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INVESTIGATION OF TRUSSLESS SHEETING FOR EXTENSIVE RANGE OF INDUSTRIAL SHEDS

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ABSTRACT

A truss is a framework that supports a roof, bridge, or other structure. Typically, it is made up of rafters, posts, and struts. An arrangement of interconnected steel pieces that forms a structure intended to span or bridge a particular kind of opening is called a steel truss. A steel truss distributes pressure or weight to weight-bearing buildings on either side of the opening. There are numerous varieties of steel trusses that are typically utilized for large roofs and bridges. Although steel can be used to improve the load-carrying capacity of any truss—and it frequently is—there are a variety of steel truss types, some of which are more prevalent than others. Self-supporting, meaning it doesn't need an extra frame support structure. The buildings are built by mobile roll-forming machines established on a trailer and built on-site. The structures may be constructed without support columns, beams or trusses creating a structure with 100% useable area. Building of up to 20,000 square feet may be manufactured in a single day. In this present study, comparing the cost of roofing on Steel (Angular) Truss, Hollow Tube Truss with Self-Supporting Roof for the opening of 6 meter, 12 meter, 18 meter and 24 meter. Hollow tube truss is 40.35% and 44.15% cheaper than Steel (Angular) Truss and Self-Supporting Roof for the opening of 6 meter. Similarly 24.37% and 21.97% cheaper for the opening of 12 meter. As the length of opening increase from 12 meter Self-Supporting Roof becomes cheaper. Self- Supporting Roof is 36.26% and 4.41% cheaper than Steel (Angular) Truss and Hollow tube Truss for the opening of 18 meter. Self-Supporting Roof is 28.50% and 11.42% cheaper than Steel (Angular) Truss and Hollow tube Truss for the opening of 24 meter.

I. INTRODUCTION

Steel is a material which has high strength per unit mass. Steel as a construction material is one of the very important materials used in the industry, the reason is because of its characteristics and properties that it has. Steel is strong, hard, tough, ductile, fire resistant and has also got a very high melting point. The designing of industrial Steel Structure includes designing of the structural elements including principal rafter or roof truss, column and column base, purlins, sag rods, tie rods, gantry girder, bracings, etc. India has the second fastest growing economy in the world and a lot of it, is attributed to its construction industry which figures just next to agriculture in its economic contribution to the nation. So, in regard of the same Steel industry is growing rapidly. The use of steel structures is not only economical but also eco friendly at the time when there is a threat of global warming. Here, “economical” word is stated considering time and cost.

1.1 Truss

Truss derives from the old French word trousse, from around 1200, this means that "collection of things bound together". The term truss has often been used to explain any assembly of members such as a cruck frame or a couple of rafters. One engineering definition is: "A truss is a single plane framework of individual structural member linked at their ends of forms a sequence of triangle to span a large distance" . In engineering, a truss is a structure that "includes –force participants most effective, in which the members are organized simply so the assemblage as a whole behaves as a single item". A "-force member" is a structural aspect wherein force is accomplished to only points. Despite the fact that this rigorous definition allows the contributors to have any shape linked in any stable configuration, trusses usually consist of 5 or extra triangular units constructed with directly participants whose ends are linked at joints called nodes.

1.2 Objective of the study :

- Design and estimating of steel (angular)truss for 6m,12m,18m,and 24m span.

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- Design and estimating of hollow tube truss for 6m,12m,18m, and 24m span.
- Design and estimating truss less sheeting for 6m, 12m,18m, and 24m span.
- Cost comparisons between steel (angular) truss, hollow tube truss and self-supported truss.

II. LITERATURE REVIEW

1. Shujat & Desai (2018) This study provides the comparative study of Conventional steel building (CSB), Pre Engineered Building (PEB) and Tubular Structure. The design is madeasperIS800-2007.Deadload, Liveloadandwindloadcalculationismade IS875 part I, II and III respectively. The concept includes the technique of providing the best possible section according to the optimum requirement. This concept has many advantages over the Conventional Steel Building (CSB) concept of buildings with roof truss. Design and analysis is done with the help of STAAD Pro V8i Software.

