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Cost Comparison between Conventional Building and Pre-Engineering Building

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ABSTRACT: it's a composite structural material made up of tiny portions of cement mortar strengthened by many layers of steel wire mesh positioned closely together. Because of the low self-weight, there is no need for more specialized labour or formwork in the construction business.

Hexagonal wire meshes, welded wire meshes, woven wire meshes, expanded metal meshes, and three-dimensional meshes are all employed in Ferro-cement. A multi-layered chicken wire construction can be used to create the desired shape, which can then be reinforced with steel wire or steel bars if necessary. A suitable mixture of cement, sand, and water is spread over the completed framework. The Ferro-cement is kept moist throughout hardening to ensure that it sets and hardens properly. When compared to R.C.C., the quantity of PEB required in building construction is significantly smaller. As a result, the dead load of a PEB structure is decreased by at least 50%. As a result, the foundation cost is lowered. When the cost-time for each material used in the building industry was compared, it was discovered that the material that comprises The most suitable alternative to the existing traditional approach such reinforced cement concrete is the construction method, new techniques, and installation process.

KEYWORDS: Pre-engineering building, conventional, Construction management, Pre-engineering building construction, time and cost analysis, quality and productivity

I. INTRODUCTION

1.1 General Introduction

Pre-engineering building is a simple technique that entails producing structural elements in the proper or good environment, as well as to the required quality, then transporting them to the job site in the proper or good environment (i.e. on trailers, long trucks) and erecting these elements on the proper location as shown in the drawing with the help of tower cranes. Pre-engineering building construction is a type of construction that involves pouring concrete into a reusable mould or form, curing it in a controlled environment, then transporting it to the job site and lifting it into position.

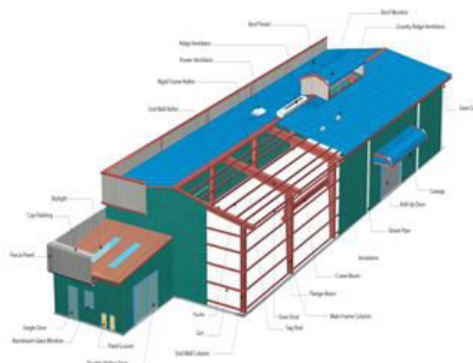


Figure1.1: Pre-Engineering Building

Pre-engineering building is given the opportunity to cure properly and be continuously monitored by plant staff by being produced in a controlled setting (usually referred to as a Pre-engineering building plant/Pre-engineering building



Factory). In the Indian context, Conventional construction is gaining traction, particularly in metropolitan areas. General Conventional, which is sector specific, such as buildings, power distribution, and water supply, is dispersed throughout India. This area, too, necessitates the participation of prominent actors.

What is Cost?

Expense incurred by a contractor for labour, material, equipment, financing, service utilities etc. plus overheads and contractors' profit. Cost of land, architectural design, fee of consultant and engineer are not construction costs.

Types of cost Fixed Costs

- ❖ **Fixed costs** are those that do not change throughout the life-cycle of a project. For example, if construction of road is there, the excavators and bulldozers are fixed costs. For software development projects, the physical development space and development computers are fixed costs to the project.
- ❖ **Direct Costs** Direct Cost are expenses that come out of the project budget directly. For example, if outsourcing some of the development work, the developers are expected to put in a specific amount of time, which is then billed for. The developer salaries are direct costs.
- ❖ **Sunk Costs** Sunk costs are those that have been incurred in a project, but have not produced value towards the project's objectives.

Factors Affecting Construction Cost

There are many factors which affect the construction cost estimate and have significant impact on project cost and they are as following:

- ❖ **Similar Construction Projects:** For the construction estimate, the best reference will be similar construction projects. The final cost of those similar projects can give the idea for the new construction project cost calculation. The final cost of past project needs to be factored with current construction cost indices.
- ❖ **Construction Material Costs:** Construction material cost consists of material cost, shipping charges and taxes applicable if any. So, it is important consider all these variations while calculating construction material cost.
- ❖ **Labor Wage Rates:** Labor wages varies place to place. So, local wage rate should be considered in calculation. If the project has to be started after several months of estimating the project cost, the probable variation in wage rates has to be considered in the calculation.
- ❖ **Construction Site Conditions:** Project site conditions can increase construction costs. Site conditions such as poor soil conditions, wetlands, contaminated materials, conflicting utilities (buried pipe, cables, overhead lines, etc.), environmentally sensitivity area, ground water, river or stream crossings, heavy traffic, buried storage tanks, archaeological sites, endangered species habitat and similar existing conditions etc. can increase the project cost during construction phase if these variations are not considered during estimation.
- ❖ **Inflation Factor:** A construction project can continue for years before completion. During the construction period, the cost of materials, tools, labors, equipment etc. may vary from time to time. This variation in the prices should be considered during cost estimation process.
- ❖ **Project Schedule:** Duration of construction project is affects the cost. Increase in project duration can increase the construction project cost due to increase in indirect costs, while reduction in construction cost also increases the project cost due to increase in direct costs. Therefore, construction project schedules also need to be considered during project cost estimation.



- ❖ **Quality of Plans & Specifications:** A good quality construction plans and specifications reduce the construction time by proper execution at site without delay. Any vague wording or poorly drawn plan not only causes confusion, but places doubt in the contractor's mind which generally results in a higher construction cost.
- ❖ **Insurance Requirements:** Cost estimation for construction projects should also need to consider costs of insurance for various tools, equipment, construction workers etc. General insurance requirements, such as performance bond, payment bond and contractors general liability are normal costs of construction projects. In some special projects, there can be additional requirements which may have additional costs.
- ❖ **Size and Type of Construction Project:** For a large construction project, there can be high demand for workforce. For such a requirement, local workmen may not be sufficient and workmen from different regions need be called. These may incur extra costs such projects and also for the type of construction project where specialized workforce is required.
- ❖ **Location of Construction:** When a location of construction project is far away from available resources, it increases the project cost. Cost of transportation for workmen, equipment, materials, tools etc. increases with distance and adds to the project cost.
- ❖ **Engineering Review:** Sometimes it is necessary to carry out technical review of construction project to make sure the project will serve the required purpose with optimum operational and maintenance cost. This review cost shall also be added to the project cost.
- ❖ **Contingency:** It is always advisable to add at least 10% contingency towards the total project costs for unforeseen costs and inflation

Conventional: A Beginner's Guide

What Is the Benefit of Conventional Building?

