

Teräsrakenteiden T&K päivät 24-25.8.2016, Lappeenranta

Recent developments in component method, 3D actions, tubular joints, fire

Markku Heinisuo, Tampere University of Technology

## Abstract

During last 40 years (Zoetemeijer, 1974, Tschemmerneg et al, 1987) the component method for design of metal joints has been developed for the wide range of applications. In this paper, it is summarized recent developments dealing with 3D actions of joints, welded tubular joints and fire design.

General concepts for 3D actions of joints was presented in (Da Silva, 2008) and different approaches are given since then in many papers. In TUT two PhD theses are going on for 3D actions. As a conclusion it can be stated when considering the design of connected members using Bernoulli-Euler 3D beam elements having six degrees of freedoms the joint response can be evaluated in some cases. However, Vlasov's torsion is so far totally unexplored subject in the component method.

Under CIDECT contract the component method has been extended for welded tubular joints (Weynand et al, 2015). In that report the strict rule was that the scope was only the cases which are available in the present Eurocode EN 1993-1-8. However, due to generic nature of the component method the formulation enables may extensions in the future. In TUT is going on one PhD thesis dealing with fire design of tubular joints.

First application of the component method in fire was presented in (Leston-Jones, 1997). Since then especially in Sheffield, Manchester, Coimbra, Aveiro, Prague and Liege many doctoral theses and other researches have been completed. Also, RFCS projects such as COMPFIRE, have had focus in the component method in fire. In fire the decrease phase of fire has caused severe collapses, such as WTC. In the analysis large displacements with temperature dependent material properties and varying temperatures means an extremely difficult problem, but they have managed to solve this kind of problems with success. The success of the analysis has been proved by comparison of the results with the tests.