

EuroMec Project

D2.2 Framework of shared Learning Outcomes (LOs)

EQF 4-5

This guideline describes the course PED Inspector learning goals, consisting off

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

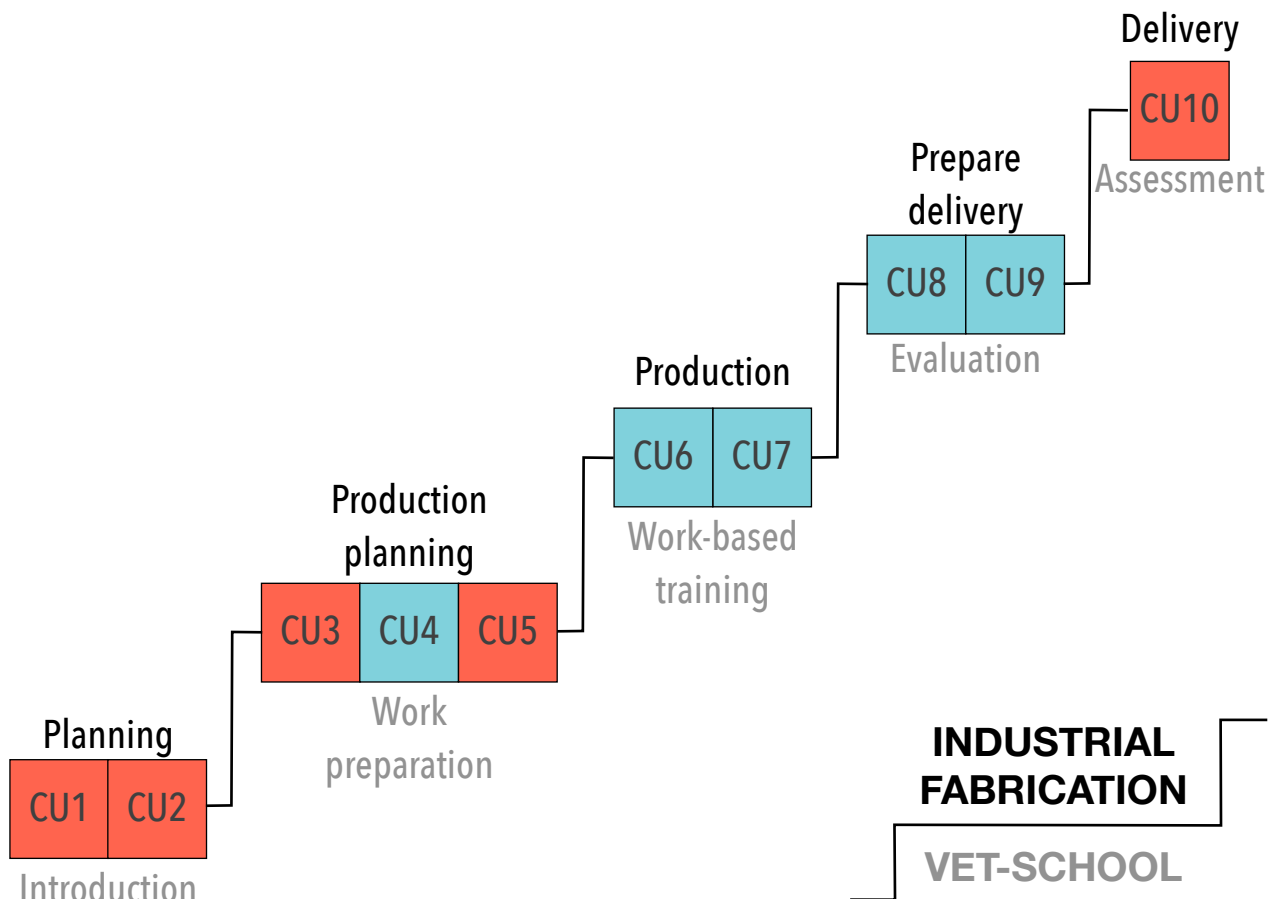
at the course level and at the Competence Units (CUs) levels.

