International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 02 | Feb 2022 www.irjet.net p-ISSN: 2395-0072

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

Shubham Bindoriya[1] Dr. J. N Vyas[2]

[1]Student, Department of civil engineering Mahakal Institute of Technology and Management Ujjain
[2]Director, Mahakal Institute of Technology and Management Ujjain

---

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 structure is proposed to design according to IS 800-2007. And the dead live and wind 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 a 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 patterns:

Case 1- Harp shape Bracing pattern: Harp shape bracing pattern system are those. in which the head displacement in each column is directly controlled by axial tensile action from its corresponding bending beam. This system is more efficient system in bracing beam, when working against bending stress, displacement and finally achieves certain control of frame. This new type bracing system is called harp shape bracing pattern.

Case 2- Perimetral shape Bracing pattern: Perimetral bracing shape connect with AlterNet panel like end panel and mid panel. And control deflection and forces of member. In steel structure trusses the column is receive first load after that they initially suffer a trend to displace, but use bracing beam to stop displacement of the column or beam.

Case 3- Peripheral shape Bracing pattern:. In peripheral bracing minimum deflection control in eave ends and. give batter results to control deflection and lateral forces. Various advantage and disadvantage of choosing this shape of bracing pattern in trusses they are also effect price of structure and also effect size of footing.

II. ANALYSIS OF PEB STRUCTURE

DESIGN DATA –

a). Length Of Span - 60M b). Width of Span - 30M
c). Uniform Height of Span - 8M
d). Bay Spacing - 7.5M
e). No. of spacing - 8 No
f). Height of Truss - 11M
g). Angle of Slope - 11 Degree
h).Location of truss - Pithampur indore
i). Wind Speed - 39 M/S
j).Earthquake Zone - II

- **DEAD LOAD**

Self Weight of Structure as per staad pro software analysis and multiplication factor 1.1 is taken to for weight of welding and connection.

1) 1) Assume weight of Galvanized sheet – 4.51 Kg/m^2.
2) Self Weight of design purlins – 6.40 Kg/m^2

TOTAL LOAD = 10.91 Kg/m^2 = 11 Kg/m^2

3) U.D.L for main rafter at mid = 0.11 x7.5 = 0.825 KN/M^2
4) U.D.L for main rafter at end.= 0.11 x7.5/2 = 0.4125 KN/M^2

- **LIVE LOAD**
  As Per IS 875 part – 2 imposed load for non excisable roof or truss = 0.75 KN/M^2

- **WIND LOAD**
  As Per IS 875- (2015) part – 3 wind load

- **EARTHQUACK LOAD :-**

As per IS 1893 part 1 (2000/2005)

DIFFRETNT PATTERN OF BRACINGS USE –

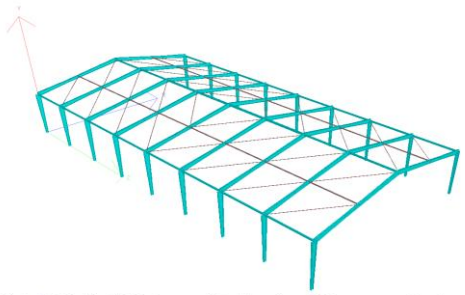


Fig 1. 3D Model of PEB Structural Configuration of **Harp pattern Bracings**.

Fig 1.1. 3D Model of PEB Structural Configuration of **Harp pattern Bracings**.

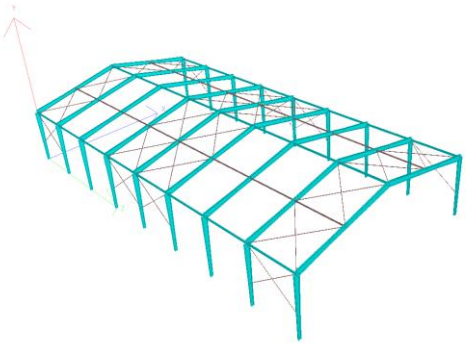


Fig 2. 3D Model of PEB Structural Configuration of Perimetral Pattern Bracings.

