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Feasibility Study of JIT for Better Project Management

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ABSTRACT: In the discipline of construction management, material management is extremely important. Also The cost of materials accounts for a considerable amount of the total building cost. During the construction process, improper material handling and management will have an impact on the overall project cost, schedule, and quality. Materials are sometimes ordered weeks or even months ahead of time, resulting in uneconomical inventory on construction site or in the warehouses of contractors. Building material inventory represents the cost of purchasing, storing, and insuring the inventory, as well as the cost of preventing theft and the cost of replacing the inventory as it becomes obsolete. JIT deliveries reduce, even though not completely eliminate, the requirement for on-site material storage. This not only improves site logistics, but it also minimizes the chances of damage or loss of materials held on-site, as well as congestion and the risks that come with it, such as safety issues. This research explores the feasibility of a Just-in-Time (JIT) production system for multistorey building construction, comparing JIT and traditional material management methods.

KEYWORDS: Just-In-Time, material management , construction industry, multi-storeyed building.

I. INTRODUCTION

Despite several management initiatives, the construction sector continues to face numerous challenges in terms of optimum performance and productivity. Many initiatives fall short of their primary goals, particularly in terms of project delivery on time. The fact that the construction process comprises many operations that provide little value to the final customer is a contributing cause to this problem. As a result, the local construction sector need improved project management procedures in order to improve project outcomes by minimizing any operations that do not lead to a better final delivery. Time wastage is a significant problem that has a direct impact on the timely completion of building projects

The construction industry, in particular, is known for not achieving maximum productivity and for having difficulty sticking to schedules due to delays during the development process. With this in mind, the implementation of the Just-in-Time concept is frequently advantageous, especially when dealing with the coordination of construction materials and workers on construction sites. Just-in-time technique was first developed for the manufacturing industry. It began in Japan in the mid-1950s and was developed in the gracefully chain region by Taichi Ohno and his Toyota colleagues. Just-in-time delivery is a framework that ensures that the necessary items are delivered at the right time and in the right quantities, without wasting any time. The objective is to reduce or eliminate multiplicity and waste. Pausing, putting away inventory, and transferring materials are all waste in our construction sector.

II. JUST IN TIME TECHNIQUE OF MATERIAL MANAGEMENT

In a flow process, Just In Time meant that the proper parts for an assembly arrive at the assembly line at the righttime and in the right quantity. The Just-in-Time strategy is an excellent management technique that can determine whether a building project succeeds or fails. It is based on waste removal that is planned and continual enhanced productivity. This method controls the flow of materials, components, tools, and other project-related information. The primary principle underlying the JIT concept is to disclose hidden problems, involve all employees in solving them, maintain quality standards, and shorten cycle times so that larger stock levels are not required, i.e. decreasing nearby stocks and insufficient working hours. The faults not only cause building waste,

but they can also bring the project to a halt. Just-in-Time (JIT), also known as Zero-Inventory-Policy (ZIP), is a manufacturing and delivery approach that aims to reduce and eliminate waste and overstock.

III. METHODOLOGY

Problem statement

Just in Time (JIT) is a system of inventory management in which items are only acquired from suppliers as needed. Time philosophy offers a lot of potential for material management systems, and it's being used in the construction industry all around the world. JIT has a number of issues, including employee disengagement and worker resistance to continuous improvement, cultural differences, huge inventories, long lead times, market instability, and forecasting errors, etc.

The review of literature study elaborates wide scope of JIT growing in various industries like production, manufacturing, automobile, retailers, restaurants and so on and with limited study in construction industries.

The paper will focus on identifying feasibility of JIT method, particularly in the construction of multistorey buildings, by reducing time and eliminating excess inventory, as well as lowering costs and improving quality.

Case study

To determine the actual feasibility of JIT implementation in multi-story building construction, we used a case study. Godrej element, a landmark residential project in Hinjewadi, Pune, Maharashtra, was chosen as the case study for the research work. The project consists of seven towers, each having P1+ P2+ 19 stories. However, for the sake of this study, we only used one tower.

JIT Implementation Process

To determine the feasibility of the Just-In-Time method, we compare the total cost necessary, including purchasing cost of material and overhead costs, on the current site, estimated using the conventional method, with the total cost calculated using the JIT method. The JIT approach ensures that materials are delivered to the construction site on the day of usage or the day before. For this research work, we focus on four primary construction materials: steel, doors and windows, AAC block, and flooring (containing tiles, dado, and skirting).

IV. EXPERIMENTAL RESULTS

Calculation Of Quantities And Per unit Item rate

The Abstract sheet provides information on quantity and per unit item rate. The I4 tower construction schedule was created using Microsoft Project (MSP) software, which allowed us to see the current, predecessor, and successor operations on site as well as the exact quantity of items required on any given day. Below table shows the purchasing cost of material including transportation charges, labour charges and so on.

