



**UNIVERSIDAD ESTATAL PENÍNSULA DE SANTA ELENA**  
**FACULTAD DE CIENCIAS DE LA INGENIERÍA**  
**CARRERA INGENIERÍA CIVIL**

**“ASSESSING GFRP REBARS AS A SUSTAINABLE ALTERNATIVE TO  
STEEL IN AGGRESSIVE ENVIRONMENTS: TENSILE TESTING AND  
MATERIAL IMPLICATIONS”**

**TRABAJO DE TITULACIÓN EN MODALIDAD ARTÍCULO PROFESIONAL**

**PARA LA OBTENCIÓN DEL TÍTULO DE:  
INGENIERO CIVIL**

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**La Libertad, Ecuador**

**2025**

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**“ASSESSING GFRP REBARS AS A SUSTAINABLE  
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**RESUMEN**

El acero es el material más utilizado para el refuerzo del concreto; sin embargo, presenta un bajo desempeño en ambientes agresivos (por ejemplo, zonas costeras) debido a la corrosión (humedad y cloruros). Este estudio tiene como objetivo analizar la resistencia a la tracción del acero y de las barras de polímero reforzado con fibra de vidrio (GFRP) mediante ensayos de laboratorio, a fin de evaluar su viabilidad y aplicación en la construcción. Las barras de acero fueron ensayadas según la norma ASTM E8/E8M-22, obteniéndose valores de 606,61 MPa (Ecuador) y 676,46 MPa (Perú), mientras que las barras GFRP fueron ensayadas conforme a la norma ASTM D7205/D7205M-21, alcanzando 1.000 MPa. El análisis indicó que las barras GFRP ofrecen ventajas estructurales (adecuadas para elementos en zonas costeras con actividad sísmica baja a moderada), beneficios ambientales (menores emisiones de CO<sub>2</sub> durante su fabricación) y mayor durabilidad (resistencia a la corrosión).

**Palabras Claves:** Fibra de vidrio, Compuestos, Acero, Resistencia a la tracción, Estructuras de concreto

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**ABSTRACT**

Steel is the most used material for concrete reinforcement; however, it performs poorly in aggressive environments (e.g. coastal areas) owing to corrosion (moisture and chlorides). This study aims to analyse the tensile strength of steel and glass fibre-reinforced polymer (GFRP) bars through laboratory testing to assess their feasibility and application in construction. Steel bars were tested by ASTM E8/E8M-22, obtaining values of 606.61 MPa (Ecuador) and 676.46 MPa (Peru), whereas GFRP bars were tested following ASTM D7205/D7205M-21 (1,000 MPa). The analysis indicated that GFRP bars offer structural advantages (suitable for elements in coastal zones with low to moderate seismic activity), environmental benefits (lower CO<sub>2</sub> emissions during production), and enhanced durability (corrosion resistance).

**Keywords:** Glass fiber, Composites, Steel, Tensile strength, Concrete structures

# ASSESSING GFRP REBARS AS A SUSTAINABLE ALTERNATIVE TO STEEL IN AGGRESSIVE ENVIRONMENTS: TENSILE TESTING AND MATERIAL IMPLICATIONS

2025 The 9th International Conference on Building Materials and Materials  
Engineering

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Naples, Italy | October 16-18, 2025

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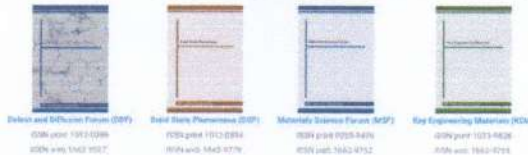
*Galo Gonzalez-Robles, Josué Briones-Bitar, Lucrecia Moreno-Alcivar and Paúl Carrión-Mero*  
Universidad Estatal Península de Santa Elena; ESPOL Polytechnic University, Ecuador

**Abstract ID:** BM25-320

**Title:** Assessing GFRP Rebars as a Sustainable Alternative to Steel in Aggressive Environments: Tensile Testing and Material Implications

Dear Galo Gonzalez-Robles, Josué Briones-Bitar, Lucrecia Moreno-Alcivar and Paúl Carrión-Mero,  
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June 26, 2025



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