

A Comparison of the Durability of Plaswall and Traditional Construction Blocks in the Philippines

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Abstract—Over the last few years, there has been an increase in the demand for low-cost housing. As the demand for low-cost housing and construction grows, an innovative building solution has become essential. In recent years, many developers have experimented with technologies that can reduce overall construction costs, making housing more affordable for those who are less fortunate. The study's goal is to increase the use of Plaswall and provide more information about it so that it is known by more people. Two tests were performed on the Plaswall and Concrete Hollow block to compare and prove their durability and efficiency. This paper will investigate the affordable housing produced by an innovative system and present various studies demonstrating how efficient the Plaswall panel system is in comparison to traditional construction. The information gathered came from a variety of sources, including websites, studies, and experiments.

Keywords—Traditional Construction Blocks, Characteristics of Concrete Hollow Blocks,

Plaswall Building System, Materials and Components of Plaswall, Durability of Plaswall and Traditional Constructions Blocks

I. INTRODUCTION

There is an increase in infrastructure across the globe, particularly in non-aligned or developing states. The established norms and methods for solving this problem in construction and housing are under stress from expanding populations and rising demand. Traditional construction methods are falling short of expectations despite increased money and aspirations that are higher. Unfortunately, many economies throughout the world are slowing down as demand for lighter and taller buildings increases. People in the engineering and construction professions pushed through improvements and better solutions in response to the enormous rise in demand for effective technological systems for the modern world. (De Leon, 2016).

The use of eco-friendly materials, which must be low cost and durable, could have a significant impact on whether an affordable housing project is economically possible. The Plaswall Panel System, a new innovative building system that is now being adopted in several regions of the nation and even in some parts of the world, is very durable, eco-friendly, and allows easier and faster construction due to the high pressure of good building qualities and housing projects.

The Plaswall Building technology is better than the existing hollow concrete block construction method. Plaswall is a pre-rendered wall solution that considers things like construction speed, severe industrial loads, and aesthetic views. In the Philippines, and more specifically in the city of Cagayan de Oro, this new technology is creating out a place for itself in the building industry. Due to its efficiency and long-term durability, it is an innovation that has a significant impact on the building industry. According to Niwane (2016), Plaswall is a well-organized, prefabricated modular load-bearing construction solution. This is marketed as being environmentally friendly because it doesn't produce industrial waste, is made of recycled plastic, and uses recycled and reused water during manufacturing. This ensures that the waste generated is small in comparison to other structures or construction methods.

According to the Building Materials & Technology Promotion Council(BMTPC), fiber cement boards, spacers, glue, cement, and sand are used to create Plaswall panels, which are used as walling material. In place of costly steel, aluminum, and plywood formworks, Plaswall is a special fiber cement loss in place or permanent concrete formwork. Comparing the mentioned Plaswall to concrete hollow blocks, it is far more effective and durable because it is made of reliable and safer components. In one of the upscale subdivisions in the Philippine city of Cagayan de Oro, Plaswall was first applied. The said project was constructed by the Homechoice Planners & Construction Corporation(HPCC) and its outcome became successful, with the faster building process and great quality results.

According to Fabtech Sterling, the Plaswall Panel System has several benefits to offer, one of which is that it is non-combustible and has a high level of fire resistance. Plaswall is far more effective to use than traditional construction due to its vulnerability to such pests and its resistance to termites and other pests. Compared to traditional construction systems, this system not only performs structurally and functionally better, but it also delivers speed, safety, and sustainability.



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II. METHODOLOGY

Phase 1: Identification of the use of Plaswall and Traditional Construction Blocks in the Philippines and other countries

This phase aimed to acquire a concept and context about the use of Plaswall and traditional construction blocks in the Philippines and other countries. It consists of 3 steps, which include the Review of Related Literature, analysis, and evaluation of factors wherein Plaswall and the traditional construction blocks are used. This phase was done by obtaining research studies through e-Libraries, news articles, and research articles that have credible citations.

Step 1: Review of articles and literature regarding Plaswall and Building Construction Blocks to evaluate its durability

This step focused on articles and other reading materials pertaining to Plaswall and Building Construction Blocks to evaluate its durability and acquire an overview of the presence of knowledge on the topic. The review of relevant literature and studies focused on deriving the differences between Plaswall and building construction blocks. The Articles, documents, and manuals from related sources utilized in these steps came from a reliable internet source that serves as the foundation for the intended study.

Step 2: Analysis of construction articles containing information where plaswall and traditional construction is used.

This step reviewed and analyzed project reports and reliable related sources using the plaswall and traditional construction. This step focused on defining the distinction between utilizing the plaswall and the traditional materials used in the construction. It emphasized the evaluation of the credible documents regarding the existing construction projects that used the plaswall and standard materials in the construction came from a reliable source on the internet.

Step 3: Evaluation of construction plans that utilized the use of plaswall and the traditional construction.

In this step, the data gathering procedure is similar to steps one (1) and two (2). This process involves reviewing and analyzing project plans and relevant sources using Plaswall and traditional construction. The documents and project report analysis from construction project plans are based on the past and current project plans of existing structures utilizing the Plaswall and typical construction materials. Through this step, the study factors are assessed and discussed.

Phase 2: Devising a methodology approach to evaluate the durability of Plaswall and Traditional Construction

This phase focused on determining which methodology approach will be used to determine the durability of the wall and the block. Data gathering procedure, instruments, and respondents were determined in this phase, and it will also adapt the conditions said in phase 1.

Step 4: Research different methods for determining the durability of Plaswall and building construction blocks.

Identifying the suitable methods in determining the durability of Plaswall and traditional construction blocks is the most important part of this research because it gives a better understanding for the researchers to identify the most effective way to obtain the results. It consists of a review of related literature and internet research.

