



Comparative Study of Effect of Wind Load on Sloping Ground on Etabs Software

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ABSTRACT :

In this research paper we are going to study about wind load effects on sloping ground can have significant implications, especially in the areas prone to strong winds or where terrain varies. Wind load is one of the most important phenomenon which is affecting on structure through out the life. In this paper different structural models are prepared on flat as well as sloping ground. Wind effect on RC structures supported on different slopes and analysis is done using ETABS. Wind loads are considered. Here we look at 5 different wind speeds and 3 different slopes and analyze them. The results are formed in terms of shear force, moment and displacement, which are mainly analyzed to quantify the various effects of the inclined surface. The project work examines the structural behaviour of building in sloping terrain of various categories. In this study a G+10 storey building is analysed on varying sloping angles with degrees 0,10,20 And 30 with different shapes of structure square shape, C shape, and I shape.

KEYWORDS: Wind load, Loading Calculations, Sloping ground, Etabs, Different building shapes

INTRODUCTION:

Wind load is one of the normal burdens for structural designing designs viz. for long range spans, tall structures, pinnacles and pole structures too. Wind load is following up on such construction all through its life expectancy. Hence it is most significant peculiarity to be thought about for a primary designer. Because of shortage of land or because of rocky territories in North and North-East piece of India more often than not structures are developed on slanting grounds which is difficult for primary specialist for examination and plan. These designs are additionally straightforwardly exposed to wind loads. India is likewise having enormous records of quake which abandoned loss of many lives and weighty annihilation to property and economy. Examination of structures in uneven locales with slanting grounds is to some degree not quite the same as the structure situated over an evened out ground. In present review 3D structure casings of 10 celebrated building laying on level territory and slanting ground are thought about. For inclining ground slants of 0°, 10°, and 20° are thought of. They are to be investigated for wind speeds 47 m/s. The demonstrating and investigation should be possible utilizing ETABS programming which represents broadened three layered examination of building framework with different building shapes.

OBJECTIVES

1. Estimated Wind Load Distribution
2. Determine the wind load distribution on the structure considering both flat and sloping ground conditions.
3. To determine impact of wind load on different sloping ground like 10, 20, 30 degree slopes.
4. To analyse the effect of wind load on sloping ground with different building shapes.

