COMPARATIVE STUDY OF RCC BUILDING WITH DIFFERENT SLAB SYSTEM USING NONLINEAR STATIC ANALYSIS

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Abstract*— The objective of Earthquake Engineering is to design a structure in such manner so that the damage of structure or structural member during earthquake is minimized. Response spectrum and time history are dynamic analysis whereas seismic coefficient and pushover analysis are the static seismic analysis methods. The three systems are from the most attractive and commonly used floor systems, especially in high-rise constructions. In high seismicity regions, This paper is attempted to understand the basic fundamental of the static pushover analysis with respect to other methods and the review of differential studies of seismic analysis available in the literature on seismic analysis of different type of slab system for Convetional slab, Flat-slab, Ribbed slab for different span and story-height which would better perform to resist all parameter of Nonlinear static Pushover analysis is carried out.

Keyword: base-shear, displacement, performance level, spectrucal-accelaration,spectral-displacement,effectivedamping,effectivetime-period.

I. INTRODUCTION:

The static pushover analysis is becoming a popular tool for seismic performance evaluation of existing and new structures. The pushover analysis of a structure is a static non-linear analysis under Permanent vertical loads and gradually increasing lateral loads. Most Commonly using slab system to resist Dead load, Live load and Seismic load to change Flexibility, Story shear to possibility of behaviour would be changed The purpose of pushover analysis is to evaluate the expected performance of structural systems by estimating performance of a structural system by estimating its strength and deformation demands in design earthquakes by means of static inelastic analysis, and comparing these demands to available capacities at the performance levels of Interest Static Pushover analysis is to determine the effect of earthquake on the structure in which the capacity curve that is applied shear v/s Roof displacement and the demand curve of the structure, the intersection point of both this curve gives the performance point which provides the information about nonlinear behavior and predict maximum displacement of structure during particular earthquake. Static pushover procedure is the modern approach to determine the capacity and performance level of the structure at the same time it can be applicable to new and existing structure.

II. LITERATURE REVIEW:

Dalal Sejal P , Vasanwala S A, Desai A K [1] Performance based Seismic design is an elastic design methodology done on the probable performance of the building under different ground motions. The derivative of the PBSD method, known as the Performance-based Plastic design (PBPD) method that has been widely recognized as an ideal method for use in the future practice of seismic design. Performance-based Plastic design method is a direct design method starting from the pre-quantified performance objectives, in which plastic design is performed to detail the frame members and connections in order to achieve the intended yield mechanism and behavior.

Qi-Song "Kent" Yu, Raymond Pugliesi, Michael Allen, Carrie Bischoff [2] This paper know the weak zone in the structure and then we decide retrofitted or rehabilitated according to requirement to frame 5 and 12 stories respectively analyzed. Pushover curve shows no decrease load carrying of building suggest good structure. Behavior of properly detailed RCC frame adequate as indicated by intersection of demand and capacity curve distribution of hinge in the beam and columns. Most of the hinges developed in the beams and few in the columns but with limited damage.ilding mainly due to the higher shift in the time period.

GOURAMMA G1, Dr. JAGADISH KORI G [3] These System Most Commonly Floor System for all the models (36 m x30 m).In The Different Zone Flat slab experienced more displacement compare to convention slab and ribbed slab system. To This Analysis Is Completed In Etabs. Base shear in flat slab is less than conventional and ribbed slab building. Displacement Is High In Effect Of Higher Story. Flat slab with edge beams experienced less displacement compare to flat slab. The Result Obtained As Demand, capacity Spectrum and Plastic hinge Insight Real Behavior Of Structure.

Ashraf Habibullah and Stephen Pyle [4] This article presents the steps used in performing a pushover analysis of a simple three-dimensional building. SAP2000 is used as a tool for performing the pushover. The SAP2000 static pushover analysis capabilities, which are fully integrated into the program, allow quick and easy implementation of the pushover procedures prescribed in the ATC-40 and FEMA-273 documents in which the magnitude of the structural loading is incrementally increased in accordance with a certain predefined pattern. With the increase in the magnitude of the loading, weak links and failure modes of the structure are found. Pushover analysis is a static, nonlinear procedure. This paper discusses pushover stapes in detail and to evaluate the real strength of the structure. It promises to be a useful and effective tool for performance base design.

