Functional Durability-related Bitumen Specification (FUNDBITS)

CEDR Transnational Road Research Programme (CEDR-TRRP) 2013

Sponsors:
This project is sponsored by CEDR (Conference of European Directors of Roads) Transnational Research programme - Energy Efficiency: Materials and technologies and funded by the following countries and their Road Authorities: Germany, Norway, United Kingdom, Austria, Slovenia, The Netherlands.

PROJECT INFORMATION

Aim
In the last years, relevant harmonised performance-based asphalt test methods of the EN 12697-series, in particular, parts 12 (water sensitivity), 24 (fatigue), 25 (rutting resistance), 26 (stiffness) and 46 (low-temperature cracking) were applied Europe-wide in order to evaluate the mechanical properties of asphalt mixtures. To find correlations between binder and asphalt mixture properties, in parallel a lot of research has been conducted internationally which should allow stronger proposals to draft specifications for paving grade and polymer-modified bitumen that will broadly improve the durability, and thus the energy efficiency, of asphalt pavements. Furthermore, asphalt producers who improved the asphalt mixture properties during mix design were also forced to conduct tests on bitumen performance characteristics in order to establish quality control for their products. Therefore, data from the asphalt industry are available which will allow the correlation of asphalt and binder performance-based characteristics to be determined.
The aim of the FunDBitS project is to review this new internationally available data to derive performance-based bitumen characteristics which may be then introduced into bitumen specification standards EN 12591, EN 14023 and EN 13924.

Schedule
April 2014, start of project Project. April 2015, Paper compilation completed. August 2015, correlative performance properties identified. September 2015, proposal of bitumen performance specifications, end of project.

Coordinator
Jan Valentin, jan.valentin@fsv.cvut.cz, Faculty of Civil Engineering , Czech Technical University in Prague, Thakurova 7 166 29 Praha Czech Republic.

All project outputs, once delivered to and approved by the client, will be available on the project website: www.fundbits.eu

PROJECT PARTNERS

- Czech Technical University in Prague
- University of Kassel
- Belgian Road Research Centre
- Solvenian National Building and Civil Engineering Institute (ZAG)
- TRL Limited
- École Polytechnique Fédérale de Lausanne (EPFL)
- European Asphalt Pavements Association (EAPA)
- Laboratório Nacional de Engenharia Civil, I.P.
- Turkish Asphalt Contractors Association (ASMUD)
- Vienna University ofTechnology
- NYNAS

BACKGROUND

More than 80 % of the Europe Road Network is paved with asphalt materials. Energy efficient asphalt pavements can be built by using durable pavement materials in order to avoid or postpone maintenance and rehabilitation works. To improve the durability of asphalt, performance-based project specifications were introduced for asphalt mixtures. Although the durability of asphalt mixtures is highly dependant on the properties of the bituminous binder, these are specified based on empirical test procedures which were devised around 100 years ago and they do not allow a prediction of the asphalt mixture performance, particularly for polymer-modified binders. In addition, the ageing of bitumen, its durability and recyclability are not taken into account by European specifications in terms of performing functional testing after short- or long-term ageing. For asphalt mixtures, performance-based specifications were introduced with EN 13108-series in 2006, whilst performance-based bitumen specifications are still not implemented in EN 12591 (paving grade bitumens), EN 14023 (polymer modified bitumens) and EN 13924 (hard and multigrade paving grade bitumens). In the FunDBitS project, new internationally available data will be reviewed in order to develop performance-based bitumen characteristics which may be introduced into future versions of bitumen specification standards EN 12591, EN 14023 and EN 13924. The correlations found may also be applied for special binder products containing various additives (e.g. waxes or crumb rubber). By having all stake-holder parties involved in the project, including national road research laboratories, universities, asphalt industry and bitumen producers, the required discussions on the feasibility of test procedures and the results for the specification will shorten the subsequent discussions in the CEN TC336 committees. The data sources will cover the whole of Europe and most asphalt mixture types will be addressed in the evaluation. This will allow the development of climate-specific specification requirements which can be applied throughout Europe.

KEY PROJECT OBJECTIVES

The FunDBitS project new data sources will be evaluated to propose a system for performance-based bitumen specifications based on:

- changes of EN 12591, EN 14023 and EN 13924 for bitumen characteristics applied for performance-based specifications;
- changes of bitumen test procedures in order to be more precise on the test conditions and to improve the test precision;
- proposed improvements for EN 13108, including suitable bitumen performance characteristics for selected asphalt mixture types.

WORK PACKAGES (WP)

WP1 leader: Jan Valentin, CTU Prague
WP2 leader: Stefan Vansteenkiste, BRRC
WP3 leader: Konrad Mollenhauer, University of Kassel
WP4 leader: Cliff Nicholls, TRL
WP5 leader: Nicolas Bueche, EPFL

WP1 content:

- To coordinate and manage the project, follow the set working programme & deliverables to assure reaching the objectives of this project.
- To coordinate the dissemination of all results and prepare a final international workshop on the project results, including the relevant CEN committees, Eurobitume & EAPA.
- To ensure good quality of the work and to gain results in an effective, rational and sustainable way.

WP2 content:

- To clearly identify what relevant information, needed to establish relationships between binder properties and/or corresponding test methods and mixture/pavement performance in the field, are avaible.
- To enable the gathering of latter information in WP3 and, facilitate its further processing into a single database to serve as a tool to select data accordingly to a specific topic to be reviewed in WP4.

WP3 content:

- To collect available data on P-R bitumen characteristics in combination with asphalt properties to allow the correlation between these properties.
- To assess available data sources according to test methods and test parameters, binder type and asphalt mix design. For each data source, available test values will be implemented to the database which will allow the combined correlation analysis for similar data sets.

WP4 content:

- To identify the relevant information available in the literature, combine and sort that on each of the major aspects of asphalt performance.
- To review the relationship between the bitumen and asphalt properties in particularly its durability and service life, with due consideration for the reliability of the test methods and presence of other factors on the asphalt properties. The work will be split into five tasks for each of the main asphalt properties. Permanent deformation, low temperature, fatigue cracking, binder/aggregate interaction.

WP5 content:

- Based on the observed relations between bitumen characteristics and obtained performances, some specification requirements will be drawn up. These do not aim at being normative but propose some limit values that can be considered when choosing binders during the asphalt mix design. The proposed specification will also take into account the expected conditions (climate, traffic) and, thus, consider various specification levels. The WP is divided into the same tasks, as in WP4 corresponding to the main asphalt properties analysed.

FunDBitS
Functional Durability-related
Bitumen Specification