

## **Impact of Prefabricated Technology on Profitability by using Project Management Software**

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**Abstract**— Prefabricated frameworks and structures are mounted from uniform prefabricated three-dimensional units, providing quality, pre-set warm properties of structures, dynamic dependability, and permanence of geometric estimation of the prefabricated components amid their make, transportation, and establishment in exceptional and troublesome conditions. Prefabrication has been generally viewed as an economic development strategy as far as its effect on environment. Prefabrication likewise enhances security in the work zone by decreasing the measure of action that is required over activity or at high heights to develop the tall structures. Prefabricated building construction will bring about fast development and limited delays over the span of venture. Quick track construction systems utilize construction parts to quickly erect a development. The imperative part of this exploration is the impact of construction on development squander lessening and the aggregate venture cost and undertaking consummation time reduction. So in this exploration I analysed the finish time and aggregate cost of customary development assembling and prefabricated development working by utilizing scheduling and planning software primavera. Likewise by doing this exploration I got some broad advantages of prefabrication construction over conventional construction.

**Keywords** - Prefabrication, Primavera, Cost, Time, Economic, Environment, Development

### **1.0 INTRODUCTION**

Prefabrication is the act of gathering parts of a structure in a plant or other assembling site and transporting complete congregations to the construction site where the structure is to/be found. The part of construction in design has been commended for its capability to expand profitability and productivity while not giving up quality. The estimations of better, quicker and less expensive are pertinent to created nations, for example, the U.S., Japan, and Europe, whose white collar class keeps on requesting this condition in structures that range from the amazing to the mundane. Creating nations, including China, India, Africa and numerous parts of South America, that are starting to depend on construction have the potential focal points of acknowledging lodging rapidly and moderately; in any case, more noteworthy dependence on fabricated generation has conceivably a larger number of inconveniences than preferences for these societies.

The fundamental favourable position of prefabricated technique is the celerity by which the development procedure happens. Quick urbanization, colossal lack of talented work and the requirement for having both free development techniques is a trigger to offer pre-fabricated innovation to construct any sort of building quicker. Other incredible favourable position of construction is strength. These pre-fabricated structures demonstrate better execution as they experience strict checking instrument that guarantees the item turns out to be imperfection proof.

### **1.1 NEED FOR STUDY**

Due to rapidly increasing construction and traditional techniques which are used in construction are more time consuming, badly affects environment, less economical and less productive so by implementing prefabricated techniques we can construct low cost, less time, more quality, less effect on environment type buildings with less labour and material.

### **1.2 OBJECTIVES OF STUDY**

- ➔ To study the application and behaviour of prefabricated system.
- ➔ To improve the construction speed, eco-friendly effect, and reduce the construction cost using primavera as planning and scheduling software

### **1.3 RESEARCH METHODOLOGY**

- ➔ Research will be conducted by preferring various research paper of prefabricated technology, doing questionnaires in construction firms, and by using primavera comparing and analysing the conventional building's project cost, time and quality etc. with prefabricated building.

## 1.4 PREFABRICATION FUNDAMENTALS

**Modularization -:** The off-site advancement of a whole structure before its transportation to the site of improvement. The modules may every now and again be required to be isolated into humbler sizes for straightforwardness of transportation. Modularization as a general rule incorporates into abundance of one trade.

**Prefabrication -:** This for the most part includes a solitary ability or exchange and is for the most part characterized as a generation procedure, which typically happens at a particular manufacturing plant where distinctive materials are consolidated to shape the segment of a finished result. For whatever length of time that the part is fabricated at a production line and isn't an entire framework, it is viewed as pre-fabricated.

**Preassembly -:** By definition, preassembly is the blend of different materials and pre-fabricated segments at a different office before establishment as a solitary unit. This establishment is completed like the procedure of modularization in which the made parts are gathered near the site, trailed by on location portion. Ordinarily viewed as a blend of modularization and construction, preassembly more often than not includes works shape different specialties and parts of various frameworks.

