# CONSIDERATION OF RESIDUAL STRESSES DURING CRACK PROPAGATION ON WELDING DETAILS

## 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, The high thermal input caused by welding results in residual stresses. Without subsequent heat treatment, these can reach the magnitude of the yield point of the material. The magnitude of the residual stresses depends on the manufacturing conditions, metallurgical material behavior and the design of the detail. Since the exact boundary conditions during production cannot be reproduced retrospectively, the residual stresses are unevenly distributed over the cross-section and are influenced by many parameters, an exact description of the residual stresses present in historic steel bridges is impossible. In a flawless component, the residual stresses are in an internal equilibrium, but as soon as a crack is present, they are "released", i.e. relieved or redistributed. Due to the influence of notch effect and metallurgical conditions, and thus also the design and loading type and direction, a complex multidimensional problem exists. Nevertheless, it is necessary to adequately capture the influence of residual stresses in the planned fracture mechanics considerations. To this end, the influence of existing welding residual stresses is to be investigated and a proposal for their inclusion in crack propagation simulations is to be developed.

## Tasks

- Familiarization with the subject of welding residual stresses
- Simulation of different options of consideration of welding residual stresses
- Assessing the influence of different assumptions on crack propagation
- Developing a proposal for capturing residual stresses in crack propagation simulations

## Processing period

flexible, from now on

## Prerequisites

Good knowledge in structural mechanics, basics in fracture mechanics and FEM beneficial

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