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Comparative Study of Different 2D Roof Truss Design

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Abstract

For decades, the construction industry has relied on structural steel, a resilient material that can be moulded into any shape requested to achieve a project's final and attractive look. In addition to Type, Pratt, Howe and Warren types of steel trusses, there are many additional options available. They are also available in a variety of sections, such as tubular, square, and rectangular hollow. The Warren type, the Howe type, and other truss types are examined side by side in this work. There have been no delays in the building of Pratt and K-type trusses with a 36-meter span and varied heights. Rather of using solid pieces, hollow components are employed in their place. Some of the parts that are commonplace Stad pro v8i software is utilised to conduct the research. According to the results of this comparison, it will be established that the most cost-effective steel truss structures are those with the lowest prices and lightest weight.

Structure, hollow parts, design, and lowest weight are some of the key terms.

INTRODUCTION

Externally applied loads only affect the triangular frame members of trolley truss constructions to axial forces. Because the cross section is strained almost equally, steel members exposed to axial stresses perform better than steel members in flexure. Because trusses are primarily composed of axially loaded components, they are quite good at coping with external forces. They may be used for a broad range of different things. a wider variety of time periods With less material and more labour required to build than other methods, truss structures are more cheap. This is very fitting in an Indian context. Plane truss and space truss are the two types of trusses that may be used. trusses with parallel elements are known as plane trusses. They're all arranged in a straight line and on the same plane in two dimensions. Aside from that fact, all of these pressures exerted against it are placed on the same plane. Truss is used to hold things in place while they are orbiting the Earth. Forces may be applied in any direction due to the components' three-dimensional orientation. Generally speaking, there are three main kinds of plane truss: All of the roof trusses listed above are examples of the kind of roof truss.

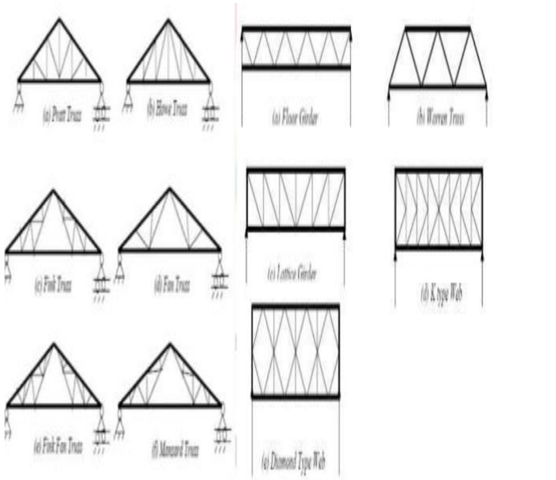

Figure 1.1 Pitched roof trusses Figure 1.2 Parallel chord trusses

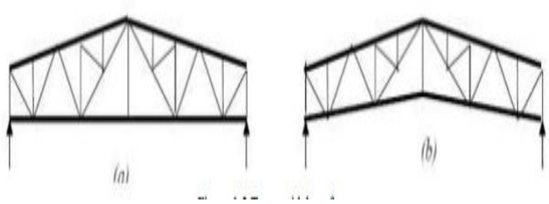

Figure 1.3 Trapezoidal roof trusses

STRUCTURAL MODELING STEPS & DETAILS

The step by step procedure for this study is as under:

1) Generate Geometry of Standard truss configuration

2) Calculate Dead load, Live load and Wind load.

3) Create Staad file from basic input and perform analysis.

4) Create steel design command to perform steel design.

5) Call Staad result and result interpretation.

Our main objective is to find out the truss configuration which has minimum weight for the same loading. In this work the rise and section vary

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for different configuration of the truss. The different values required for the load calculation and for the modelling in the software are shown in the table 2.1.

