along X at storey 1shows higher the story drift value than other storey levels.

2. From the above table and graph, along Y at storey 1 shows higher the story drift value than remaining storey level.

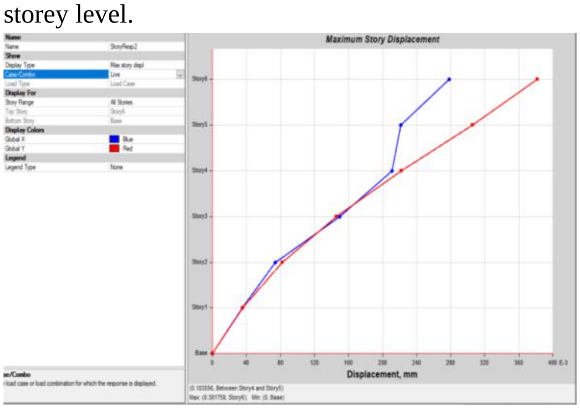

Fig 4.maximum of Story Displacement for Live Load With Base Isolation

Storey Displacement (Mm) For Live Load

levels	Basement	Level1	Level 2	Level 3	Level 4	Level 5	Level 6
Along x	0	38	70	150	210	230	280
Along y	0	38	80	150	220	280	360

Discussion:

1. From the above table and graph, along X at storey 6 shows higher the displacement value than other storey levels.

2. From the above table and graph, along Y at storey 6 shows higher the displacement value than remaining storey level.

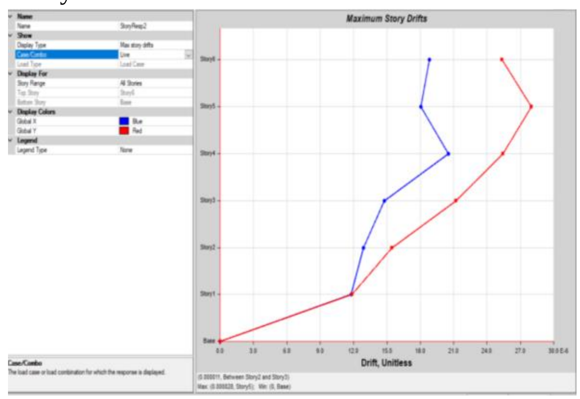

Fig 5.Maximum of Story Drift for Live Load With Base Isolation

Maximum of Story Drift for Live Load with Base Isolation

Levels	Basement	Level 1	Level 2	Level 3	Levels 4	Levels 5	Levels 6
Along x	0	12	13	15	20	18	19
Along y	0	12	16	21	265	28	26

Discussion:

1. From the above table and graph, along X at storey 4 shows higher the story drift value than other storey levels.

2. From the above table and graph, along Y at and storey 5 shows higher the story drift value than remaining storey level.

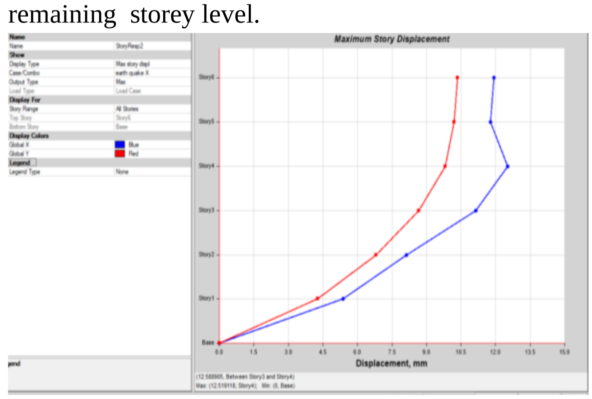

Fig 6.Maximum of Story Displacement For Earth Quake X Dirction With Base Isolation

Maximum Of Story Displacement for Earthquake X Dirction with Base Isolation

Levels	Base ment	Level 1	Level 2	Level 3	Level 4	Level 5	Leve l 6
Along x	0	56	80	114	128	119	120
Along y	0	44	68	85	101	102	104

Discussion:

1. From the above table and graph, along x at storey 4 shows higher the displacement value than other storey levels.

2. From the above table and graph, along Y at storey 5 shows higher the displacement value than remaining storey level.

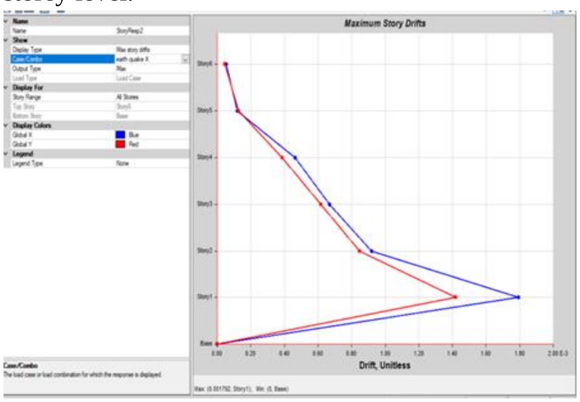

Fig 7.Maximum of Story Drift for Earthquake Load Along X Axis with Base Isolation

Maximum Story Drift (Mm) For Earthquake Along X Axis

Levels	Base ment	Leve l1	Level 2	Level 3	Level 4	Level 5	Leve l 6
Along x	0	1.8	0.9	0.75	0.5	0.15	0.1
Along y	0	1.4	0.85	0.6	0.4	0.15	0.1

Discussion:

1. From the above table and graph, along X at storey 1 shows higher the story drift value than other storey levels.

2. From the above table and graph, along Y at storey 1 shows higher the story drift value than remaining storey level.

IV CONCLUSION

Following conclusions are made from the analysis's results:

1.For Maximum Story Displacement

For load combination and dead load there is maximumum dispacemet at storey 6 along X axis and at sorey 5 along Y axis

For live load and earthquake along X axis the maximum displacement at storey 6 along X axis and at storey 6 along Y axis

For earth quake along Y axis the maximum displacement at storey 4 along X axis and at storey 6 along Y axis

For wind load X axis the maximum displacement at storey 4 along X axis and at storey4,5, 6 along Y axis and alon wind load Y axis no displacement along X axis and at storey 6 along Y ais

2.For Maximum Story Displacement

For a given load combination, the largest amount of drift occurs at storey 1 along the X and Y axis.

The maximum drift for a live load is at story 4 along the X axis and storey 5 along the Y axis.

Maximum drift for earth quake load along X axis occurs at story 1 along X and along Y axis.

Maximum drifting for earth quake load across Y axis occurs at storey 1 along both the X and Y axes.

Maximum drifting for wind loads along the X axis occurs at storey 1 along the X and along the Y axis.

There is no maximum drifting along X and storey 1 along Y axis for wind load along Y

SUGGESTIONS

I advise all designers and architects to apply these helpful and significant procedures during their projects to save either assets or people's lives after evaluating a variety of approaches and alternatives for earthquake structure design.

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