2. Kureshi1 & Desai (2017) In this study the foot over bridges are made up of different steel sections and these steel sections are either conventional steel sections or closed hollow section. For instance, angle section, circular hollow steel section (CHS), rectangular hollow section (RHS) and square hollow section (SHS). An exertion has been done here to calculate discrepancy in weight between conventional steel section and closed hollow section with different truss configurations like Pratt truss, Howe truss and Warren truss.

3. Bokade & Vairagade (2017) Industrial building is the design and construction of buildings serving industry. Such buildings rose in importance with the industrial revolution, and were some of the pioneering structures of modern architecture. Paper covered two types of industrial building such as conventional and pre-engineered building. Pre- Engineered Building (PEB) concept is a new conception of single storey industrial building construction. This methodology is versatile not only due to its quality pre-designing and prefabrication, but also due to its light weight and economical construction. The concept includes the technique of providing the best possible section according to the optimum requirement. This concept has many advantages over the Conventional Steel Building (CSB) concept of buildings with roof truss.

III. METHODOLOGY

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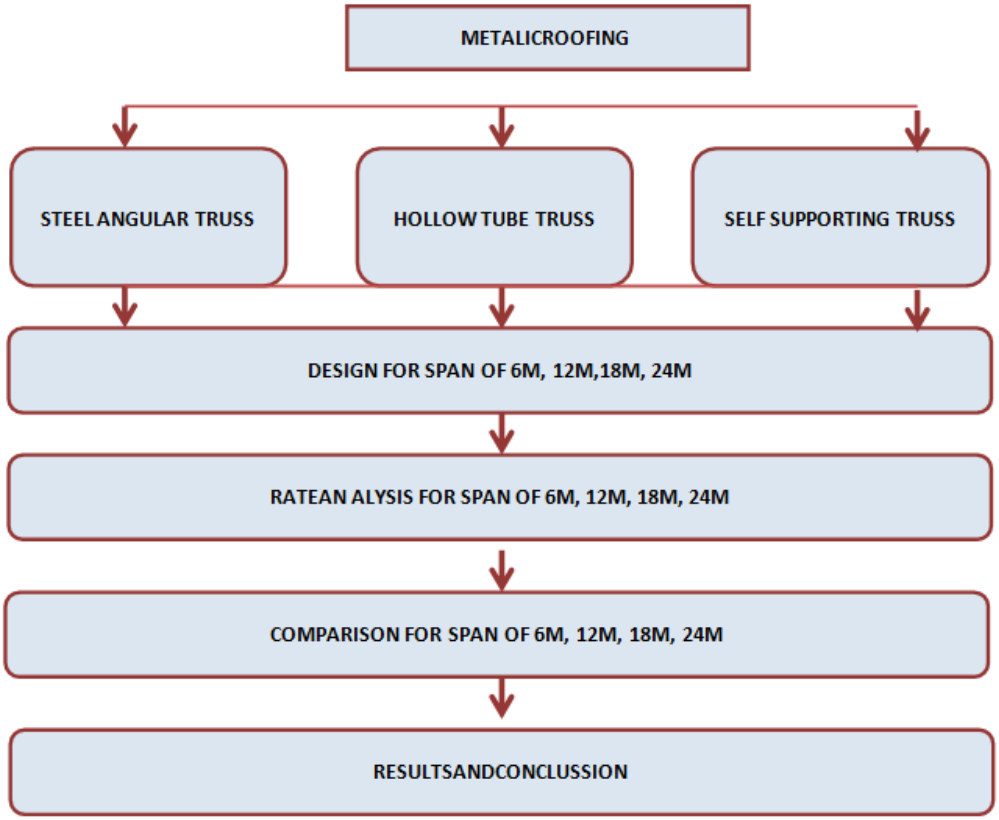

IV. RESULT ANALYSIS

In this chapter include Results And Discussion of roofing on Steel (angular) truss, hollow tube truss and self-supporting roofing is done for the opening of 6 meter, 12 meter, 18 meter and 24 meter and sheeting up to 10 meter. Once the design is completed using STAAD.pro v8i, estimating and costing is done for all the roofing. Then comparison of rate is done, through which conclusion will be made.