Table 2.1 Geometry and design data

Criteria	Values
Span	36
Rise	Between 1/12 to 1/48
Bay Spacing	4 m
Height up to eaves level	12m
Total Dead Load (Sheeting + Purlin + Fixing + Service)	Varies with geometry
Total Live Load	Varies with geometry
Basic Wind Speed	44m/s (Surat)
Life of structure	50 years
Wall Opening	5 to 20%
Wt. of Purlin in N/m^2	90
Wt. of Wind Bracing in N/m^2	15
Wt. of GI sheets in N/m^2	130
Yields strength of steel	310 N/mm^2

RESULTS

3.1 Summary of Truss Weight for Different Section

i. Pipe Section i

i. Rectangular section

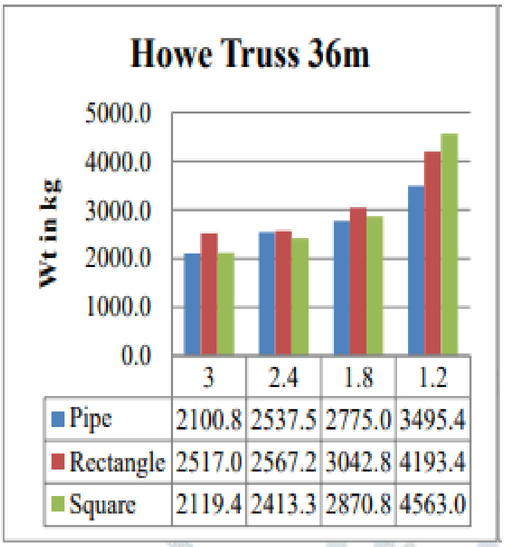
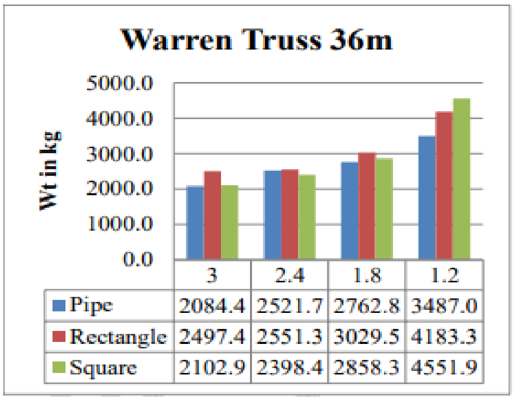


Chart 3.4: Truss wt. Vs. Truss sections for Howe truss Chart



3.5: Truss wt. Vs. Truss sections for Warren truss with change in rise

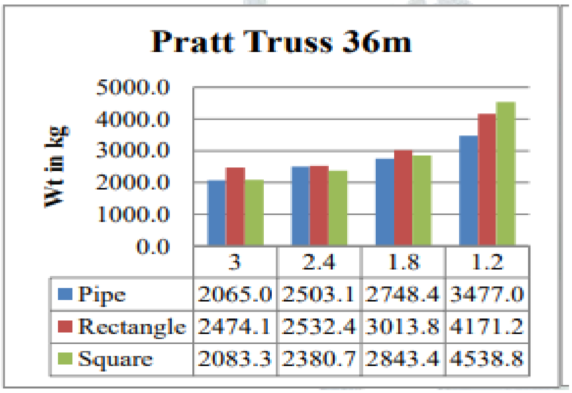
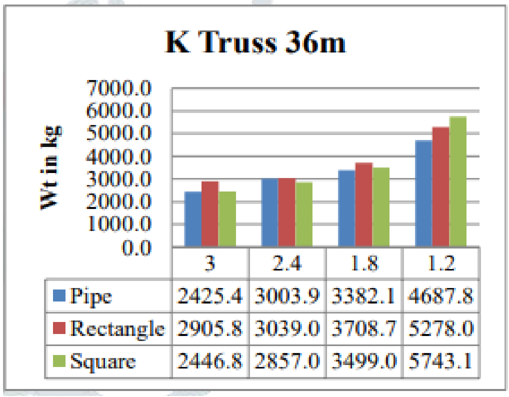


Chart 3.6: Truss wt. Vs. Truss sections for Pratt truss Chart



3.7: Truss wt. Vs. Truss sections for K truss with change in rise

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CONCLUSIONS

a) For all the span of 36m, Pratt truss configuration is the most economical truss than Howe truss, Warren truss and K truss.

b) The economy of truss using the different section for different rise of the truss is different. For 3m rise of the truss Pipe section is more economical in all the cases. But there is an exception for 2.4m rise in which square section is more economical in the entire truss configuration.

c) In the entire truss configuration and for all the spans 3m rise is more economical than 2.4m, 1.8m and 1.2m rise

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