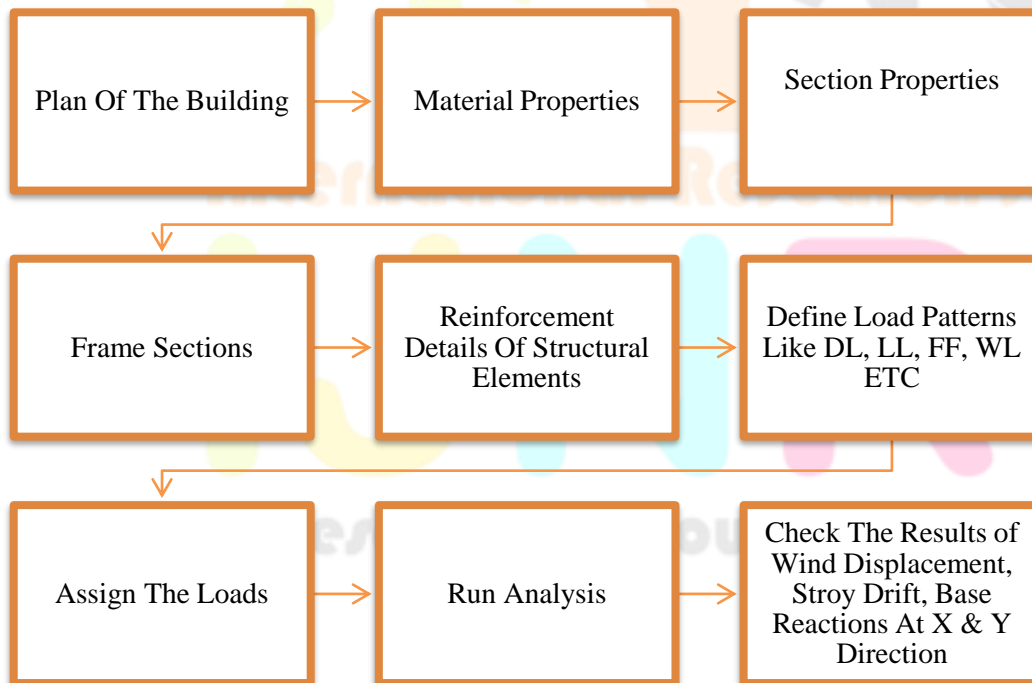
METHODOLOGY

This paper deals with comparative study of wind behavior of high rise structures building frames with different geometrical configurations, different building shape and different slope of ground, under the wind effect as per 875(Part-III):1987 and IS 1893-1 (2002) static analysis.

TABLE 1.1 Material & Geometrical Properties of Different Building Shapes.

Parameters of Building	Descriptive Values
Type of Building	Residential Building
SHAPE OF BUILDING	SQUARE SHAPE, C SHAPE, I SHAPE
No. of Storey	G+10
LOCATION	Naintal
BASIC WIND SPEED	47M/s
SLOPE ANGLES	0 , 10, 20 degree
Height of Flat Slope Building (M)	36m
Height of Each Story	3m
THICKNESS OF SLAB	125MM
THICKNESS OF OUTER WALL	230MM
THICKNESS OF INNER WALL	230MM
Grade of Concrete	M30
Reinforcement Grade	Fe500

Modeling And Analysis In ETABS Software



Above procedure is adopted for different shapes of building like square shape, C shape & I shape for different slope angles like 0 degree, 10 degree and 20 degree slope.

And check the results of Wind Displacement, Story Drift, Base Reactions At X & Y Direction. And compare the results .

