

## Rockwell Hardness Test

The Rockwell hardness test method consists of indenting the test material with a diamond cone, hardened steel or tungsten carbide ball indenter. The indenter is forced into the test material under a preliminary minor load  $F_0$  (Fig. 1A) of 10 kgf. When equilibrium has been reached, an additional major load  $F_1$ , either 60, 100 or 150 kgf is applied with a resulting increase in penetration (Fig. 1B). When equilibrium has again been reached, the additional major load is allowed to dwell for a predefined time, before being removed, whilst the preliminary minor load is still maintained. Removal of the additional major load allows a partial recovery, so reducing the depth of penetration (Fig. 1C). After a further dwell time the permanent increase in depth of penetration, resulting from the application and removal of the additional major load is used to calculate the Rockwell hardness number, using the following formula.

$$HR = E - e$$

- $F_0$  preliminary minor load in kgf
- $F_1$  additional major load in kgf
- $F$  total load in kgf
- $e$  permanent increase in depth of penetration due to major load  $F_1$  measured in units of 0.002 mm
- $E$  a constant depending on form of indenter: 100 units for diamond indenter, 130 units for ball indenter
- HR Rockwell hardness number
- $D$  diameter of ball

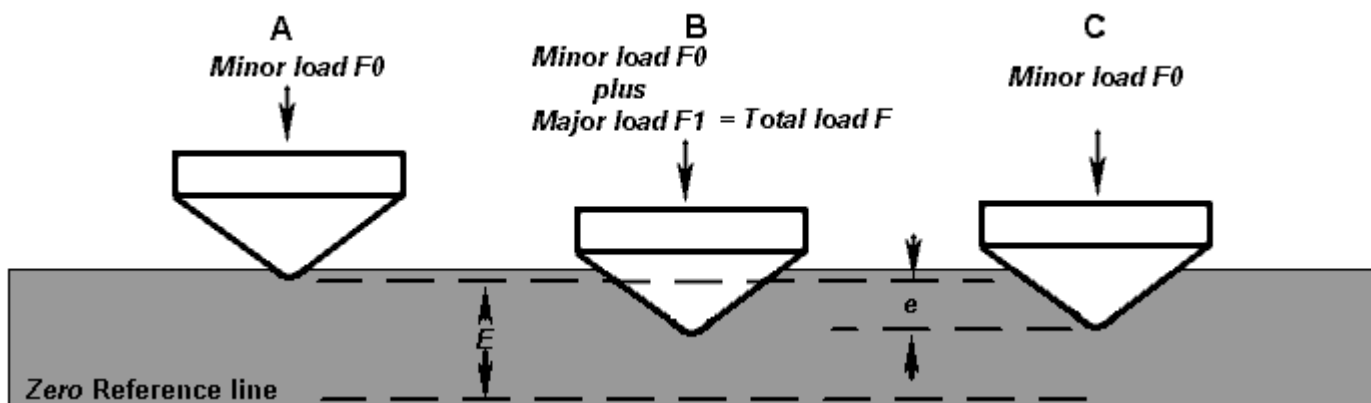


Fig. 1. Rockwell Principle