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## **Learning Resources for the course:**

### **Steel Structure Inspector Course for EN 1090**

**This document covers only:**

**Competence unit no. CU-6 TESTING, DT/NDT AND LOADING**

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**Structure of this document:**

Introduction.

Objective.

A. Teacher Guideline.

B. Students Guideline

C. Learning resources

D. Students tasks

E. Test yourself

F. Evaluation

G. Appendix.

**Introduction.**

**Note. It is assumed that the teacher has in depth knowledge of the industry requirements for the topics discussed in this CU.**

**Reference document covering the course structure, see document D2.2  
The content of this document covers deliverables for D4.1 and D4.2**

The CU covers the topic Testing DT/NDT and loading. In this CU visual Inspection also covers inspection of materials and parts as well as inspection before, during and after welding. It also covers inspection of surface preparation and coating as well.

The reference material covers the most common DT and NDT methods as well as practical procedures and examples of reports.

The document examples can be used as guidelines, but practical examples from the students own industries should be added here

**Please also note that the learning resources summarized and added in chapter C, is the deliverables harvested from 3 different pilot courses in Hungary and Slovenia**

**Objective.**

The objective for this CU is that the student knows the different DT and NDT methods and their advantages, disadvantages as well as practical limitations. The students shall be able to create an inspection plan with the different DT/NDT methods and document the results and also plan and carry out corrective actions.

## **A. Teacher Guideline.**

### **Content of the Teacher Guideline:**

The CU 6 covers the thematic Visual Inspection and NDT. The CU contains both a theoretical part as well as a practical part that should be carried out in the workshop.

The theoretical content should follow the EWF Guideline, item 2.3 from module 2, covering Visual Inspection as well as MT and PT.

The learning resources in CU 5 can also be used here.

The documents identified and created in CU 4 can be used in the work that shall be carried out in the workshop.

Important in this CU is the interpretation of the findings in the practical work and how to document this in a correct way.

It should also be highlighted in this CU how to carry out corrective actions and repair for the findings.

The methods have their limitations. These should be discussed and agreed upon through group discussions.

We assume that the students will have some examples from their own companies.

Try to bring these examples forward and use them as examples for discussions.

Also discuss what may happen if the students do not find or document the errors, and the consequences of such examples.

One important topic is the equipment used for the activities. Go through and describe how to use the equipment correct and highlight also the advantages and disadvantages of it. Try to give practical examples as well or ask the students for examples from their companies.

## **B. Students Guideline**

The CU 6 covers the thematic Visual Inspection and NDT, with PT and MT, as well as loading.

The tasks in this CU cover both the theoretical content and a set of practical tasks to be carried out in your company.

The practical tasks must be documented by submitting short video reports of how you have carried out the control activities.

We assume that you have cases from your company that you can share with the other students and the teacher. Please submit these examples and create a discussion around them.

Examples can be successful examples, but examples of failures are just as important. If you have examples of failures then try to describe how you have corrected these failures.

Under folder with "Resources and activities". The material is available as pdf-files, word- and excel files,

and video material (online at YouTube and as mp4 files stored in the learning management system). Please notice that the written assignments should be answered by using the word-files that are embedded into the description of the tasks. **You shall not use** the Office package installed on your own device.

If you are not using Its Learning LMS system, then the teacher have to decide where you shall find the resources for the course.

### **Type of work:**

You have 2 weeks to complete each CU. The first week should be preparation activities, while the second week should be used to solve the tasks, exercises and hand in your results to the teacher. The learning activities include individual studies, work-based training in your company, group activities, classroom training and a digital Zoom video meeting with the teacher once per week (Saturdays) of using zoom meetings

## **C. Learning resources**

Support resources from selected from the Internet.

<b>Title</b>	<b>Producer</b>	<b>Reference</b>	<b>Language</b>	<b>No of pages</b>	<b>Copy-right</b>
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Learning resources developed in the project.

