

BET Project

D2.2 Framework of Shared Learning Outcomes (LOs)

EQF 5-6

Version 1.0

This guideline describes the course EN 1090 learning goals, consisting off

- General Content
- General Learning Outcomes
- Specific Learning Outcomes
- General Competences

at the course level and at the Competence Units (CUs) levels.

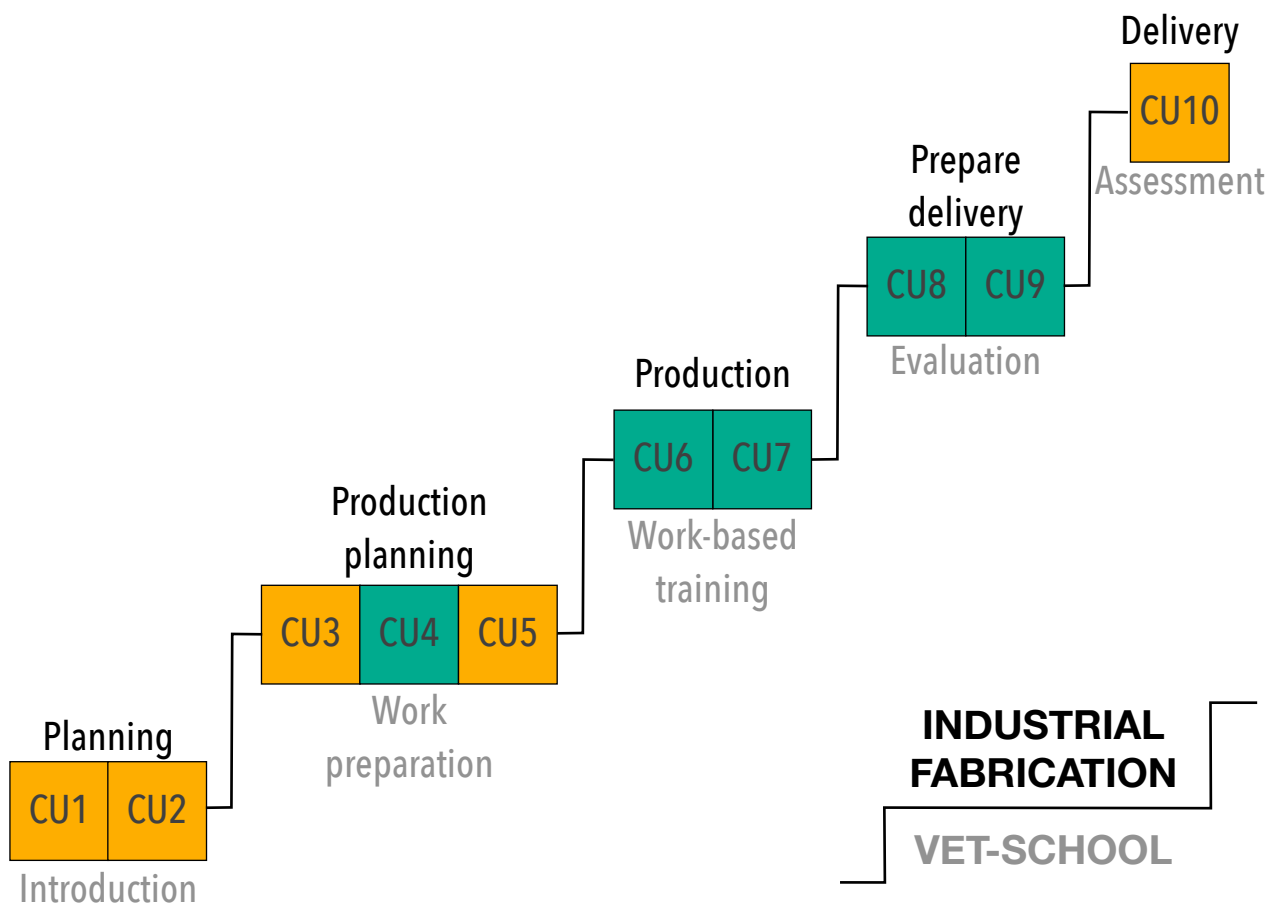
A CU is the smallest educational unit available. The CU is a specific subject module that is leveled and aggregated for site machine operatives and fabrication process technician levels. They should be structured and delivered according to the industry needs, whereby they follows the industry fabrication requirements for specific methods, processes and materials.

