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Important note about the ongoing European RFCS SAFEBRICTILE project – "Standardization of safety assessment procedures across brittle to ductile failure modes"

INVESTIGATION ON THE PARTIAL SAFETY FACTOR γ_M

ECCS recommends to provide as many data as possible in order to help the project to reach important conclusions, and to determine a proper value of γ_{M1}.

Introduction to the SAFEBRICTILE project

Currently, safety assessment is not consistently considered throughout the many parts of Eurocode 3, mainly due to a lack of guidance and lack of existing databanks containing information on the distribution of the relevant basic variables and steel properties. Therefore, in SAFEBRICTILE an objective and consistent assessment procedure for the safety assessment of the various failure modes that are relevant for steel structures is developed. The unified procedure will result in codified procedures for inclusion in the structural Eurocodes and is able to cover ductile failure modes (driven by plasticity), semi-ductile failure modes (driven by stability) and brittle failure modes (driven by fracture). In addition, several rules in Eurocode 3 covering the failure modes treated in the project are reassessed in order to fulfil the developed safety assessment procedures. The results of this project will lead to major competitiveness gains: (1) **faster time cycle** in the development of new design procedures able to cope with innovation; (2) **increased reliability** in the accuracy of new design models; (3) **major savings in R&D costs** by avoidance of major duplication of work.

*The safety assessment procedure and the partial safety factor γ_M**

At this point, a safety assessment procedure in line with Annex D of EN 1990 (*Design Assisted by Testing)* is adopted. In order to apply the procedure, the resistance for certain type of failure mode is calculated, first with GMNIA (Geometrically and Materially Nonlinear Analysis with Imperfections), then with the respective formula from Eurocode 3. When applying the procedure, the result is a corrected coefficient γ_M*, which is calculated for the specific sample (e.g. one γ_M* can be defined based on 100 GMNIA results). Finally, by comparison, the accuracy of the design method can be evaluated.

The procedure is very sensitive, meaning that if the results are not split correctly (divided by steel grade, divided by slenderness, etc.), higher values of γ_M* can be obtained; however, it does not necessarily mean that γ_M values should be high, so various subsets are studied.

The Database – Call for data!

The data from steel producers is essential to reach realistic conclusions within this project. When the procedure mentioned above is applied, distributions of the steel properties are used (e.g. yield stress, geometrical dimensions, Young's modulus). Usually, the mean value of the yield stress f_y, measured by tensile tests, is higher than the nominal value provided in Eurocode 3. This favourable effect is accounted for in the procedure, i.e. higher mean value of f_y leads to lower γ_M*. However, it is different for other properties, such as the dimensions (e.g. their mean value is found around the nominal one, thus meaning that one can easily find b=195mm instead of b=200mm which is unfavourable). In addition, there are other types of data, such as imperfections, Young's modulus, for which there is no information available. For now, the studies of the project are made based on assumptions about the statistical distributions provided from older measurements. In order to obtain recent data, a European database of steel properties resulting from experimental tests has been developed, see www.steelconstruct.com (>Projects >Research Fund for Coal and Steel >SAFEBRICTILE). This database is available to all interested people that would like to support the project by providing data (a confidentiality agreement is provided).

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