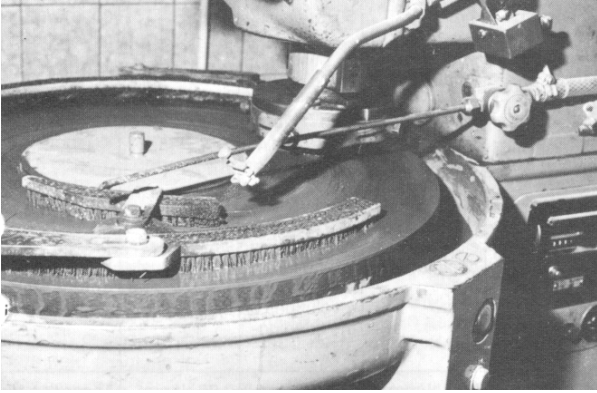


Appendix U.5.7 – NBN B15-233

Generic Name of Test	<i>Sliding Fine Abrasive : Abrasion Test</i>						
Principle of Test	Large revolving steel disc causes abrasive to slide/roll beneath loaded specimens						
Historic Development of Test	This Belgian test, <i>NBN B15-233 (1970) Tests on Concrete Abrasion, Belgian National Standard</i> , 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)]						
Apparatus and Abrasives	Figure U.5.7.1 shows the apparatus consisting of a horizontally rotating cast iron disk against which two specimens are held. Abrasive grit is used between the specimens and plate. The two square test specimens with a surface area of 50cm ² are mounted such that the applied load may be controlled. [Alexander (1984)]						
 <p data-bbox="326 1278 1248 1339">Figure U.5.7.1 Detail of an Amsler-type machine used in the NBN B15- 233 test [v.d. Klugt (1989)]. Note that the test specimen is rotated at the same time as the main grinding disc.</p>							
Test Method	The concrete is tested after being oven dried at 105 ⁰ and is tested dry. The specimen 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. The test duration is unspecified. [Alexander (1984)]						
Abrasion Wear	This is specified as the average depth of abrasive wear. The abrasion wear is measured as the loss of thickness of the concrete specimen.						
References	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;"><u>Author</u></th> <th style="text-align: left; border-bottom: 1px solid black;"><u>Comment</u></th> </tr> </thead> <tbody> <tr> <td>Alexander (1984)</td> <td>Source document</td> </tr> <tr> <td>v.d. Klugt (1989)</td> <td>Source document</td> </tr> </tbody> </table>	<u>Author</u>	<u>Comment</u>	Alexander (1984)	Source document	v.d. Klugt (1989)	Source document
<u>Author</u>	<u>Comment</u>						
Alexander (1984)	Source document						
v.d. Klugt (1989)	Source document						

APPENDIX U.5.7

Wear Mechanisms according to Author

- (i) Alexander (1984): The abrasive action is that of rubbing and grinding and cutting and sliding of the grit.
(Similar to DIN52108)
- (ii) Visual Effects:

Wear Mechanisms according to writer [R2 S2 I0]

(i) Rolling and Sliding: The mechanism of wear is shown in figure U.5.7.2 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:

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

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

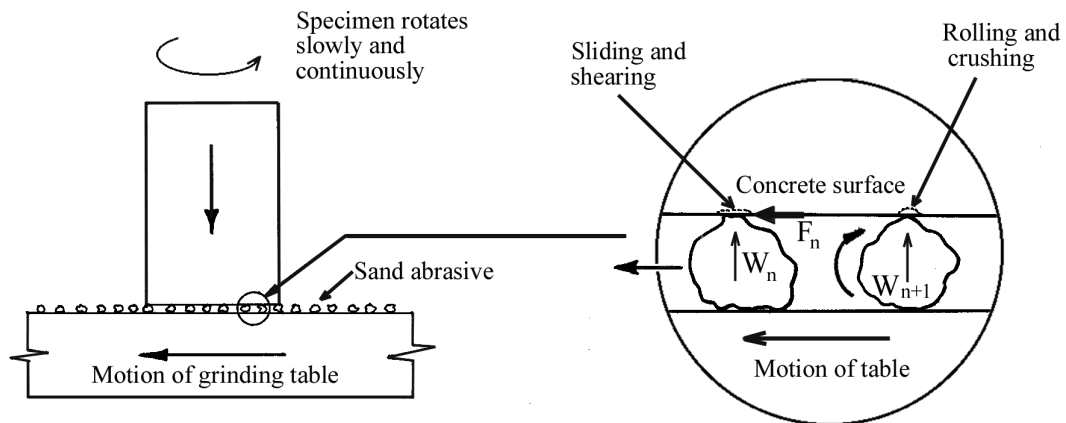


Figure U.5.7.2 Rolling and sliding wear mechanisms

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