Analysis and Design of Industrial Building by Using Tubular Section and its Comparison with Conventional Sections

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Abstract — Steel sections most widely used in construction of industrial building as they having good tensile as well as compressive strength. Steel sections having other best properties due to which it used in industrial building construction, such as fire resistance and appearance. There are lots of structures which are constructed by using conventional steel members. Which are responsible for increase in dead load of structure. It is also responsible for increase in cost. Now day’s tubular steel section is another choice stand up, which gives better result than traditional sections used in steel structures. Such sections having very less self-weight, as their dead load goes on decreasing it will directly effects on economy point of view of whole structure. The main target of present work comprises the hollow sections with conventional sections on economy point of view.

Key words: Tubular Section, Conventional Section, Industrial Building

I. INTRODUCTION

As less time required for construction of steel structures, it is very helpful option to any country in construction industry for fast growing. In many situations lighter steel structure were invariably prepare to the heavier alternatives such as reinforce concrete or priestess concrete. The main advantages of steel structure were its intrinsic strength, prefabrication and quicker transportability to the work site and faster erection. Steel structures can easily dismantle without loss to the integrity of the original structure. Most structural steel units were prefabricated in a workshop with a superior quality control compared to In-situ construction. Tolerance specified in the Indian Standard codes for steel structural component during the fabrication erection were small compared to similar reinforced concrete structures. Steel also plays an important role in composite construction in conjunction with reinforced and priestess concrete structure. With the development of steel as a construction material, the varieties of steel sections were also increased. Among these sections, the Hollow structural sections (HSS) or Structural hollow sections were the most reliable one. Due to their outstanding features, the application of these sections in present commercial market has been tremendously increased. Weight per meter of conventional steel section is very high as compare to hollow section.

II. LITERATURE REVIEW


The main purpose of this study is to analyze 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 is calculated considering different conditions of class of structure, Terrain, height and structure size factor, topography factor, permeability conditions and compare the results so obtained with the calculations made in SP-38(S&T):1987; Handbook for typified designs for structures with steel roof trusses, in which there is no consideration for different conditions as mentioned above. Because of this, there are large variations in calculated results for wind loads and design forces in members of truss. Analysis of trusses called A-shaped truss is addressed. A roof truss is basically a framed structure formed by connecting various members at their ends to form a system of triangles, arranged in pre-decided pattern depending upon the span, type of loading and functional requirements. In industrial buildings, steel trusses are commonly used. The steel trusses have been analyzed as simply supported on columns. The support at one end is assumed to be hinged and the other end on rollers for the purpose of analysis. The truss has been analyzed for dead load, live load and wind load according to IS: 875(Part 3)-1987.

B. Jyoti P. Sawant and Prof. Vinayak Vijapur (2013) Analysis and Design of Tubular and Angular Steel Trusses by Post-Tensioning Method

Now a day there is pronounced application of Post-tensioning to steel trusses. The bridges which were earlier designed for lighter loads has to bear the increased load due to rapid urbanization and increased population and thus to replace the earlier bridge is uneconomical and also disrupts the transportation. So, these bridges are strengthened by the application of post-tensioning. Now post tensioning is most widely accepted all over since trusses consume a lot of less material compared to beams to span the same length and transfer moderate to heavy loads. In countries like India where labour cost is less post-tensioning can be utilized to the fullest extent. In the current study post tensioning has been applied to both angular and tubular trusses for 30m span Mansard and Pratt trusses with single and double drape tendons using SAP2000v15 software it has been 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 have been reduced. External Post-tensioning is considered in the present study since the tendons are outside the trusses. Here the trusses are examined for member forces, pre-stressing forces at zero deflection at the mid span of the truss, the reduction in the cross sections and weight of the members of trusses.


The study aims to evaluate the economic significance of the Hollow Structural Sections (HSS) in contrast with open sections. This study was carried out to determine the
percentage economy achieved using Hollow Structural Sections (HSS) so as to understand the importance of cost effectiveness. The technique used in order to achieve the objective included the comparison of different profiles for various combinations of height and material cross-section for given span and loading conditions. The analysis and design phase of the project was performed using STAAD PRO V8i. The sample results of STAAD analysis were validated with the results of Manual analysis.

III. OBJECTIVE

The main objective of work is to analysis of steel structure and designs it. Tubular sections are hollow steel sections. In market there are solid members are available which are very heavy. But same dimensions tubular section gives less weight as compared to conventional steel section. This directly affects the cost of projects. So, tubular steel sections are easily available in the markets of India. It is used for construction of various kinds of steel buildings such as industrial shades, playground stadiums, bridges, etc. This project is analytical investigation to find out the best option between steel structures made by conventional sections steel members and tubular section steel member by manually calculations and excel program.

1) To study the properties of tubular sections.
2) To study the relevant IS code for designing the tubular steel sections.
3) To design the industrial building for tubular section by using relevant IS code.
4) To design same industrial building for conventional (hot rolled) sections by using relevant IS code.
5) To comparison between above results.

IV. METHODOLOGY

The study work is to analysis steel truss by considering the load combinations as per IS codes and finding out forces in members. Then design members of steel truss for analyzed load combinations for conventional steel members. For same load combinations design same steel truss with tubular sections. Make an excel program to check the correctness of calculation work and try other dimensions of truss to compare between conventional steel members and tubular steel members. The comparative report prepare before arriving at the final conclusion.

Following methodology will be followed for proposed work:
- Collection of review of journals and articles to get idea of research work conducted on proposed subject of work.
- Studying the properties of conventional steel sections and tubular steel sections.
- Understand analysis and design procedure of tubular steel sections by referring IS-806 codes.
- Define problem statement for analysis and design of steel structure.
- Analysis and design of above steel structures by referring IS 806 codes for tubular sections.
- Analysis and design of same steel structures by referring IS 800 codes for conventional steel sections.
- Make an excel program to check calculations carried out.
- Try another problem statement in excel program.
- Conclude best option on economy point of view for steel structure between conventional steel sections and tubular steel sections.

REFERENCES


