



PRE-ENGINEERED BUILDING AND ITS COST COMPARISON WITH TYPICAL R.C.C. FRAMED STRUCTURE

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ABSTRACT

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. This concept has many advantages over the Conventional R.C.C. structure. This paper is a comparative study of PEB concept and R.C.C. framed structure.

Keywords-Industrial steel building, Pre-Engineering Building, IS 875:1987 (LSM)

I. INTRODUCTION

An industrial building is any structure that is used to store raw materials, house a manufacturing process, or store the furnished goods from a manufacturing process. Industrial buildings can range from the simplest warehouse type structure to highly sophisticated structures integrated with a manufacturing system. These buildings are low rise

steel structures characterised by low height, lack of interior floor, walls, and partitions. The roofing system for such a building is a truss with roof covering. Design of basic elements of the structure (Roof deck, Purlins, Girders, Columns and Girts) is not difficult, but combining them into functional and cost effective system is a complex task.

In Industrial building structures, the walls can be formed of steel columns with cladding which may be of profiled or plain sheets, GI sheets, precast concrete, or masonry. The wall must be adequately strong to resist the lateral force due to wind or earthquake.

1.1 COMPONENT OF AN INDUSTRIAL BUILDING

The elements of industrial buildings are listed below.

- 1) Purlins
- 2) Sag rods
- 3) Principal Rafters
- 4) Roof Truss
- 5) Gantry Girders
- 6) Bracket
- 7) Column and Column base

8) Girt Rods

9) Bracings

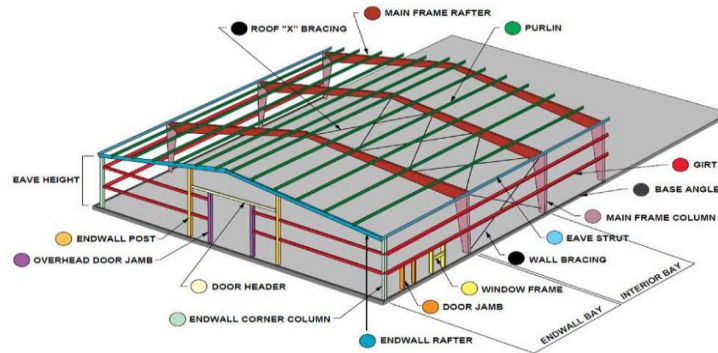


Fig 1: Various component of Industrial building

1.2 ADVANTAGES OF STEELCONSTRUCTION

1. High quality, aesthetic
2. Lower maintenance costs
3. Non combustible to fire
4. Steel is environmentally friendly
5. Components can be used again and again
6. Steel components are frequently functional
7. Steel construction is strong, durable and stable
8. Steel Construction promotes good design and safety
9. Construction with Steel is sustainable to Temperature effects
10. Steel frame construction is rigid in structure and dimensionally stable
11. Steel can be re-used without effecting the environment
12. Construction with Steel components is very fast compared to other materials
13. Steel construction of buildings with steel components is resistant to termites and other destructive insects.
14. Steel constructions are cheaper than any other construction methods

1.3 APPLICATION OF PEB

The most common applications of Pre-Engineered Buildings are:

- 1) Factories
- 2) Steel Mills
- 3) Sports Stadiums
- 4) Shipyards
- 5) Logistic Centers
- 6) Waste Treatment Factories

II. DATA ANALYSIS AND RESULTS OBTAINED

The comparative study has been taken out for conventional R.C.C. structure with Pre-Engineered building having the plan, footing details, roof truss of an R.C.C. building and column location plan of P.E.B with side wall excavation details. Detailed estimate has done by calculating quantity of each item and final cost of construction has estimated in abstract sheets. Following graphs shows the cost comparison in percentage.

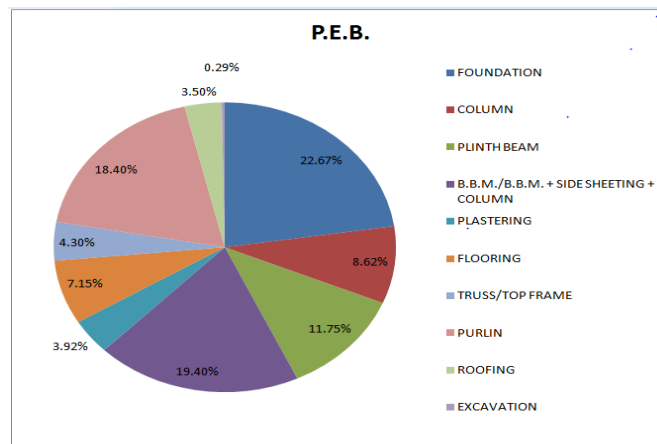


Fig. 2 Percentile cost of P.E.B. building (Itemwise)

