

Efficacy Study of Post-Tensioned I Girder Made of Ultra-High Performance Fiber Reinforced Concrete and Ordinary Concrete for IRC Loading

Authors : Ayush Satija, Ritu Raj

Abstract : Escalating demand for elevated structures as a remedy for traffic congestion has led to a surge in the construction of viaducts and bridges predominantly employing prestressed beams. However, post-tensioned I-girder superstructures are gaining traction for their attributes like structural efficiency, cost-effectiveness, and easy construction. Recently, Ultra-high-performance fiber-reinforced concrete (UHPFRC) has emerged as a revolutionary material in reshaping conventional infrastructure engineering. UHPFRC offers exceptional properties including high compressive and tensile strength, alongside enhanced durability. Its adoption in bridges yields benefits, notably a remarkable strength-to-weight ratio enabling the design of lighter and slender structural elements, enhancing functionality and sustainability. Despite its myriad advantages, integration of UHPFRC in construction is still evolving, hindered by factors like cost, material availability, and design standardization. Consequently, there's a need to assess the feasibility of substituting ordinary concrete (OC) with UHPFRC in bridges, focusing on economic considerations. This research undertakes an efficacy study between post-tensioned I-girders fabricated from UHPFRC and OC, evaluating cost parameters associated with concrete production, reinforcement, and erection. The study reveals that UHPFRC becomes economically viable for spans exceeding 40.0m. This shift in cost-effectiveness is attributed to factors like reduced girder depth, elimination of un-tensioned steel, diminished need for shear reinforcement and decreased erection costs.

Keywords : post tensioned I girder, superstructure, ultra-high-performance fiber reinforced concrete, ordinary concrete

Conference Title : ICSET 2024 : International Conference on Structural Engineering and Technology

Conference Location : Singapore, Singapore

Conference Dates : July 04-05, 2024