The usage of Conventional members for manufacturing members quickly while still satisfying the specified strengths is the new boom in the construction sector. The primary benefit of employing Conventional concrete members is their speed of installation, as well as their adaptability and design flexibility.

These members' accomplishments are of exceptional caliber. With these, we can quickly build greater spans in one go. They cover every phase of pre-engineering construction, making building easier. Conventional concrete members are attractive and well-finished. No additional or significant form work is required. These members are structurally sound and long-lasting. The project's labour and maintenance costs have been cut. The key benefit of using these members is that it requires less building time and is environmentally beneficial.

Conventional construction is used in a variety of ways.

concrete is becoming more widely used these days. Building construction (columns, beams, and slabs), bridge construction (bridge girders and decking), tunnel lining members, railway slippers, and road pavement blocks are just a few of the applications for Conventional concrete.

Time Contrast

Because the prefabricated materials and elements are delivered precisely in time and placed on site, the Pre-engineering building method saves time by reducing needless handling and equipment use. This allows other professions to start working more immediately, reducing construction time and cost while minimising disruption to the surrounding area. Because concrete requires a minimum of days to acquire 99 percent of its total strength, the cast-in-situ method of concreting takes a long period. It takes a lot of time and effort, making it far less cost-effective than the Conventional process. Pre-engineering building concrete shines in most building projects when speed of construction and tight construction schedules are important objectives. These two things should be considered in order to increase the benefits of Pre-engineering building:

- Plan the layout of the building to maximize the use of Pre-engineering building modules.



- Optimize the quantity of standardized components by designing building details.

The data obtained from Pre-engineering building manufacturers was used to calculate the duration of a Pre-engineering building. The project's completion time was divided into three stages: substructure, superstructure, and finishing works. Where the cast in situ and Pre-engineering building substructures took the same amount of time to complete, the Pre-engineering building superstructure was completed faster since the walls and slabs were manufactured off site and put on site during the project.

Cost Analysis

Conventional is an excellent choice for creating a residential structure since it allows for the mass manufacture of similar pieces in large quantities, lowering costs. Conventional concrete offers cost-effective durability, flexibility, and sound durability. The Conventional technology, as advocated by Building and Planning, also has lower maintenance costs. The cost of Conventional varies depending on the kind and size of the structure. Due to the lack of bulk production of elements, the cost of Conventional increases for a small project; however, the cost of larger projects may be greatly reduced. Activities such as foundation, column, beam, and slab building can be segregated in a home project. In the table below, the same element is shown as a percentage of the total cost of a multilevel vehicle parking project. The costs of building the footing, columns, beams, and slab using steel frame, Pre-engineering building frame, or a mix of the two are compared. More cost-effective is a Pre-engineering building frame with a Pre-engineering building concrete floor.

The Pre-engineering building frame with concrete floor is 23.10 percent less expensive than the steel frame with composite deck floor in terms of direct cost. However, in one of the case studies of a double-story residential building, it was discovered that the cost of construction using Pre-engineering building materials was 13% more than the cost of construction using cast-in-situ elements. This is because, while prefabricated construction has an advantage in the construction of massive, industrialized infrastructure, its use in the construction of individual residences in India has been fraught with difficulties. Because labour wages in industrialized countries are relatively high, construction businesses boost capital investment in order to reduce labour input.

Prefabricated construction, on the other hand, is more cost effective because it consists primarily of machine-made products and requires less labour intensive work. On the other hand, construction companies in developing countries such as India rely heavily on cast-in-situ, which takes advantage of the low cost and large number of labour inputs to achieve better cost savings than prefabricated construction.

Productivity

The labour productivity of a structure built with a Conventional system is higher than that of a structure built in-situ. When compared to the CIS approach, Conventional takes less time to install structural components. The variability of productivity with the Conventional process is relatively low, implying that productivity numbers are steadier over time. Efficiencies lost throughout the construction process are also examined. It is proved that the loss of efficiency in the Conventional method is reduced as a result of a lower labour force at Conventional construction sites. The labour efficiency of the project has an impact on the project's cost. The baseline productivity for the methodologies, the Conventional component unit rates, and the productivity factors' link to construction productivity were discovered. This study used questionnaires, interviews, a video camera, and secondary data such as project schedules, monthly progress reports, and other pertinent materials related to construction labour productivity to gather data.

A study of the severity and relative impact of five delays reasons on total system productivity of forty installation cycle times, including labour, management, environmental, equipment, and material. Second, three Pre-engineering building components were used, and a statistical study of their installation cycle time was performed to see if the delay induced by the prior procedure was due to Pre-engineering building segment variation. While the government should encourage the construction of concrete manufacturing plants, onsite production can be enhanced by building a decision model that can be used by suppliers, contractors, and managers to help meet the expanding demand.

Goodness

In the construction industry, technological advancements are changing the way things are done. Companies who continue to use traditional construction methods have no chance of succeeding in today's competitive business environment. Adoption of new technological trends and methodologies is critical to the success of businesses and the growth of the sector. Pre-engineering building concrete solutions can help to cut down on on-site waste.



1.2 Background Information

To solve the problem of or to fulfil the housing need specially in urban area it is very important and necessary to adopt some new advanced technology in the method of construction than the traditional method of construction. Construction is a complicated process where each construction activity involves money and time. At present the methods of construction are cast in situ construction, Pre-engineering building concrete construction technology, mivon technology etc. when each and every component of a structure is cast at place, it is called cast in situ technique of construction. When the components are casted before actual construction in industry or on site called Pre-engineering building concrete technology; Pre-engineering building concrete technology has many advantages such as speed, precision less wastage of construction material, high quality control, timely completion, requirement for skilled is minimum, safety, saving in material for formwork, eco-friendly as compared to cast in situ technique.

