Appendix U.5.6 – BS 812

Generic Name of Test	*Sliding* Fine Abrasive : Abrasion Test
Principle of Test	Large revolving steel disc causes abrasive to slide/roll beneath loaded specimens
Historic Development of Test	The original test method 'BS 812 1975 Sampling and testing of Mineral Aggregates, Sands and Fillers. (Part 3: Methods for Determination of Mechanical properties)' was revised in 1990 and updated to BS 812 : Part 113 : 1990.
Apparatus and Abrasives	Figure U.5.6.1 shows the 600mm diameter horizontally rotating machined cast iron or steel grinding disc used in the BS 812 test. Two machined metal trays hold the cast specimens. The metal trays are fixed such that they can move in the vertical direction but not in a horizontal plane. Adjustable weights with a circular base are used to provide a constant load on the test specimens. Abrasive (silica sand) dispensers are used to provide the necessary flow of sand in front of each specimen. [BS 812 : Part 113 : 1990]

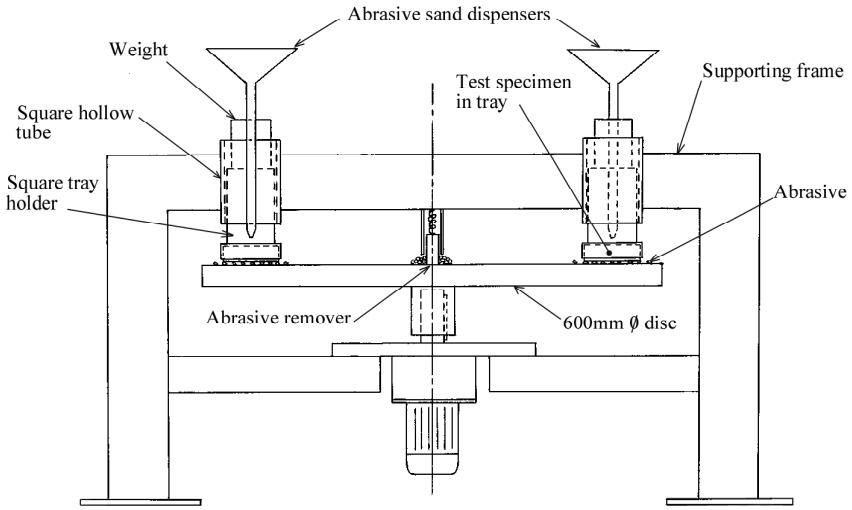

Figure U.5.6.1 Layout of BS 812 Part 113 apparatus, as envisaged from the text.

Test Method	The test specimens are cast to a size of 92 x 54 x 16mm and held in metal trays, the weight of each test specimen and tray being adjusted to 2kg. The two weighted test specimens are held diametrically opposite each other on the grinding disc. Abrasive sand is fed in front of each test specimen at a rate of 700g/min to 900g/min and is removed from the disc after it has passed beneath the test specimen. The duration of the test is unknown. [BS 812 : Part 113 : 1990]
Abrasion Wear	The difference in mass of the test specimen allows an aggregate abrasion value to be determined. [BS 812 : Part 113 : 1990]
References	Author — Comment BS 812 : Part 113 : 1990 — Source document Connell (1985) — Source document

APPENDIX U.5.6

Wear Mechanisms according to Author

(i) Connell (1985): This abrasion test simulates a severe abrasion condition likely to be found with hard wheeled vehicles moving over concrete that has some grit on it.
A low paste strength will result "in plucking" of the aggregate particles whereas high strength may magnify any variation in paste quality.

Note: This machine also operates on the Böhme principle. Böhme's principle is that the sample is held under a certain pressure onto a steel or cast iron disc, rotating in the horizontal plane. An abrading agent is applied to the disc. Usually abrasion is measured in terms of loss of thickness.
(ii)Visual Effects:

Wear Mechanisms according to writer [R2 S2 I0]

(i) Rolling and Sliding: The mechanism of wear is shown in figure U.5.6.2 and is one of microscopic crushing and shearing at the contact points, as the sand is made to move laterally beneath the specimen. The sand will be made to both slide and roll. 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:

$$Q_{Crushing} \propto W_{n+1}$$

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

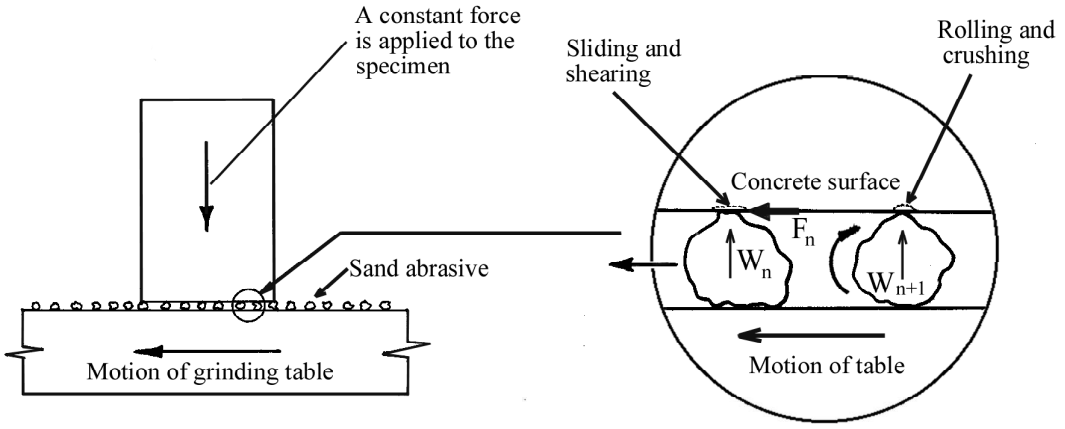

Figure U.5.6.2 Rolling and sliding wear mechanisms

Note: This test does not measure the aggregate/paste bond. The aggregate particles that are loosened during the abrasion process are unable to 'escape'. In effect they contribute to an unrealistically high 'abrasion resistance' result, whereas in practise they would be plucked out of the matrix by traffic etc. The size of loose aggregate that is in effect 'trapped' will depend on the gap between the test sample and the grinding table, and this in turn is determined by the size of the abrasive particles.

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