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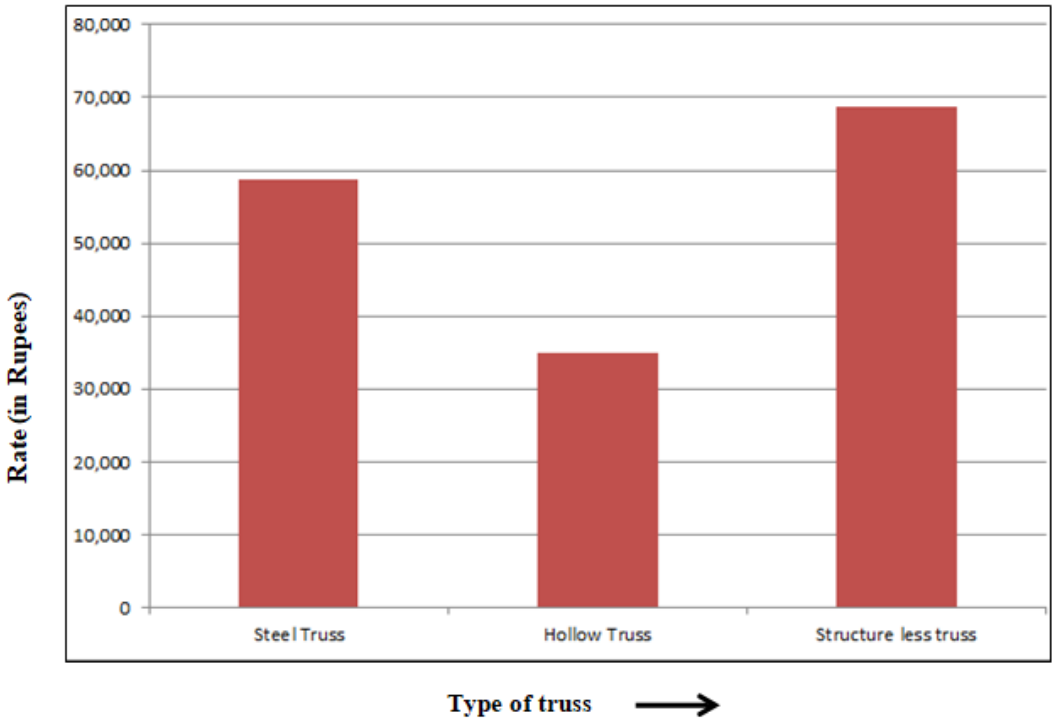

Figure 4.1:- Rate Analysis for 6m opening

Table 4.1:-Rate Analysis for 6m opening

Truss Opening(In meter)	Rate(in Rup.)		
	Steel Truss	Hollow Truss	Structure less truss
6	58,683	35,000	68,670

For 12 m opening of truss increase in rate of Hollow truss is 206.16% from 6 m. similarly Steel (angular) truss is 141.46% but for Truss-less sheeting increase in rate is 100%. Though for 12 meter opening of truss sheeting on Hollow Tube Truss is 24.37% cheaper than Steel (Angular) truss and 21.97% cheaper than Truss-less Sheeting.