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 PED Inspector course is structured in 10 Competence Units (CUs). 5 of the CUs (blue 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 description of the framework for the learning goals (front page) should be done at **course level** and at the **competence unit levels**. This innovative and flexible training solution methodology demonstrates how VET schools may apply standards to set up, establish and deliver blended learning solutions that better respond to industry demands. The CUs should be structured and delivered according to the industry needs, whereby the CUs follows the fabrication industry requirements for specific methods, processes and materials.

- CU1 - Introduction
- CU2 - Evaluating and inquiry
- CU3 - Design review
- CU4 - Documentation
- CU5 - Economy in welding inspection
- CU6 - Visual inspection and NDT
- CU7 - Destructive testing
- CU8 - Surface protection and dimensional control
- CU9 - Documentation before delivery
- CU10 - Summary and exam

PED Inspector Course

Course Content

The course will clarify the inspector's role during manufacturing. It begins well before the welding processes starts, continues during the welding operation, involves action after welding is completed, and is finalized when the results have been 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 the documentation that secures traceability of the components and related manufacturing actions during this process.

General Learning Outcomes

- Be able to explain the role and responsibilities of welding inspector's job function in manufacturing of welded components.
- 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 systems for inspection.
- Be capable of applying, follow up and supervise the implementation of quality control procedures.
- Know the key factors related to personnel and equipment and their influence on the 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 usage and limitations of visual inspection tools.
- Be able to develop a traceability scheme for a welded product.



Specific Learning Outcomes

- Manage to create inspection procedures, including reviewing and assessing inspections reports.
- Learn how to develop inspection plans for a welded product.
- Develop a traceability plan for all relevant inspection documents.
- Carry out inspection before, during and after welding.
- Estimate inspections costs and the other requirements for resource during the producing a welded product.
- Understand and interpret the international and European standards and directives, for fabrication of welded products.
- Learn how to define none-conformances and corrective actions
- Create skills update plans for inspection personnel.

