Design and Analysis of Conventional and Pre-Engineered Building (R.C.C and Steel)

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Abstract **- Now a day there is a vital change in the steel industry, majorly in the industrial structures the usage of Conventional steel building and Pre-Engineered building is more. Conventional steel building and Pre-Engineered building concept is a new conception of single storey industrial building construction. This methodology is versatile not only due to its quality pre-designing and prefabrication, but also due to its light weight and economical construction. The concept includes the technique of providing the best possible section according to the optimum requirement. In Conventional steel building and Pre-Engineered building concept, the complete designing is done at the factory. The Conventional steel building and Pre-Engineered building calls for very fast construction of buildings and with good aesthetic looks and quality construction. Conventional steel building and Pre-Engineered building can be used extensively for construction of industrial and residential buildings. The buildings can be multi storied (4-6 floors).**

Key Words **- Conventional steel building, Pre-Engineered building, Comparison of CSB and PEB displacements, Load carrying capacity of CSB and PEB.**

I. INTRODUCTION

In steel industry, majorly in the industrial structures the usage of Conventional steel building and Pre-Engineered building is more**.** Standard hot rolled "I" or "C" sections are used. The Features of Conventional steel building and Pre-Engineered building are high tensile strength and weather resistance and easy to install, longer service life and cost-effective and economical. Here, "economical" word is stated considering time and cost. Time being the most important aspect, steel structures (Pre fabricated) is built in very short period and one such example is Pre Engineered Buildings (PEB). Pre engineered buildings are nothing but steel buildings in which excess steel is avoided by tapering the sections as per the bending moment's requirement. Thus in pre engineered buildings, the total design is done in the factory, and as per the design, members are pre fabricated .The structural performance of these buildings is well understood and, for the most part, adequate code provisions are currently in place to ensure satisfactory behaviour in high winds. In this paper we will discuss the various advantages Conventional steel building and Pre-Engineered building with the help of examples, a Comparison will be made between pre engineered buildings and conventional steel structures.

Frame type = clear span, rigid frame
Support = fixed
Building width (w) = 100 m
Building length (l) =110 m
Bay spacing = 20 m
Eaves height = 5 m
Roof slope = < 3°
Roof Purlin = continuous over one span
Spacing = 5m c/c
Panel type- Roof- organic coated, pre-painted galvanized steel sheeting 0.5mm thick.

Loading:
Live load are considered as per IS 875 (part-2)
The live load intensity is 2.5 kn/m²

S.NO	Slab Span length (m)	Live load (KN/m)
1	20 × 48.2	12.5
2	25 × 25	15.62
3	25 × 45	30.62
4	25 × 10	85.93
5	25 × 20	15
6	20 × 20	12.5
7	20 × 10	68.75
8	25 × 22.3 × 34.18	27.875
9	50 × 40 × 24.49	30.27
10	25 × 54.72 × 48.2	18.82

Table.(1) Live load Calculation:

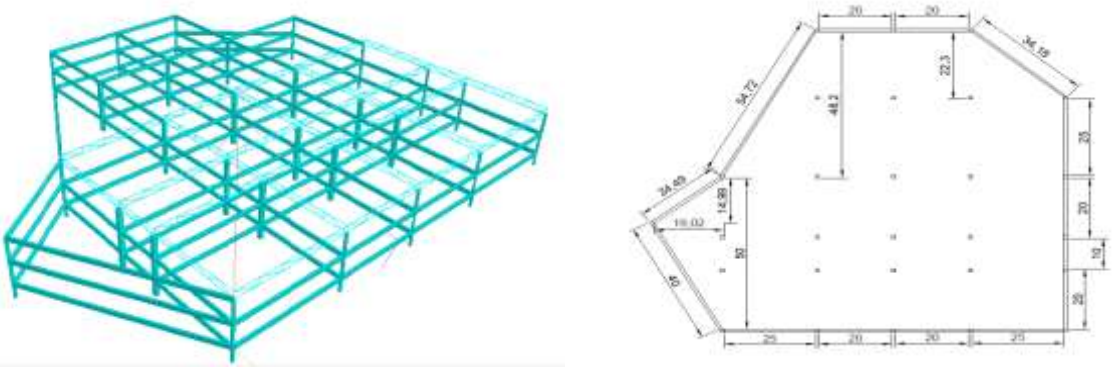

Figure-1 Plan and STAAP.Pro Model

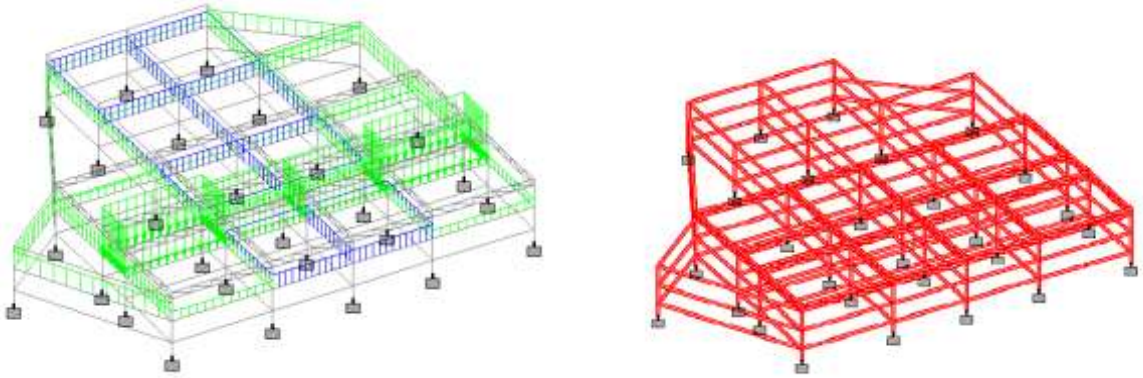

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Figure 2- Live Load and Dead Load diagrams of STAAD.Pro

RESULTS AND DISCUSSIONS

Table(4):Conventional building steel take off

Tapered	MembNo:	1	104.00	50.108
ST	ISMC150		1000.00	160.399
LD	ISA110X110X10		509.95	165.000
ST	ISMB175		100.00	18.898
ST	ISMC225		120.00	30.430
ST	ISMC200		960.00	208.040
Tapered	MembNo:	103	220.00	162.243
ST	ISMB450		27.50	19.499
ST	ISMB250		192.50	70.242
LD	ISA130X130X10		448.76	172.780
			TOTAL =	1057.638

Table(5):Pre Engineered building steel take off

Tapered	MembNo:	1	104.00	53.304
ST	210ZS60X2		280.00	15.708
Tapered	MembNo:	8	24.00	10.089
Tapered	MembNo:	22	5.02	2.215
Tapered	MembNo:	23	5.02	2.359
Tapered	MembNo:	24	5.02	2.503
ST	150ZS60X3.15		720.00	52.673
D	ISMC150		110.00	35.288
ST	210ZS60X3.15		440.00	38.578
Tapered	MembNo:	103	220.00	160.080
Tapered	MembNo:	109	127.12	69.063
Tapered	MembNo:	123	27.64	16.147
Tapered	MembNo:	124	27.64	17.732
Tapered	MembNo:	125	27.64	19.317
LD	ISA150X150X10		226.27	100.921
LD	ISA130X130X10		113.42	43.669
Tapered	MembNo:	1751	0.28	0.119
			TOTAL =	639.765

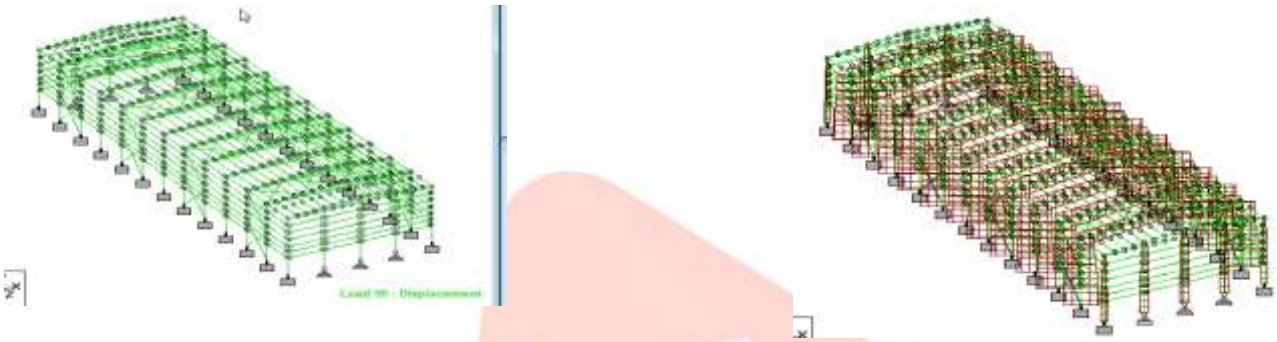

Table.(2) Comparision of CSB and PEB displacements

Name	CSB(mm)	PEB(mm)
Front column	0.387	0.121
Middle column	4.115	3.746
End column	0.392	0.194

