3.8.2 Rockwell Hardness Test

This test is more common due to its quick and simple method. There is no need of any calculation because the Rockwell Hardness (HR) may be read directly on the dial. The test involves application of an initial load of 10 kg on the specimen so that the effects of dust, dirt, oil, etc., are nullified. This makes Rockwell test more accurate than Brinell test.

Scale	Type of indenter	Initial load (kg)	Major load (kg)	Pointer position	Kind of material
A	Cone, 120°	10	50	0	Much harder such as carburized steel, cemented carbides
B	Ball, 1.58 mm	10	90	30	Soft steels, copper, aluminium, brass, grey cast iron
C	Cone, 120°	10	140	100	Hard steels, Ti, W, V, Etc.
D	Cone	10	90	-	Thin ferrous metals
E	Ball, 3.0 mm	10	90	-	Very soft such as bearing metals, magnesium alloys, etc.
F	Ball, 1.58 mm	10	50	-	Soft such as babbitts, bronze, brass, etc.

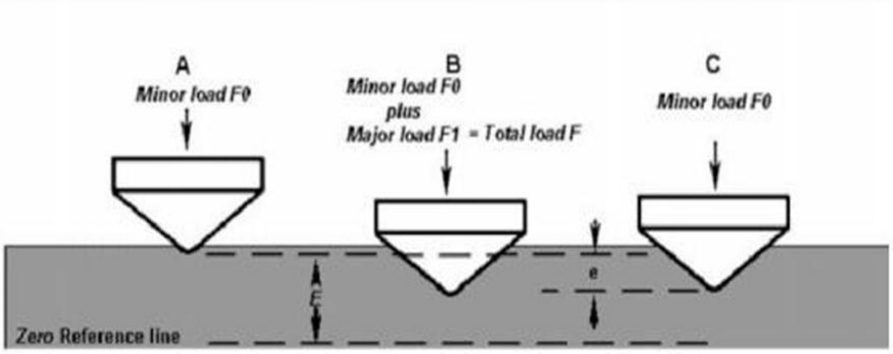

Fig. 1.Rockwell Principle

		kgf	kgf	kgf	E
A	Diamond cone	10	50	60	100
B	1/16" steel ball	10	90	100	130
C	Diamond cone	10	140	150	100
D	Diamond cone	10	90	100	100

Fig 3.8.1(b) Indentation due to load

This test employs a ball and a cone as indenters. The specimen is subjected to a major load for about 15 seconds, after the initial load. These scales are named as A, B, C, D, E, F, M, R, etc. Of these B-scale and C-scale are commonly employed.

B-scale is preferred for soft steels and aluminium alloys, while C-scale is chosen for titanium and hard steel. B-scale employs a ball of 1/16 inch (1.58 mm) diameter. A cone indenter is used in C-scale with an angle of 120° and point of radius 0.2mm. hardness value determined from B-scale is referred to as HRB and from C-scale as HRC.

Different scales, initial and major loads to be given on them, their suitability to kind of materials and other related details are given in the table. If the depth of penetration in mm is known then the hardness may also be calculated from the following relation.

$$\text{HRA} = 100 - \frac{t}{0.002}$$

$$\text{HRB} = 130 - \frac{t}{0.002}$$

$$\text{HRC} = 100 - \frac{t}{0.002}$$

Rockwell hardness method may be used to determine hardness of wires, blades, inside and outside cylindrical surfaces such as in IC engine cylinder and piston. Finished components can also be tested by this method as the indentation made

is small. This method is suitable for hardness beyond the range of Brinell hardness.

Precautions:

•Successive impressions should not be superimposed on one another, nor made too close.

•Thin specimen or edge should not be selected.

•Care should be taken for surface preparations, because small size impressions are made.

•The surface of specimen should be flat and free from spring action.

Advantages

•It is more flexible than Brinell test. Large combinations of indenters and loads are available.

•Rockwell testers are fitted with number of fixtures for testing different size and shapes.

•The measurement can be made quickly.

•Since, impressions made are small, it is considered as non-destructive.

Limitations:

•Requires great care for sample preparation.

ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY

PH 8251 MATERIALS SCIENCE