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SEISMIC ASSESSMENT OF PUBLIC BUILDING BY IS1893-1984 IN COMPARISON WITH IS1893-2016.

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Abstract: Earthquake engineering is a branch of structural engineering within which Design and Analysis of structures like buildings, bridges, dams etc. is allotted by considering earthquake forces which are possibly visiting act on structure. the most moto behind that design and analysis is, to form the structure more earthquake resistant. The structural engineer wants to design structure specified, it shouldn't be damage by minor earthquake and will not be collapse by the highly intensive earthquake. during this paper IS 1893-1984 and IS 1893-2016 is preferred for assessment of bulding by using Etabs software

Index Terms **– Earthquake Engineering, IS 1893, ETABS Software.**

I. INTRODUCTION

Earthquake engineering is now widely preferring and developing since few decades because of the urbanization. There are also drastic changes going to made in Indian Standards due to change in the method of construction and climatic conditions. A large numbers of existing buildings are constructed from last few decades by referring IS codes which is latest while designing that building. But due to changes in the criteria and guidelines in current seismic code it is required to check whether that building is fulfilling all the possible guidelines as per current code or not. By comparing considered building with both old and current codal provisions, we can take the appropriate decision against the safety of that structure.

There Ground vibration due earthquake may cause forces & deformations within the structure. So it's required to design those structures by a standard procedure to face up to against earthquake effect without significant loss of life still as property. These standard procedure is nothing but the Indian Standard Codes which can helps to the engineers for planning, designing, detailing and constructing the structure. the foremost aspects of IS codes are as follows-

1.Goodstructuralconfiguration
2.Lateralstrength
3.Adequatestiffness
4.Goodductility

Seismic codes are unique for each country as per there local seismology, method of construction and accepted level of seismic risk. the primary Indian seismic code namely 1893 was published in 1962 then further it had been revised in years of 1966, 1970, 1975 and 1984.The said code is again revised in 2002 as a fifth revision after earthquake which was happened at Bhuj in 2001. Then after the most recent revision of code is administered in 2016 by BIS namely "Criteria for Earthquake Resistant Design of structures (sixth revision)". IS 1893-2002 is further divided into five different parts as per the various varieties of structures but IS 1893-1984 contains provisions for all these structures in single document.

Retrofitting is that the concept of modifying or strengthening the structural components of a existing building. Various terms are associated to retrofitting with marginal difference like strengthening, repair, remoulding, reconstruction, rehabilitation etc. the requirement of retrofitting may arise from one or quite one reason from following i.e. (a) If the building is designed by considering seismic code, but there's upgradation within the provisions within the latest seismic code. (b) If the building is meant by latest code but there's some deficiencies exist within the design or in construction in existing building. (c) Essential building e.g. hospital, historical monuments or architectural buildings are required to be strengthened. (d) The buildings which are required to provides immediate service even just after earthquake. (e) The buildings whose use has changed through the years. (f) The buildings which are renovated, expanded or rebuilt. the strategy of retrofitting is usually horizontal and vertical load resisting system of the structure further as variety of material employed in construction. It also depends on technique which feasible and economical for construction.

II. OBJECTIVE

For the project, the following objectives have been set.

a. To carry out modelling of Considered G+4 Public building by using ETABS software.

b. To calculate earthquake forces using Equivalent Static Load Method using both the codes.
c. To analyse the structure and compare the results.

Live load on floor	3KN/m^2 (IS 875 part2:1987)

III. MODELLING AND ANALYSIS

A. Modelling

Following properties were considered while modelling of G+4 Bank Building-

Particulars	Reinforced concrete Building
Occupancy	Public building
Number of stories	(G+4)
Total height of building	21.3 M
Ground floor height	3.66 M
Intermediate floor height	3.66 M
Nature of soil	Medium soil
Seismic zone	III

Table -1: building description

Column Size	230 x 450 MM 230 x 600 MM 230 x 750 MM 300 x 750 MM
Beam size	230 x 380 MM 230 x 450 MM 230 x 600 MM
Slab Thickness	125 MM
External wall thickness	230 MM
Internal wall thickness	150 MM

Table -2: Member dimension

Grade of concrete	M20
Grade of steel	Fe-415
Density of concrete	25KN/m^3(IS-875 part1:1987)
Density of Brick	18.85 KN/m^3

