Relation between binder properties and damage characteristics of pavements (Performance orientated methods) (VSS1999/131)

Zusammenhang zwischen Bindestoffeigenschaften und Schadensbildern des Belages (Performanceorientierte Methoden)

Funding: National (Switzerland)
Duration: Dec 1999 - Aug 2010
Status: Complete with results

Background & policy context:
Faulty or qualitatively insufficient binder, according to pavement experts, are the main reasons for a wide range of pavement damages. In particular thermal and fatigue cracking, missing interlayer bond strength, raveling and rutting have to be mentioned. The new research project has to find a relationship between these damages and the corresponding binder properties.

Objectives:
The objective of the project is to determinate the connection between binder properties and distress type; preparation of proposals for the transfer to the practice.

Methodology:
During the project following steps are done:
Finding appropriate road surfaces with binder damage proved to be far more difficult than expected. Despite a survey of the cantons of the planned number of sampling could not be conducted. This year, this should be taken again in attack and begin carrying out the checks.

Parent Programmes:
ARAMIS - ARAMIS information system

Institute type: Public institution
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Partners:
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Swiss Federal Roads Office
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Key Results:
Binder of about 10 damaged road sections with the classical tests (softening point, penetration, breaking point, viscosity) and newer test methods (DSR, BBR, chromatography) examines the relationship between binder properties and damage pattern. For comparison tests on sections of road with the same binder places a similar possible mix recipe, comparable climatic conditions and an approximately equal volume of traffic to be examined. The damage, fatigue cracks and rutting are in the foreground; two routes with cold cracks (transverse cracks) should be included in the study. There routes are examined with modified and unmodified bitumen. A preliminary investigation is to ensure that only sections with damage that can be attributed to a large extent the binder, are included in the study. The nature and extent of the damage, and the state of well-behaved compared distances are recorded.

The cross-comparison between the results should demonstrate the practical relevance of audits by Swiss standards. It is possible to draw conclusions that allow properties particularly relevant statements above damage risks. The analysis of the test results to identify which properties of the binder for the behavior of the coating are important. Here also the dependence of the risk of damage to be taken into account by air, since under different climatic conditions very different losses is to be expected.

As a conclusion, the research project showed clearly that the binder properties on its own are not able to explain the cause of damaged pavements, even when the selection was restricted to binder typical defects. Just the difficulties in finding suitable objects shows, that the role of the binder was originally overestimated. In general, compaction, aggregate gradation, binder and void content, as well as other volumetric and mechanical characteristics of the hot mix have a stronger influence on the performance of the pavement. Therefore, it is of particular importance to consider all relevant parameters for the performance behaviour of mixtures already in the planning and implementation of a research project, instead of focusing only on few selected ones.

Evaluation of the results of the new performance oriented test methods gave indications, that in some cases the differentiation of the results was better. Particularly, the rheological tests with DSR resulted in a larger spread of the results between damaged and undamaged pavements. However, this statement is based on a restricted number of results and fur

Documents:
EMPA20100668.pdf (Final report)

STRIA Roadmaps: Vehicle design and manufacturing, Infrastructure

Transport mode: Road transport