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Finite Element Approach to Evaluate Time Dependent Shear Behavior of Connections in Hybrid Steel-PC Girder under Sustained Loading

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Abstract : Headed stud shear connections are widely used in the junction or embedded zone of hybrid girder to achieve whole composite action with continuity that can sustain steel-concrete interfacial tensile and shear forces. In Japan, Japan Road Association (JRA) specifications are used for hybrid girder design that utilizes very low level of stud capacity than those of American Institute of Steel Construction (AISC) specifications, Japan Society of Civil Engineers (JSCE) specifications and EURO code. As low design shear strength is considered in design of connections, the time dependent shear behavior due to sustained external loading is not considered, even not fully studied. In this study, a finite element approach was used to evaluate the time dependent shear behavior for headed studs used as connections at the junction. This study clarified, how the sustained loading distinctively impacted on changing the interfacial shear of connections with time which was sensitive to lodging history, positions of flanges, neighboring studs, position of prestress bar and reinforcing bar, concrete strength, etc. and also identified a shear influence area. Stud strength was also confirmed through pushout tests. The outcome obtained from the study may provide an important basis and reference data in designing connections of hybrid girders with enhanced stud capacity with due consideration of their long-term shear behavior.

Keywords : finite element, hybrid girder, shear connections, sustained loading, time dependent behavior
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