PARAMETRIC STUDY ON DESIGN VARIOUS STEEL WITH VARIOUS DESIGN CODES FOR SELECTING A BETTER OPTION FOR CONSTRUCTION OF STEEL STRUCTURE

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Abstract:

Construction projects require many decisions. A key decision is to find the most effective option, as well as determining which process could produce ideal results. Construction work is done mainly by two types, Steel structures and Concrete structures. Following are some points how Steel structure is advantageous over concrete structure. This chapter presents briefly review of relevant studies of various papers published related to this dissertation. The main objective of this literature is to explore related studies of analysis and design used in this dissertation of analysis and design of conventional steel building and pre-engineered building.

Keywords: Seismic load, stresses, shear force, high rise building, STAAD Pro, bending moment, deflection

I. INTRODUTION

Background of Present Work

Construction projects require many decisions. A key decision is to find the most effective option, as well as determining which process could produce ideal results. Construction work is done mainly by two types, Steel structures and Concrete structures. Following are some points how Steel structure is advantageous over concrete structure.

Costs: A large majority of all steel manufactured today comes from recycled materials, this recycling usage makes the material much cheaper when compared to other materials. Although the price of steel can fluctuate, it typically remains a less expensive option compared to reinforced concrete.

Strength: Structural steel is extremely strong, stiff, tough and ductile; making it one of the leading material used in commercial and industrial building construction.

Fire resistance: Steel is inherently a non-combustible material. However, when heated to extreme temperatures, it's strength can be significantly compromised. Therefore, the IBC requires steel to be covered additional fire resistant materials to improve safety.

Sustainability: Structural steel is nearly 100% recyclable as well as 90% of all structural steel used today is created from recycled steel. Due to its long lifespan, steel can be used as well as adopted multiple times with little to no compromise to its structural integrity. When manufactured, fabricated and treated properly, structural steel will have a minimum impact on the environment. Steel with such processes such as water resistant seals and paint care. Fire resistant features may be included when water-resisting seals are applied. By considering all the above points, Steel structures are the most preferable type of construction.

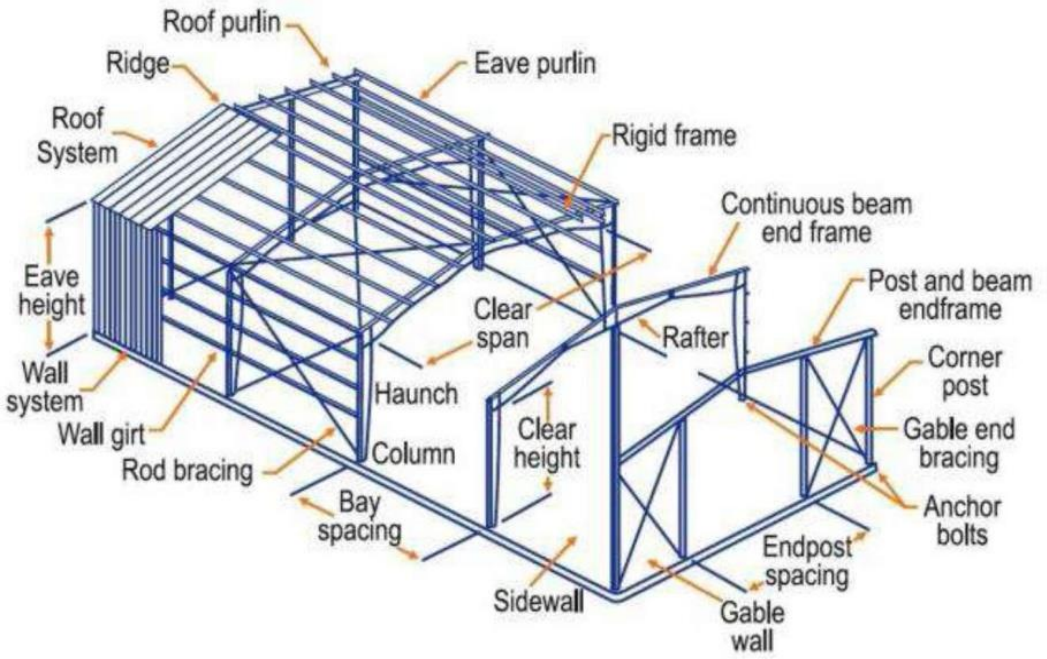


Fig. 1

1.2. Objectives:

The primary objectives of this project can be summarized as follows:

1) To study the different IS codes and ASCE codes required for analysis and Design of Steel sheds.
2) Analysis of steel shed of different span arrangement and Different Loadings using STAAD.
3) Design of steel sheds using different codes i.e. Indian and American codes.
4) Comparing the design results for different span arrangement on the basis STAAD results and Cost incurred in the construction of whole shed.

