

Comparative Study on PEB Structure and Conventional Industrial Building

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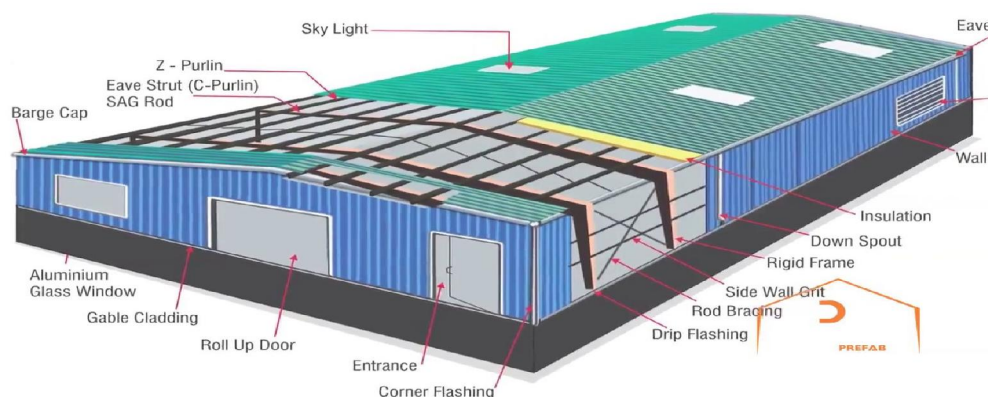
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Abstract: Cost of steel is increasing day by day and use of steel has become inevitable in the construction industry in general and in industrial building in particular. Hence to achieve economic sustainability it is necessary to use steel to its optimum quantity. 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. In this paper an attempt has been to present comparative study of conventional and Pre-engineered steel structures which is a truss of span 30m carrying a crane of 10tonne, 15t and 20t. It has shown considerable reduction in the quantity of material.

Keywords: PEB Structure

I. INTRODUCTION

Pre-engineered buildings is those that are totally designed and manufactured in the factory and then shipped to the site for jointing /fixing. In pre -engineered building, usually I shaped members also called as I beams are used. In Indian manufactures trying to catch up, Comparatively, PEB industrial steel structure is new concept in India. Pre-engineered buildings are generally used for low rise buildings which are ideal for offices, houses, showrooms, steel plants, automobile industries, light, utility and process industries, thermal power stations, warehouses, assembly plants, storage, garages, small scale industries, etc. Presently, with the improvement in technology, computer software's are easily available for analysis and design of Pre-engineered building.



1.1 Conventional Industrial Building

Nowadays, steel used worldwide due to ductility and flexibility properties. Steel bend when it's subjected to heavy loading rather than crushing. Steel is recyclable flexible so that is also eco-friendly due to less wastage are generated. In CSB hot rolled steel section is used. Where members are manufactured in factories and later transported to the site. For connections of different members welding process are used. Steel offers speedy construction right from the start. Due to its important characteristics like ductility, flexibility etc, steel is been widely used in the construction industry. It bends

under the application of heavy loads rather than undergoing crushing and crumbling. Due to its strength, less rate, stability, flexibility and recyclability, it makes a great choice to use steel in construction. It is also seen that steel has some reserve strength in them. The conventional steel buildings are stable. Usually hot-rolled structural members are used in these buildings. Here the members are fabricated in factories and then transported to the site. The changes can be made during the erection by welding and cutting process. Normally trusses are used in this system.



II. LITERATURE SURVEY

(1) Hemant Sharma ,et.al(2017)

‘A Comparative Study on Analysis & Design of Pre-Engineered & Conventional Industrial Building’ have studied comparison and analysis of PEB & CSB staad Pro. In this case study comparison for industrial building is done for bending moments at different sections & the results are compared for economy and time saving in construction. After analysis and design the report is concluded with 37% material saving in case of PEB than that of CSB.

(2) Abhyuday Titiksh, Abhinav Dewangan, Ankur Khandelwal , Akshay Sharma(2015)

‘Comparative Study of Conventional Steel Building and PreEngineered Building to be used as an Industrial Shed’ This paper mainly focuses on the advantages of pre-engineered buildings over conventionally designed buildings. The different fields of comparison mainly constitute its cost effectiveness, time saving, future scope, subtleness and economy of pre-engineered buildings over conventionally engineered buildings and its importance in developing nations like India. This case study for Industrial Shed based on the review & studies which shows experimental and analytical studies carried out in this field. The result shows that these structures are economical, energy efficient and flexible in design”.

[3] Milind Bhojkar ,Milind Darade (2014)

‘Comparison of Pre Engineering Building and Steel Building with Cost and Time Effectiveness’ have studied that the cost can be minimized by utilizing optimum cross-section of steel. Also they have shown the various application of PEB. They showed that for low rise building, PEB is found to be more economical than CSB. From their studies they concluded that CSB is 26% heavier than PEB and also PEB is 30% economical.