Sr. No.	Item	Quantity required per day	Unit	Material available on site before start of any activity(In days)		Cost of material	
				Traditional	JIT	Traditional	JIT
1	Steel	26.73	MT	10	1	443718	443718
2(a)	Doors				1		
2(b)	Windows	24	No.	10	1	171000	171000
3	Flooring						
	Matt finish ceramic tile	131.4	Sq.m	10	1	163067.4	163067
	Glossy finish tiles	8.46	Sq.m	10	1	10498.86	10498.9
	vittrified tile	272.52	Sq.m	10	1	310672.8	310673
	Anti-skid ceramic tile(300 x 300)	43.02	Sq.m	10	1	46590.66	46590.7
	Anti-skid ceramic tile (600x600)	26.84	Sq.m	10	1	29067.72	29067.7



	Prepolishedkota stone 25mm thick	125	Sq.m	10	1	264500	264500
3(a)	Skirting						
	Prepolishedkota stone 25mm thick	51	RM	10	1	19539.47	19539.5
	Granite	6	RM	10	1	3934.7	3937.7
	Vitrified	5	RM	10	1	1416.2	1416.2
4	AAC blocks	1817	No.	10	1	1544450	1544450
	Total cost					3008455.81	3008459

Table no.1. Shows Purchasing cost of material

The Purchasing cost of materials is about the same in both the conventional and JIT methods. And the purchasing material cost is Rs.3008455.81/-.

Site Overheads

Subcontractors, machinery, equipment, insurance, office suppliers and workers, automobiles, and other costs linked with the construction project are all included in site overheads. Management expenses, consultancy fees, profit fees, and off-site overheads, on the other hand, are not included. The table below gives a list of various site overheads that were used on the current site using the traditional way, and we determined the heads that may be required using the JIT method through research.

Sr No.	Head	Rate per unit	Total No./Area required	Total Head cost	Total No./Area required	Total Head cost
			Conventional		JIT	
1	BG cost			406875		406875
2	staff salary					
2.1	Store keeper	35000	1 No.	35000	1 No.	35000
2.2	Store Assistant	23000	1No.	23000		
2.3	Store helper	18000	2 No.	36000	1 No.	18000
2.5	Security	18000	5 No	90000	1 No	18000
3	site infrastructure					
3.1	Mobilization/demobilization cost	500000		500000		300000
3.2	Tubular Shed - Store with racks & furniture + cement godaun + safety with shahabad flooring	17 rs./sq.ft	1200Sq.ft	20400	300 Sq.ft	5100
3.3	reinforcement yard	131201		131201		
3.4	shuttering yard	215855		215855		215855
3.5	PMV shops	67200		67200		
3.6	temporary yard	35000		35000		35000
4	department labour					
4.1	material shifting	525/day	6no.	3150	2no.	1050
4.2	Scrap sorting	525/day	2 no.	1050	1no.	525
4.3	material loading /unloading	525/day	5 no	2625	2 no	1050
4.4	material cleaning and stacking	525/day	4 no.	2100	1no.	525
	Total Overhead Cost			1569456		1036980

Table No.2 shows Overhead cost Comparison between Conventional and JIT method

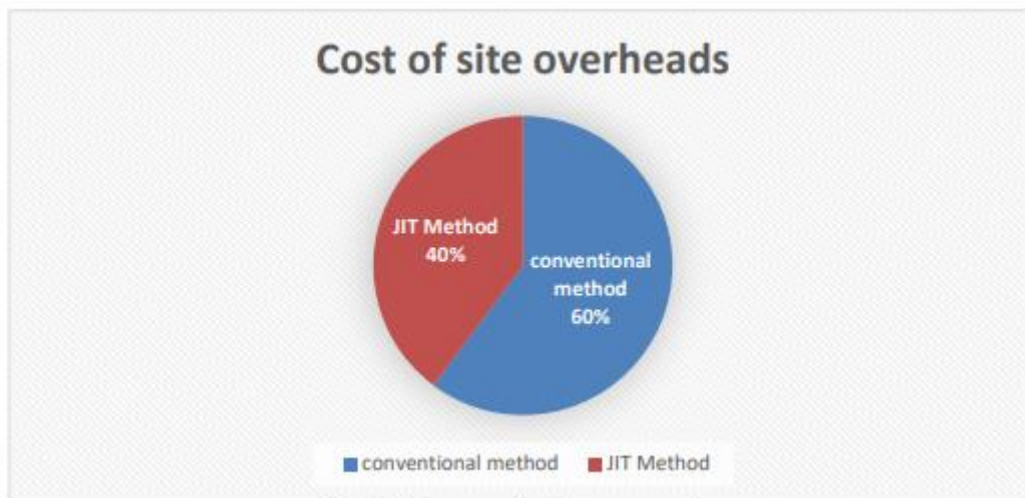


Fig. (a) shows overhead cost comparison

Cost comparison

To establish the economic feasibility of applying JIT, we compare the overall cost, which includes material purchasing costs and site overhead costs, required by the conventional method with the JIT method.

