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ON THE SAFETY OF THE EUROPEAN STABILITY DESIGN RULES FOR STEEL MEMBERS

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Abstract. *The European stability design rules for steel columns, beams and beam-columns are classically based on Ayrton-Perry formulations that rely on the calibration of imperfection factors in order to estimate the* maximum *resistance. More recently, "general approaches" have been proposed that combine in-plane and out-of-plane behaviour based on a single reference length. The safety of design rules in modern codes of practice is based on the use of partial factors and the separation of the uncertainty related to loading and resistance. EN 1990 - Annex D, for example, contains a procedure for the safety analysis of resistance functions, based on First-Order Reliability Methods. However, its application to stability design rules is not straightforward and several additional assumptions are necessary to ensure that a target probability failure is achieved. Finally, design rules and its accuracy depend on the accuracy of the relevant basic variables such as material properties, geometric properties and imperfections. It is therefore required to appropriately characterize the statistical distributions of these basic variables in order to comply with the (semi-) probabilistic safety level assessment of design rules. This paper discusses the different approaches for the derivation of design rules for columns, beams and beam-columns and proposes a mechanical consistent general approach. Secondly, a consistent procedure for the probabilistic assessment of the safety level of stability design rules is presented that simplifies the way material and geometrical properties are considered while maintaining its statistical relevance.*