Study the Behavior of Response Spectrum of Regular and Haunch Beam Building in ETAB

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Abstract - – *Hunched beams are designed by forming a rigid moment connection between the beams and columns. The depth of the haunch is selected primarily to provide an economic method of transferring moment into the column. The length of the haunch is selected to reduce the depth of the beam to a practical minimum. This paper presents on comparative study of Seismic analysis of multi storey building with and without haunch beam. The seismic performance of buildings with regular beam and haunch beam remains subject to research especially since well-defined design procedures and code provisions are often scarce. Finally, a comparative study between regular beam and haunch beam structure for the same building was undertaken. It compare the results can be broken down into modal time period, base shear, displacement, Drift details.*

Key Words: Regular beam, haunch beam, multi storey building, Seismic analysis

1. INTRODUCTION

Haunch beam frame structure are not commonly built in reinforced concrete structure but in steel structures. The haunch beam frame are very much advantageous than prismatic beam frame. The haunch beam frame are very much advantageous than prismatic beam frame. It can increase strength, stability and stiffness of the frame. It causes efficient use of material as well good aesthetic. The main principle in the design of a haunch beam is that framing into columns reduces the design moment and deflection of the beams. It would not normally be practical to introduce a large quantity of R/F into the slab as adequate moment transfer can usually be achieved through the haunch.

2. Preliminary Data Considered for the Modeling and Analysis –

a) Architectural details– Total building height: 81m
Floor to Floor height: 3m

b) The basic parameter considered for the analysis of the structure –

Live load in floor area : 3 kN/sq. m : As per IS 875 Part 2

Live load in Balcony area : 3 kN/sq. m

: As per IS 875 Part 2

Live load in passage area : 3 kN/sq. m : As per IS 875 Part 2

Live load in urinals : 3 kN/sq. m : As per IS 875 Part 2

Floor finish load : 1.5 KN/ sq. m : As per IS 875 Part 1 Stair case loading: 3 kN/sq. m : As per IS 875 Part 2

c) Framing Details Slab depth: 120 mm thick : Assumed
Wall thickness : 230 mm thick wall : Assumed

Column Details:

	Rcc without huanch beam	Rcc with huanch beam frame
Base to 9th floor	300X600 mm	300X600 mm
10th to 18 th floor	300X530 mm	300X530 mm
19th to 27th floor	300X450 mm	300X450 mm

Beams details:

	Rcc without huanch beam	Rcc with huanch beam frame
Base to 9th floor	300X600 mm	(300X600, 300x530)mm
10th to 18 th floor	300X530 mm	(300X530, 300x450)mm
19th to 27th floor	300X450 mm	(300X450, 300x380)mm

d) Material Property Grade of Concrete – M20 Modulus of elasticity of concrete (E): 2X10^5 Density of concrete: 25 KN/M^3 Grade of bars: Fe500

e) Earthquake parameters considered
Zone: I
Soil type: Hard soil
Important-factor:1.5 Response reduction factor (R): 5

f) Modeling with E-TAB 3-D model is being prepared for the frame static analysis and dynamic time history analysis of the building in ETAB