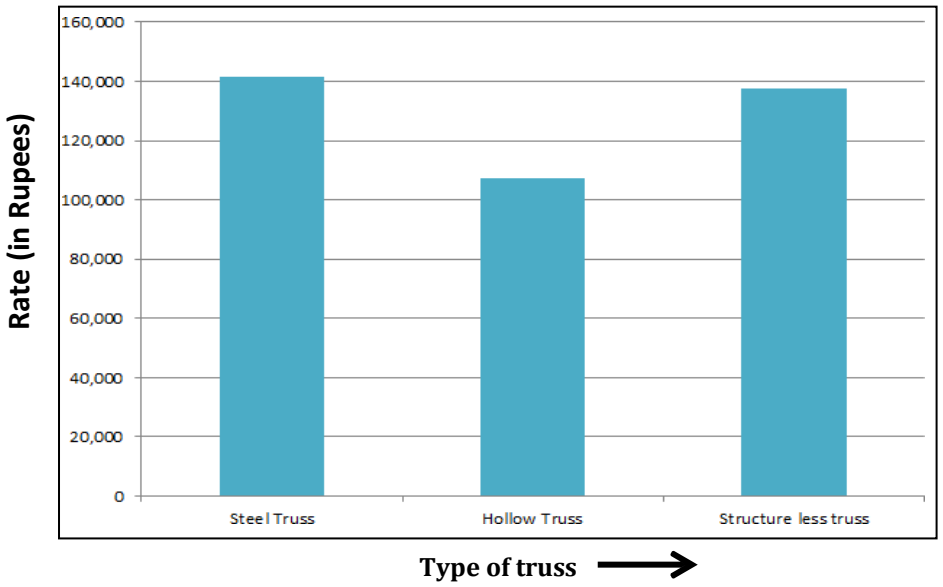

Figure 4.2:-Rate Analysis for12m opening

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Table 5.2:-Rate Analysis for 6m opening

Truss Opening (in meter)	Rate(in Rup.)		
	Steel Truss	Hollow Truss	Structure less truss
12	1,41,701	1,07,156	1,37,340

For 18 m opening of truss increase in rate on Hollow truss is 515.76% from 6 m. similarly Steel(angular)truss is 451.13% but for Truss-less sheeting increase in rate is 200%. Therefore for18 meter opening of truss Truss-less Sheeting is 36.26% cheaper than Steel (Angular)truss and 4.41% cheaper than Hollow Tube Truss.

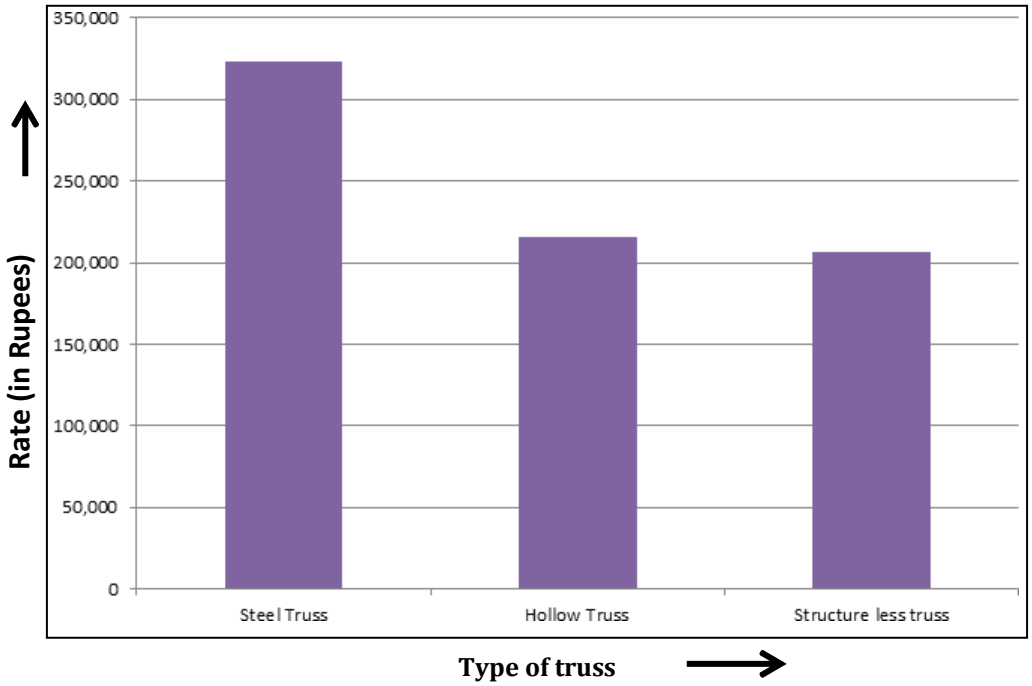

Figure 4.3:- Rate Analysis for 18m opening Table

Table 4.3:- Rate Analysisfor18mopening

Truss Opening (in meter)	Rate(in Rup.)		
	Steel Truss	Hollow Truss	Structure less truss
18	3,23,220	2,15,517	2,06,010

For 24 m opening of truss increase in rate on Hollow truss is 786.01% from 6 m. similarly Steel (angular) truss is 554.60% but for Truss-less sheeting increase in rate is just 4 times. Therefore for 24 meter opening of truss Truss-less Sheeting is 28.50% cheaper than Steel (Angular) truss and 11.42% cheaper than Hollow Tube Truss.