<b>Title</b>	<b>Producer</b>	<b>Language</b>	<b>No of pages</b>	<b>Copyright</b>
Destructive test	MHtE	English/ Hungarian	8	No
Visual Inspection and NDT testing	MHtE	English	12	No

### **Video resources created for this CU**

No video resources developed

<b>Title</b>	<b>Producer</b>	<b>Time</b>	<b>Referenc e</b>	<b>Language</b>	<b>Format</b>	<b>Copy- right</b>
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## D. Students tasks

\*Carry out visual inspection on an object in production

The object ought to have a number of seems to be inspected.

\*Carry out inspection before-during and after welding

\*Difference the expression—Visual Testing and Visual Inspection

\*Selection of NDT method for the product

\* Discuss the work instruction for a welding inspector

\*Report with picture of the tools to be used for visual inspections.

\*Example of documents for visual inspection

\*2 -3minutes video from practical work

Tasks for the students:

1. Select the tools and documents to be used for visual inspection
2. Identify where visual inspection shall take place
3. Select tools for visual inspection
4. Carry out visual inspection and report the findings

## E. Test yourself

**1. The exposed surfaces of each fillet-weld-break specimen ( $t= 5 \text{ mm}$ ) shall show:**

- \* no undercut greater than 2 mm
- \* at least 3 mm sound metal between adjacent inclusions
- \* complete penetration and fusion
- \* I do not know.

**2. When automatic or semiautomatic welding is used, which of the following shall be removed by grinding before welding over them?**

- \* surface porosity clusters

- \* bead starts
- \* all of the above
- \* I do not know.

**3. Incomplete fusion due to cold lap (IFD) is defined as:**

- \* weld metal not melted in the joint root
- \* weld metal not remelted on the joint face
- \* a discontinuity between two adjacent weld beads or between the weld metal and base metal that is not open to the surface
- \* I do not know.

**4. Field beveling of pipe ends by manual oxygen cutting is acceptable if authorized by the customer.**

- \* true
- \* false
- \* true statement only if the cutting operator is an experienced welder (>5 years)
- \* I do not know.

**5. Any length of internal concavity (IC) found by NDT is acceptable provided:**

- \* the density of the radiographic image of the IC does not exceed that of the thinnest adjacent base metal
- \* the density of the radiographic image of the IC must exceed that of the thinnest adjacent base metal
- \* IC is never acceptable
- \* I do not know.

**6. The maximum thickness of the penetrometer to be used in radiographic inspection is based on:**

- \* the thickness of the pipe wall or the weld
- \* the flange rating of the piping system
- \* the type of radiographic film used
- \* I do not know.

**7. When a radiographic source is centered inside the pipe for exposing a butt weld:**

- \* three exposures are adequate for the radiographic inspection of the completed weld.
- \* two exposures are adequate for the radiographic inspection of the completed weld.
- \* one exposure is adequate for the radiographic inspection of the completed weld (SWE/SWV).
- \* I do not know.

**8. When a weld is radiographed, using a DWE/DWV procedure and hole type penetrameters:**

- \* one penetrometer is placed on the source side
- \* the penetrometer image must not be superimposed on the weld image
- \* a and b above
- \* I do not know

**9. The only API-approved method for testing a Nick-Break specimen is breaking it in a tensile machine.**

- \* true
- \* false
- \* true, but the exposed area of the fracture must be at least 6 mm
- \* I do not know.

**10. Film or other imaging media shall be processed, handled, and stored so that the images are interpretable for at least 3 years after they are produced:**

- \* is required for any acceptance criteria of imperfections
- \* only when requested by the customer
- \* a very good thing to do
- \* I do not know.

## **F. Evaluation**

**1. Did you find this module relevant ?**

- \* Yes
- \* No
- \* I don't know

**2. Was it time enough for going through the material ?**

- \* Yes
- \* No
- \* I do not know

**3. Was the resources relevant for this module ?**

- \* Yes

- \* No
- \* I do not know

## **G.Appendix.**

Learning resources developed for this CU.



# **CU7**

## **Destructive test**

# 1. Destructive test

For destructive examination parts of the workpiece and the weld must be prepared. Test pieces are taken from the weld and machined. In some cases, these test pieces are further prepared by making a local reduced section, a making notch in the surface or polishing the surface.

One special way is breaking the test piece under normal temperature.