1.3 Aim

To study cost-benefit analysis, in order to establish the economic feasibility associated with the implementation of different material and the benefits can be compared with the costs, and the net profit of each management alternative can be also determined. To make a comparison between the Pre Engineered Building and Conventional building and to bring out the variations in cost and time of construction

1.4 Problem Definition

“This study attempted to determine how much profit and efficiency of construction projects could be increased using new materials like ferrocement & etc. This study also explored and evaluated differences between constructions in India, by analyzing the traditional material like Mesh & etc for Conventional Building over Pre-engineering Building. We reduce the cost and get more benefits and to analysis resource management for pre-engineering building,”

1.4 Scope for Construction

From the Literature review analysis it can be said that the Pre-engineering building concrete system is economical than conventional cast in place method,

The cost difference is found to be around in cr. but still there are some conditions which we have to take care of while using Pre-engineering building, those are quantity of construction, Distance of site from manufacturing unit.

Type of building etc. we have identified that for standard & Repetitive work Pre-engineering building is the best option to choose. The main limitation of Pre-engineering building is transportation from place of manufacturing to place of site where it is to be fixed

1.5 Objectives

- To study Effect on total project cost and benefits and advance construction techniques.
- To minimize energy costs / waste without affecting production & quality and to minimize environmental effects and to identify the source of wastes for specifically chosen activities at a construction site and relate them to the waste generate in construction industry
- To find the differences in cost by analyzing construction project cost between RCC structure and PEB structure
- To find how much time need to complete one project using Reinforced concrete and PEB.
- To find for repair of construction work which material is feasible for implementation and their pros and cons

II. LITERATURE REVIEW

Bailey et al. (2020) COVID-19 Pandemic: The Effects and Prospects in the Construction Industry

Highlighted the impact of COVID-19 pandemic and how it is being managed. This pandemic is having a substantial effect on construction projects; however, the legal implication varies from contract to contract, nations to nations. Although, the pandemic was not rendering projects to incomplete, but was slowing processes causing disruption and delay.

The projects have stopped completely to commence work at a later date. Health and safety risk assessments need to be considered to be consistent with scientific, medical and government guidelines; for instance, people working in an



enclosed environment are at higher risk than people working outside. COVID19 being an unforeseeable circumstance can be considered to be a force majeure occurrence. Force majeure under any standard form of contract, will usually afford contract extension of time for the delay during the pandemic and not compensation for cost. Evertheless, any new regulations given by the public authorities may have legal effect and override any contractual position/obligation initially laid down before the commencement of the projects

P.KarthigaiPriya, M.Neamitha “A Review of Pre-engineering building”. (IRJET) Jan 2018

Most of the construction activities in India take place by conventional cast in situ method of construction. But still there is a huge demand for housing in India. So the construction activity has to take place in a much faster way. This cannot be achieved by conventional method of construction. It can be done possible with Pre-engineering building concrete of construction. Moreover there are more advantages of Pre-engineering building concrete when compared with conventional one. So various literatures are studied and a review of those all has been given in this paper. Also the advantages and disadvantages of Pre-engineering building construction are also discussed here

A Data Technology Oriented to Information Fusion to Build an Intelligent Accounting Computerized Model Ziyang Xu and Wenxue Zhou, Scientific Research Article 8 December 2021

This paper improves the big data technology, improves the traditional accounting process, combines the big data technology to build a computerized accounting system, and obtains scientific and effective accounting information processing results through intelligent big data processing the design goal of the enterprise accounting management system is that the system can efficiently complete the enterprise cost budget accounting work after the design is completed and ensure the normal and stable progress of the enterprise cost budget accounting work. Through the experimental research results, it can be known that the computerized intelligent accounting system based on big data technology constructed in this article has certain effects.

COMPARATIVE ANALYSIS OF PRE-ENGINEERED BUILDING AND CONVENTIONAL STEEL BUILDING BY STAAD PRO Mr. Hitesh Jibhate, Prof. Dilip L. Budhlani, International Research Journal of Modernization in Engineering Technology and Science, July 2021

Technology that provides structures that is cost-effective, environmentally friendly, and long-lasting. Prior to the implementation of the PEB system in steel structure construction, the conventional steel building (CSB) method was employed, which provided time-consuming and costly design. The CSB is more expensive since it consumes more steel due to the utilization of a consistent cross-section of the hot-rolled section throughout the member length. However, only bolted connections are given at the construction site based on the loading effect built-up section employed in PEB. PEB saves time and provides a lightweight construction, making it preferable to CSB when the span is considerable and column-free area is necessary.

Cost Comparative Study of PEB with Conventional Method for Industrial Building, Ms. Shalaka Patil, IJARIE 2021

Concept is totally versatile not only due to its quality, prefabrication, and light weight and economical construction. The study is achieved by time and cost performance in industrial construction for pre-engineered building. In this, industrial shed has been designed (only primary framing members) using conventional steel bldg. concept and PEB concept and the comparison of design results of that structure had been carried out in details. The Present work involves the comparative revise of Pre-Engineering Buildings (PEB) and Conventional steel Building (CSB). Conventional Steel Building is old concept which takes lots of time, quality and typical erection factor to modify that issues Pre-Engineering concept is developed.

