International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 05 | may 2022 www.irjet.net p-ISSN: 2395-0072

Development OF Low Cost Durable Precast Compound Wall

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Abstract - *Sustainability is a global concern and therefore the goal of humanity should be to create a sustainable world. To ensure sustainability, methods that should be used for the efficient use of long-term resources, to reduce waste of energy, energy and control overuse, and to ensure that there are areas reserved for future generations without total exhaustion. This presents a report on the results of an investigation into low-cost use, a solid pre-built wall and how it is made. It must be ensured that it is easy, sustainable, economical, fast and a solution to the environmental inequalities caused by the overuse of resources and energy. Thus, we aim to conclude that by using low cost, solid precast wall in construction than conventional construction methods, we can achieve a simpler, faster and cheaper construction method.*

Key Words: Precast Compound Wall, M Sand, Construction, Sustainability, Wastage Material

1.INTRODUCTION

1.1 Background of the study

Factory wall panels are designed and designed to fully utilize its profile to provide greater stability and ease of services and modifications such as electricity, plumbing, etc. Even after the panels have been repaired, the modifications made can be fixed with cement sand mortar. This is easy to set up and conversion machines can be used along with local staff. With minimal adjustment, the panels can be used for endless assembly work. A continuous type of construction as the volume of materials used is small. Cement, sand and mortar are essential requirements for any construction industry. Sand is the main material used to prepare mud and concrete and plays a very important role in the formation of the mixture. The use of natural sand is usually high, due to the high use of concrete and mud. A developing country like India facing a shortage of high quality natural sand and especially in India, natural sand residues are being exploited and pose a serious threat to the environment and society. The facts as in India are almost the same in other countries. Therefore, the need to find another way to river sand in construction works is very important now-days. Contractors have long recognized that regular construction in the metropolitan area has resulted in significant labor costs and delays due to lost time in the transportation of workers to and from the project site, transportation, tools, tools, etc. due to traffic congestion. Due to the very advanced development of the earth's crust, there is a much restricted space for storage and directing of equipment. Deep work in the construction site causes pollution, dust, noise, air pollution, traffic congestion, other disturbances and ongoing disturbance to people living in nearby buildings. In the case of pre-concrete construction, pre-construction of concrete and structural concrete products is carried out in easily accessible areas away from congested facilities. Wall panels, beams, columns, slabs, stairs, facades of buildings and other components are made under controlled conditions in areas with sufficient working and storage space. Precast components are made of high strength, durable steel and high quality concrete in cast iron or glass fiber, which provides a repetitive and economical recycling. Precast Concrete is a building product that is made by throwing concrete on the skin and can be stored in a controlled environment, placed on a construction site and then lifted and placed in place. Part of the precast concrete is one of the structures in place. Locally applied concrete is commonly used, where its basic materials are readily available anywhere in the country. But with the total cost of construction, construction speed, high quality of work, low weight building and environmentally friendly projects, the empty concrete part is another developer solution. In order to improve the infrastructure the precast concrete industry is heavily influenced by Government-initiated projects.

1.2 Traditional Warring Walls V / S Precast

In the past bricks were considered the best choice for composite walls to work with them and now precast composite walls are getting a lot of attention with a better design. Precast composite walls are available in a variety of sizes, shapes, designs, colors that make up a classic building design, which not only looks beautiful but also saves construction time.

1.2.1 Traditional composite walls

• Traditional composite walls are made of clay and other heating systems, the durability of which depends on the quality of the concrete used during the repair.

• The construction of a traditional wall (around 100mtr) takes at least 7 days to build and another 7 days for water healing that requires long installation and hard work.

• In terms of building materials and construction processes, the construction of traditional brick walls is very expensive.

• Traditional brick walls are not as strong as precast composite walls Its 150mm thick bricks can be easily broken with standard hand tools.

• If brick walls are built in areas with wet weather, they can easily be damaged by the weather.