# 1.1 Fracture test

The fracture test is mainly applied for fillet welds. It is a quick test that shows whether the fillet weld has a good penetration and whether there is lack of fusion. The judgement requires expertise (EN1320)



# 1.2. Macro test

A careful preparation is necessary for producing a macro of a weld cross section. After the necessary saqing and polishing, etchant is applied to the weld. After some time, you will see that the weld and the deviations become such as:

- Porosity
- Lack fusion
- Insufficient penetration



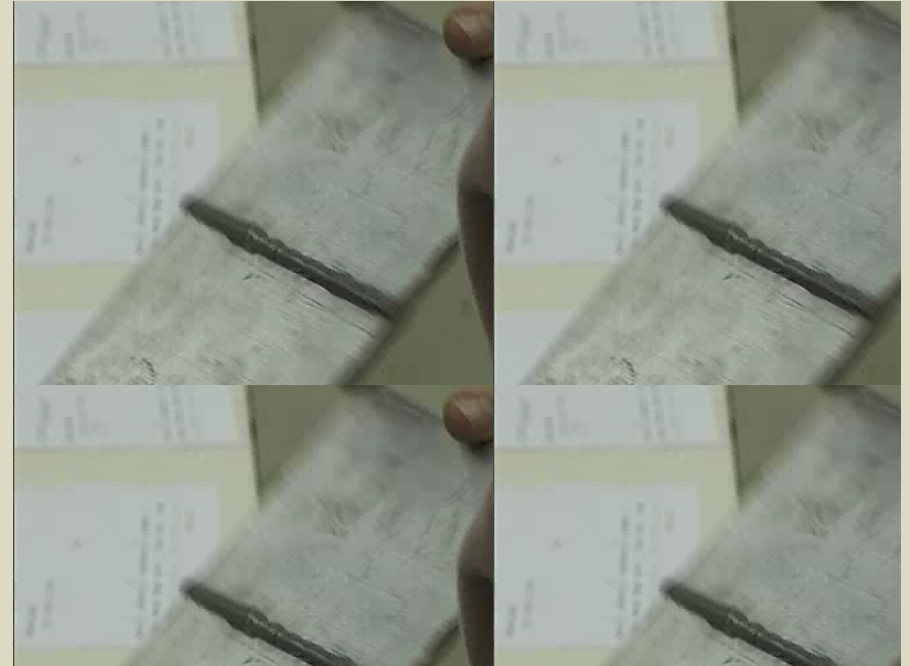
# 1.3 Hardness test

This test measures the ductility of the joint. Ductility gets lower if the hardness of the weld is too high. The process is called, Vickers hardness test. The unit of hardness given by the test is known as the Vickers Pyramid Number (HV). The pyramid refers to the diamond used in the test. The maximum hardness of a weld for a determined material is prescribed and is given in „HV” value. The locations of the weld to be tested are precisely prescribed too.



# 1.4 Transverse tensile test

For a butt weld the fusion between weld and base material can be tested and measured with a transverse tensile test. The dimensions of the test piece are taken accurately before testing. Finally the load at fracture and the location of the fracture are registered.



# 1.5 Bend test

The bend test is carried out on a correctly prepared test piece taken from a butt weld. It gives mainly information about the existence of lack of fusion defects in the weld.





# 1.6 Notch fracture test

This test gives information about the ductility of the welded joint. The test specimen can be taken from different parts of the test piece, it can be taken from the weld and the heat affected zone. In this testpiece a notch is milled, which will or will not be the initiation of the fracture.

This examination is done in different temperatures.





	VISUAL WELDING INSPECTION REPORT		REPORT NO.	
			REV.	
			DATE	
			SHIFT [DAY]	
			[NIGHT]	
SHEET				

JOB NO. :	PROJECT NAME :
CLIENT :	LOCATION :
WELDED PART/COMPONENT :	

NO.	JOINT NO.	WPS NO.	WELDER NO.	RESULT		REMARKS
				ACC	REJECT	

TYPE OF WELD VISUAL UNACCEPTABLE	Accepted Criteria	SKETCH :
UC : Under Cut		
WS : Welding Spatter	No	
GM : Gouging Marks	No	
UWP : Unacceptable Weld Profile	No	
IW : Incomplete Weld	No	
CR : Cracks	No	
CT : Craters	No	
CL : UnCleaning	No	