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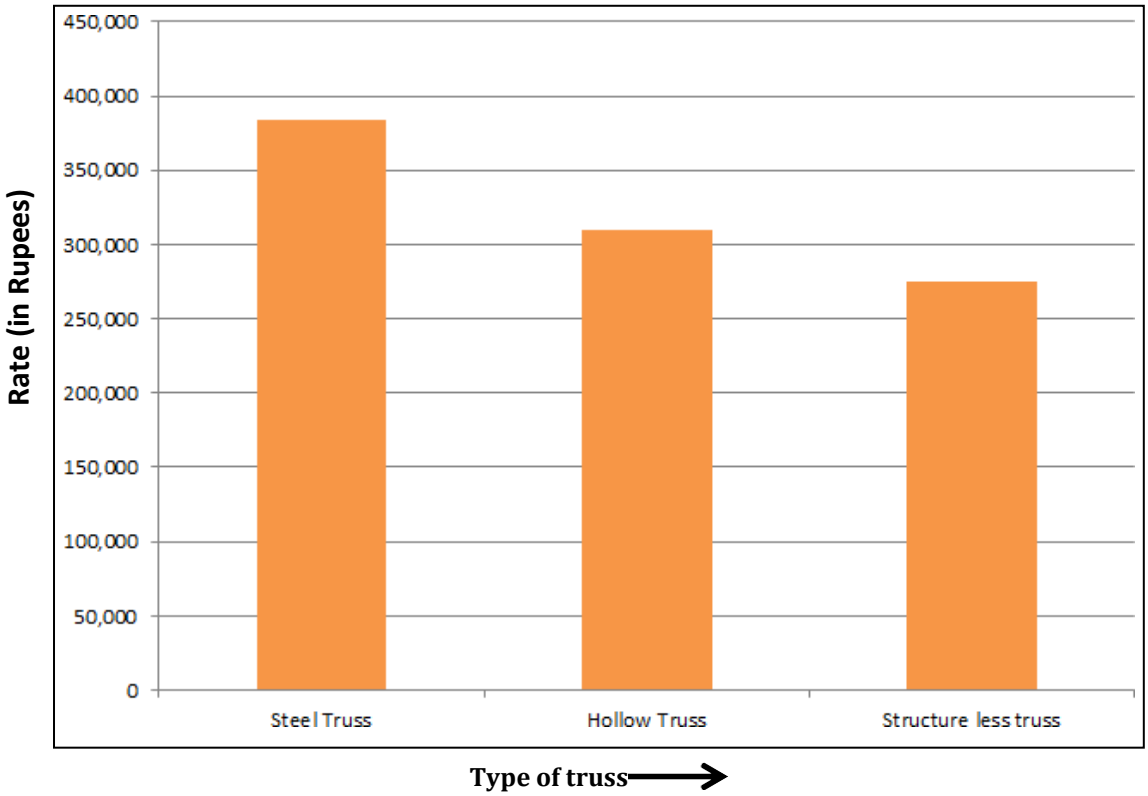

Figure 4.4:-Rate Analysis for 24m opening

Table 4.4:- Rate Analysis for 6m opening

Truss Opening (in meter)	Rate(in Rup.)		
	Steel Truss	Hollow Truss	Structure less truss
24	3,84,140	3,10,104	2,74,680