• In the event of a failure during construction, we need to build approximately a new compound.

• The durable material of a brick wall depends on the quality of the size, the quality of the sand, and the craftsmanship, making it naturally weak.

1.2.2 Precast Compound Walls

• Precast composite walls are made of concrete and steel that are heavy and durable compared to conventional brick walls.

• The construction of a 100mtr integrated wall takes about 2 days which greatly reduces the time required to build the wall.

• Compared with traditional brick walls these walls are expensive and offer a long lasting life.

• These walls have strong ropes every 75 mm and can only be cut with a machine.

• Precast walls are resistant to mold, fire, and moisture and have no effect on them.

• In the event of a failure during construction, only a few columns may be affected so that we can replace those panels only. By making small adjustment panels that can be reused.

• Precast panels provide high security. The panels are made of solid reinforced concrete with high quality concrete for mechanical cutting.

1.3 Introduction To Precast RCC Wall Panals

Precast Concrete is a building product that is made by throwing concrete on the skin and can be stored in a controlled environment, placed on a construction site and then lifted and placed in place. Part of the precast concrete is one of the structures in place. Locally applied concrete is commonly used, where its basic materials are readily available anywhere in the country. But with the total cost of construction, construction speed, high quality of work, low weight building and environmentally friendly projects, the empty concrete part is another developer solution. In order to improve the infrastructure the precast concrete industry is heavily influenced by Government-initiated projects. However, these are also widely used in residential (low and high) and functional buildings due to their various attractive features. The efficiency, durability, ease, cost effectiveness, and natural properties of these products have brought about a new transformation in the construction of any building. The construction industry is a huge energy-intensive industry, and pre-played concrete products are strong and will continue to operate more economically than their counterparts. The wide range of designs, colors and design options offered by these products also makes it a good choice for its customers. Ordinary concrete is strong but high in personal weight. This feature affects the ease of the Construction which will extend the construction time. More construction workers are needed to accelerate the progress of the construction work. Due to the increase in staff, costs will also increase. Traditional methods of dismissal involving three problems; that is, dirty, heavy and dangerous have always been associated with the construction industry. The construction industry suffers from low productivity, safety and quality control due to this situation. The materials used for precast concrete structures are provided as concrete, structural steel and bolts, steel reinforcement, and non-cement materials (rubber & mastics used for soft bearing pads, Elastomeric bearings Neoprene, backing strips etc.). Many different types of concrete concrete molding systems vary in size, purpose, and cost can be used for structural purposes.

1.4 Materials Used For Precast Concrete

Concrete - Concrete is often the preferred material for exterior walls in commercial buildings due to its high structural integrity and low repair requirements. Unlike other building materials, concrete develops its maximum strength in the first 30 days but continues to increase strength in the life of the building. Since buildings have a demolition relationship over time, rather than evolving, concrete is an interesting variation. The hydration process is the source of its non-traditional age for advanced years. Water installation is continuous and concrete structures become longer; as the compounds increase, they connect and form a powerful unit. Precast concrete structure is of the highest possible quality both in terms of strength and durability. Concrete is poured into pure metal forming, to produce common elements such as columns and beams. The use of attached filters attached to the correct oscillation by the size and weight of the completed mold ensures the correct density to a size of 2400kg / m3 (without tightening). The higher the finishing effect, the less porosity the greater the hardness.

Steel Reinforcement - Steel provides high friction and shear strength to correct what the concrete means. Iron and concrete behave in the same way in changing places which means they will shrink and expand with concrete, helping to avoid cracking. Rebar is the most common way to strengthen concrete. It is usually made of steel, with ribbing to attach to the concrete as it heals. Rebar is flexible enough to bend or

join to support the shape of any concrete structure. Rebar is the most common way to strengthen concrete. It is usually made of steel, with ribbing to attach to the concrete as it heals. Rebar is flexible enough to bend or join to support the shape of any concrete structure. Carbon steel is the most common rebar material. However, stainless steel, raw steel and epoxy coating can be used to prevent corrosion. The hot tub ribs (HT rebar) is used in 95% of cases, even for shaving relatives where soft metal may be appropriate.

