VOLUME 2

FACTORS AFFECTING THE

ABRASION RESISTANCE OF CONCRETE,

MECHANISMS OF ABRASION-WEAR IN CONCRETE,

AND CLASSIFICATION OF

CONCRETE ABRASION TESTS.

ABSTRACT OF VOLUME 2

Whereas volume 1 is mainly a discussion of the writer's own experimental results, focussed on a limited number of variables, volume 2 begins with a comprehensive review of the literature on abrasion resistance, covering virtually all the materials/components that make up the concrete system, such as water content, void content, binder type and content, aggregate type and content, and aggregate-paste bond. The impact of subsequent processes and influences are also considered, such as finishing, curing, surface treatments, temperature, surface cracks, weathering and corrosion.

The conflicting findings in the literature by some authors can often be explained by recognizing that they used different tests, each with its unique characteristics and abrasion processes. For example some tests with relatively *mild* abrasive actions do not always correlate well with compression testing, which effectively only measures the strength of the deeper '*core*' concrete, and conversely *severe* abrasion tests are insensitive to variations in '*surface*' zone effects from processes such as bleeding, finishing, curing, various surface treatments, carbonation, etc.

This prompted a fundamental study of the various mechanisms of abrasion-wear. As little information was available on wear mechanisms in concrete, the work carried out over many years in metals, alloys, ceramics and polymers was examined, and applied to concrete where relevant. Such mechanisms – which occur mostly on a microscopic scale - are generally the result of various types of rolling (resulting in cracking/crushing effects), and/or sliding (resulting in shearing effects), and/or impact (resulting in fracturing effects, crushing and shearing).

Building on this knowledge, the abrasive actions of 66 abrasion/surface tests are studied. The tests are classified according to several characteristics, and especially by their distinctive abrasion-wear mechanisms. An abrasion code is developed to signify the abrasive action and the severity of the abrasion process.

The 66 tests were examined according to a number of selection criteria. Two important attributes of a test are its ability to measure the contribution that aggregate makes to the overall hardness of the surface, and its ability to test the aggregate-paste bond. Three tests are recommended for further investigation, with the aim of adopting one of them as an industry standard.

Finally the many factors governing abrasion resistance and their interdependencies are brought together in a wiring diagram that embodies a simple philosophy – abrasion resistance is primarily a function of hardness and aggregate-paste bond.