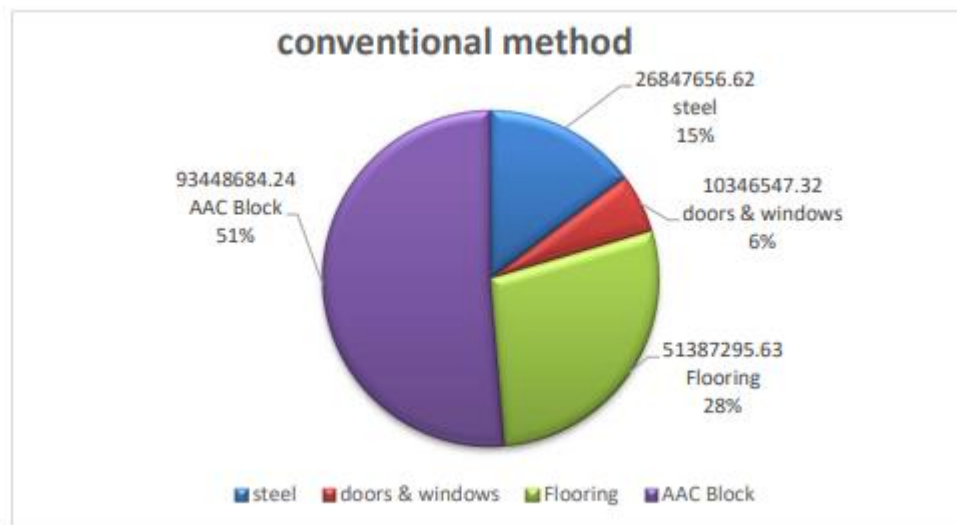


Fig. (b) shows Overall cost of material by using conventional method

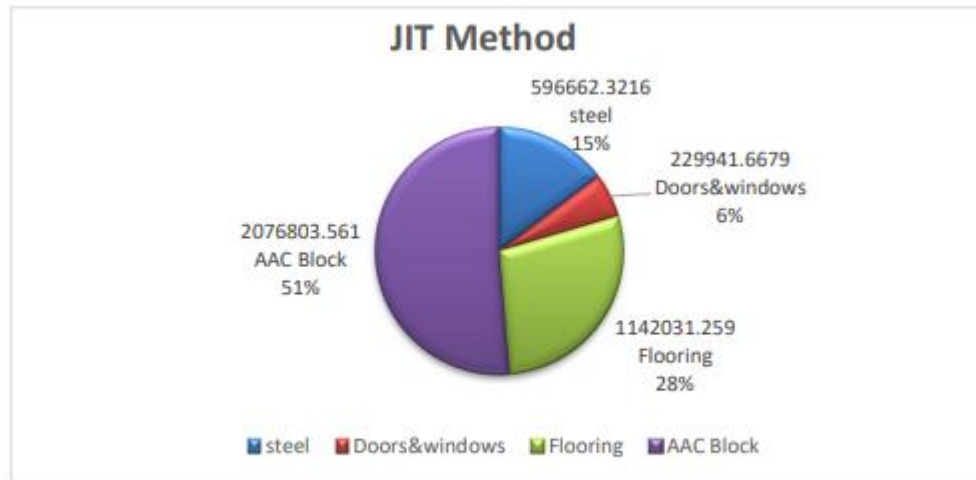


Fig. (c) shows Overall material cost by using JIT Method

Result

1. Overall cost of material required using conventional method

= Rs. 4577914.81/-

2. Overall cost of material required using JIT method

= Rs. 4045438.81/-

3. Total cost saving by using JIT method

= 4577914.81 - 4045438.81

= 532476.00/-

4. Total percentage of cost saving using JIT method

= $(532476.00 / 4577914.81) * 100$

= 11.63 %

Therefore, from the above result we conclude that economic feasibility by using JIT method is 11.63%

V. CONCLUSION

For many years in India, the conventional method of material distribution has been applied in construction projects. The strategy caused lots of new issues for the construction industry. Because of the rapid advancement in communication, higher material quality, and quick material transportation networks, we have chosen the JIT method. To see whether the JIT strategy was feasible, we used a case study of a multistorey building construction project and compared the present material management approach to the JIT approach. We observed that successful installation and execution of the Just-In-Time technique can reduce a number of factors, including stock level, capacity space, initial generation cost, supervisory cost, rehandling cost, security cost, and wastage due to unforeseen events and so on. The findings of this study reveal that JIT does not reduce material costs, but it does affect overhead costs. The entire cost of material is reduced by 11.63 percent, which may vary from site to site depending on site circumstances, geological conditions, lead time, material availability, and other factors.



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