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3D FRAME ANALYSIS BY USING ETABS

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Abstract - *The main objective of this study was to develop two dimensional and three-dimensional finite element modeling (2D & 3D-FEM) of frame that can be used to investigate the response of base shear value of frame. A parametric study for static analysis is performed to investigate the effect of gravity load and lateral load on frame.*

***Key Words*: 2D FE, 3D FE, Base shear, Gravity load, lateral load.**

1. INTRODUCTION

ETABS is the present-day leading design software in the market. Many design company's use this software for their project design purpose. It is easy to use, special purpose analysis and design program developed specifically for building system. ETABS features an intuitive and powerful graphical interface coupled with unmatched modeling, analytical, design and detailing procedure in all. Integrated using a common database. Although quick and easy for simple structure ETABS can also handle the largest and most complex building models, including a wide range of nonlinear behaviors necessary for performance-based design making it the tool of choice for structural engineers in the building industry.

1.1 Advantages of ETABS

Dating back more than 40 years to the original development of ETABS the predecessor of ETABS, it was clearly recognized that buildings constituted a very special class of structure. Early releases of ETABS provided input, output and numerical solution techniques that took into consideration the characteristics unique to building type structure.

2. 2D FRAMES SUBJECTED TO GRAVITY LOAD AND LATERAL LOADS

A 16m X 16m, 4 storey multi storey regular structure is considered for the study. Story height is 4m. Modeling and analysis of the structure is done on ETABS software.

2.1 Preliminary Data:

Length x Width	16m x 16m
No of Story's	4(G+3)
Beam	450mm x 300mm
Columns	600mm x 300mm
Slab thickness	150mm
Support condition	Fixed
Thickness External Wall	120mm
Grade of concrete and steel	M30 and Fe415
Length of each bay	4m

2.2 Loading Consideration

Loads acting on structure are dead load (DL), Live Load (IL) and Earthquake Load (EL) DL; self weight of the structure, Floor load and Wall loads.

Live Load: 3KN/m2 Importance Factor: 1

Seismic Zone: II Soil Type: II

Zone Factor: 0.10 Response Reduction: R=5

Time period: 0.427 sec (calculated as per IS 1893:2002)

