Effects of Stability on the Resistance of Composite Concrete-Filled Rectangular Steel Pipes According to World Standards

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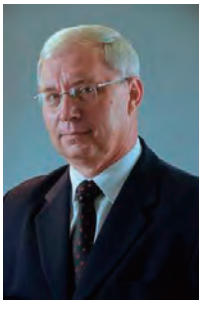

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Summary

The paper presented pertains to the effects of local and global stability on the resistance of concrete-filled hollow steel sections subject to compression, mainly the resistance of rectangular composite columns. The existent valid world standards, such as Eurocode 4, DBN V.2.6 – 160:2010, SUOS2011, ANSI/AISC 360-10, CAN/CSA-S16-01 concerning the design of such structures are presented, which stipulate several methods of taking account of the effects of local and global stability on the resistance of structural members. The paper demonstrates and compares these methods on the example verifying a concrete-filled rectangular hollow steel section subject to axial compression. Based on the comparison, the progress of further research into filled composite sections with the account of local and global stability effects is outlined.

Keywords: composite structures; column; design codes; global stability; local buckling.

1. Local and global stability of concrete-filled rectangular hollow steel sections

There is a sufficiency of world standards for the design of concrete-filled rectangular hollow steel sections under compression today. The effects of local and global stability on these structural members are accounted for in a different manner in each of the standards concerned. The standard procedures provided and applied in the individual countries are presented as follows: European Union [9], Ukraine [10], China (Hong Kong) [11], USA [12] and Canada [13].

2. Verification of a filled composite column according to EC4, DBN V.2.6 – 160:2010, SUOS2011, ANSI/AISC 360-10 and CAN/CSA-S16-01

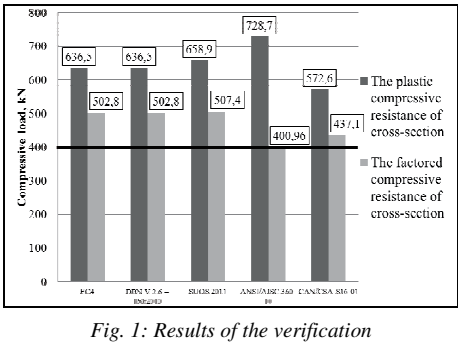

Fig. 1: Results of the verification

The comparison of mentioned above standards, demonstrated on the example of a three-metre-high, hinged, axially compressed column made of a rectangular hollow section of *RHS 150/100/4,0* (Steel Class *S235)* fully filled with concrete (Class *C25/30*). The design value of short-term compressive normal force applied to the column is *400 kN.*

The results of the verification demonstrate that, the lowest margin (only *0,2%*) is provided by the American standard [12] (see Fig. 1).

3. Conclusions

The comparison of existent valid world standards has given the research a particular goal and direction: to investigate the local and global stability of rectangular hollow steel sections filled with concrete whose slenderness does not comply with the condition stipulated in EC4 [9].

Acknowledgments

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