Appendix U.6.1 – C&CA - Steel Pads

Generic Name of Test	*Sliding* Steel Pads : Abrasion Test
Principle of Test	Loaded steel pads slide over specimens in an orbit
Historic Development of Test	This test was developed by Sadegzadeh and Kettle at Aston University. The machine is modelled on the C&CA apparatus with the rotating wheels (see figure U.4.3) replaced with revolving pads to simulate light traffic. [Sadegzadeh (1988)]
Apparatus and Abrasives	Three hardened steel pads are mounted on a circular rotating plate (figure U.6.1.2). A fixed load of 40kg is applied and the machine (see figure U.6.1.1), which is held in place by 2 bolts fitting into holes in the concrete slab. No abrasive is used [Sadegzadeh (1988)]

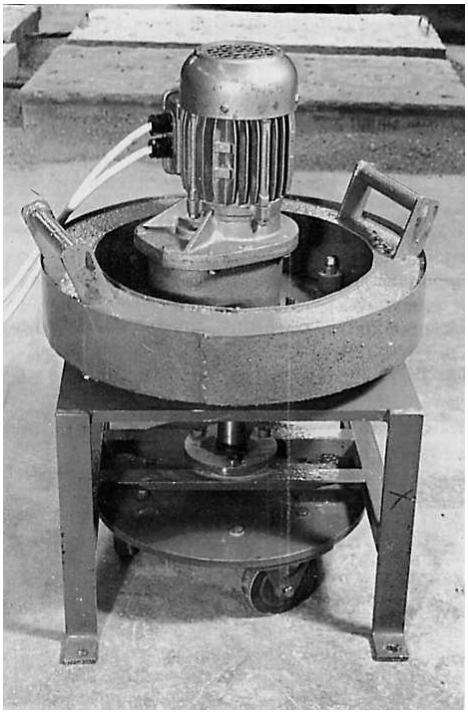

Figure U.6.1.1 The C&CA abrasion apparatus [Sadegzadeh (1988)]

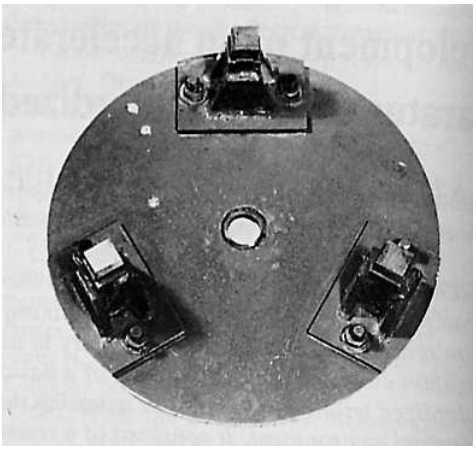

Figure U.6.1.2 Abrasion pads fastened to revolving disc. [Sadegzadeh (1988)]

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

Wear Mechanisms according to Author

(i) Sadegzadeh (1988): This head was designed to cause wear by a rubbing action. It simulates wear by light industrial traffic.

(ii) Visual Effects: A circular path is abraded with a width of 20mm.

Wear Mechanisms according to writer [R1 S2 I0]

Two phases may be distinguished

(i) Shearing: Initially, the principle means of abrasion will be one of tangential shearing of the microscopic asperities on the concrete surface. The cutting edge of the revolving pads shear the protruding asperities as indicated. Unlike the wire brush test, the asperities of the aggregate must be levelled at the same rate as those of the paste (see figure U.6.1.3)

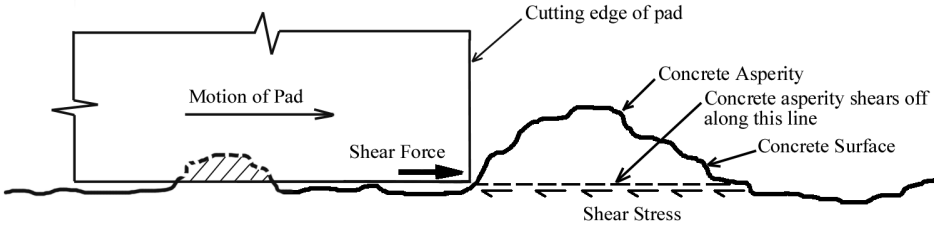

Figure U.6.1.3 Shearing wear mechanism

(ii) Rolling and Sliding: The mechanism of wear is principally one of microscopic crushing and/or shearing at the contact points, as the very fine abraded debris is made to move laterally beneath the pad. The minute particles will both slide and roll. The predominant action in the case of sliding will be microscopic 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 two cases may be referred to as: $Q_{Crushing} \propto W_{n+1}$ and $Q_{Shearing} \propto F_n = \mu W_n$. However, abrasion wear in this case will take place at a very slow rate for two reasons. Firstly the debris generated consists of very fine particles. Secondly these particles are the same hardness as the concrete surface. (For significant cutting/shearing to occur, the abrasive particles should be at least 1.2 times as hard as the test surface). These wear mechanisms are illustrated in figure U.6.1.4

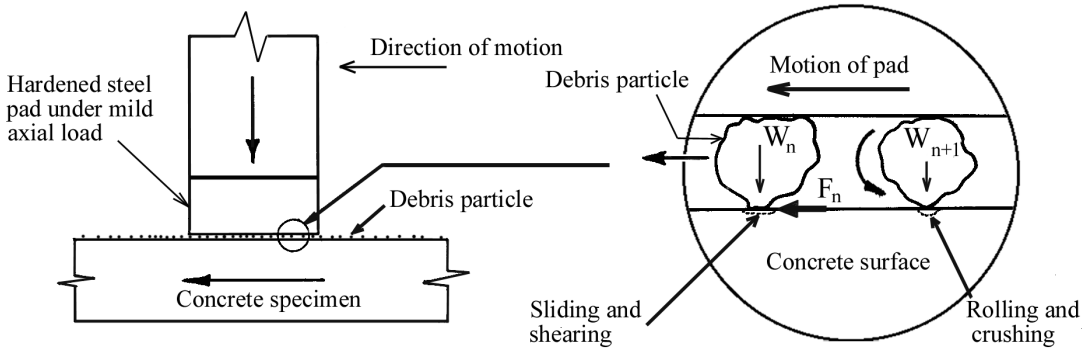

Figure U.6.1.4 Rolling and sliding wear mechanism

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