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Study of Pre Engineered Steel Building

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Abstract – The scientific-sounding term pre-engineered buildings came into being in the 1960s. The pre-engineered steel building system construction has great advantages to the single storey buildings, practical and efficient alternative to conventional buildings. It helps in reducing steel quantity, also increases atheistic view of structure.

Keywords: Large Clear Span, Time Efficient, Design Flexibility.

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INTRODUCTION

Time being the most important aspect, steel structures (Pre-fabricated) is built in very short period and one such example is Pre Engineered Buildings (PEB). Pre-engineered buildings are nothing but steel buildings in which excess steel is avoided by tapering the sections as per the bending moment's requirement. One may think about its possibility, but it's a fact many people are not aware about Pre Engineered Buildings. If we go for regular steel structures, time frame will be more, and also cost will be more, and both together i.e. time and cost, makes it uneconomical. Thus in pre-engineered buildings, the total design is done in the factory, and as per the design, members are pre-fabricated and then transported to the site where they are erected in a time less than 6 to 8 weeks. The structural performance of these buildings is well understood and, for the most part, adequate code provisions are currently in place to ensure satisfactory behaviour in high winds. Steel structures also have much better strength-to-weight ratios than RCC and they also can be easily dismantled.

LITERATURE REVIEW:

G. Sai Kiran, A. Kailasa Rao, R. Pradeep Kumar (2014) observed that in recent years, the introduction of Pre Engineered Building (PEB) concept in the design of structures has helped in optimizing design. The adoptability of PEB in the place of Conventional Steel Building (CSB) design concept resulted in many advantages, including economy and easier fabrication.

C. M. Meera (2013) observes that 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.

Aijaz Ahmad Zende, et.al (2013) observes that even though PEB structures provides clear span, it weighs lesser than that of Conventional Buildings. Pre-engineered buildings are the best solution for longer span structures without any interior column in between.

Syed Firoz, Sarath, et.al (2012) Observed that, the pre-engineered steel building system construction has great advantages to the single storey buildings, practical and efficient alternative to conventional buildings

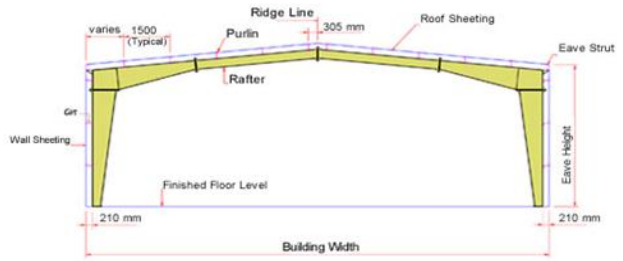
METHODOLOGY:

The pre-engineered metal building system is a building enclosure system that always includes a structural system and often includes roof and wall cladding. The general idea of the system is represented in the diagram below. The structural

system consists of rigid frames that are fabricated from plate steel and “cold formed” into an “I” shape through a manufacturing process. These rigid frames consist of roof beams and columns that are field bolted together. These frames can span large distances without intermediate supporting columns. The frames are spaced at intervals between 15’ and 60’ and can span, column-free, up to 300’ across a building.

On top of and running perpendicular to these frames are roof secondary structural spanning members often referred to as Purlins. They are spaced 4’ to 5’ apart across the width of a building. The roofing system attaches to the purlins. The wall systems include wall secondary structural members called girts that also span from frame to frame. Girts support a wall cladding system (frequently metal panel.)

The pre-engineered metal building system is advantageous because it very economically allows for the creation of large column-free enclosures. The alternative structural framing choices, such as mill steel and light gauge metal, use more steel and are therefore considerably more expensive to build. The best applications for the pre-engineered metal building system include industrial applications such as complex industrial facilities, warehouses and distribution centers.



APPLICATION

Industrial Buildings

- Warehouses
- Commercial Complexes
- Showrooms
- Offices
- Schools
- Indoor Stadiums
- Outdoor Stadiums with canopies
- Gas Stations
- Metro Stations, Bus Terminals
- Parking Lots Primary Health Centers, And many
- More

ADVANTAGES

a) Construction Time: Buildings are generally constructed in just 6 to 8 weeks after approval of drawings. PEB will thus reduce total construction time of the project by at least 40%. This allows faster occupancy and earlier realization of revenue. This is one of the main advantages of using Pre-engineered building.

b) Lower Cost: Because of systems approach, considerable saving is achieved in design, manufacturing and erection cost.

c) Flexibility of Expansion: As discussed earlier, these can be easily expanded in length by adding additional bays. Also expansion in width and height is possible by pre designing for future expansion.

d) Large Clear Spans: Buildings can be supplied to around 90m clear spans. This is one of the most important advantages of PEB giving column free space.

e) Quality Control: Buildings are manufactured completely in the factory under controlled conditions, and hence the quality can be assured.

f) Low Maintenance: PEB Buildings have high quality paint systems for cladding and steel to suit ambient conditions at the site, which in turn gives long durability and low maintenance coats.

g) Energy Efficient Roofing: Buildings are supplied with polyurethane insulated panels or fiberglass blankets insulation to achieve required “U” values (overall heat transfer coefficient).

CASE STUDY

Metro Rail Projects

Metro Rail Projects are new to India and hence many state governments have initiated metro rail projects to get relief from the congested traffic on road. A ballpark figure is estimated for the projected demand

arising from these projects in several cities is 176250 MT.

CONCLUSION

Pre-engineered steel structures building offers low cost, strength, durability, design flexibility, adaptability and recyclability. Steel is the basic material that is used in the materials that are used for Pre-engineered steel building. It negates from regional sources. Infinitely recyclable, steel is the material that reflects the imperatives of sustainable development, Based on the analytical and design results thereon of conventional and pre-engineered steel buildings, the following conclusions are drawn. It is also seen that the weight of PEB depends on the Bay Spacing, with the increase in Bay Spacing up to certain spacing, the weight reduces and further increase makes the weight heavier. To Conclude "Pre-Engineered Building Construction gives the end users a much more economical and better solution for long span structures where large column free areas are needed".

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