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PERFORMANCE ASSESSMENT OF BUILDING WITH SSI AND WITHOUT SSI

ABSTRACT

This study consider low (5-storey), medium (10-storey) and high-rise (20-storey) buildings founded on hard, medium and soft soils according to IS code. These 9 buildings designed for base shear obtained from IS 1893 (Part-1)-2016, fixed base and flexible base respectively show that buildings designed according IS code are over designed when compare with flexible base. To check safety of these overdesigned buildings linear dynamic analysis and pushover analysis were performed. These analysis show that flexible base design is safe and economic than IS code and fixed base design buildings.

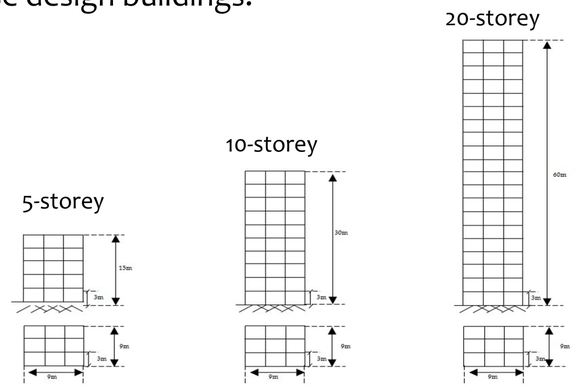

Fig 1 Plan and Elevation of Low, Medium and High-rise Buildings

RESULTS

Table 1 Time Period and Base Shear of the Structures

Base Conditions	Natural time period (sec)								
	5 Storey			10 Storey			20 Storey		
	IS Code	Fixed Base	Flexible Base	IS Code	Fixed Base	Flexible Base	IS Code	Fixed Base	Flexible Base
Hard Soil	0.57	0.64	0.64	0.96	1.21	1.21	1.62	2.40	2.40
Medium Soil	0.57	0.64	0.64	0.96	1.20	1.23	1.62	2.34	2.41
Soft Soil	0.57	0.64	0.89	0.96	1.19	1.73	1.62	2.28	3.94
	Base Shear (kN)								
Hard Soil	197	175	176	253	201	201	313	211	211
Medium Soil	268	239	243	344	276	270	425	294	287
Soft Soil	281	281	212	423	343	235	522	371	214

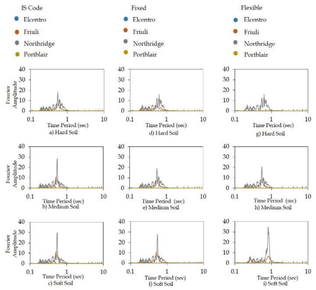

Fig 2: Fourier Amplitude of 5 Storey response

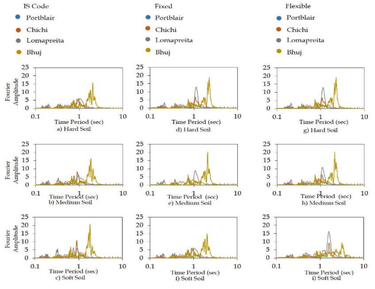

Fig 3: Fourier Amplitude of 10 Storey response

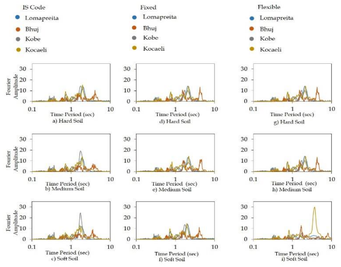

Fig 4: Fourier Amplitude of 20 Storey response

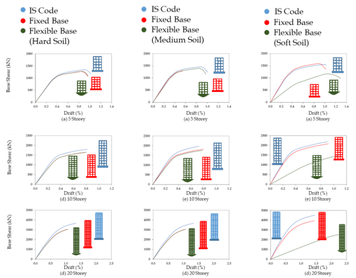

Fig 5: Pushover curves of 5,10 and 20 storey Buildings

CONCLUSION

This study aims at importance of soil flexibility in design of buildings.

- IS code buildings are always over designed than required when compare to flexible base buildings.
- In hard soil, buildings designed for IS Code is 11%, 21%, 33% overdesigned than flexible base building in low, medium and high-rise buildings respectively.
- In medium soil it is 9%, 21%, 33% overdesigned and in soft soil it is 25%, 45%, 59% overdesigned.
- Linear dynamic analysis show that acceleration attracted at roof top of buildings in IS code models are high compare to flexible base model.
- Pushover analysis show IS code models have more drift compare to flexible base models.
- Pushovers analysis also show lateral stiffness, lateral strength and ductility of flexible base models are less compare to fixed base models.
- Over all, this study show that flexible base buildings which are designed for respective base soil conditions are safe and economic when compare to buildings designed according to IS code.

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