

FRP strengthening of web panels of steel plate girders against shear buckling. Part-II: Fatigue study and cyclic series of tests

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Abstract

The result of an experimental programme investigating a novel technique to strengthen web plates of steel plate girders against breathing fatigue due to shear buckling deformations is presented. An experimental test series is present in which six specimens were manufactured to simulate the end panel of a plate girder; these were strengthened with an optimized FRP retrofit panel that was developed in an earlier phase of the research project, and tested for plate girder web shear buckling deformation mitigation under repeated cyclic loading, as well as ultimate load capacity enhancement. Test results and non-linear finite element modelling demonstrated the efficiency of this technique for stiffening the web against these deformation and thus reducing the critical stresses, consequently increasing the fatigue life of the girders by a factor ranging between three and seven, depending on the applied stress range and the fatigue resistance assessment method. The research demonstrates the applicability of this novel FRP strengthening technique to prolong and extend the fatigue life of existing plate girder bridges