

Project title: Fibre reinforced plastics as repair/renovation method of steel

Project number: InfraQuest-2011-06, zaaknummer 31057338

Start date: 6 September 2011 **End date:** 29 February 2012

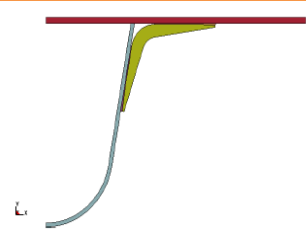
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Embedding in IQ-programme: Within the Masterplan Materials, maintenance is one of the themes that is addressed (Theme 3). One of the items in this theme is the application of innovative materials for repair, renovation and upgrading of existing structures with limited blocking of traffic. As such there is a clear connection with the research performed in this project.

Type of project: Fundamental concept Integration & development Validation of results Product-in-context / valorisation

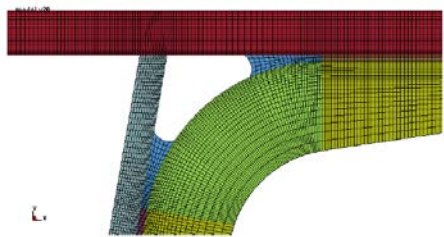


1. Possible fatigue crack in trough bridge

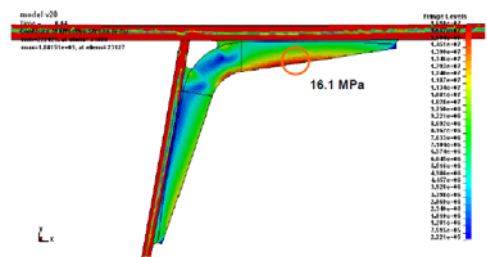


2. Overview patch with deck and trough

Graphical abstract:



3. Detail patch corner with adhesive layer



4. Stresses in patch and adhesive due to truck loading

Research questions:

- Is a repair method of a fatigue crack in a steel trough bridge feasible without hot works
- Which methods are available in general and what are criteria for method selection
- Can a composite patch be utilised in this situation
- What are the demands on the adhesive layer properties and surface preparations for in service conditions, leading to a good bonding during the lifetime of the bridge
- Can FE modelling be used to calculate stresses in patch and bond-layer and optimisation of the bond-layer shape.

Conclusions:

Several repair techniques are considered, however the composite patch repair is clearly the most promising looking both at implementation effort (considerable experience with similar repair techniques has been obtained in the aeroplane industry and the oil and gas industry) and effectiveness.

In this first study, looking only at ultimate strength the concept of composite patch repair seems promising. A patch can be designed capable of transferring the expected ultimate loads. An adhesive selection procedure showed that the in service conditions can be met with several commercially available adhesives. With a correct geometrical shape of the adhesive (easily applied using molds), the stresses in the bond line are below the stress limits. A fatigue life assessment of this concept still needs to be done before implementation of the study. For that assessment a 3D model should be developed.

Other results:

Glue joining seems to be a good alternative for structural applications, combining composites with metal structures.

Dissemination:

This research is mentioned in the new promotional film of RWS on the use of FRP.

Further information:

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