Structural Steel and Bolts - These include rectangular and rectangular folded sections (RHS, SHS), solid billets, channels and angles, plates and welded tees, etc. In most cases the most emphasized support is where direct contact between concrete areas should be avoided. steel parts & curved or flat metal plates are welded to make used metal connectors. Dipped heaters are used for open communication, such as dovetail channels of brick ties. Sturdy adhesive bolts are used in special cases where the integrity and safety of the connection is made by standard bolts in the opening holes.

Non Cementations Material - Communication where rapid energy gain is required, e.g. up to 40N / mm2 in 2-3 hours, epoxy-based metals are used to partially or completely. Heat expansion of epoxy material 7 times than concrete. Neastrene Elastomeric bearings, rubber & mastics used for soft bearing pads, backing strips, etc.

1.4 Motivation of research

Nowadays construction costs, quality and speed of construction play a significant role in the installation of the building. The precast concrete elements are a solution for building construction due to the economic benefits of construction speed. Communication between the panels is very important as it affects both the speed of the assembly and the overall reliability of the structure. Precast concrete wall panels have many advantages over cast in situ members, which include reliable quality, suspension speed, and high concrete strength. Recently, a precast process was adopted to address this issue such as speed, quality and cost. In this project, research is done on a precast concrete wall panel in which the option of a stable structure, which provides durability, reduced humidity and air permeability, energy efficiency, recycled content, recycling, low weight, and low maintenance. Communication between the panels is very important because they provide monolithical structure of the structure.

1.6 Objective

The main objective of this project is to find a suitable construction method that is low-cost and offers a minimum of time by conducting comparative research between previous construction and conventional construction.

• Improving low cost, solid precast composite wall using other materials.

• Determining all the elements between a precast wall and a brick wall.

• Determining stability stability, cost analysis, precast wall time analysis.

2. LITERATURE REVIEW

In this chapter the following research paper has been researched to do this work.

Mr. Kartik Janakram (2018) Research conducted on ICW-25 (Internal Cavity Wall) 'Precast Concrete-Non-loading partition wall building' ICW-25 is an advanced technology for producing precast concrete wall that incorporates matrix strength. with a rib profile, which improves structural stability. A thickness of 25mm is achieved due to the suspension which prevents bending wide. These LIGHTING LIGHTS have a unique TWIN space wall panel attached to the back with a 50mm air gap, which helps resources be added after the construction of the panels on one side. ICW-25 panels improve work quality and reduce load on the building. Its low size results in a reduction in raw material. It lasts a long time and is affordable.

A. Surekha, J.D. Chaitanya Kumar and E. Arunakanthi (2016) A cross-sectional study of the design of 'pre-distributed load-bearing wall' states that the lateral load of a storey building is the most important factor to consider in design. To determine the impact of earthquakes and the effects of wind on a multistory building, a study of the G + 11 precast load-bearing wall was performed. Four different earthquake zones and all air zones are considered for analysis using ETABS. Structural response due to rear loads with a combination of loads is excluded. Impact of side load in off-plane times, axial strength, shear strength, base shear, high floor slope and strong shear wall thickness are planned. Finally, the impact of the earthquake and the atmosphere is divided.

Dinesh Kumar et al. (2015) conducted a study to study the current state of the precast construction industry in India. In his study two important factors are considered cost and time. For this purpose the data collection was done in the form of a questionnaire and from this study the current status and scope of the predictive strategies are unknown. The residential structure is taken as an example and comparisons are made. Comparisons have shown that there is a significant cost difference between the methods, where prefab is much higher compared to conventional for each type of housing. Prefabricated construction of the cost of a two-story apartment is 13% higher than conventional construction. This is the main advantage of prefab construction which is not cost-effective construction in this case. At the same time prefab construction is easy to operate and reduces project length, reduced by 63 days compared to normal. At this stage conventional construction is more economical and comfortable compared to previous construction.

