Note

subject:	Wattstone GmbH
date:	November 20, 2023
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1 Introduction

Peutz have been commissioned by Wattstone GmbH of Voerde, Germany, to measure the friction coefficients between their solar PV supports system for flat roofs and several roof covering materials. This has been done upon using a sample obtained from Wattstone GmbH, provided with rubber feet. Measurements have been done by pulling at the sample and measuring the pull force by means of a hand held force transducer, as shown in f 1.1.

f 1.1 Measurement setup of bitumous roofing

The measurements have been done at dry as well as wet roof covering materials and are done with smooth concrete, EPDM, smooth bituminous roof covering as well as bituminous roofing with slate and PVC. The method is analogous to report TNO 2002-BS-R0195.

2 Measurements and results

The measurements have been performed using a KERN CH force measurement device. After having done the measurements with dry materials, the materials have wet and the measurements have been repeated, as shown in

f 2.1 Wet measurement of bitumous roofing with slate

The friction coefficient is the ratio between the downward pushing force perpendicular to the surface and the horizontal pull force needed to drag the system away, i.e. to set in in motion. Both forces have been expressed in the kg unit, for dry and wet roof conditions respectively, in t 2.1 and t 2.2. In f 2.2 the five investigated roof coverings are shown.

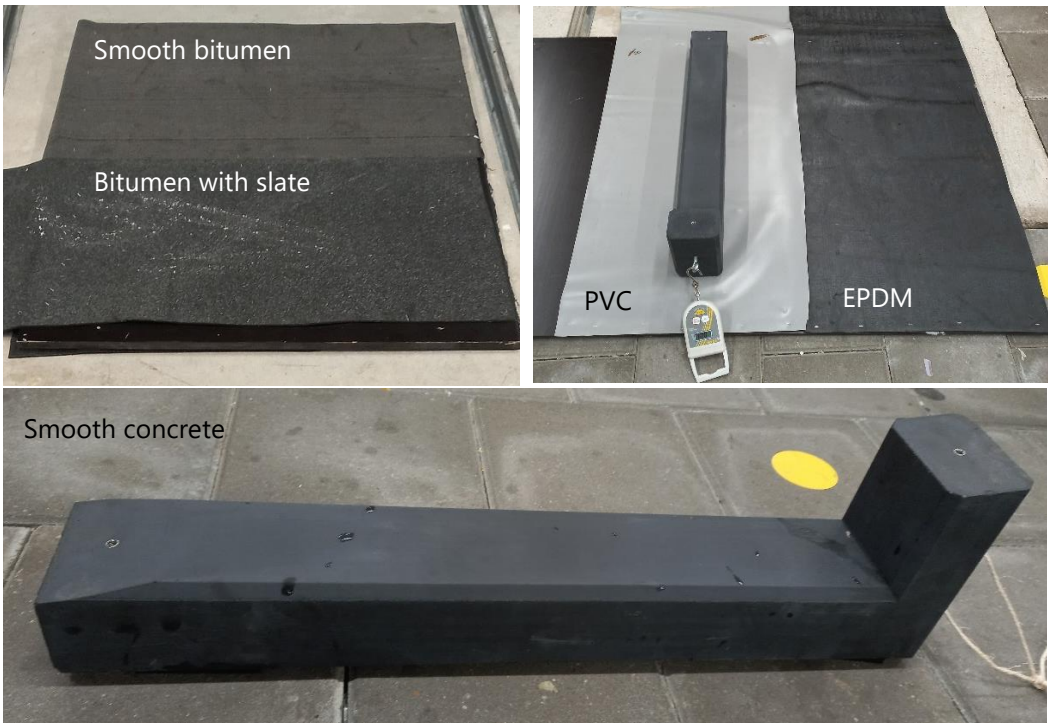
All measurements have been repeated three times. The variation/inaccuracy in friction values found, typically amounts to +/- 0.01 for all reported values. As stated in report TNO 2002-BS-R0195, this inaccuracy will be accounted for in a proper manner when the safety factor for self weight Y = 0,9 is applied in the calculations of the ballast needed for PV panels and solar supports.

t 2.1 Measurement results with dry roofing materials

Material	Weight support system [kg]	Measured force [kg]	Friction coefficent
Smooth bitumen	24	21	0.88
Bitumen with slate	24	23	0.96
PVC	24	19	0.79
EPDM	24	23	0.96
Smooth concrete	24	16	0.67

t 2.2 Measurement results with wet roofing materials

Material	Weight support system [kg]	Measured force [kg]	Friction coefficent
Smooth bitumen	24	16.5	0.69
Bitumen with slate	24	16	0.67
PVC	24	14.5	0.60
EPDM	24	17	0.71
Smooth concrete	24	15.5	0.65



f 2.2 Investigated roof coverings: smooth bitumen, bitumen with slate, PVC, EPDM and smooth concrete

3 Discussion

As can be seen in t 2.1, the highest values have been measured for EPDM and bitumen with slate. The friction coefficients for these roofing in the dry situation reach values up to 0.96.

All roof surfaces show values that are slightly smaller in rainy situations. We advice to use these values.

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