The development of a standard for a common competence framework will ease the recognition of qualification equivalencies, assisted by ECVET and shared delivery by VET specialists and industry experts. This is leading to a unitized, modernized delivery system based up on CUs to be shared nationally and transnationally.



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The EN 1090 inspector course is structured in 10 Competence Units (CUs). 5 of the CUs (green boxes) apply work-based learning where the training follows the fabrication process of a product. Each CU targets various stages in the fabrication process.

The EN1090 Inspector course aims to boost provision of new skills and address skills mismatches by designing new curricula that is applying an innovative design. Thus, the EN1090 Inspector course aims to boost provision of new skills and address skills mismatches by designing new curricula that is applying an innovative design. The students' digital skills, which are increasingly important in all job profiles across the entire labor market, are going to be developed and enhanced by applying modern ICT tools and services.

- CU1 - Introduction and ICT
- CU2 - Evaluating and inquiry
- CU3 - Design Review
- CU4 - Documentation and Production Plan
- CU5 - Greener Economics in Welding and Cutting Inspection
- CU6 - Non Destructive Testing (NDT) Inspection
- CU7 - Mechanical Fastening and Erection of the Structure
- CU8 - Surface Protection and Dimensional Control
- CU9 - Dimensional Control and Delivery Documentation
- CU10 - Summary and Examination

EN 1090 Inspector Course



Course Content

The course clarifies the inspector's role in manufacturing. It begins well before the welding starts, continues during the welding operation, involves action after welding is completed, and is finalized when the results are properly reported.

The course applies work-based training and follows the manufacturing process from the order is received until the welded product is ready for delivery. The inspector is responsible for producing documents that ensure traceability of the components and related manufacturing action throughout this process.

General Learning Outcomes

- Be able to explain the role and responsibilities of welding inspector's job function in welding manufacturing.
- Identify the main aspects regarding the inspector's attitude and code of ethics.
- Understand the basic project planning techniques and how they are applied to inspection activities.
- Understand and describe the main differences between quality assurance, quality control and inspection systems.
- Be capable of apply, follow up and supervise the quality control procedures implementation.
- Know the basic factors related to personnel and equipment and their influence for quality of a welded construction.
- Ability to recognize and evaluate WPS/WPQR for welded components and their relations.
- Understand the purpose of visual inspection and the use and limitations of visual inspection tools.
- Be able to develop a traceability scheme for a welded product.
- Identify the role of the Production Coordinator and the responsibilities of the coordinator.
- To develop a SPC (Statistical Production Control) system for the company.
- Identify the role of the Production Coordinator and the responsibility of the coordinator.

Specific Learning Outcomes

- To be able to create inspection procedures and the ability of reviewing and assessing inspections reports.
- To be able to develop inspection plans for a welded product.
- To be able to develop a traceability plan for all relevant inspection documents.
- To be able to carry out inspection before, during and after welding.
- To be able to estimate inspections costs and other resource requirements for producing a welded product.
- To be able to create skills update plan for inspection personnel.
- To be able to interpret the international, European, standards and directives, for fabrication of welded products.
- To be able to define none-conformances and corrective actions

General Competence

After completing the course, the student will get an advanced knowledge and competence of welding and inspection theory and practical implementation of inspection. This base will enable the candidate to perform the following tasks:

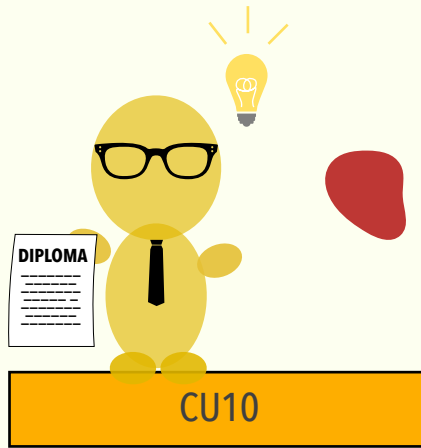
- Develop, comment and review Quality Control Plans and Inspection and Testing Plans based on product standards, codes, specifications, drawings and regulatory requirements.
- Verify the compliance of WPQRs and WPSs and welder qualifications and approvals against the applicable standards, codes and specifications for conventional applications
- Take decisions on acceptance of quality documents related to welding manufacturing.
- Take decisions based on quality documents according to the requirements defined for the product.
- Verify product documentation according to company and contract requirements.
- Establish non-conformance documentation and specify corrective actions.

Better Effect of Training

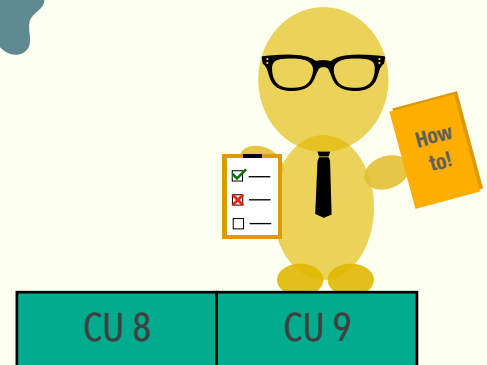


Work-based
learning methods

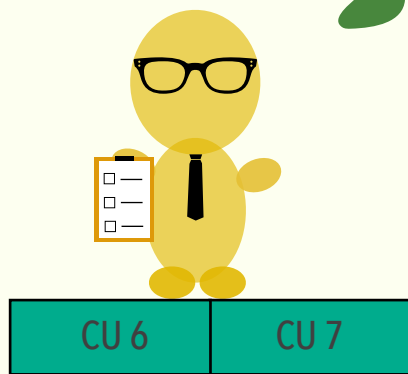
EN1090 Inspector course



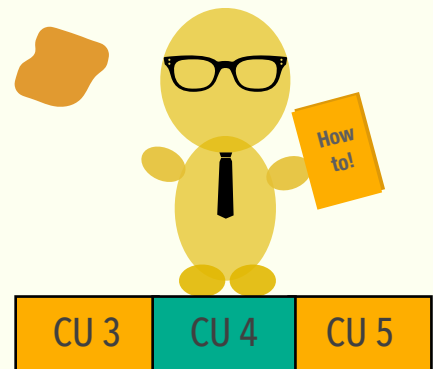
CU10
Delivery
Assessment



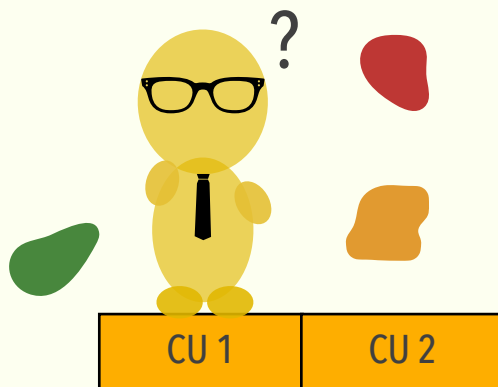
CU 8 | **CU 9**
Prepare delivery
Evaluation



CU 6 | **CU 7**
Production
Work-based training



CU 3 | **CU 4** | **CU 5**
Production planning
Work preparation



CU 1 | **CU 2**
Planning
Introduction





CU 1 - Introduction and ICT

General Content

The students will get an introduction to the course, containing the following topics:

- An in-depth knowledge of the data tools to be used in this course.
- A presentation of the education structure and methodology with emphasis on work-based training and how this will be implemented in the course.

This CU will be part of Step 1 (Planning) in the production cycle for work-based learning in the company.

General Learning Outcomes

- Learn to know the EN 1090 Standard and its structure.
- Learn about the consequences and benefits of the CPR (Construction Product Regulation).
- Be able to navigate through the available welding standards and select the right standard for a task.
- Get an overview over European harmonized product standards.
- Be able to evaluate risks associated with accepting new product orders in a company.