[4] Nitin Vishwakarma, Hardik Tayal(2018)

‘Optimization of Industrial Building using Pre-Engineering Building and Conventional Steel Building by Fully Stressed Design’ have studied Pre Engineered and Conventional Steel Building concept of Design for Industrial building of 18 m long span located in Palwal near New Delhi, India. A fully stressed design of Pre Engineered Building with members of varying thickness, Conventional Building with Conventional Steel members and Conventional Building with different hollow and compound section are discussed in paper. A total of five cases are studied. It concluded that more than PEB, truss bracing gives the best suited result based on the economical possibility and the structural safety. They have also concluded that the material cost is reduced by 40% to 42% from PEB portal, when only tube sections are adopted in portal with truss pattern.

[5] Sagar Wankhade and Prof. Dr. P. S. Pajgade

“Review Paper on Comparison of Conventional Steel Building & Pre-Engineering Building” have given importance of using pre-engineered-structure in construction, mainly for single storey building. They also have shown that conventional steel-structure has disadvantages compared to pre-engineered-structure. They have done comparative study of pre-engineered building with conventional steel-building. From their studies they have found that pre-engineered building can be designed using simple procedures. Also they concluded that pre-engineered-building has various advantages over conventional steel-building in terms of cost, speed of construction etc.

[6] Vivek Thakre and Mr. Laxmikant Vairagade(2016)

“Analysis and Cost Comparative study of conventional Industrial building with PEB structure” have shown that there are many advantages of pre-engineered buildings having single storey especially including economy and ease of fabrication. Here they have analyzed and designed an industrial structure according to IS codes 800-1984, IS 800-2007 and by MBMA-96 and AISC-89. Later they have also compared the economy which is in terms of comparison of weight between IS codes and American codes. From their research they have concluded that the design of pre-engineered-structures is done by simple procedures with respect to IS codes. They have also found out that there are various advantages of preengineered structures over conventional steel-structures in terms of cost, weight, erection etc

[7] Swati Wakchaure and N.C.Dubey(2018)

‘Comparative Study of Design of Industrial Warehouse Using CSB, PEB and Tubular Sections’ have shown that by using preengineered-structure in construction, there are various advantages because according to the bending moment diagram, the designing of members is done. As a result, the steel is reduced. They have analyzed and studied according to IS 800-2007 and IS 800-1984 & the comparison of pre-engineered-structure with conventional steel-structure is done. They have also compared the weight of both the structures. From their studies they concluded that conventional steel-structure is 30% heavier than pre-engineered-structure and as a result the size of foundation is reduced of pre-engineered-structure.

[8] Jatin D. Thakar, 2013

"Pre-Engineered Building Design of an Industrial Warehouse" explicit that Pre-Engineered product place of 25m, 30m, and 40m width and 6m eave height have been analyzed & planned by utilizing STAAD Pro.2007 to comprehend the conduct of Pre-Engineered structure and to check in which case it accomplish the economy in steel amount by shifting narrows dividing as 4.5m, 5.5m, 6.5m, & 7.5m. Design is done based on IS: 800. Yield stress of the steel is assumed as 540 Mpa in the PEB warehouse. The load case considered in modeling are dead load, live load, wind load and seismic load along with the various combinations as specified in the IS. Examination results are watched for base response, section minute, beam minute, dislodging at edge, removal at midrange. Analysis results also are compared for every bay spacing.

[9] Syed Firoz, Sarath Chandra Kumar B and S. Kanakambara Rao, 2012

Declared that the pre-built steel building framework development has incredible favorable circumstances to the single story structures, pragmatic and productive option in contrast to regular structures, the System speaking to one focal model inside numerous controls. Pre-engineered building makes and keeps up progressively multidimensional, information rich perspectives through a task support is at present being actualized by Staad ace programming bundles for structure and designing. Choosing steel to plan a Pre-built steel structures building is to pick a material which offers minimal effort, quality, strength, plan adaptability, versatility and recyclability. Steel is the fundamental material that is utilized in the Materials that are utilized for Pre-built steel building. It nullifies from provincial sources. It additionally implies picking dependable mechanical items which arrive in a colossal scope of shapes and colours; It implies deciding to focus on the standards of supportability. Boundlessly recyclable, steel is the material that mirrors the goals of supportable improvement.

[10] G. SaiKiran, A. Kailasa Rao, R. Pradeep Kumar, 2014

Declared that as of late, the presentation of the Pre Engineered Building (PEB) idea in the plan of the structures has helped in streamlining structure. The adaptability of the PEB in the spot of the Conventional Steel Building (CSB) structure idea brought about numerous focal points, including economy and simpler manufacture. Right now, mechanical structure (WareHouse) is dissected and planned by the Indian measures, IS 800-1984, IS 800-2007 and furthermore by alluding MBMA-96 and AISC-89. Right now, structure with length 187m, width 40m, with clear stature 8m and having R-Slope 1:10, is considered to do analysis & plan for 2D outlines (End outline, outline without crane and casing with 3 module cranes). The economy of structure is examined as far as its weight correlation, between the Indian codes (IS800-1984, IS800-2007) and American code (MBMA-96), and between the Indian codes (IS800-1984, IS800-2007).

III. CONCLUSION

From past studies the PEB structures are prove to be more economical and results in material saving. The implementation of PEB is increasing but use if PEB is less than expected. The researches show that PEB structures are easy to design. These designs are efficient and results in speedy construction. These structures are more reliable than CSB. Hence the more research required for more outputs for design methods and reducing material in PEB structures.

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