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 – tensile and compression tests

Report

1. Tensile test in ambient temperature (according to PN-EN 10002-1:2002)

1.1 Examined material, properties:... $E=$............... MPa

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

1.3 Testing machine, range:...

1.4 Measured data:

Diameter of specimen's cross-section.. $d_0=$................ mm

Initial area of cross-section.. $S_0=\frac{\pi d_0^2}{4}=$................ mm^2

Diameter at maximum force.. $d_m=$................ mm

Cross-section area at maximum force.................................... $S_m=\frac{\pi d_m^2}{4}=$................ mm^2

Diameter after fracture... $d_u=$................ mm

Cross-section area after fracture.. $S_u=\frac{\pi d_u^2}{4}=$................ mm^2

Initial gauge length.. $L_0=$................ mm

Gauge length after fracture.. $L_u=$................ mm

Initial distance between markings on longer part of specimen............ $L_0'=$................ mm

Distance between markings on longer part of specimen after fracture. $L_u'=$................ mm

Force corresponding to lower yield stress.. $F_{eL}=$................ kN

Force corresponding to upper yield stress... $F_{eH}=$................ kN

Maximum force.. $F_m=$................ kN

Rupture force... $F_u=$................ kN

1.5 Strength properties of the material

Lower yield stress.. $\mathbf{R}_{eL}=\frac{F_{eL}}{S_0}=$........................=................MPa

Upper yield stress.. $\mathbf{R}_{eH}=\frac{F_{eH}}{S_0}=$........................=................MPa

Tensile strength.. $\mathbf{R}_m=\frac{F_m}{S_0}=$........................=................MPa

True stress at max. force................................ $\sigma_m=\frac{F_m}{S_m}=$........................=................MPa

True strain at max. force.. $\varepsilon_m=\ln\frac{S_0}{S_m}\cdot 100\,\%=$................%

Nominal (engineering) stress at rupture................. $\frac{F_u}{S_0}=$........................=................MPa

Rupture stress (true stress)....................... $\sigma_u=\mathbf{R}_t=\frac{F_u}{S_u}=$........................=................MPa

True strain at rupture... $\varepsilon_u=\ln\frac{S_0}{S_u}\cdot 100\,\%=$................%

Total percentage elongation at max. force........... $A_{gt}=\left(\frac{L_u'-L_0'}{L_0'}+\frac{R_m}{E}\right)\cdot 100\,\%=$...........%

Percentage elongation after fracture.............................. $A_{ft}=\frac{L_u-L_0}{L_0}\cdot 100\,\%=$................%

Total percentage elongation... $A_t=A_{ft}+\frac{R_t}{E}\cdot 100\,\%=$................%

Percentage lateral contraction of the cross-section .... $Z=\frac{S_0-S_u}{S_0}\cdot 100\,\%=$................%