Specific Learning Outcomes

In this course we will particularly focus on the following:

- Know the structure of European directives with regards to essential safety requirements and their relation to welding fabrication.
- Know the benefits and have an overview of the tools available through CPR.
- Identify execution classes of requirements in EN 1090.
- Identify and specify the role and tasks of the welding inspector.
- Initiate procedures required for compliance with the European directives.
- Identify the role of the Production Coordinator.

General Competence

The student will know how to apply data tools needed in e-learning sessions and use a LMS in their theoretical- as well as work-based VET. This includes submitting their replies and answers to tasks, exercises and solving multiple choice questions. They shall know how to collaborate together in groups supported by usage of modern data tools that are applied during the course. This includes communicating with the instructor and the other students by using modern video communication systems.

CU 2 - Evaluating an Inquiry

General Content

An inquiry has arrived from the company and an offer is being developed. This inquiry is documented through the drawings and specification as a part of the learning material. The students will now be in the position to follow this inquiry through its steps through the company as it materializes into a product to be delivered. The key topic is Management of Inspection and an evaluation of your resources and, if needed, how to update your resources. Additionally, a verification of the drawings and its content must be used in order to verify if they are correct.

This CU will be part of Step 1 (Planning) in the production cycle for work-based learning in the company. The company's own drawings can be applied here. A student may apply the company's own drawings during the work-based training.

General Learning Outcomes

- To understand the responsibilities associated with inspection activities as they relate to staff, company/organization and record generation, retention and archiving.
- To understand the responsibilities and requirements in the company based on EN1090 and CPR.
- To be able to understand and to develop a quality plan for the inquiry given in CU 1.
- To recognize the importance of accurate records and monitoring of activities with respect to the inspection process.
- To be able to develop a client feedback loop/routines for communication with client.

