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Comparative Study of Pre-Engineered & Conventional Steel Building

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ABSTRACT: In structural engineering, a pre-engineered building (PEB) is designed by a manufacturer to be fabricated using a pre-determined inventory of raw materials and manufacturing methods that can efficiently satisfy a wide range of structural and aesthetic design requirements. Pre engineered steel buildings can be fitted with different structural accessories including mezzanine floors, canopies, fascias, interior partitions etc. and the building is made water proof by use of special mastic beads, filler strips and trims.

In pre-engineered building concept the complete designing is done at the factory and the building components are brought to the site in knock down condition. An efficiently designed pre-engineered building can be lighter than the conventional steel buildings by up to 30%. Lighter weight equates to less steel and a potential price savings in structural framework.

KEYWORDS: Pre-engineered Building. Steel, design.

I. INTRODUCTION

India being a developed country massive house building construction is taking place in various parts of the country. Since 30% of Indian population lives in towns and cities; hence construction is more in the urban places. The requirement of housing is tremendous but there will always be a shortage of house availability as the present masonry construction technology cannot meet the rising demand every year. Hence one has to think for alternative construction system for steel or timber buildings, but timber is anyway not suitable to tropical countries like India.

In structural engineering, a pre-engineered building (PEB) is designed by a manufacturer to be fabricated using a pre-determined inventory of raw materials and manufacturing methods that can efficiently satisfy a wide range of structural and aesthetic design requirements. Within some geographic industry sectors these buildings are also called Pre-Engineered Metal Buildings. Historically, the primary framing structure of a pre-engineered building is an assembly of I-shaped members, often referred as I beam. In PEB, I section beams used are usually formed by welding



together steel plates to form of I section. I section beams are then field-assembled (e.g. bolted connections) to form the entire frame of the pre-engineered building. Cold formed Z and C-shaped members may be used as secondary structural elements to fasten and support the external cladding. Roll-formed profiled steel sheet, wood, tensioned fabric, precast concrete, masonry block, glass curtain wall or other materials may be used for the external cladding of the building.

II. RELATED WORK

Pre-engineered buildings are becoming increasingly popular in the construction industry due to their cost-effectiveness, speed of construction, and flexibility. A paper publication on pre-engineered buildings could cover topics such as design considerations, construction techniques, and case studies of successful project.

In structural engineering, a pre-engineered building (PEB) is designed by a PEB supplier or PEB manufacturer with a single design to be fabricated using various materials and methods to satisfy a wide range of structural and aesthetic design requirements.

III. METHODOLOGY

- *Design Problem For Pre- Engineered Building*

Table structure parameter

<i>Type of structure</i>	<i>PEB (tapered section)</i>
<i>Location</i>	<i>Karad</i>
<i>Area of building</i>	<i>900 m²</i>
<i>Eave height</i>	<i>5 m</i>
<i>Rise</i>	<i>2.5 m</i>
<i>Span width</i>	<i>18 m</i>
<i>Number of bays</i>	<i>10</i>
<i>Single bay length</i>	<i>5 m</i>
<i>Total bay length</i>	<i>50 m</i>
<i>Support conditions</i>	<i>Fixed</i>

METHODOLOGY-

From the above problem design a Fink Truss of Conventional Steel Building (CSB) and Pre- Engineered Building (PEB) on Staad Pro Software. The following results are calculated after design.

- Design Steps for PEB:

Step 1: Nodal Point generation. With respect to the positioning of the column, respective nodalpoints have entered on Staad model.

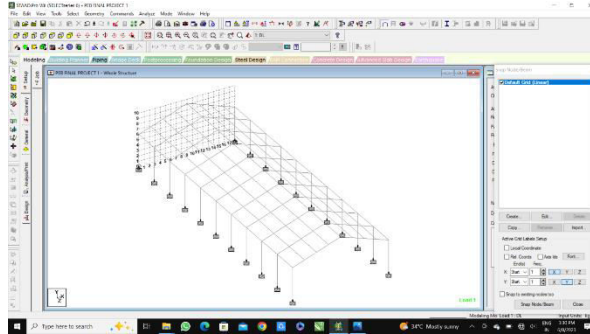


Fig. Show Snap Node Beam Grid

Step 2: Beam and Column representation. Based on the nodal points, with the help of add beamcommand on Staad Pro, Beams and Columns have been generated.

Step 3: Assign support. After Column generation, supports have been provided below every column as fixed supports.