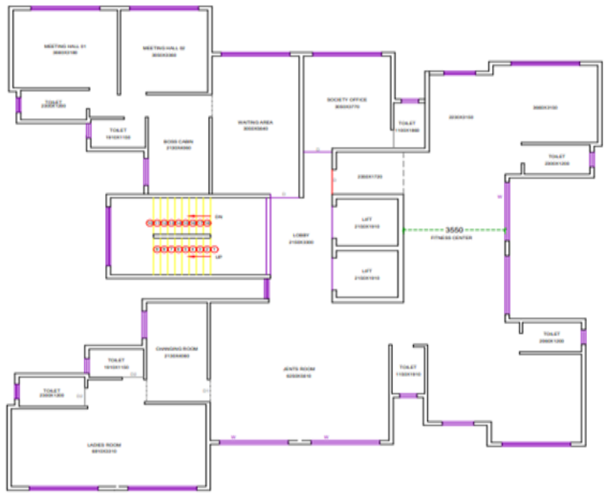

Fig.01 Typical floor plan details

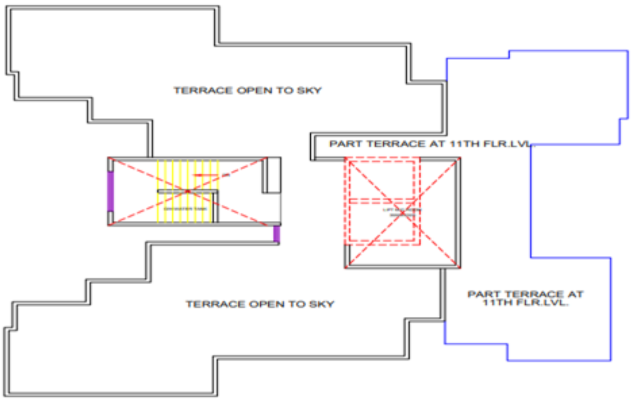

Fig.02 Terrace floor plan details

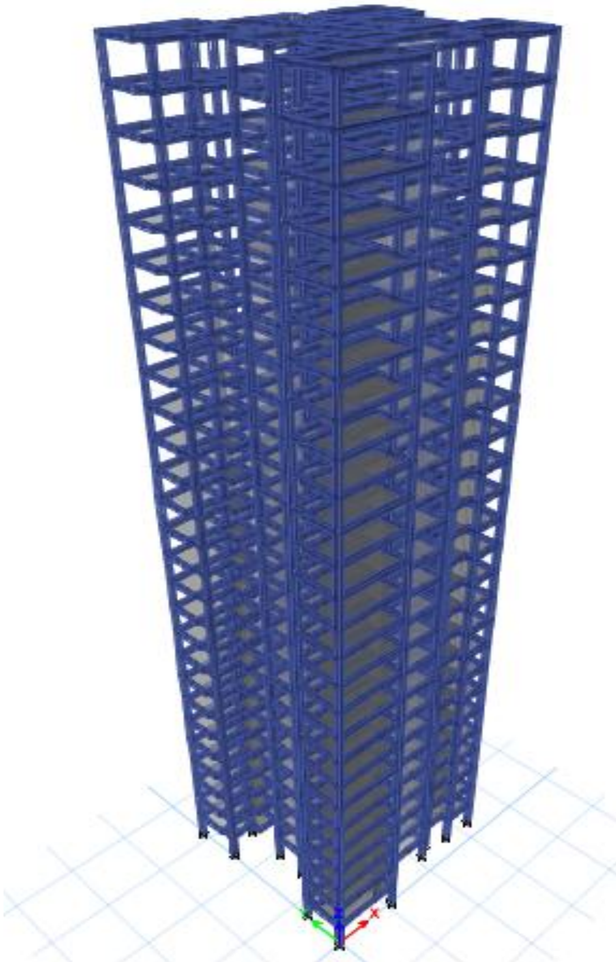

Fig.03 Shows the skeleton model and 3d view

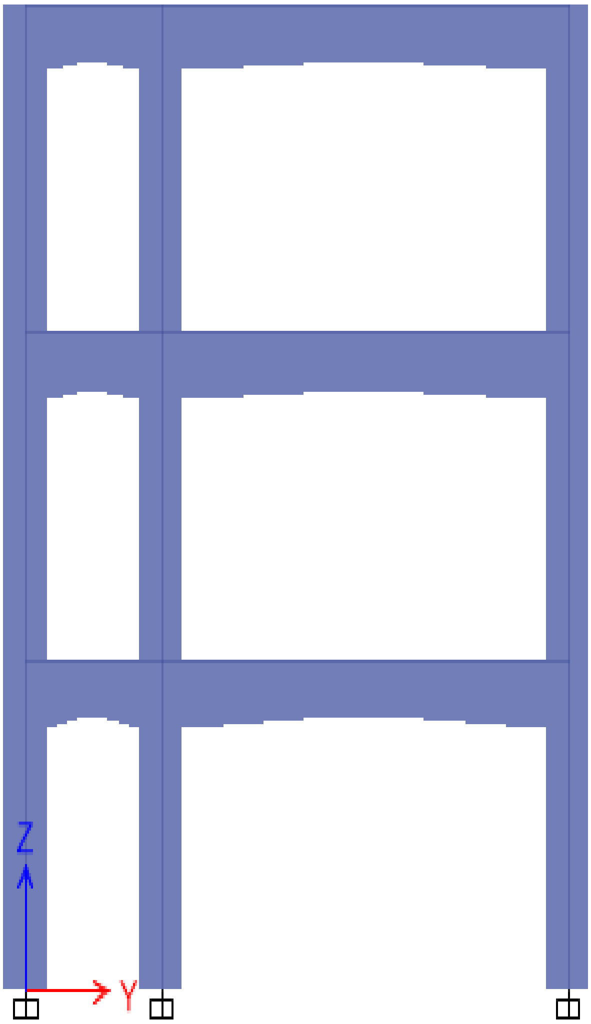

Fig.04 Shows the hunch beam pictorial diagram

3. RESULTS AND DISCUSSION: –

3.1 Model time periods

Table 01 Model time periods Details

Case	Time period in sec For without haunch beam	Time period in sec for for with haunch beam
Modal 1	4.909	4.987
Modal 2	4.402	4.464
Modal 3	4.226	4.296
Modal 4	1.612	1.643
Modal 5	1.494	1.518
Modal 6	1.458	1.485

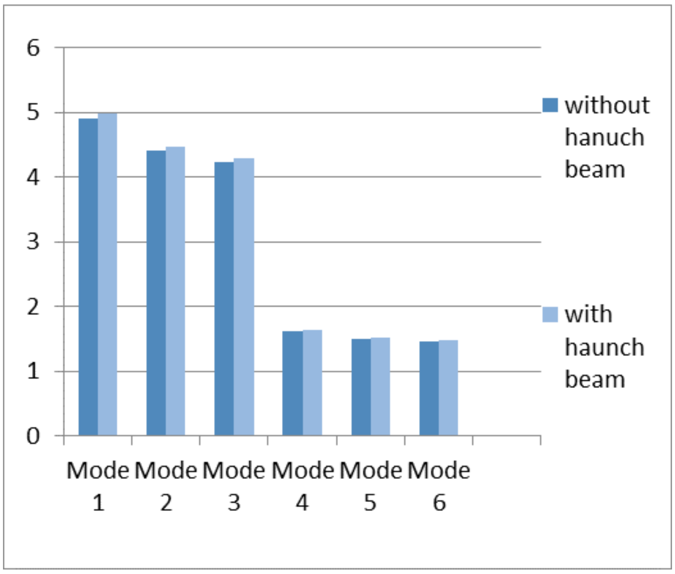

Fig. 05 Modal Time Period for Regular beam and Haunch beam