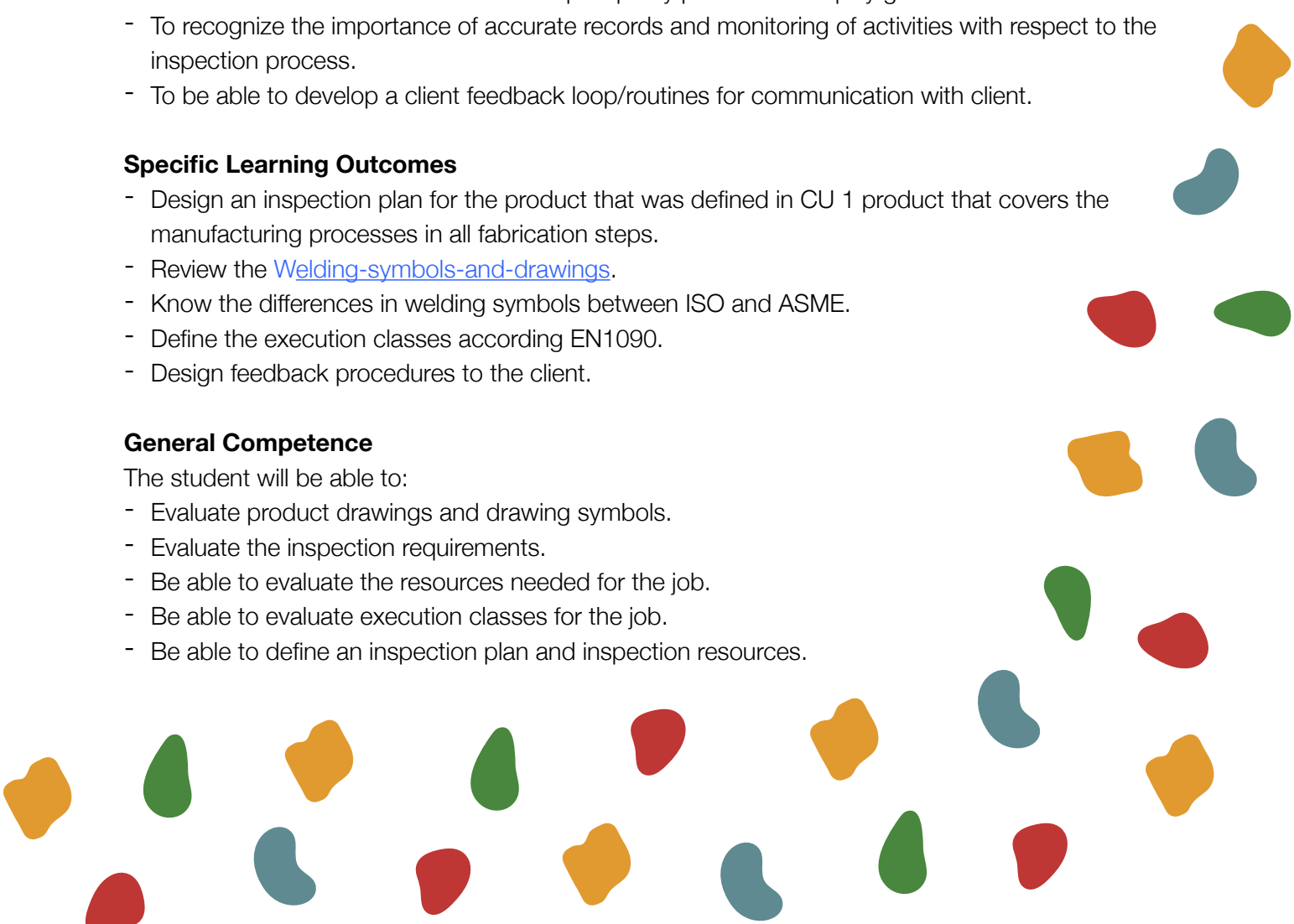
Specific Learning Outcomes

- Design an inspection plan for the product that was defined in CU 1 product that covers the manufacturing processes in all fabrication steps.
- Review the [Welding-symbols-and-drawings](#).
- Know the differences in welding symbols between ISO and ASME.
- Define the execution classes according EN1090.
- Design feedback procedures to the client.

General Competence

The student will be able to:

- Evaluate product drawings and drawing symbols.
- Evaluate the inspection requirements.
- Be able to evaluate the resources needed for the job.
- Be able to evaluate execution classes for the job.
- Be able to define an inspection plan and inspection resources.





CU 3 - Design Review

General Content

The students carry out a design review process and develop a quality plan for the order and product. They learn how to develop procedures for the inspection activities and to verify the design from an inspection point of view.

The students learn the key quality assurance principles to be applied when receiving an order. They learn how to create a deviation report for the findings during the design review process. This CU will be part of Step 2 (Production planning) in the production cycle for work-based learning in the company.

General Learning Outcomes


- To describe the main differences between quality assurance, quality control and inspection systems and their usage for welded manufacturing.
- Be capable to apply, follow, supervise the quality control procedures and their implementation.
- Be capable to interpret and select appropriate part in EN 1090 and the referred standards, and to understand and explain the CPR regulation.
- Know the basic factors related to personnel and equipment, which influence the quality of a welded fabrication.
- Be capable of interpreting and defining the inspector's role during manufacturing activities, and to check if the correct standard, Eurocodes and local requirements are met.
- Verify if a competent person has checked the designated drawings and specifications, and if any NDT and other testing where appropriate specified.
- To be able to develop a client feedback loop/routines for communication with client.

Specific Learning Outcomes

- To be able to ensure that all the steps in the inspection plan can be covered with the correct procedures and actions.
- Define a follow up plan for corrective actions and ensure that these are followed up, and to be able to create a detailed inspection plan for the product.
- Define execution classes, and design feedback procedures to the client.
- Develop a Design Review report.

General Competence

The student will be able to:

- Verify if the requested design can be fabricated in the factory.
 - Verify if the design should be altered to meet the current fabrication facilities.
 - Create a design review report with or without non-conformities.
 - Define the inspectors' tasks for a the current product design.
 - Define Design Review reports with request for change order.
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CU 4 - Documentation and Production Plan

General Content

The students learn how to develop control documents for Quality Control in welding, and procedures for Quality Control that shall be used during the Quality Control and Inspection process. Practical examples from industry will be discussed.

This CU will be part of Step 2 (Production planning) in the fabrication cycle for work-based learning where the documentation requirements are defined.

