STUDY OF HARPS PERIPHERAL AND PERIMETRAL BRACINGS PATTERN SHAPE IN PRE ENGINEERING BUILDING

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Abstract - India is a fast growing country in industrialization. So there are need of store and manufacture of low cost industrial warehouse. A Warehouse is a building in which various types of industrial manufactures transportation and storage purpose are use. They are many large span in their for working or storage purposes. This topic of work is decided as to know the driftnet type of bracing pattern is use for design of industrial warehouse. This PEB Shed is proposed to design according to IS 800-2007. And All Lateral and Longitudinal load assign as per

IS875-1987/2015 – Part 1 to 3

***Key Words*: Industrial building, bracing, lateral load, optimization, and steel weight/cost.**

I. INTRODUCTION

Highlight from 20th century onwards, steel buildings are being used in all kinds of structure and their demand is increasing. The use of steel buildings became more useful when people got to know about its various advantages. These structures are used for various types of industrial and commercial purposes. Pre- engineering buildings came into existence in 1960's. It has floor, ceiling frame etc. which were put together to make the structure. As a result, this made construction easier bracing pattern in trusses they are also effect price of structure and also effect size of footing.

II. ANALYSIS OF PEB STRUCTURE

DESIGN DATA –

ALL DESIGN DATA MENTIONED IN PAPER -1

REFRANCE PAPER: STUDY OF HARPS PERIPHERAL AND PERIMETRAL BRACINGS PATTERN SHAPE IN PRE ENGINEERING BUILDING.

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III. PROCEDURE FOR ANALYSIS AND DESIGN

1) Modeling in Staad pro and applying load on structure as per codes.
2) Deflection control all rafter purlins and column deflection are control in permissible limit.
3) Minimum and maximum tensile and compressive stress checks and verified in all three cases.
4) Utilization is also check in purlins and rafter at all three cases and compares each and one shown in table.
5) At all the three case moment and shear force value are also compare in end and mid span. And all the trapezoidal member sizes are fixed as per moment resisting frame.
6) Optimization is done so arrive at an economic structural configuration.
7) Extract all the result and compare it in all three cases.

IV. SERVICEBELITY CHECK

As per table no. 6 IS 800: 2007.

Permissible limit of deflection for rafter and purlins is span /180.

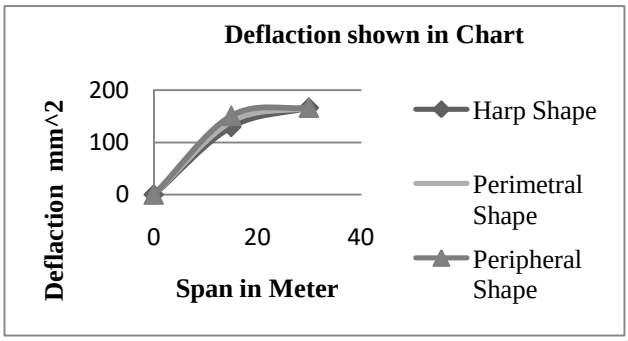

Fig.4.1 – Maximum Displacement in various types of Bracing Pattern.

SERVISIBELITY DEFLECTION SHOWN IN TABLE 1 :-

S NO.	BUILDING TYPE	PERMISIBLE DEFLECTION	ACTUAL DEFLEC-TION	Critical Load Case
1.	PEB Shed With Harp Bracing.	166.67mm	139mm	1.0(DL +LL)
2.	PEB Shed With Perimetral Bracing.	166.67mm	151.8mm	1.0(DL +LL)

3.	PEB Shed With Peripheral Bracing.	166.67mm	140 mm	1.0(DL +LL)

V. COMPARISION FOR STRESS RESULT SHOWN

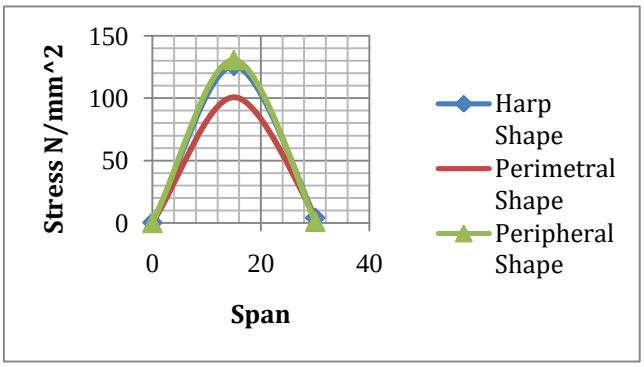

Fig.5.1 – Stress shown in various types of Bracing Pattern.

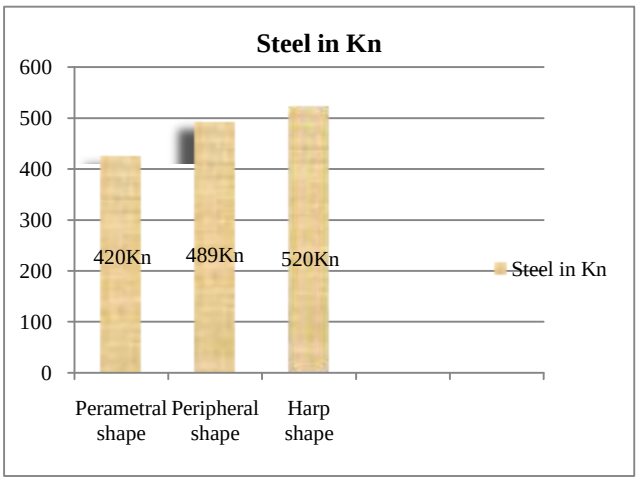

Fig.6.1 – Total steel consumption in Kn.

