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Utilization of Advance Technology and Techniques In Analysis of A Tall Structure

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ABSTRACT

Presently a-days, the modelers frequently disallow the widths of the segments so that all the more free space is accessible and for the great tasteful look of the structure without sections jutting out of the dividers and corners. Advances in basic individuals and methods to oppose parallel powers are commonly utilized now days to imagine more steady and safe structure.

In present work with the ultimate objective to differentiate sustained strong structure utilizing customary segments against structure planned with unique molded segments considering seismic loads on G+12 multi-story building having plan estimation 63.20mx29.50m m is shown and dismembered in Etab transformation composed structure diagram programming. Proportionate static examination and dynamic response range assessment are performed on the structure.

Keywords: Structural Stability, Analysis, Advance Techniques, Software's, Columns, Lateral Forces.

I. INTRODUCTION

As of now a-days, the originators consistently deny the widths of the portions so more free space is open and for the incredible in vogue look of the structure without areas anticipating out of the dividers and corners.

Strong structures with non-rectangular remarkably framed unstable fragments found as an alternative rather than the above said issue and it is found that non-rectangular particularly shaped petite sections performs well essentially with all examination results inside good cutoff focuses. Such a structure satisfies spatial necessities of corners similarly as intersection purpose of corners with the objective that no undeniable edges or obvious portion would appear in the structures. This develops the genuine usable floor an area and more furniture can be placed into the structures. Therefore, plot structure with extraordinarily framed section is fitting blooms, especially for house and multi-story structures. This paper explains the direct of structures with Rectangular fragments and structures with remarkably formed portions and assessments of various limits like story coast, story movement, story solidness, etc dependent on equal weights.

Fundamental arrangement is a science and claim to fame of understanding the direct of assistant people

presented to weights and arranging them with economy close by prosperity, handiness and as a solid structure. The current proposal work will oversee such an examination of essential people made of RCC as it is commonly used because of its flexibility. Segment is on a very basic level an assistant part designated for passing on compressive weights. It passes on center burdens from shafts and moves it to adjust. The areas are perceived from different perspectives and various sorts are viewed. Taking into account the slimness extent segments are called as short or long sections. The short portion crashes and burns by beating and long section bombs by fastening. Considering the stacking plan there are significantly stacked fragment, center point section with uniaxial bowing, center portion with biaxial curving. Sections continue differently under static and dynamic stacking conditions. The dynamic weight thought is must for places where the seismic development is high. In this way when seismic weights are seen as the joined procedure of malleability and quality must be applied. The breeze loads, snow loads, creep, shrinkage and temperature impacts are seen as where they are fundamental. The snow load thought varies on country to country, and district to territory. It must be considered by significant arrangement codes of huge codes. The idea of wind stacks essentially endless supply of structure and the bearing and speed of the breeze in the district .The portions should be proposed to pass on the breeze loads in such conditions. A part of the complex numerical conditions and building irregularities requires test and methodical techniques for different material properties and sectional properties. Such limits can't be honestly made sure about by the structure code books and rules. The auxiliary essential leads the planner to think about different shapes and cross regions of the columns, fragments, plates, etc. This incited unmistakable cross portions of fragments reliant on the spot and limit, for instance, L-shape, Tshape, C-shape, +shape, etc. In fact, even the different conditions of fragments are also eventually, for instance, shaft, trapezoid, zenith and cross segment. All of these sections should be structure and cast with prosperity, economy and jazzy appearance. Regularly the particular cross portions of fragments, for instance, L-shape, Tshape, C-shape, cross shape have rolled out an improvement in essential planning by which they offers the basic response for zones in unprecedented cases.

In the RCC structures, fragments are assistant parts which are dominatingly presented to urgent compressive forces, minutes, and moves hard and fast weight from the super structure to sub-structure. Various conditions of the sections are used. Some ordinary shapes are square, rectangular, round segments and some unprecedented conditions of fragments are L-formed, T-framed and notwithstanding (+) formed sections as showed up in figure 1.1 which are not consistently used at this point gives more indoor space than normally used conditions of portions. Outstanding formed sections avoid prominent corners in a room which increases usable floor zone.

