



TIMBERCRETE : AN INNOVATION SUSTAINABLE CONSTRUCTION MATERIAL

Mr. Sarthak Vitthal Adulkar

Mr. Unmesh Bharat Patil

Mr. Shantanu Parashuram Shinde

Mr. Sarthak Sunil Powar

Prof. Akshay M. Karape, [Lecturer]

Prof. Arjun S. Patil, [Lecturer]

Dr. D Y Patil Polytechnic, Kasaba Bawada, Kolhapur

Name of Department of Civil Engineering,

City- Kolhapur, India

Abstract : Conventional concrete has low thermal insulation property, Timbercrete is lighter than conventional concrete. Timbercrete is an innovative and environmentally friendly construction material developed as an alternative to traditional concrete and fired clay bricks. It is a composite material made by combining waste timber, such as sawdust or wood chips, with cement, sand, and other binding agents. The purpose of developing Timbercrete is to utilize waste wood from the timber industry while reducing the environmental impact associated with conventional building materials

I. INTRODUCTION

Timbercrete is a new and green building material that has been developed as a replacement for traditional concrete and fired clay bricks. It is a composite material made by mixing waste timber, also called sawdust or wood chips, with cement, sand, and other additives. The combination of these different materials produces a lightweight, durable, and green building material. Timbercrete was first developed in Australia in the early 1990s as a way to use waste timber obtained from sawmills. The main idea behind the creation of Timbercrete is to recycle waste timber, which would otherwise have gone to waste or been burnt. Mixing sawdust with cement and sand produces a strong composite material, which can be molded in different shapes and used in the construction of buildings and other structures. Thus, Timbercrete reduces waste and the use of natural resources, which are used in the creation of traditional concrete. In this way, it is becoming increasingly popular as a green building material in the construction industry. One of the most important features of Timbercrete is that it is a lightweight material. It is much lighter compared to traditional concrete or fired clay bricks, which makes it a very attractive building material. Timbercrete is a new and green building material that has been developed as a replacement for traditional concrete and fired clay bricks. It is a composite material made by mixing waste timber, also called sawdust or wood chips, with cement, sand, and other additives. The combination of these different materials produces a lightweight, durable, and green building material. Timbercrete was first developed in Australia in the early 1990s as a way to use waste timber obtained from sawmills. The main idea behind the creation of Timbercrete is to recycle waste timber, which would otherwise have gone to waste or been burnt. Mixing sawdust with cement and sand produces a strong composite material, which can be molded in different shapes and used in the construction of buildings and other structures. Thus, Timbercrete reduces waste and the use of natural resources, which are used in the creation of traditional concrete. In this way, it is becoming increasingly popular as a green building material in the construction industry. One of the most important features of Timbercrete is that it is a lightweight material. It is much lighter compared to traditional concrete or fired clay bricks, which makes it a very attractive building material. Another significant aspect of Timbercrete is that it is a good thermal insulator. The presence of wood particles in the composition of Timbercrete creates small air pockets that act as insulators. This means that the temperature inside a building made of Timbercrete blocks will remain stable. This helps in efficient energy consumption by reducing the need for excessive heating or cooling, hence reducing the amount of electricity used. Timbercrete also has good acoustic insulation qualities. This means that it has the ability to absorb sound, thus being appropriate for use in buildings where acoustic insulation is necessary. This is particularly important in residential areas, learning institutions, hospitals, and offices, where a quiet environment is necessary. From an environmental perspective, Timbercrete is a sustainable material. This is because, unlike concrete, which uses a lot of cement, Timbercrete uses significantly less cement, thus reducing carbon dioxide emissions. Moreover, Timbercrete encourages the recycling of organic wastes, thus being a sustainable material. Finally, Timbercrete bricks require significantly less energy to produce than clay bricks, which require firing. From a strength perspective, Timbercrete has adequate strength, thus being appropriate for use in construction. Although it is not as strong as concrete, it is strong enough to be used in building partitions, walls, and other structures. Its strength can be enhanced through appropriate manufacturing techniques.

Timbercrete blocks and bricks are also easy to work with, thus being appropriate for use in construction. They can be cut, drilled, etc., thus being appropriate for use in construction sites.

Timbercrete is appropriate for use in construction because it has adequate strength, it has good acoustic insulation qualities,

II. PROBLEM STATEMENT

The construction industry is one of the largest consumers of natural resources such as sand, gravel, and stone aggregates. Traditional concrete production requires large amounts of cement and aggregates, which leads to environmental problems such as resource depletion, high energy consumption, and increased carbon emissions. At the same time, wood waste generated from sawmills, carpentry workshops, and furniture industries is often discarded or burned, causing environmental pollution and inefficient waste management.

Another major issue in conventional construction materials is the heavy weight of concrete blocks and bricks. These materials increase the dead load of structures, require more transportation cost, and demand stronger foundations, which ultimately raises the overall construction cost. In addition, traditional concrete has relatively poor thermal insulation properties, leading to higher energy consumption in buildings for heating and cooling.