Siva Priya et al. (2009) conducted this study, as the construction industry changed its approach to conventional methods with various new techniques in the construction and selection process. Precast Construction Methods can enhance productivity and quality of work through better construction equipment, materials, building materials, and comprehensive pre-project planning. This research is important because there is no organized body. In this research thesis precast construction and conventional method are compared and it is found that the total cost required to construct a building using the precast concrete method is reduced by 20% compared to the conventional method.

Akash Lanke et al., (2016) developed a thesis to analyze the structure, cost and time of pre-built buildings and the RCC. Apart from these factors a variety of other minor factors such as construction speed, quality control, environmental conditions, human resources, durability, connection, size, position etc. are also considered for analysis. Cost and duration compared to major factors. one building is chosen as an example and the Design is designed for the same structure as the precast building and the Traditional Cast in-situ building. In this analysis it is surprisingly common that the cost of a precast building is greatly reduced and the construction time is also much less than the traditional method. From all this research we can conclude that the precast concrete system is more economical than conventional installation but there are still some factors that we must take into account when using precast, that is the construction cost, the distance from the production unit. , Structure type etc.

Souma Alhaj et al. (2016) made a thesis on the development of pre-concrete production. The production process is therefore investigated using a production delay model. Forty cycle data is used for analysis. The impact of comparisons and robustness is measured by five causes of delays, namely: personnel, environment, management, equipment and materials in the productivity of the entire system. It is obtained by analyzing the production delay of the item, followed by the availability of equipment and the fact that workers contribute significantly to the system delay. Second, statistical analysis during the input cycle of the three pre-broadcast segments is performed, to confirm whether the apparent delay in the first step is due to the variability of the previous character fragments. It has been concluded that future work is to develop a decision-making model that can be used by production and construction managers to improve crop production and environment.

Low Cost Housing Published by Rinku Taur and Vidya Devi (2016) (TCE Consulting Engineers Ltd, New Delhi). This paper aims to highlight the various aspects of low-cost construction methods of low-cost housing by highlighting different building strategies, as well as the economic benefits achieved through its adoption. The current major methods of construction plans considered here are, building block walls, small block walls, prefabricated roofing parts such as RC panels, hollow concrete panels, pre-built concrete / Ferro cement panels.

3. PROPOSED METHODOLOGY

In this chapter the following methods are used to conduct, evaluate, collect information, analyze and complete this work.

3.1 Material Used:

1. The standard Portland cement grade 53, which meets the requirements of IS 12269: 1987 (reaffirmed 1999) was used in this study. Aggregates, which comprise 60 to 75 percent of the total amount of concrete, are divided into several different categories, and rough or fine. OPC 53 Grade Cement is required to comply with the definition of BIS IS: 12269-1987 with a capacity designed for 28 days at a minimum of 53 MPa or 530 kg / sqcm. The 53 Grade OPC provides high strength and durability of structures due to the distribution of suitable particles and a very high gloss structure. The 53rd grade cement is Portland Cement (OPC), the most widely used cement in India. Grade 53 cement gets 27 MPa (compression strength) in 3 days. And it is a quick set-up cement among other grades.

2. M-sand is used as a positive aggregate in this project. Dust is selected from a nearby source as raw material without processing the dust from the quarry. Quarry dust is a product of the processing of granite rocks that break up into rough compounds of various sizes.M-Sand has been used as a substitute for a good amount. The density of the sand produced was 1860 kg / m^3, the specific gravity and fineness modulus were found to be 2.56 and 3.10 respectively.