The braced strong structure system with exceptionally formed areas is a system by and large got in private structures on account of no revealed shafts and portions in the room. The common sense and solace of reinforced concrete (RC) layout with phenomenal shaped areas in helper structure and its positive help make it for the most part used being developed industry.

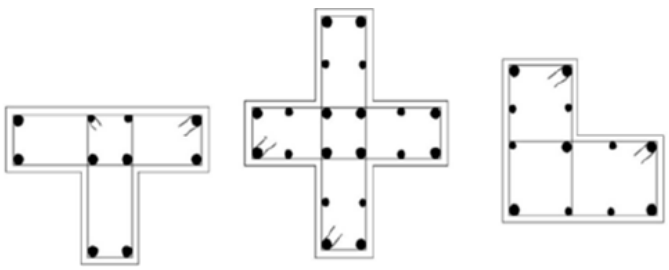

Fig 1. Specially shaped (T, +, Plus) columns with Longitudinal and lateral reinforcement.

II. LITERATURE REVIEW

Yuzhuo WANG et al (2019) The investigation paper presented testing of three T-outlined steel-sustained solid segments examined under high temperature and vertical weights, to imitate fire influence. The results assumed that failure characteristics, dissemination of temperature field, vertical deformation credits and invulnerability to fire were moreover investigated under various focus pressure degrees and different eccentricity. The test besides indicated that the breaks reached out with the augmentation of focus point pressure degree and uncommonness. The damages of the web were severer than the rib. The breaks were for the irregular side on the capricious side and all things considered slanted parts in the model. The vertical growth wound up being continuously evident as the eccentricism diminished. The invulnerability to fire decreased as the significant weight degree expanded. Separated and, the imperviousness to fire of tremendous center weight models (the dire weight degree was 0.6) was diminished by 57% than less center point pressure models (the middle weight degree was 0.2). The imperviousness to fire diminished by about 30min as unpredictability reached out by 20mm.

Mary Paul V and Nisha Vargheese (2019) The assessment paper dissected Crisscrossed framed sections related by the coupling bar, Single vertical steel plate with stiffeners, Double vertical steel plate, Effect of stature, Effect of width and essential compressive lead. The qualities of the restricted part assessment were utilized on beyond what many would consider possible conditions and material properties utilizing ANSYS 16.2.

The outcomes inferred that Mono parts related with twofold vertical steel plate had more weight passing on limit anyway Mono portions related by a coupling bar had a less weight passing on limit. Mono areas related by single vertical steel plate with stiffeners have more weight passing on limit than confining bars. Weight giving breaking point oppositely propositional to the stature of the parts. Weight passing on limit relies upon the width of the steel plate. The extent of restraint concrete extended weight passing on limit.

Objectives of the study:

The main objectives of this study are to evaluate the performance of building with special shaped column.

Followings are the specific objectives of this study.

(1) To determine the stability of the structure considering lateral forces.

(2) To determine the variation in structural stability considering three different shaped columns.

(3) To compare specially shaped columns with general columns.

(4) To Perform finite element analysis using analysis tool ETABS 20'

(5) To Determine cost analysis of tall structure as per S.O.R. (M.P. PWD)

III. METHODOLOGY

For this research work following steps should be followed:

Step-1 Firstly literature survey should be done to determine the past research and

Need of study.

Step-2 To prepare Sample of light weight concrete to determine its properties to be

Assign in ETABS.

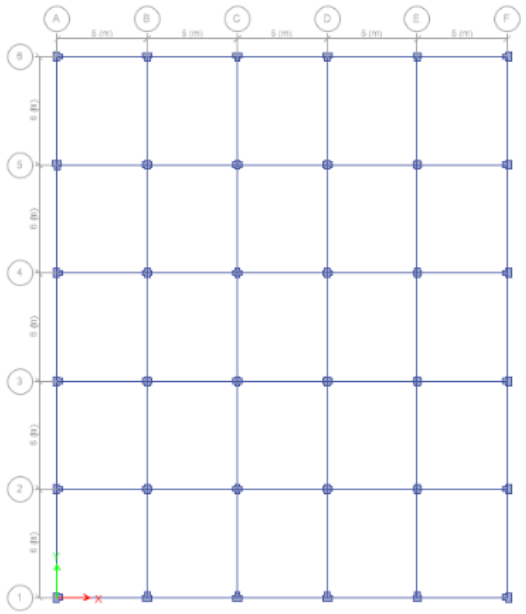

Fig 2. Plan of structure

Step-3 To prepare modelling of a symmetrical building frame (G+12) using ETABS"17.