General Learning Outcomes

- Outline the typical structure of an IT (Production, Inspection and Test Plan), how to implement, and to develop the necessary tasks.
- Be able to develop a weld joint traceability scheme for the welded product.
- Identify the procedures necessary to review and validate the typical inspections records and reports.
- Be able to define positive reporting techniques and techniques for negative reporting.
- Develop a develop a full Production, Inspection and Test Plan.
- Be able to develop a traceability plan, materials, cutting, welding, mechanical fastening, anti corrosion protection, dimensional control.
- Be able to develop a production sequence, erection plan, temporary attachments, tack welding.

Specific Learning Outcomes

- Develop a traceability scheme for the product with the relevant documents.
- Create the report documents needed for an order.
- Develop procedures and instructions for the inspection activities.
- Definition and implementation of reporting techniques.

General Competence

The student will be able to:

- Define the documentation needs for given designs and to create these documents.
- Define various inspection plans and create procedures for a given designs.
- Establish routines for documentation and reporting through the manufacturing process.
- Create and develop experience in writing procedures.





CU 5 - Greener Economics in Welding and Cutting inspection

General Content

The students learn how the cost of inspecting a product, will influence on both the product costs itself and the repair costs, including the relations between these costs. The costs will cover the overall costs as well as the lifetime costs associated with inspection.

This CU will be part of Step 2 (Production planning) in the product cycle for work-based learning.

General Learning Outcomes

- To understand the influence of inspection methods to costs on the overall costs in the welding fabrication.
- Learn to describe the factors affecting welding inspection cost.
- Develop a budget for the total cost of the inspection activities for a selected product.
- Better understanding the life cycle costs of a given design.
- Discuss the cost influence of the repair rate.
- Understand the quality and safety relations and influence on the costs.

Specific Learning Outcomes

- Develop a cost budget for the inspection activities for the product envisaged.
- Develop a cost budget for welding activities.
- Calculate repair rate at different production stages.

General Competence

The student will be able to:

- Create costs calculations for alternative fabrication scenarios.
- Create repair cost profile for the design.
- Evaluate the costs associated with different inspection methods.

CU 6 - Non Destructive Testing (NDT) Inspection

General Content

This CU addresses visual Inspection and NDT testing. Visual Inspection includes the inspection of materials and components, as well as inspection before, during and after a welding operation. Inspection of surface preparation and coating is included.

CU 6 will be part of Step 3 (Production) in the production cycle for work-based learning where the production is carried out.

General Learning Outcomes

- Describe the purpose of visual inspection at all stages of welding.
- Understand the purpose and limitations of tools used in visual inspection.
- Describe limitations of tools used in NDT inspection.
- Perform visual inspection and report in detail the defects identified during the inspection processes.
- Read and understand the implications of NDT reports.
- Create a non-conformance report and develop a repair request.
- To understand the standard ISO 6520.
- Define and differentiate between acceptable and not-acceptable defects and deviations.
- To recommend and communicate with external NDT providers.

