SEISMIC EVALUATION OF BASE ISOLATED REINFORCED CONCRETE BUILDING CONSIDERING EFFECT OF DUAL SYSTEM

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Abstract: In recent years the number of high raised buildings are increasing rapidly so the main concentration is on the structure which is expect to be tall slender. Earthquake is an incalculable effect to the human beings from the past many years so many investigators have been struggling to save the structure from the earthquake. The advantage of using base isolated building with effect of dual system is so safe for the building and living being to overcome the seismic effect.

We used dual system as a shear wall, beam and column, base isolation device as a rubber lead bearing. The comparative study on the regular building / dual system building considering the pushover curve, time period, storey drift, lateral displacement, base shear. By using the ETABS software all these experimental results are obtained from the models and shown as the graphical representation also.

Keywords: Base isolation with lead rubber coat, shear walls, Response spectrum method, Equivalent static method, Pushover analysis etc.

1. INTRODUCTION

In this Era there is an Enormous increase in the number of High-Raised Building in the Present areas and their main Concentration is on actualization of the structure which is expect to be tall slender. Considering the all these selection building should be examined carefully. After all the structure is examined for seismic and wind loads. So that determining for the building to prevent / Resist lateral forces with perpendicular forces. Dual system has been noticed to attack lateral loads effectually /actively, after all this is mixture of two load resisting system. Consolidation of moment resisting frames along with shear walls, beam columns used. Shear wall is a structural perpendicular member which helps to fight parallel to the plan of wall (lateral loads) shear wall also act as cantilever. Thus, it gives good performance.

Base Isolation is the greatest defending quake behaviour. The structure which is supported by the base isolation devices help to overcome shaking and distraction the structure. In this case study we are using lead bearing rubber, this rubber bearing is made from rubber and coatings of steel. This is firm and durable in y track but stretchy in x direction.

2. LITERATURE REVIEW

Hamdy Abou-Elfath, et al, executed work to estimate the seismic progress of 6 story Reinforced concrete (RC) building by using one diagonal buckling restrained brace. Ten ground waves with changed PGA planes are used in this investigation. In this seismic evaluation he has worked out on the static push over analysis and time history earthquake analysis. He calculated the values of roof drift ratio, maximum story drift ratio, brace ductility factor for the seismic presentation valuations. The outcome obtained in this study specify that the solidification of the RC structures with buckling restrained braces is an effective method as it expressively rises the PGA volume of the RC building.

R Montuoir, et al, investigated the impact of the bracing system happening the seismic performance of moment Attacking Frames- Unconventionally Braced Frames (MRF-EBF) dual classifications, planned conferring two planned methods. Primary is based on the Euro code 8 (EC 8) design provisions. The main determination of the current effort is to relate, design methods, dissimilar seismic presentations resultant after the usage of the four-dissimilar bracing system projected in codes. For this purpose, 5 bays building thru 4, 6, & 8 storeys have been studied as four bracing schemes if over-all number of 12 structural scheme analysed. The seismic performances have been estimated by means of Incremental dynamic analysis (IDA) worked out till the accomplishment of structural failure and repetitive for a usual of ten earthquake ground movement.

Mohsen Ali Shaya far, et al, carried out the work to investigate the dual system from a prototype RC frame shear wall building using pushover analysis. The structure is modelled constructed on the dependable frame work established via confirming modelling styles. Detailed description in the modelling approaches and validation in this study gives guide lines for simulation of different RC structural elements under large deformations. The result shows that progressive collapse resistance decreases from lower to higher stories under column removals from different stories at the same locations.

3. OBJECTIVES OF THE STUDY

To study the various presentation levels, location of hinges by using push over analysis.

4. METHODOLOGY

Models considered for analysis

- Regular RC G + 10 Building with Base Isolation.
- RC G + 10 Building with Base Isolation and effect of Dual System.
- Regular H - Shaped RC G + 10 Building with Base Isolation.
- H - Shaped RC G + 10 Building with Base Isolation and effect of Dual System.
- Regular E - Shaped RC G +10 Building with Base Isolation.
- E - Shaped RC G + 10 Building with Base Isolation and effect of Dual System.
- Regular C - Shaped RC G + 10 Building with Base Isolation.
- C - Shaped RC G + 10 Building with Base Isolation and effect of Dual System.

5. Push over analysis Procedure

Push over analysis is also called as a Non – linear static analysis. From the control stage to collapse stage of building pushover gives the force – displacement curve. This offers a graphical picture of the predictable seismic presentation of the structure by crossing the structure volume spectrum with response spectrum of the earthquake. The crossing point is called as the presentation point.

6. RESULTS AND DISCUSSIONS

Performance Evaluation of Buildings

Performance evaluation of fixed base building and soil structure interaction building models are carried out by using pushover analysis.

