



Sustainable Building with Papercrete: Investigating Its Mechanical Capabilities and Construction Possibilities

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Introduction

Sustainable building practices are increasingly important in the construction industry as we seek ways to reduce environmental impact and enhance resource efficiency. Papercrete, an innovative building material composed of recycled paper, cement, and water, offers a promising alternative to traditional concrete. This introduction explores the potential of papercrete as a sustainable building material, examining its mechanical capabilities and construction possibilities.

Materials and Method

The study utilized a range of materials essential for the production of papercrete. Recycled paper was selected as the primary raw material due to its environmental benefits and availability. Ordinary Portland cement was used as the binder to facilitate the setting and hardening of the papercrete mixture. Fine aggregate, consisting of clean sand, was incorporated to provide bulk and improve the material's stability. Water was added to the mix to enable proper chemical reactions and to achieve the desired consistency. This study focuses on the evaluation of papercrete's mechanical properties and its potential applications in construction. Specifically, the study will determine the compressive strength of papercrete at 28 days for different cube sizes. Additionally, beams with specific dimensions will be tested to evaluate their mechanical capabilities. The compressive strength tests will be conducted using mix ratios of 1:3, 1:4, and 1:6 as control samples, while papercrete samples will use ratios of 1:1:2, 1:1:3, and 1:1:5. These mix designs aim to optimize the mechanical properties of papercrete and establish reliable guidelines for its use in construction. The research aimed to provide a thorough analysis of papercrete by following a systematic approach, starting from material preparation to the final testing phases. Initially, materials were selected and prepared, including the collection of recycled paper and other essential components. The study involved multiple stages, including soaking, blending, and batching of the papercrete mixture. Each stage was carefully executed to ensure consistency and accuracy in the results. The methodology also included the casting of concrete samples in various forms, such as cubes and beams, to assess their strength and durability. The testing procedures focused on evaluating compressive and flexural strengths, which are critical for determining the suitability of papercrete in construction applications. Air curing was utilized to simulate real-world conditions and to monitor the performance of papercrete over time.

Results and Discussion

Table 4.1 presents the water absorption data for various material proportions over 7, 14, 21, and 28 days. The results show that water absorption generally decreases over time for most material combinations, reflecting a reduction in porosity and improved water resistance as the material cures. For the proportion of Cement + Paper + Sand at 1:1:2, water absorption decreases from 15% at 7 days to 13.5% at 28 days. The proportion of Cement + Paper + Sand at 1:1:3 shows a similar trend, with absorption reducing from 25% to 23.5% over the same period. The proportion of Cement + Paper + Sand at 1:1:5 exhibits the highest water absorption, increasing from 27% to 28.21% over 28 days, indicating higher porosity or less effective bonding.

Conclusion

This study examined the mechanical capabilities and construction possibilities of papercrete by analyzing the water absorption, compressive strength, and flexural strength of various mixes involving cement, paper, and sand in different proportions. The results provide insights into the performance of papercrete compared to traditional cement and sand mixes, highlighting the potential and limitations of papercrete as a construction material.