Table -3: Material used

Sunk load	5 KN/m^2
Store Room	5 KN/m^2
Pantry	3 KN/m^2
Floor finish Load	1KN/m^2(IS875 part2:1987)
Staircase Load	4 KN/m^2
Lift Machine Room Load	10 KN/m^2
External wall load	13.28 KN/m
Internal wall load	8.66 KN/m

Table - 4: load considered

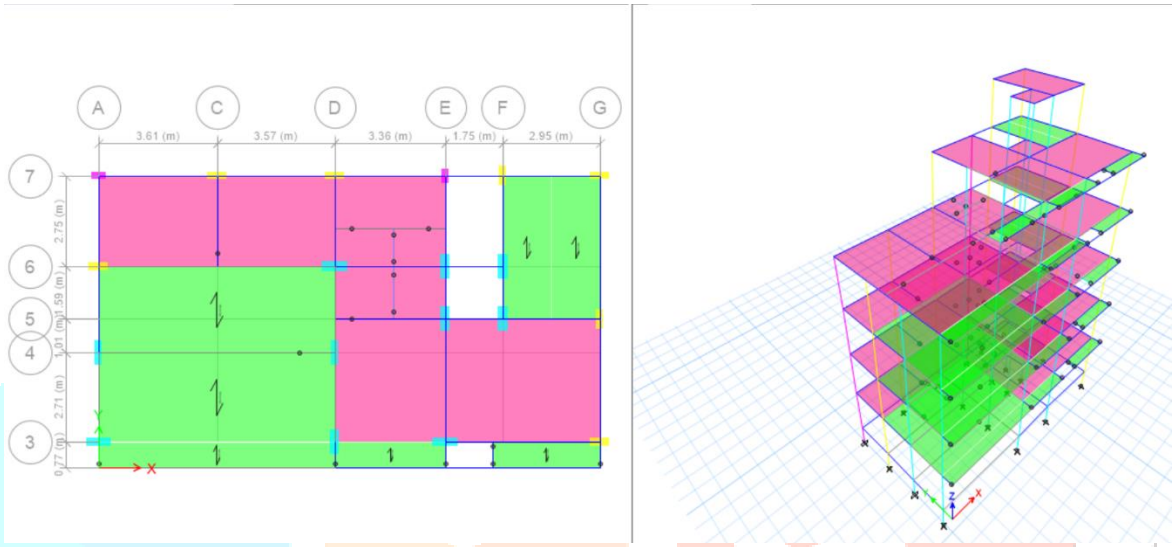

Fig. no.1 ETABS model for IS 1893-1984

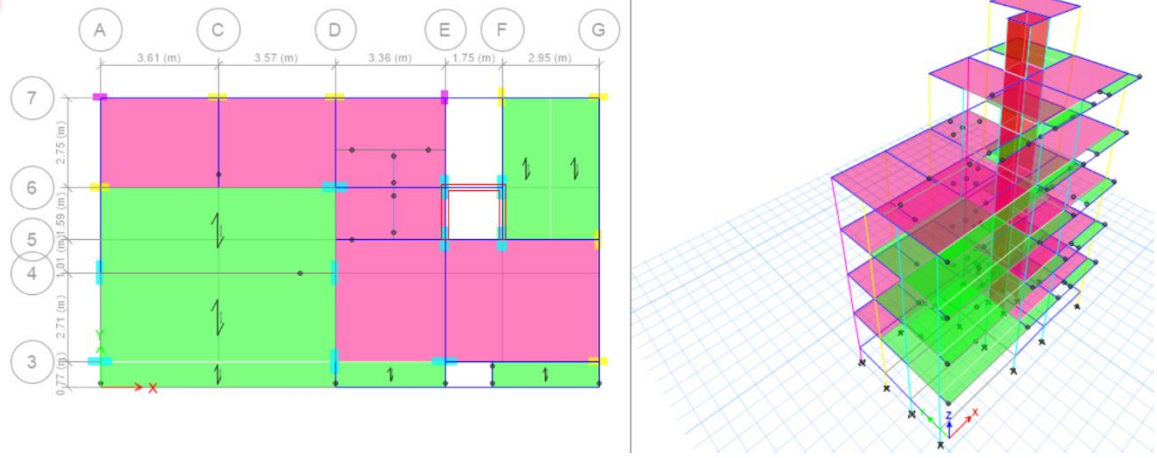

Fig. no.2 ETABS model for IS 1893-2016

B. Analysis

						FROM 1984		FROM 2016	
STOREY LEVEL	**Wi**	**hi**	**Wihi^2**	**Wihi^2/ΣWihi^2**		**VBx**	**VBy**	**VBx**	**VBy**
HEADROOM	542.8	21.3	246262.93	0.10076824		100.096	92.088	133.461	112.107
TERRACE	1524.91	18.3	510677.11	0.208963782		207.569	190.964	276.759	232.477
FOURTH	4015.3	14.64	860597.64	0.352147638		349.797	321.813	466.396	391.772
THIRD	4476.9	10.98	539736.85	0.220854729		219.381	201.83	292.508	245.706
SECOND	4267.5	7.32	228662.89	0.093566486		92.942	85.5066	123.923	104.095
FIRST	4323.6	3.66	57917.216	0.023699125		23.5409	21.6577	31.3879	26.3658
		TOTAL=	2443854.6						
						993.326	913.859	1324.43	1112.52
						KN	KN	KN	KN

IV. RESULTS

The following results from both the IS 1893-1984 & is 1893-2016 were discussed below