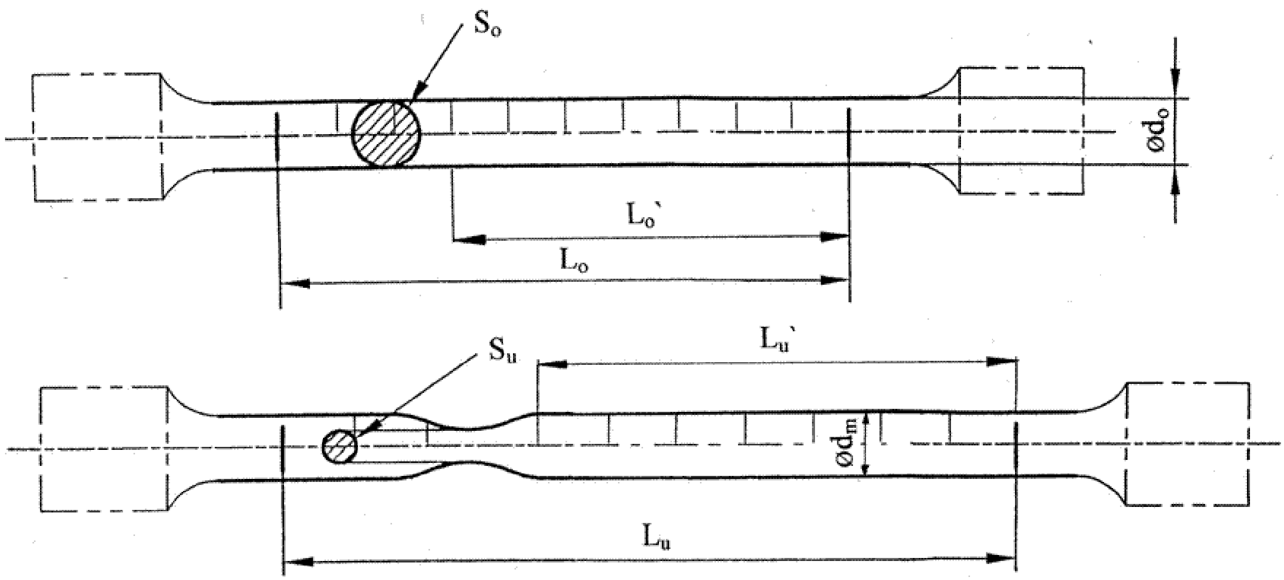

Fig. 1.1 – Sketch of a specimen with main dimensions

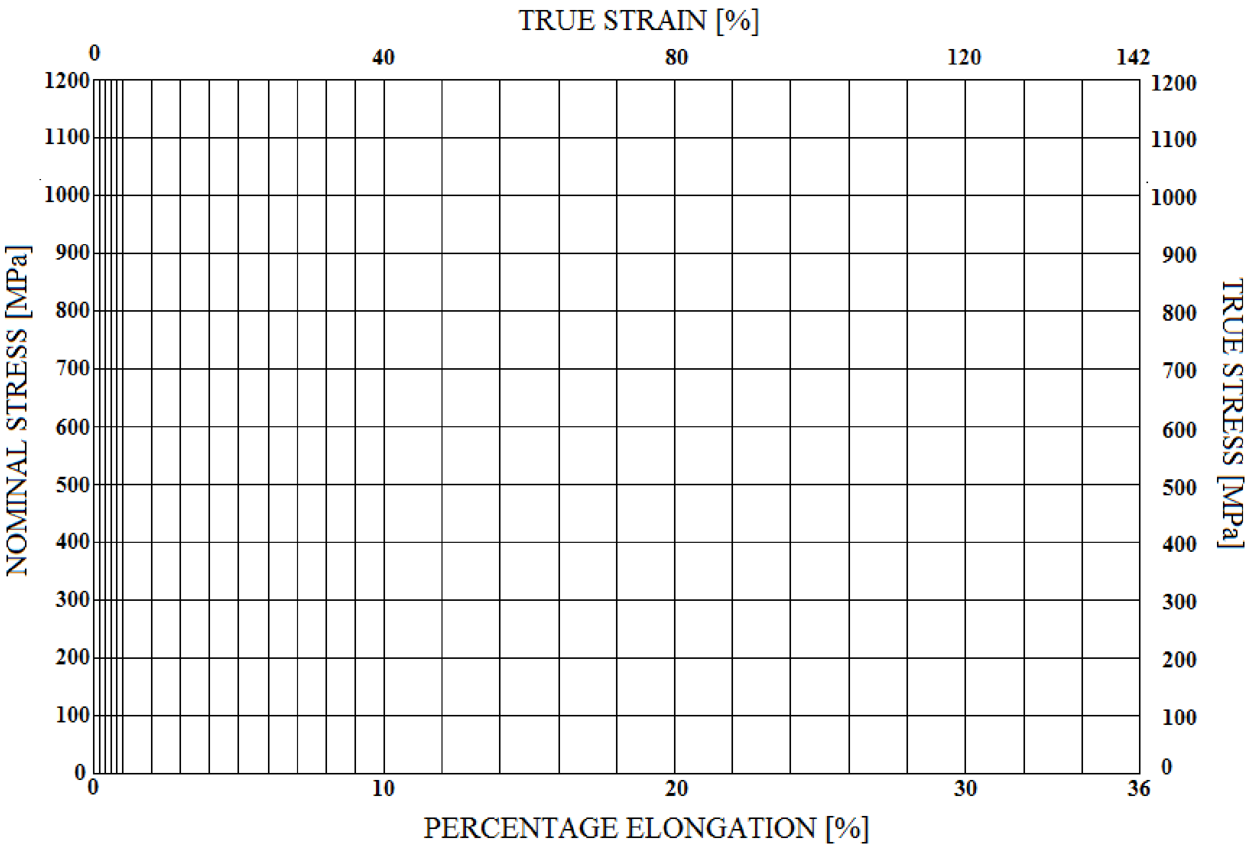

Fig. 1.2 – Stress-strain curve
engineering stress-strain curve – continuous line ————
true stress-strain curve – dashed line - - - - - - -

2. Compression test of ceramic materials (gypsum specimen, according to PN-86/B-4360)

2.1 Examined material, properties..

2.2 Shape of a specimen (Fig. 2.1)..

Fig. 2.1 – Specimen shape and dimensions

2.3 Testing machine, range..

2.4 Measured data

Initial diameter of the specimen.. d_0 = ... mm

Initial height of the specimen... h_0 = ... mm

Initial cross-section area... $S_0 = \frac{\pi d_0^2}{4}$ = ... mm^2

Rupture force.. P = ... kN

Compression strength.. $R_s = \frac{P}{S_0}$ = ... MPa

Fig. 2.2 – Stress-strain curve