**Industrialization -:** This term alludes to an incorporation of each of the three previously mentioned classes of offsite development. Industrialization depends on the idea of assembling and is characterized as the acquisition of innovation, hardware and offices keeping in mind the end goal to build profitability, diminish difficult work and enhance creation quality.

## 1.5 DIFFERENT TYPES OF PREFABRICATION SYSTEMS

**Small prefabrication -:** The initial three types are fundamentally arranged by their level of precast. Components utilizing as a part of that development for e.g. block is a little unit precast and utilized as a part of structure. So in this level of precast component is low.

**Medium Prefabrication -:** Assume the roofing systems and flat individuals are furnished with pretested components those development are known as medium pre-fabricated development here the level of prefab components are direct.

**Large Prefabrication -:** In extensive construction the vast majority of the individuals like divider boards, material/flooring Systems, shafts and sections are pre-fabricated. Here level of precast components are high.

**Cast in Site Prefabrication -:** One of the fundamental factor which influence the production line construction is transport. The width of distraught dividers, method of transport, vehicles are the components which construction is to be done nearby on production line.

**Open system of prefabrication -:** In the aggregate construction frameworks, the space designers are gave a role as a solitary unit and raised at the site. The divider fitting and other settling are done nearby. This sort of development is known as open arrangement of construction.

**Closed system of prefabrication -:** In this system the entire things are threw with fixings and raised on their position.

**Partial prefabrication -:** In this technique for development the building component (for the most part level) required are precast and afterward raised. Since the costing of flat components (rooftop/floor) regularly take as much time as necessary because of erection of from work the culmination of the building is deferred and thus this strategy is re-established. In the greater part of the building destinations this strategy is prominent more. Child in mechanical structures where the components have longer traverses. Utilization of twofold tees, channel units, cored wounds, chunks, and hyperboloid should and so on are a portion of the even components.

## 1.6 WHY CHOOSE PREFABRICATED CONSTRUCTION METHOD OVER CONVENTIONAL CONSTRUCTION METHOD

- ➔ Wealth in substantial scale venture with high level of reiteration in work development.
- ➔ Exceptional prerequisite in wrapping up.
- ➔ Stability in auxiliary quality control.
- ➔ Quick speed of development.
- ➔ Restriction in accessibility of site assets (e.g. Materials and Labourites)
- ➔ More space and ecological requirements.

## 1.7 PROCEDURE OF PREFABRICATED CONSTRUCTION

Prefabricated structures are created and made in a controlled domain with the most recent assembling advances. They were composed with such adaptability to have the capacity to alter with changes made by the proprietor of the structure. Repeatable plan is one of the key advantages of utilizing pre-fabricated structures. In light of the steady creation of this material, the manufacturing plant engineers are permitted to consistently screen the generation procedure and make the essential enhancements at whatever point conceivable to have the capacity to convey the best quality for their items. The pre-fabricated fabricating process for the most part begins with collecting of the steel, cement and wood, or unadulterated solid edges. The machine-cut wood, steel, or solid dividers are generally added to the pre-fabricated structures with correct plan details. At that point, the electrical wiring and the pipes are introduced before preparing the unit for transport to the site. In some cases, repetitive quality controls are being done to check and affirm any spot-on assembling deserts before the material leaves the plant.

## 2.0 DATA COLLECTION

As per my objective I studied all the research paper related to the prefabricated technology and its comparison to the conventional construction technology by doing this I got idea about how much prefabricated technology affects the time and cost of the construction so further in process of achieving my objective I need to compare the time and cost of construction project with prefabricated technology and convention construction technology by using the project management software in this research I am using Primavera for analyse the cost and time of construction project. Below shows the data I have collected for this comparison.

