Appendix U.5.9 – ONORM 3232

<table>
<tr><td>Generic Name of Test</td><td>Sliding Fine Abrasive : Abrasion Test</td></tr>
<tr><td>Principle of Test</td><td>Large revolving steel disc causes abrasive to slide/roll beneath loaded specimens</td></tr>
<tr><td>Historic Development of Test</td><td>The Austrian ‘ONORM B 3232 Ceramic Wall and Floor Tiles’ test utilises the Amsler apparatus. The name of this apparatus derives from the Swiss firm Alfred J. Amsler, which built abrasion machines according to the Böhme principle. Böhme’s principle is that the sample is held under a certain pressure onto a cast iron disc, rotating in the horizontal plane. An abrading agent is applied to the disc. The loss of thickness is measured after a certain number of rotations of the disc. The number of revolutions is converted into the total wear path. [v.d. Klugt (1989)]</td></tr>
<tr><td>Apparatus and Abrasives</td><td>Figure U.5.9.1 shows the apparatus consisting of a horizontally rotating cast iron disk against which the specimen is held. Abrasive grit (artificial corundum) is used between the specimen and plate. Test specimens are prepared to a size of 50cm^2. [v.d. Klugt (1989)]</td></tr>
<tr><td colspan="2">

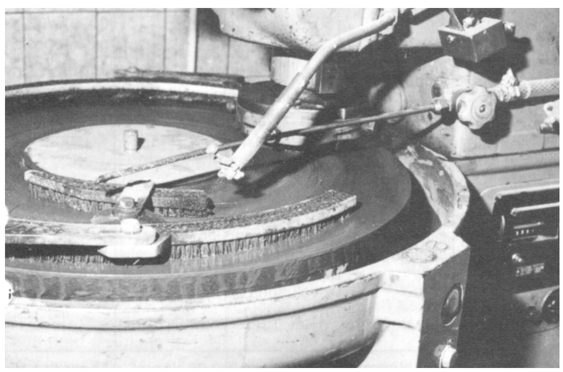

Figure U.5.9.1 Detail of an Amsler-type machine used in the ONORM 3232 test [v.d. Klugt (1989)]. Note that the test specimen is rotated at the same time as the main grinding disc.

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<tr><td>Test Method</td><td>The specimen is tested in a dry state. It is held against the rotating grinding disk at a controlled pressure and is rotated slowly and continuously about its own axis for the duration of the test, which is 690m. The disc rotates at 38 rpm. [v.d. Klugt (1989)]</td></tr>
<tr><td>Abrasion Wear</td><td>The wear is reported as cm^3 of lost material per 50cm^2. [v.d. Klugt (1989)]</td></tr>
<tr><td>References</td><td><u>Author</u> — <u>Comment</u>
v.d. Klugt (1989) — Source document
Alexander (1984) — Source document</td></tr>
</table>

APPENDIX U.5.9

Wear Mechanisms according to Author

(i) v.d. Klugt (1989): No comments of the mechanism of abrasion wear
Alexander (1984): The abrasive action is that of rubbing and grinding and cutting and sliding of the grit. (Similar to DIN 52108)
(ii) Visual Effects:

Wear Mechanisms according to writer [R2 S2 I0]

(i) Rolling and Sliding: The mechanism of wear is shown in figure U.5.9.2 and is one of microscopic crushing and shearing at the contact points, as the sand is made to move laterally beneath the specimen. Lateral displacement of the sand is caused primarily by the movement of the grinding table, but rotation of the sample also contributes to a degree. The sand will be made to both slide and roll. The predominant action in the case of sliding will be shearing in the form of scratching, scraping and cutting of the asperities. In the case of rolling, sharp points are likely to generate high compressive stress, resulting in microscopic crushing in very localised areas. The corresponding abrasion wear for the 2 cases may be referred to as:

$$Q_{Crushing} \propto W_{n+1}$$

$$Q_{Shearing} \propto F_n = \mu W_n$$

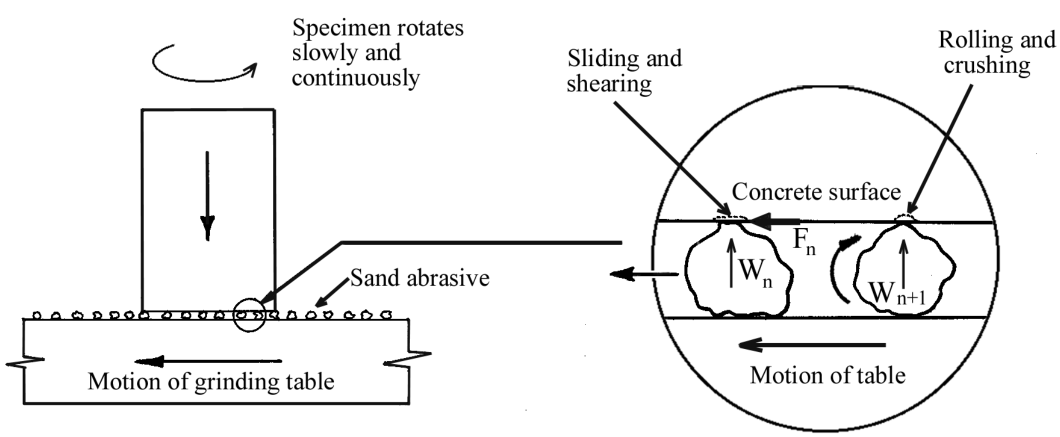

Figure U.5.9.2 Rolling and sliding wear mechanisms

Note: This test does not measure the aggregate/paste bond. The aggregate particles that are loosened during the abrasion process are unable to ‘escape’. In effect they contribute to an unrealistically high ‘abrasion resistance’ result, whereas in practise they would be plucked out of the matrix by traffic etc. The size of loose aggregate that is in effect ‘trapped’ will depend on the gap between the test sample and the grinding table, and this in turn is determined by the size of the abrasive particles.

(ii) Adhesion and deformation: See note 1 in introduction to appendix U