Course title: IW-Fillet Welder

An IQSIM2 blended learning Pilot Distance Course **(pdIW-F)**

Overview of CUs and Learning Outcome

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Definitions

Face to face meeting: Physical meetings to be arranged by the course provider.
E-learning: The content and tasks to be delivered through Its Learning software platform. A separate student guide (under development) for the use of Its Learning, will be available for this purpose.
Work based Learning: Is an educational strategy that provides students with real-life work experiences.
Zoom: Zoom video meeting initiated by the teacher
Zoom groups: If required for the course, groups can be defined. If so, also individual zoom group meetings may take place
Practical tasks: Work to be arranged either through the training provider or in own workshop together with a local mentor.
Manufacturing: is the making of welded goods, or products, by hand or by machine that upon completion the business sells to a customer. Items used in manufacture may be raw materials or component parts of a larger product. The manufacturing usually happens on a large-scale production line of machinery and skilled labor.
Competence: A Competence is the ability to do something well. It indicates a satisfactory state of knowledge, skills and attitudes and the ability to apply them in an aspect of your job without the supervised practice of a mentor.
Knowledge: The understanding, or awareness, of or information about a subject that you get by experience or education/study.
Skills: A learned ability to do a determined activity or job well, especially because you have practiced it before.
Learning Outcomes: Learning outcomes are statements that describe the knowledge or skills students should acquire by the end of a particular assignment, class, course, or program, and help students understand why that knowledge and those skills will be useful to them.
Competence Units, CU: Measurement of learning, a Competence indicate a satisfactory state of knowledge, skills and attitudes and the ability to apply them in a variety of situations. It is the minimum element of a knowledge or competence that can be partially recognized and accredited.
RPL: Mapping (Request) for prior learning (RPL). In this document RPL is an abbreviation for mapping of experience related to the topic in the CU.

Course structure.

The course consists of a number of CU´s. A CU is the smallest element in the education system that specifies Learning Outcomes, Skills and Competence. A CU can be delivered individually, or it can be delivered in combinations with other CUs in order to cover a defined range.

In this course **there are only one type** of Competence Units. In the EWF Guidelines they describe two different types of CUs, but from a practical point of view for this project such a differentiation should not be required.

According EWF Guidelines:

* Cross-cutting Competence Unit - A competence unit whose learning outcomes are not directly linked with one job function since the knowledge and skills achieved will be mobilized in several job functions and activities. (CU-1, Introduction to the course, is a typical example of such a unit). Or one might define such CUs as horizontal CU which can be used in different structures.

* Functional Competence Unit - A competence unit whose learning outcomes are directly linked with at least one job function and in which the knowledge and skills achieved will be mobilized in specific job functions and related activities. This can also be seen as a vertical CU because it will be a part of a skills education.

The expected learning outcomes are described in two ways: generic outcome descriptors organized in knowledge, skills, autonomy and responsibility; and in detail for each competence unit, organized in job functions and related activities, knowledge and skills corresponding to a specific proficiency level (we are following the EWF´s Systems Framework levels).

On each Competence Unit, objectives and scope are defined for a specific depth of knowledge and skills.

Work Based Content

The course will clarify the inspector’s role in manufacturing where it begins well before welding starts, continues during the welding operation, involves action after welding is completed, and is finalized only when the results are properly reported.

The course will be work-based 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.

Learning methods and activities

The activities in this course are work-based and follows a product as it is being produced in the factory until it is ready for delivery. The manufacturing process has been divided in logical steps whereby the learning activity and learning content and tasks, are distributed according to the status of the manufacturing process.
Activities in the course will be both planning activities as well as practical tasks to be carried out in the workshop together with the company mentor.
The learning material will be distributed through the LMS (Learning Management System) system provided for this course.
Learning methods will be a mixture of solving planning and reporting tasks through the classroom or through the LMS (Learning Management System) system and practical hands-on training in the workshop.
The CUs will follow the work-based production process. Each CU will either be a part of the work preparation activities or a part of the production activities.

RPL

Request for prior learning (RPL) will be carried out before the start of the course and the CU`s. The RPL will contain relevant questions about the student’s background and experience. The teacher may, based on the result, choose to divide the participants into groups where each group will contain a mixture of students with knowledge and skills and students with less knowledge and skills.
RPL might also be used during the course, as a start for the course CUs, in order to highlight the most important factors to address during the CU presentation and discussions.

Compulsory assignments

The students must submit all tasks, both practical and theoretical, given through the different course CUs. All CUs have practical tasks for the students.