INSPECTED BY.     QC. INSPECTOR	REVIEWED BY.     Sr. QC OFFICER	ACCEPTED BY ,     
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# MSZ EN ISO 17658

Hegesztés  
Lángvágott, lézersugárral vágott, és plazmával vágott felületek eltérései  
Terminológia

Készítette: Mészáros Gézné  
2022.09  
mszrsgzn1@gmail.com

# Plazmavágás

Kézi



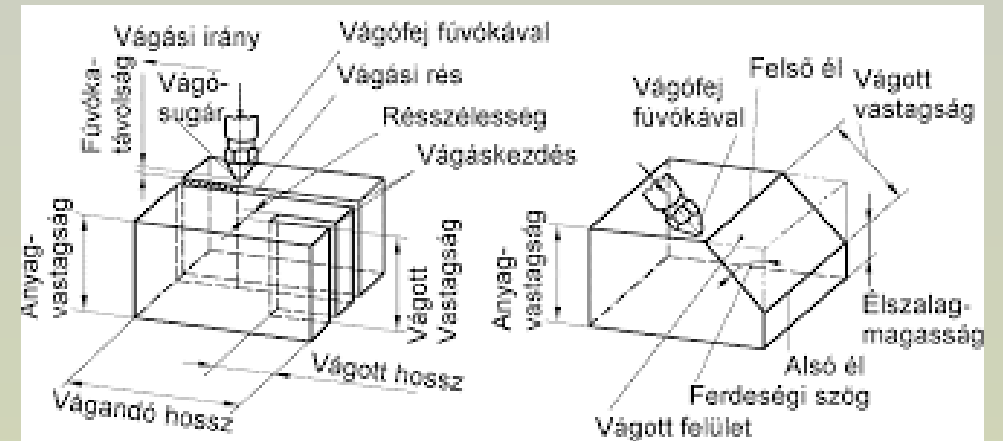
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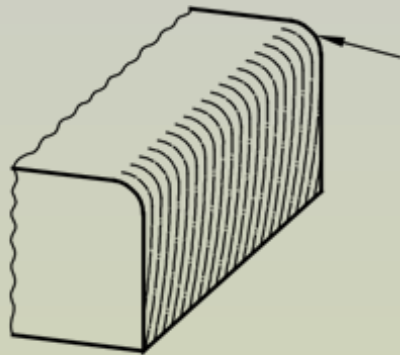


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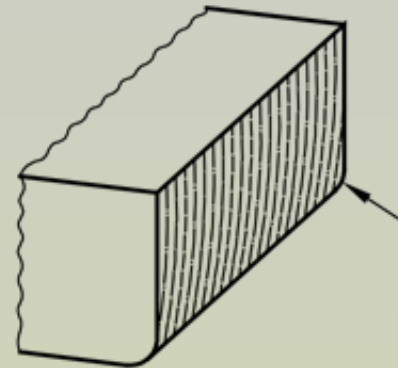


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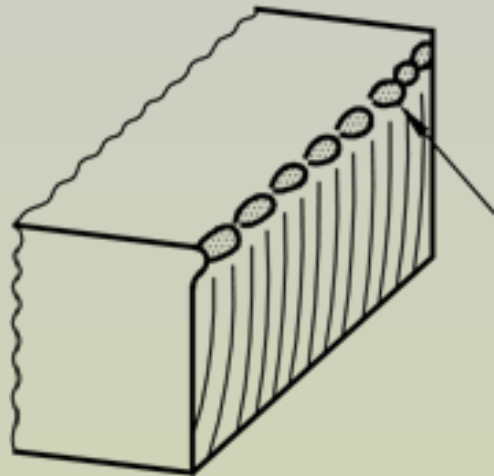


