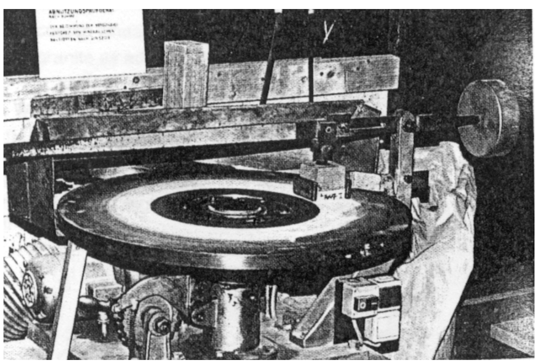
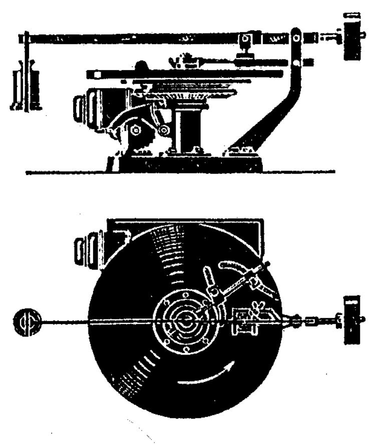
Appendix U.5.4 – UNE 7015

Generic Name of Test	*Sliding* Fine Abrasive : Abrasion Test
Principle of Test	Large revolving steel disc causes abrasive to slide/roll beneath loaded specimens
Historic Development of Test	The *Spanish National Standard UNE 7015 Test for the abrasion resistance of cement tiles by grinding* 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	Figures U.5.4.1 and U.5.4.2 show the apparatus consisting of a horizontally rotating cast iron disk against which the specimen is held. Abrasive grit (special sand or artificial carborundum) is used between the specimen and plate. A simple lever system applies a constant force to the test specimen. [Alexander (1984)]
 **Figure U.5.4.1** Amsler apparatus as used in the Spanish UNE 7015 test. [Pickel (1997)]	 **Figure U.5.4.2** Böhme disc. Note the simple lever system for applying a controlled pressure. [Pickel (1997)]
Test Method	Test specimens are prepared to a size of 50 x 50mm. For interior applications, the test specimens are tested dry using abrasive sand and for exterior applications, the test specimens are tested wet using carborundum. It is not clear if the specimen is rotated or not and the duration of the test is not known. [Alexander (1984)]
Abrasion Wear	This is expressed as the average depth of abrasion wear, which is measured as the loss of thickness of the test specimen. [Alexander (1984)]
References	Author — Comment Alexander (1984) — Source document van der Klugt (1989) — Source document Pickel (1997) — Source document

APPENDIX U.5.4

Wear Mechanisms according to Author

(i) Alexander (1984): The abrading action is that of rubbing and grinding and sliding and cutting of the grit. No high stresses or impacts are applied.
(ii) Visual Effects:

Wear Mechanisms according to writer [R2 S2 I0]

(i) Rolling and Sliding: The mechanism of wear is shown in figure U.5.4.3 and is one of microscopic crushing and shearing at the contact points, as the sand is made to move laterally beneath the specimen. 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:

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

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

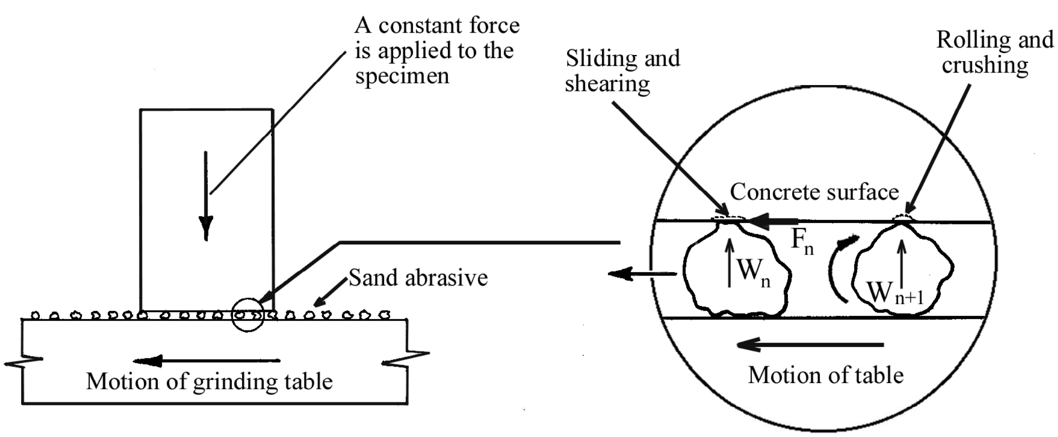


Figure U.5.4.3 rolling and sliding wear mechanism

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