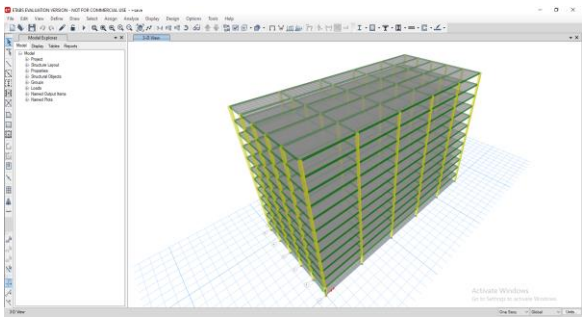

Fig 2. Model of the structure

Step-4 To assign properties and support conditions.

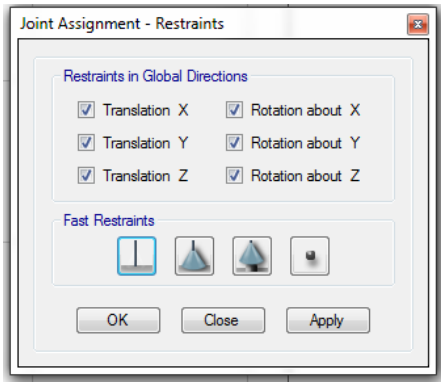

Fig 3. Assigning support conditions

Step 5 Defining and Assigning section Properties

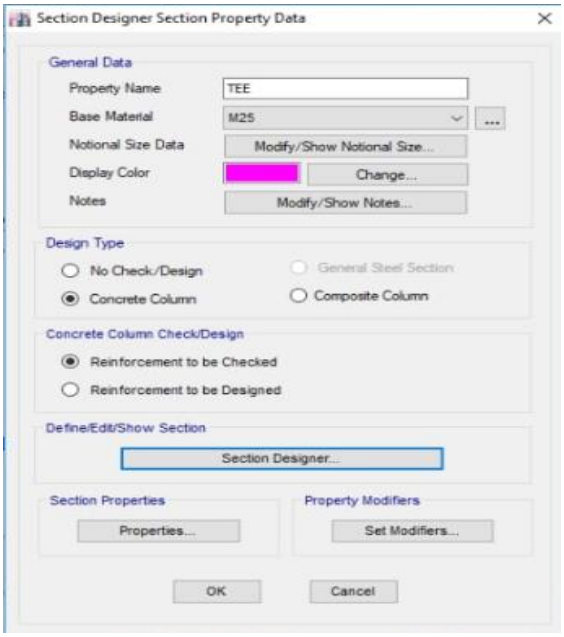

Fig 4 (a). Defining Section Properties

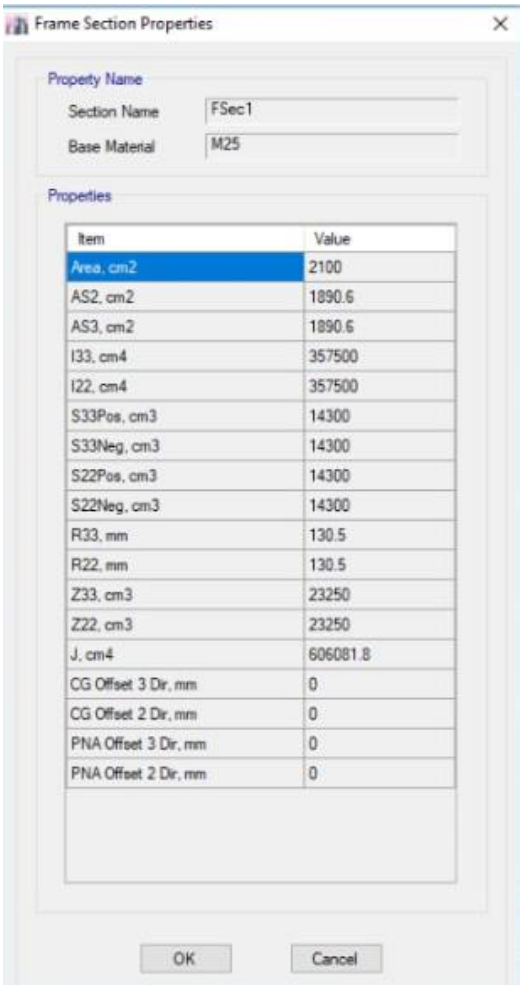

Fig 4 (b). Defining Frame Section Properties

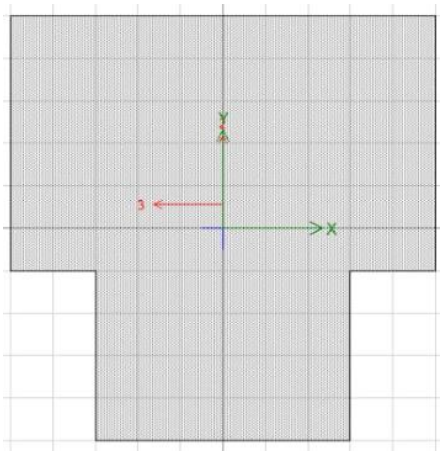