a. Story displacement in X direction

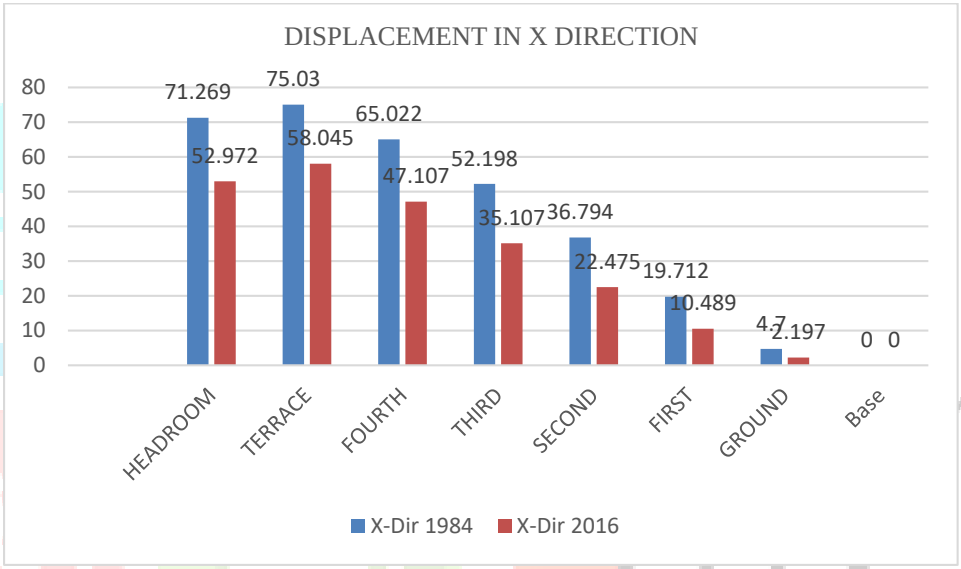

Table - 5: Story displacement in X direction

b. Story displacement in Y direction

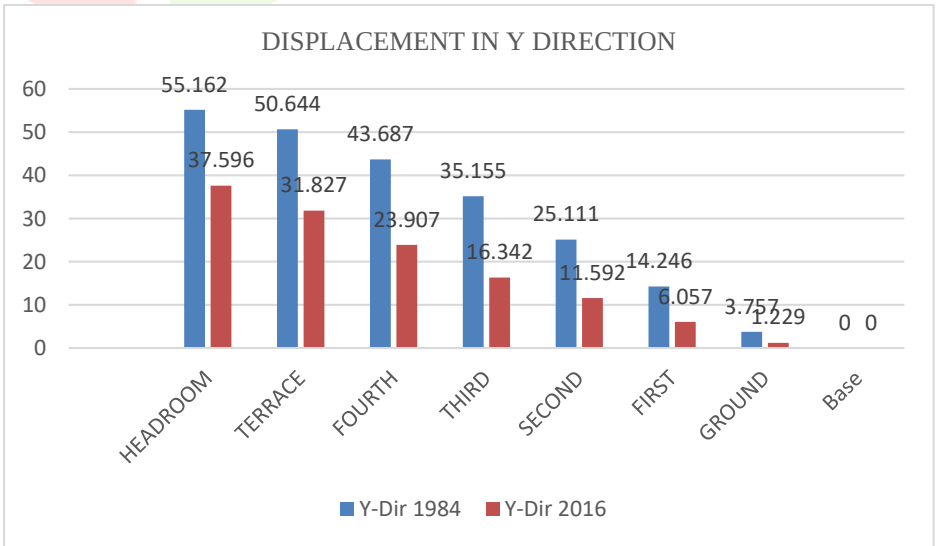

Table - 6: Story displacement in Y direction

c. Story Drift in X direction

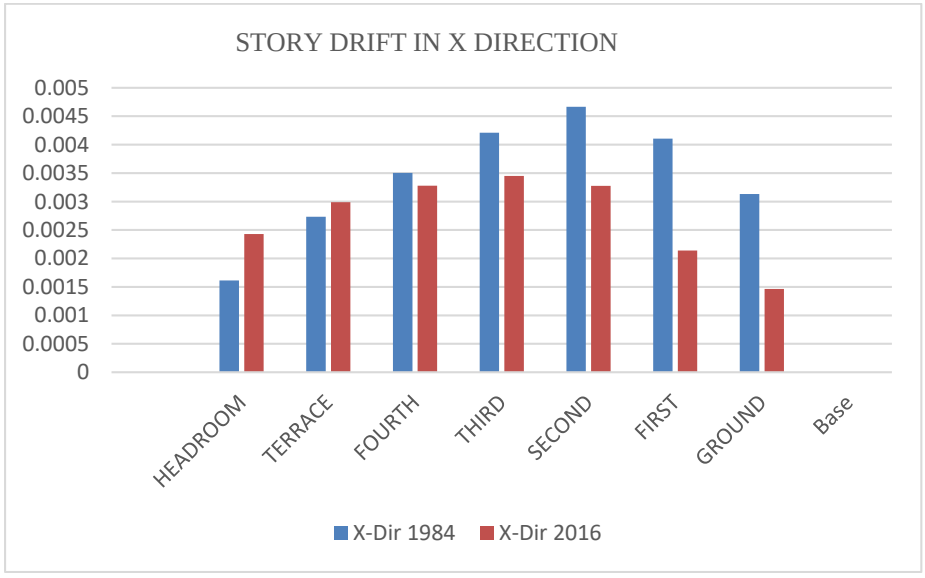

Table - 7: Story Drift in X direction

d. Story Drift in Y direction

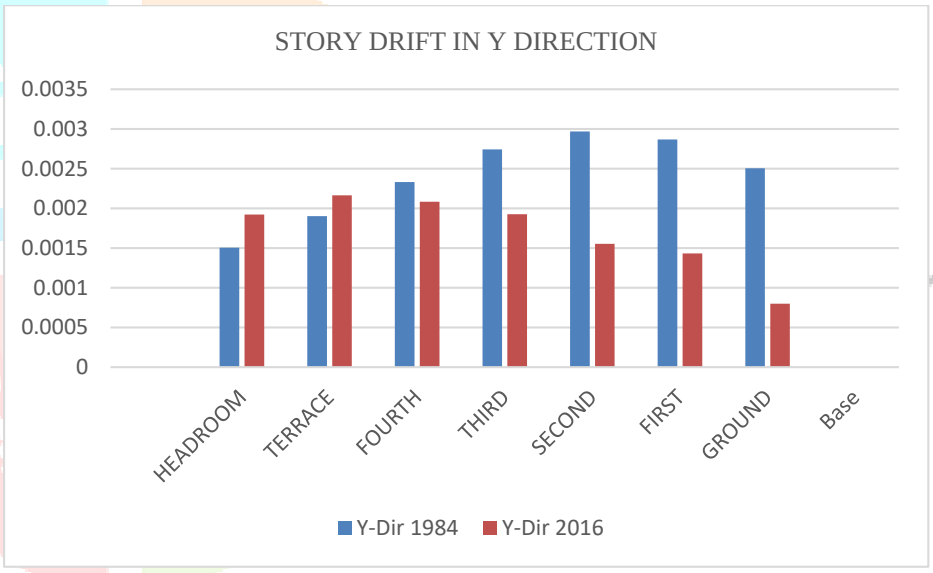

Table - 8: Story Drift in Y direction

e. Lateral forces in X direction

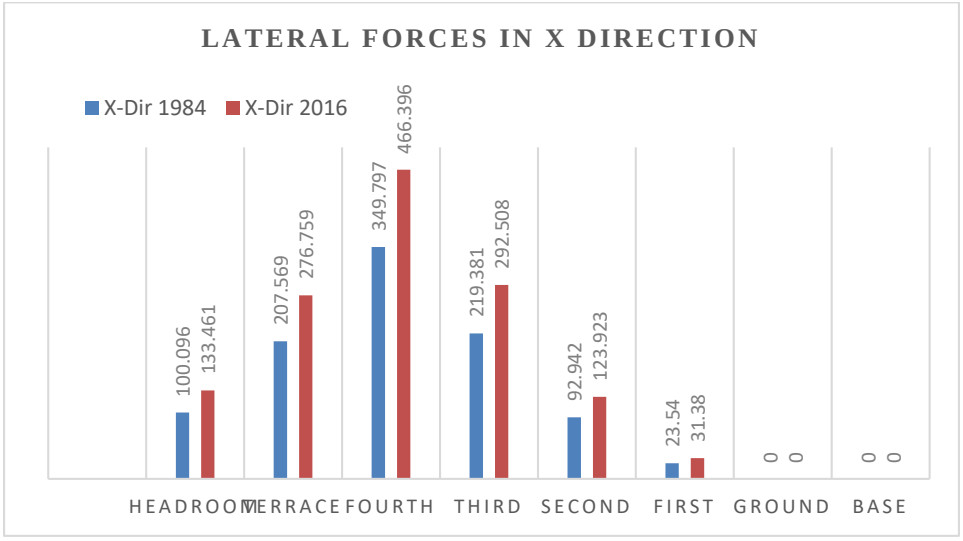