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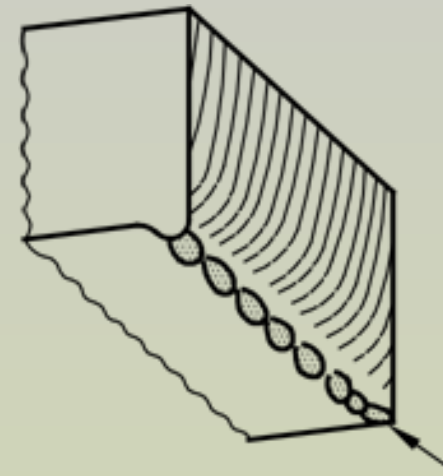


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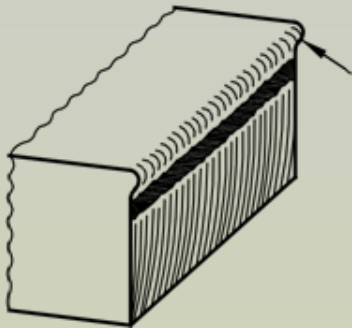


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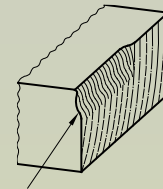


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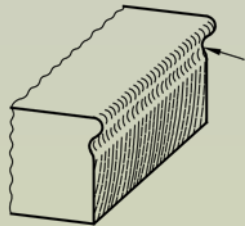
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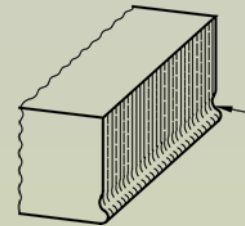


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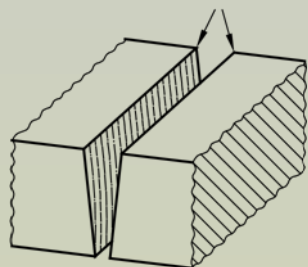


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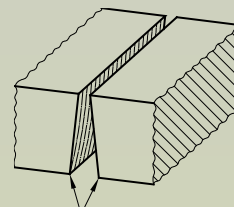


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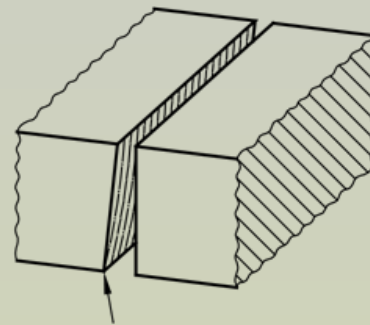
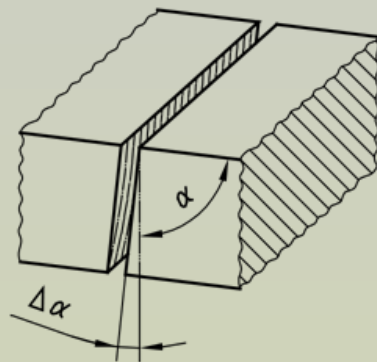


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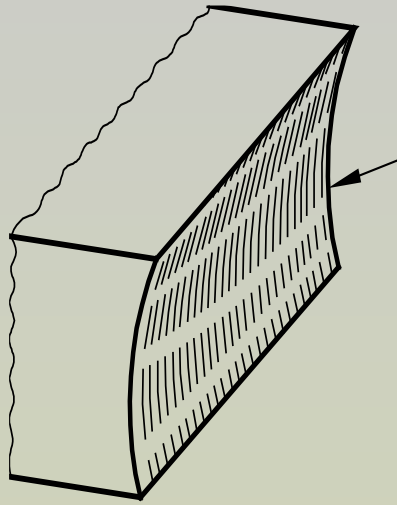


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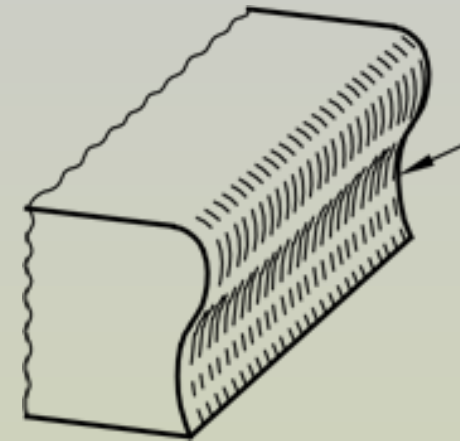
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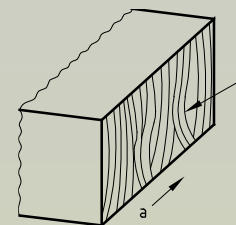
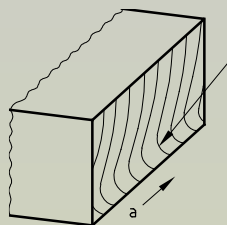
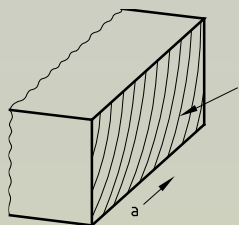
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vágott profil