Fig 4 (c). Section Design T Shaped

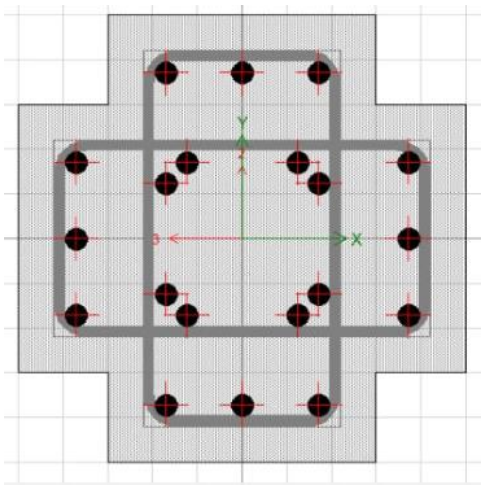

Fig 4 (d). Section design Plus Shaped

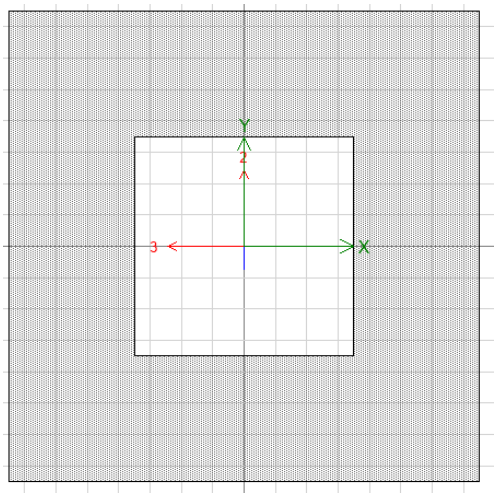

Fig 4 (e). Section design General Shaped

Step-6 To Assign lateral force (response spectrum) dynamic analysis as per I.S. 1893-Part-I: 2016.

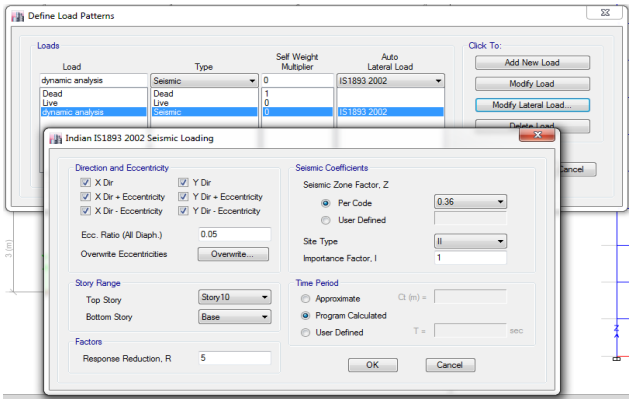

Fig 5. Defining loading conditions

Step-7 To analyze the structure for dynamic loading.

