

Appendix U

U.01 – U.66

Abrasion Tests for Concrete

General notes on appendix U

In this appendix two pages are devoted to describing each of the 66 abrasion tests. In each case some space is devoted to describing the apparatus and the test method under appropriate headings, but most of the emphasis is placed on the mechanisms of wear. The appendix should be read in conjunction with chapter 4, where several of the underlying principles are discussed in greater detail, particularly as regards the wear mechanisms.

The 66 tests have been placed into eight groups, U.1 through U.8, according to the type of abrasion action, as may be seen in Table 4.1. Generally there will be some variations within a particular test type, although some of these variations may be very minor. For example there are ten tests that all operate on the Böhme principle (U.5.1 through U.5.10), and the test method of each test generally only varies slightly. (The differences represent the different preferences of the specifying authorities of the various countries).

Each appendix is described under the following headings:

(a) Generic Name of Test

This is essentially a compound name.

The first term describes the main abrasive action, which is either impact, rolling or sliding. In the case of non destructive tests the term, NDT is used.

The second term in the name is the same as the abrading medium that was used in the test, and by it is meant the actual material in *direct* contact with the concrete. These are described in Table 4.1 under the heading 'abrading medium' respectively as: steel drum, steel balls, steel tracks, chained tyres, studded tyres, dressing wheels, steel wheels, fine abrasive, steel pads, wirebrush, diamond scratcher, steel hammer, water, sound.

The third term in the name indicates whether the tests is purely an abrasion test, or also an erosion test.

(b) Principle of Test

This is also given in Table 4.1 under the heading 'Principle of Test'. It describes how the 'abrading medium' is made to move over the surface, and in so doing will likely give the reader some idea of the apparatus and test method.

(c) Historic Development of Test

Some idea is given here of the dates and events that led up to this test. This may mean reference is made to earlier versions of the test and the names of people or organisations that developed/adopted the test. Where a test has become an official abrasion test or has been incorporated into a wider specification, then the full name of the test/specification is given.

(d) Apparatus and Abrasives

The apparatus is described, and wherever possible is accompanied by photographs and/or sketches. In some of the appendices, where no visual material was available, a sketch was made of the apparatus as 'envisaged' by the writer from the description of the test in the text.

(e) Test Method

This describes how the test is conducted including such aspects as the duration of the test, the preparation of the specimens, method of fastening the specimens, speed of rotation, applied load, quantity of abrasive, etc.

(f) Abrasion wear

This is generally measured in terms of depth of penetration, volume loss or weight loss. The equipment or materials used to do the measurements are also described here.

(g) References

The authors of material that was used to construct the appendix in question are listed, using the standard format of author(date) This allows the reader to go to the 'References' situated at the back of volume 2, and look up further details such as the title of the publication, names of co-authors, etc.

(h) Wear Mechanisms according to Author

Where an author has commented on the wear mechanism, this is reported. Frequently however, they make no mention of this aspect and in this case a note is made to that effect.

(j) Wear Mechanism according to Writer

The mechanism of wear is considered one of one of the most important aspects of this thesis, and the theory developed in chapter three and four is applied here to the various abrasion tests. It is shown that many of the 66 tests have wear mechanisms that do not simulate some important aspect of abrasion, as for example aggregate/paste bond, or the contribution made by the aggregate.

In each appendix abrasion is described in terms of the three abrasive actions; impact, rolling and sliding. Some indication is also given as to the severity of the abrasive action, and this is further quantified by stating the 'abrasion wear code'.

Note 1: 'Adhesion and Deformation' may also be regarded as abrasion actions that give rise to a very small degree of wear. These actions are discussed in section 3.3 of volume 2. In figure 3.3 some of the asperities are shown to be adhering and deforming without shearing, crushing or cracking effects. The degree of abrasion wear is likely to be minute compared to that of crushing, shearing and cracking, since these are the predominant wear mechanisms in brittle materials. For this reason adhesion and deformation related abrasion are not discussed in appendix U.

Note 2: An attempt has been made to make each appendix self contained. This allows the reader to look up a test and find the relevant facts at that particular appendix without having to do any cross referencing. It also allows slight differences to be clearly defined, and easily compared, given that similar tests are grouped together.