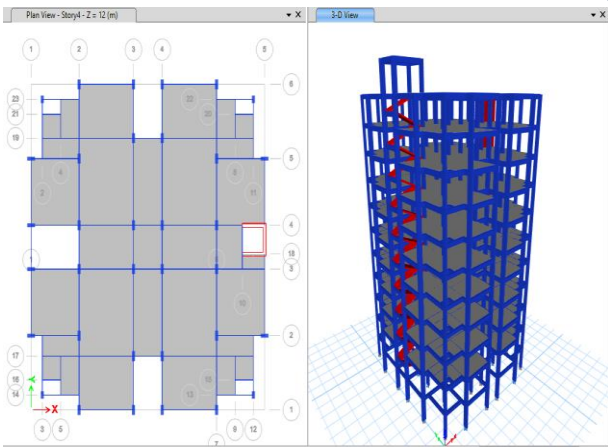


Fig. 1.1 Square Shape Building At 0 degree Slope

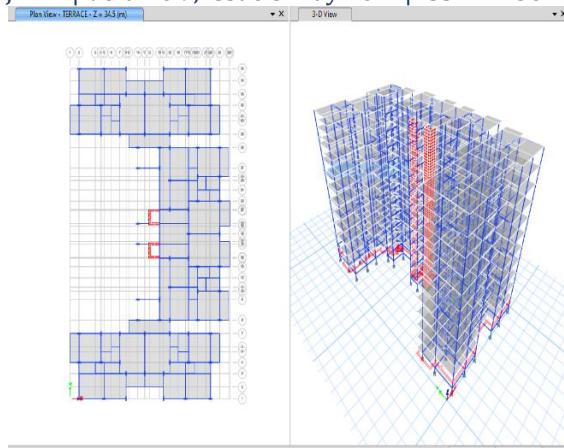


Fig. 1.2 C Shape Building At 0 degree Slope

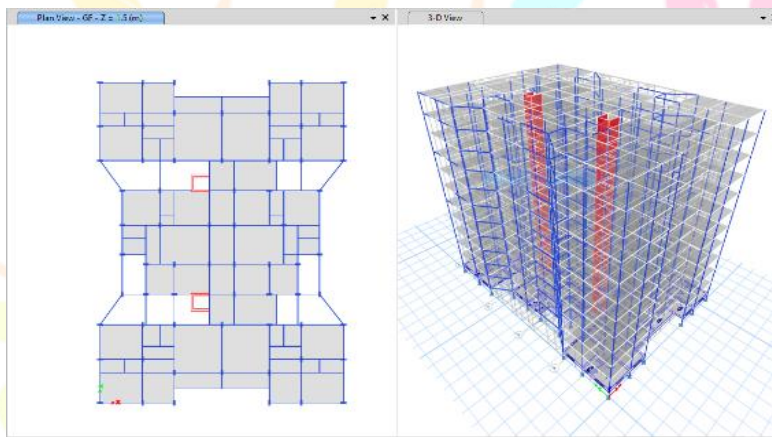


Fig. 1.3 I Shape Building At 0 degree Slope

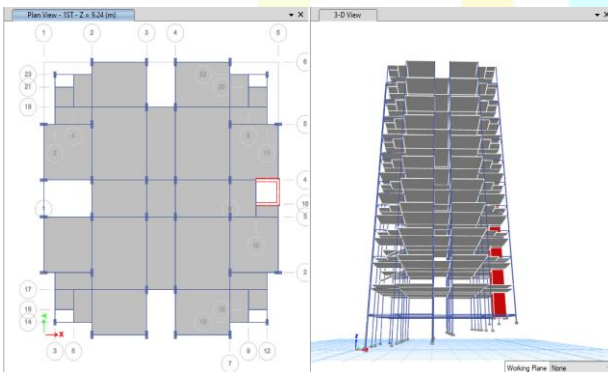


Fig. 1.4 Square Shape Building At 10 degree Slope

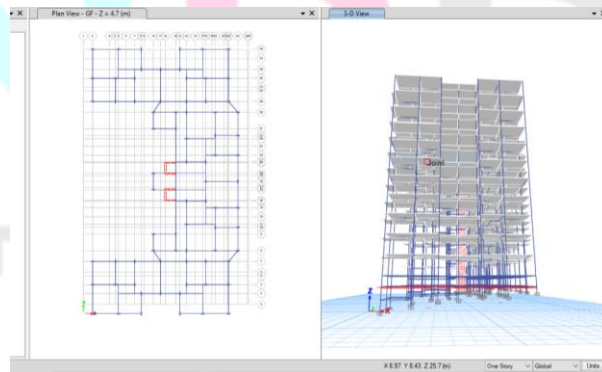


Fig.1.5 C Shape Building At 10 degree Slope

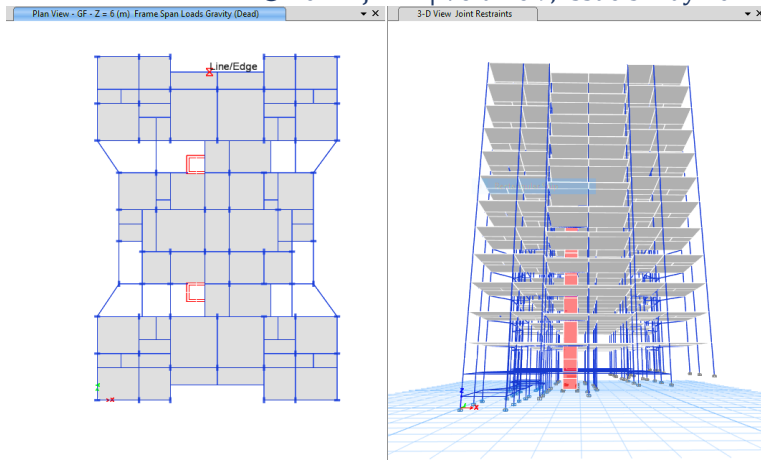


Fig. 1.6 I Shape Building At 10 degree Slope

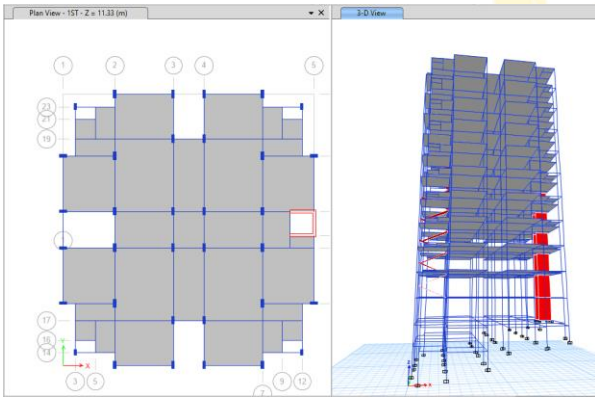