To address these issues, there is a need for sustainable and lightweight construction materials that reduce environmental impact while maintaining sufficient strength and durability. Timbercrete, a composite material made by combining cement with wood waste such as sawdust or wood chips, has emerged as a potential alternative. Timbercrete blocks are lighter than conventional concrete blocks and offer improved thermal insulation while utilizing recycled wood waste.

However, despite these advantages, there are still challenges related to its mechanical strength, durability, water absorption, and long-term performance in construction applications. Therefore, it is important to study and analyze the properties of timbercrete and evaluate whether it can be effectively used as a building material.

The purpose of this project is to investigate the characteristics, strength, and performance of timbercrete and to determine its suitability as a sustainable alternative to traditional concrete materials in the construction industry.

III. OBJECTIVE

- To research and understand Timbercrete as a construction material made by mixing timber wastes like sawdust or wood chips with cement, sand, and water.
- To make effective use of timber wastes and reduce environmental pollution due to the disposal or burning of wood wastes.
- To prepare Timbercrete samples or blocks with the required proportions of the materials.
- To perform tests like compressive strength, density, and water absorption tests to understand the properties of Timbercrete.
- To compare Timbercrete with regular concrete in terms of strength, weight, and efficiency.
- To understand the environmental advantages of using Timbercrete in sustainable construction materials.
- To research the possibilities of using Timbercrete in construction works, like blocks, partition walls, and insulation materials.
- To understand the feasibility of using Timbercrete as an eco-friendly and cost-effective construction material.

IV. SCOPE OF PROJECT

The range of the project Timbercrete includes studying, developing, and evaluating Timbercrete as an alternative and sustainable building material in the construction industry. Timbercrete is an alternative building material obtained from the mixing of cement, sand, water, and timber waste such as sawdust and wood chips. The project is primarily focused on the study of its properties, manufacturing process, and performance.

1. Study of Raw Materials

The first part of the project includes the study of the materials used in the manufacturing and production of Timbercrete. Timber waste such as sawdust and wood shavings are used as an alternative material in the manufacturing of concrete. The properties of cement, sand, and timber waste are studied to determine their impact and effect on the strength and durability of Timbercrete.

2. Mix Design and Preparation

Another significant part of the project is the design and preparation of the mix proportion required to manufacture Timbercrete. The mix proportion includes the proportion of cement, sand, timber waste, and water used in the manufacturing and preparation of

Timbercrete. The mix proportion is prepared by mixing different materials such as cement, sand, timber waste, and water. The prepared mix proportion is then used to cast Timbercrete

3. Manufacturing Process

The other part of the project is the study of the process that is followed in the manufacture of Timbercrete blocks or specimens. The general

steps followed in the manufacture of Timbercrete are:

- Gathering of timber wastes
- Mixing of cement, sand, timber wastes, and water
- Placing the mixture in the mold
- Compaction of the mixture
- Curing for some time
- Knowledge of the manufacturing process is essential for the improvement of the material.

4. Testing of Timbercrete

As part of the project, various tests are conducted on Timbercrete to assess its performance and suitability for use in construction.

The tests are conducted to assess whether Timbercrete can be efficiently utilized for construction work. The tests conducted are:

- Compressive Strength Test: To assess the load-bearing capacity of Timbercrete blocks.
- Density Test: To assess the lightweight properties of Timbercrete.
- Water Absorption Test: To assess the permeability and durability of Timbercrete.
- Thermal Insulation Test: To assess the heat resistance of Timbercrete.
- Durability Test: To assess the durability of Timbercrete.

5. Environmental Impact Study

One of the scopes of the Timbercrete project is to study the environmental benefits it provides. Timbercrete assists in the recycling of wood wastes that would otherwise be dumped as garbage. The utilization of timber wastes promotes the management of wastes in the construction sector.

6. Cost and Economic Analysis

Another scope of the Timbercrete project is to analyze the economic viability of the project. The cost of production, availability of raw materials, and the process of manufacture are all examined. Timbercrete could prove to be cost-effective since timber wastes could either be cheaply obtained or even free.

7. Application in Construction

The scope of the project also includes the possible application of Timbercrete in the field of construction. Due to its lightness and insulating qualities, Timbercrete can be used in:

- Non-load bearing walls
- Partition walls
- Lightweight blocks
- Acoustic and thermal insulation panels
- Eco-friendly building materials

This study is helpful in determining the possible application of Timbercrete in the field of modern building construction.

8. Limitations and Future Improvements

The project also includes the limitations of Timbercrete, such as its low compressive strength compared to regular concrete. Suggestions may be made to further enhance its qualities by changing its mix design.

