

Structural knowledge and reliability assessment of existing bridges

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Currently, many existing bridges exhibit significant criticalities, as unfortunately highlighted by recent catastrophic events. They stem from the aging of these structures provoked by the materials natural deterioration facilitated by inadequate maintenance strategies. To this, it should be added that in many cases existing bridges are also subjected to an increasing traffic load.

However, the knowledge process of existing bridges may not be generalized. It results significantly complex due to the specific characteristics and peculiar vulnerability of each structural typology, influencing their assessment. For instance, the scientific community is paying particular attention to Post-Tensioned (PT) concrete bridges, since they have demonstrated significant vulnerability in the recent years due to hidden cable corrosion.

For these structures, the appropriate measure of the structural reliability is represented by the failure probability including the current materials deterioration and traffic loads demand. It forms the basis of a risk-based decision-making process, regarding management and interventions, in conjunction with the economic resources.

This Special Session aims to discuss on the reliability assessment of existing bridges, including the testing, diagnostics and monitoring techniques necessary to better estimate the current conditions of a bridge and, consequently, to estimate the current reliability. We welcome contributions addressing:

- Material characterization and degradation assessment;
- Experimental tests, survey methods, and associated uncertainties;
- Assessment and monitoring of traffic-induced loads and their effects on aged existing bridges;
- Traffic loads models for the reliability-based assessment;
- Seismic assessment and reliability of existing bridges, considering also deteriorating factors;
- Materials models including time-variant degradation;
- Reliability assessment of existing bridges under multi-hazard;
- Structural Health Monitoring (SHM) approaches to improve the knowledge of in-service bridges, with a focus on traffic impact, conservation status, and external actions;
- Methods for estimating the residual service life of PT bridges via integrated degradation models.

By fostering discussions on these key topics, this Special Session aims to advance knowledge and provide practical solutions for improving the reliability of existing bridges.