

Appendix U.3.6 – ASTM C779 Proc. B

Generic Name of Test	Rolling Dressing Wheels : Abrasion Test
Principle of Test	Loaded dressing wheels orbiting on surface.
Historic Development of Test	'ASTM C779 Proc B Test Method for Abrasion Resistance of Horizontal Concrete Surfaces' was developed from 1964 though to 1971. It can yield wear-time curves for horizontal concrete surfaces. [Liu (1991), Alexander (1984)]
Apparatus and Abrasives	As indicated in Figure U.3.6.1 and U.3.6.2 three sets of 7 dressing wheels mounted on horizontal shafts are attached to a larger rotating planetary disk. An electric motor powers the machine, which produces an annular abraded area on the concrete. No abrasive material is employed. [ASTM C779]

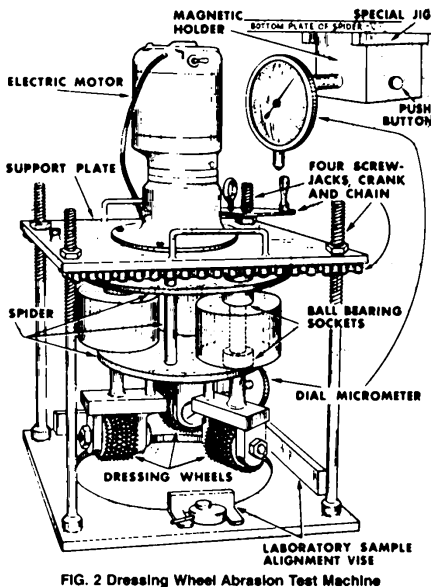


FIG. 2 Dressing Wheel Abrasion Test Machine

Figure U.3.6.1 Test Apparatus

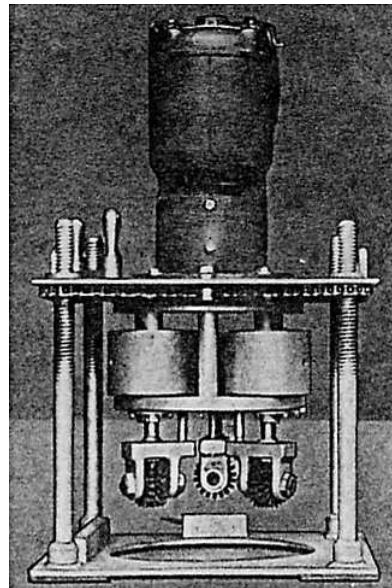


Figure U.3.6.2 Dressing wheel machine [Lane (1973)]

Test Method	A dry concrete specimen (usually 305 x 305 x 90 mm) is prepared and clamed in place. When the machine is run the dressing wheels abrade a circular annulus on the concrete as the main disk is rotated. [Liu (1991)]										
Abrasion Wear	This is expressed as the average depth of the abrasive wear. [Liu (1991)]										
References	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Author</th> <th style="text-align: left;">Comment</th> </tr> </thead> <tbody> <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> <tr> <td>Horiguchi (1994)</td> <td>Source document</td> </tr> </tbody> </table>	Author	Comment	Liu (1991)	Source document	Alexander (1984)	Source document	Lane (1973)	Source document	Horiguchi (1994)	Source document
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Alexander (1984)	Source document										
Lane (1973)	Source document										
Horiguchi (1994)	Source document										

Wear Mechanisms according to Author

(i) Alexander (1984): Abrasion wear is produced by impact, sliding friction and high local stresses due to the steel dressing wheels

(ii) Visual Effects:

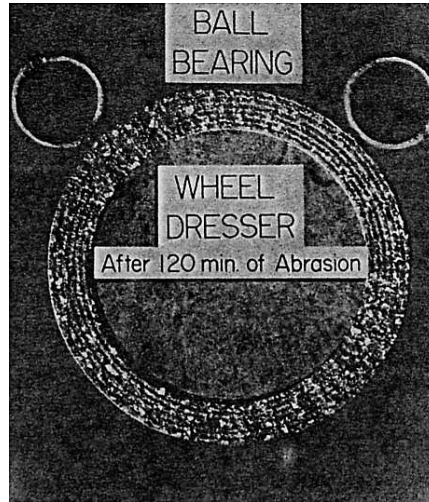


Figure U.3.6.3
Characteristic abrasion wear pattern, showing abraded circular wear annulus [Lane (1973)]

Wear Mechanisms according to writer [R3 S3 I3]

(i) Rolling and Skidding: As the dressing wheels rotate, their high points will be pressed into the face of the concrete and at the same time slip or skid somewhat relative to the surface. There will therefore be both microscopic crushing and shearing effects of the concrete asperities (see figure U.3.6.4).

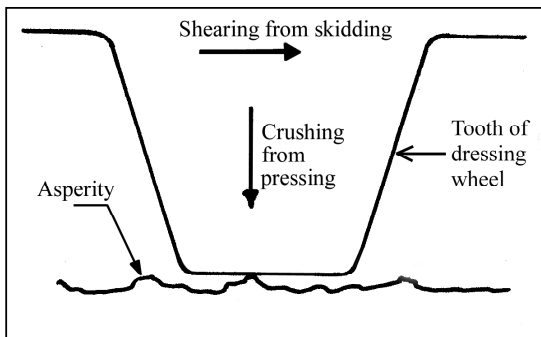


Figure U.3.6.4 Wear mechanisms beneath a tooth of a dressing wheel

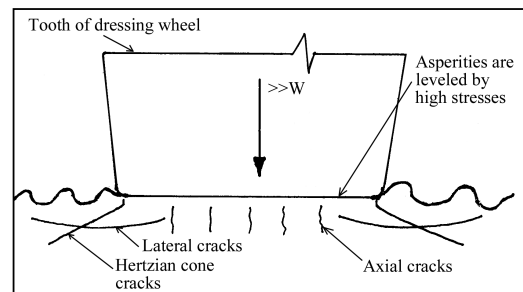


Figure U.3.6.5 Wear mechanism beneath a tooth - severe loading case

(ii) Impact: Vibration and bouncing effects occur owing to the toothed shape of the dressing wheels and this becomes more pronounced as the wear path becomes rougher. This impact may result in sub-asperity cracking as indicated in figure U.3.6.5. The various forms of cracking that are possible include Hertzian cone cracks, lateral cracks, or axial cracks (discussed in more detail in chapter 3). Cracks result in an accelerated wear process.

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