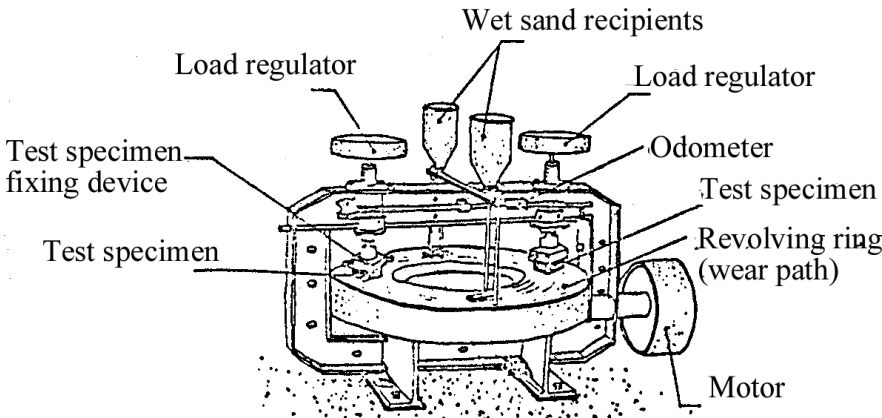


Appendix U.5.1 – Dorry Hardness

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	The abrasion test using the Dorry Hardness testing machine was devised by the French school of bridges and roads, and used by United States Office of Public Roads and Rural Engineering for tests on rocks [Abrams (1916)]. It has subsequently been used to test concrete by both Di Maio (1999) and de Almeida (1994).						
Apparatus and Abrasives	See figure U.5.1.1. The apparatus consists of a horizontally rotating ring (800mm external and 640mm internal diameter) and a support frame to hold 2 test specimens on opposite sides of the disk. The load on each test specimen may be controlled. Abrasive grit is used wet. [de Almeida (1994)]						
 <p>Figure U.5.1.1 The Dorry testing apparatus [de Almeida (1994)]</p>							
Test Method	<p>The tests were carried out following the Portuguese standard NP-309 which is similar to the Brazilian standard test method MB-3379 and to the German standard DIN 52108, using the Dorry apparatus.</p> <p>The test specimens are clamped and pressed against the upper surface of the revolving ring under a load of 334 N. The abrasive sand is fed wet at a rate of 150g/min. The test duration is 200m at a speed of 1.25m/s (measured at the centre of the test specimen). [de Almeida (1994)]</p>						
Abrasion Wear	This is measured as the average depth of abrasion wear. [de Almeida (1994)]						
References	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Author</th> <th style="text-align: left; border-bottom: 1px solid black;">Comment</th> </tr> </thead> <tbody> <tr> <td>de Almeida (1994)</td> <td>Source document</td> </tr> <tr> <td>Abrams (1916)</td> <td>Source document</td> </tr> </tbody> </table>	Author	Comment	de Almeida (1994)	Source document	Abrams (1916)	Source document
Author	Comment						
de Almeida (1994)	Source document						
Abrams (1916)	Source document						

APPENDIX U.5.1

Wear Mechanisms according to Author

(i) de Almeida (1994): No comments on wear the mechanism.

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.5.1.2 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:

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

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

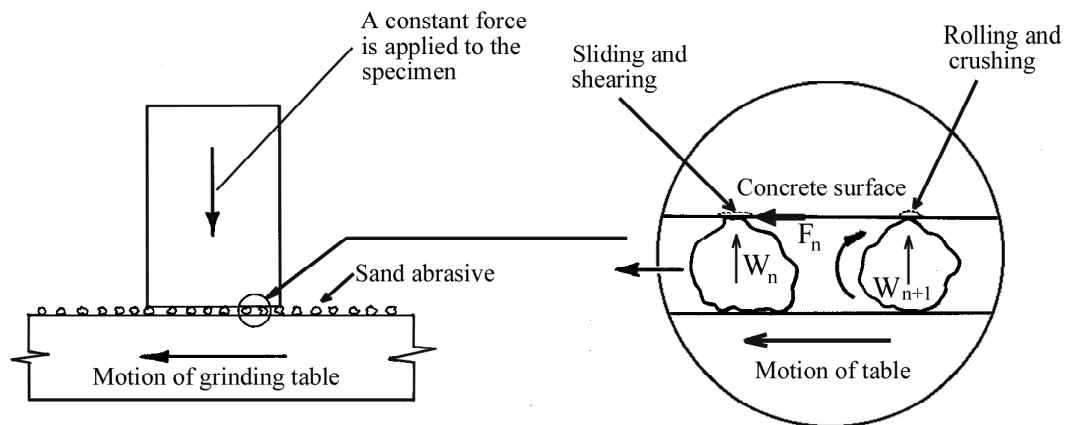


Figure U.5.1.2 Rolling and sliding wear mechanisms

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