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Reliability-based assessment of existing structures: from fundamental research towards standardisation

The assessment and management of existing structures poses a contemporary challenge in civil engineering as a result of an ageing patrimony. New construction rates in industrialized countries stagnate while refurbishment and retrofitting of existing structures gain in importance. Contrary to the design of new structures, the current state-of-the-art in relation to the assessment and management of existing structures is less consolidated and still poses many research challenges.

Structural reliability methods, simulation techniques and Bayesian updating provide advanced and adequate tools for reliability based-assessment of existing structures, enabling informed decision making with respect to structural interventions. However, due to the complexity of many of these approaches, there is also a need for simplified approaches that enables standardisation, providing sufficient flexibility and pragmatism adequately balances with theoretical adequacy and focusing on the applicability and ease-of-use for practitioners.

In this keynote lecture, some new developments in relation to the reliability-based assessment of existing structures will be highlighted in relation to standardisation efforts. A simplified partial factor based assessment procedure will be explained and illustrated. The validation of this approach will be analysed using full-probabilistic calculations. Finally, the effect of parameter and fracture estimations on the calculated safety level will be quantified.

Bio: Robby Caspeele obtained his Ph. D. degree in Civil Engineering from Ghent University in 2010. In 2013, he was appointed professor in the field of Structural Reliability at Ghent University, Department of Structural Engineering. His main areas of expertise relate to full-probabilistic and semi-probabilistic structural reliability analysis and risk management of structures, structural robustness, analysis of concrete and steel structures, assessment of existing structures, production and conformity control, numerical simulation techniques and large-scale testing. As author or co-author he has contributed to more than 150 national and international publications in journals and conference proceedings. He is Laureate of the Award Gustave Magnel edition 2010-2014. He is a member of several national and international standardization committees and working groups related to structural engineering. Among others, he is member of the Joint Committee on Structural Safety (JCSS), convenor of TG3.1 offib Commission 3 on 'Reliability and safety evaluation: full-probabilistic and semi-probabilistic methods for existing structures', member of CEN/TC250 'Structural Eurocodes' as well as several of its subcommittees and working groups, and President of the Belgian mirror committee of the Structural Eurocodes.