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Pan European CoP forum

Change Management, guidelines to implement the proposed new standards

Agnieszka Bigaj-van Vliet, Diego Allaix, Jos Wessels, Paola Daró

Agenda

14:00	Welcome **(Agnieszka Bigaj-van Vliet, TNO)**
14:05	IM-SAFE proposal for new standardization on monitoring, data-informed safety assessment and maintenance of the transport infrastructure **(Diego Allaix, TNO)**
14:15	Session 1: Guidelines for the adoption plan of the new standards **(Jos Wessels, CROW)**
14:40	Session 2: Recommendations about the set-up of pilot projects **(Paola Daró, Sacertis)**
15:00	Q&A
15:30	Closure

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Speakers

Dr.ir. Agnieszka Bigaj-van Vliet

- **IM-SAFE Project Coordinator**
- TNO Department of Structural Reliability
- Senior Scientist Concrete Structures
- Presidium member of *fib* (International Federation for Structural Concrete)
- Deputy Convener of *fib* T10.1 Model Code 2020 for Concrete Structures
- Head of the National Delegation of NL to *fib*
- Member of ACI-318 (subcommittee L)

Dr. Diego Allaix

- **IM-SAFE WP Leader (Standardization)**
- TNO Department of Structural Reliability
- Senior Scientist Structural Reliability
- Visiting Professor University of Gent
- Member of CEN/TC 250 WG3 “Safety formats for non-linear problems”
- Member of *fib* TG3.1 “Reliability and safety evaluation”

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Speakers

Jos Wessels MSc, MBA

- **IM-SAFE WP Leader (Stakeholder Engagement)**
- CROW
- Senior project manager
- Coordinator platform Inner City Quay Walls
- Coordinator platform Geotechnics
- Project manager CROW Program Advisory Board Hydraulics and Geotechnics
- Involved in establishing NL platform Bridges & NL platform Inspections

Dr.ir. Paola Darò

- **IM-SAFE WP Leader (Data informed safety evaluation and maintenance management)**
- SACERTIS Ingegneria S.r.l
- Technical Director Engineering Department
- SHM, structural diagnostics, data analytics field expert
- Former Research Fellow DISEG - Politecnico di Torino
- MIT Technology Review Italy - Award as Young Innovator TR35 2019

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IM-SAFE proposal for new standardization on monitoring, data-informed safety assessment and maintenance of the transport infrastructure

Diego Allaix (TNO)

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Scope of amending and extension of standardisation

- **New standard on structural monitoring**
  - decision-making regarding the design of the monitoring strategy
  - effective use of monitoring data to produce useful and meaningful information relevant for diagnostics of structures, safety assessment and maintenance approaches

- **Further amendment to the existing Eurocodes** on safety assessment taking into account inspections, monitoring and testing
  - full utilisation of structure-specific data in the safety assessment of existing structures
  - assessment of actual safety through consideration of deterioration and damage by models
  - better prediction of end-of-service life by appropriate choice of the safety framework

- **New standard for** risk-based maintenance management and preventive condition-based **maintenance of transport infrastructures**
  - improvement of the decision-making process regarding maintenance at network and object level

- **Digitalization as enabling technology**

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New standard on structural monitoring

Objectives:

- to formulate the **principles of setting the objectives of structural monitoring**
- to formulate essential principles of setting the design of the monitoring system incl. requirements related to the reliability of sensor systems
- to provide essential requirements related to the **methodologies used for translating data into useful and meaningful information** relevant for diagnostics of structures, safety assessment and maintenance approaches
- to maintain the **openness to innovations** (i.e. in sensing technology and data analysis methods)

Needs for standardization :

- framework for **decision making** regarding the monitoring strategy:
  - definition of the objectives of the monitoring activities
  - choice of the monitoring type (e.g. periodic / continuous)
  - choice of the measured quantities
  - definition of the required measurement accuracy
  - selection of the monitoring technologies
  - design of the monitoring system, including amount and placement of the monitoring devices
  - evaluation of alternative monitoring strategies
- the requirements for **installation and operation of the monitoring system** aiming to guarantee reliable data
  - requirements for data acquisition (calibration, post-installation verification, management and maintenance of the acquisition system)
  - requirements for data pre-processing (identification of outliers, removal of the environmental effects from the raw data, data validation, etc.)
- the requirements for **analysis of the monitoring data for extracting useful information** for the safety assessment and risk management of structures (updating of structural models, identification of damage and deterioration processes)
- the requirements for **data management for future use**
  - requirements for data storage and management (in relation to through-life information management systems)
  - requirements for data security and ownership

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Further amendment to the existing Eurocodes on safety assessment taking into account inspections, monitoring and testing

Objectives:

- to enable the **use of structure-specific data in the safety assessment of existing structures**
- to formulate the **framework for including information from diagnostics** of structures based on data from inspection, monitoring and testing
- to provide background material to CEN for translating the framework into **practical clauses for the assessment at the semi-probabilistic level**

Needs for standardization :

- use of structure-specific indirect information in the safety assessment
  - updating the failure probability and the basic variables of the limit state functions based on direct and indirect information
  - use of the outcomes of proof-load testing in the safety assessment at the semi-probabilistic level
  - to determination of the design value of the loads,
- consideration of deterioration and damage in the safety assessment incl. implementation of state-of-the-art models for damage and deterioration in the safety verification
- use of monitoring of the structural response in combination with threshold values for assessing safety during operation incl. the definition of alarm thresholds
- minimum reliability requirements (and corresponding reference period) considering differentiation of reliability requirements between the assessment of the fitness-for-use of an existing structure during operation and the design of structural interventions
- via amendments to the current Eurocodes :
  - EN 1990 “Eurocode - Basis of structural design”
  - EN 1991-2 “Eurocode 1: Actions on structures - Part 2: Traffic loads on bridges”
  - EN 1992 “Eurocode 2: Design of concrete structures”
  - EN 1993 “Eurocode 3: Design of steel structures

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New standard for condition-based and risk-based maintenance of transport infrastructure

Objectives:

- to promote transition from corrective maintenance strategies towards the **preventive and condition-based maintenance strategies**
- to promote risk-based maintenance management
- to provide principles and requirements for **data-informed (inspection, monitoring and testing) decision-making in maintenance management**

Needs for standardization :

- classification of hazards and vulnerable elements of bridges and tunnels
- **risk-based decision process regarding maintenance management**
  - the principles updating risks based on inspection, testing and monitoring
  - the principles for risk-based classification of structures
  - performance assessment of the transport infrastructure network (KPIs for network management and the corresponding performance targets)
- **condition-based decision process regarding condition survey and maintenance**:
  - the principles for formulating key-performance indicators (KPIs) and condition indices and for updating them based on inspection, testing and monitoring
  - the principles of condition-based planning of inspections and maintenance
- **through-life management documentation**

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Q&A

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Thank you for your attention

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