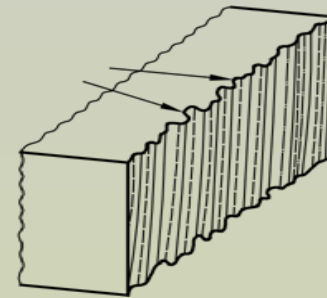
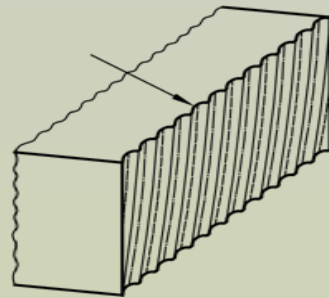
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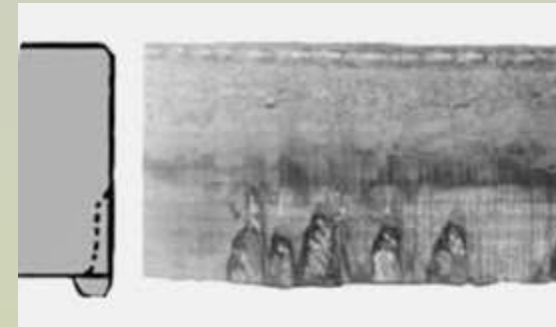
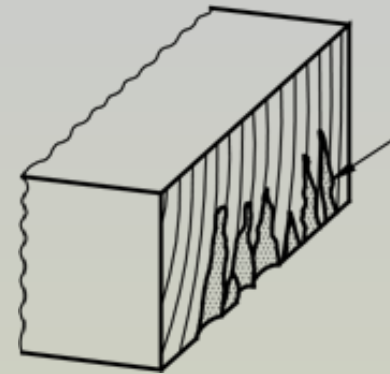
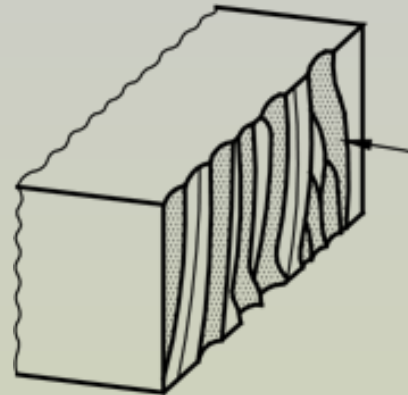
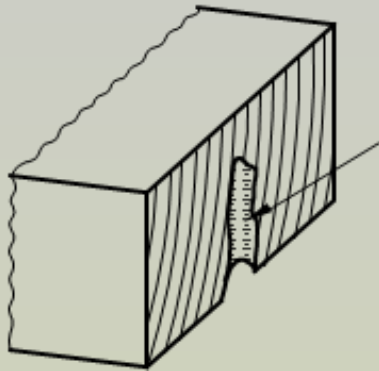
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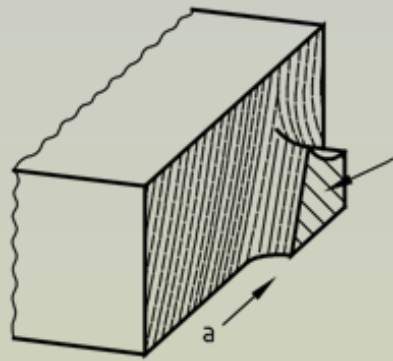
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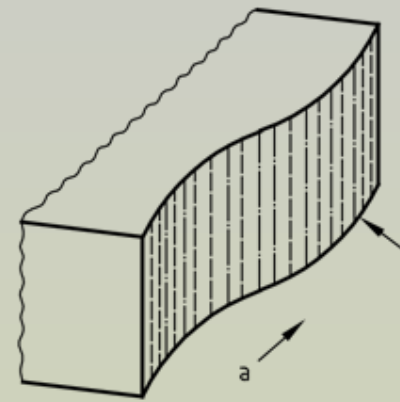
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# Nem befejezett és nem sík vágás