2.3 ANALYSIS USING SOFTWARE:

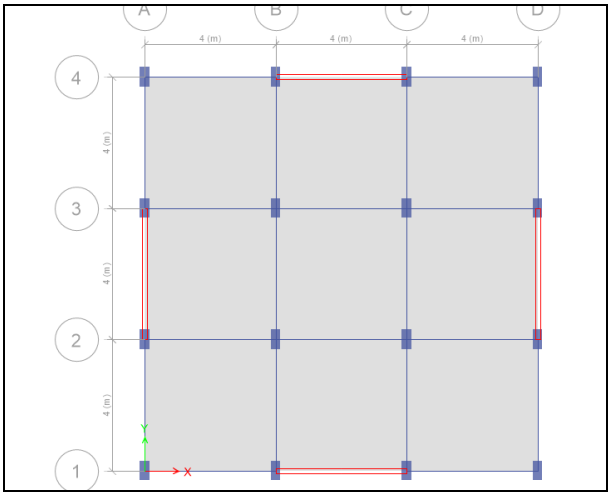


Figure 1 PLAN

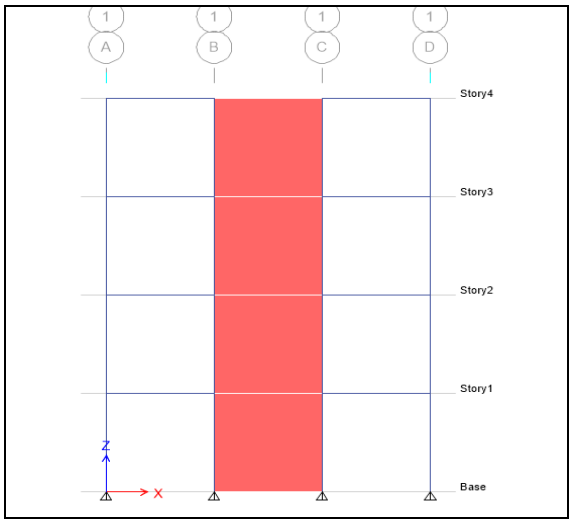


Figure 2 ELEVATION

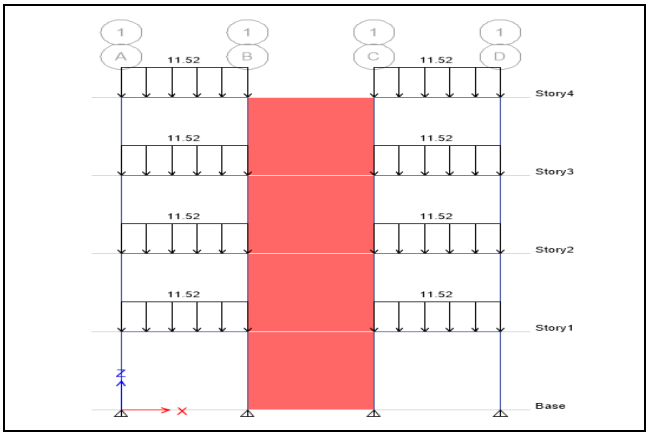


Figure 3 UDL DUE TO WALL ON BEAM

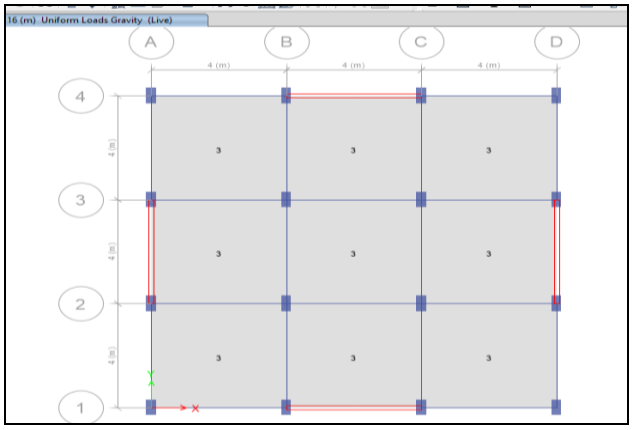


Figure 4 APPLY LIVE LOAD ON EACH FLOOR-3kN/m

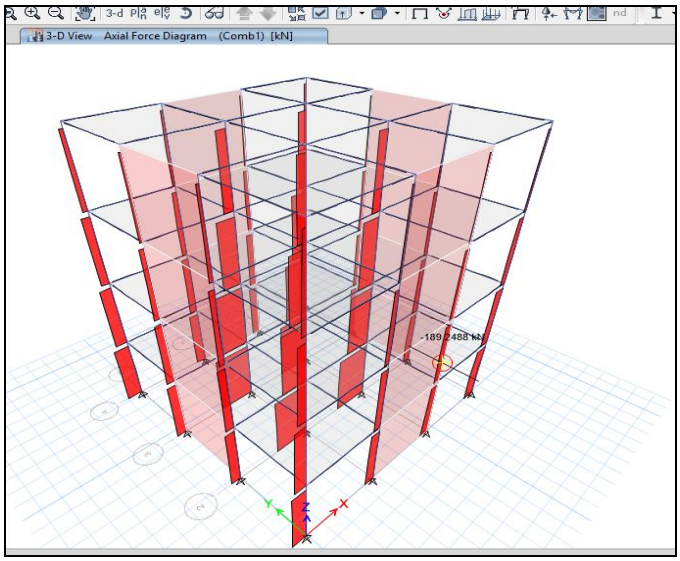


Figure 5 AXIAL FORCE DIAGRAM

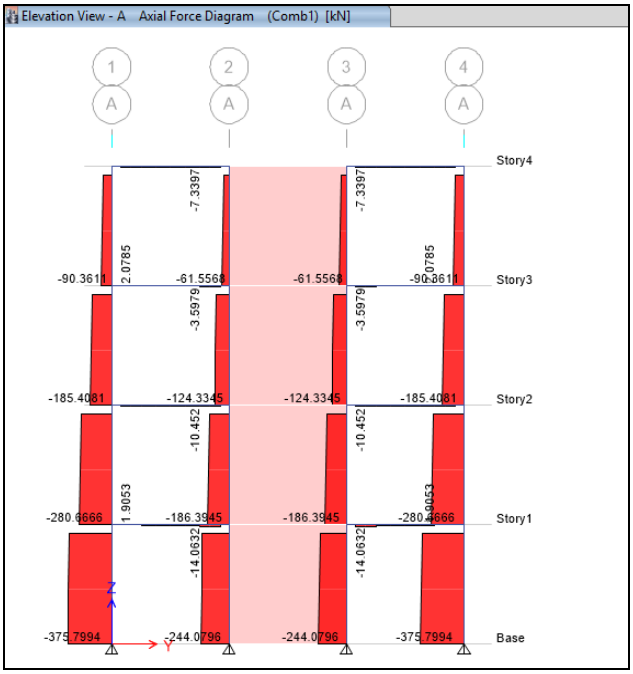
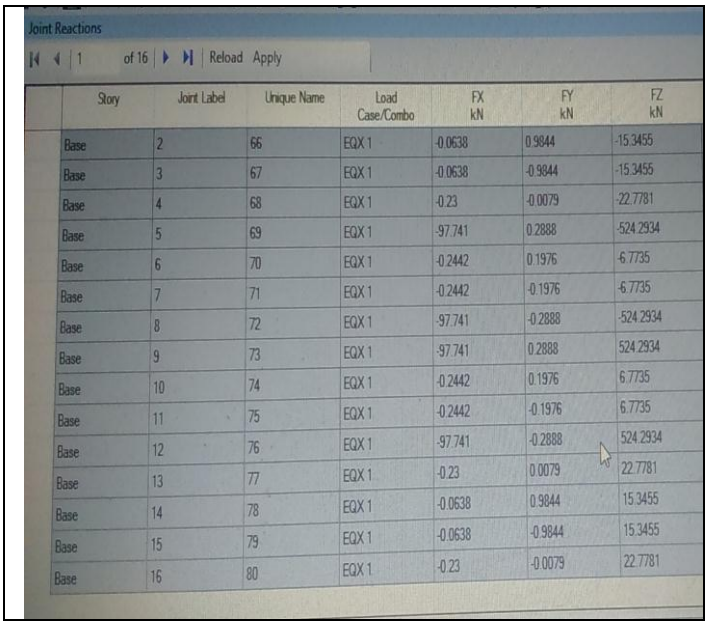