3. Typical broken granite letters with sizes 16mm, 12mm and 8mm are used on the panel. Aggregate acts as a guarantee of adding strength to composite materials, concrete. Salary aggregates are particles larger than 4.75mm, but generally vary between 9.5mm to 37.5mm in diameter. It can be from primary, secondary or recycled sources. Basic, or 'pure', collections include Land- or Marine-Won. Gravel is a winning marine compound; halls found in the world consist of stone and crushed stone. Stones comprise a large portion of the coarse concrete used with crushed stone making up the bulk of the residue.

4. Master Glenium-8233 is used as a composite in making these wall panels. Master Glenium 8233 is a new generation compound based on modified polycarboxylic ether. The product is primarily developed for use in high performance concrete where high durability and performance are required. MasterGlenium 8233 is low in chloride and low alkali. Compatible with all types of cement.

Recommended Use of Master Glenium- 8233 -

• Rheodynamic concrete production

• High concrete performance for durability

• High strength concrete early and finally

• High performance without separation or bleeding

• Precast & Pre-stressed Concrete

• Concrete containing pozzolans such as microsilica, GGBFS, PFA including high-volume fly ash ash

5. 8mm and 6mm diameter steel is used as a surety, using a standard fastening cord. The TMT 500D is a TMT bar with strong ribs, used for reinforcing concrete. The high strength of this bar is 500 MPa and 'D' represents its high ductility, thus defining a certain nomenclature. Energy consistency is guaranteed for the entire length of the rebar as the level of impurities such as Sulfur and Phosphorous is kept below 0.075% in construction. The TATA Tiscon 500 D complies with the highly revised standards (last revised 2012) set by the Bureau of Indian Standards (BIS).

3.2 Methodology

In the present study, the M53 range with a combination of names such as IS 456-2000 was used. The portion of mixing concrete (cement: fine aggregate: coarse aggregate) is 1: 1.8: 2.925 by volume and a water content of 0.42 is taken. The added weight of the mixture is 1.90 Kg / m3.

3.2.1 Concrete Mix Design

The measuring mix is designed for a Target Mean Strength of 38.25 N / mm2 and a factor strength of 30 N / mm2 @ 28 days.

Table 3.1: Mix proportions for 1m³ of concrete

Mass of Cement in kg/m3	400
Mass of Water in kg/m3	160
Mass of Fine Aggregate in kg/m3	720
Mass of Coarse Aggregate in kg/m3	1170
Mass of Admixture in kg/m3	1.90
Water Cement Ratio	0.42

4. RESULTS AND DISCUSSIONS

By conducting this research and data analysis the following results were developed based on experimental and research studies.

