

BridgeSpec – Quality Specifications for Roadway Bridges, Standardization at a European Level

Summary

In engineering, quality control (QC) is related to systems development in order to ensure that products or services meet or exceed, the expectations and needs of users and the wider community. Concerning road infrastructures, it can be said that asset management and QC are two sides of the same coin. Though they belong to the domain of public service, their management mechanism can be conducted by the state or under a private public partnership. However, in both cases, there is an increasing need of developing strategies to ensure the quality of the entire system, with the aim of reducing the risk of unexpected costs.

Road asset management is a task of great responsibility, since it involves vital assets to the community. They allow us, for example, to reach our workplaces, services, schools, to transport goods to their various sale points or to make the most of our free time. An efficient transportation network is essential for the modern society from the economic, societal and environmental point of view. Today, it is a challenge for operators to manage road infrastructures under their responsibility in an efficient way, meeting the present and future needs of the community they serve.

Roadway bridges, together with other roadway structures, such as tunnels, are the most critical components of road infrastructures. Throughout their life, they require regular maintenance actions whose costs are generally supported by the operator. Accordingly, it becomes important to define strategies to maximize the societal benefits, derived from the investment made in these assets. This investment should be planned, effectively managed and technically supported by appropriate management systems.

Some of the main outcomes from the correct implementation of strategies for roadway bridges management are: (i) an improved user satisfaction, by improving the quality of provided service; (ii) an improved sustainable performance; (iii) a guarantee of a pre-specified safety level; (iv) an optimized return of investment; (v) a long-term planning and reliable performance; (vi) an improved risk management.

For this purpose, the authorities need to produce an asset management plan, which should not only define the goals to be achieved by exploiting the roadway bridge network, but that should also identify the investment needs and priorities based on a life cycle cost criterion. In addition, a proper condition assessment of these assets must be conducted to support the decision-making process regarding their preservation. A set of maintenance operations,

carefully planned and executed at proper time, is then established through this process. This will allow to reduce the risk of further deterioration, minimize costs and, simultaneously, ensure the quality of delivered service.

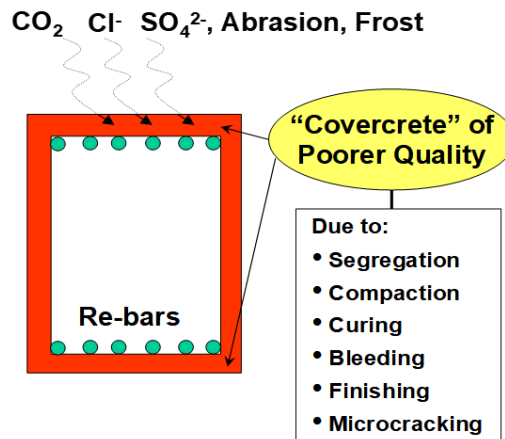


Figure 1. Example of a condition-affecting factor in a RC bridge.

All over the world, the need to manage roadway bridges in an efficient way led to the development of management systems. Hence, nowadays, many countries have their own system. Although, they present a similar architectural framework, several differences can be appointed, for example, with regard to the condition assessment procedure. These differences constitute a divergent mechanism that may conduct to different decisions on maintenance actions.

Within the roadway bridge management process, the identification of maintenance needs is more effective when developed in a uniform and repeatable manner. This process can be accomplished by the evaluation of performance indicators, improving the planning of maintenance strategies. During the implementation of asset management strategies, maintenance actions are required in order to keep assets at a desired performance level. In case of roadway bridges, specific performance indicators are established for their components. These indicators can be qualitative or quantitative based, and they can be obtained during principal inspections, through a visual examination, a non-destructive test or a temporary or permanent monitoring system. Then, obtained indicators are compared with performance goals, in order to evaluate if the quality control plan is accomplished. It is verified that there is a large disparity in Europe regarding the way these indicators are quantified and how such goals are specified. Therefore, this Action aims to bring together, for