R.K. Goel [5] The nonlinear static procedures specified in the FEMA-356, ASCE/SEI 41-06, ATC-40, and FEMA-440 documents for seismic analysis and evaluation of building structures using strong-motion records of reinforced concrete buildings. For this purpose, maximum roof displacement predicted from the nonlinear static procedure is compared with the value derived directly from recorded motions.The improved FEMA-440 Capacity Spectrum Method generally provides better estimates of the roof displacement compared to the ATC-40 CSM

Kavita Golghate, Vijay Baradiya, Amit Sharma [6] A Three Story Existing RCC Building In Sudan, Paper Is Focus on study of seismic performance. Plastic Hinge is used to represent failure mode in the beam and columns when the member yields. Weak elements of predicting failure mechanism and redistribution force during progressive yielding. The Results show design considering only gravity load is found inadequate consider earthquake in design building.

III. MODELING OF BAR-FRAME

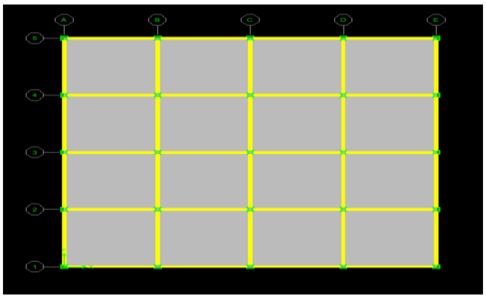


Figure: 3.1 Modeling of Frame

In this study G+8, G+10 and G+12 reinforced concrete building with selected for performing Performance Based analysis. This reinforced concrete frame is a real building with slight modification to simplify the analysis and design process. I Will Perform Conventional, Flat slab, With Ribbed Slab Type Of Frame Structure. By 6mx6m, 8mx8m, 10mx10m Spacing size(Bay width), Both Side X-direction & Y-Direction both side 4-column Bay frame considered.

Hinges for Beam:-PM3 Shear, Column:-PM2M3 Shear For Beam is carry to resist bending moment and column is carry to seismic Axial force and Bi-axial bending.

No of Floor	G+8, G+10, G+12
Typical plan dimention	24mx24m, 32mx32m, 40mx40m
Ground Story Height	4.0m
Typical Story Height	3.0m
Size of Column Span	900x900mm
	750x750mm
	600x600mm
Size of Beam Span	300x900mm
	300x750mm
	300x600mm
Slab	150mm thick
Thickness of wall	230mm
Type of Structure	R C Regular Frame Structure
Live load	3 KN/m2 All Floor
	1.5KN/m2 Terrace Floor
Floor Finish	1.5KN/m2
Earthquake load	As Per IS:-1893:2002 (Part I)
Type Of Soil	Type II, Medium AS per IS:-1893:2002
Seismic Zone	III