Fig. 1.7 Square Shape Building At 20 degree Slope

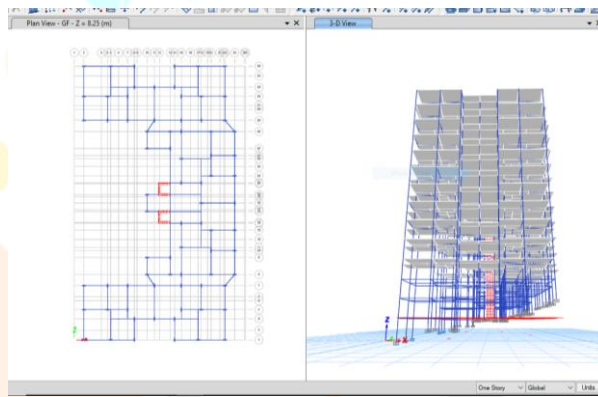


Fig. 1.8 C Shape Building At 20 degree Slope

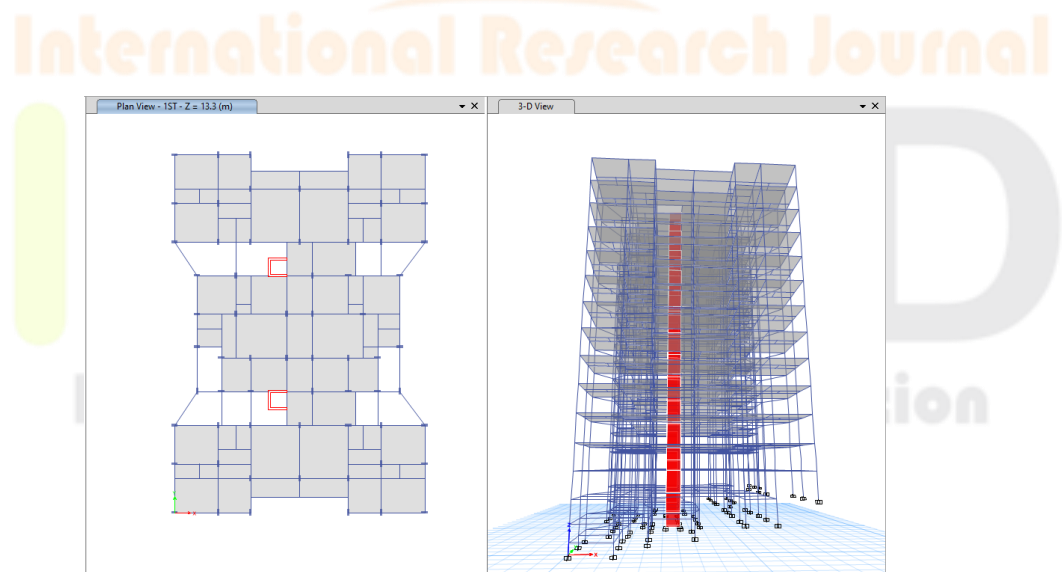


Fig. 1.9 I Shape Building At 20 degree Slope

WIND DISPLACEMENT AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES						
BUILDING SHAPES	SQUARE SHAPE		C SHAPE		I SHAPE	
	X	Y	X	Y	X	Y
FLAT GROUND	30.06	24.82	19.53	9.39	31.85	19.35
10 DEGREE SLOPE	32.06	29.90	20.14	9.94	39.99	23.88
20 DEGREE SLOPE	33.40	33.17	24.16	12.20	49.75	29.45

TABLE 1.2 WIND DISPLACEMENT AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES

TABLE 1.3 STORY DRIFT AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES

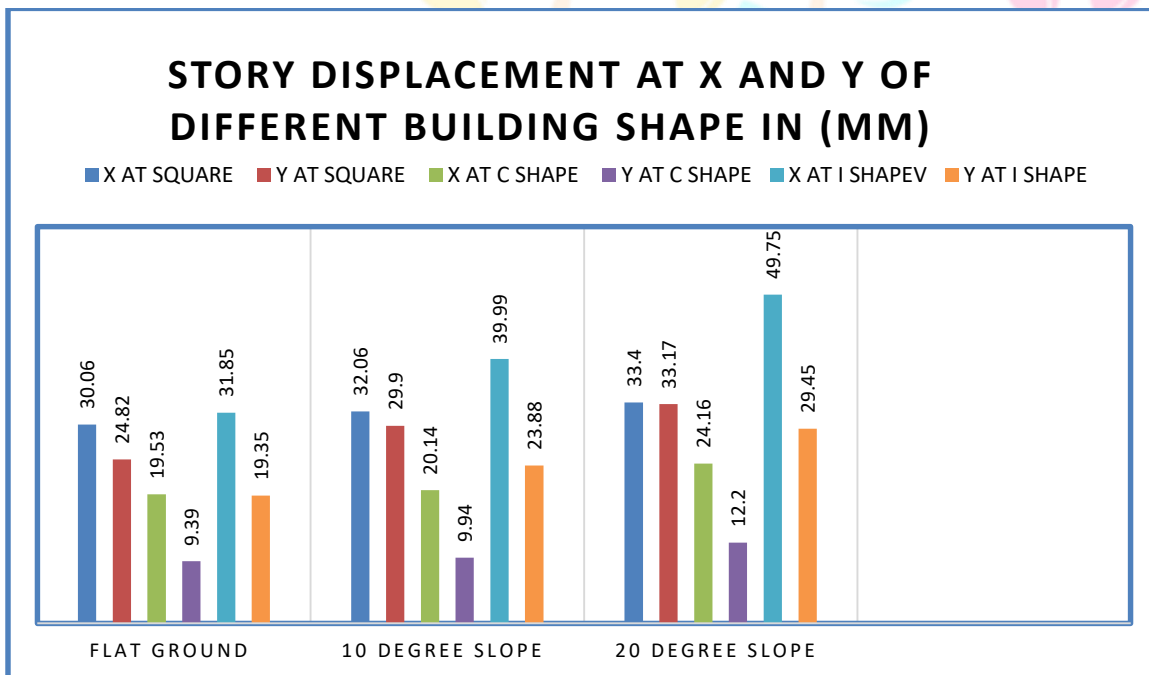
STORY DRIFT AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES						
BUILDING SHAPES	SQUARE SHAPE		C SHAPE		I SHAPE	
	X	Y	X	Y	X	Y
FLAT GROUND	0.001033	0.001183	0.000726	0.000336	0.001363	0.000844
10 DEGREE SLOPE	0.00112	0.0001272	0.000767	0.000352	0.001599	0.000979
20 DEGREE SLOPE	0.001163	0.001334	0.000912	0.000498	0.002190	0.00135

TABLE 1.4 RS AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES

RS AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES						
BUILDING SHAPES	SQUARE SHAPE		C SHAPE		I SHAPE	
	X	Y	X	Y	X	Y
FLAT GROUND	0.000707	0.000802	0.000867	0.000785	0.001053	0.00094
10 DEGREE SLOPE	0.000717	0.000771	0.000874	0.000781	0.001119	0.000942
20 DEGREE SLOPE	0.000733	0.000471	0.000958	0.000897	0.001323	0.000939