Study on Comparison between Prefabricated and Conventional Structures, Suraj kinase, Gajanan Gaikwad, International Journal of Research in Engineering and Science (IJRES) 2021

The paper based on time comparison of PEB concrete vs. cast-in-place (i.e. traditional) concrete. How total time of construction by PEB concrete system is less than the time by use of cast-in-place concrete. Time of any construction is directly varied with cost of construction. The time required for steel binding, shuttering, concreting then time required for curing will be minimize



Advantages of Pre-Engineered Building over Conventional Building Rajnandan Verma, Raghvendra Singh, International Journal of Innovative Technology and Exploring Engineering (IJITEE), January 2020

The cost and time of construction is in more priority for the client with the large working area for various uses. For the economically and minimum loss of material, pre-engineered building system (PEBs) has many advantage, because it gives more column free space at low cost. Pre-engineered metal buildings are more reliable for various uses like complex industrial facilities, warehouses and distribution centers, stock-house, shopping malls, resort, motor court, office, cabin, service complex, aircraft-hanger, athletics and fun stadium, study places, temples, hospitals, and any types of industrial structures. In the pre-engineered metal building system, the rigid frame consists of slab, wall are connected with primary member (beam and column)

Benefits and Challenges of PEB Construction in India – A Review, Azharuddin Ahmed, International Journal of Civil Engineering, July 2020

There are more advantages of PEB concrete construction over conventional one. So various kinds of literature are studied and reviewed, some of those have been given in this paper. PEB engineering's unique approach to construction brings a new facet to civil engineering as well as contributes opportunities to the transportation sector of the country. Undoubtedly it is one of the most beneficial techniques in construction and hopefully shall become a leader in the development of housing and metropolitans of our country. The following study analyses different aspects including PEB construction materials, designing, and calculations as well as economic advantages and limitation of PEB construction engineering

A Review on “Comparative Study between Cast-In-Situ Construction and Prefab Construction using Primavera Software” Mr. Sarvapalli S. Ikhar¹ Dr. Leeladhar S. Pammar, International Journal for Scientific Research & Development | Vol. 8, Issue 3, 2020

For effective construction management time is most important aspect, so there is necessity of many alternative building materials to minimize the duration of project. Prefab construction and off-site manufacturing have been a part of building construction process for a long time in many countries. This prefab constructed building sets an example of cost effectiveness and rapid construction process to reduce duration of project along with maintaining safety, environmental sustainability and enhance modularity in construction. A literature study was performed in order to gather information and data to study the difference between the cast-in-situ constructed buildings with prefab constructed building. During this study it is analyze that, time and cost require for prefab constructed building is comparatively less than cast-in-situ constructed building.

Cost Comparison Between Normal Building and Green Building Considering Its Construction and Maintenance Phase, Sneha S. Nagrale, International Journal of Scientific Research and Engineering Development— Volume 3 Issue 4, July –Aug 2020

This paper suggest some methods to opt the concept of green building without with minimum changes in cost needed for construction as compared to the conventional building. Also, it includes the sustainable and economic studies with references to the Indian contexts with a supporting live recent case study of a newly designed and constructed luxurious residential bungalow in a small town in India. The case study is specially selected as a residential building which is designed and constructed as a sustainable and a green structure. Increase efficiency in life cycle cost of building with the help of green building materials is the main motive of this research. This research study is related to selection of materials, which take less cost with same material properties after analysis of materials with the help of Revit software. This research study compares normal building and green building in construction and operational phase. This research will also helpful to find out how much extra cost required to construct green building and how much cost saves in energy consumption in life cycle period of green building.

Comparative Study of Warehouse Structure in P.E.B. with C.S.B. 1Bhupesh Kumar, International Journal of Trend in Research and Development, June 2020

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,



In this Paper it is noted that the Cost Analysis of PEB as consistent with Indian code structure by 45.36% and Cost Analysis of PEB as consistent with American code structure with the aid of 50.78% as compared to lesser than the Cost Analysis of CSB structure.

Comparative Study Of Pre Engineered And Conventional Steel Building HumanaazArifQureshi, Dr. Kuldeep R. Dabhekar, IOSR Journal of Engineering (IOSRJEN), Dec. 2019

This system is used worldwide due to its more quality control, less weighted member and economical design. This paper is the advantages of the PEB system over the CSB system. In this paper a comparative study of PEB and CSB carryout.

M. Harish, J.D. Chaitanya Kumar, "Analysis of multi Storey Building with Pre-engineering building load bearing walls with and without openings" (IJCIET) Jan 2017

In the present days population is growing rapidly, to meet the requirements of population multi storied building with rapid construction. In this present residential building is considered for analysis. Pre-engineering building structural system is considered in this present work for rapid construction. The total Building consists of the Pre-engineering building load bearing members walls and slabs in this research paper Pre-engineering building is constructed with shear walls for earthquake resistant design considering with and without openings. Shear walls are mainly used for earthquake resistant structure which are highlighted due to many calamities. by keeping all the above factor under consideration the paper is worked out by analyzing 2 buildings i.e. conventional building and Pre-engineering building shear wall building under 4 different zones

Akash Lanke, Dr. D. Venkateswarlu, "Design, cost & time analysis of Pre-engineering building& RCC building" (IRJET) June 20

In this study we have carried out detailed study of various concepts of Pre-engineering building, go through number of literature & found the facts associated with it. We have taken one building as a case & Design the same building as a Pre-engineering building& Traditional Cast in-situ building. Here we have made cost analysis as well as feasibility check on basis of costing & Duration. For more practical study we have visited the two on-going construction sites of Pre-engineering building& cast in-situ & gathered required information, From this analysis It is remarkably seen that the cost of Pre-engineering building is significantly reduces & duration of construction is also much lesser than traditional method. From all this study we can be conclude that the Pre-engineering building concrete system is economical than conventional cast in place method but still there are some conditions which we have to take care of while using Pre-engineering building, those are quantity of construction, Distance of site from manufacturing unit, Type of building etc.

Vakas K. Rahman, prof. A.R.Mundhada," Comparative study of RCC and pre-stressed concrete flab slab" (IJMER) May 2013

This paper presents the comparison of R.C.C. and Pre-stressed Concrete Flat Slab. This work includes the design and estimates for R.C.C. and Pre-stressed Concrete flat slabs of various spans. The aims of this work are to design R.C.C. as well as pre-stressed concrete flat slabs for various spans and then compare the results. Programming in MS EXCEL is done to design both types of flat slabs. The idea is to reach a definite conclusion regarding the superiority of the two techniques over one another. Results reveal that a R.C.C. flat slab is cheaper than pre-stressed concrete flat slab for smaller spans but vice versa is true for larger spans.