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Leading Institution

UMinho – University of Minho (Portugal)

Partners

UPC – Universitat Politècnica de Catalunya-Barcelona Tech (Spain), ETH Zurich (Switzerland), University of Twente (Netherlands), University of Belgrade (Serbia), Kedmor Engineers Ltd (Israel), University College Cork (Ireland), IRCA – Icelandic Road and Coastal Administration (Iceland), LNEC – National Laboratory for Civil Engineering (Portugal)

CERIS Principal Investigator

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CERIS Research Team

Rui Neves

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CERIS

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the first time, both research and practicing community in order to accelerate the establishment of a European guideline in this subject. It will be also analysed new indicators related to sustainable and economic performance of roadway bridges.

The main objective of the Action is to develop a guideline for the establishment of QC plans in roadway bridges, by integrating the most recent knowledge on performance assessment procedures with the adoption of specific goals. This guideline will focus on bridge maintenance and life-cycle performance at two levels: (i) performance indicators, (ii) performance goals. By developing new approaches to quantify and assess the bridge performance, as well as quality specifications to assure an expected performance level, bridge management strategies will be significantly improved, enhancing asset management of ageing structures in Europe.

In order to reach the main general aim stated above, the following more specific objectives/deliverables have been considered: (i) to systematize knowledge on QC plans for bridges, which will help to achieve a state-of-art report that includes performance indicators and respective goals; (ii) to collect and contribute to up-to-date knowledge on performance indicators, including not only technical indicators but also environmental, economic and social ones; (iii) to establish a wide set of quality specifications through the definition of performance goals, aiming to assure an expected performance level; (iv) to develop detailed examples for practicing engineers on the assessment of performance indicators as well as in the establishment of performance goals, to be integrated in the developed guideline; (v) to create a data basis from COST countries with performance indicator values and respective goals, that can be useful for future purposes; (vi) to develop a webpage with information about the Action and its participants, as well as, video streaming from presentations at training schools, workshops and

conferences, e-lectures, written material (e.g. technical reports),etc.; (vii) to support the development of technical/scientific committees; (viii) to disseminate activities, such as Short-Term Scientific Missions (STSM), training schools and other teaching activities (e.g. e-lectures), for practicing engineers and researchers, regular workshops, a conference and special sessions at international conferences.

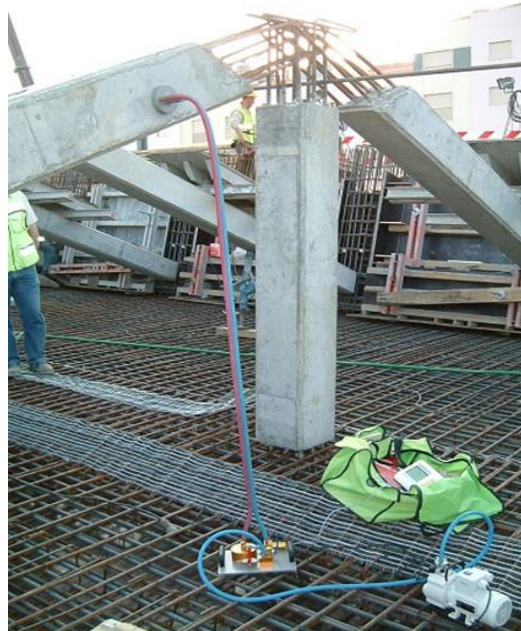


Figure 2. Site QC of concrete in a RC bridge.

The scientific focus of the Action is centred in the production of a guideline for the establishment of QC plans for roadway bridges across Europe. In this context, this Action deals with recent developments on bridge safety, maintenance and management, according to a life-cycle outlook, aiming to define a standardized procedure for performance assessment as well as for the establishment of performance goals in order to accomplish a pre-specified service level. Moreover, it is intended to demonstrate the applicability of developed guideline, and other recommendations, with case studies.