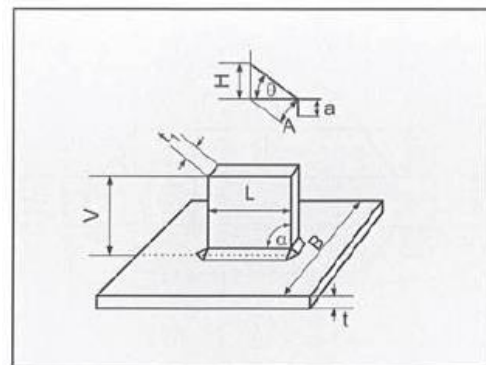


## CRITICAL STRUCTURAL DETAILS OF HISTORIC WELDED STEEL BRIDGES

### Content

Since about 1950, steel railroad bridges have increasingly been welded. In the near future, these bridges will reach an age that requires an evaluation with regard to their ongoing use. For this purpose, an evaluation can be made on the basis of fracture mechanics concepts, which are carried out with the aid of crack propagation calculations.

For this purpose, calculation formulas for the occurring stress intensity exist for various idealized details. Real constructive details can thus be idealized via fracture-mechanical reference models with corresponding shape functions to take the properties into account. Such reference models can be found, for example, in the FKM guideline, BS 7910, DAST guideline 009 and various other guidelines, books and scientific publications. As an example, Figure 1 shows a welded plate with longitudinal stiffener. However, for an application of these reference models, first an assignment of real construction details and then the applicability must be verified. Finally, the idealized dimensions to be assumed must be defined. Analogous to a detail catalog of riveted details, a summary of welded details is to be developed and calibrated with FEM, which assigns suitable reference models to typical construction details of older welded steel bridges and specifies idealized dimensions as well as the assumed crack starting position.



**Figure 1: Reference model of a welded plate with surface crack - longitudinal stiffener [from FKM guideline 2009]**

### Tasks

- Compilation of typical welding details of historical railroad bridges
- Assignment of the real details to fracture mechanics reference models
- Calibration of the weld details using FEM and determination of suitable idealized dimensions, as well as critical crack initiation position (or assignment of the critical reference model)
- Compilation of the results in a detail catalog (or supplementation of already existing results from previous work)

### Processing period

flexible, from now on

### Prerequisites

Basics in fracture mechanics and FEM beneficial

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