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A REVIEW ON COST ASSESSMENT OF CONVENTIONAL STEEL STRUCTURE AND SQUARE TUBULAR SECTIONS USING FORCE CO-EFFICIENT METHOD

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ABSTRACT

The main aim of this study is cost comparision between conventional steel structure with warren truss and square tubular sections using STAAD.Pro. and manual calculations by using force coefficient method in conventional structures and tubular sections design is carried out by using IS 806. This type of tube sections, dead weight is reduced for many structural members and this is best replacement method comparing to conventional use and it will give better properties.

Key words: Warren Truss, Square Tubular Shapes, Force Coefficient Method, STAAD. Pro

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1. INTRODUCTION

In many situations lighter steel structure were invariably prepare to the heavier alternatives such as reinforce concrete or prestress 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 is Indian Standard codes for steel structural component during the fabrication erection were small compared to similar reinforced concrete structures Tubular Sections is the best replacements to the conventional ones with their useful and comparatively better properties. Tube sections and assigns most suitable section according to its dead weight and ease of connection methods. In this tube section, dead weight is to be reduced for many structural members. one of the main advantages in this section is higher strength to weight ratio could result in upto 30% savings in steel due to the high torsional rigidity and compressive strength. In tubular sections there are various shapes namely circular, rectangular and square shapes. **[Abhishek P. Jaiswal]** described 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. [**M.G.Kalyanshetti]** says that paper tubular sections like square, rectangular and circular are also to be used.In conventional steel structure they have to take industrial building plan area and using modified howe truss are to be taken. The main objective of this study is cost comparision between conventional and tubular structure using STAAD.Pro.From this paper it is concluded that, tubular sections proves to be economical. Total saving of almost 50% to 60% in cost is achieved. **[Ankit C. Chhatwani]** This study aims is to study the strength and economical comparison of hollow structural section (HSS) to the conventional sections in trusses. This also covers the advantages of hollow sections in its effectiveness to reduce corrosion, minimizing overall cost, and improvement in aesthetic value. The study involves the comparative analysis of a truss using hollow and conventional sections under the influence of usual loading values. **[Dr. Vivek Garg] -** In design of steel trusses different types of geometries (A-type truss, Fink truss, Pratt truss, Howe truss, King post truss, Queen post truss etc) and sections (Angle section, Tube section, Square hollow section etc) are widely used. In present work, roof truss of span 16m has been analyzed for different geometries and sections to get the desired optimum truss design. The various truss analyses are performed by using structural analysis software i.e. STAAD Pro.**[Prof. P. S. Pajgade]-** In this paper Industrial Steel truss Building of 14m x 31.50m, 20m x 50m,28m x 70m and bay spacing of 5.25m, 6.25m and 7m respectively having column height of 6m is compared with Pre-engineering Buildings of same dimension. Design is based on IS 800-2007 (LSM) Load considered in modeling are Dead load, Live Load, Wind load along with the combinations as specified in IS. Analysis results are observed for column base as hinge base. Results of Industrial steel truss buildings are compared with the same dimensions of Pre-Engineering Building.

WARREN TRUSS

In warren trusses web members of equal length. Forces on diagonals alternate between tension and compression. In double pitched warren trusses even though the equal length convenience is not there, the space between the web rods created space for placing service channels. Warren is used with additional verticals, introduced in order to reduce the unsupported length of compression chord members.

TUBULAR SECTIONS

Tubular Sections is the best replacements to the conventional ones with their useful and comparatively better properties. Tube sections and assigns most suitable section according to its dead weight and ease of connection methods. In this tube section,

dead weight is to be reduced for many structural members. one of the main advantages in this section is higher strength to weight ratio could result in upto 30% savings in steel due to the high torsional rigidity and compressive strength.

2. TRUSS DESIGN DETAILS

CALCULATIONS FOR WARREN TRUSS:

To determine Loads on trusses, Analysis of member forces, load combination and design of members.

ASPECTS OF TRUSS DESIGN

1. Economical pitch (H) = L/8 to L/10
2. Economical End rise (h) = H/5 to H/7
3. Economical Truss spacing (s) = L/3 to L/5

FORCES IN TRUSS MEMBERS

For nodal gravity unit load the truss is analysed method of force coefficient using bending moment and shear force values. Convert the loads into nodal loads. Consider the half truss loaded with nodal unit force. The shear force and bending moment diagrams are to be explained in this method.

ANALYSIS OF MEMBER FORCES

For each of the load form – dead load, live load, wind normal to ridge and wind parallel to ridge analyse the truss for member forces. Arrive at maximum and minimum forces in the members of the truss for the following combinations

1. Dead load + Live load
2. Dead load +Wind load (wind perpendicular to ridge)
3. Dead load +Wind load (parallel to ridge)
4. 1.5 (Dead load + Live load)
5. 1.2 (Dead load + Live load) + (0.6 Wind load pressure)
6. 1.2 (Dead load + Live load) + (0.6 Wind load suction)
7. 1.2 (Dead load + Live load + Wind load pressure)
8. 1.2 (Dead load + Live load + Wind load suction)

4. Out of the load combinations select the maximum and minimum member force

3. NUMERICAL INVESTIGATION

Dead load analysis is done according to IS 875 (Part1) with the help of STAAD-PRO, Live load analysis is done according to IS 875 (Part2) with the help of STAAD-PRO, and Wind load analysis is done according to IS 875 (part 3) with the help of STAAD-PRO. Designing is done according to IS 800, IS806 and STAAD PRO.Conventional design is carried out using force coefficient method and tubular sectioned design is carried out as per IS 806.

4. CONCLUSION

From this paper, it is concluded that cost comparision between conventional steel and square tubular sections. Tubular section is saving 30% to 40% saving the cost compare than conventional structure and it's become reduced dead weight and it is used for compression members and torsional members.It is the best replacement for conventional steel sections.

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