<u>Appendix U.7.2 – Rebound Hammer</u>

<table>
<tr><td>Generic Name of Test</td><td>Impact Steel Hammer : Abrasion / Non destructive Test</td></tr>
<tr><td>Principle of Test</td><td>Hammer / plunger strikes specimen surface</td></tr>
<tr><td>Historic Development of Test</td><td>The rebound hammer was originally developed in 1948 by Ernst Schmidt. The first British Standard BS 4408 : Part 4 : 1971 was superseded by a revised version: BS 1881 : Part 202 : 1986 – Recommendations for surface hardness testing by rebound hammer.</td></tr>
<tr><td>Apparatus</td><td>The apparatus shown in figure U.7.2.1 and U.7.2.2 consists of a spring-loaded hammer mass that is propelled by a spring, and strikes the plunger that is being pressed against the concrete surface. A scale measures the distance the hammer rebounds off the surface. [Chaplin (1991)]</td></tr>
<tr><td colspan="2">

Figure U.7.2.1 A rebound hammer [Chapin (1990)]

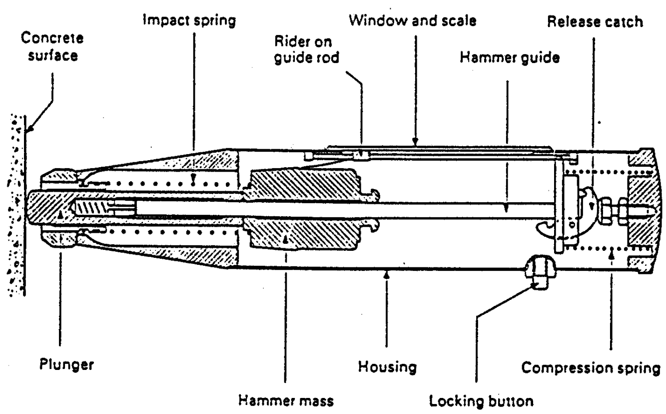

Figure U.7.2.2 Section through the Type N Concrete Test Hammer [C&CI Notes: level 4 NDT (1997)]

</td></tr>
<tr><td>Test Method</td><td>The surface to be tested must be smooth and dry. The test area should not exceed 300 x 300mm. A grid with 50 x 50mm lines is drawn within the area and 12 readings are taken at the intersecting points. The highest and lowest values are discarded. [BS 1881 : Part 202 : 1986]</td></tr>
<tr><td>Abrasion Wear</td><td>The distance that the head of the hammer rebounds after striking the surface is measured. [BS 1881 : Part 202 :1986]</td></tr>
<tr><td>References</td><td>
<table>
<tr><td><u>Author</u></td><td><u>Comment</u></td></tr>
<tr><td>BS 1881 : Part 202 : 1986</td><td>Source document</td></tr>
<tr><td>Chaplin (1990)</td><td>Source document</td></tr>
<tr><td>C&CI level 4 Notes: NDT (1997)</td><td>Source document</td></tr>
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</td></tr>
</table>

APPENDIX U.7.2

Mechanisms according to Author

(i) Chaplin (1990): There is a large data base to support the view that the rebound index is a useful and sensitive measure of compactive abrasion resistance (as determined by the C&CA abrasion test). However, as an indirect measure, its best use is making comparisons between areas on floors where parameters such as cement type and content and sand type are largely good.

(ii) BS 1881 : Part 202 : 1986: The assessment of the wearing quality of a concrete floor can be based on its hardness. The characteristics of a concrete surface which govern abrasion resistance have been shown to correlate reasonably well with those characteristics which determine rebound hammer readings. Hardness measurements for this purpose should not be made earlier than 14 days nor later than 3 months after laying the concrete.

(iii) Visual effects: None shown.

Mechanisms according to writer [R0 S0 I3]

Although the rebound hammer test is not strictly an abrasion test, it does give a good indication of the hardness of the surface, which in turn *is* strongly related to abrasion resistance. The principle of this test is that when the ‘hammer mass’ strikes the ‘plunger’ the hammer mass itself, the plunger, as well as the concrete surface are compressed elastically for a brief moment in the process of deceleration. An instant later the hammer-mass/plunger/concrete return to their uncompressed state, and this accelerates the hammer back up the ‘hammer guide’. Hard surfaces will yield higher rebound numbers than soft surfaces. Clearly soft surfaces are slightly crushed in the process (see figure U.7.2.3), and act as energy absorbers damping the rebound effect, whereas hard surfaces have a fully elastic response and the harder the surface the greater is the spring effect. Sub-asperity cracking as indicated below may be expected.

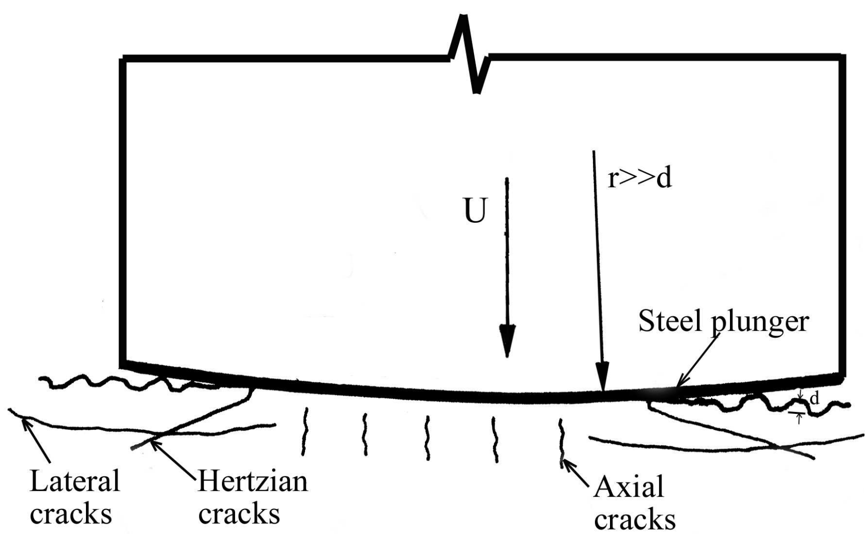

Figure U.7.2.1 Cracking mechanisms below the steel plunger