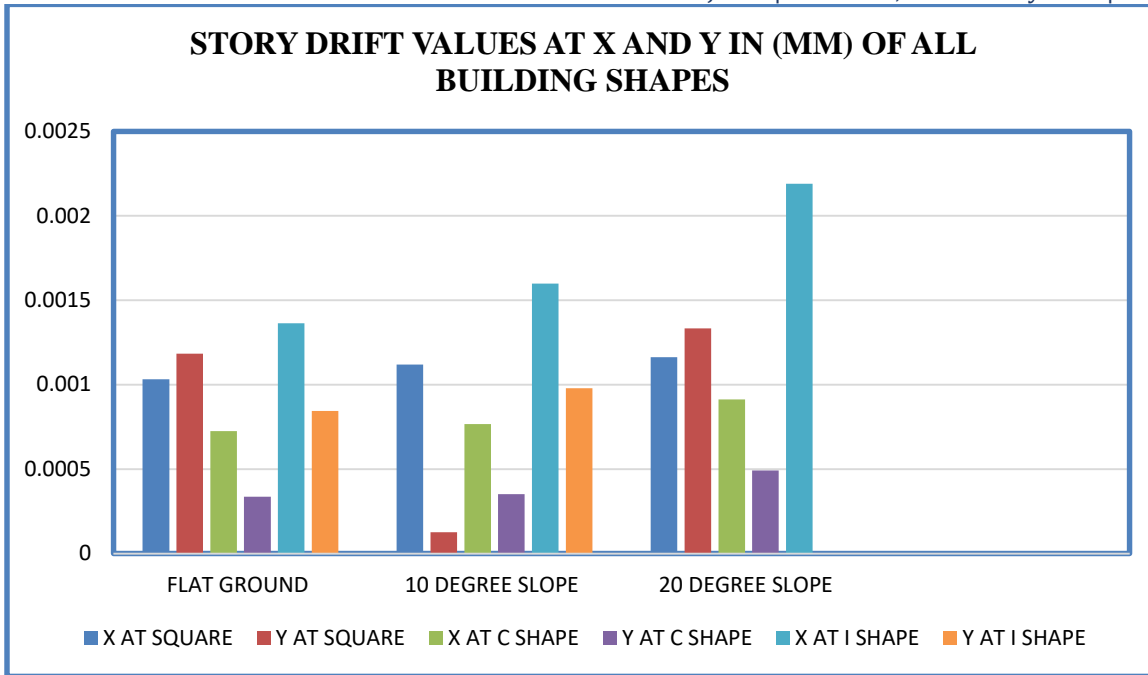
TABLE 1.5 BASE REACTIONS AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES

BASE REACTIONS AT X AND Y IN (MM) OF SQUARE, C AND I SHAPE BUILDING SHAPES						
BUILDING SHAPES	SQUARE SHAPE		C SHAPE		I SHAPE	
	X	Y	X	Y	X	Y
FLAT GROUND	859.60	801.10	1621.9695	993.39	2438.75	1707.97
10 DEGREE SLOPE	955.60	890.31	1669.72	1022.97	2508.24	1756.64
20 DEGREE SLOPE	968.79	902.58	1709.17	1047.45	2581.25	1807.77

