

Abstract – ASEC 2024

Keynote

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Title:

Design of high-strength and ultra-high strength steels in the frame of Eurocode 3

Abstract:

Whenever even higher-strength steels were developed, there were doubts about their cost-effectiveness and usability. However, the development from S355 to S460 and finally to S700 has shown that this innovation paid off in a very short time. In terms of sustainability, the use of ultra-high strength steel up to S960 can save resources, make connections more efficient and extend the service life of bridges. These aspects can be realised through the use of high-strength steel (HSS) and ultra-high strength steel (UHSS), and the extension of the scope of Eurocode 3 from S700 to S960 will be realised by a new code prEN 1993-1-12. At the same time, further investigations are required to clarify the behaviour of HSS and UHSS and adapt existing rules in Eurocode 3.

For an effective use of HSS and UHSS, welded connections and their design are decisive. Therefore, extensive investigations on butt welds and fillet welds made of S960 were conducted, to extend the existing design concepts for the scope of ultra-high strength steel.

From the other side, with an increasing material yield strength, the effectiveness of the high-frequency mechanical impact (HFMI) treatment for welds leads to a further increase in fatigue strength. The application of HFMI for HSS is covered in the rules of the new Annex F in prEN 1993-1-9, which now should be extended to UHSS. Another area of application is the use of high-strength steels for welded connections of hollow section joints that are covered by EN 1993-1-8. To use hollow section joints of HSS and UHSS, their relevant failure modes also in view of the ductility of the connection have to be investigated.

This keynote presents results from various research projects addressing the aforementioned matters carried out at the University of Stuttgart, Germany and shows where HSS and UHSS can be used in the frame of the revised Eurocode 3.