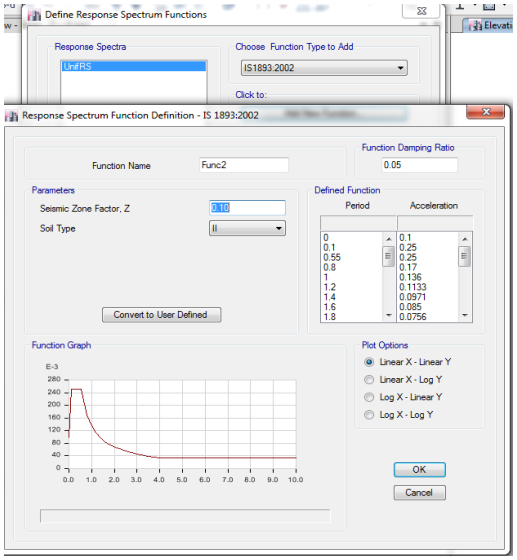

Fig 6. Dynamic analysis

Step-8 To compare the results of the structure.

Problem Formulation:

Table 1. Details and Dimension of the Building Models

Type of structure	Ordinary moment resisting RC frame
Grade of concrete	M 40 (fck= 40 N/mm2)
Grade of reinforcing steel	Fe 415
Plan area	63.20mx29.50m

Number of stories	G+12
Total Height of Building	43.2 m
Floor height	3.6 m
Rectangle Shaped Column	230x 600mm
Plus Shape column	350mmx750mm
T Shape Square column	350mmx600mm
Beam size	500x300mm
Wall thickness	230mm
Thickness of Slab	200 m
Density of concrete	25000 KN/ m^3
Live Load on Floor and roof	3 kN/mm2 and 1.5 kN/ mm2
Plan irregularity	T Shape and Plus Shape
Seismic Zone	II
Soil Condtion	Medium Soil
Floor Finish	1.0 kN/m2

Table 2. Material properties of structure

S. no	**Description**	**Values**
1	Material property	Values
2	Grade of concrete	M-25
3	Young's modulus of concrete, E_c	$2.17x10^4$ N/mm^2
4	Poisson ratio	0.17
5	Tensile Strength, Ultimate steel	505 MPa
6	Tensile Strength, Yield steel	215 MPa
7	Modulus of Elasticity steel	193 - 200 GPa

IV. ANALYSIS RESULT

Max. Bending Moment:

Table 3 : Max. Moment in KN-m

Moment in kN-m			
Storeys	Rectangular Column	T Shape	Plus Shape
storey12	826.76	734.17	566.81
storey11	814.58	705.63	553.84
storey10	789.44	677.09	540.87
storey9	770.21	648.55	527.9
storey8	719.3	620.01	514.93
storey7	698.67	591.47	501.96
storey6	675.2	562.93	488.99
storey5	629.1	534.39	476.02
storey4	559.89	505.85	463.05
storey3	578.9	477.31	450.08
storey2	524.99	468	437.11
storey1	510.22	461.05	424.14

Max. Shear Force

Table 4 : Max. Shear Force in KN

Shear force in kN-m			
Storeys	Rectangular Shape	T Shape	Plus Shape
storey12	941.85	840.43	821.54
storey11	923.25	813.87	797.91
storey10	904.65	787.31	771.23
storey9	886.05	760.75	748.9
storey8	867.45	734.19	712.45
storey7	848.85	707.63	694.766
storey6	830.25	681.07	672.85
storey5	811.65	654.51	637.31
storey4	793.05	627.95	619.21
storey3	774.45	601.39	583.36
storey2	755.85	574.83	554.45
storey1	737.25	548.27	528.77

