International Journal of Engineering Inventions
e-ISSN: 2278-7461, p-ISSN: 2319-6491
Volume 12, Issue 3 [March. 2023] PP: 67-69

A Review on Analysis of Various Truss System for industrial Structure

Ajay Mahajan[1], Mayur Singi[2]
[1]*PG Scholar, CED, BMCT College Indore, M.P., India*
[2,3]*Assistant Professor, CED, CED, BMCT College Indore, M.P., India*

Abstract - *In a developing nation like India, the capital expenditure for setting up industries and, as a result, building industrial buildings is very high. Therefore, it is essential to standardize the various aspects of industrial buildings according to broad norms to make it possible to quickly adopt prefabricated members, especially in cases where repetitive structure could be used. The goal of the project is to select the most cost-effective truss for use in warehouses, workshops, light and medium engineering industries, and process industries. By doing this, a great deal of time will be saved in setting up an industry, leading to increased production. Indirectly, this would boost the nation's economy as a whole. Additionally, this would promote orderly use.*
Key Words: *Pitched Roof, Trusses,*

Date of Submission: 01-03-2023 Date of acceptance: 12-03-2023

I. INTRODUCTION

When structural members are connected in triangular configurations, a "truss" is created. One of the fundamental designs for frames made of structural members is the truss. A truss is made up of several ties and struts that are joined together to form a framework that serves as a long span beam. The members are typically arranged in the shape of one or more triangles in a single plane; external loads are applied at the joints, which theoretically results in either axial tension or axial compression in the members. It is assumed that the members are joined at their joints by frictionless hinges or pins that permit the members' ends to slightly rotate.

II. CONTRIBUTION OF RESEARCHERS

Daniel Ruiz and Alberto Sarria [1] By means of dynamic analyses and nonlinear static analyses (pushover), the effect of different earthquakes' components is studied on a truss and other structural elements of an industrial large span structure designed by international consultants.

It was studied that for redundant large span structures, have a critical damping coefficient lower by 5 % (in the order of 1.5 % to 2 %) because the dissipation of energy could be reduced due to the contribution of a only few elements.

Thomas W. Murphy, Jason D. Hinkle[2] The investigations showed the order of structural hierarchy resulting in the lightest weight; solid element truss-column is 2nd (a truss made from trusses) for requirements representative of space structures. The resulting truss-column is typically an order of magnitude lighter than the corresponding 1st order truss-column. Space structures often have stringent size requirements and are lightly loaded. Such structures are more stiffness -limited than strength-limited, precluding the need to incur the complexities of increased hierarchy.

A. Jayaraman, R Geethamani, [3] Studied the behaviour of roof trusses and purlins by comparison of limit state and working stress method.

In was concluded that the total roofing load configuration is the same in both the working stress and limit state method. But area of section was 37% as per limit state method as compared to the working stress method

Jyoti .P. Sawant, Prof. Vinayak Vijapur [4] Studied that post tensioning was applied to both angular and tubular trusses for 30 m span Mansard and Pratt trusses with single and double drape tendons using SAP2000 software. It was found that with the application of Post tensioning with single and double drape tendons at the eccentricity of 0.9 m and 1.2 m, the pre-stressing force in the members was reduced. Post tensioning by external tendon layout is suggested to strengthen and to increase useful life of steel truss. For the trusses' configuration with different tendon profile for post tensioning, the truss with different eccentricities is considered and the effect of post tensioning on member forces, cross section of members and weight of truss are studied.

Dr. S.K. Dubey, Prakash Sangamnerkar, Prabhat Soni[5] analyzed the steel roof truss under the normal permeability condition of wind according to Indian Standard Code IS: 875(Part 3)-1987, in which, intensity of wind load was calculated considering different conditions of class of structure, terrain, height and structure size factor, topography factor, permeability conditions and compared the results with the calculations made in SP-38(S&T):1987.

It was observed that in case of terrain category (1) and (2), calculated wind forces were greater than values as per SP38:1987. On other hand, for terrain category (3) & (4) calculated wind forces were lesser than values as per SP38:1987.