### 2.1 PLAN USED FOR COMPARISON AND PROJET INFORMATION

Figure 1 Plan of Project



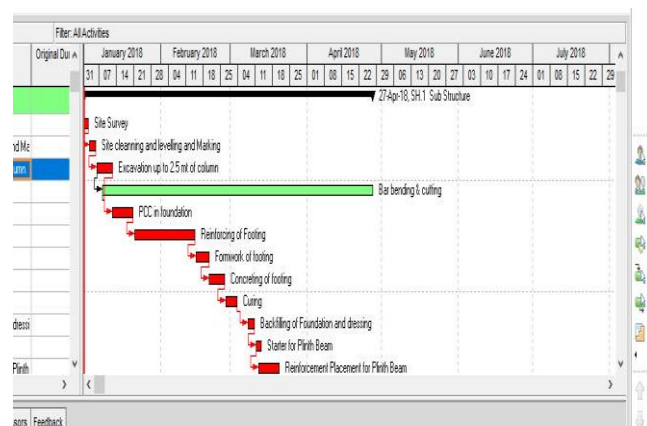
<b>Name of Company</b>	Krimal Infrastructure
<b>Estimated cost of project</b>	4.5 – 5.0 crore
<b>Area of project</b>	Ground floor – 1485.86 m <sup>2</sup> First floor – 1657.25 m <sup>2</sup>
<b>Place</b>	Deesa, Banaskantha
<b>Project type</b>	Government educational building (G+1)
<b>Name of project</b>	Model primary and higher secondary school
<b>Address of project</b>	TCD ground, Near Sardar Patel high school At-Deesa (B.K)
<b>Specification and Design</b>	As per provided by Government

### 2.2 SCHEDULING IN PRIMAVERA FOR CONVENTIONAL CONSTRUCTION METHOD

Figure 2 Activity list out, duration and cost

SH.1 Sub Structure	105	105	0%	01-Jan-18	27-Apr-18	Rs429,490.00	Rs269,900.00
A1000 Site Survey	2	2	0%	01-Jan-18	02-Jan-18	Rs4,200.00	Rs0.00
A1010 Site cleaning and leveling and Me	3	3	0%	03-Jan-18	05-Jan-18	Rs8,100.00	Rs0.00
A1020 Excavation up to 2.5 mt of column	6	6	0%	05-Jan-18	12-Jan-18	Rs6,800.00	Rs0.00
A1030 Bar bending & cutting	88	88	0%	08-Jan-18	27-Apr-18	Rs164,640.00	Rs0.00
A1040 PCC in foundation	8	8	0%	12-Jan-18	20-Jan-18	Rs33,600.00	Rs1,690.00
A1050 Reinforcing of Footing	23	23	0%	21-Jan-18	14-Feb-18	Rs98,900.00	Rs154,000.00
A1060 Formwork of footing	5	5	0%	15-Feb-18	20-Feb-18	Rs0.00	Rs0.00
A1070 Concreting of footing	6	6	0%	20-Feb-18	26-Feb-18	Rs38,400.00	Rs1,690.00
A1080 Curing	5	5	0%	27-Feb-18	03-Mar-18	Rs3,000.00	Rs0.00
A1090 Backfilling of Foundation and dressing	3	3	0%	08-Mar-18	10-Mar-18	Rs2,250.00	Rs750.00
A1100 Slatler for Plinth Beam	2	2	0%	11-Mar-18	13-Mar-18	Rs3,600.00	Rs1,690.00
A1110 Reinforcement Placement for Plinth	8	8	0%	12-Mar-18	20-Mar-18	Rs44,800.00	Rs56,000.00

Figure 3 Bar Chart of Activity



2.3 DATA COLLECTION ON PRECAST ELEMENTS

For 1 m <sup>3</sup> concrete work coat including labor, steel cost.	8700 Rs.
Movable one crane's rent charges per month	3,00,000 Rs.
For joints (Grout)	25 Kg bag for 350 Rs.
Labor Charges per day	450 Rs.
<b>Daily work done by one crane</b>	
<b>Element</b>	<b>Per day completion with grouting</b>
Beam	6
Column	6
Slab	15
Brick	5