II. LITERATURE REVIEW

1) G. Durga, Rama Naidu, K Shriniwasa, Vengala Rao, V. Divya Sri, M. Navakanth, G. D. Rama Rao, **(2014)**.

In this paper, Long Span, Column free structures are the most essential in any type of industrial structures and Pre Engineered Buildings (PEB) fulfills this requirement along with reduced time and cost as compared to conventional structures. The present work involves the comparative study and design of Pre Engineered Buildings (PEB) and Conventional steel frames. Design of the structure is being done in Staad Pro software and the same is then compared with conventional type, in terms of weight which in turn reduces the cost. Three examples have been taken for the study. Comparison of Pre Engineered Buildings (PEB) and Conventional steel frames is done in two examples and in the third example, Pre Engineered Building structure with increased bay space is taken for the study. In the present work, Pre Engineered Buildings (PEB) and Conventional steel frames structure is designed for wind forces. Wind analysis has been done manually as per IS 875 (Part III) – 1987.

2) C.M. Meera, **(2013)**

In this paper Pre-Engineered Buildings (PEB) are analysed as it 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. This paper is a comparative study of PEB concept and CSB concept. The study is achieved by deigning a typical frame of a proposed Industrial Warehouse building using both the concepts and analyzing the designed frames using the structural analysis and design software Staad.Pro.

3) Pradeep V., Papa Rao G., **(2014)**

In this paper, Pre-Engineered Buildings are analyzed as Long span, Column free structures are the most essential in any type of industrial structures and Pre-Engineered Buildings (PEB) fulfil this requirement along with reduced time and cost as compared to conventional structures. This methodology is versatile not only due to its quality predesigning and prefabrication, but also due to its light weight and economical construction. The present work presents the comparative study and design of conventional steel frames with concrete columns and steel columns and Pre Engineered Buildings (PEB). In this work, an industrial building of length 44m and width 20m with roofing system as conventional steel truss and pre-engineered steel truss is analyzed and designed by using STAAD Pro V8i.

4) Vaibhav Joshi, Prof. V. B. Patel, Prof. V. A. Arekar **(2016)**

In this paper Parametric study of Pre-engineered Building is done. The Pre-Engineered Building is having many advantages over Conventional Steel Building. It is fact that there are variations in use of steel quantity with using different type of PEBs like regular, mono slope and curved frame PEB. For this, the analysis has carried out by taking the optimized section for loads and load combinations calculated by excel sheet, considering DL, LL and WL with the Combination according to IS 800: 2007. The analysis has done through the software ANSYS which is based on FEM. Stresses have found for design load and the stress ratio of the support frame has found with quantity of steel and compared with each other for deriving economic type of PEB. One typical frame has also take for deriving which stress is predominant for failure.

III. RESEARCH METHODOLOGY

The proposed work is planned to be carried out in the following manner

1) Study of IS code IS 800:-1984, IS 800:2002, IS 875: (Part I, Part II, Part III, Part IV), IS 1893 :2002, IS 801(For cold form sections).
2) Study of Design parameters used in STAAD.
3) Preparation of STAAD models for Steel sheds with various codes and various steel sections such as Hot rolled or Built up Sections.
4) Analysis and Design of Various steel sheds depending upon length, span and height.
5) Preparation of Comparative Statement on the basis of Design.

