Editorial: Implementation of high-strength, high-performance steel structures

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Implementation of high-strength, high-performance steel structures

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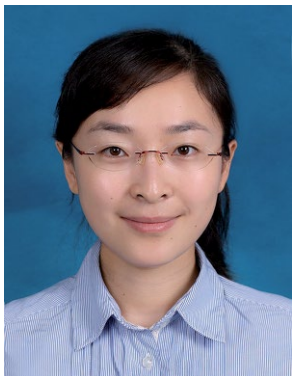

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The introduction of high-strength, high-performance steel structures will only be successful when the high-strength, high-performance steel grades are fully implemented in the new versions of the relevant standards. The next generation of Eurocode 3 is now under revision and the first voting on the recently submitted parts EN 1993-1-1 and EN 1993-1-8, which incorporate the design rules for steel grades up to S700, is taking place. It is expected that the complete set of the new generation Eurocode 3 will be available in 2022. In EN 1993-1-12 the focus will be on additional rules for and restrictions on the application of steel grades greater than S700 up to and including S960.

Design rules for steel grades with yield strengths up to 690 MPa are available in the USA for seismic applications (ANSI/AISC 360-16, 2016). The production of structural high-strength steel (Q460 to Q960) has been specified in the Chinese code and considerable investigations have been conducted into the behaviour of high-strength steel structures. The design rules of a Chinese specification for designing high-strength steel structures will be finished soon.

Similar developments are recognized in Europe. The Eurocode 3 parts are now being updated, and once these parts are formally accepted, designers need to be helped to implement this knowledge in their designs. Therefore, it is the right time to set up an education programme to inform designers about the verification rules that are then also valid for high-strength, high-performance steel grades up to S700.

Pre-normative research should be initiated to improve the existing rules or develop rules for subjects not yet covered in the Eurocode 3. These rules could first be issued as recommendations, as it was done previously by the ECCS (European Convention for Constructional Steelwork). After experimental use in practice, these rules can be handed over to CEN/TC250-SC3 to be included in future versions of Eurocode 3.

The implementation of the new series of Eurocode 3 in design practice needs to be handled with great care. In addition, design manuala should be published and, possibly, an education programme highlighting the design background should also be established.

A tradition of developing such educational programmes exists in Europe. To accomplish it, several activities need to be undertaken:

- Development of programmes of education to help the universities implement the new series of Eurocode 3 parts, with special emphasis on the use of high-strength steels.
- Publication of design guides and manuals.
- Development and dissemination of technical guidance papers that help universities and technical colleges to base their lectures on the new series of Eurocodes. As examples for providing this material, it is possible to use the experience obtained in ESDEP (European Steel Design Educational Programme) and SSEDTA (Structural Steelwork Eurocodes Development of a Trans-National Approach).

– A compilation of FAQs should be prepared and made accessible on a Eurocode website. A good example of this is the CeStruCo (Continuing Education in Structural Connections) database developed with the financial support of the Commission.

HSS is an international material, manufactured by international corporations and used worldwide in different applications. It will not be possible to achieve the same database of experiments as was set up for traditional steel grades, primarily because of the enormous resources spent on testing structural components made of steels up to S355. Additionally, the methods available to predict structural behaviour and evaluate the outcomes of physical experiments statistically are today much more sophisticated and commonly used than ever before. However, the tradition of using HSS in structural applications still varies considerably around the world. This will certainly remain the case for the foreseeable future and will initiate knowledge development that focuses on local traditions.


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