

# ANALYSIS OF PRE-ENGINEERED BUILDING AND CONVENTIONAL BUILDING USING PRIMAVERA SOFTWARE

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**Abstract** - Prefabrication has been widely regarded as a sustainable construction method in terms of its impact on environmental protection. This project is based on analysis of Pre-engineered industrial steel building and conventional steel building. Two warehouses are selected for this case study located at Kasargod and Kannur dist, Kerala. In this study an effort is made to analyze the pre-engineered steel building and compare it with conventional steel structure for cost and time criteria. The planning and scheduling is done according to the requirements and the various activities included in the construction of the structure. These are done by using Primavera P6 software, which is one of the best project management software used nowadays in construction site. It found that pre-engineered buildings have 15% cost reduction as compared to the conventional buildings and the time duration reduced by 16 days.

**Key words:** primavera, time, cost, pre-fabrication and conventional method.

## 1. INTRODUCTION

### 1.1 GENERAL

Steel is a material which has high strength per unit weight. Henceforth it is utilized in industrial structures with large span column free space. An Industrial Warehouse is structure with large space and is generally constructed as single-story steel structures with or without mezzanine floors. The periphery of the area of these structures might be covered with stone work, solid dividers or Galvanized Iron (GI) sheet covers. These enclosure parts are non-load bearing, however adequately sufficient to withstand the lateral force due to the wind or seismic tremor. The industrial structure layout mainly consists of the component such as rafters, column, girts, bracing, girders, etc. For the construction of such building it uses both hot and cold formed sections. Modern buildings can be classified as Pre-Engineered Buildings (PEB) and Conventional Steel Buildings (CSB), as indicated by the structure ideas.

### 1.2 OBJECTIVES

- To know the sequence of the construction activities involved in the construction of PEB and CSB.
- To find out the time required for each activity in the construction process.
- To study the scheduling techniques followed in the industries to plan and schedule projects.
- Studying and managing of the construction project using Primavera software.
- Study the advantage of the PEB and Conventional building in terms of time and cost.
- Compare the variation in planned and executed schedule in progress of the work

## 2. METHODOLOGY

The data for project planning is collected in three main ways;

- Pre- data/information
- Collection of Site Information
- Collection of Post data or information

Pre-data collection is mainly used to accumulate the information or the data before the beginning of the work. The information might be from the past report investigations. The information so gathered is kept up as in the report form, which is fundamental to set the project objective. It likewise incorporates the gathering of the site information, the material required, the labor and the devices required.

Collection of site information is carried out by checking; daily progress report, monthly progress report, work output on each day and by making comparison of each activities.

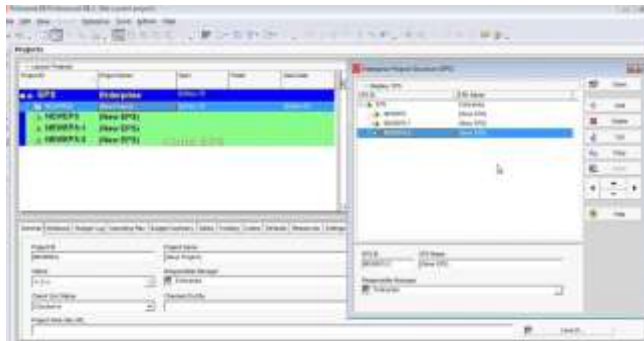
After collecting the data, it is implemented into Primavera Software and analyzed both the structure in cost and time preferences. Tasks performed in primavera;

- Setting up EPS and OBS
- Description of resources and authorities
- Assessment of WBS

- Description of budget
- Establishing project symbols
- Creating calendar
- Implement activity code and schedule
- Functioning with activities and budget
- Updating, scheduling and leveling
- Managing the schedule
- Tracking the process

**2.1 ENTERPRISE PROJECT STRUCTURE**

EPS is the chain of importance utilized in the task organization and furthermore the association of the organization level with structure of the project. The Organization breakage structure or the individual in charge of every movement ought to distinguish to make the EPS. Depending upon work of the Organization the EPS can be divided into quantities of nodes or levels.



**Fig-1: EPS**

**2.2 WORK BREAK STRUCTURE FORMATION**

The way towards dividing the activities into the sensible smaller segments to plan is called as work break down structure. The total work is divided into the individual segment in various leveled path in WBS. The task, resource allotment, responsibility of each activity and project control is characterized in the WBS.

**2.3 CREATING ACTIVITIES AND CALENDAR**

The making of calendar for the task is significant before assigning activities. The product enables us to make and allocate the schedule to the activities. This logbook gives the data of accessible working hours in the timetable day. In the logbook we can include the occasions, non-working days, and so on.