Lovneesh Sharma, NileshwarTaak, "A Comparative study between the pre-engineered structures and conventional structure", J.MATPR March 2020,

Pre-engineered buildings are mainly prepared using predesigning and prefabrication process. The advancement in the pre-engineered building construction approach involves time limitation, cost-effectiveness, improved structural behaviour and advanced architectural view. Pre-engineered buildings are becoming an effective replacement of conventional steel buildings in every aspect. It shows more advanced results in case of cost comparison, construction time, quality parameters and architectural point of view. The main objective of the current study is to compare pre-engineered steel buildings and conventional steel building in every aspect. A pre-engineered building was designed and then comparative analysis was done concerning a conventional building with the same configuration.



Anoj Kumar Dubey, “Comparative Study on Various Behaviors of an RC Structure with Pre-stressed Concrete Structure, Research Gate”, January 2019,

This paper deals with the various structural behaviour of a multi-storied RC Convention Centre building having large spans of around 32 m. The effect on the structure due to these large spans is compared with both RC and pre-stressed concrete. The roof slab of the auditorium portion of the structure is designed with normal RCC and compared with Slabs resting on Pre-stressed Post-tensioned Girders using the software Adapt Builder 2016. A comparative study between RCC and pre-stressed concrete is also done. Diaphragm action of the structure is considered for seismic design in order to provide a monolithic action and hence to counteract the effect of torsion. A comparative study is done with and without considering the effect of torsion into account and the results shows that in higher seismic zones the effect of torsion is predominant and proper care should be given to extreme columns and corner columns which are more vulnerable to failure. Response spectrum analysis of the structure is done in STAAD.Pro and storey response plots are obtained.

Hari Prasad M “Comparative Study between Pre-engineering building and Cast In-Situ Structure Under Combination of Connections between Pre-engineering building Elements, IJSRD 2016

Pre-engineering building system offers a wide range of benefits and advantages to the designer to meet all the client's requirements. The rapid growth in usage of Pre-engineering building systems demands the improvement of its structural behavior when it is subjected to dynamic loads. This Project deals with the analysis and design of Pre-engineering building Substation building with Crane (5tons capacity) subjected to Dynamic loads due to Earthquake. In order to justify its structural behavior, the cast in-situ structure is also analyzed and compared with Pre-engineering building structure.

Sukhi V. Sendanayake David P. Thambiratnam Nimal Perera Seismic mitigation of steel modular building structures through innovative inter-modular connections, Elsevier, 25 October 2019

The proposed connections have an additional steel plate and resilient layers to provide increased ductility and dissipation of seismic energy with desired ductile failure mechanisms. Three-dimensional numerical models of the proposed connections are developed in ABAQUS software considering geometric and material nonlinearities, as well as contact formulations to accurately capture their response to the lateral loads and failure propagations. The numerical model is verified based on experimental results in the literature and used for extensive parametric studies. Seismic reliance of the proposed connections in terms of ductility, failure patterns, and energy absorption are compared with those of a standard inter-modular connection currently used in modular buildings. The outcome of this study demonstrates that the proposed connections have superior dynamic performances compared to the standard inter-modular connections in use today. New information generated through this study will enable to improve life safety and dynamic performance of modular building structures under typical gravity loads as well as under seismic loading.

Bhanu Prakash P.M, T A Srirama Rao “Review On Comparative Study On RCC And Steel Structure For Different Criteria's”, International Journal of Multi-disciplinary Educational Research 2021

This study investigates about the composite structure is gaining more popularity in developing countries. For medium and high rise building in RCC structure is no longer economical because of increase dead weight, span restriction, low natural frequency and hazardous formwork. Steel and concrete composite structures are becoming more popular nowadays and safe over its design life span. The steel and concrete constructions are best solution for modern buildings. In this paper we have discuss the various results of the building construction for RCC, Steel and composite structure considering different researches.

Nagaraju Kaja, Anupam Jauswal, “Review of Pre-engineering building Concrete Technology in India”, International Journal of Engineering Research & Technology (IJERT) June-2021

Various technical studies show that the application of Pre-engineering building technology is only 2% (approx.) of the total Indian construction industry. Presently the adaptation of Pre-engineering building concrete construction (PCC) technology is limited to infrastructure projects like Metro, Monorail, Bridges, etc. This research paper studied the different methods and components of Pre-engineering building concrete technology. This paper also reflects the various



factors which should be taken care of to increase the adaptation of PCC technology in the Indian construction industry. The research suggested that the application of PCC technology is a sustainable method to achieve a high quality along with lesser consumption of resources like cost and time during the construction.

UmamaheswaraRaoTallapalem, et.al “Time History Analysis on Pre-engineering buildingBuilding Connections”, International Journal of Recent Technology and Engineering (IJRTE) November 2019

In present study we consider the three types of Beam-columns connections such as Rigid connection ,semi-Rigid connection and Hinged connections are developed in G+20 High rise building .These High rise building analyzed with help of Time history analysis of High Seismic waves, Moderate Seismic waves and Low seismic waves .It helps to Identify the behaviour of connections and The results of Top Displacements , story Drifts and Inter storey Drifts are compared for the Different connections and Different Seismic waves.

Raviraj S. Gaikwad1, Dhananjay S. Patil, THE ECONOMICS OF LANDFILL MINING, IJRETS: International Journal of Research in Engineering, Technology and Science, Volume XIII, Issue VIII, September, 2020

Landfill mining of municipal solid waste is a technology that combines the concepts of material recycling and sustainable waste management. In this research work, an economic feasibility was assessed for landfill mining scenario. Initially the cost-benefit framework was prepared which has included seven indicators of costs and seven indicators of benefits of landfill mining scenario. The cost-benefit framework was applied to a selected case study and the cost-benefit analysis was performed for assessing an economic feasibility of landfill mining scenario for the same

International Conference on Sustainable Engineering Techniques (ICSET 2019), IOP Conf. Series: Materials Science and Engineering 518 (2019), Impact of the Feasibility Study on the Construction Projects, SawsanRasheed Mohammed, Hafeth I. Naji, Rouwaida Hussein Ali

A Feasibility studies include recognizing and analyzing the power and the flaws of the project, in conjunction, also defining the chance and intimidations external the company within the construction industry. There are a number of problems of the feasibility study as it regards overlooked part in Iraqi construction industry and the problems of feasibility studies abuses. Misinterpretation of study stages and also having incorrect idea of the goal of the feasibility studies, other factors that affect directly and negatively in the Iraqi industry such as delay, cost, and other issues that affect quality of the construction projects The aim of this paper Assess the awareness level of the feasibility study in construction projects and to determine the effects of feasibility study in construction industry and to identify the causes of abuses of feasibility study in construction industry. The methodology of the paper includes survey and formulation of the questionnaire to identify the factor the cause the feasibility study to fail and then use system dynamic to analysis the impact of these factors. The results show that the feasibility study is neglected part in Iraqi construction project due to the fact that its neglected, the were abuse in use the abuse of the feasibility study lead to cost and time over runs, and system dynamic technique approved to be a significant in the analysis of the impact of the.