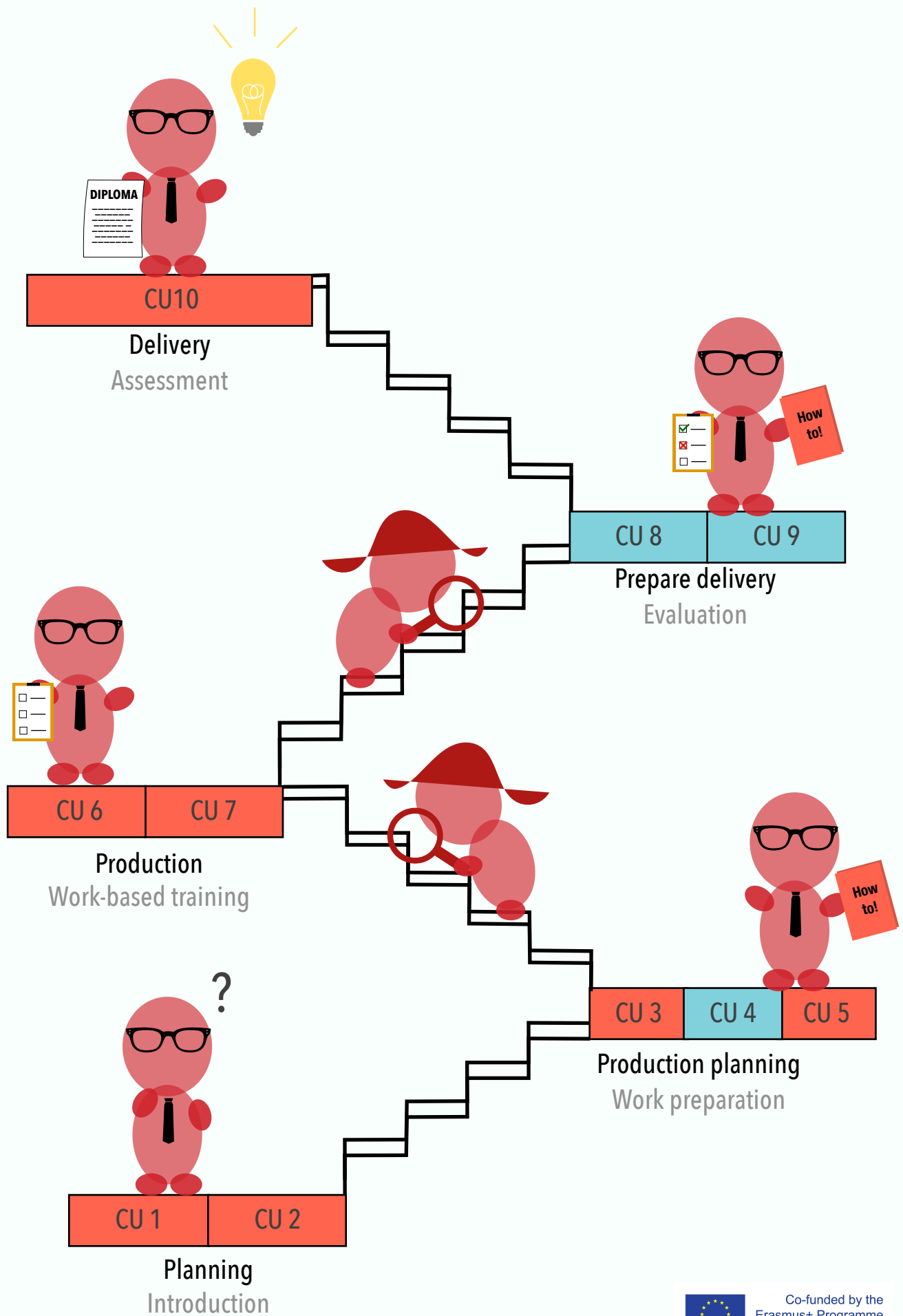
General Competence

After completing the course, the student will get an advanced *knowledge and competence* of welding and inspection theory, and how to implement inspection processes at the practical levels.

This will enable the skilled worker to carry out the following tasks:

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





CU 1 - Introduction

General Content

To learn how to use a Learning Management System (LMS) and a videoconferencing tool. Integration of these tools into work-based learning.

CU1 will be part of Step 1 (Planning) in the fabrication cycle for work-based learning in the company.

General Learning Outcomes

- Pressure equipment directive (PED), Simple Pressure Vessels Directive (SPVD) and other directives specified in the list of learning materials.
- Learn how to navigate through the available welding standards and select the correct standard for a task.
- Get an overview of European harmonized product standards, typical structures, requirements and usage that comply with the directives.
- Learn how to evaluate risks associated with accepting new product orders in a company.
- Compliance to the European directives applying both non-harmonized and harmonized standards.

Specific Learning Outcomes

- Know the structure of European directives with regards to essential safety requirements, and their relation to welding fabrication.
- Identify classes of requirements within welding product fabrication.
- Identify and specify the role and tasks of the welding inspector.
- Develop procedures required for compliance with the European directives.
- Apply governing standard requirements to the fabrication of welded products.
- Interpret the harmonized standard requirements to comply with European directives.

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 and an offer must be developed. This inquiry is documented through drawings and specifications that are components of the learning materials. The training follows the fabrication steps until it materializes into a product, to be delivered at the end of a course. Key topics include Management of Inspection, evaluation of the available resources and, if needed, how to update the resources. A verification process of the drawings and the specifications must be applied.

CU 2 will be part of Step 1 (Planning) in the fabrication cycle for work-based learning in the company. A student may apply the company's own drawings during the work-based training.

General Learning Outcomes

To understand

- the responsibilities and the authorities of the personnel associated with inspection activities
- the responsibilities and requirements in the company based on PED
- and develop a quality plan for the inquiry given in CU 1
- and recognize the importance of accurate records and monitoring of inspection activities
- and develop a client feedback loop containing routines for communication with client