**2.4 SCHEDULING**

The graphical portrayal demonstrating the advancement of the construction activities with the

beginning date to the end date and the connection between the different activities in a project which empower the execution of the work in a systematic way and is called as planning. The project calendar will be included the data, for example, spending plan, length, resource portion, task term and respectabilities of the different activities.

While scheduling, there is lag in the superstructure construction process for the conventional structure as compared to the PEB structure. This is because; the structure needs many alterations and corrections during the project undertaking. But the PEB structure is in completely knock-down condition with precise regulations in molding.



**Fig-2: Schedule for Conventional steel structure**



**Fig-3: Schedule for Pre-engineered Structure**

**3. RESULTS and DISCUSSION**

The schedule for the two types of configuration are done using the Primavera Software. The different activities involved in the both type of structures is worked out and the activities are assigned with starting and the ending dates. Based on these activities the schedule is prepared for the PEB and CSB structure. The approximate budget is made for the both of the structure and the comparison is made based on the schedule and the budget for the both options. On the basis of these parameters the best system is selected. After that the monitoring for the actual progress of the work in

the site is done for the system to check the actual schedule required and the factors effecting variation are studied.

**3.1 TIME ESTIMATION**

Completion time (CSB=150 days, PEB=136 days)

According to scheduling, the time required for sub-structure work is same for the both structures, but the time required for the construction of the super structure differs. The time required for the superstructure is 45 days for the conventional structure but the same for the PEB is 25 days. While dealing with the PEB construction a lag of 20 days occurred due to the delay in the material supply. But it is compensated in the erection time by making the activities in a fast manner.

**3.2 Cost Estimation**

**Table -1:** Cost estimation of PEB

Sl. No.	Item detail	Amount(INR)
1	Foundation	700000
2	Brick work - Basement	166500
3	Earth Filling	1050000
4	PCC	462500
5	Plinth beam	165000
6	Floor Slab	660000
7	PEB	2250000
8	Brick work - Super structure	943500
9	Plastering	448000
10	MEP works	337500
11	Painting	256000
12	Door and Windows	255000
13	Misc cost	200000
		Total =7894000

**Table- 2:** Cost estimation of CSB

Sl.No.	Item detail	Amount(INR)
1	Foundation	756000
2	Brick work - Basement	166500
3	Earth Filling	1050000
4	PCC	462500
5	Plinth beam	165000
6	Floor Slab	660000
7	Roof Truss	3500000
8	Brick work - Super structure	943500

9	Plastering	448000
10	MEP works	450000
11	Painting	256000
Sl.No.	Item detail	Amount(INR)
12	Door and Windows	255000
13	Misc cost	200000
		Total = 9312500

From the table it can be seen that the PEB costs less than the truss structures. This is due to the reduction in the material required and the fast completion of the work. The truss structure cost around 93 lakhs that for the conventional steel structure is 80 lakhs. So, there is a 15% reduction in the cost of construction for the PEB as compared to the truss structure. The usage of steel is comparatively high in CSB than PEB. The PEB uses tapered section most of the time instead of providing the uniform section throughout the length.

**4. CONCLUSIONS**

1. Pre-engineered buildings are well equipped with advancement technique of construction, one-point sources, cost effective design, etc. So we can conclude that, Pre-Engineered building is to be the most efficient type of structure in terms of time and cost of construction.
2. There is reduction in the cost by 15% as compared to that of the Conventional structure. So it can be concluded that PEB buildings are less costly as compared to the conventional steel structure.
3. Better quality control can be achieved in the case of the PEB as everything is manufactured in the factory under good super vision as compared to the conventional truss structure.
4. Erection and assemblage is done in the site and all other work is done in the fabrication yard in the PEB. Therefore it is concluded that, the time duration of the project in the case of PEB is less as compared to that of conventional truss structure.
5. Since there is a complete knock down condition in the case of pre-engineered building, it is concluded that pre-engineered buildings are easy to construct and dismantle when compared to conventional steel structure.
6. From the study it can be concluded that the pre-engineered buildings are the better system for the industrial warehouse as compared to the conventional truss.

## 5. SCOPE FOR THE FUTURE STUDY

- In this study, due to the short time span, the scheduling and cost comparison is done. Further other monitoring of the complete construction can be done and the schedule can be updated according the pace of construction.
- The study can be continued further by using the different tools of primavera such as resource management, delay analysis and resource leveling.
- In future the study can be further extended by using other software available for the project management like Microsoft Project and future the results also can be compared with primavera software.

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