Step 4: Assign Member Property

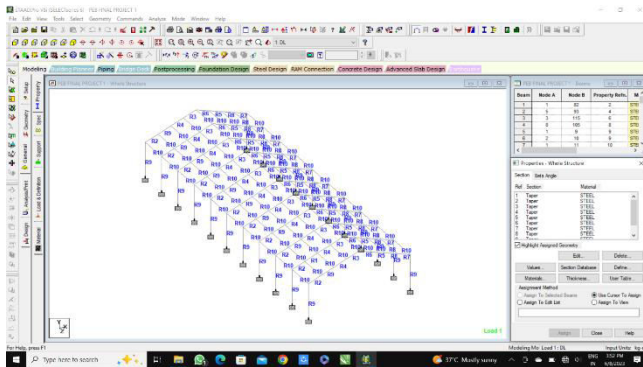


Fig. Show Properties

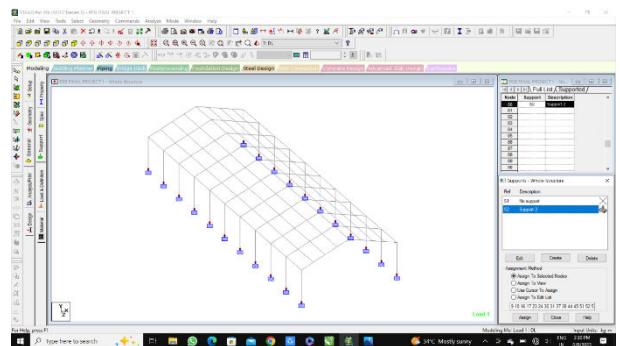


Fig. Show Support

Step 5: Assign Loading – Seismic Load assignment According to IS 1893-2002, taking ResponseReduction Factor-3, Importance Factor-1.5, Damping Ratio – 0.02

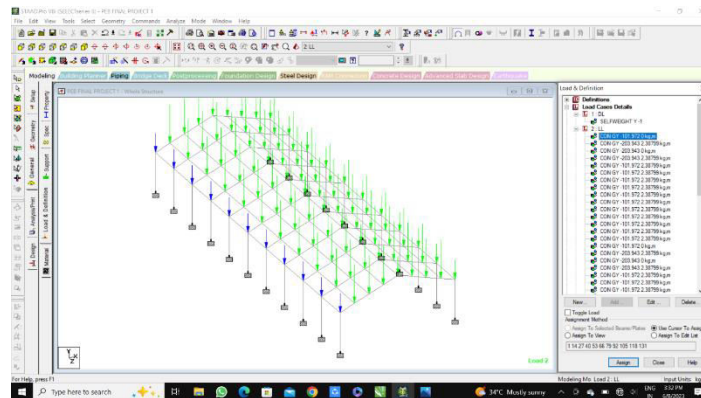


Fig.Show Loads and Definition

Step 6: Analysis of the Structure on Staad Pro with the help of Run Analysis. The Structure is analyzed and detailed study of forces and bending moment is undertaken through the Postprocessing mode.

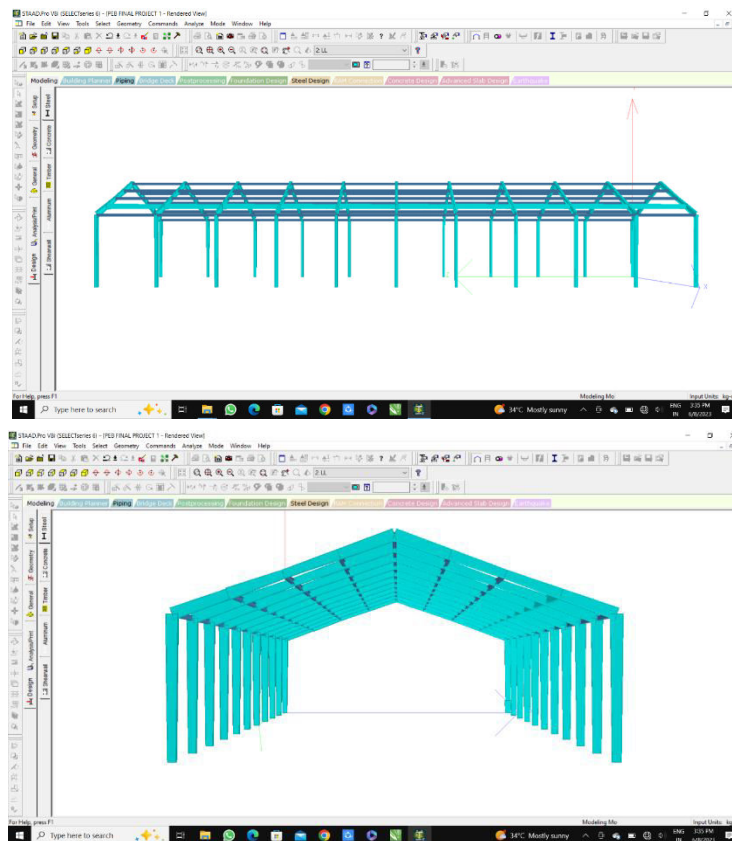
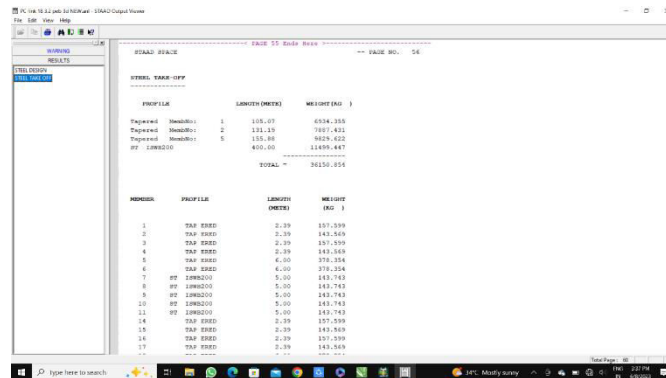


