ANALYSIS AND DESIGN OF MULTISTORY BUILDING WITH GRID SLAB USING ETABS

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ABSTRACT: Grid floor systems consisting of beams spaced at regular intervals in perpendicular directions, monolithic with slab. They are generally employed for architectural reasons for large rooms such as auditoriums, vestibules, theatre halls, show rooms of shops where column free space is often the main requirement. The rectangular or square void formed in the ceiling is advantageously utilized for concealed architectural lighting. The sizes of the beams running in perpendicular directions are generally kept the same. Instead of rectangular beam grid, a diagonal. In the present problem G+5 Building is consider and analysis and design is done for both Gravity and lateral (earth quake and wind) loads. And this is compared with the flat slab.

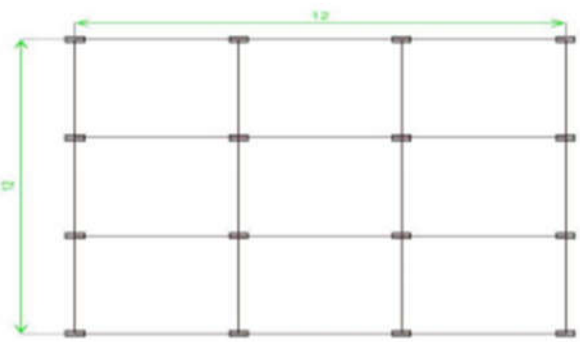
I.INTRODUCTION A building is a man-made structure with a roof and walls standing more or less permanently in one place. Buildings come in a variety of shapes, sizes and functions, and have been adapted throughout history for a wide number of factors, from building materials available, to weather conditions, to land prices, ground conditions, specific uses and aesthetic reasons. To better understand the term building compares the list of nonbinding structures. Buildings serve several needs of society – primarily as shelter from weather, security, living space, privacy, to store belongings, and to comfortably live and work. A building as a shelter represents a physical division of the human habitat (a place of comfort and safety) and the outside (a place that at times may be harsh and harmful).

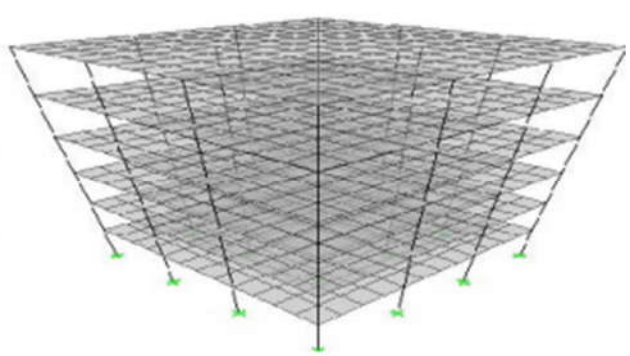
GRID SLAB Grid floor systems consisting of beams spaced at regular interval in perpendicular directions, monolithic with slab. They are generally employed for architectural reasons for large rooms such as auditoriums, theatre halls, show rooms of shop where column free spaced void formed in the ceiling is advantageously utilized for concealed architectural lighting. The sizes of the beam running in perpendicular directions are generally kept the same. Instead of rectangular beam grid, adiagonal.

II.LITERATURE SURVEY Torben Valdbjorn Rasmussen (2013) has worked on Novel Radon Sub-Slab Suctioning System. A new principle for radon protection is currently presented which makes use of a system of horizontal pressurized Air ducts located within the lower part of the rigid insulation layer of the ground-floor slab. The function of this system is based on the principles of pressure reduction within the zone below the ground-floor construction. For this purpose a new system of prefabricated lightweight elements is introduced. The Effectiveness of the system is demonstrated for the case of a ground-floor reinforced concrete slab situated on top of a rigid insulation layer (consisting of a thermal insulation layer located on top of a capillary-breaking layer) mounted intern on stable ground. Sandesh (2012) has worked on Dynamic Analysis of Special Moment Resisting Frame Building with Flat Slab and Grid Slab. A popular form of concrete building construction uses a flat concrete slab (without beams) as the floor system. This system is very simple to construct, and is efficient in that it requires the minimum building height for a given number of stories. Unfortunately, earthquake experience has proved that this form of construction is vulnerable to failure, when not designed and detailed properly, in which the thin concrete slab fractures around the supporting columns and drops downward, leading potentially to a complete progressive collapse of a building as one floor cascades down onto the floors below