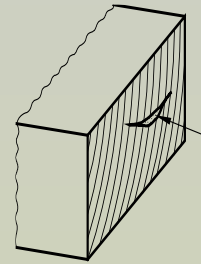
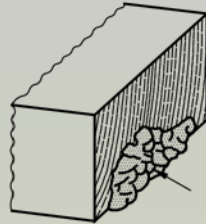
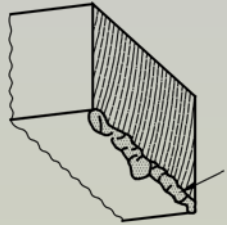
a Cutting direction



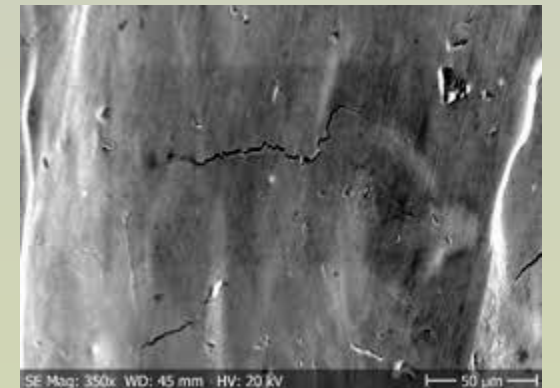
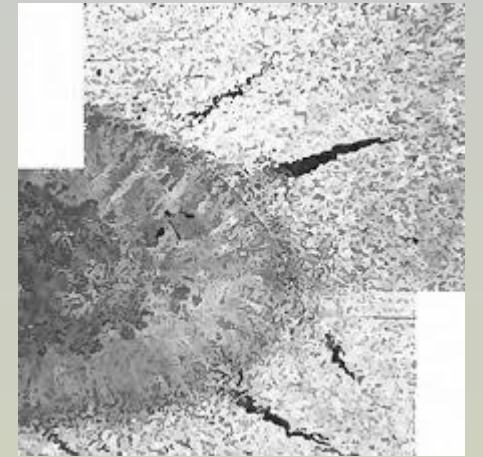
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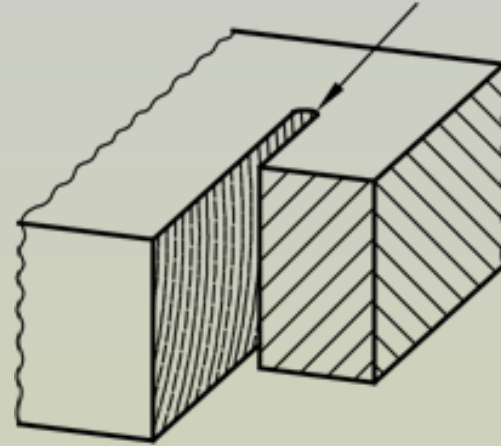
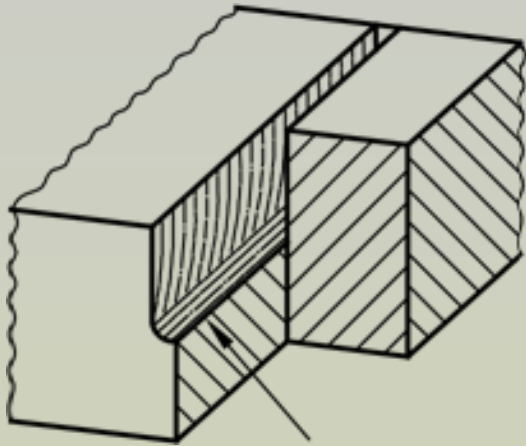
# Salakosság repedés



# Makro-



# Befejezetlen vágás



**KÖSZÖNÖM A FIGYELMET!**