

RELIABILITY OF STEEL STRUCTURES IN COMPLIANCE WITH THE PRINCIPLES OF THE EN 1990 Theoretical and Experimental Studies, Part 1

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The reliability of steel elements designed according to the EN1993-1-1 will be studied in the present paper. The material and geometrical characteristics of an IPE steel profile determined experimentally will be considered to be information basis. The basic case of IPE270 tensile beam will be dealt with. There will be discussed the question whether partial factors and procedures for determining the loading effects of the standard EN 1990 guarantee a reliable steel structure design.

Key words: yield strength, reliability, simulation method, imperfections, partial factor

1. Introduction

The basic European standard for design of building structures EN 1990 [2] gives three loading effect determination procedures. Each procedure results in a different reliability level. Besides design standards, the input material and geometrical characteristics, above all, take part in general design reliability. The variability of these material and geometrical characteristics depends on the production technology in a decisive extent. In efforts to the design reliability, we should aim at such design procedures for load carrying structures which should correspond to real load carrying capacities of real structures. In national annexes, this can be guaranteed by the choice among variants of the design procedures, by recommendation of values of various loading types, and by reliability indexes, as well. However, national interests of individual CEN (Comité Européen de Normalisation – European Normalisation Committee) countries will certainly play their roles in establishing national annexes. Each state is expected to elaborate its own national annexes in which the recommendations on national determined parameters will be given, and thus also the national structure reliability level will be chosen.

In the newly introduced unified European standard for steel structures design, EN1993-1-1, an unusually strict value of material safety factor $\gamma_{M0} = 1.0$ is recommended for basic loading cases; this is derived from the West European evaluation programme of rolled IPE beams. Aiming at a contribution to European steel structures design methodology according to limit states, we will present the probability studies of an IPE270 rolled, simple tension force loaded steel beam. Our study will be based on statistical and geometrical material characteristics obtained from experimental research [8].

The paper presented links with numerous previous studies elaborated at the Klokner Institute in Prague, and at the Faculty of Civil Engineering in Brno [4, 5, 6, 8].

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