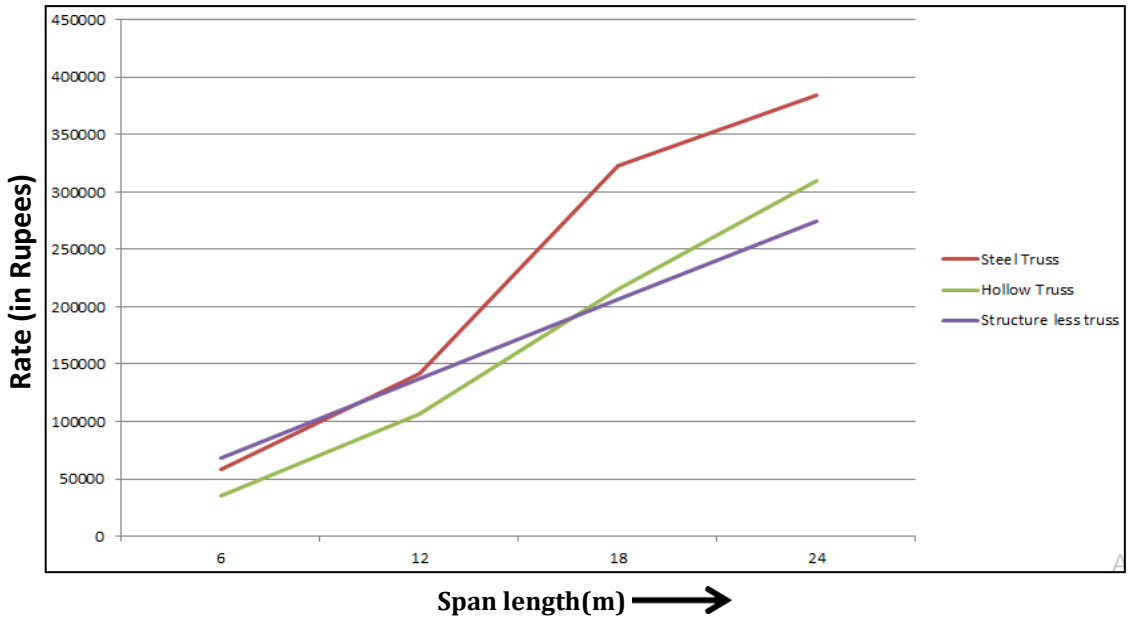

Figure 4.5:- Increase in rate of trusses for different openings

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Table 4.5:- Thickness Variations in truss less sheeting

Item No.	Particulars of Items	Quantity	Unit	Thickness	WEIGHT PER SQ MTR.	Rate Rs.	Per	Amount Rs.	P.
1	Galvalume roofing	60	Sq. m	0.8	10	1030	Sq. m	61800	
				0.9	11.1	1144	Sq. m	68640	
				1	12.5	1287	Sq. m	77220	
				1.1	13.9	1431	Sq. m	85860	
				1.6	20	2060	Sq. m	123600	
2	Galvalume roofing	120	Sq. m	0.8	10	1030	Sq. m	123600	
				0.9	11.1	1144	Sq. m	137280	
				1	12.5	1287	Sq. m	154440	
				1.1	13.9	1431	Sq. m	171720	
				1.6	20	2060	Sq. m	247200	
3	Galvalume roofing	180	Sq. m	0.8	10	1030	Sq. m	185400	
				0.9	11.1	1144	Sq. m	205920	
				1	12.5	1287	Sq. m	231660	
				1.1	13.9	1431	Sq. m	257580	
				1.6	20	2060	Sq. m	370800	
4	Galvalume roofing	240	Sq. m	0.8	10	1030	Sq. m	247200	
				0.9	11.1	1144	Sq. m	274560	
				1	12.5	1287	Sq. m	308880	
				1.1	13.9	1431	Sq. m	343440	
				1.6	20	2060	Sq. m	494400	

V. CONCLUSION

Following the research, a few conclusions are drawn. The following are the conclusions:

1. Hollow tube is 44.15% less expensive than truss-less sheeting and 40.35% less expensive than steel (angular) trusses for a 6 m opening.
2. Truss sheeting on hollow tube trusses is 21.97% less expensive than truss-less sheeting and 24.37% less expensive than steel (angular) trusses for a 12-meter opening.
3. Truss-less Sheeting costs 36.26% less for an 18-meter truss opening than an angular steel truss and 4.41% less than a hollow tube truss.
4. Truss-less Sheeting is 28.50% less expensive for a 24 meter truss opening than Steel (Angular) trusses and 11.42% less expensive than Hollow Tube Trusses.
5. Depending on a number of factors, truss-less sheeting structures are more cost-effective than hollow tube trusses and steel (angular) trusses.

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