

MEASUREMENTS OF IMPERFECTIONS AND FE-CALCULATIONS FOR COMPRESSED HIGH-STRENGTH STEEL TUBES

Content

Stub column tests are used to assess the local buckling risk of bars. For this purpose, such a short section of the bar is cut out so that global stability failure in the form of buckling cannot occur. In the case of a tube, the FE modeling at this point can be conducted using shell elements. Due to the curvature of the tube in the annular direction, postbuckling reserves in particular can be activated. As is otherwise the case with stability verifications in the form of (bending) buckling, also in the case of local buckling due to geometric and structural imperfections, the ideal buckling load according to shell theory is not reached.

In this bachelor thesis, 3D deformation analysis GOM Aramis will be used to record the geometric imperfections on existing specimens. In addition a small test series on specimens, where the deformation is recorded in the course of the stub column test. The small series of tests is then to be numerically simulated in a simple shell model with consideration of the measured component imperfections. A calibration of the model with consideration of the residual stress state is carried out subsequently. The FE programs are either SOFiSTiK for the transformation into simple equivalent imperfections or ANSYS for a more detailed description of the geometric imperfections.



Figure 1: Left: first buckling mode based on a linear prebuckling analysis of a stub-column-test in SOFiSTiK;right: example of a optical shape change analysis¹

Tasks

- Familiarization with the operation of GOM Aramis
- Examination of the different types of imperfections
- Recording of imperfections on a stub column specimen
- Numerical study with approach of actual imperfections and substitute imperfections and mesh study

Processing period

From now on

Prerequisites

Interest in experiments in steel constructions and FEM

¹ GOM Homepage <https://www.gom.com/de-de/produkte/3d-testing>

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