Report

Reference Material

BAM-E005

Rubber base ring for the portable tester for measuring the surface roughness of streets

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Summary

This report describes preparation and characterization of the reference materials (RM) BAM-E005.

These reference materials (RM) are vulcanized rubber compounds, for use in testing the roughness of streets.

The mentioned reference materials have been prepared to such an extent that they are ready to be used in an efflux meter in accordance to MOORE.

This report contains detailed information on the preparation of the RM as well as on investigations concerning homogeneity and stability as well as on the methods used for characterization. From the results, guidelines for shipment, handling and use of the RM are inferred.

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1 Introduction

The measurement of the horizontal drainability of relatively smooth surfaces (typically pavements or street surfaces) simulates the drainage of water from the contact area beneath a moving vehicle tyre. The used outflow meter (a calibrated cylinder volume) is placed on the test surface and filled with water. The time required for the water level to fall from an upper to a lower mark is recorded.

The outflow meter is contacted to the surface via an elastomer ring. The elastomer is attached to the cylinder via a metal ring. The fixed combination of the metal ring and elastomer ring constitutes the reference material BAM-E005.

2 Candidate material and characterization study

Over time, technical regulations stipulated the use of BAM rubber base rings (for the outflow meter) in combination with sliding bodies (for the SRT pendulum measuring the skid resistance) on roads in Germany. Note that both properties are related to different aspects of the surface roughness of the test surface.

Examples:

Erlass des Bundesministers für Verkehr vom 27. November 1972 (RSch StB 9/38.56.05-36/9080 Vms 72II) bezüglich Griffigkeitsmessungen mit dem SRT-Pendel nach Arbeitsanweisung für kombinierte Griffigkeits- und Rauheitsmessungen mit dem Pendelgerät und dem Ausflussmesser / Technische Prüfvorschrift für Griffigkeitsmessungen im Straßenbau, Teil: Messverfahren SRT; TP Griff-StB (SRT)

Allgemeines Rundschreiben Straßenbau Nr. 17/2005
(S 17/38.56.05-15/20 Va 05) des Bundesministeriums für Verkehr, Bau- und Wohnungswesen

Allgemeines Rundschreiben Straßenbau Nr. 19/2010
(StB 7/7182.8/3/1266404) des Bundesministeriums für Verkehr, Bau und Stadtentwicklung

Allgemeines Rundschreiben Straßenbau Nr. 20/2021
(StB 25/7182.8/3-ARS-21/20/3556151) des Bundesministeriums für Verkehr und digitale Infrastruktur

2.1 RM BAM-E005:

The requirements for this reference material were described in the following regulations:

Rauheitsmessungen mit dem Pendelgerät und dem Ausflussmesser Technische Prüfvorschrift für Griffigkeitsmessungen im Straßenbau, Teil: Messverfahren SRT; TP Griff-StB (SRT).

Technische Prüfvorschriften für Griffigkeitsmessungen im Straßenbau; Teil Messverfahren SRT, Ausgabe 2004; (TP Griff-StB (SRT)).

Technische Prüfvorschriften für Griffigkeitsmessungen im Straßenbau; Teil Messverfahren SRT, Ausgabe 2021; (TP Griff-StB (SRT))

Later, a European standard for the procedure was developed:

EN 13036-3:2002
"Road and airfield surface characteristics - Test methods Part 3: Measurement of pavement surface horizontal drainability".

Establishing the as specification for the rubber:

The property of the vulcanized rubber ring shall be as follows:

hardness 48 ± 1, Shore A, in accordance with ISO 868.

3 Homogeneity testing / Evaluation of stability

It must benoted that the measurement methods for the approval of elastomers available in the BAM laboratory cannot be directly referenced in relation to the measurements of surface roughness. Therefore, measurements carried out at the BAM with regard to the homogeneity and stability of the elastomer itself also have no direct relation to the measurements with the outflow meter.

Therefore, the stated Shore A hardness is taken as reference, Furthermore, the RM BAM-E005 has been in use for a long time, and during this period, no users have expressed or reported any concerns regarding the homogeneity and stability of the material.

In this context, it should be noted that the measurement of surface roughness is influenced by many factors that can affect the results obtained.

3.1 Homogeneity testing

From each batch of the mixture for the RM, first a test plate is manufactured, and its hardness is determined according to ISO 868. If the results meet the requirements, the complete parts consisting of metal ring with the rubber ring are produced.

For each single part of the RM, the hardness of the rubber ring is measured four times in accordance with ISO 868. The average of these four measurements must meet the material requirements specified in EN 13036-3.

3.2 Evaluation of stability

The properties determined at release of an RM can be tracked over time. This allows the stability of the mixture to be monitored in relation to these points.

The rings BAM-E005 were stored at approx. 7 °C over a longer period of time and the Shore A hardness was measured repeatedly.

The change in hardness over time was tracked using RM test plates. It was found that after one year of storage, the hardness had increased by one hardness value. After two and three years, respectively, the hardness increased by one hardness value in each case.

4 Specification of an uncertainty in the RM document

The attached reference material document, issued by BAM, confirms that the RM meets the requirements of the relevant standard.

For this purpose, the customer is informed about the relevant values measured for each batch in the accredited testing laboratory.

An indication of the measurement uncertainty is also provided in the presentation of these results.

Notes on the variation in hardness due to stability and homogeneity are included in the previous sections of this document.

The relationship to surface roughness measurement has also already been explained.

5 Information on the proper use of the RM

5.1 Shelf life

Based on many years of experience with BAM-E005, a suitable shelf life has been determined for storage between 4 and 10 °C.

The measured values specified in the Reference Material Document are valid for 1 year from the date of shipment provided the reference material is stored cool, dry, protected from light and kept in a protective cover (the original pressure seal bag) completely closed.

Experience gained from use in accordance with EN 13036-3 shows that the complete rubber base ring can be used for up to three years.

5.2 Transport, storage, use

The stability of the RM allows dispatching the material at ambient temperature. On receiving, it is to be stored between 4–10 °C in a pressure seal bag. Before use, the pack must have reached ambient temperature. In addition, the instructions of the manufacturer of the test device apply.

After use, the RM must be stored between 4–10 °C, again in a tightly closed pressure seal bag.

5.3 Safety instructions

Information on safe handling can be found in the available safety data sheet.

It is strongly recommended to handle and dispose of the reference material in accordance with the guidelines for materials legally in force at the site of end use and disposal.

6 Information on the RM and its purchase

Reference material are supplied by

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Each Reference material will be distributed together with a detailed datasheet.

Information on reference materials (RM) and certified reference materials (CRM) can be obtained from BAM, www.bam.de.