Figure 6 AXIAL LOAD IN EACH COLUMN

3. CONCLUSIONS

The final base shear value and vertical distribution of base shear to different floor is calculated and it is defined as

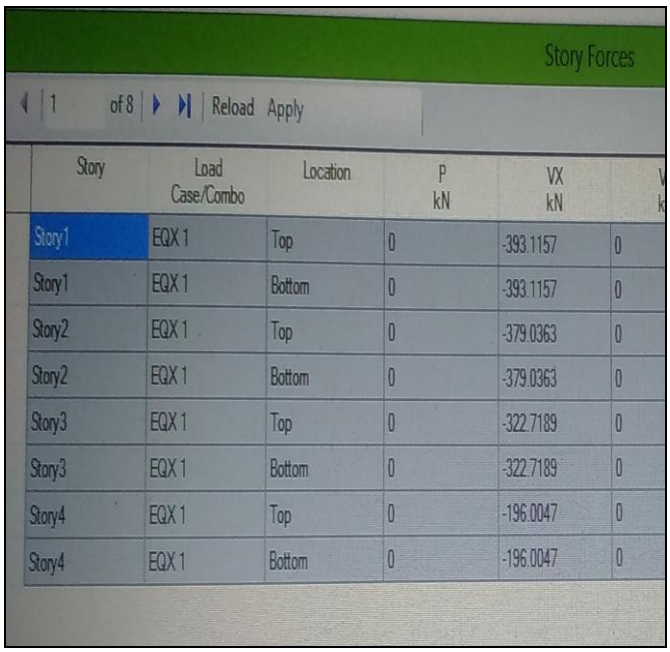


Joint Reactions

1 of 16 Reload Apply

Story	Joint Label	Unique Name	Load Case/Combo	FX kN	FY kN	FZ kN
Base	2	66	EQX 1	-0.0638	0.9844	-15.3455
Base	3	67	EQX 1	-0.0638	-0.9844	-15.3455
Base	4	68	EQX 1	-0.23	-0.0079	-22.7781
Base	5	69	EQX 1	-97.741	0.2888	-524.2934
Base	6	70	EQX 1	-0.2442	0.1976	-6.7735
Base	7	71	EQX 1	-0.2442	-0.1976	-6.7735
Base	8	72	EQX 1	-97.741	-0.2888	-524.2934
Base	9	73	EQX 1	-97.741	0.2888	524.2934
Base	10	74	EQX 1	-0.2442	0.1976	6.7735
Base	11	75	EQX 1	-0.2442	-0.1976	6.7735
Base	12	76	EQX 1	-97.741	-0.2888	524.2934
Base	13	77	EQX 1	-0.23	0.0079	22.7781
Base	14	78	EQX 1	-0.0638	0.9844	15.3455
Base	15	79	EQX 1	-0.0638	-0.9844	15.3455
Base	16	80	EQX 1	-0.23	-0.0079	22.7781

Figure 7 BASE SHEAR VALUES



Story Forces

1 of 8 Reload Apply

Story	Load Case/Combo	Location	P kN	VX kN	V kN
Story1	EQX 1	Top	0	-393.1157	0
Story1	EQX 1	Bottom	0	-393.1157	0
Story2	EQX 1	Top	0	-379.0363	0
Story2	EQX 1	Bottom	0	-379.0363	0
Story3	EQX 1	Top	0	-322.7189	0
Story3	EQX 1	Bottom	0	-322.7189	0
Story4	EQX 1	Top	0	-196.0047	0
Story4	EQX 1	Bottom	0	-196.0047	0

Figure 8 VERTICAL DISTRIBUTION OF BASE SHEAR TO DIFFERENT FLOORS

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