2.4 PRECAST CONSTRUCTION SCHEDULING ON PRIMAVERA

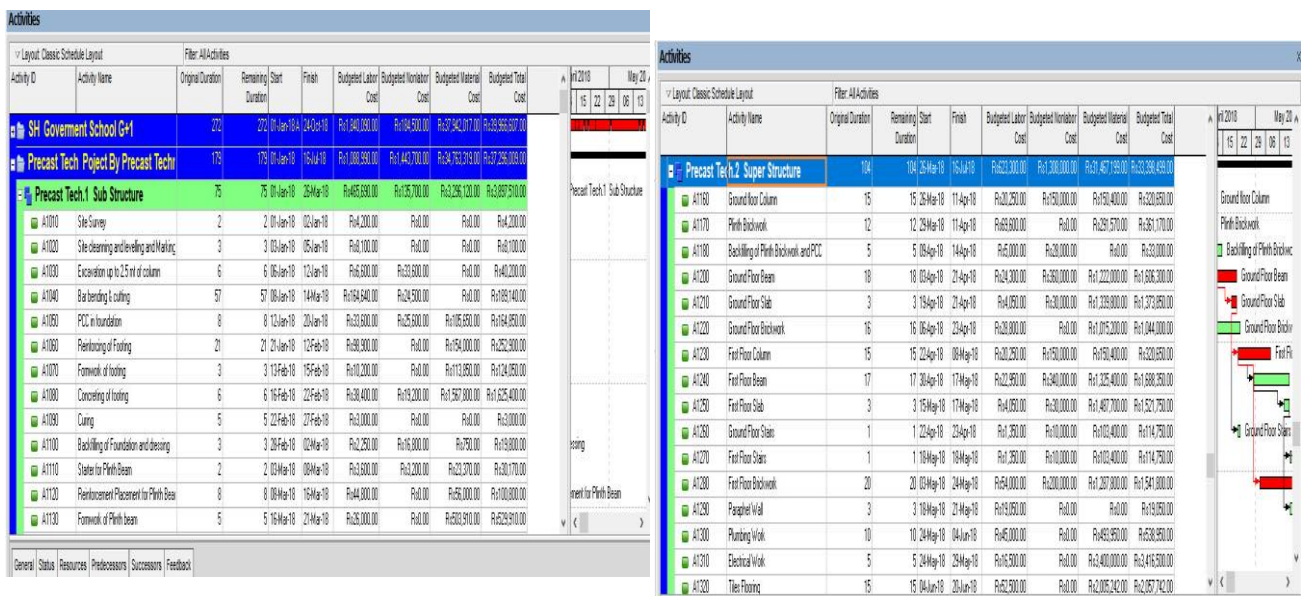


Figure 4 Precast Construction Cost and Duration

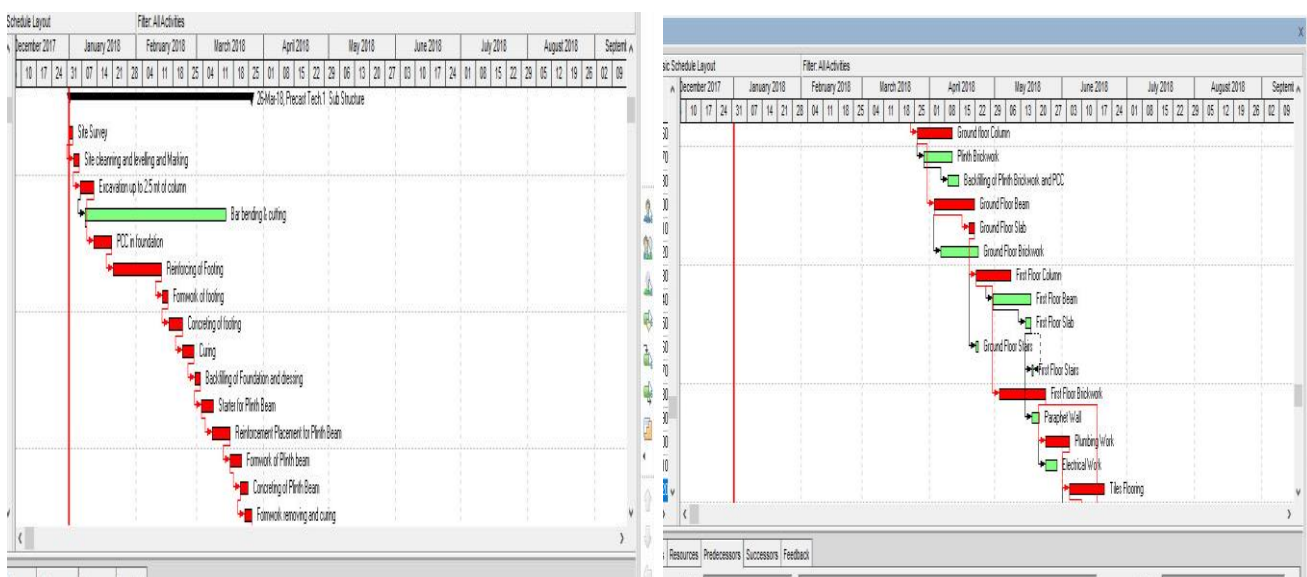


Figure 5 Bar Charts Precast Construction

### 3.0 DATA ANALYSIS

Data that I have collected for comparison of time and cost between conventional construction method and precast construction method by using primavera I calculated total duration of project completion and total cost of project completion for both conventional construction method and precast construction method and by doing this analysis in primavera we can calculate difference of time and cost for these two methods. The whole analysis of time and cost between conventional and precast construction method describes below.

#### 3.1 COST ESTIMATION FOR CONVENTIONAL CONSTRUCTION BUILDING

Sr. No.	Description	Quantity	Unit	Amount (Rs)
1	Earth Work Excavation	3720	M <sup>3</sup>	40,200
2	PCC in Foundation	560	M <sup>3</sup>	1,64,850
3	Footing Work	358	M <sup>3</sup>	20,05,350
4	Backfilling	3340	M <sup>3</sup>	19,800
5	Plinth Beam	176	M <sup>3</sup>	14,65,870
6	Ground floor Column Work	57.2	M <sup>3</sup>	4,53,670
7	Plinth Brickwork	140	M <sup>3</sup>	3,61,170
8	Ground Floor Slab and Beam	287	M <sup>3</sup>	25,13,340
9	Ground Floor Brick Work	166	M <sup>3</sup>	4,35,384
10	Ground Floor Stair Case	11	M <sup>3</sup>	61,750
11	First Floor Column Work	55.2	M <sup>3</sup>	4,14,100
12	First Floor Beam Slab Work	311	M <sup>3</sup>	26,97,300
13	First Floor Brickwork	211	M <sup>3</sup>	5,50,824
14	First Floor Staircase	11	M <sup>3</sup>	61,750