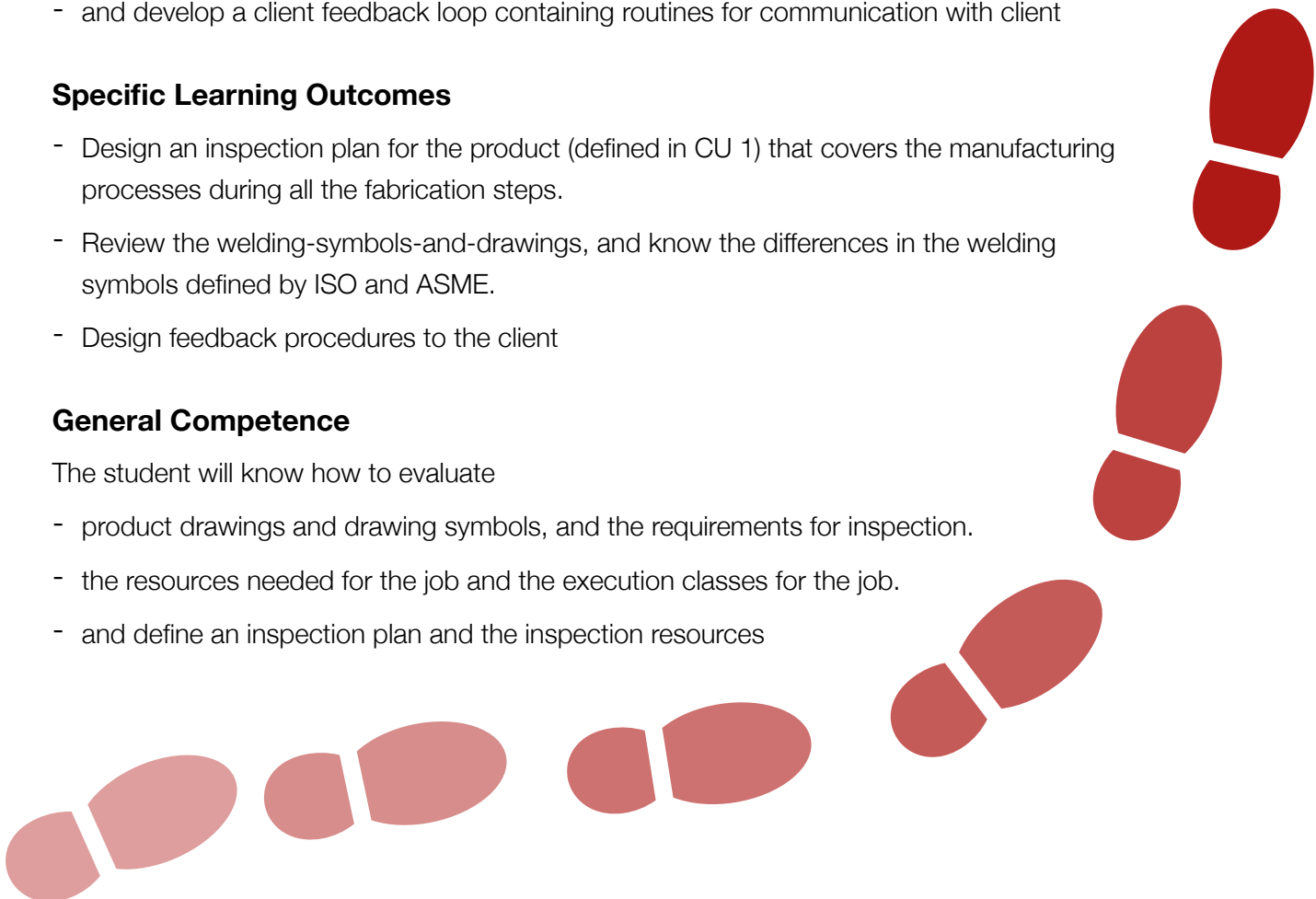
Specific Learning Outcomes

- Design an inspection plan for the product (defined in CU 1) that covers the manufacturing processes during all the fabrication steps.
- Review the welding-symbols-and-drawings, and know the differences in the welding symbols defined by ISO and ASME.
- Design feedback procedures to the client

General Competence

The student will know how to evaluate

- product drawings and drawing symbols, and the requirements for inspection.
- the resources needed for the job and the execution classes for the job.
- and define an inspection plan and the 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.