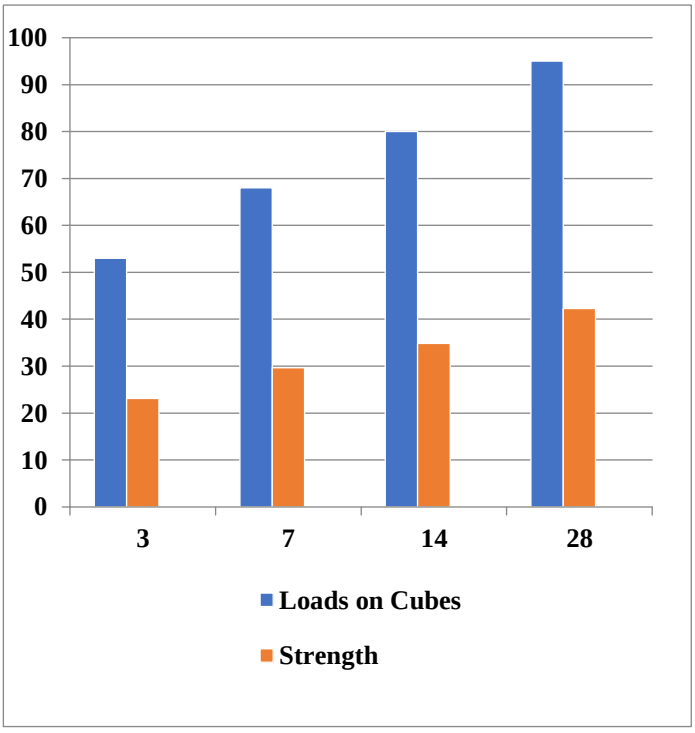
4.1 Test on concrete

4.1.1 Compressive Strength Test

Inspection of solid concrete area in an important role in controlling and ensuring the quality of cement work. One of the most important properties of solid concrete is its strength represents the ability of concrete to withstand strength. When the nature of energy is to produce pressure, energy is called the force of pressure. The compressive strength of solid concrete is generally considered to be the most valuable asset and is generally considered to be an indication of the total amount of concrete defined as the load that causes the failure of the sample, each crass section unit uncomfortably. pressure below a given loading level. Test tubes are prepared as specified and stored for treatment for 3, 7 and 14 days. Tests are performed on the density test machine as per the specifications specified in the IS code.

Table 4.1: Compressive strength of Concrete

Specimen No.	No. of days cured	Load on cubes (tons)	Strength (N/mm²)
1	3	53	23.108
2	7	68	29.65
3	14	80	34.88
4	28	95	42.25



4.2 Slump Test

Unsupported concrete when burned will flow to the sides and will sink to a height. This straightforward living space is known as a slump. Slump measurement indicates the consistency or efficiency of cement concrete gives an idea of the water content required for concrete to be used for various functions. Concrete is said to be effective if it is not easily mixed and easily laid, glued together. Active concrete should not show any separation or bleeding. Separation occurs when a coarse amount tries to separate from the fine material and the aggregate reduction of roughness in one place occurs. This results in larger voids, less durability and less strength. Bleeding occurs when more water rises over the concrete. This causes small holes in the amount of concrete and is not required. Deterioration increases with increasing W / C rate. To test the components of the mix are calculated. Mix the dry parts well to get the same color and add water. The tests are performed as IS specifications and the results are tabulated.

Table 4.2: Slump value for concrete mix

Water-Cement Ratio	Slump (mm)
0.42	290

4.3 FABRICATION AND INSTALLATION

4.3.1 Fabrication

Bar Bending- The Rebar bends to get the required shape and length. The size of the rebar, the space and the length of the lap are determined according to the diagrams. Metal plumbing, safety steel pipes, seats, hoisting hooks and fittings must be properly installed and properly protected. Using a production rig can help ensure the accuracy of the rebar adjustment and space. Where necessary, tacking welding can be done to secure these items. Adequate numbers of spaces of appropriate size must be properly placed and secured to achieve the required concrete cover during molding. With pre-stressed concrete element, such as planks, pulling the strings should only be done when the release agent is dry to some degree that will not contaminate the wires. Check and make sure all details are complete with drawings

Concrete mixing - Check the quality of concrete used in terms of design specifications. Perform demolition tests in accordance with IS standards to check the effectiveness of concrete mix before applying concrete to the skin. A mechanical mixer is used for mixing concrete. Add 2: 5: 7 ratio. While mixing 300 ml of admixture (master glenium-8233) is applied with 50 kg of cement.

Molding - Mold details and contacts ISMB 200, ISMC 200, 60 × 6 mm flat, 5mm sheet (spaced sheet) materials used for mold. The different parts of the mold are fixed using a bolt connection. It should be checked that the joints and edges of the mold, bolts are well secured. The size of the mold is within the specified tolerance. The mold used in this process should be clean and free of debris and mud that can be removed using a sieve or measuring stick. Engine oil or an agent that removes mold should be applied evenly over the mold. The type of mold is determined by the cost or revenue generated. The process of forming Rebar objects thrown in, the lifting hooks should be well positioned and well secured. Welding is done to protect the property, where necessary. A sufficient number of spaces of the correct size must be properly placed and secured to achieve the required concrete cover during molding. The prepared concrete mixture is poured on the skin, the droplet height of the concrete mix should not exceed 1 meter. Vibration should be performed using 3000rpm, 150hp vibrator, tip needle. The top layer of concrete is trampled. Finishing is done using a roller.

