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Evolution of Economical Structural System of Single Storey Long Span Halls

The composite structure consisting of steel truss or girder with concrete columns is most commonly used technique in long span structures. In short span structures, columns cover a lot of space, and create visibility problem that's why it is better to design long span halls so that internal space can be used more efficiently. For a given span, economy of truss depends on its configuration, panel length and height of truss. As, there are no guidelines available to fix these parameters which lead to minimum weight of truss, that's why an attempt is being made to obtain economical configuration of all trusses. The selection of most economical steel roof system is a major concern these days. The work focuses on most common steel roof structural system to propose cost effective roof for long span. The span selected for roof is 120ft long. Three different types of trusses (Arch, Quadrangular and Pratt truss) and lattice girder are selected. Dead load, live load, seismic load and wind load are considered for design of these structural systems. The codes used were ACI 318-14, UBC 1997, and ASCE 7-05 for dead, seismic, and wind load respectively. Steel roof structural system (steel trusses and steel girder) are analyzed and designed in ETABS and total weights of each structural system are obtained. The one with minimum weight of material is considered as economical structural system. It is observed that among these steel roof structural systems, lattice girder is more economical as compared to steel trusses.

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