Table: 3.2 Data for building Analysis

IV. BUILDING ANALYSIS

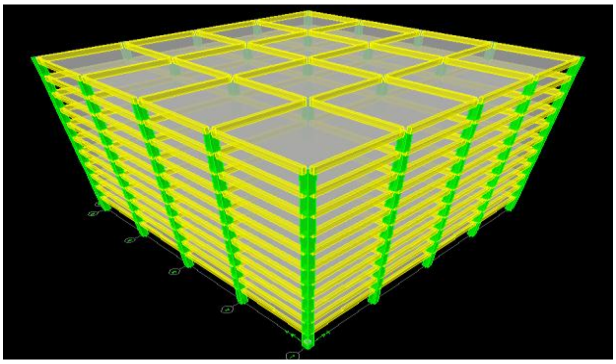


Figure: 3.3 3-D view of Conventional slab building

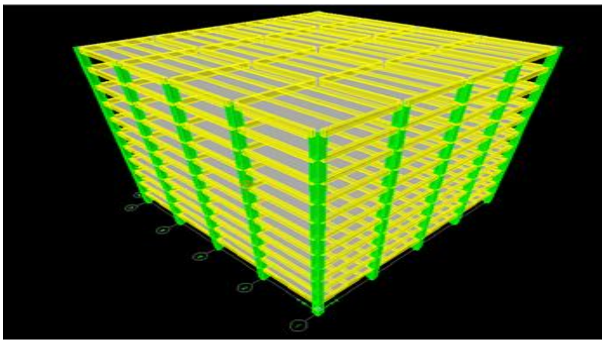


Figure: 3.4 3-D view of Ribbed slab building

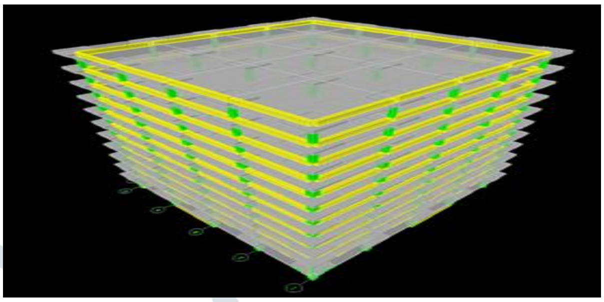
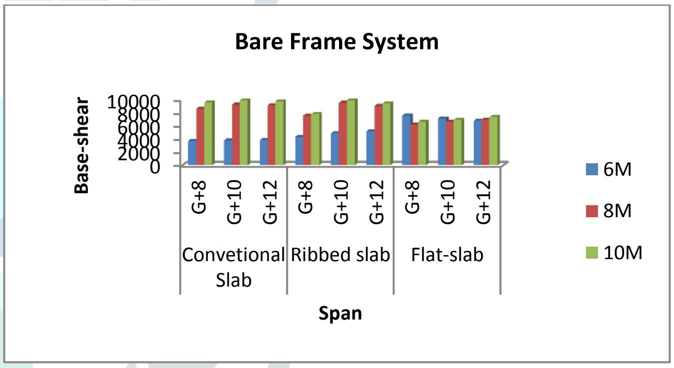


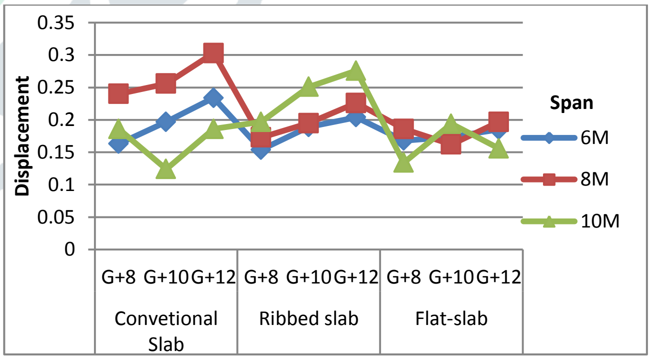
Figure: 3.5 3-D view of Flat slab building