Table 1 Performance point and location of hinges for RC regular building along X direction by pushover analysis

Model No.	Performance Point			Position of Hinges					
	Displacement mm		Base Force kN	A-B	B-IO	IO - LS	LS-CP	CP to E	Total
1	Yield	50.4	1720.867	4244	276	0	0	0	4520
	Ultimate	543.6	3140.239	3512	216	720	0	72	4520

2	Yield	49.5	1470.383	3576	224	0	0	0	3800
	Ultimate	550	2778.73	2902	186	628	0	84	3800
3	Yield	34.1	1386.097	4056	144	0	0	0	4200
	Ultimate	544.2	3139.442	3192	216	720	72	0	4200
4	Yield	33.4	1289865	3290	110	0	0	0	3400
	Ultimate	533.7	2678982	2616	176	560	48	0	3400

Table 2 Performance point and location of hinges for RC dual system building along X direction by pushover analysis

Model No.	**Performance Point**			**Position of Hinges**					
	Displacement mm		**Base Force kN**	**A-B**	**B-IO**	**IO - LS**	**LS-CP**	**CP to E**	**Total**
1	Yield	58.3	6144.74	3944	176	0	0	0	4120
	Ultimate	546.7	7469.17	2694	58	1366	2	0	4120
2	Yield	40.5	5552.54	3784	76	0	0	0	3860
	Ultimate	279.7	7439.70	2476	1142	242	0	0	3860
3	Yield	47.8	8263.33	3614	116	0	0	0	3730
	Ultimate	55.2	8481.57	3470	260	0	0	0	3730
4	Yield	48.4	4660.41	2858	132	0	0	0	2990
	Ultimate	52.2	4777.75	2858	132	0	0	0	2990

From the above table 1 and 2 we conclude that, in dual system building model 1,2,3, and 4 having more base force by comparing regular building models 1,2,3 and 4 by 57.96 %, 62.65%, 62.9% and 43.93% at ultimate stage by pushover analysis along X – axis. In table 5.36, the hinges are fashioned inside the life safety range at the last state is 98.41%, 97.79 %, 100% and 100% in model 1,2,3 and 4. Similarly in table 5.37, the hinges are shaped with in the life safety series at the ultimate state is 99.95%, 100%,100% and 100% in model 1,2,3 and 4.

Table 3 Performance point and Position of hinges for RC regular building along Y direction by pushover analysis

Model No.	**Performance Point**			**Position of Hinges**					
	Displacement mm		**Base Force kN**	**A-B**	**B-IO**	**IO - LS**	**LS-CP**	**CP to E**	**Total**
1	Yield	102.7	1583.137	4254	266	0	0	0	4520
	Ultimate	450.8	2090.732	3806	182	392	0	140	4520
2	Yield	53.3	1084.636	3696	104	0	0	0	3800
	Ultimate	408.9	1922.364	3194	218	350	18	20	3800
3	Yield	55.5	997.5167	4092	108	0	0	0	4200
	Ultimate	435.3	1825.839	3678	156	324	42	0	4200
4	Yield	49	1002323	3310	90	0	0	0	3400
	Ultimate	414.4	1709862	2940	140	276	44	0	3400

Table 4 Performance point and location of hinges for RC dual system building along Y direction by pushover analysis

Model No.	Performance Point			Position of Hinges					
	Displacement mm		Base Force kN	A-B	B-IO	IO - LS	LS-CP	CP to E	Total
1	Yield	47.0	5845.41	4048	72	0	0	0	4120
	Ultimate	570.4	6974.22	2666	122	1320	8	4	4120
2	Yield	50.7	2916.83	3804	56	0	0	0	3860
	Ultimate	148.7	4493.75	2750	1110	0	0	0	3860
3	Yield	33.1	5354.1	3611	119	0	0	0	3730
	Ultimate	94.9	5848.7	2613	1117	0	0	0	3730
4	Yield	31.5	3858.5	2982	0	0	8	0	2990
	Ultimate	69.2	4691.16	2459	529	0	0	2	2990

From the above table 3 and 4 we conclude that, in dual system building model 1,2,3 and 4 having more base force by comparing regular building models 1,2,3 and 4 by 70.02%, 57.22%, 68.78%, and 63.55% at ultimate stage by pushover analysis along y- axis. In table 5.38, the hinges are shaped inside the life safety range at the final state is 96.9%, 99.0%, 99.0% and 98.71% in model 1,2,3 and 4. Similarly in the table 5.39, the hinges are formed inside the life safety range at the ultimate state is 99.71%, 100%, 100% and 99.93% in model 1,2,3 and 4.

CONCLUSION

Hinges are formed less in RC Dual System buildings comparatively than the RC Regular buildings and all the hinges are formed within the life Safety region of all buildings.

REFERENCES

[1] Mohsen Ali Shayanfar, Mohammad Mahdi Javidan et, al (2017) "Progressive Collapse-Resisting Mechanisms and Robustness of RC Frame – Shear Wall Structures" volume 5

[2] Jose A Pincheria, James O. Jirsa et, al (1995) "Seismic Response of RC Frames Retrofitted with Steel Braces or Walls**"** volume 4

[3] K.V.G.D Balaji, N Jitendra Babu et, al (2013) "Pushover Analysis of Unsymmetrical Framed Structures on Sloping Ground" volume 3

[4] Swapnil Ambasta, Dushyantsahu, G.P. Khare(2018),"Analysis of the Base Isolated Building (Lead Plug Bearing) in ETABS**",**Volume-05 Issue-01January 2018.

[5] Praveen Rathod, and Dr.S.S.Dyavanal, (2014), "Pushover Analysis of Seven Storeyed RC Buildings with Openings in Infill Walls", IJETT-Volume 14

[6] Vinod R. Thorat and Dr. R. S. Talikoti (2014), "Base Isolation In Seismic Structural Design", International Journal of Engineering Research & Technology (IJERT), Vol. 3 Issue 7, July – 2014.

[7] Sumana C V, Raghu M E, Er. Rajesh Harugoppa (2016), "Comparative Study on Fixed Base Isolated for Building on Sloping Ground",Vol. 5, Issue 8, August 2016.

[8] Sunny Patel and Abbas Jamani (2017),"Effect of Base Isolation on Seismic Performance of RC Irregular Buildings**",** Volume-04 Issue-11 November 2017.