

Innovative Application of Roller Compacted Concrete in Urban Development Projects

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Abstract - The use of roller compacted concrete (RCC) in pavements are widely used for a variety of industrial and heavy duty pavement application that involves low-speed traffic. The aim of this investigation is to evaluate the effect of bagasse ash and triangular polyester fiber (TPF) on mechanical properties of RCC mixtures addressed. Optimal water content value for the maximum dry density of each RCC mixture is one of the main concerns for mix design. In this study, an effect of TPF used as 0.25%, 0.50% and 0.75% per one cum with bagasse ash 15%, 30% and 45% by cement weight as a partial cement replacement on optimum water content, mechanical properties was investigated. The mechanical properties of RCC mix with TPF decrease due to water requirement increase. RCC mixtures with bagasse ash 30% partial replacement of cement and TPF at 90 days curing should be designed to fulfill the requirement of strength and workability

Key Words: Roller-Compacted Concrete (RCC), Sugarcane Bagasse Ash (BA), Recron-3S Fiber, Triangular Polyester Fiber (TPF), Sustainable Construction, Pozzolanic Material, Compressive Strength, Flexural Strength, Split Tensile Strength, Pavement Engineering, Cement Replacement, Agricultural Waste Utilization, Concrete Durability, Time-Lag Performance, Green Concrete..

1. INTRODUCTION

This state-of-the-art report contains information on applications, material properties, mix Proportioning, design, construction, and quality control procedures for roller compacted Concrete pavements (RCCP). Roller compacted concrete (RCC) use for pavements is

relatively recent and the technology is still evolving. Over the last ten years several major Pavement projects have been constructed in North America using RCC and the performance of these pavements has generally been favorable. Roller compacted concrete pavements are also gaining acceptance in several European countries and Australia. The advantages of using RCC include cost savings as a result of the construction method and the increased placement speed of the pavement

2. Body of Paper

Roller-Compacted Concrete (RCC) is widely used for industrial pavements, heavy-duty roads, parking areas, ports, and other applications subjected to low-speed heavy traffic. RCC combines the strength and durability of conventional concrete with the economy and rapid construction associated with asphalt pavements. The material is placed using asphalt paving equipment and compacted using vibratory rollers, resulting in a dense and durable pavement structure.

The increasing demand for sustainable construction materials has encouraged the incorporation of industrial and agricultural waste products into concrete. Sugarcane Bagasse Ash (BA), a by-product of the sugar industry, has shown significant potential as a supplementary cementitious material due to its pozzolanic characteristics. Similarly, Triangular Polyester Fiber (TPF) enhances crack resistance, ductility, and toughness of concrete.

3. CONCLUSIONS

This study investigated the performance of Roller-Compacted Concrete (RCC) incorporating Sugarcane Bagasse Ash (BA) as a partial replacement for cement and Recron-3S (Triangular Polyester Fiber) as a reinforcing material. Based on the experimental results, the following conclusions can be drawn:

1. The use of Bagasse Ash in RCC contributes to sustainable construction by utilizing agricultural waste and reducing cement consumption, thereby lowering the environmental impact of concrete production.
2. RCC mixtures containing Bagasse Ash exhibited satisfactory mechanical properties, with strength development improving at later ages due to the pozzolanic reaction between Bagasse Ash and calcium hydroxide released during cement hydration.
3. The addition of Recron-3S Fiber improved the flexural strength, split tensile strength, toughness, and crack resistance of RCC, resulting in enhanced pavement performance and durability.
4. The optimum combination was found to be **30% Bagasse Ash replacement with 0.50% Recron-3S Fiber**, which provided the best balance between strength, workability, and durability characteristics.
5. The selected RCC mix demonstrated adequate performance even under delayed compaction conditions, indicating its suitability for field applications where transportation and placement delays may occur.

ACKNOWLEDGEMENT

The authors express their sincere gratitude to all those who contributed to the successful completion of this research work on **“Revolutionizing Construction: Roller-Compacted Concrete.”**

We are deeply thankful to our guide, faculty members, and department staff for their valuable guidance, technical support, and encouragement throughout the study. Their expertise and constructive suggestions played a vital role in shaping this research.

We also extend our heartfelt appreciation to the laboratory personnel for providing the necessary facilities, equipment, and assistance during the

experimental investigations and testing of concrete specimens.

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