15	Plaster Work	19.70	M <sup>3</sup>	2,38,700
16	Paint Work	-	-	8,13,618
17	Electrical Work	-	-	34,67,500
18	Plumbing Work	-	-	5,47,950
19	Flooring Work	-	M <sup>2</sup>	44,65,280
20	Miscellaneous	-	-	90,00,000
<b>TOTAL</b>				<b>2,97,78,386 Rs.</b>

#### 3.2 COST ESTIMATION FOR PREFABRICATED BUILDING

Sr. No.	Description	Quantity	Unit	Amount (Rs)
1	Earth Work Excavation	3720	M <sup>3</sup>	40,200
2	PCC in Foundation	560	M <sup>3</sup>	1,64,850
3	Footing Work	358	M <sup>3</sup>	20,05,350
4	Backfilling	3340	M <sup>3</sup>	19,800
5	Plinth Beam	176	M <sup>3</sup>	14,65,870
6	Ground floor Column Work	57.2	M <sup>3</sup>	7,06,050
7	Plinth Brickwork	140	M <sup>3</sup>	3,61,170
8	Ground Floor Slab and Beam	284	M <sup>3</sup>	29,80,150
9	Ground Floor Brick Work	107.8	M <sup>3</sup>	10,44,000
10	Ground Floor Stair Case	11	M <sup>3</sup>	1,07,050
11	First Floor Column Work	57.2	M <sup>3</sup>	7,06,050
12	First Floor Beam Slab Work	311	M <sup>3</sup>	32,10,100
13	First Floor Brickwork	137	M <sup>3</sup>	15,41,800
14	First Floor Staircase	11	M <sup>3</sup>	1,07,050
15	Plaster Work	19.70	M <sup>3</sup>	2,38,700
16	Paint Work	-	-	8,13,618
17	Electrical Work	-	-	34,16,500
18	Plumbing Work	-	-	5,47,950
19	Flooring Work	-	M <sup>2</sup>	44,65,280
20	Miscellaneous	-	-	60,71,550
<b>TOTAL</b>				<b>3,00,13,088 Rs.</b>

➔ In above two table shows the cost estimation between traditional construction method and prefabrication construction method in which traditional construction method cost us **2, 97, 78,386 Rs.** and prefabricated construction cost us **3, 00, 13,088 Rs.** which is **0.78 %** higher than traditional construction method.