Fig1.2. 3D Model of PEB Structural Configuration of **Perimetral Pattern Bracings**.

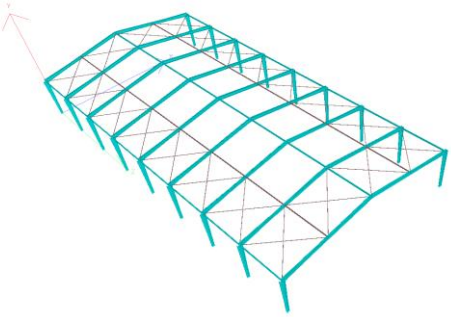


Fig 1.3. 3D Model of PEB Structural Configuration of Peripheral **Pattern Bracings.**

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) Optimization is done so arrive at an economic structural configuration.
6) Extract all the result and compare it in all three cases.

IV. SERVISIBELITY CHECKS

As per table no. 6 IS 800: 2007.

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

S NO.	BUILDING TYPE	PERMISIBLE DEFLECTION	ACTUAL DEFLECTION	Critical Load Case
1.	PEB Shed With Harp Bracing.	166.67mm	139mm	1.0(DL+LL)
2.	PEB Shed With Parimetral Bracing.	166.67mm	151.8mm	1.0(DL+LL)
3.	PEB Shed With Peripheral Bracing.	166.67mm	140 mm	1.0(DL+LL)

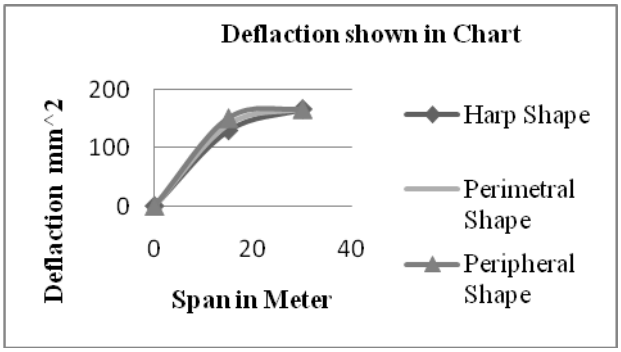
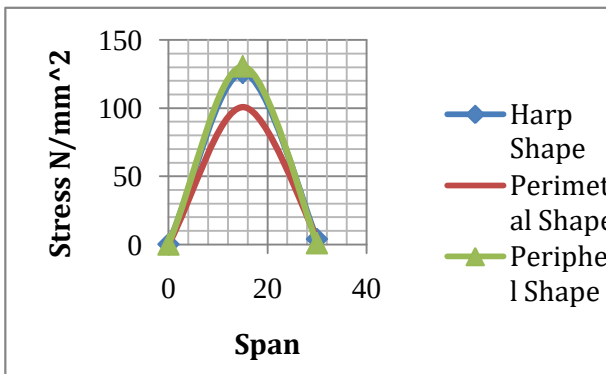


Fig. – Maximum Displacement in various types of Bracing Pattern.

V. COMPARISION FOR STRESS RESULT SHOWN



VI. TOTAL STEEL CONSUPTION:

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

VII. 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.

ACKNOWLEDGMENT

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

REFERENCES

1. **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.
2. **Vaibhav B. Chavan** determined optimum span length for economy.
3. **Subhrakant Mohakul** designed an Industrial warehouse and did a thorough study of behaviour of members due to effect of failure at connecting joints.
4. **Manan D.Maisuri** stated that the consumption of steel of whole industrial building can be reduced by deciding appropriate geometry of truss and by using hollow steel section with compare to conventional steel section. Thus stating tube sections are most economical.
5. **A.Jayaraman** presents a study on behavior and economical of roof trusses and channel section purlins by comparison of LSM and WSM.
6. **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.
7. **Viren Chandanshive (2018)** took up the study of design of industrial warehouse as per Indian standard code.
8. **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