

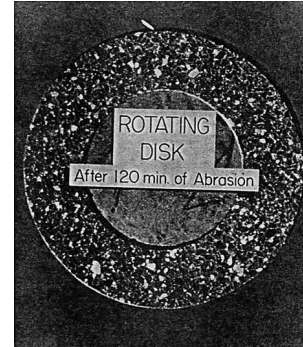
## Appendix U.5.15 – ASTM C779 Proc. A

<b>Generic Name of Test</b>	<i>Sliding Fine Abrasive : Abrasion Test</i>										
<b>Principle of Test</b>	Loaded rotating steel discs moving in planetary circuit cause abrasive to slide/roll over specimen										
<b>Historic Development of Test</b>	<i>ASTM C779 Proc A: Test Method for Abrasion Resistance of Horizontal Concrete Surfaces</i> was developed from 1964 though to 1971 to measure the average depth of wear. Wear-time curves for horizontal concrete surfaces may be generated. [Liu (1991)] and [Alexander (1984)]										
<b>Apparatus and Abrasives</b>	As indicated in Figure U.5.15.1 and U.5.15.2 three flat rotating steel disks are attached to a larger rotating planetary disk. An electric motor powers the machine, which produces an annular abraded area on the concrete. A No.60 silicon carbide abrasive is used [ASTM C779]										
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div data-bbox="256 793 857 1306" style="text-align: center;"> <p><b>Figure U.5.15.1</b> Diagram showing test apparatus [Liu (1991)]</p> </div> <div data-bbox="889 785 1318 1310" style="text-align: center;"> <p><b>Figure U.5.15.2</b> Rotatong disk machine [Lane (1973)]</p> </div> </div>											
<b>Test Method</b>	A supply of No.60 silicon carbide abrasive is fed to the 3 rotating disks. The concrete specimen is usually 305 x 305 x 90 mm and the duration of the test is 30-60 minutes. [Liu (1991)], [Alexander (1984)]										
<b>Abrasion Wear</b>	This is expressed as the average depth of abrasion wear										
<b>References</b>	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left; width: 50%;">Author</th> <th style="text-align: left; width: 50%;">Comment</th> </tr> </thead> <tbody> <tr> <td>ASTM C779</td> <td>Source document</td> </tr> <tr> <td>Liu (1991)</td> <td>Source document</td> </tr> <tr> <td>Alexander (1984)</td> <td>Source document</td> </tr> <tr> <td>Lane (1973)</td> <td>Source document</td> </tr> </tbody> </table>	Author	Comment	ASTM C779	Source document	Liu (1991)	Source document	Alexander (1984)	Source document	Lane (1973)	Source document
Author	Comment										
ASTM C779	Source document										
Liu (1991)	Source document										
Alexander (1984)	Source document										
Lane (1973)	Source document										

**Wear Mechanisms according to Author**

- (i) Liu (1991): Frictional forces produce wear by rubbing and grinding. Sliding and scuffing is accomplished by the rotating steel disks in conjunction with abrasive grit.
- (ii) Visual Effects:

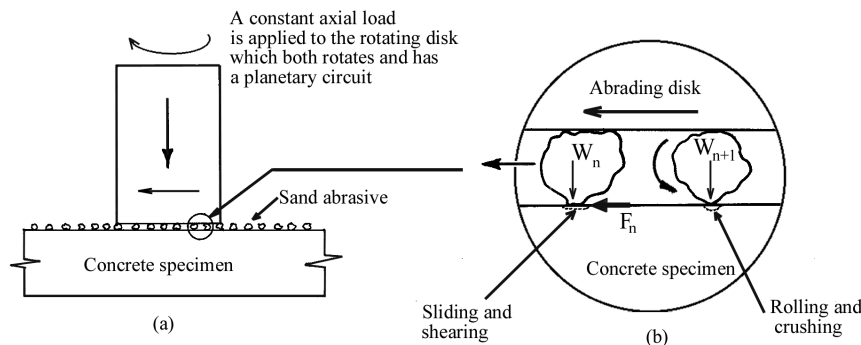
**Figure U.5.15.3** Abraded wear pattern left by the abrasive material beneath the rotating discs moving in a planetary circuit [Lane (1973)]



**Wear Mechanisms according to writer [R2 S2 I0]**

(i) Rolling and Sliding:

The mechanism of wear is one of microscopic crushing and/or shearing at the contact points, as the sand is made to move laterally beneath the specimen. The sand will both skid and roll. The predominant action in the case of skidding 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. These wear mechanisms are illustrated in figure U.5.15.4



**Figure U.5.15.4** Rolling and skidding wear mechanisms

(ii) Exposure of Abrading Surface: For the purpose of the discussion hereafter, it will be convenient to refer to the tests detailed in U.5.1 through U.5.10 as the Böhme suite of tests, those of U.5.11 and U.5.12 as the Capon tests and those of U.5.13 through U.5.15 as the 'US-disc' tests. The abrasion mechanism for the US-disc tests is shown in fig U.5.15.4 (b). This abrasion mechanism is very similar to that of the Böhme tests and the Capon tests. One difference is that in the US-disc tests the specimen is below, while in the Böhme tests it is above and in the Capon tests it is upright. There is however another important distinction. In the Böhme and Capon type tests the face of the specimen being abraded is always concealed throughout the test. In effect the face is both supported and reinforced by the abrading disc, separated only by the abrading medium. Any loose / de-bonded aggregate particles are therefore unable to 'escape'. They therefore contribute to abrasion resistance in the test, whereas in a real-traffic environment they would be dislodged by abrasive forces. This can be quite misleading in the case of very hard wearing aggregate in a relatively weak paste. The US-disc tests do not have this shortcoming. Because the revolving abrading disc moves in a planetary circuit, it leaves the abraded face of the concrete exposed as it moves away. In this process any loose aggregate at either the leading or trailing edge of the advancing discs will be spun out. The abrasive material at the front / back of the disks in effect grips the loose aggregate particles and rolls them out of the path. It may therefore be stated that the US-disc tests measure both the aggregate hardness **and** the aggregate / paste bond.

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