III. MODELING OF R.C MOMENT RESISTING FRAME In this present study ground +5 storey r.c.c building is considered 12m x 12m panel. The constriction Technology is R.C moment resisting frame and Grid slabs. The modeling is done in ETABS. The structure is divided into frame and shell elements. Grid lines are made for the x, y and z coordinates and the wall is drawn from scratch. Boundary conditions are assigned to the nodes wherever it is required. Boundary conditions are assigned at the bottom of the wall i.e., at ground level where restraints should be against all movements to imitate the behavior of structure. The material properties are defined such as mass, weight, modulus of elasticity, Poisson's ratio, strength characteristics etc.

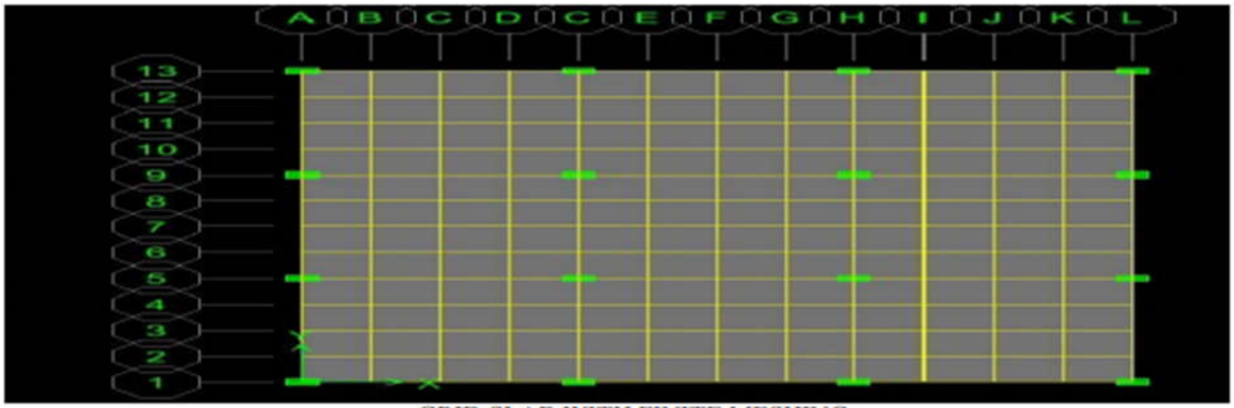
Material name	Concrete
Type of material	Isotropic
Mass per unit volume	2.5 knm^3
Modulus of elasticity	32 kN/mm^2
Poissonratio's ratio	0.2
Concrete strength	20 MPA





GEOMETRIC DATA

S.NO.	ITEM	DIMENSION
1	Plane dimensions	12 × 12 m
2	Length in X-direction	12 m
3	Length in Y-direction	12 m
4	Floor to floor height	3.0 m
5	No. Of storiesstories height	G + 5
6	Total Height of the building	18 m
7	Thickness of slab	200 mm
8	Beam	230 × 380 mm
9	Size of coloumn	230 × 450 mm
10	Grade of concrete	M 20
11	Grade of steel	Fe 415
12	Panel dimension	4 m × 4 m



GRID SLAB WITH FINITE MESHING

In this present work consider both gravity and lateral load cases. The load combinations as per the Indian standards are considered. The primary load cases and the load combinations are shown in table.

Seismic co efficients AS PER IS: 1893-2001			Wind coefficients AS PER IS: 875-1987	
Seismic Zone Factor	0.16		Wind speed(V_b)	44m/s
Soil type	III		Terrain Category	II
Importance Factor (I)	1		Structure Class	B
Response Reduction (R)	3		Risk Coefficient k_1 factor	1
			Topography k_3 factor	1
			Windward coefficient	0.8
			Leeward coefficient	0.5

IV. SUPPORT REACTIONS Structural systems transfer their loading through a series of elements to the ground. This is accomplished by designing the joining of the elements at their intersections. Each connection is designed so that it can transfer, or support, a specific type of load or loading condition. In order to be able to analyze a structure, it is first necessary to be clear about the forces that can be resisted, and transferred, at each level of support througoht the structure.