V. BACKGROUND

Construction is one of the industries that uses a lot of natural resources, including sand, gravel, and stone. The ever-increasing need for infrastructure development, including buildings, has led to overuse of these materials, hence contributing to environmental problems like depletion of resources as well as carbon emissions. At the same time, there is a lot of wood wastes being discarded by industries like sawmills, woodwork industries, as well as construction sites. Most of these wood wastes end up in landfills or being burned, hence contributing to environmental pollution.

However, in an attempt to mitigate these problems, researchers and engineers have been looking for innovative materials that can be used in constructions, materials that are not only sustainable but also environmentally friendly. One of these innovative materials

is Timbercrete. Timbercrete is a newly invented material that is composed of timber wastes, cement, sand, and water. The main idea behind Timbercrete is to effectively use timber wastes, hence reducing the use of materials like sand, cement, and water.

Timbercrete was originally designed as a lightweight, eco-friendly alternative to traditional concrete blocks. The addition of timber particles to concrete makes it a lightweight material. It also offers better thermal and acoustic insulation compared to normal concrete. Therefore, Timbercrete can be used as non-load-bearing walls, partition blocks, and insulation materials in building constructions.

One of the significant aspects of Timbercrete is its contribution to environmental protection. The use of timber in Timbercrete reduces the amount of timber disposed of as waste. The use of timber in Timbercrete also reduces the use of natural aggregate materials. The extraction of aggregate materials is done by mining, which is harmful to the environment. The use of Timbercrete promotes sustainable development in building constructions by supporting the use of green materials.

The background of this project is based on the need to develop new and creative materials for use in construction that can be used to reduce the effects of environmental degradation while still maintaining satisfactory strength and durability. The properties, performances, and applications of Timbercrete material have been studied and analyzed through the Timbercrete project. Tests have been conducted to evaluate the compressive strength, density, water absorption, etc., of the material.

Therefore, the Timbercrete project has been focused on seeking a solution to the use of timber wastes in construction works in an environmentally friendly manner. The study has been conducted to evaluate the use of Timbercrete material in modern construction works.

VI. DATA ANALYSIS AND INTERPRETATION

The collected data will be analyzed to compare the performance of timbercrete against conventional concrete. Statistical and graphical representations will be used to demonstrate improvements in concrete properties.

VI. MATERIAL USED

- Cement
- Sand
- Aggregate
- Sawdust



VIII. RESULT

The results of the Timbercrete project can be achieved after preparing the Timbercrete samples and performing various tests to check the properties of Timbercrete. The results of the project can be used to understand the behavior of Timbercrete as a building material.

1. Compressive Strength

The test for compressive strength is conducted to check the load-carrying capacity of Timbercrete blocks. The results of the test show that Timbercrete has lower compressive strength than regular concrete. The main reason for this phenomenon is that the particles of the timber used in Timbercrete are softer than the particles of regular concrete. The results of the test, however, show that Timbercrete can be used to make non-load bearing structures.

2. Density of Timbercrete

The most important results of the Timbercrete project can be concluded after analyzing the results of the experiments. The most important result of the experiments conducted for the project is that Timbercrete has lower density than regular concrete. The particles of timber used to produce Timbercrete have a lower density than the particles of regular concrete. The low-density nature of Timbercrete can be used to produce a structure that has lower weights.

3. Water Absorption

The water absorption test revealed that Timbercrete has a tendency to absorb more water compared to normal concrete. This is due to the porous nature of wood particles. However, this effect can be minimized if proper curing is done.

4. Thermal Insulation

Another significant result from the project is that Timbercrete offers better thermal insulation compared to normal concrete. The timber particles have air spaces that help in the reduction of heat transfer. Therefore, Timbercrete is applicable in building structures where temperature is a significant factor.

5. Environmental Impact

Another significant result from the project is the impact of Timbercrete on the environment. The project revealed that the use of timber waste in concrete is beneficial in recycling wood materials and minimizing the use of natural aggregates.

6. Workability

It was observed that during the mixing and casting of Timbercrete, the workability of the Timbercrete was good, and blocks could easily be shaped. The mix, however, needs to be properly mixed for the Timbercrete blocks to have consistency.

7. Overall Performance

The overall performance of the Timbercrete project reveals that although Timbercrete cannot replace conventional concrete for construction, it has good performance for lightweight construction that is non-load bearing. The benefits of Timbercrete are obvious, including weight savings and the environment.

IX. CONCLUSION

The Timbercrete project involves investigating the use of timber wastes like sawdust or wood chips, cement, sand, and water to produce a lightweight, eco-friendly, and environmentally sustainable material. The main purpose of this project is to use timber wastes in a productive way by reducing the use of natural materials in concrete mixtures. From the experimental study of Timbercrete, it is found that it has low compressive strength compared to normal concrete. However, it is found to be light in weight, providing better thermal insulation. Hence, it is best used in non-load-bearing constructions like partition walls, blocks, etc. This project also discusses the advantages of using Timbercrete, as it is useful in recycling timber wastes. Hence, it is considered to be an alternative material for eco-friendly constructions..