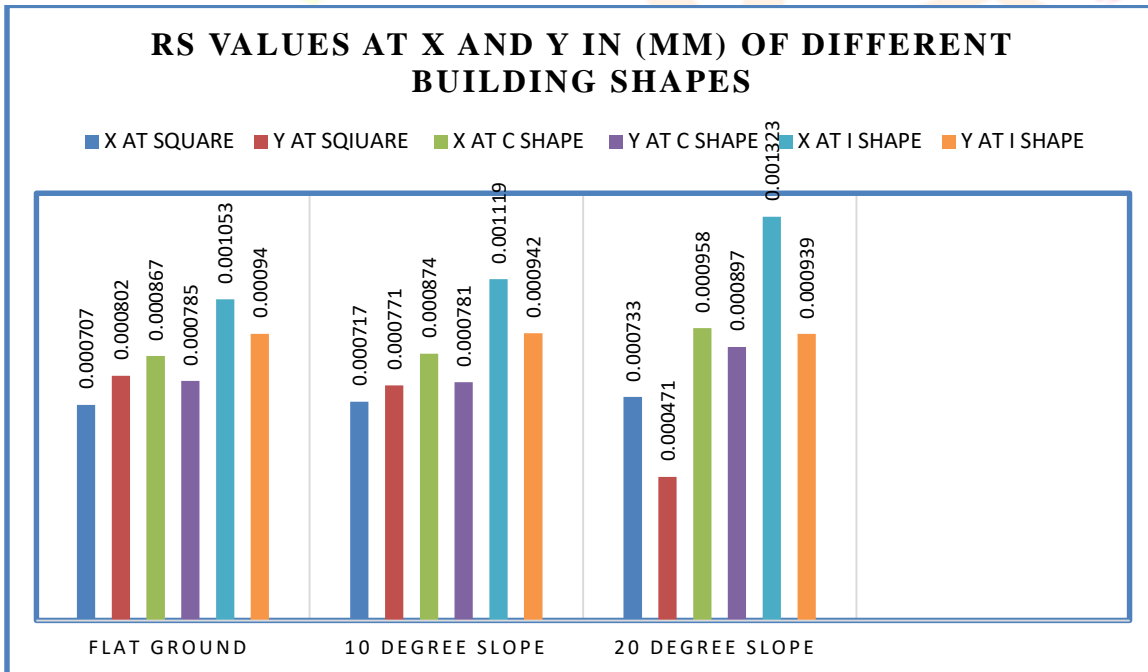


GRAPH 1.1 WIND DISPLACEMENT RESULTS

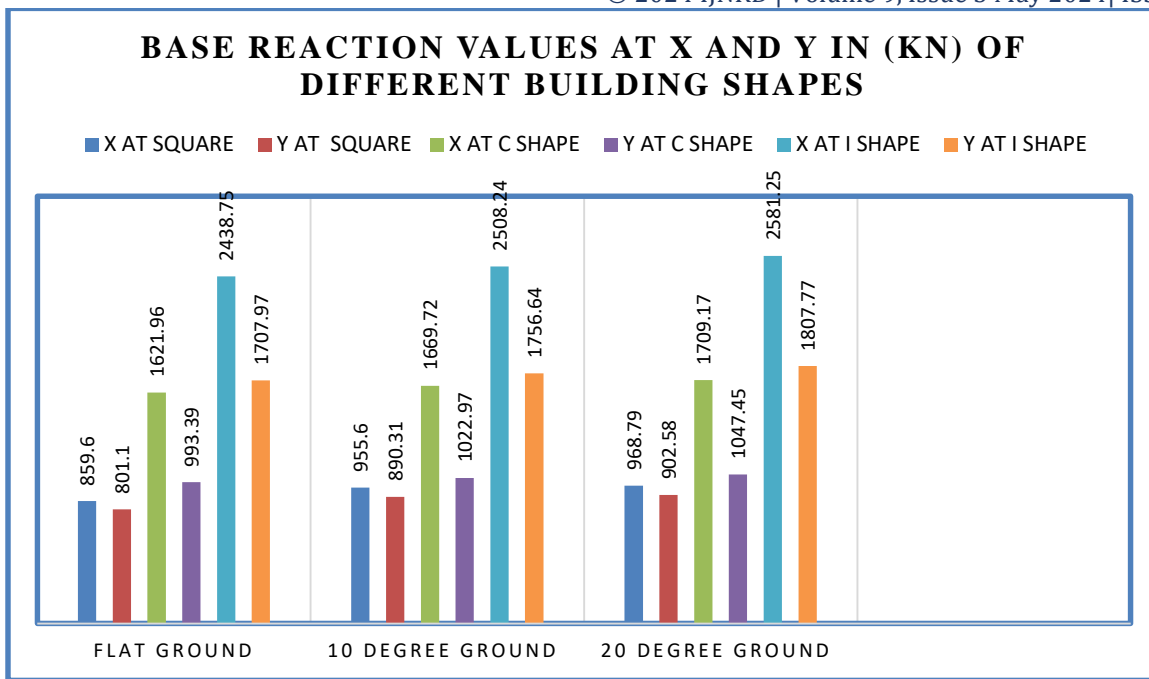
Research Through Innovation



GRAPH 1.2 STORY DRIFT RESULTS



GRAPH 1.3 RS AT X AND Y RESULTS



GRAPH 1.4 BASE REACTION RESULTS

Conclusion

1. Analysis of RCC structure with different slope angles i.e. resting on flat ground, 10 degree, and 20 degree sloping ground with basic wind speed i.e. 47m/sec has been done and significant variations are observed in different slope angles with different shape of building.
2. Wind displacement increases with respect to slope angle, hence when ground slope increases wind displacement also increases.
3. Story drift increases with respect to slope angle, hence when ground slope increases story drift also increases. As shape of building changes results also changes and increases.
4. As shape of the building increases wind displacement, story drift and base reactions results also increases,
5. I shape building displacement results are more as compared to square shape and C shape building.

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