Hardness Testing

### Rockwell Hardness Test (ISO6506-1 JIS Z 2244)

**Calculation Formulas**

- Rockwell hardness: \[ H_R = \frac{F_2 - F_1}{C} \times 10^3 \]
  - \( F_2 \): Rockwell hardness value (kgf for 100kgf or 150kgf, N for 30kgf and 45kgf)
  - \( F_1 \): Preliminary test force (kgf for 100kgf or 150kgf, N for 30kgf and 45kgf)
  - \( C \): Correction factor

**Indentation Shape**

- Rockwell hardness: \( \tan \theta = \frac{h_1 - h_2}{2d} \)
  - \( h_1 \): Indentation depth produced by the preliminary test force.
  - \( h_2 \): Indentation depth produced by the test force.
  - \( d \): Specimen-edge to indentation-center distance

**Minimum Allowable Indentation Spacing**

- Minimum Allowable Indentation Spacing: \[ x \geq \frac{4d}{3} \]
  - \( d \): Diameter of the ball indenter

**Minimum Allowable Thickness of Specimen or Plating**

- Rockwell hardness: \[ t \geq \frac{(2.5d + 0.3)}{3} \]
  - \( t \): Thickness of specimen or plating
  - \( d \): Diameter of the ball indenter

### Rockwell Superficial Hardness Test (ISO6507-1 JIS Z 2245)

**Calculation Formulas**

- Rockwell Superficial hardness: \[ H_{RS} = \frac{F_2 - F_1}{C} \times 10^3 \]
  - \( F_2 \): Rockwell Superficial hardness value (kgf for 100kgf or 150kgf, N for 30kgf and 45kgf)
  - \( F_1 \): Preliminary test force (kgf for 100kgf or 150kgf, N for 30kgf and 45kgf)
  - \( C \): Correction factor

**Indentation Shape**

- Rockwell Superficial hardness: \[ \tan \theta = \frac{h_1 - h_2}{2d} \]
  - \( h_1 \): Indentation depth produced by the preliminary test force.
  - \( h_2 \): Indentation depth produced by the test force.
  - \( d \): Diameter of the ball indenter

**Minimum Allowable Indentation Spacing**

- Minimum Allowable Indentation Spacing: \[ x \geq \frac{2.5d}{3} \]
  - \( d \): Diameter of the ball indenter

### Hardness Test Methods and Applications

- **Brinell Hardness Test** (ISO6508-1 JIS 2246)
  - Notation Method: \( D \), \( F \), \( H \), \( R \), \( S \), \( T \)
  - Indentation Shape: Circle
  - Minimum Allowable Indentation Spacing: \[ x \geq \frac{2d}{3} \]
  - Thickness of Specimen or Plating: 3 or more

- **Vickers Hardness Test** (ISO6503-1 JIS Z 2244)
  - Notation Method: \( A \), \( B \), \( C \), \( D \), \( H \), \( K \), \( N \), \( V \)
  - Indentation Shape: Square
  - Minimum Allowable Indentation Spacing: \[ x \geq \frac{2.5d}{3} \]
  - Thickness of Specimen or Plating: 3 or more

### Hardness Conversion Table (ISO10405)

- **Table for Cartridge brass (70% Copper 30% Zinc Alloy)**
- **Table for Structural steel (8% Carbon 10% Manganese)**
- **Table for Tool steel and Mould steel**