3.2 Base shears Details:

Table 02 – Base Shear Details for Static Condition in X and Y Direction

	Base shear in KN For without haunch beam	Base shear in KN for with haunch beam
Static Ex	3520.7396	3482.9055
Static Ey	3456.3827	3389.3346
DynamicDx	804.4598	781.0386
DynamicDy	574.9200	731.2421

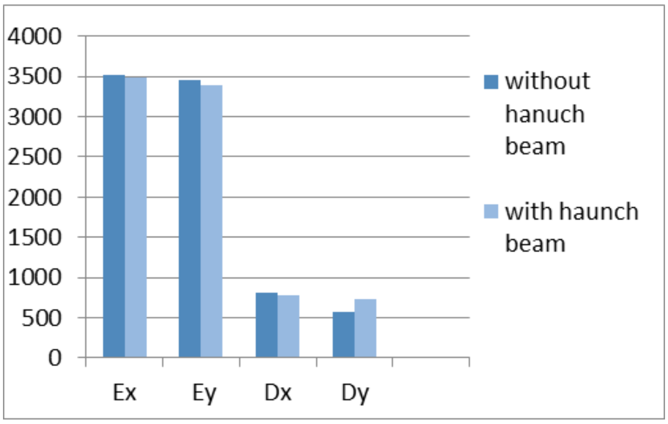

Fig. 06 Base Shear Details for Static and dynamic load Condition in X and Y Direction-

3.3 Displacement Details

Displacement Details: –

Table 03 – Displacement Details in X and Y Direction for Seismic Condition-

	Displacement in m For without haunch beam	Displacement in m for with haunch beam
Static Ex	0.385	0.399
Static Ey	0.467	0.481
DynamicDx	0.063	0.064
DynamicDy	0.091	0.093