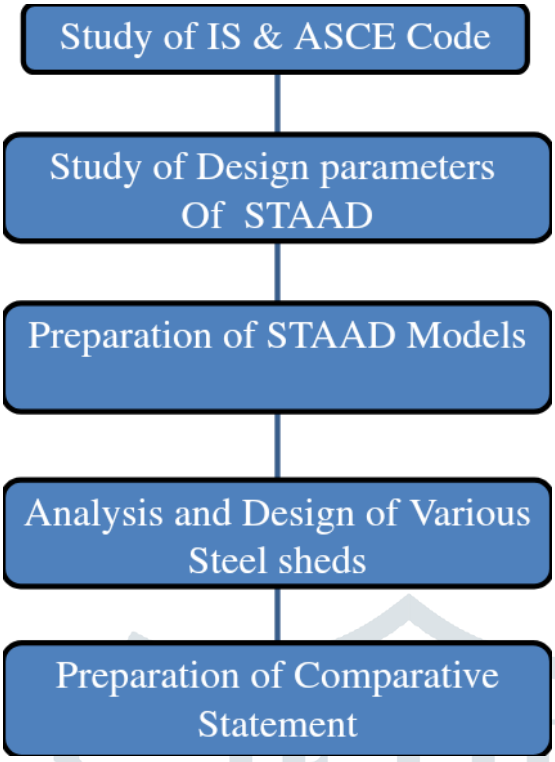
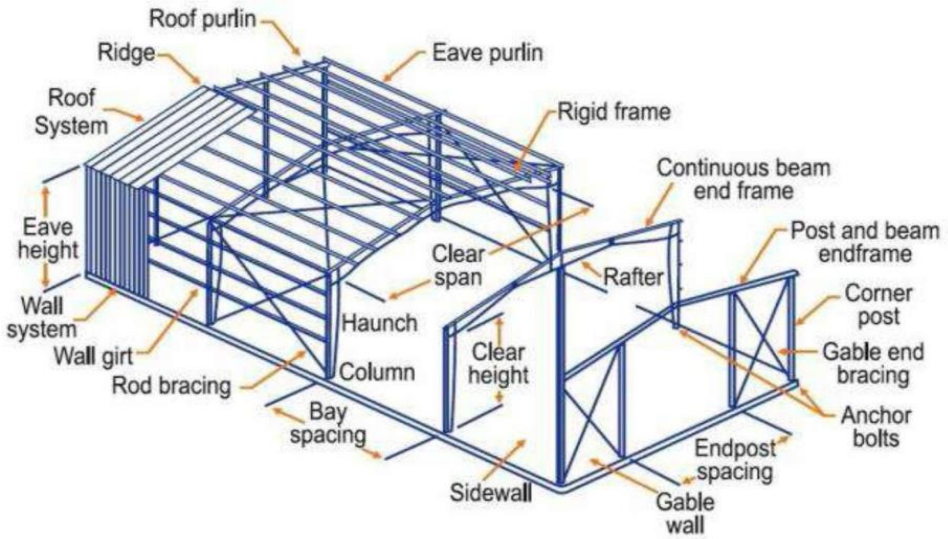


Fig. 2

IV. PROBLEM FORMULATION

Research is currently underway. Analysis will be done by using 2-Dimensional STAAD model for different span arrangements. The Span Length varies from 5m to 40m keeping vertical Clear height equal to 4m to 10m The distance between 2frames is



considered as 7m. Different loads such as Dead Load, Live Load, Wind load, Earthquake Load will be applied on STAAD model at appropriate location as per codes used for Loading. Length is considered as 35m. In this steel shed is analyze for Two wind speeds and two earthquake zones are considered. No additional loading is considered on structure such as crane load or any other. Design is done firstly, by Indian Codes and then by American codes. Wall condition is considered same for all sheds. All the results obtain from STADD are compared with the help of Excel sheets.

V. COMPONENT OF A PRE-ENGINEERED BUILDING

Pre-engineered steel building use a combination of built-up sections, hot rolled sections and cold formed elements which provide the basic steel frame work with a choice of single skin sheeting with added insulation or insulated sandwich panels for roofing and wall cladding. These pre-engineered steel building can be fitted with different structural accessories including mezzanine floors, canopies, fascias, interior partitions, crane systems etc. The building is water tight by use of special mastic beads, filler strips and

trims. This is a very versatile building system and can be finished internally to serve any required function and accessorized to achieve attractive and distinctive architectural styles. It is most suitable for any low-rise building and numerous over conventional building.

VI. CONCLUSION

Steel structure are becoming more popular in construction industry more or less PEB system is also becoming an eminent segment in pre-engineered construction industry. It has become possible because pre-engineered building encompasses all the characteristics that are compatible to modern demands, namely speed, quality and value of money.

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