Storey Displacement in mm

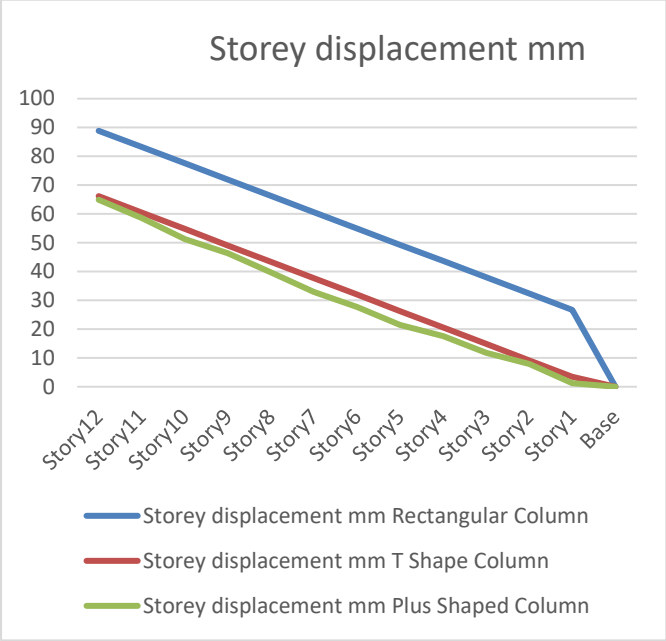

Fig 7. Storey Displacement

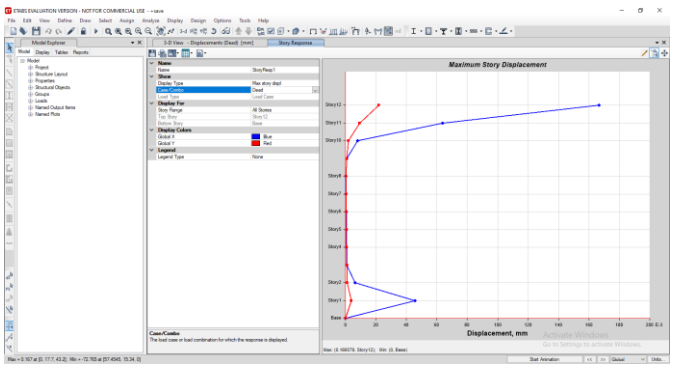

Fig 8. Storey Drift

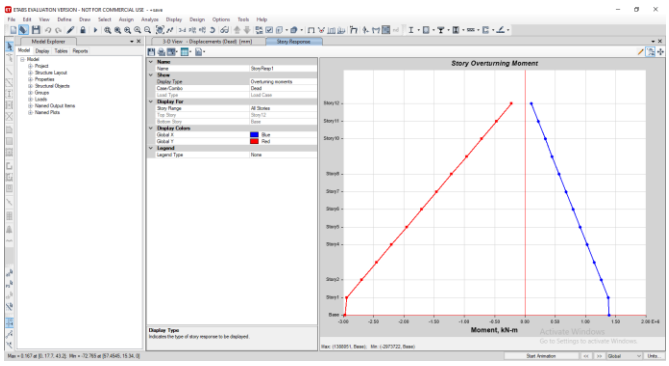

Fig 9. Overturning Moment

V. CONCLUSION

Maximum Bending Moment:

In the chapter above, it is clearly observed that bending moment in structure using Rectangular column was 826.76 kN-m whereas structure using T shapes and Plus Shaped column showed less bending moment as 734.17 and 566.81 kN-m, thus Plus shaped case requires less reinforcement.

Maximum Shear force:

In above chapter it is observed that unbalance forces are maximum in rectangular case 941.85 kN whereas in Plus shaped case these are reduced to 840.43 kN which shows stability of the structure.

Maximum storey displacement:

It is observed that lateral stability is comparatively increased in structure with plus shaped column case comparing to structure using traditional rectangular column. In case of light weight structure displacement is minimised to 66.16 mm instead of 88.84 mm in bare frame.

Axial Force:

In the above chapter it is observed that there is very minute variation in axial force as it is considered for same loading condition in both the cases.

Future scope:

i) In the proposed work high rise building is considered which can be increased to some more floors in future with variation in floor to floor height.

ii) In this study seismic analysis is considered whereas in future study wind load can be consider.

iii) In this study analysis is done using etabs whereas in future SAP2000 can be prefer for P-delta analysis.

iv) In this study cost analysis is performed as per S.O.R. whereas in future one can adopt market rate for estimation.

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