Step 5: Validation of methods to use from recent research studies, construction projects, and standards.

Same procedures with step 4, the researchers verified the method if it is effective through past research studies, construction projects, and standards. Using case study to gather information will generate information on what data gathering procedure will be done.

Phase 3: Water absorption test and drop and impact test in Plaswall and Traditional Construction blocks

In this phase, 2 tests were conducted to determine the durability of Plaswall and traditional construction blocks, which are the water absorption test and the drop and impact test. After doing the following test, a comparison of the results between the walls and blocks were studied.

Step 6: Determining the water absorption test for Plaswall and traditional construction blocks

One major issue that was thought to offer access to aggressive compounds that could reduce concrete's strength was the absorption of water. A specific gravity test is used to evaluate the strength or quality of the material, whereas a water absorption test is used to evaluate the strength or quality of aggregates. The main objective of these tests is to evaluate the strength or quality of the material. A water absorption test was conducted to further evaluate and contrast the tensile strength and durability of both materials.

Step 7: Determining drop and impact test in Plaswall and traditional construction blocks

In this step, the researchers conducted a drop and impact test to determine the various characteristics of materials, including the toughness, hardness, ductility, and strength of

the Plaswall and traditional construction blocks. This step assessed how well the two different product materials and designs will hold up against a certain level of external impact force.

Step 8: Comparison of the use of Plaswall and traditional construction blocks

The researchers evaluated the comparison between the use of plaswall and traditional construction blocks regarding the test conducted in the previous step. This step determined the advantages and disadvantages of the two materials used in the construction and assesses which materials have a better quality to utilize in constructing a structure.

Phase 4: Justification of using the Plaswall in the Philippines

In this phase, the researchers evaluated both plaswall and traditional construction blocks. The objective of this phase is to justify that Plaswall has the best durability and is the best to use in construction here in the Philippines.

Step 9: Identifying significant results from the comparison

The comparison started with the necessary data that were gathered from step 8. The results are significant for the objectives of the study. The significant results that were gathered in this study were used to determine which is the most durable between Plaswall and the traditional construction blocks.

Step 10: Evaluation of the durability of Plaswall and traditional construction blocks

The researchers evaluated the durability of Plaswall and traditional construction blocks. Evaluation of quality establishes if and how well the two different materials function. Durability establishes how long and under what circumstances the product lasts. This step also determined the most cost-effective among the Plaswall and traditional construction blocks in construction.

Step 11: Presenting significant results of the durability test between Plaswall and traditional construction blocks

After evaluating, the results were presented as to which has the best durability between Plaswall and traditional construction block. The results were presented by the analysis, and the conclusions were made regarding the results from the entire study.

Step 12: Formulate recommendations for future studies

The final step of the study consists of recommendations for future studies to further improve it by adding different methods to determine the best block or wall to use in construction buildings.

The results were able to formulate a recommendation for the study.

III. RESULTS AND ANALYSIS

The data acquired, the findings of the experimental study performed, and the researchers' interpretation of the study is presented in this chapter. The results were largely derived from an experimental investigation using two different tests, namely the drop test and the water absorption test. The results were gathered through an experiment that made physical observations.

A. Water Absorption Test Results

Bubbles may be seen emanating from both materials during the water absorption test, proving that both have successfully absorbed water. Despite this, it was visible that a few CHB pieces had separated from the main specimen. Water absorption, percent (%) by mass, after 1 hour immersion in cold water, is given by the formula,

$$W = \frac{M_2}{M_1} \times 100\% \quad (1)$$

Table 1. Results gathered in the Water Absorption Test, Drop and Impact Test Results

Type of specimen	Time Interval	Weight of the Specimen Before	Weight of the Specimen After	Water Absorption Values of the Specimen in Percentage
Sample wall made using the traditional method (concrete hollow blocks)	3:30 pm to 4:30 pm	10 kg	11kg	10%
Sample wall made using Plaswall	5:30 pm to 6:30 pm	25 kg	25 kg	0

Three trials were done by the researchers. The first trial was done using a dumbbell that weighs 1kg and was dropped onto the CHB, and minimal scratches were seen on the block after the first trial. For the second trial, a dumbbell that weighs 2kg was dropped, and a lot of scratches were seen on the block. At the last trial, the researchers dropped the CHB on the floor, which made the concrete block crack and break into 3 pieces



Before



After

Fig. 2. Minimal scratches after dropping weight.



After

Fig. 1. A weight of 2kg was dropped



Before

After obtaining the results from the CHB, the sample Plaswall was also put through a drop and impact test. The identical weight of the dumbbells used in CHB was likewise employed for the three trials. At the first trial with a 1kg dumbbell dropped on the precast concrete, there were no dents or scratches seen. For the second trial, a 2kg dumbbell was dropped, and a small dent was seen. At the last trial, the researchers also dropped the precast concrete on the floor and a bigger dent and some scratches were seen.

IV. CONCLUSION

The main objective of this study is to determine and compare the durability of traditional construction blocks and plaswall in the Philippines. Both the Plaswall building system and traditional construction have the same objectives which is to build houses and buildings. They both rely heavily on concrete as their primary building material. However, when it comes to usage and construction, both have significant differences. Plaswall allows for up to three times faster installation than traditional construction or any other conventional construction. The main components can be assembled on-site faster, lowering financing and labor costs. It saves time and money on construction because it uses less skilled labor and does not require heavy equipment on the job site.

In conclusion, the plaswall system is more durable and efficient compared to the traditional construction hollow block. The Plaswall system is effective to use in construction in the Philippines, knowing that our country always experiences natural hazards, and the Plaswall system provides more resistance to earthquakes and storms.

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