CU 3 will be part of Step 2 (Production Planning) in the fabrication 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 manufacturing of welded products.
- To apply, follow up and supervise during the quality control procedures and their implementation.
- Interpret and select appropriate parts of the PED, as well as ISO 9001, ISO 3834 and the referred standards.
- Understand and explain the regulation specifications.
- Know the key factors related to personnel and equipment, which influence the quality of a welded fabrication process.
- Interpreting and defining the inspector's role during manufacturing activities.

Specific Learning Outcomes

- Secure that all the steps in the inspection plan can be covered by applying the correct procedures and actions.
- Define a follow up plan containing corrective actions and secure that these are followed up.
- Create a detailed inspection plan for the product.
- Create a Design Review report

General Competence

The student will know how to:

- Verify if the requested design can be fabricated in the factory.
- Verify if the design should be altered in order to apply the existing fabrication facilities.
- Create a design review report with or without non-conformities.
- Define the inspectors' tasks for a the selected product design.
- Define Design Review reports with request for changing the order



CU 4 - Documentation

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.

CU 4 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

- Describe the typical structure of an ITP (Inspection and Test Plan), including how to implement and develop the necessary tasks.
- Develop a weld joint traceability scheme for the welded product.
- Identify the procedures necessary to review and validate the typical inspections records and reports.
- Define positive reporting techniques and techniques for negative reporting

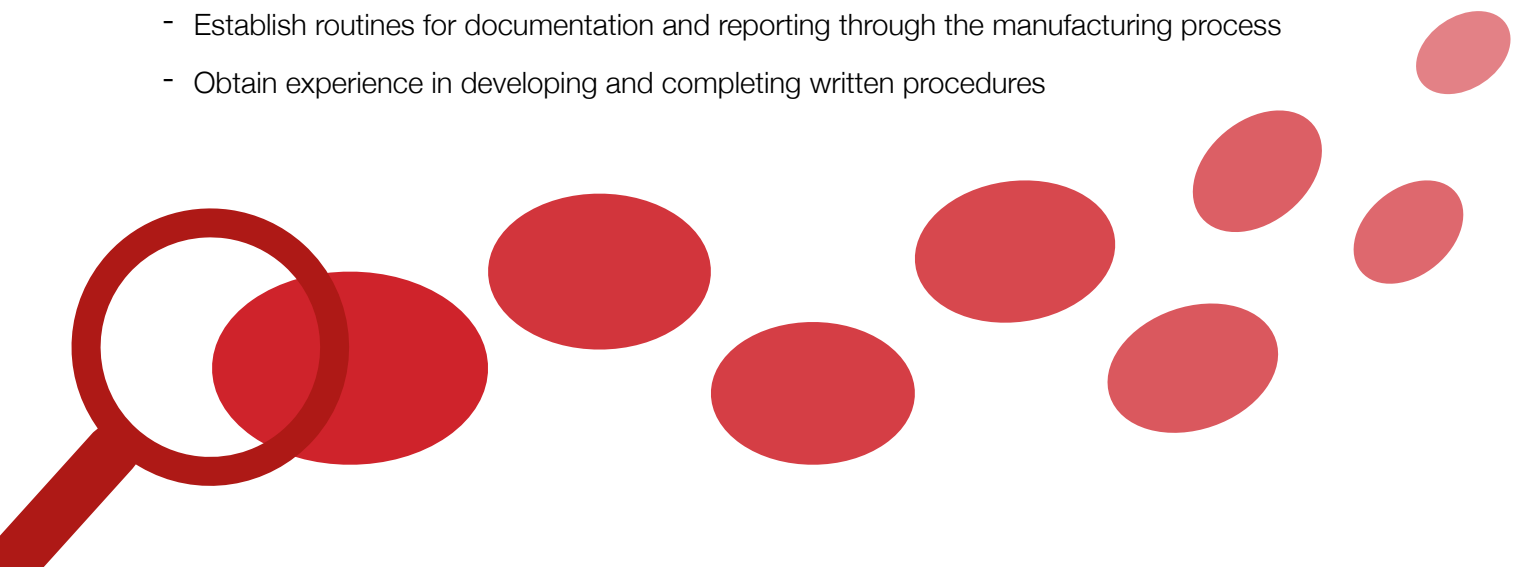
Specific Learning Outcomes

- 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 know how to:

- Define the documentation needs for the selected designs and to how to create these documents.
- Define various inspection plans and create procedures for selected designs.
- Establish routines for documentation and reporting through the manufacturing process
- Obtain experience in developing and completing written procedures



CU 5 - Economy in Welding 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.