J Prakash Arul Jose, P Rajesh Prasanna, Fleming Prakash “Lean Design Strategy of Waste Minimization in Construction Industries” International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 6 (2018) pp. 4593-4598

Construction waste minimization is practiced, for the system to be economical and feasible, irrespective of the construction methodology. This paper would be the answer for wastage problems that are common in construction sectors. On reviewing the reliability and accuracy over both the construction and demolition waste, a management scheme is proposed in accordance with lean construction concept. In lean design, last planner system is implemented to identify the confronting problems, where resource management and scheduling are the key concepts that are focused on. Hence this proves to be an ideal approach in dealing with waste minimization and productivity enhancement by the analysis of the percent of planned complete.



Economic Viability of Construction and Demolition Waste Management in terms of Cost Savings -A Case of UK Construction Industry Article · September 2020, AbioyeOyenuga, RaoBhamidimarri,

The economic viability of managing C&D waste on construction site can be justified by the cost-savings potential in many cases. However, by understanding of proper waste management, the total benefits will continue to exceed cost associated to waste operations as a whole. The paper investigated the problem of C&D waste and management awareness, strategies, and current practice in the UK construction industry, and extended study scope to evaluate the economic viability of applying the 3Rs principle to construction and demolition waste in terms of cost savings. The study found out that net benefit of reusing and recycling of C&D waste is estimated at a significant amount of total project budget. Realistically, the UK construction industry can, in fact, save money by implementing waste minimization practices using 3Rs principles in managing wastes on construction sites.

III. METHODOLOGY

By operating advance technology at construction project reduce cost and time in transporting of material and increase efficiency of work that ultimately reflect of time and cost.

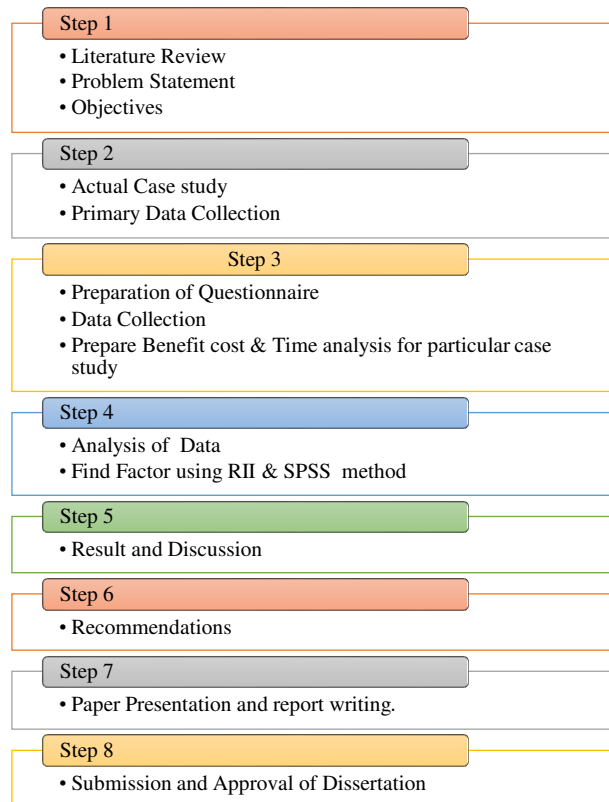


Figure1.2: Methodology chart

From literature found that because of frequent change of project managers, Appointment of staffs in the site who are not experienced and also Non sequential progress of works and that Work was not followed as per procedure instead it was followed as per availability of resources caused delays in construction project on pandemic situation Unavailability of adequately trained health workers and lack of experience in managing an unprecedented emergency; the pandemic and the confinement measures created a psychosocial burden for the population and, especially, the wellbeing of the health workforce.

The construction industry is the vehicle through which physical development is achieved, and this is truly the locomotive of the national economy. The more resources, engineering know-how, labor, materials, equipment, capital, and market exchange provided from within the national economy, the higher the extent of self- reliance. The increasing complexity of infrastructure projects and the environment, within which they are constructed, place greater demands on construction managers to deliver projects on time, within the planned budget and with high quality.



Therefore, improving construction efficiency by means of cost-effectiveness and timeliness would certainly contribute to cost savings for the country as a whole. Efforts directed to cost and time effectiveness were associated with managing time and cost.

It also aims to identify the main factors that lead to project delays and to suggest recommendations on how to overcome or mitigate effects of the problem. Data is gathered from responses from questionnaire survey and interviews with those involved in construction project.

The surveys and research findings indicate that incidents occur mainly during the construction phase of a project and one or more parties usually contribute to delay. This paper highlights the importance of having more experienced and capable construction managers as well as skilled labourers to enable the industry to develop at a faster rate either nationally or internationally.

A questionnaire and personal interviews have formed the basis of this research. Factor analysis and regression modelling were used to examine the significance of the delay factors. From the factor analysis, most critical factors of construction delay were identified as

- Lack of commitment;
- Inefficient site management;
- Poor site coordination;
- Improper planning;
- lack of clarity in project scope;
- lack of communication; and
- Sub-standard contract.