Fig. Shows of PEB Front View and Side View

Step 7: Structural Design on Staad Pro and Output Generation. The design is undertaken as per IS 800: 2007. The design parameters have been assigned to respective beam and column

IV. EXPERIMENTAL RESULTS



PROFILE	LENGTH (METS)	WEIGHT (KG)
Engineered Member: 1	118.07	6736.238
Engineered Member: 2	131.13	7671.421
Engineered Member: 5	155.88	8829.422
PP LWB200	800.00	31496.847
TOTAL		50150.855

MEMBER	PROFILE	LENGTH (METS)	WEIGHT (KG)
1	TAP EBE2	2.39	157.559
2	TAP EBE2	2.39	143.569
3	TAP EBE2	2.39	157.559
4	TAP EBE2	2.39	143.569
5	TAP EBE2	6.00	376.354
6	TAP EBE2	6.00	376.354
7	PP LWB200	5.00	143.743
8	PP LWB200	5.00	143.743
9	PP LWB200	5.00	143.743
10	PP LWB200	5.00	143.743
11	PP LWB200	5.00	143.743
12	PP LWB200	5.00	143.743
13	TAP EBE2	2.39	157.559
14	TAP EBE2	2.39	143.569
15	TAP EBE2	2.39	157.559
16	TAP EBE2	2.39	143.569
17	TAP EBE2	2.39	143.569

V. CONCLUSION

Steel is such a versatile material that every object we see in our daily life has used steel directly or indirectly. There is no viable substitute to steel in construction activities. Steel remains and will continue to remain logical and wide choice for construction purpose, environmentally also, as much of the steel used is recycled.

Steel building offers more design and architectural flexibility for unique or conventional styling. Its strength and large clear spans mean the design is not constrained by the need for intermediate support walls. As your requirements changes over the years, you can reuse, relocate, & modify the structure.

REFERENCES

1. IS: 875 (Part 1) 1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Dead Load)
2. IS: 875 (Part 2)-1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Imposed Load)
3. IS: 875 (Part 3)-2015 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Wind Load)
4. IS 1893(Part 1)-2016 Criteria for Earthquake Resistant Design of Structures.
5. IS: 800-2007 Indian Standard General Construction in Steel - Code of Practice. Shaik, K., BSS, R. R., & Jagarapu, D. C. K. (2020).
6. An analytical study on pre-engineered buildings using staad pro. Materials Today: Proceedings,33, 296-302.
7. Kiran, G. S., Rao, A. K., & Kumar, R. P. (2014). Comparison of design procedures for pre engineering buildings (PEB): a case study. International Journal of Civil, Architectural, Structural & Construction Engineering (IJCASCE), 8(4), 4.
8. Mehendale, A. P., Gupta, A. K., & Desai, D. B. (2016). Overview of Pre-Engineered Buildings. Imperial Journal of Interdisciplinary Research, 2(6), 1421-1425.
9. Sharma, H. (2017). A Comparative Study on Analysis & Design of Pre-Engineered & Conventional Industrial Building. International Journal for Innovative Research in Science & Technology, 3(10)
10. Zoad, M. D. P. (2012). Evaluation of pre-engineering structure design by IS-800 as against pre engineering structure design by AISC. International Journal of Engineering Research & Technology (IJERT), 1(5), 8.



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