

DETERMINATION OF THE INITIAL CRACK LENGTH FOR STABLE CRACK PROPAGATION CALCULATIONS

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 these crack propagation calculations, a number of input parameters is required. These include the assumption of initial crack sizes, on the basis of which the crack propagation is calculated step by step using the Paris law (Figure 1). Detected or assumed cracks are idealized and transformed into a geometry for which fracture mechanics solutions are available. For a damage-tolerant design, the initial crack size results from the detection limit in the course of a non-destructive inspection. Here, it is not the smallest detectable crack that must be used, but rather the largest potentially overlooked initial crack size. The question of the decisive occurrence position and crack growth direction, as well as the treatment of initially invisible cracks (e.g. weld root cracks), must also be clarified. Alternatively, existing measured crack lengths can serve as a basis for evaluation, although here, too, the measurement is subject to uncertainties that can be described by distribution functions. In the course of this thesis, reasonable assumptions for initial crack sizes of different structural details shall be determined and evaluated.

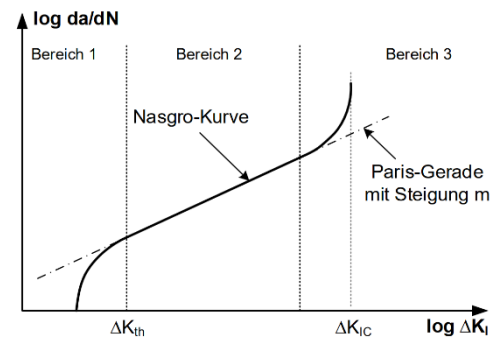


Figure 1: Stable crack propagation described by the Paris law

Tasks

- Extensive literature research on initial crack sizes
- Assumption of distribution functions for the initial crack sizes
- Creation of a "crack catalog" with decisive occurrence position and crack growth direction
- Detailed consideration of a root crack: recalculation of the initial crack size based on a visible crack size on the surface
- Evaluation of the influence of different initial crack sizes on crack propagation

Processing period

flexible, from now on

Prerequisites

Basics in fracture mechanics and statistics
beneficial

Contact Person

Dorina Siebert, M.Sc.
Chair of Metal Structures
Theresienstr. 90

Mail: dorina.siebert@tum.de
Tel: 089/289-22527
Room: 0101.Z1.0378