V. DATA COLLECTION & ANALYSIS

PEB Problems and Critical Success Factors in the Recent Market Situation

Improved technical skills Technical proficiency is a critical foundation and a requirement for surviving in the industrial marketplace. Typically, firms who are unable to invest in their own in-house R&D department form partnerships with reputable companies in order to deliver a big number of high-quality products. As a result, rather than investing in their own R&D, the large amount of money is spent on product purchasing and rewarding businesses with profits related to members. PEB construction is not ex gratia for prime go up buildings because it is not the best choice for manufacturing plant buildings to sustain badly so much dead and live masses on top of the bottom dead masses and live masses. As a result, the engineering experience provides low-rise manufacturing plant structures and their aesthetic want with vast spanning capability a varied operational applications so as to put the corporation in an extremely high level of competitiveness to handle rivalry.

Modularization and standardisation All of them want to succeed, which means they want to build a framework that meets the customer's requirements. So, in order to maximise profit by satisfying the customer's want, you'll need to design production methods such as standardisation and modularization of constructing components. It also enables for more efficient transportation, which adds to the benefits of standardisation and modularization.

Enhanced Collaboration between the Manufacturing Division and other Supply Chain Partners There is a process of production and supply that is repeated. As a result, the interaction between the producing and providing arms should be harmonious. This necessitates the use of offer chain management, which can aid in the strengthening of partnerships with subcontractors and raw-material suppliers, potentially lowering the company's providing price. This can help the project's overall economy.

Competitiveness in Prices Steel fabrication is frequently completed with high-priced machineries as well as low-priced machineries. This allows for open competition and eliminates any barriers for newcomers. As a result, no single company has a clear overall advantage because the value competition spans. As a result, the delivery fees paid by enterprises are a crucial decision factor. As a result, it is a serious and decisive problem.

End-User Requirements End users want to be well-known and get competitive advantages; you want to develop and alter assembly and supply chain procedures to stay ahead of the competition. This will be accomplished by



collaboration with supply chain partners, the collection of sporadic client feedback, and the formation of strategic collaborations with large builders to forecast their own product demand.

Develop Marketing Strategies That Are Appropriate To design marketing strategies, it's necessary to first comprehend the PEB market's constraints. Once the market retainers have been identified, the public should be educated on the benefits of PEB. To entice customers with an appealing marketing strategy to a large number of residential clients, potentially opening up a whole new dimension for them This may encourage total awareness as well as trust in the corporation, which could be a significant differentiator.

PREPARE A PLAN

Estimation of traditional and prefabricated construction quantities

COLLECTION OF INFORMATION

We can learn about the procedures of building work as well as the obstacles of the job through data collection. This collection is useful for estimating project costs for both constructions. Using these inquiries, we may also determine the building project's duration.

QUANTITY PROCESSING ESTIMATION

Estimation is done to determine the material requirements for both structures. The companies provided information on the materials that were used in the building. We can estimate the material quantities if we have these details.

Analysis of Costs

This is the most important thing to consider in the project: comparing building cost analyses for prefab and conventional construction. In this examination, we will look at labour, material, and machinery resources.

Pre-engineered building technology, which first appeared in the Indian construction industry in the late 1990s, has garnered significant acceptability among end users over time and is steadily making inroads in construction and infrastructure projects across the country. This is partly owing to the fact that PEB-based construction techniques provide the most innovative, high-tech, and faster construction processes, ensuring efficient, cost-effective, and timely project completion.

Factors impacting long-term cost

1) Inadequate planning

Affects:

Construction planning is required at the beginning, during the design phase, and during the construction phase. If the project isn't well-planned, it will be necessary to update the various construction operations on a regular basis in order to finish on schedule. As a result, the expense of hiring machineries or equipment, as well as additional labour, would increase the cost of construction activities.

2) Administration of funds

Affects:

The project manager's or project management team's involvement in regulating or managing the cost of construction projects is perhaps the most essential. It is often true that a good project will encounter major issues if it is combined with inadequate project management.



3) Construction Materials Shortage

Affects:

During periods of rapid development, when construction activity is especially high in a given region, some construction materials may be in short supply. Sometimes the local market is unable to meet the complete demand for certain construction materials, necessitating the transport of these goods from other regions or their importation from abroad.

4) Inflation

Affects:

Inflation has the potential to raise construction prices. The original cost estimate will be exceeded if the rate of inflation rises above the expected level during the building period. Because of the nature of the process and the rate of return for work done on construction projects, inflation can lead contractors to lose money and project owners to incur higher costs.

5) Orders for Changes or Variations

Affects:

Changes in building projects might result in significant changes to the contract time and cost. Typically, changes in designs and contract agreements result in a change in contract pricing or schedule.

6) Inexperienced/inappropriate contractors

Affects:

If contractors are not chosen based on price, experience with a specific type of construction project, and their reputation or track record, labour productivity on construction projects will suffer.

Techniques for Cost Control

Organizing resources

The required resources to complete the project activities must be established during the first phase of the project. To determine which physical resources are required, Work Breakdown Structures (WBS) and historical data from similar projects can be employed. Consider the amount of time, material, labour, and equipment required. The associated expenses can be calculated if the resource kinds and amounts are known.

Structure of Work Breakdown

A work breakdown structure (WBS) is a critical project deliverable that divides the work of the team into manageable chunks. The work breakdown structure is defined by the Project Management Body of Knowledge as a "deliverable oriented hierarchical decomposition of the work to be completed by the project team." As each level of the work breakdown structure gives more depth and detail, the scope is visually broken down into digestible chunks that a project team can grasp. A sample job breakdown structure with three levels is shown in Figure (below).

Referring to the work breakdown structure when a project is behind schedule will rapidly identify the primary deliverables impacted by a failed work package or late sub-delivery. Color-coding the work breakdown structure can also be used to indicate the status of sub-deliverables. Assigning red for late, yellow for at risk, green for on-target, and blue for completed deliverables to create a heat-map of project progress and draw management's attention to key areas of the work breakdown structure is an effective way to produce a heat-map of project progress and draw management's attention to key areas of the work breakdown structure.

Development and Design

One aspect of a production enterprise is the design and development of products and/or services that meet both customer and manufacturing process needs (manufacturability), which typically includes product life-cycle analysis, value engineering, product prototyping, market research, and product specification.