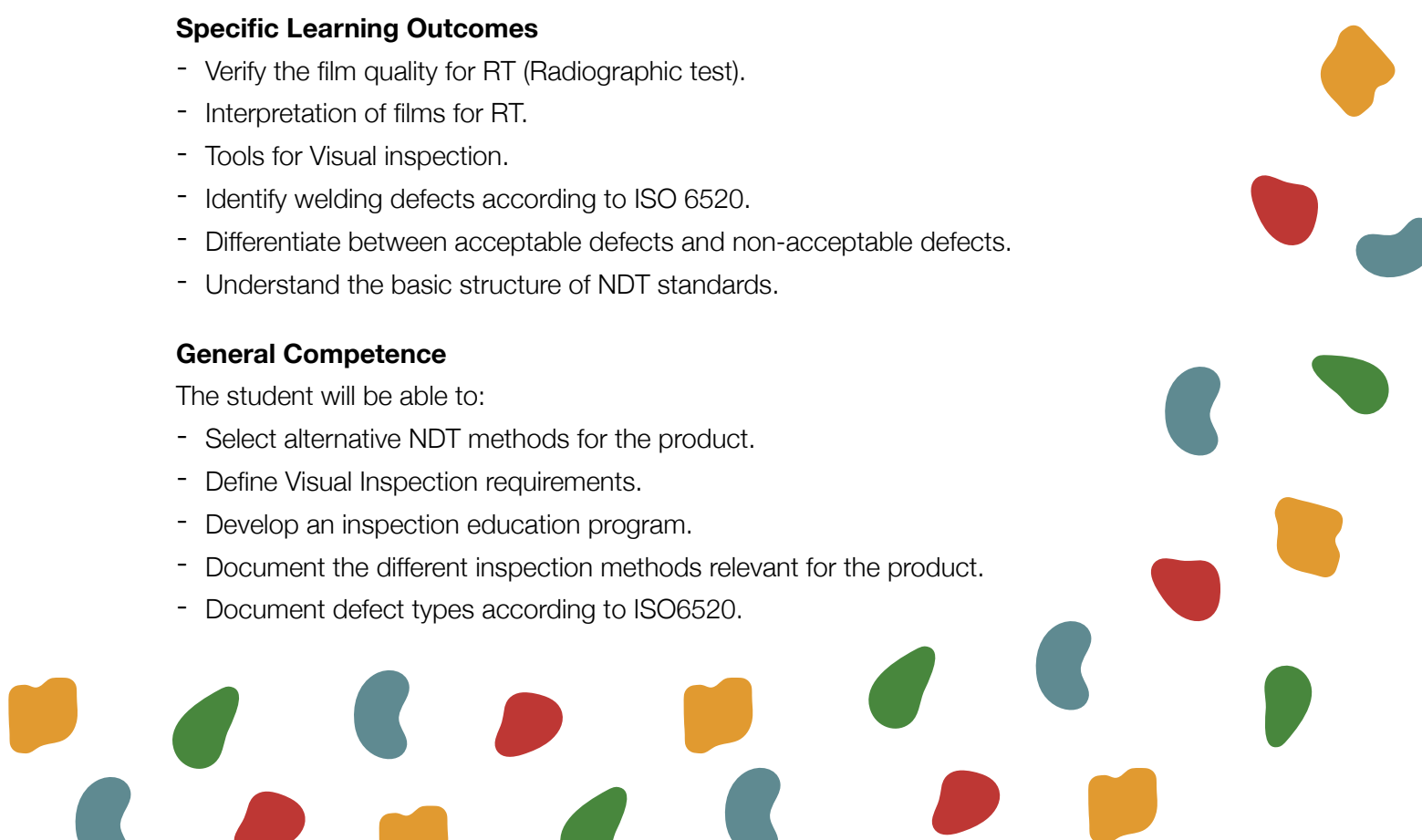
Specific Learning Outcomes

- Verify the film quality for RT (Radiographic test).
- Interpretation of films for RT.
- Tools for Visual inspection.
- Identify welding defects according to ISO 6520.
- Differentiate between acceptable defects and non-acceptable defects.
- Understand the basic structure of NDT standards.

General Competence

The student will be able to:

- Select alternative NDT methods for the product.
- Define Visual Inspection requirements.
- Develop an inspection education program.
- Document the different inspection methods relevant for the product.
- Document defect types according to ISO6520.



CU 7 - Mechanical Fastening and Erection of the Structure

General Content

The CU covers destructive testing.

In welding fabrication most of the destructive testing are related to the development of welding procedures. This will be testing and creating WPQR's, but it may also be that the materials need to be tested as well.

CU 7 will be part of Step 3 (Production) in the production cycle for work-based learning where the production is carried out.

General Learning Outcomes

- Explain the purpose and value of Destructive Testing (DT) in relation to development of welding procedures.
- Understand the objectives of welding procedure and welder qualification tests.
- Understand test reports, information and content from DT.
- Select the appropriate test that is requested by the code/standard.
- Be able to witness performance tests for welding procedures.
- Evaluate DT as a service or as an in house activity.

Specific Learning Outcomes

- To be able to select the correct Destructive testing methods and their application.
- Documentation of testing methods.
- Procedures for Destructive testing.
- Maintenance and calibration of testing equipment.

