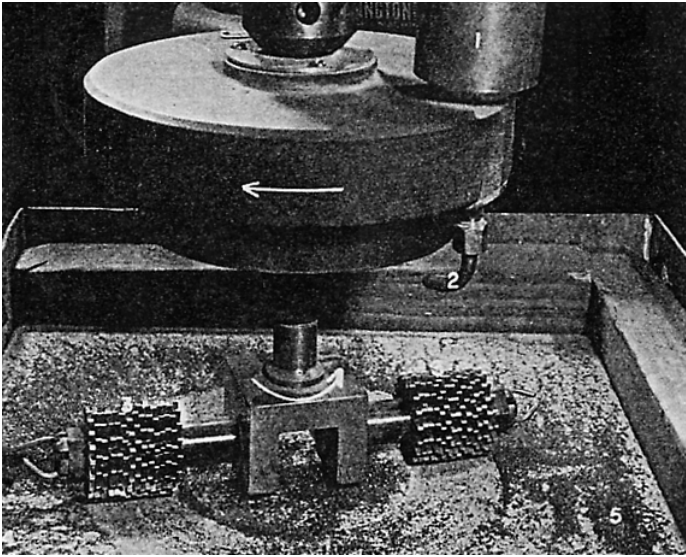


Appendix U.3.8 – Smith’s Dressing Wheel Abrasion Test

Generic Name of Test	<i>Rolling Dressing Wheels / Fine Abrasive : Abrasion Test</i>				
Principle of Test	Loaded dressing wheels orbiting on surface.				
Historic Development of Test	This dressing wheel abrasion test was developed by Smith prior to 1958 and appears to be the forerunner of ASTM C944. Although it has a smaller load relative to ASTM C944 (8kg vs. 10kg) the application of the abrasive makes it more severe.				
Apparatus and Abrasives	The apparatus consists of a modified drill press that holds an abrasive cutter, which consists of 32 grinding wheel dressers. A constant load of 18lbs (80 N) is applied to the rotating cutter (see figure U.3.8.1). A cup is used to hold No. 60 grit silicon carbide. [Smith (1958)]				
 <p data-bbox="613 1289 964 1373">Figure U.3.8.1 Modified drill press and rotating cutter used in the test. [Smith (1958)]</p>					
Test Method	The test specimen is weighed and clamped to the drill press table. The cutter is rotated on the surface at a speed of 190 rpm under a constant load of 80N. A total of 5000 revolutions are required for the test. Number 60 silicon carbide is applied at a rate of 3g per minute. [Smith (1958)]				
Abrasion Wear	This is measured as the average weight loss [Smith (1958)]				
References	<table border="0" style="width: 100%;"> <tr> <td style="text-align: left;"><u>Author</u></td> <td style="text-align: left;"><u>Comment</u></td> </tr> <tr> <td>Smith (1958)</td> <td>Source document</td> </tr> </table>	<u>Author</u>	<u>Comment</u>	Smith (1958)	Source document
<u>Author</u>	<u>Comment</u>				
Smith (1958)	Source document				

Wear Mechanisms according to Author

- (i) No mention made by author.
- (ii) Visual Effects: See figure U.3.8.1

Wear Mechanisms according to writer [R3 S3 I3]

i) Rolling and Sliding: The mechanism of wear is shown in figure U.3.8.2 and is one of microscopic crushing and shearing at the contact points, as the sand is made to roll and slide beneath the specimen. 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:

$$Q_{\text{Crushing}} \propto W_{n+1} \text{ (see diagram)}$$

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

Note: This test is also an effective measure of the aggregate/paste bond. The aggregate particles that are loosened during the abrasion process are easily removed by the rotating teeth. This action therefore correctly simulates what happens in practice.

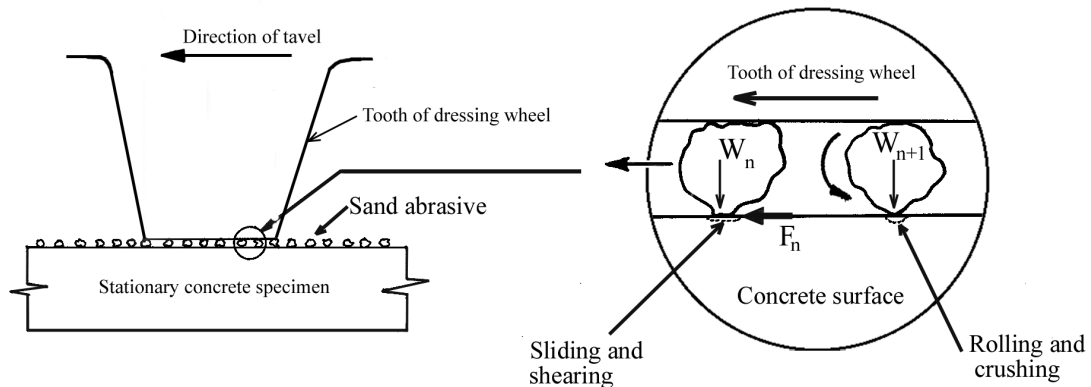


Figure U.3.8.2 Wear mechanism - abrasive between tooth of dressing wheel and concrete specimen

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