Chair of Materials Science and Testing
Seminar Thesis - Seminar Bauwerkserhaltung

Improvement methods in the clamping area of reinforcing steels in uniaxial fatigue tests

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Background and task definition:

Many buildings like wind turbines suffer a high number of dynamic loads throughout their service lifetime. This loading causes damages in the material structure, even if the stress is below the static strength of the material. In progression, the damage can lead to a fatigue failure of the material and thus significantly reducing the reliability of reinforcing concrete structures.

The fatigue behavior of reinforcing steels can be investigated in a uniaxial fatigue test. Fatigue fractures can occur in the free length (valid) and in the clamping area (invalid). Due to the reinforcing steel geometry, stress deflections and associated stress peaks (notch stresses) occur preferably in the fillet radii of the transversal ribs. High radial stresses are required to anchor the specimens in the clamping area. Due to this multi-axial stress state, fractures in the clamping area cannot be attributed to a material failure. Therefore, the results cannot be used for further evaluations. In practice, however, this failure mode occurs very frequently.

Investigations of Eick [1] and Yu [2] have shown that, for example, sandblasting or shot peening of the reinforcement ends can reduce fractures in the clamping area. This was carried out for a metallic clamping system. For larger diameters than 20 mm a wooden clamping system has to be used as a result of a machine change. In this thesis, investigations have to be carried out to transfer the improvement methods of [1, 2] on larger diameters.

Miscellaneous:

Initial literature will be provided and familiarization with the research methods will take place under guidance.

[1] Eick, M.: Untersuchungen verschiedener Verfahren zur Verbesserung des Verhaltens im Einspannbereich bei uniaxialen Dauerschwingversuchen, Bachelor's Thesis, Technische Universität München, 2021
[2] Yu, Z.: Investigations of different improvement methods in the clamping area of reinforcing steels in uniaxial fatigue tests, Master's Thesis, Technische Universität München, 2022

Date and signature of supervising professor: _____