### 3.3 BAR CHART OF COST COMPARISON

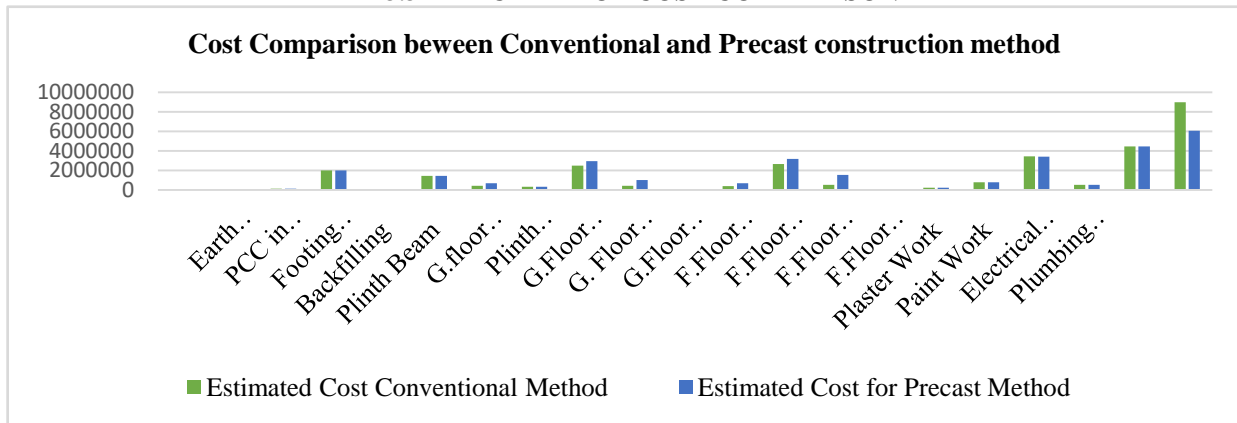


Figure 6 Bar Chart of Cost Comparison

### 3.4 TIME ESTIMATION FOR CONVENTIONAL CONSTRUCTION BUILDING

Sr. No.	Description	Days
1	Earth Work Excavation	6
2	PCC in Foundation	8
3	Footing Work	34
4	Backfilling	3
5	Plinth Beam	19
6	Ground floor Column Work	22
7	Plinth Brickwork	12
8	Ground Floor Slab and Beam	40
9	Ground Floor Brick Work	11
10	Ground Floor Stair Case	12
11	First Floor Column Work	16
12	First Floor Beam Slab Work	40
13	First Floor Brickwork	14
14	First Floor Staircase	12
15	Plaster Work	18
16	Paint Work	6
17	Electrical Work	15
18	Plumbing Work	12
19	Flooring Work	15
20	Miscellaneous	30
<b>Total</b>		<b>345</b>

### 3.5 TIME ESTIMATION FOR PREFABRICATED BUILDING

Sr. No.	Description	Duration in Days
1	Earth Work Excavation	6
2	PCC in Foundation	8
3	Footing Work	34
4	Backfilling	3
5	Plinth Beam	19
6	Ground floor Column Work	15
7	Plinth Brickwork	12
8	Ground Floor Slab and Beam	18
9	Ground Floor Brick Work	16
10	Ground Floor Stair Case	1
11	First Floor Column Work	15
12	First Floor Beam Slab Work	17
13	First Floor Brickwork	20
14	First Floor Staircase	1
15	Plaster Work	0
16	Paint Work	6
17	Electrical Work	5
18	Plumbing Work	10
19	Flooring Work	15
20	Miscellaneous	20
<b>Total</b>		<b>241</b>