V. RESULTS

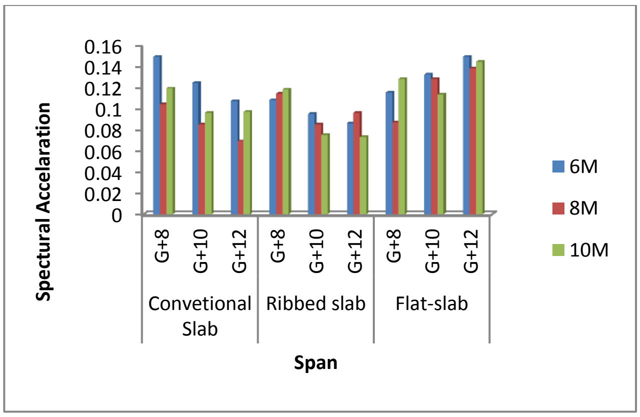
(1) BASE SHEAR



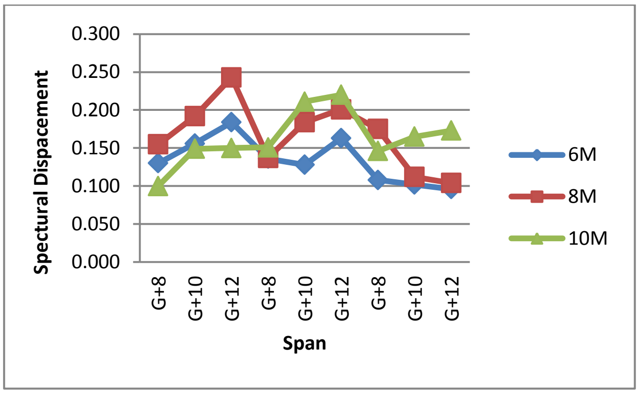
(2) STORY DISPLACEMENT



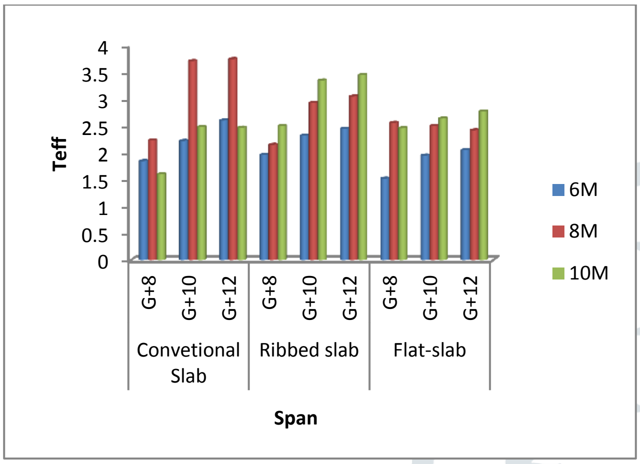
(3) SPECTRAL ACCELERATION



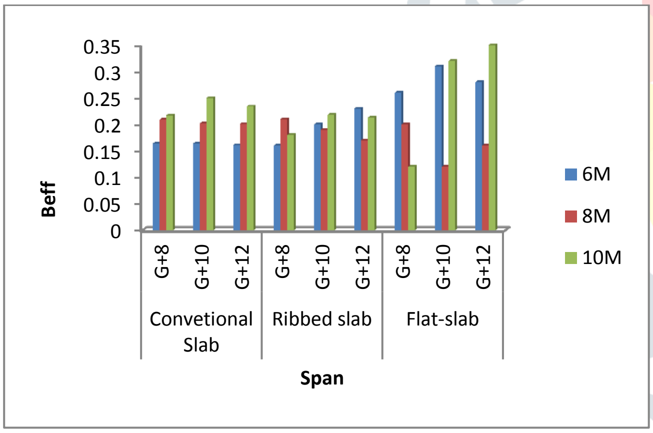
(4) SPECTRAL DISPLACEMENT



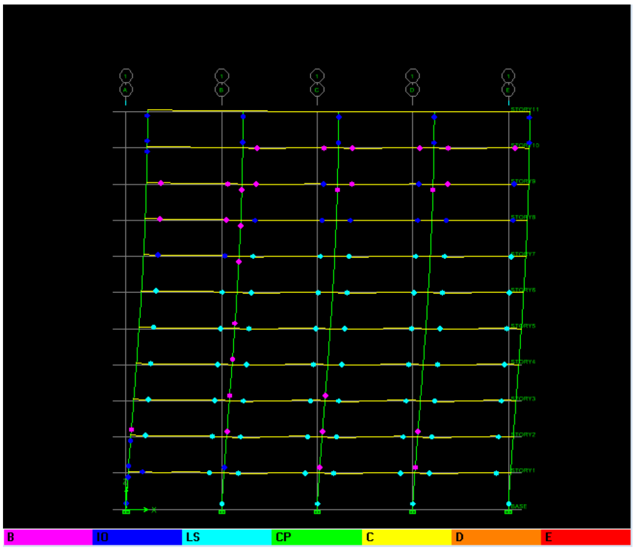
(5) EFFECTIVE TIME-PERIOD

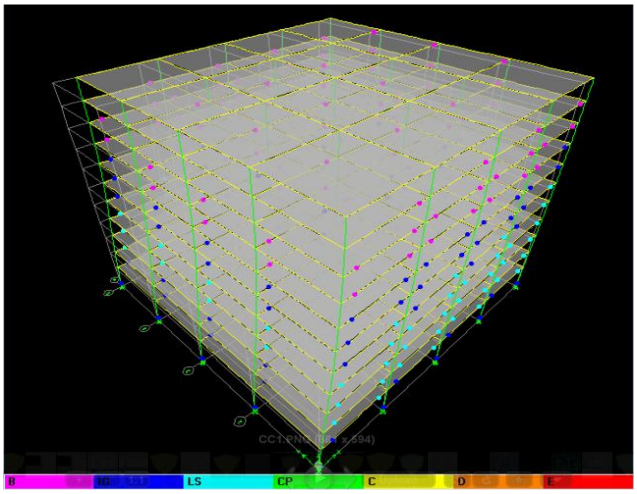


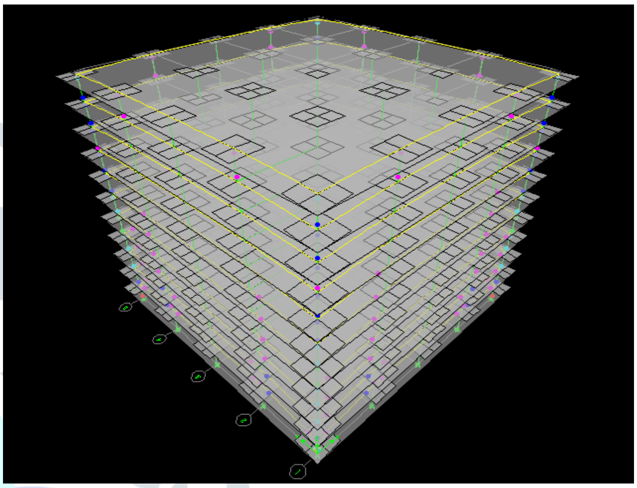
(6) EFFECTIVE DAMPING



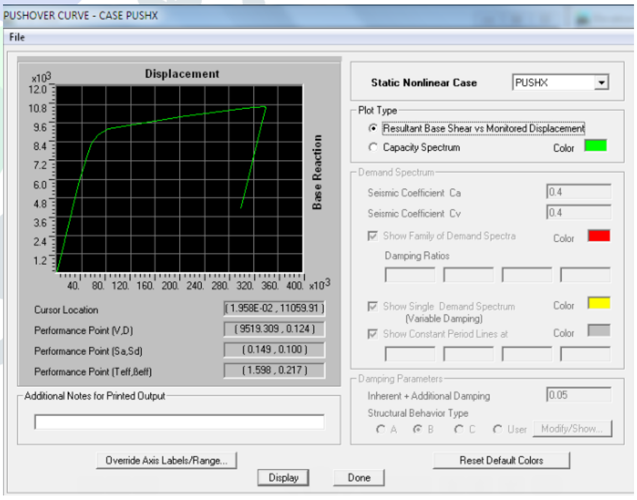
(7) HINGE FORMATION OF CASE







(8) PUSHOVER CURVE



VI. CONCLUSION

[1] Soil flexibility increases the time period of building. Time period increment is more in infill wall frame with different opening than bare frame.

[2] Effective time period of building is more than static time period more increase story height specified in IS code 1893:20002.

[3] Base shear force decreases with increase in Conventional and Flat-slab flexibility and Displacement.

[4] Displacement at performance point increases with increase in above Story while shear force at performance point decreases with increases in soil flexibility.

[5] Nonlinear static analysis concludes that the for some amount of base shear behave linearly but after a limit of base shear the undergo to behave as nonlinear, the nonlinear analysis gives the idea about the performance

point of the structure and the propagation of the damage due to the lateral loading during earthquake event of Spectral Displacement is more of flat slab to the ribbed slab.

[6] Ribbed slab self-weight of structure is more compare to flat slab and conventional slab so base shear increase to span and height Wise story difference.

[7] Flat-slab decrease base-shear and Spectral displacement and Spectral Acceleration no more change of value of span and height wise study.

IV. REFERENCES

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