Mr. Roshan S Satpute, Dr. Valsson Varghese [6] carried out the detailed analysis of industrial building with cold formed concept. The work was also extended by taking the parametric studies. A comparative study was carried out between hot rolled steel Industrial building and cold formed Industrial building.

It was concluded that in industrial building, the material & cost of the building are minimized in case of cold formed steel while in case of conventional building, it was higher in both the cases. The saving in material and cost was about 25 %.

Aijaz Ahmad Zende1, Prof. A. V. Kulkarni, AslamHutagi [7] studied that the Pre-Engineered Buildings (PEB) could be used for long span column free structures along with reduced time and cost as compared to conventional structures. The comparative study of static and dynamic analysis and design of Pre-Engineered Buildings (PEB) and conventional steel frames was carried out. Pre-engineered steel structures building offers low cost, strength, durability, design flexibility, adaptability, and recyclability.

Sagar D. Wankhade, Prof. P. S. Pajgade [8] studied industrial steel truss building of 14m x 31.50 m, 20m x 50m, 28m x 70m and bay spacing of 5.25m, 6.25m and 7m respectively having column height of 6 m; these were compared with Pre-engineering Buildings of the same dimensions. Design was based on IS 800-2007 (LSM), Loads considered in modelling were Dead load, Live Load and Wind load with the combinations as specified in IS Code.It was concluded that PEB it was economical compared to steel truss building using angle section.

Vaibhav B. Chavan, Vikas N. Nimbalkar, Abhishek P. Jaiswal [9] studied the comparison of different profiles for various combinations of height and material cross-sections for the given span and loading conditions.

It was concluded that Hollow Structural Sections (HSS) are used to achieve economy. For Belgian truss profile, economy achieved for Square Hollow Section (SHS) and Rectangular Hollow Section (RHS) was 10.57% and -2.08% respectively when compared to Open Section.

Prabhat Soni, S.K. Dubey and Prakash Sangamnerkar [10] studied the steel roof truss of 12 m span using tubular sections for truss members. The analysis presented comparison for weights of tubular member sections as per revised provisions of wind load calculations given in IS 875 (Part 3):1987 and designs obtained as per calculations made in SP 38(S&T):1987; (Handbook for typified designs for structures with steel roof trusses.)

The wind load calculations are different from the considerations used in SP 38(S&T):1987, because of which, there are considerable variations in design of truss. Hence comparative analysis of design of steel roof truss is needed.

C. M. Meera [11] studied Pre-Engineered Building (PEB) and Conventional Steel Building (CSB) concepts. The study was achieved by designing a typical frame of a proposed Industrial warehouse building using both the concepts and analyzed the designed frames using the structural analysis and design software STAAD Pro.

J. Marshall [12] studied torsional behavior of structural rectangular hollow sections. This work presented a basis for determining displacements and stresses arising from the torsion of structural rectangular hollow sections.

Vrushali Bahadure[13] studied the comparison between various configurations of industrial sheds, such as hot rolled steel shed using Howe truss, A-type, portal truss etc.

This work compared the design of various configurations of industrial sheds and concluded that which configurations was suitable & economical. The comparison gave the suitable configuration from strength point of view.

III. GAP IN RESEARCH REVIEW AND OBJECTIVE OF NEW RESEARCH

The researchers have tried to find the variation in forces which occurs various trusses, following are the outcomes of literature review:

- To analyze different steel roof trusses i.e., Double Howe, Double Fink, Fink, Queen Post, Fan, Fink-2, Pratt, Multi panel, Atticand Piggyback.
- To compare trusses with reference to weight and cost.

IV. CONCLUSION

In the present work, a various type of t pitched roof trusses are compared. The analysis and design results of steel roof trusses are presented for a span of 12 m and 6 m spacing between them. The truss configurations used are Double Howe, Double Fink, Fan, Fink, Pratt, Queen post, Fink-2, Multi panel, Attic and Piggyback. The slope of roof truss provided is 180 which is generally recommended as this may not pose any fabrication problem. The analysis of roof truss is done for wind zones I to VI. The analysis and design have been done based on the relevant Indian standards. Box sections are used in trusses. A comparison of axial force, shear force in members and also weight and cost is made. Also, axial and shear force on these trusses is compared.

