Universidad Continental

FACULTAD DE INGENIERÍA

Escuela Académico Profesional de Ingeniería Civil

Tesis

Influence of Cocoa Cob Fibre on the Durability and Performance of High-Strength Concrete

Beatriz Paola Suri Paredez
Rosmery Dalia Altamirano Huerto
Frank Anthony Bernaola Bernaola
Rando Porras Olarte

Para optar el Título Profesional de
Ingeniero Civil

Huancayo, 2025

INFORME DE CONFORMIDAD DE ORIGINALIDAD DE TRABAJO DE INVESTIGACIÓN

A	:	Decano de la Facultad de Ingeniería
DE	:	Rando Porras Olarte Asesor de trabajo de investigación
ASUNTO	:	Remito resultado de evaluación de originalidad de trabajo de investigación
FECHA	:	9 de Julio de 2025

Con sumo agrado me dirijo a vuestro despacho para informar que, en mi condición de asesor del trabajo de investigación:

Título:
Influence of Cocoa Cob Fibre on the Durability and Performance of High-Strength Concrete

URL / DOI:
https://www.scopus.com/pages/publications/105002484228 / 10.13189/cea.2025.130327

Autores:
1. Beatriz Paola Suri Paredez – EAP. Ingeniería Civil
2. Rosmery Dalia Altamirano Huerto – EAP. Ingeniería Civil
3. Frank Anthony Bernaola Bernaola – EAP. Ingeniería Civil
4. Rando Porras Olarte – EAP. Ingeniería Civil

Se procedió con la carga del documento a la plataforma "Turnitin" y se realizó la verificación completa de las coincidencias resaltadas por el software dando por resultado 6 % de similitud sin encontrarse hallazgos relacionados a plagio. Se utilizaron los siguientes filtros:

- Filtro de exclusión de bibliografía — SI [X] NO [ ]
- Filtro de exclusión de grupos de palabras menores — SI [X] NO [ ]
  N° de palabras excluidas **(en caso de elegir "SI"):** 15
- Exclusión de fuente por trabajo anterior del mismo estudiante — SI [ ] NO [X]

En consecuencia, se determina que el trabajo de investigación constituye un documento original al presentar similitud de otros autores (citas) por debajo del porcentaje establecido por la Universidad Continental.

Recae toda responsabilidad del contenido del trabajo de investigación sobre el autor y asesor, en concordancia a los principios expresados en el Reglamento del Registro Nacional de Trabajos conducentes a Grados y Títulos – RENATI y en la normativa de la Universidad Continental.

Atentamente,

La firma del asesor obra en el archivo original
(No se muestra en este documento por estar expuesto a publicación)

Civil Engineering and Architecture 13(3): 1807-1819, 2025 http://www.hrpub.org
DOI: 10.13189/cea.2025.130327

Influence of Cocoa Cob Fibre on the Durability and Performance of High-Strength Concrete

Beatriz Paola Suri Paredez, Rosmery Dalia Altamirano Huerto, Frank Anthony Bernaola Bernaola, Rando Porras Olarte*

Faculty of Civil Engineering, Continental University, Peru

Received December 6, 2024; Revised February 5, 2025; Accepted March 17, 2025

Cite This Paper in the Following Citation Styles

(a): *[1] Beatriz Paola Suri Paredez, Rosmery Dalia Altamirano Huerto, Frank Anthony Bernaola Bernaola, Rando Porras Olarte , "Influence of Cocoa Cob Fibre on the Durability and Performance of High-Strength Concrete," Civil Engineering and Architecture, Vol. 13, No. 3, pp. 1807 - 1819, 2025. DOI: 10.13189/cea.2025.130327.*

(b): *Beatriz Paola Suri Paredez, Rosmery Dalia Altamirano Huerto, Frank Anthony Bernaola Bernaola, Rando Porras Olarte (2025). Influence of Cocoa Cob Fibre on the Durability and Performance of High-Strength Concrete. Civil Engineering and Architecture, 13(3), 1807 - 1819. DOI: 10.13189/cea.2025.130327.*

Abstract The increased traffic on road infrastructure has led to higher maintenance costs, particularly for flexible pavements, while rigid pavements, despite their greater durability, require significant initial investment. In Latin America, rigid pavements are preferred for their long-term cost-effectiveness, but they can deteriorate over time. To address these challenges, this study investigates the use of cocoa pod fibers as a natural admixture in concrete to improve its mechanical, thermal, and workability properties, and ultimately enhance the durability of pavements. High-strength concrete (280 kg/cm ²) was mixed with cocoa pod fibers at dosages of 0%, 1%, 2%, 3%, and 4%. Key tests, including slump, unit weight, air content, compressive strength, and flexural strength, were conducted. The results revealed significant improvements in workability and mechanical performance, especially at dosages of 1% and 2%. These dosages provided an optimal balance between strength, flexibility, and cost-efficiency, making the concrete suitable for rigid pavement applications. Furthermore, the incorporation of 4% cocoa pod fiber resulted in a 2.32%. Thermal properties were also enhanced, with the addition of 2% cocoa pod fiber lowering the temperature by 0.7 ℃. Compressive strength increased by 15% with 1% fiber, and flexural strength peaked at 36.5 kg/cm ² with 2% fiber. The economic analysis revealed that the incorporation of 1% fiber in the concrete generated a 2.19% increase in the unit cost, which is equivalent to an increase of approximately 11.68 soles per cubic meter compared to concrete without admixtures. This additional cost is justified by improvements in mechanical properties, such as higher compressive and flexural strength, as well as improved workability of the concrete.

Keywords High-Strength Concrete Performance, Rigid Pavements, Sustainability in Construction, Cocoa Shell Fiber

1. Introduction

In the report number 6 issued by the National Institute of Statistics and Informatics (INEI) on vehicle flow in April 2024, they indicate that there was an increase of 6.1% in light and heavy vehicles, of which 5.4% were light vehicles [1]. This represents at the same time an increase in the loads on land roads, i.e. on rigid pavement, consequently often leads to an increase in vehicular flow and results in a reduction in the durability, generating maintenance costs. Since these rigid pavements are designed on average for a durability of 20 to 30 years, but due to these increases and changes in expected flow, the durability decreases [2], [3]. In recent years, rigid pavements have gained popularity in road infrastructure due to their accessibility and ease of construction. Ensuring its proper performance and durability is essential for the economic growth of communities, which has motivated the constant search for materials that improve