PROJECT

Cold recycling of reclaimed asphalt with bituminous binders (VSS2002/401)

Kaltrecycling von Ausbauasphalt mit bituminösen Bindemitteln

Funding: National (Switzerland)
Duration: Jun 2004 - Mar 2014
Status: Complete with results

Background & policy context:

Cold recycling of asphalt pavements with bituminous binders offers two main advantages. On one hand, the use of reclaimed asphalt helps to reduce the current excess, while on the other hand energy conservation and low emissions make cold recycling ecologically worthwhile. For these reasons, cold recycling of reclaimed asphalt has been used more frequently during the last 10 years in Switzerland in the form of cold mix foundations. However, a standard for state-of-the-art cold recycling does not exist yet.

Objectives:

The goal of this research project is to find target-oriented solutions to current questions in the field of material technology using established experience to develop the laboratory techniques and for the practical implementation. The key aspects investigated are specimen preparation and strength tests; additionally the study addresses suitable ways to assess the characteristics of the bituminous mixture and the built layer. Both, mixtures with foamed bitumen and cationic bitumen emulsions are examined. The conclusions of this research project should serve as a basis for revising the current standard.

Methodology:

The following steps will take place:

A) Capture the current state of the art

B) Laboratory part with the development of the bases of testing and the demonstration of formulation-related parameters influencing the material and environmental characteristic quantities. The mixtures produced in the laboratory and from mixing the following main parameters are included in the sub-Chung program:

- Variation of the PAH content in the starting material
- Variation of the recipe
- Comparison of different specimen preparation
- Comparison of the strength test
- Variation bitumen emulsion - foamed bitumen
- Analysis of the starting material and the processed material in a condensed form (specimen) for PAH and phenol in the eluent.

C) Practical part with accompaniment from installations, capture the decisive parameters for the qualitative assessment of the production and installation.

D) Reporting

Parent Programmes:
ARAMIS - ARAMIS information system

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Key Results:

Several conclusions can be drawn from the research project. Firstly, sample preparation through static compaction is closer to the conditions in the field than sample preparation through impact compaction. As a result, the currently used Duriez-compaction should continue to be applied in state-of-the-art techniques. To better match the laboratory model to conditions in the field, a reduction of the compaction force to 80 kN is suggested. Both cylinder compression strength and tensile strength can be used to determine the specific strength values; however, to avoid losing the current know-how it is recommended to keep the currently used cylinder compression strength. Besides the 7-days-strength, the 28-days-strength can be used to get a better overview of how strength develops over time. The method to determine the water sensitivity from the ratio of the cylinder compression strength before and after a 7-days-water conditioning shows a good selectivity. However, according to experience the required ratio after/before water conditioning of 0.55 is rather low. Furthermore, the test temperature has a decisive impact on the measured strength. As a conclusion, the test temperature needs to be defined in addition to the storage temperature. When looking at the recipe-based influences, it was observed that increasing the bitumen content reduces water sensitivity and strength. The addition of crushed sand increases the strength, however, not to the expected extent. In a direct comparison of cold and hot mixtures it can be stated that cold mixtures show higher water sensitivity, a clearly lower strength and a higher tendency to deform. As a binder, both foamed bitumen and cationic bitumen emulsions are suitable. Analogous to hot mixtures, core samples can be used to determine the specific compaction values of cold mixtures.

When considering the water content, the isotopic sample can be used to optimise the compaction process, however it is not suitable for acceptance tests. For plate-loading tests, the dynamic method with the light drop-weight tester is advantageous compared to static plate-loading because it has a lower temperature sensitivity. Concerning storability of cold mixtures, it could be shown that a longer storage is possible without affecting the material properties.

The recommendations for the revision of the standard focus on: the choice of Duriez samples as reference specimens (including the compaction strength), the definition of test temperature for strength tests, the inclusion of the 28

Technical Implications

The conclusions of this research project should serve as a basis for revising the current standard.

Documents:
- Final report (Final report)

STRIA Roadmaps: Vehicle design and manufacturing
Transport mode: Road transport
Transport sectors: Passenger transport, Freight transport
Geo-spatial type: Other