CU 5 will be part of Step 2 (Production planning) in the fabrication cycle for work-based learning where costs are planned.

General Learning Outcomes

- To understand the influence of inspection costs compared to the overall costs for the complete welding fabrication process.
- 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 understand the life cycle costs of a given design.
- Discuss the cost influence of the repair rate.

Specific Learning Outcomes

- Develop a budget for the inspection activities for a selected product.
- Develop a budget for welding activities.
- Calculate the repair rates at different production stages.

General Competence

The student will know how to:

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



CU 6 - Visual inspection and Non Destructive Testing (NDT)

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 visual 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

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

General Competence

The student will know how to:

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



CU 7 - Destructive Testing

General Content

This CU targets destructive testing (DT). In welding fabrication most of the destructive testing are related to the development of welding procedures. This will be testing and creating WPQR's, or to test the materials them self.

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 added value of DT in relation to the development of welding procedures.
- Understand the objectives of a welding procedure and the welder qualification tests.
- Understand test reports, including the information and results from DT.
- Select the appropriate test that is requested by the code/standard.
- Carry out witness performance tests for welding procedures.
- Evaluate DT as a service or as an in-house activity.

Specific Learning Outcomes

- 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 know how to:

- Create a Destructive Testing schedule
- To plan, execute and document destructive testing operations
- 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.

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.
- 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 know how 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.
- Create a set of tests for documentation of the inspection.



CU 9 - Documentation Before Delivery

General Content

The students learn how to produce a Product Documentation Record Book. This book will be the fabrication documentation to be delivered together with the product to the customer.

CU 9 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

- 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.
- Create a Product Documentation Record Book, for the fabricator and the customer.
- Understand the consequences of a product recall or reclamation.
- Create a feedback loop back to design that includes data from the production.

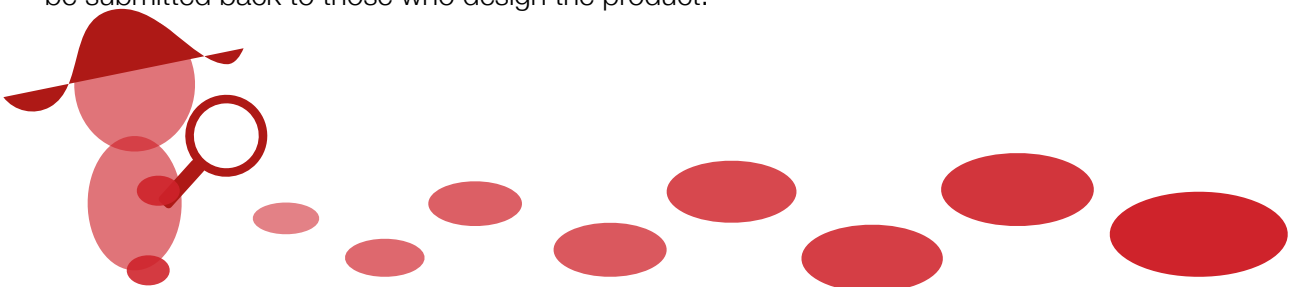
Specific Learning Outcomes

- Define and create a PDI checklist.
- Identify and list all critical components in the product delivery.
- Create a Product Documentation Record Book.
- Create a feedback document that is highlighting the experiences with the production of this product.

General Competence

The student will be able to:

- Create product documentation for the fabricator and the customer.
- Create «as-built» documentation for the product.
- Submit a Product Documentation Record Book with the product containing all relevant documentation.
- Create a feedback routine that applies a format that allow experiences from the production to be submitted back to those who design the product.



CU 10 - Course Summary, 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 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:

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

