STRENGTH OF MATERIALS – LABORATORY

AGH University of Science and Technology
Chair of Strength, Fatigue
of Material and Construction

Faculty.....
Year.....*Group*.....
Date.....*Mark*.....
Name.....
.....

Laboratory
Identification of mechanical properties of materials
PART I – toughness and hardness tests

Report

1. Toughness test – Charpy impact test (according to PN-EN 10045 and PN-EN 10045-2)

1.1 Examined material, temperature:..... T = ...….....[°C]

1.2 Shape of a specimen (Fig. 1.1):.....

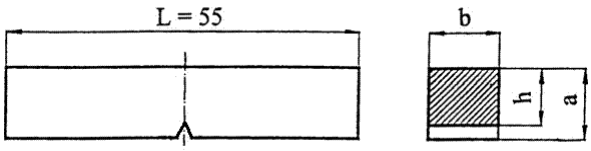
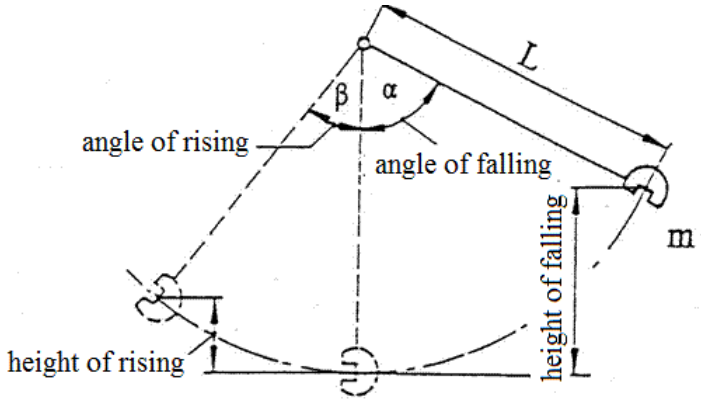


Fig. 1.1 Charpy test specimen



1.3 Initial pendulum energy: $A_P =$.....[J]

1.4 Data for calculation:

- specimen height $a =$.....[mm]
- specimen width $b =$.....[mm]
- specimen height in notched section $h =$.....[mm]
- area of cross-section at notch $S_0 = bh =$.....[cm^2]
- pendulum hammer mass $m =$.....[kg]
- gravitational acceleration $g =$.....[m/s]
- pendulum hammer weight $F_1 = mg =$.....[N]
- pendulum length $L =$.....[m]
- Angle of falling $\alpha =$.....[°]
- Angle of rising $\beta =$.....[°]
- Energy used for specimen breaking $\mathbf{KU} = F_1 L(\cos\beta - \cos\alpha) =$.....[J]
- Toughness $\mathbf{KUC} = KU / S_0 =$.....[J/cm^2]

STRENGTH OF MATERIALS – LABORATORY

2. Hardness measurement – Brinell method (according to PN-EN ISO 6506-1)

2.1 Examined material, temperature:.....T = ...….....[°C]

2.2 Machine used:.....

2.3 Time of applying force:.....[s], **time of loading during measurement**.....[s]

2.4 K parameter choice (according to material): $K = 0{,}102\, F / D^2 = ...[\mathrm{N/mm^2}]$

2.5 Ball diameter choice for assumed diameter of indentation: $d = ...[\mathrm{mm}]$

$D < D_{max} = d / 0{,}24 = ...[\mathrm{mm}]$

$D < D_{min} = d / 0{,}6 = ...[\mathrm{mm}]$

Taken diameter: $D = ...[\mathrm{mm}]$

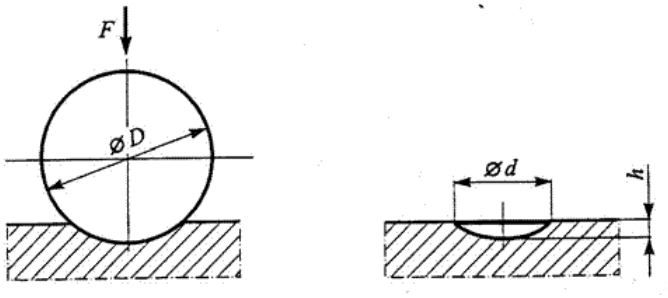


Fig. 2.1 Brinell method hardness test

2.6 Nominal value of the loading force: $F = K\, D^2 / 0{,}102 = ...[\mathrm{N}]$

2.7 Brinell hardness **HBW** ...../..... $= \dfrac{0{,}204\, F}{\pi D\left(D - \sqrt{D^2 - d^2}\right)}$ $F[\mathrm{N}]$ $D, d[\mathrm{mm}]$

HARDNESS MEASUREMENT RESULTS

Examined material	Diameter of indentation d [mm]			Brinell hardness HBW 2,5/187,5	
	Measurements		Mean		
	d_1	d_2	$(d_1 + d_2)/2$	Measured	Mean

2.8 Thickness of a specimen: $g = ...\mathrm{mm} > g_{min}^{norm} = f(d_{max}, D) = ...\mathrm{mm}$

3. Hardness measurement – Rockwell method (according to PN-EN ISO 6508-1)

3.1 Examined material, temperature:.....T = ...….....[°C]

3.2 Machine used:.....

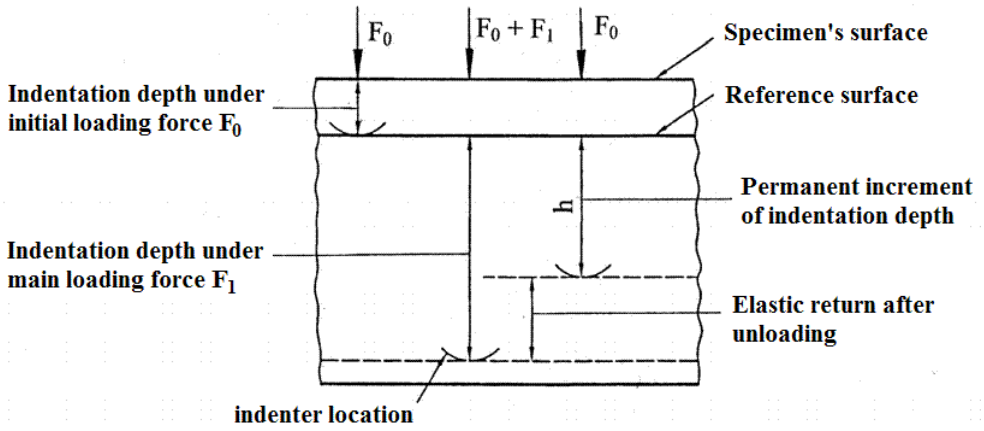


Fig. 3.1 Rockwell hardness measurement

3.3 Time of loading: with initial force F_0: $t =$.....[s]

with total force F_0+F_1: $t =$.....[s]

3.4 Scale chosen: Rockwell hardness scale.....

applicable for hardness in range ..... HR ..... ÷ ..... HR .....

Type of indenter:.....

Initial loading force $F_0 =$.....[N]

Main loading force $F_1 =$.....[N]

Total loading force $F = F_0 + F_1 =$.....[N]

3.5 Rockwell hardness: **HR** .....=.....−*h*/.....:

HARDNESS MEASUREMENT RESULTS

Examined material	***Rockwell hardness, HRBS***			
	Measurement results			Mean

3.6 Thickness of a specimen: $g =$..... mm $> g_{min}^{norm} = f(scale, HR) =$..... mm