Column Number	Reaction (kN)			
		MX	MY	MZ
1	1006.67	80.85	19.807	0.674
2	1072.03	84.678	7.882	0.674
3	1058.3	73.703	0.102	0.674
4	908.82	69.874	10.216	0.674
5	2033.45	84.730	3.885	0.674
6	2066.45	85.873	0.06	0.674
7	1452.09	83.923	13.117	0.674
8	2033.45	83.414	12.94	0.674
9	1363.22	86.181	5.081	0.674
10	1363.08	83.424	12.593	0.674
11	1363.22	84.757	13.533	0.674
12	2033.45	84.374	0.731	0.674
13	1363.22	62.498	0.076	0.674
14	1363.22	73.831	0.331	0.674
15	1501 27	88.618	0.387	0.674
16	1517.70	87.446	3.079	0.674

V.FRAME FORCES In mechanics, compression is the application of balanced inward ("pushing") forces to different points on a material or structure, that is, forces with no net sum or torque directed so as to reduce its size in one or more directions. It is contrasted with tension or traction, the application of balanced outward ("pulling") forces; and with shearing forces, directed so as to displace layers of the material parallel to each other. The compressive strength of materials and structures is an important engineering consideration.

STOREY	LOCATION	P	T	MX
5th	TOP	2724.66	2895.876	16347.89
	BOTTOM	2910.96		17465.86
4th	TOP	6748.47	4920.781	40492.44
	BOTTOM	6935.04		41610.41
3rd	TOP	10772.88	6216.785	64636.96
	BOTTOM	10959.22		65457.67
2nd	TOP	14796.9	6945.735	88781.45
	BOTTOM	17983.8		89899.20
1st	TOP	18820.9	7269.726	112925.45
	BOTTOM	19007.28		114043.67
GROUND	TOP	22845.06	7350.725	137070.36
	BOTTOM	23031.36		138188.36

VI.DIAPHRAGN DRIFT

STOREY	DIRECTIONS	MAX DRIFT
5th	X	0.002137
	Y	0.002574
4th	X	0.003391
	Y	0.004260
3rd	X	0.004258
	Y	0.005360
2nd	X	0.004717
	Y	0.005965
1st	X	0.004703
	Y	0.006610
GROUND	X	0.005089
	Y	0.007700

Drift problem as the horizontal displacements of tall buildings is one of the most serious issues in building design, relating to the dynamic characteristics of the building during earthquakes and strong winds. Drift shall be caused by the accumulated deformation of each member, such as a column, beam, brace and shear wall. Therefore, when we went to control the quantity of displacement by changing its design, we cannot figure out which member of the computer calculation.

VII.CONCLUSSIONS

1.In this present work ETABS is used to analysis the R.C moment resting frame structure of G+5 considering the gravity and lateral loads. The following conclusion is drawn from present work.
I.Maximum time period is 3.53901 for mode -1 in the structure.

II. For maximum time period the natural frequency is 0.28256 cycles/sec

III. Modal participating mass ratios for mode-10 is x-trans is 97% and Y-trans is 99%

IV. Maximum axial force in the structure is 23031.36 Kn

V. Maximum tensile force in the frame is 7350.726 kN.

VI. Maximum diaphragm drift is 0.007700.

VII. Design of R.C.C columna)Size 230 x 450 b)Reinforcement 8no's of 12dia c)0.874 % reinforcement

VIII. Design of R.C.C Beam. a)Size 230 x 380 b)0.85 % reinforcement

XI. Design of R.C.C slab a)200 mm thickness b)8 dia 230mm spacing

X. Design of R.C.C footing a)2.5m x 2.3m 2. Maximum displacement is observed in flat slab with drop compare to grid slab with and without infills in both zones, but deflection is more in zone IV than zone III. 3.Maximum Time period of grid slab is less in compare with flat slab with and without drop with and without infills structures in zone IV. Structures without infills having significantly more time period compare to structure with infills. 4.Grid slab structures possess maximum base shear in comparison with flat slab with and without drop in both zones. 5. Storey drift values of different types of buildings are within the permissible limit as per IS-1893-2002 code provision i.e. 0.4% of the floor height.

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