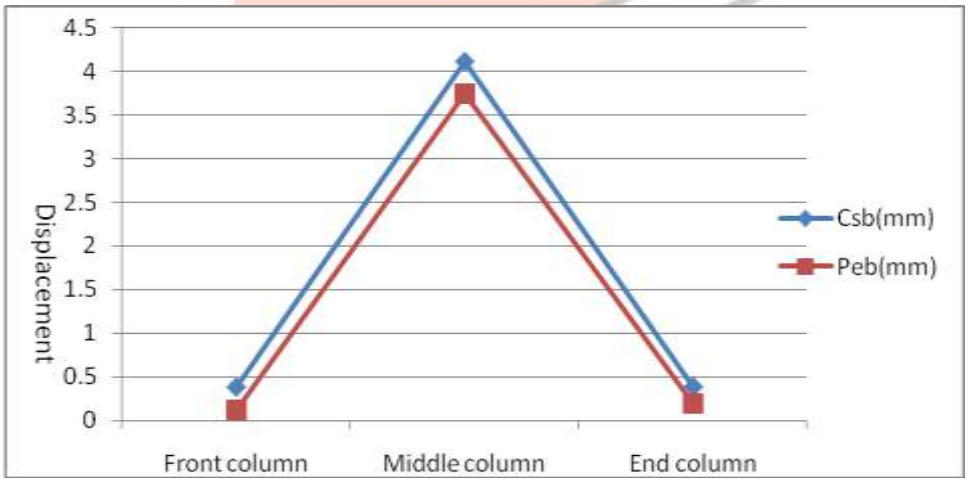

Fig. Graph explaining the Displacement with respecrive to Load

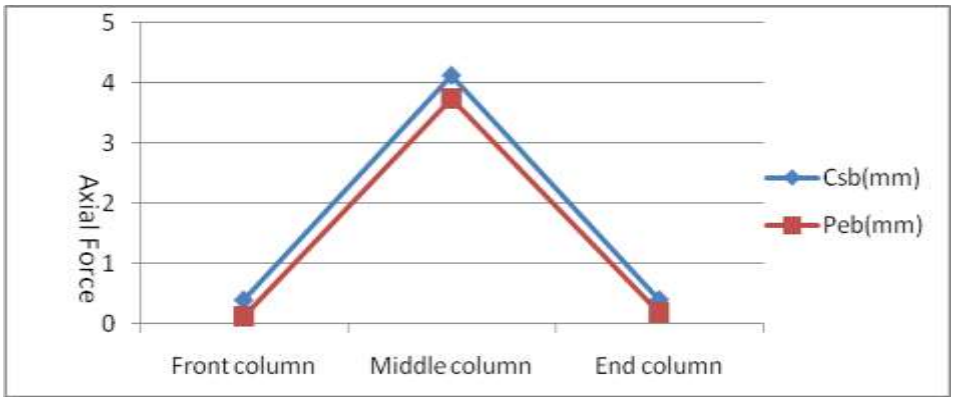

Fig. Graph explaining the Axial Force with respective to Load

Table.(3) Load carrying capacity of CSB and PEB

Name	CSB(KN)	PEB(KN)
Front	53.8	98.617
Middle	15.058	27.86
End	30.007	114.809

V. CONCLUSION

In this study comparison of displacement and steel quantity is done in conventional type of truss and pre engineered structure. In this study pre engineered structure shows less displacements in columns and less consumption of steel. Pre-engineered steel structures building offers low cost, strength, durability, design flexibility. Based on the analytical and design results thereon of conventional and pre-engineered steel buildings.

- The total steel take-off for PEB with primary frame spacing of 5 m is 60% of the conventional steel building.
- It is also seen that the weight of PEB depends on the Bay Spacing, with the increase in Bay Spacing up to certain spacing, the weight reduces and further increase makes the weight heavier.
- To conclude "Pre-Engineered Building Construction gives the end users a much more economical and better solution for long span structures where large column free areas are needed
- In this study the displacements are more in conventional building compared to the pre engineered building and the axial force are more in pre engineered building compared to the conventional steel building.

Hence we propose Pre-Engineered Building Construction are more cost effective and economical when compared to Conventional steel building and construction time and cost also reduces.

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