Configuration of Work

The operating system architecture of an organisation is referred to as job configuration. The location of buildings, plant layout, and job analysis are believed to be the three most important factors in determining a company's work organisation.

Technical factors: Productivity largely depends on technology. Technical factors are the most important ones. These include proper location, layout and size of the plant and machinery, correct design of machines and equipment, research and development, automation and computerization, etc. If the organization uses the latest technology, then its productiveness will be high.

2. Production factors: Productivity is related to the production-factors. The production of all departments should be properly planned, coordinated and controlled. The right quality of raw-materials should be used for production. The production process should be simplified and standardized. If everything is well it will increase the productiveness.

3. Organizational factor: Productivity is directly proportional to the organizational factors. A simple type of organization should be used. Authority and Responsibility of every individual and department should be defined properly. The line and staff relationships should also be clearly defined. So, conflicts between line and staff should be avoided. There should be a division of labour and specialization as far as possible. This will increase organization's productiveness.

Personnel factors: Productivity of organization is directly related to personnel factors. The right individual should be selected for suitable posts. After selection, they should be given proper training and development. They should be given better working conditions and work-environment.

5. Government factor: They should be properly motivated; financially, non-financially and with positive incentives. Incentive wage policies should be introduced. Job security should also be given. Opinion or suggestions of workers should be given importance. There should be proper transfer, promotion and other personnel policies. All this will increase the productiveness of the organization.

6. Finance factors: Productivity relies on the finance factors. Finance is the life-blood of modern business. There should be a better control over both fixed capital and working capital. There should be proper Financial Planning. Capital expenditure should be properly controlled. Both over and underutilization of capital should be avoided. The management should see that they get proper returns on the capital which is invested in the business. If the finance is managed properly the productiveness of the organization will increase.

7. Management factors: Productivity of organization rests on the management factors. The management of organization should be scientific, professional, future oriented, sincere and competent. Managers should possess imagination, judgment skills and willingness to take risks. They should make optimum use of the available resources to get maximum output at the lowest cost. They should use the recent techniques of production. They should develop better relations with employees and trade unions. They should encourage the employees to give suggestions. They should provide a good working environment and should motivate employees to increase their output. Efficient management is the most significant factor for increasing productiveness and decreasing cost

Planning and Scheduling

This branch of a manufacturing company is responsible for determining demand for a specific commodity, as well as production planning and resource requirements to meet that demand.

Consistency

In a manufacturing company, quality is deciding what constitutes quality in the process, what costs are associated with quality, how to achieve and maintain quality, and what level of quality is required.



Inventory Control

Concerns about how much of a given product can be produced in order to replace stocks, as well as how to store and handle stocks, are all part of stock management.

Management of Human Resources

This component of a manufacturing firm is concerned with how the factory organizes and manages its employees. Human capital management has an impact on a company's culture as well.

Managing the Supply Chain

Supply chain management necessitates managing domestic and international suppliers of commodities, materials, and services in order to maintain operations.

PEB is a requirement that meets the expanding construction demands for the region's extensive urbanization. Prefabricated structures assist keep construction costs low and, as a dry construction technology, provide a quick alternative. Prefabrication allows for end-to-end processes that are quick and painless. These are built to set industry standards, as they are made of high-quality materials. These steel constructions are popular because they offer benefits such as low maintenance, heat insulation, and a variety of other features that are ideal for industrial applications. These structures, contrary to popular assumption, are long-lasting. They're easy to set up and constructed to last. One of the most desirable methods for protecting structures from earthquake pressures is base isolation. Separating or decoupling the structure from its foundation is one of the main concepts in earthquake engineering. These effects reduce inter-story drift and effective displacement in the floors of the base isolated structural system, ensuring the least amount of damage to facilities while simultaneously ensuring the protection of people and property. In the last few decades, the notion of base isolation has been proposed, technologies have been made available, and knowledge of base isolation systems has been used, developed, and thus well established. Because of its ability to change the building's characteristic from rigid to flexible, seismic isolation devices are more successful when applied to high stiffness, low-rise buildings. The primary goal of our research is to examine and compare the behaviour of the PEB structure as it grows. In seismic zones, the base isolation concept is used to reduce storey acceleration, storey drift, and increase the period of oscillation due to earthquake ground excitation. It is applied to the foundation level by installing base isolators lead rubber bearing (LRB) and comparing the performance between the fixed base condition and the base isolated condition using ETABS 2016 software.

Pre-engineered building requirements

In practically every corner of the world, the steel sector is quickly increasing. Steel constructions are not only cost-effective but also environmentally benign at a time when global warming is a worry. If we employ ordinary steel constructions, the time frame and cost will be greater, but both of these considerations, time and cost, will make it more affordable. As a result, the entire structure is built in the factory using pre-engineered structures, and members are prefabricated before being delivered to the job site and constructed in less than 6 to 8 weeks. Through the launch of several new products and services, technological innovations have made a substantial contribution to the enhancement of quality of life over the last year. One such revolution was the use of pre-engineered buildings. Despite the fact that it dates back to the 1960s, its actual potential has only just been realized. This was mostly owing to technology advances that aided in the computerization of the design.

VI. CONCLUSION

Prefabrication construction technology generates less waste on site because building elements are cast in the warehouse and then transported to the site for final erection and installation.

The sustainability aspects viz. social, economic and environmental may promote prefab technology as a promising alternative in construction industry.

Pre-engineering building technique more essential for construction of rehabilitated villages in India; Cost and time required to complete the project by conventional technique is more than Pre-engineering building technique. Pre-engineering building method help to reduce on-site waste; The Pre-engineering building technology can use for the affordable construction also. Conventional construction technique will not be able to meet the need of mass housing and in the current scenario; it is clear that new construction technologies should be utilized to deliver homes fast with



minimum labour and zero wastage of materials. If Pre-engineering building technique is used over conventional technique in India it can be very useful and advantageous to solve housing problem. Maximum number of homes with greater quality and in minimum time can be provided by using Pre-engineering building technique than using conventional technique.

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