International Journal of Research in Engineering, Science and Management
Volume-1, Issue-12, December-2018
www.ijresm.com | ISSN (Online): 2581-5792

Cost Comparison between Conventional Building and Pre-Engineering Building

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***Abstract*: In recent years majority of the projects in India are facing the issues of both cost overruns and schedule delays. By adopting the concept of pre-engineered buildings both these issues can be controlled. Pre-engineered structures have many advantages like optimized design, easier fabrication, long span, light weight, less wastage, increased productivity, improved quality reduced time and cost than the traditional buildings. In this study a cost comparison is done between both the traditional and pre-engineered buildings by selecting two projects. Literature review is carried out and presented facts associated with this concept. A detailed cost analysis is carried out between both the building's and concluded that pre-engineered buildings are more economical than traditional buildings depending on the factors like better planning, distance from manufacturing unit, proper handling, and type of buildings.**

***Keywords*: Manufacturing, Conventional building, and Progressive companies**

1. Introduction

India has the second fastest growing economy in the world and a lot of it, is attributed to its construction industry which figures just next to agriculture in its economic contribution to the nation. In its steadfast development, the construction industry has discovered, invented and developed a number of Technologies, systems and products, one of them being the concept of Pre-engineered Buildings (PEBs). As opposed to being on-site fabricated, PEBs are delivered as a complete finished product to the site from a single supplier with a basic structural steel framework with attached factory finished cladding and roofing components. The structure is erected on the site by bolting the various building components together as per specifications. PEBs are developed using potential design software. The onset of technological advancement enabling 3d modelling and detailing of the proposed structure and coordination has revolutionized Conventional building construction. Pre-Engineered Buildings (PEB) is the future for India. Most of the Indian business community is just started to realize the benefits of PEB's. Where you have been building with concrete for as long as anyone can remember, it is difficult to change. However India's most progressive companies are seeing the benefits of PEB's.

A. Objectives of the study

- Cost comparison between Pre Engineered Building and Conventional building.
- Estimation of quantities for all the items of Engineering Block (Pre Engineered Building) in Indu Projects Ltd.
- Estimation of quantities for all the items of Residential building (Conventional building) in Rajahmundry.
- To make a comparison between the Pre Engineered Building and Conventional building and to bring out the variations in cost and time of construction.

B. Basic parameters of a pre-engineered building are as follows

- Building height
- Building width
- Building length
- Roof slope
- Interior bay length
- End bay length
- Design load

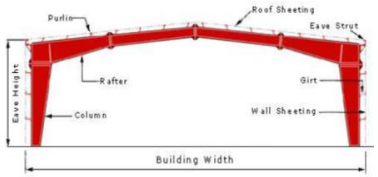

Fig. 1. Basic parameters of steel PEB (Pre-engineered building)

C. Components of pre-engineered steel buildings

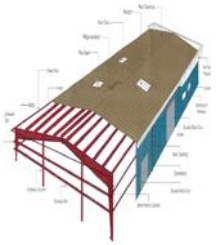

Fig. 2. Components of steel PEB

Generally there are eight major components of steel PEB and they are as follows

- Main frame or vertical columns
- Purlins, girts and eave struts

- Sheeting and insulation prefab panels
- Brick & Cement Board Walls
- Flooring
- Paints and finishes

2. Literature review

Sangale & Devalkar, 2015 The Indian construction industry is rapidly changing by adopting new and advanced construction technologies like Pre-fabricated components, timber framing system, steel framing system, block work and mould system etc. The new technologies help to build structures with high quality in low cost and time. C.Sivapriya & S.Senthamilkumar, May 2016 Pre-cast concrete construction issues are classified in to direct and indirect issues. Direct issues are production, handling, assembling, elements, connections, and demounting. Indirect issues are structural analysis, material used, technology, building physics, and equipment. Selective use of pre-cast concrete may be economical and time saving in both small and big projects.

3. Conventional building

A. Approximate estimating techniques at pre schematic stage

The main function of approximate estimating for the quantity surveyor is to provide a preview of the probable tender figure. He needs to do this for two reasons:

- To make the client aware of his probable financial commitment as early as possible to avoid the waste of expensive resources.
- To let the architect and / or client know if the design is at all feasible.

It is important to note that the first figure that the client hears is usually the one that he will remember. Hence it is equally important for the quantity surveyor not to overestimate as it is for him to under estimate. As already stated the estimate will only be as accurate as the information available and the skill of the estimator, however as the design develops and more information becomes available the certainty of accuracy should increase. The accuracy of the estimate will be reflected in the amount of price and design risk that is incorporated into the estimate: indeed many surveyors call the price and design risk element the 'Surveyors contingency sum'. Basically, approximate estimating can be divided into two parts:

- Preliminary estimates
- Later stage estimates

Preliminary estimates: These being to establish the broad financial feasibility of the project, for example the unit method. *Later stage estimates:* These being to produce a figure comparable with the lowest tender figure. The methods for the use by the quantity surveyor are as follows: Preliminary estimates

- Unit method Cube method
- Cube method
- Superficial method
- Story enclosure method

B. Later stage estimate

- Approximate quantities
- Elemental estimating

By careful choice of which method to employ at a particular stage during the design of the project, the quantity surveyor should then be able to meet the aims and objectives of cost planning and cost control systems.

4. Methodology

In the present study an Industrial steel structure with Conventional steel structure with concrete columns, Conventional steel structure with steel columns and 3.Pre-Engineered structure are considered for the analysis, design using Staad.Pro V8i. Conventional Steel Building of length 20 m and span 44 m. Bay lengths are maintained at an interval of 4 m along length. The height of the truss is taken as a minimum pitch that is 1/5th of span. So slope of roof is taken as 21.8˚and covered with GI sheet. The spacing of purlins is maintained as 1.35 m. The eave height of the building has been taken as 5.5 m in which 3 m from ground level is used for brick work and remaining 2.5 m is used for cladding. Pre Engineered Steel Building of length 20 m and span 44 m. Bay lengths are maintained at an interval of 4 m along length. For this structure from general practice slope of the roof is taken as 5.71˚. The spacing of purlins is maintained as 1.26 m. The eave height of the building has been taken as 5.5 m in which 3 m from ground level is used for brick work and remaining 2.5 m is used as cladding.

5. Results and discussion

Comparison between cost of pre-engineered building and cost of conventional building

Table 1
Results

Sl .No.	Description	Pre-engineered building	Conventional building
1	Total cost of the building	Rs 3,01,21,050.30	Rs 24,74,490.58
2	Plinth area in Square Meter	1984 Sq m	151.5 Sq m
3	Cost of building per Sq.m	Rs 15145.98 per Sq m	Rs 16333.27 per Sq m

From the above estimates it clearly say's that cost of the Pre-engineered building is less than that of conventional building and also less time is required for pre-engineered building than conventional building.

6. Conclusion

Steel constructions have a lot of advantages like quality, economy, low cost, aesthetics, and ecofriendly. So steel pre-engineered should be preferred. Steel pre-engineered building have a lot of scope in India because it can fulfill the shortage of housing, educational, health care institutions, airport, railway

stations, storages, and industrial buildings etc. proper supervision, handling, connections and short lead distance can made the project more beneficial.

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