General Competence

The student will be able to:

- Create a Destructive Testing schedule.
- To plan, execute and document Destructive Testing.
- Create documentation for WPS/WPQR.
- To establish a document register (archive) and traceability for welding procedures.
- To create a document register for DT documents and procedures.



CU 8 - Surface Protection and Dimensional Control

General Content

This CU gives the students key knowledge and competence related to surface protection of welded products. Additionally, it contains information and examples for dimensional control.

CU 8 will be part of Step 4 (Prepare delivery) in the production cycle for work-based learning where the delivery of the product is prepared.

General Learning Outcomes

- Explain the purpose of surface protection of steel and aluminum structures.
- Describe the different surface protection methods and techniques for steel and aluminum materials.
- Prepare the materials for surface protection.
- Create procedures and documentation for surface protection.
- Handling of tools and measuring devices.
- Describe the tools and methods for dimensional control of steel structures.
- Define procedures and documentation for dimensional control.
- Be able to witness pressure tests and to perform dimensional control.
- Develop and check working procedures for surface protection.

Specific Learning Outcomes

- Witness and understand the principles of pressure, leakage tests and dimensional control
- Apply the tools used for surface protection tests as well as dimensional control.
- To be able to recommend the correct surface protection technology and its prerequisites.
- Prepare for surface protection and/or for dimensional control, including creating test reports.

General Competence

The student will be able to

- Define the requirements for surface protection and surface protection procedures.
- Planning, execution and follow up surface protection work.
- Define requirements for pressure tests and dimensional control.
- Verify the company resources for surface protection and dimensional control.
- Explain the influence of the surface protection on welding conditions.
- Develop a set of test documentation of the work.



CU 9 - Dimensional Control and Delivery Documentation

General Content

The students will be able to create a Product Documentation Record Book, which is the fabrication documentation to be delivered together with the product to the client.

CU 9 will be part of Step 4 (Prepare delivery) in the product cycle for work-based learning where the delivery of the product is prepared.

General Learning Outcomes


- Describe how to carry out a pre-delivery inspection (PDI).
- Understand why PDI and tests are important.
- Understand the consequences of improper or missing PDI.
- Develop a Product Documentation Record Book, for the fabricator and the client.
- Understand the consequences of a product recall or reclamation.
- Develop a feedback loop back to the design containing data based up on experiences.

Specific Learning Outcomes

- Define and create a PDI checklist.
- Identify and list all critical components in the product delivery.
- Develop a Product Documentation Record Book.
- Develop a feedback document highlighting production experience of this product.

General Competence

The student will be able to:

- Develop product documentation for the fabricator and the client.
 - Develop «as-built» documentation for the product.
 - Submit a product record book with the product containing all relevant documentation.
 - Develop a feedback routine and format that allow production experience to be submitted to design.
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CU 10 - Summary and Examination

General Content

This CU targets the product delivery phase with acceptance, by focusing on the delivery of the product to the customer. It addresses how to create delivery acceptance reports and eventually, non-conformance notice and corrective actions.

A summary of the course and the preparation of final assessment of the course is included.

CU 10 will be part of Step 5 (Delivery) in the production cycle for work-based learning where the delivery of the product take place.

General Learning Outcomes

- Describe how to carry out the delivery of the product.
- Prepare for the delivery acceptance.
- Understand the consequences of missing acceptance tests.
- Learn how to create a non-conformance report.
- Understand the consequences of a product recall or reclamation.
- Understand the knowledge and competence requirements for the final assessment.

Specific Learning Outcomes

- Define and create a delivery acceptance report.
- Identify and list all critical components, for the design, in the product delivery which may be redefined in a subsequent follow up delivery.
- Create a Product Documentation Report highlighting request for design alterations.
- Provide a summary the subjects and the course before the final assessment. This includes both the theoretical- and practical tests.

General Competence

The student will know how to

- Develop a product acceptance test for the fabricator and the customer.
- Develop a «non-conformance» report for the delivery of the product.
- Develop a summary of important topics for the assessment.