VI. TOTAL STEEL CONSUPTION SHOWN IN TABLE 2:

BRACING TYPE	WEIGHT IN TON	FLOOR AREA IN SQFT	WEIGHT IN KG/ SQFT
PEB Shed With Harp shape bracing.	520KN	19377 SQFT.	2.69 Kg /sqft.
PEB Shed With Perimetral shape bracing.	420 KN	19377 SQFT.	2.16 Kg /Sqft.
PEB Shed With Peripheral shape bracing.	489KN	19377 SQFT.	2.52 Kg /Sqft.

VII. BANDING MOMENT AND SHEAR FORCE CALCULATION

MIDDLE BAY RAFTER BANDING MOMENT SHOWN IN TABLE - 3:-

S NO.	BUILDING TYPE	MOMENT AT SUPPORT	MOMENT AT MID	Critical Load Case
1.	PEB Shed With Harp bracing.	702 KN-m	375 KN-m	1.5(DL +LL)
2.	PEB Shed With Perimetral	687 KN-m	359 KN-m	1.5(DL +LL)
3.	PEB Shed With Peripheral	693 KN-m	365 KN-m	1.5(DL +LL)

END BAY RAFTER BANDING MOMENT SHOWN IN TABLE - 4:-

S NO.	BUILDING TYPE	MOMENT AT SUPPORT	MOMENT AT MID	Critical Load Case
1.	PEB Shed With Harp bracing.	55 KN-m	27 KN-m	1.5(DL +LL)
2.	PEB Shed With Perimetral	45 KN-m	20 KN-m	1.5(DL +LL)
3.	PEB Shed With Peripheral	50 KN-m	25 KN-m	1.5(DL +LL)

MIDDLE BAY RAFTER FORCES SHOWN IN TABLE- 5:-

S NO.	BUILDING TYPE	FORCE AT SUPPORT	FORCE AT MID	CRITICAL LOAD CASE
1.	PEB Shed With Harp bracing.	160 KN	20 KN	1.5(DL+LL)
2.	PEB Shed With Perimetral	150 KN	15 KN	1.5(DL+LL)
3.	PEB Shed With Peripheral	157 KN	18 KN	1.5(DL+LL)

END BAY RAFTER FORCES SHOWN IN TABLE- 6:-

S NO.	BUILDING TYPE	FORCE AT SUPPORT	FORCE AT MID	CRITICAL LOAD CASE
1.	PEB Shed With Harp bracing.	30 KN	0 KN	1.5(DL+LL)
2.	PEB Shed With Perimetral	20 KN	0 KN	1.5(DL+LL)
3.	PEB Shed With Peripheral	25 KN	0 KN	1.5(DL+LL)

VIII. CONCLUSIONS :

1. The overall study shown that Perimetral shape bracing are more effective to control lateral and longitudinal load. And use Perimetral shape of
2. Bracing are much economical comparatively other pattern of bracing.
3. As per the all three cases there are no changes in load case, load pattern and wind forces, which change with the Bracing pattern, location and sizes of bracing, The change of Bracing location and pattern is also affect the forces and control the forces.
4. Steel is a very costly material of construction. So In our study for warehouse structure Use tapered section, tapered section is reducing self weight of structure, increases life of structure.
5. Reduction quantity of steel is directly affect the reduction of dead load and reduction of dead load are reduce size of footing, column and all other member.
6. The overall study showed that Perimetral shape bracing pattern is very helpful to control stress as compared to other cases.
7. The overall study showed that the Perimetral shape bracing pattern is very helpful to control the cost of the structure. And cost saving is very major part of all projects.

ACKNOWLEDGMENT

I would like to thanks director sir for their precious guideline and support.

REFERENCES

M. Sabetha completed a numerical study and concluded that Weight of single Truss utilizing Angle and Pipe both is less compared to PEB yet because of Weight of Channel Purlin, Weight of Steel Truss Building is on higher side.

Vaibhav B. Chavan determined optimum span length for economy.

Subhrakant Mohakul designed an Industrial warehouse and did a thorough study of behavior of members due to effect of failure at connecting joints.

A. Jayaraman presents a study on behavior and economical of roof trusses and channel section purlins by comparison of LSM and WSM.

Praveen S. et al. (2015) took up the study of various types of roof trusses like Warren, N, Pratt and Howe truss systems. It was seen that the Warren truss is most economical among all.

Seena Somasekharan(2017) carried out a study of wind load analysis for industrial building with different bracing patterns and its comparison with pre engineering building.

Viren Chandanshive (2018) took up the study of design of industrial warehouse as per Indian standard code.

Anil V. Bandre at al. (2019) carried out a study to compare design using hot rolled steel section and built up sections. It has been concluded that the shear force, bending moment and displacements are comparatively lower in PEB than in using hot rolled steel section.