### 3.6 BAR CHART OF TIME COMPARISON

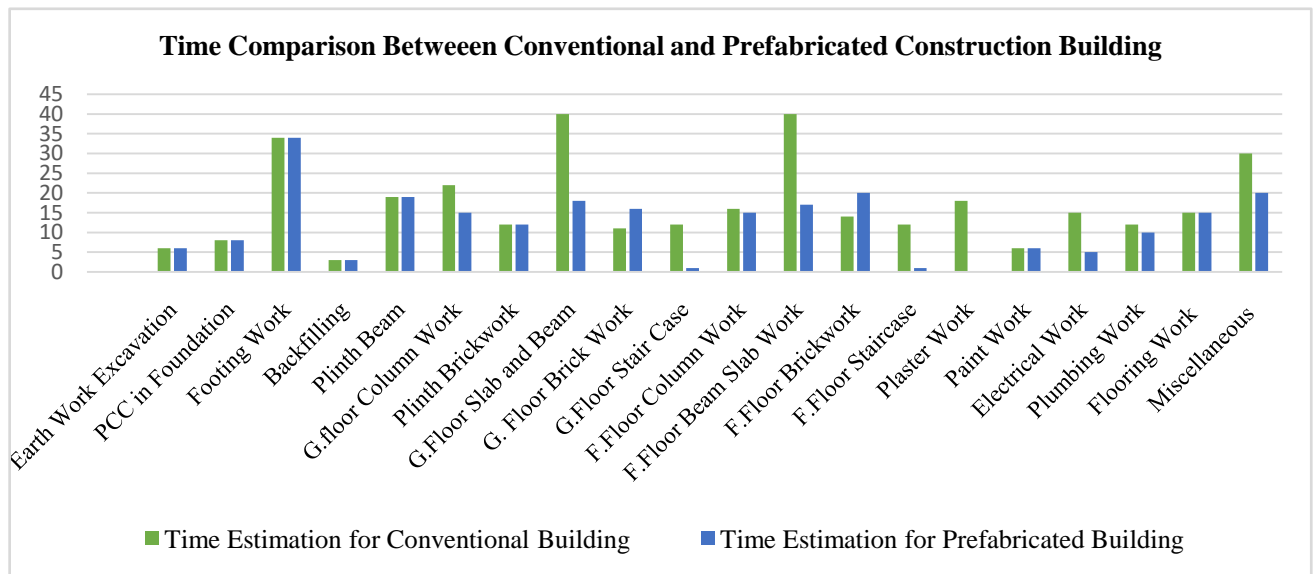


Figure 7 Bar Chart of Time Comparison

### 3.7 TIME ESTIMATION FOR CONVENTIONAL CONSTRUCTION BUILDING AND PREFABRICATED BUILDING AFTER GIVING LOGICAL RELATIONSHIP

Sr. No.	Description	Duration in Days
1	Substructure	75
2	Superstructure	155
3	Finishing Work	42
<b>Total</b>		<b>272</b>

Sr. No.	Description	Duration in Days
1	Substructure	75
2	Superstructure	71
3	Finishing Work	33
<b>Total</b>		<b>179</b>

