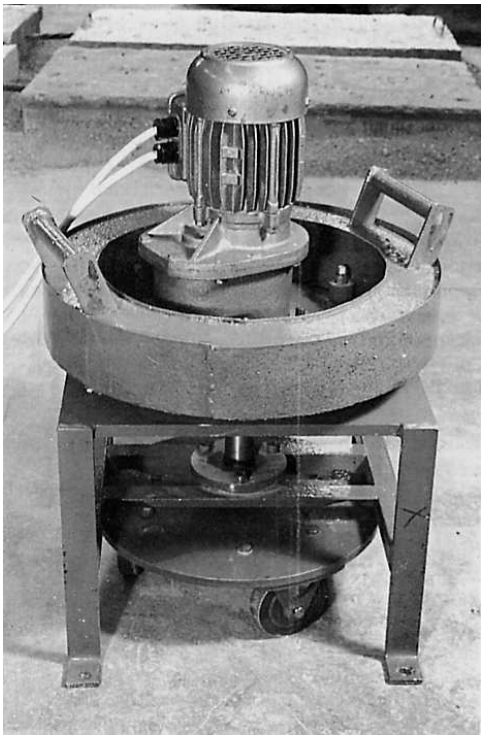
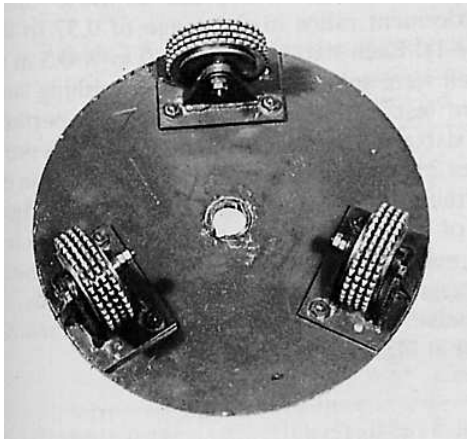
Appendix U.3.7 –C&CA Dressing Wheels

Generic Name of Test	*Rolling* Dressing Wheels : Abrasion Test
Principle of Test	Loaded dressing wheels orbiting on surface.
Historic Development of Test	This test was developed by Sadegzadeh and Kettle at Aston University in the early 1980s. The machine is modelled on the C&CA apparatus with the rotating wheels replaced with dressing wheels in order to simulate heavy traffic. [Sadegzadeh (1988)]
Apparatus and Abrasives	Three sets of dressing wheels consisting of 4 cutters with a total width of 20mm are mounted on a circular rotating plate. A fixed load of 65kg is applied and the machine, which is held in place by 2 bolts fitting into holes in the concrete slab. No abrasive is used (see figure U.3.7.1 and figure U.3.7.2). [Sadegzadeh (1988)]
  **Figure U.3.7.1 and U.3.7.2** Abrasion apparatus with dressing wheel head [Sadegzadeh (1988)]	
Test Method	The machine is fixed to the floor to be tested and the loading weights are applied. The rate of rotation is approximately 178 rpm and the test duration is 15 minutes. [Sadegzadeh (1988)]
Abrasion Wear	This is measured as the average depth of abrasion wear. [Sadegzadeh (1988)]
References	Author — Comment Sadegzadeh (1988) — Source document

APPENDIX U.3.7

Wear Mechanisms according to Author

(i) Sadegzadeh (1988): Dressing wheels produce wear by rolling, impact and a cutting action and simulates the wear associated with heavily loaded steel wheels.

(ii) Visual Effects: A circular groove with a width of 20mm is produced

Wear Mechanisms according to writer [R3 S3 I3]

(i) Rolling and Sliding: As the dressing wheels rotate, they will be pressed into the face of the concrete and at the same time slip or slide somewhat relative to the surface. At the contact points there will therefore be both crushing and shearing effects from W and F respectively (see figure U.3.7.3). The corresponding abrasion wear may be expressed as $Q_{Crushing} \propto W$ and $Q_{Shearing} \propto F (=\mu W)$.

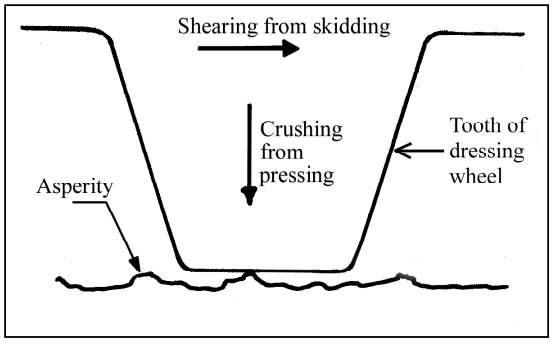


Figure U.3.7.3 Wear mechanisms beneath a dressing wheel

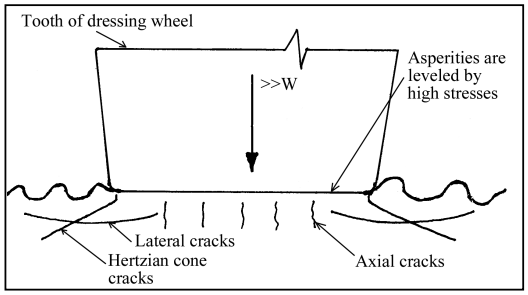


Figure U.3.7.4 Wear mechanism beneath a dressing wheel - severe loading case

(ii) Impact: Vibration and bouncing effects occur as the wear path becomes rougher. This resultant impact has the effect of increasing W. If W is increased to a point where the asperities are levelled and the resulting stress beneath the tooth exceeds a critical value, then various forms of sub-asperity cracking are possible including Hertzian cone cracks, lateral cracks, or axial cracks as indicated in figure U.3.7.4 (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