



Subject:

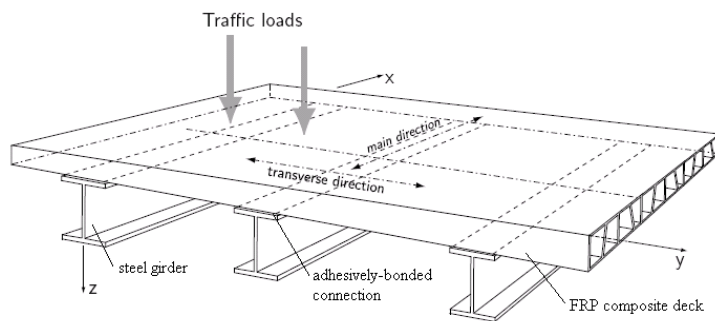
Thanks to the various advantages (rapid installation, low maintenance and low weight) offered by FRP bridge decks, they have rightly found their way onto the market. Today more than 200 bridges with FRP decks are in service worldwide. Most of them need steel or concrete main girders to bridge the required span. But assessment of their load-bearing capacity or deflections still remains difficult. Because no design method exists which allows determination of the stresses and deflections of composite girders, and takes the degree of composite action of the bridge deck into account. And also the long-term performance can not be evaluated accurately.

Goal:

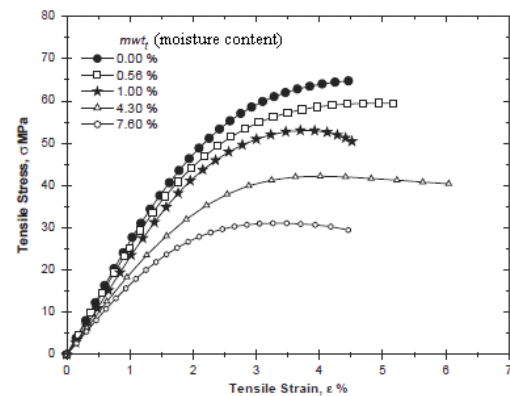
To study the long-term performance of steel-FRP composite girder system, and propose the basis for design methods of such joints.

Expected Results:

From well-designed experiments, mechanical properties and moisture diffusion coefficients of FRP composite and adhesive materials under hot/wet environments should be obtained. Durability of FRP composite-steel adhesively-bonded joints should be investigated through dozens of experiments and FEM parameter studies. Degree of composite action of steel-FRP composite girder system under hostile environments should be evaluated by the analytical description.



Steel-FRP composite girder system



Typical moisture-dependent stress-strain curves of adhesive (AV119)



Friedberg Bridge in Germany

Durability of Steel-FRP Composite Girder System

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Goals

To study the long-term performance of steel-FRP composite girder system, and propose the basis for design methods of such joints.

Research Question

How moisture and temperature will affect the mechanical properties of FRP composite and adhesive material? What is the longevity of steel-FRP composite girder system under hostile environments?

Strategy

FRP composite and adhesive material will be investigated experimentally under different aging condition (high temperature, high relative humidity and de-icing water). FEM analysis will be employed to study the moisture concentration distribution through the FRP composite-steel adhesively-bonded joint as a function of time and evaluate the transient mechanical-hygro-thermal stress-strain state resulting from the combined effects of hygro-thermal effects and applied load. Failure modes of joints will be studied experimentally under different aging conditions and damage mechanism and fracture mechanism will be employed to predict the life-time of the joint.

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Research Period

November 2008 - November 2012