MATERIALS SCIENCE II

HARDENABILITY OF STEELS

Student:	Year:
Date:	Teacher:

Program:

a) Principles of hardening, hardenability.

b) Jominy end-quench test.

c) Grossmans diagrams.

d) Determination of hardenability according to given materials.

Tasks:

Task 1:

Do the Jominy end-quench test of hardenability according to ČSN EN ISO 642:

a) heating up the testing specimen in the furnace on the defined temperature

b) rapid cooling of testing specimen with a stream of water

c) measuring of hardness on longitudinal grounded areas of testing specimen

Task 2:

For a given steel, draw a curve of hardenability and determine Jominy index of hardenability J, on the basis of J determine the critical diameter of hardenability D_K for intensity of quenching enviroment H.

Elaboration

Given materials No.……:

Material specifications and parameters of test:

a) Hardenability curve - mm paper

Draw the graph on mm paper (Rockwell hardness **HRC** vs depth from the quenched surface **h**).

b) Jominy index of hardenability

From the hardenability curve find the distance from the quenched end $\mathbf{h_{50}}$ where the hardness HRC_{50} (hardness of the structure with 50% martensite) was reached.

h_{50} = …….[ ]

Jominy index:

c) Critical diameter of quenching D_K

From the first Grosman's diagram (Fig.1.), find the critical diameter D_k. To get the diameter D_k, use the distance from the quenched end h_{50} and the severity of the quenching medium H.

D_K = …….[ ]

d) Ideal critical diameter of quenching D_I

For the given carbon content, grain size and content of alloying elements, calculate the ideal critical diameter of quenching D_I, according to:

$$D_I = D_I^* \cdot K_1 K_2 K_3$$

where: $\mathbf{D_I}$ is the ideal critical diameter, $\mathbf{D_I^*}$ can be obtained from Fig.2. and **K** is the coeffcient corresponding to the content of alloying elements (element 1,2,3,…) according to Fig.3.

D_I^* = …….[ ]

D_I = ……...[ ]

e) Consideration of hardenability (D_K) when changing the parameters of test

Discuss, how the hardenability will be changed in relation to changing the grain size, carbon conten and alloying elements.

Conclusion:

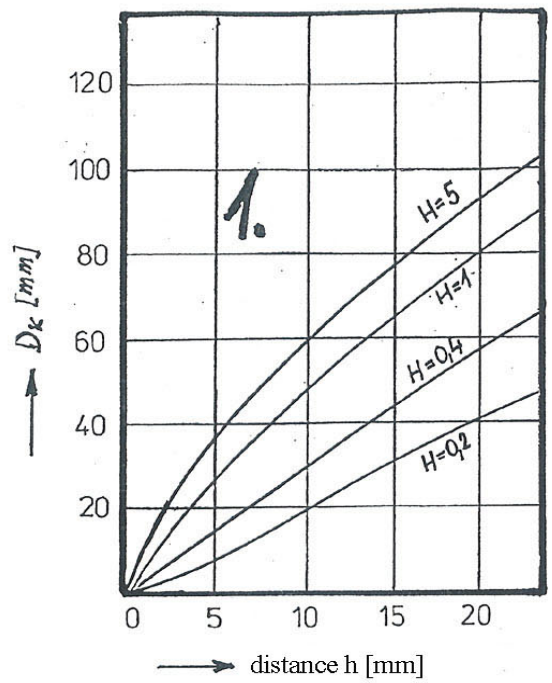

Fig. 1. Dependence of critical diameter D_k on the distance from quenched end h and the severity of quench H.

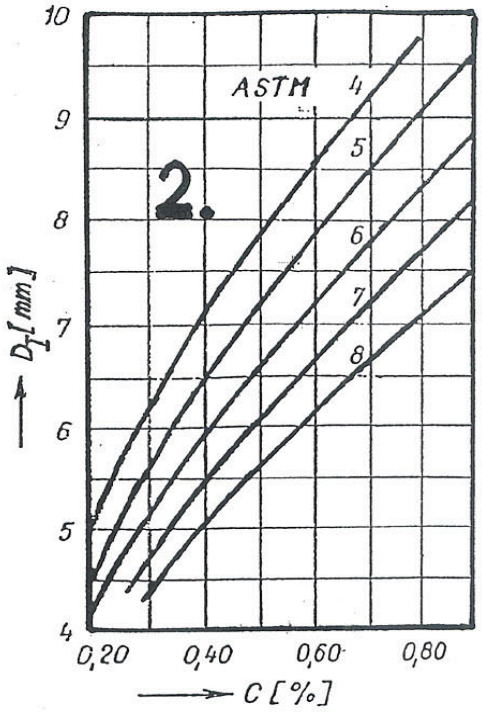

Fig.2. Dependence of ideal critical diameter D_I on the carbon content and the grain size.

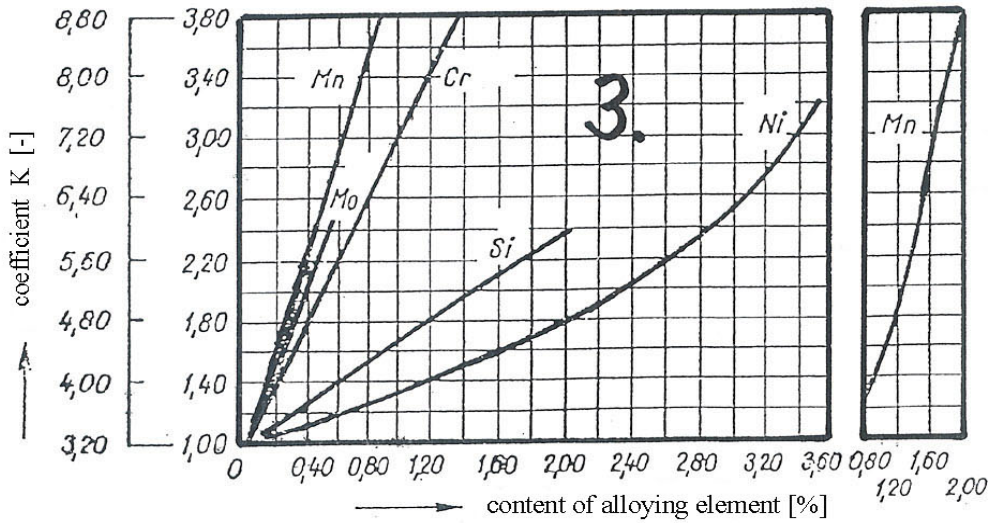

Fig.3. Influence of alloying elements on ideal critical diametr D_I.