

Comparative analysis of GFRP bars and higher-strength-reinforcing bars for road infrastructure

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Abstract

This paper presents a comparative analysis of Glass Fiber Reinforced Polymer (GFRP) bars and higher-strength reinforcing bars (e.g., high-strength steel) in the context of road infrastructure applications. GFRP bars and high-strength steel bars are both employed to enhance the performance and durability of road structures, yet they offer distinct advantages and limitations.

GFRP bars are renowned for their exceptional corrosion resistance, lightweight nature, and high strength-to-weight ratio. These properties make them particularly advantageous in environments prone to aggressive conditions, such as high chloride exposure in coastal areas. The resistance to corrosion extends the service life of structures and reduces maintenance costs, though the initial cost of GFRP bars is typically higher compared to conventional steel reinforcement. Furthermore, GFRP bars do not conduct electricity or magnetism, providing additional benefits for structures in sensitive applications.

Conversely, higher-strength steel reinforcing bars offer superior mechanical properties and are generally more cost-effective in terms of initial material costs. The high tensile strength and ductility of these bars make them suitable for applications requiring significant load-bearing capacity and flexibility. However, steel reinforcement is susceptible to corrosion, which can compromise the durability of structures unless adequate protective measures are implemented.

This study reviews and compares the performance, cost implications, and practical considerations of using GFRP bars versus higher-strength steel reinforcing bars in road infrastructure. Case studies and recent research findings are analysed to provide insights into the relative advantages and limitations of each material. The conclusion offers recommendations for selecting appropriate reinforcement strategies based on specific project requirements and environmental conditions.