Demolition and Treatment - During demolition concrete strength must be high to overcome gravity and collisions during demolition. The crane is used for demolition, due to its weight. The mold is placed in such a way that the wall panel rests on the floor. Loosen and remove all bolts and fill in the various mold forms. The mold has now been raised using a crane, a small hammer will ensure the release of mold from the panel due to vacuum emissions. Sufficient healing time is determined by the area you want. The wall panels are covered with water mats and cured for three days. After 3 days of treatment, the wall panel will be replaced.

4.3.2 Transport

Wall panels are checked before shipment. Required symbols and numbers are created to avoid confusion in the area. A 6-wheeled truck will have a limit of 10 tons, so the four panels will have 8.8 tons. The walls are horizontally aligned with the truck and fitted with appropriate packaging materials so that they do not jump and move on the truck. Loading the truck panels will be done using a crane.

4.3.3 Installation

Digging 1 foot deep and 600mm wide is done. Placed 100mm thick PCC bed. The wall panel is lowered into the transport vehicle using a crane. The wall is placed on a PCC bed, with a gap of 2 inches or other suitable space between the walls depending on the layout plan. Panel alignment is checked, and good adjustments can be made. The left rebar from the bottom of the wall is welded with an 8mm rebar for the entire length. Fill in the foundation space using the remaining earth work. The gap between the panels is filled with mud and can be closed with matches and filled with mud.

4.4 Stability Check

The stability of a wall panel in different types of soil can be achieved by using the individual weight of the wall panel, the base area and the SBC of the specific soil. The prices given below for the safe carrying capacity of various types of soil are in accordance with the National Building Code of India (SP 7).

4.5 Cost Analysis

Volume of 1 wall - (2.44 X 2.82 X 0.1) + 2 (0.5 X 0.08 X 0.15) + (0.4 X 0.1X 2.44) = 0.815m3 Considering the volume of items listed above the estimated cost of 1 wall material is Rs. 57. For the purpose of cost analysis some research is done. Estimated costs are calculated from the construction of the factory building in conventional methods (using bricks and blocks of C.C.) and are compared with the panel construction method as listed below in Table 4.3.

Table 4.3: Cost comparison for construction

Type of construction	Cost of construction (in INR)
Conventional construction using Bricks	1,583,150.00
Conventional construction using C.C Blocks	1,400,750.00
Panel Construction	1,000,130.00

4.6 Time Analysis

The average time required for various activities is noted and tabulated below for one wall fabrication.

Table 4.4: Time required for fabrication, shifting and placing of one wall

Work	Time Required
Bar Bending	2 hours
Molding	1 hours
Demolding	20 minutes
Curing	3 days
Loading at factory	20 minutes
Transport to site	Depends on site location
Unloading	15 minutes
Placing	10 minutes

5. CONCLUSION

Through the conduct of this study the following conclusions were made based on exploratory research and research. Research on the use of RCC wall panels has yielded excellent results in major construction problems such as reduced construction time, clearing the view of reusable concrete buildings, replacement of natural sand with M sand, significant reduction in work these major concerns these days.

The following research has significantly noted the following;

• Replacement of natural sand with M sand results in a 70% reduction in sand cost making the wall panels more economical in the current sand shortage situation.

• Timely analysis has shown that building using wall panels is faster than 56% significant construction as production is doubled.

• Panels are more stable than conventional brick walls as the member is much smaller.

• The joints between the walls are made of mortar strips to remove and the planks can be reused. This suggests that concrete structures can be reused as steel structures.

• The cost analysis of a simple factory construction project has shown that the construction of wall panels reduces costs by about 30 to 35%.

ACKNOWLEDGEMENT

The authors are grateful to the GURU NANAK INSTITUTE OF TECHNOLOGY, NAGPUR, MAHARASHTRA, INDIA ,for providing guidances and resources to carry out this work.

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