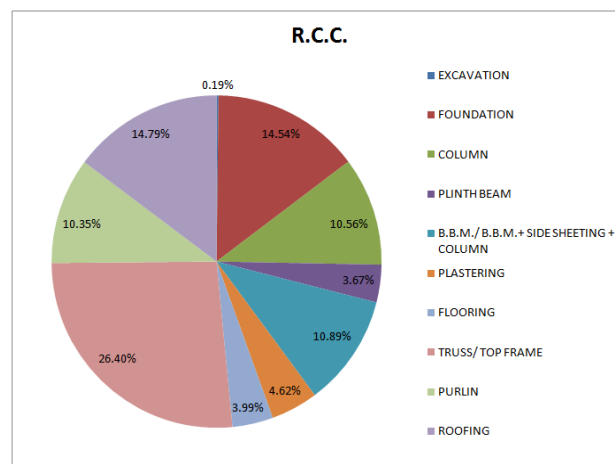


Fig.3 Percentile cost of R.C.C. building (Itemwise)

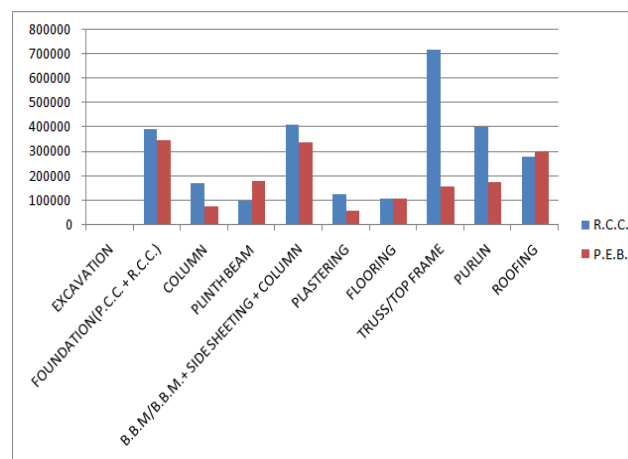


Fig. 4 Item-wise cost comparison between pre-engineering building and typical R.C.C. framed building

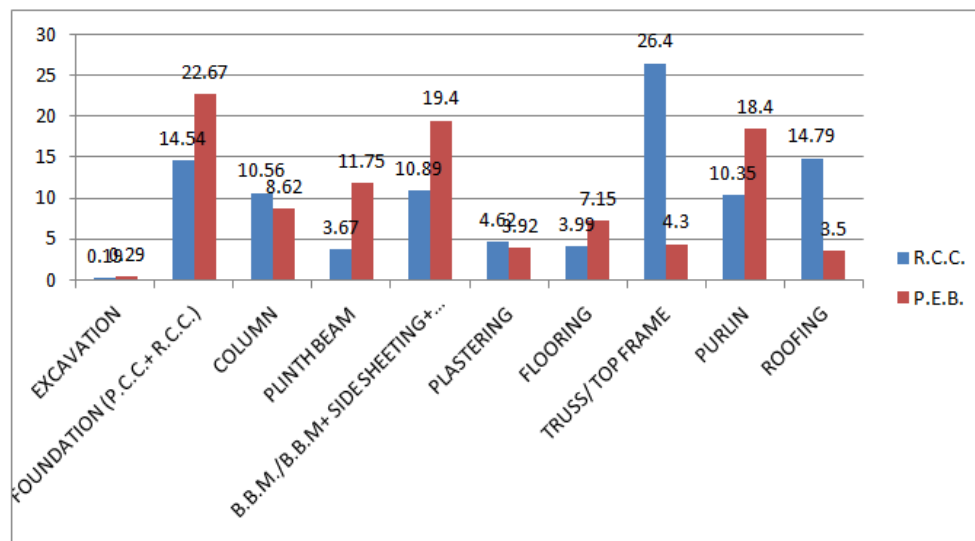


Fig. 5 Percentile item-wise cost comparison between pre-engineering building and typical R.C.C. framed building.

III. CONCLUSION

1. P.E.B. structure offers significantly higher strength to weight ratio over conventional R.C.C structure with truss and purlin configuration.
2. Speed of construction of P.E.B. structures exceeds for any conventional system thus reducing interest cost and increasing operation revenues.
3. P.E.B. structures are highly flexible, since they can be easily extended or dismantled. This allows the P.E.B. designer greater flexibility in choosing the layout and positioning of columns.
4. Analysis and test shows that double layered grid have much greater fire resistance than conventional structures. Hence they are ideal for higher risk industries such as chemical and textile.
5. P.E.B. has also greater resistance to horizontal earthquake forces.
6. P.E.B. components can be finished with a wider range of shop finishes.
7. On P.E.B. double layer grid can be assembled with a pre-fabricated element, which is precisely made insuring accuracy and speed in erection. The small size of components greatly simplifies handling, transportation and erection.
8. P.E.B. is generally used in industrial purpose.
9. P.E.B. structure provides overall economy for longer span and heavy loads, when compare to equivalent conventional structure such as R.C.C. beam- slab roofs, prefabricated and mass production can ensure.

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