Optimized Design of Temporary Long Span Steel Roof Structure

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Abstract-*The objective of the study is to presents the simultaneous cost, weight and standard cross-section optimizationation of temporary long span steel roof structures. Recent growth in India for construction of large span roof steel structure using shop fabricated steel sheet are facing challenges in transportation and erection from shop to site. Modern long-span space structures, developed during the 1970s and 1980s, are light weight and effective structures based on new technologies. Long span structure as a Steel roof structure are used for sports areas,exhinition halls, assembly halls , transport terminals , airplane hangers , ware houses, workshops , etc. Industrial roof Structures have been developed by the combination of different structural forms and materials which need to cover large areas while maintaining unobstructed interior spaces. This research follows two consecutive steps: the first one aims at developing an optimized procedure of preliminary designs for temporary long span roof; the second one focuses on the study of wind action on these structures.*

Keywords-optimized design, temporary, truss and lattice, steel roof structure.

I. INTRODUCTION

Various structural forms have been developed over the last 30 years that optimize the cost of the steel structure in relation to the space provided. However, in recent years, forms of expressive structure have been used in architectural applications of industrial buildings, notably suspended and tubular structures.

A single large hall is the main feature of most industrial buildings. The construction and appearance of an industrial building provides the design engineer with a wide range of possible configurations in order to realize the architectural ideas and the functional requirements. Generally, an industrial building has a rectangular floor space, which is extendable in its longdirection. Thedesign of the building has to be coordinated with functional requirements and the energy-saving concept, including lighting.For temporary design of steel structures can be arch structure, foldable vault structure, and foldable dome structure for varying range. Ex: - 10 m to 30 mtrs. As per different literature review there are number of steel roof truss designs. I have studied roof design and material for optimized used in this review paper.

II. LITERATURE REVIEW

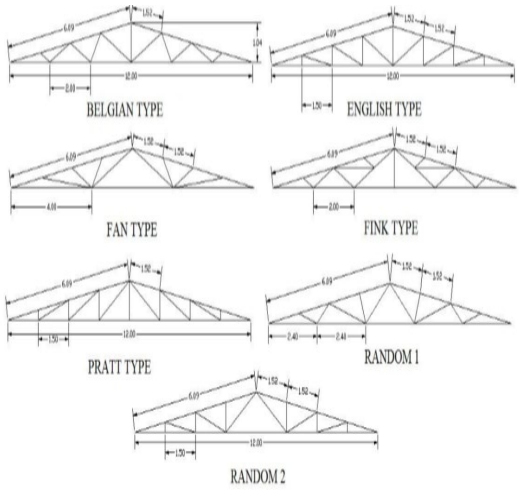
Goraviyala Yogesh (2016) studied "Design and Comparison of Steel Roof Truss with Tubular Section (using SP: 38 And IS: 800-2007) ". He has studied different configuration of steel roof trusses, such as Howe type, Fan type, Fink Fan type, and Ntype with different span has 9m, 12m, 15m, 18m and 21m, with varying slopes like 12, 14 and 16 degrees with different wind zones, different spacing have been analyses and design as per SP: 38 and IS: 800-2007 by using tubular section. He gave comparative analysis of a truss using tubular and angled sections under the influence of usual loading values.

Milan Masani (2015) has studied "Large Span Lattice Frame Industrial Roof Structure". Study was carried out with case study. This shows for different eave height and span range from 30 mtrs to 60 mtrs relation can be achieved. He gave formula for eave height to span of rafter. As per case study both base are fixed. This formula is given H= m X (ø/π) X L where H= Eaves Height ø = Pitch of Roof L = Span of Rafter m= co-efficient varies between 3.00 to 4.00, depending upon the pitch . A STAAD model is than prepared and run for detail analysis and working out final member sizes.

Upendra Pathak Et al. (2015) has studied "optimization and rationalization of truss design" .Roof truss of span 16m has been analyzed for different geometries and sections to get the desired optimum truss design. The design is further optimized for varying slopes of truss. The support conditions (fixed/hinged) and type of connection (welded/bolted) between truss members also effect the forces in truss members. The various truss analyses are performed by using structural analysis software i.e. STAAD Pro. The analysis results are compared to obtain optimum and accurate truss design. The results indicate that A-type truss has lesser weight compared to other truss geometries. The truss consists of tube/square hollow section is having much lesser weight compared to angle section. The optimum truss slope is found nearly 24□. The truss with rigid connection between members

is found heavier than the truss with pin connection. Similarly truss supported on fixed base/purlins resting on truss members causes bending moment in top chord of the truss members which in turn modify the sectional requirement of the members. Hence case specific analysis is necessary for rational solution of truss design.

Vaibhav B. Chavan Et al. (2014) has studied "Economic Evaluation of Open and Hollow Structural Sections in Industrial Trusses" .this gives analysis and comparison of design in industrial structures with different spans and profiles. HSS and open section for materials gives also weight optimization. Two type of truss design were studied .1) Belgian type 2) random type. As per research the overall mean economy achieved for SHS was 14.20% with respect to Open section whereas; RHS was 0.33% uneconomical with respect to open section.It was observed that Belgian profile was more cost effective when compared to Random- 1.



III. STUDY AREA

As per all literature reviews for Industrial truss / lattice design can be done for temporary steel design wind and terrain factor are different as per IS: 875. Span range can also be vary from 20 mtrs to 100 mtrs with configuration of truss in STADD pro. Analysis. Weight optimization can be achieved for the same.

IV. CONCLUSION

Followings are the major conclusion of the study

1. In this paper, after the study of different literature review by using proper selection of material truss building can be economical compared to PEB.
2. Methodology of SP:38 should be reviewed with IS:875 in relative to wind load criteria.
3. When large area should be covered and large unsupported length can be assigned with tubular section which will be find overall economy. The tubular steel section are structurally more efficient than conventional section because its resistance of torsional is very high and high strength to weight ratio. So main aim of the study Analysis of optimized design for temporary steel roof ranging from 20 mtrs to 100 mtrs with help of Staad-Pro.

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