### 3.8 PIE CHART OF TIME COMPARISON BETWEEN PREFABRICATED BUILDING AND CONVENTIONAL BUILDING

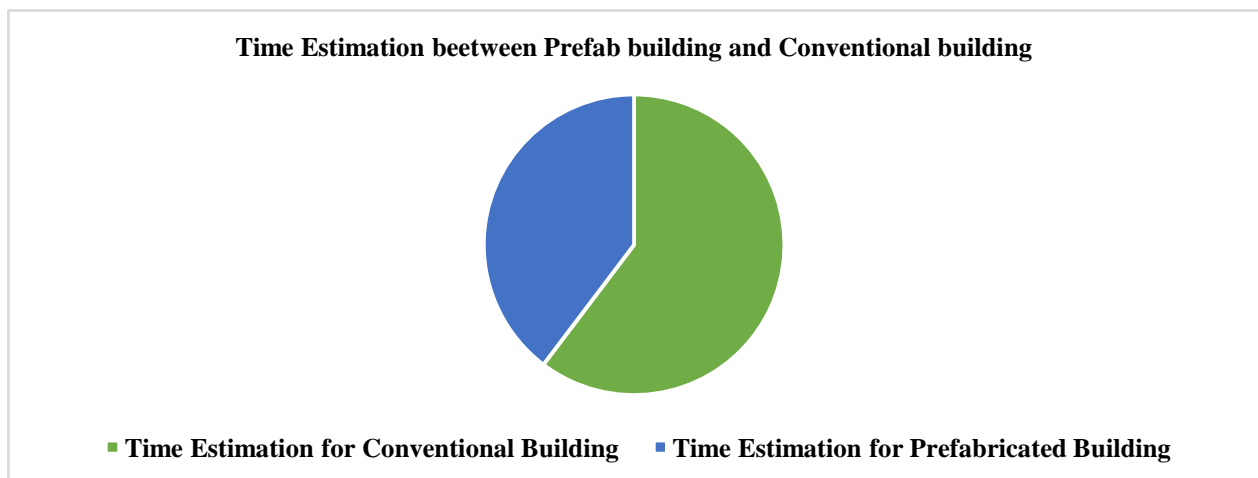


Figure 8 Pie Chart of Time Estimation

**3.9 GENERAL COMPARISON BETWEEN PREFABRICATED CONSTRUCTION AND CONVENTIONAL CONSTRUCTION TECHNIQUE AFTER THIS STUDY**

<b>Prefabricated Construction</b>	<b>Conventional Construction</b>
Labour requirement is less so labour cost less. (1.44 Lakhs)	Labour requirement is more so labour cost more. (1.85 Lakhs)
No wastage of materials because of precast elements are used.	More wastage of materials.
Equipment cost is higher due to use of crane.	Equipment cost is lesser.
Soil less pollutes.	More polluted soil due to different materials used on site.
Planning phase longer but execution phase shorter.	Planning phase and execution phase both are longer.
Space increases due to less width of walls.(16 m <sup>2</sup> )	Space not increases due to general size of wall width higher than prefab walls.
Less number of activities due to removal of formwork, plaster work and reinforcement work.	More number of activities.

**4.0 CONCLUSION**

- ➔ The comparative study on the traditional construction method and prefabricated construction method uncovers that the aggregate time of the project completion can be lessened up to **34.20 %** by using prefabricated construction technology. The study likewise demonstrated the minor increment around **0.78 %** in cost of development of the prefabricated construction. So in this comparison the total cost of the project is little higher for prefabricate construction but the time of project completion is reduces with very big margin.
- ➔ Development of different components by utilization of precast technology causes us to accomplish economy and quick track development which is need of construction industry.
- ➔ After doing this study we can also conclude that whenever project is big and very large amount of resources and materials required for the project in this scenario using prefabrication technology is gives us very fast and economical construction.

**5.0 REFERENCES**

- 1) BN Precast Pvt. Ltd
- 2) Oracle Primavera P6 Professional R8.2
- 3) International Journal of Emerging Trends & Technology in Computer Science (IJETTCS) Web Site: [www.ijettcs.org](http://www.ijettcs.org) Volume 6, Issue 3, May- June 2017 ISSN 2278-6856
- 4) International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Volume 1 Issue 9 (October 2014) [www.ijirae.com](http://www.ijirae.com)
- 5) Resin cap International Journal of Science & Engineering Volume 1, Issue 2, February 2017.
- 6) Hindustan Prefab Limited Official Website
- 7) "http://www.hindprefab.com/"
- 8) IJSRD - International Journal for Scientific Research & Development| Vol. 1, Issue 7, 2013 | ISSN (online): 2321-0613
- 9) <http://precast.org/wpcontent/uploads/docs/100.pdf/>
- 10) International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 4, April 2016 ISSN: 2278 – 7798
- 11) International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 11 | Nov -2016 [www.irjet.net](http://www.irjet.net) p-ISSN: 2395-0072