REFERENCES

[1]. Vaibhav B. Chavan, Vikas N. Nimbalkar, AbhishekJaiswal (2014), "Economic Evaluation of Open and Hollow Structural Sections in Industrial Trusses." Vol. 3, Issue 2, February 2014 ISSN: 2319-8753

[2]. Jyoti .P. Sawant, Prof. Vinayak Vijapur (2013), " Analysis and Design of Tubular and Angular Steel Trusses By Post-Tensioning Method "Journal of Engineering, Computers & Applied Sciences (JEC&AS) ISSN No: 2319-5606 Volume 2, No.8, August 2013

[3]. Mr. Roshan S Satpute, Dr. ValssonVarghese (2012) , Building Design Using Cold Formed Steel Section. International Refereed Journal of Engineering and Science (IRJES) Volume 1, Issue 2

[4]. Aijaz Ahmad Zende1, Prof. A. V. Kulkarni 2, Aslam Hutagi (2008),Comparative Study of Analysis and Design of Pre-Engineered-Buildings and Conventional Frames. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN : 2278-1684 Volume 5, Issue 1

[5]. Sagar D. Wankhade,Prof. P. S. Pajgade (2008), Design & Comparison of Various Types of Industrial Buildings.International Refereed Journal of Engineering and Science (IRJES) Volume 3, Issue 6

[6]. Daniel Ruiz and Alberto Sarria (2004). Response of large span steel frames subjected to horizontal and vertical seismic motions.13 World Conference on Earthquake EngineeringVancouver, B.C., Canada August 1-6, 2004 Paper No. 1404.

[7]. A.Jayaraman, R Geethamani, N Sathyakumar, N Karthiga Shenbagam (2014). Design and Economical of roof trusses & purlins, IJRET: International Journal of Research in Engineering and Technology EISSN: 2319-1163 PISSN: 2321-7308

[8]. Dr. S.K. Dubey, Prakash Sangamnerkar, Prabhat Soni (2012). "Analysis of steel roof truss under normal permeability condition", International Journal of Advanced Engineering Research and Studies, E-ISSN2249–8974

[9]. J. Marshall. (1972). "Torsional behavior of structural rectangular hollow sections". The structural Engineer, 50(5).

[10]. C. M. Meera, Pre-engineered building design of an industrial warehouse.

[11]. Thomas W. Murphey Jason D. Hinkle, Some performance trends in hierarchical truss structures,AIAA-2003-1903

[12]. Vrushali Bahadure, Prof. R.V.R.K.Prasad, "Comparison Between Design And Analysis of Various Configuration Of Industrial Sheds" Vol. 3, Issue 1, January -February 2013, pp.1565-1568, ISSN: 2248-9622

[13]. Prabhat Soni , S.K. Dubey and Prakash Sangamnerkar. "Comparison of Design of Steel Roof Truss using IS 875 and SP 38", Research Journal of Engineering Sciences ISSN 2278 – 9472

[14]. IS : 875 (Part 1) – 1987. Code of practice for design loads (other than earthquake) for buildings and structures

[15]. IS : 875 (Part 2) – 1987. Code of practice for design loads (other than earthquake) for buildings and structures

[16]. IS:875 (Part 3) – 1987. Code of practice for design loads (other than earthquake) for buildings and structures

[17]. IS: 800-1984."Indian standard General Construction in steel-code of practice".

[18]. IS: 801-1975. "Code of practice for use of cold-formed light gauge structural members in general building construction"

[19]. IS: 811-1987. "Indian Standard-Specifications for cold-formed light gauge structural steel sections".

[20]. IS: 806-1968. "Code of practice for use of steel tubes in general building construction" (first revision), Bureau of Indian Standards.

[21]. IS: 4923-1997."Hollow steel sections for structural use-specification", BIS.

[22]. IS: 875-1987."Code of practice for design loads (other than earthquake) for buildings and structures" Part I to V.

[23]. SP: 6(5)-1980. Hand Book for Structural Engineers: "Cold Formed Light Gauge Steel structures".