Table - 9: Lateral forces in X direction

f. Lateral forces in Y direction

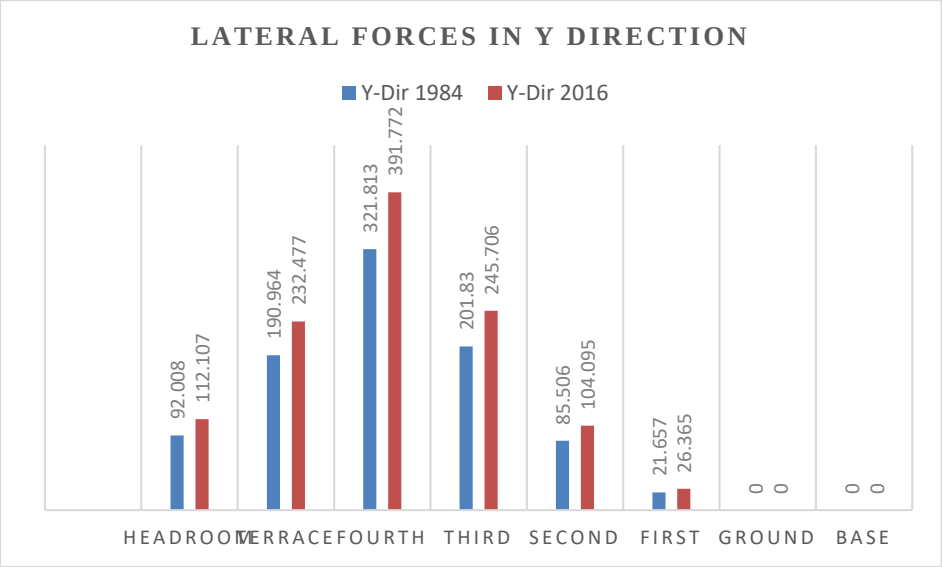

Table - 10: Lateral forces in Y direction

V. CONCLUSION

1. Maximum displacement values found along EQx & EQy as per IS 1893-1984 are 75.03mm and 55.162mm respectively and as per IS 1893-2016 are 58.045mm and 37.596mm respectively.
2. Story drift values along X & Y direction as per IS 1893-1984 are 0.004667 and 0.002969 respectively and as per IS 1893-2016 are 0.003451 and 0.001927 respectively.
3. The Base shear values calculated along X & Y direction as per IS 1893-1984 are 993.326 KN & 913.859 KN respectively and as per IS 1893-2016 are 1324.43 KN and 1112.52 KN respectively.
4. The percentage increase in base shear value as per IS 1893-2016 over IS 1893-1984 in X & Y direction is 33.33% & 21.73% respectively.
5. Due to increase in lateral forces which are calculated as per IS 1893-2016, the building is not going to withstand against earthquake forces hence retrofitting is done in the form of provision of shear wall for lift duct.

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