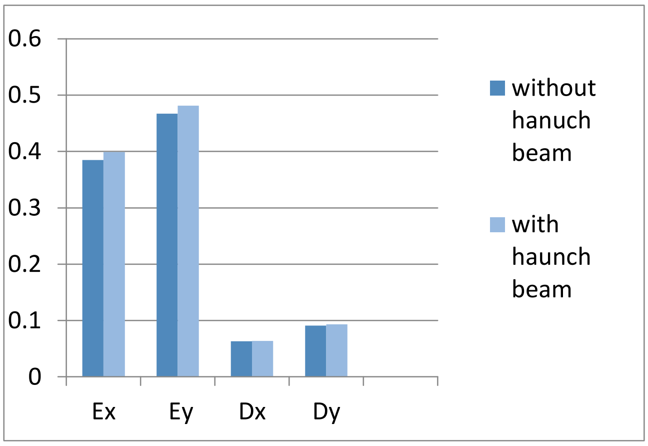

Fig. 07 Displacement Details for Static and dynamic load Condition in X and Y Direction-

3.4 Drift Details

Table 04- Drift Details in X and Y Direction for Seismic Condition-

	For without haunch beam	for with haunch beam
Static Ex	0.385	0.399
Static Ey	0.467	0.481
DynamicDx	0.063	0.064
DynamicDy	0.091	0.093

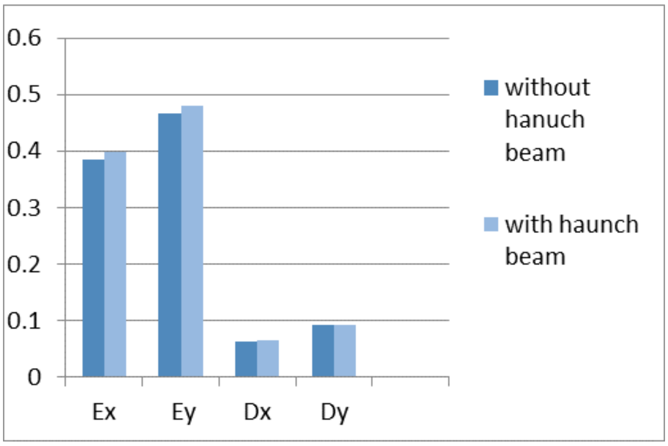

Fig. 08 Drift Details for Static and dynamic load Condition in X and Y Direction-

3.5 Storey stiffness:

Table 05 – Story stiffness in X and Y Direction for Seismic Condition-

	For without haunch beam	for with haunch beam
Static Ex	538441	522818
Static Ey	600131	582392
DynamicDx	537174	523428
DynamicDy	539410	520036

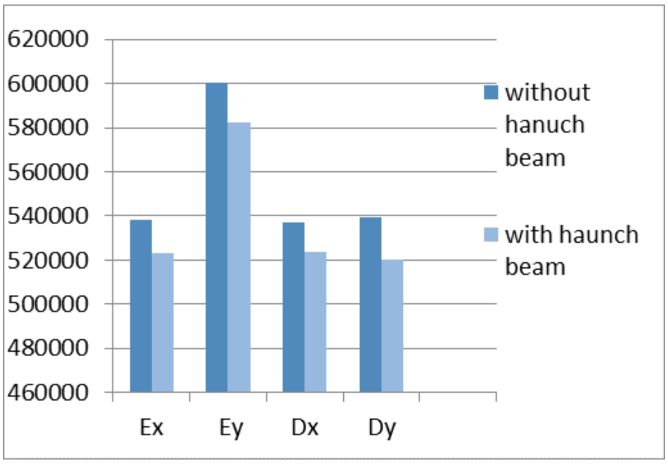

Fig. 09 Storey stiffness for Static and dynamic load Condition in X and Y Direction-

4. CONCLUSIONS: - Following are the conclusion we have obtained from above analysis results are: -

1. Time period-
   In case of modal Time period the values where obtained for structure regular beam is lesser than the structure with haunch beam. This means that while using without

haunch beam for the Earthquake analysis the building will take more time to oscillate for all six modes when comparing with haunch beam structure.

2. Base shear
   Base shear values are in Static and dynamic direction is more in regular beam structure as compared to with haunch beam structure

3. Displacement
   The displacement values for EX, EY, Dx, Dy are in regular beam structure is higher than the haunch beam structure.

4. Drift
   Storey drift values for EX, EY, Dx, Dy are in regular beam structure is lesser than the haunch beam structure.

5. Storey stiffness
   The storey stiffness values for EX, EY, Dx, Dy are in regular beam structure is higher than the haunch beam structure.

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