Specific conditions

The course requires that the student has access to a workshop where products are manufactured. The products in the workshop will be used during the practical training sessions in this course.

Student’s background

Students enrolling this course ought to have the following background:

- The students must possess sufficient level of health, and physical and mental capacity to undergo the training.
- The students must possess knowledge of, or education, in metalworking.

Course materials

Course materials contains relevant international standards and EWF (European Welding Fabrication) Guidelines for International Welder, EWF-IAB-089r5-14, which are relevant for this course. Theory modules A+S (+P)
Additional course materials have been developed for this course and can be downloaded by the students from the LMS system

Examinations

Each course CU will have a short examination, assessment, test yourself, through a set of multiple-choice questions. It will in addition be a continuous assessment of the course through each CU.

Expected workload for the students

The expected total workload for the course is 220 hours, where 140 hours in the course itself is related to practical welding, 40 hours of theory and estimated own workload approximately 40 hours in addition.
The workload of 170 hours follows the EWF Guideline for European Fillet welder.

IW_Fillet Welder course.

General, Course content

In this course the students will get an advanced knowledge of welding both in theory and in practical work and application. The knowledge and competence gain through this course will enable the student to perform the following tasks in the company:

* Know the operating principles of the welding equipment
* Know and understand the hazards and basic safety requirements when welding
* Know how to perform welding activities in the fabrication workshop in a safe manner
* Know how to work to a WPS and knowing the welding parameters
* Know the effect of the welding parameters on performance and the weld geometry
* Know the basic of welding steel
* Know the basic of welder qualification according to ISO 9606
* Know the basic of the power source for MIG/MAG(131/135)
* Know the responsibility for quality and documentation of own quality.
* Know how to report own work.

General Learning Outcome for the course

- Describe the principles of arc welding
- Be able to select the right filler material and to treat the filler material according to procedures
- Be able to use personal protection equipment
- Be able to protect the working environment from welding hazards
- Be able to understand and interpret welding drawings with symbols

Specific Learning Outcomes

- To be able to set the working parameters in the welding equipment according to a WPS
- To be able to understand the metal transfer principles for arc welding

- To be able to develop competence for single and multi-pass fillet welds
- To be able to work in confined spaces in a safe manner
- To be able to read welding drawings and understand welding symbols
- To be able to create a skills update plan for inspection personnel.
- To be able to interpret the ISO 9606 and understand the range of qualification
- To be able to define none-conformances and corrective actions

General competence for the course

After completing the course, the student will get an advanced knowledge and competence of fillet welding in mild steel.
This will enable the student to perform the following tasks:
*Verify, comment and review a work order with WPS for fillet weld.
* Set-up and adjust the welding equipment according the WPS
* Take decisions based on visual inspection of own work and document corrective actions if required
* Set up the working environment based on HMS requirements
* Define the correct equipment for personal safety
* Carry out visual inspection of own work
* Establish non-conformance documentation

Course Competence Units---CU`s

CU-1	**Title: Introduction, ICT**	**Learning material: 43 pages, PDF format**
	Content In this CU the students will get an introduction to the course, containing the following topics where they will learn to know each other and the teacher. A presentation of the course and the education methods for this course will be presented. The data tools in this course, Its Learning and ZOOM will be presented, and the students will be familiarized in how to use them for getting information, delivering reports and for communication purposes. A presentation of the education structure and methodology with emphasis on work-based training and how this will be implemented in the course will be presented and explained.	

	General Learning outcomes *Learn the EWF Guideline for International Welder *Be able to navigate through the available welding standards and select the right standard for a task * Get an overview of the welding standards * Be able to evaluate which other standards and procedures that shall be met during work * Be able to evaluate the HMS requirements for å job **Specific Learning Outcomes.** * Know the basics responsibility for own work as a fillet welder * Identify the welders' responsibilities in fabrication * Understand the HMS responsibilities of the welder **Competence.** The student will know how to: * Use the data tools needed for e-learning sessions. * Use an LMS (its Learning) tool for extracting learning materials. * Use an LMS tool for submitting tasks and solve multiple choice questions. * Work in groups through using modern data tools, used in the course. * Use Zoom, or similar, video communication tool to communicate with the teacher and other students **Use of IQSIM** Not foreseen in this CU	
CU-2	**Title: Evaluating a work order**	**Learning material: 13 pages, PDF format**
	Content. Through this CU the students will face the following situation: A work order has been released. The welder will get appropriate drawings and Welding Procedures t be used during his/her work. The student will evaluate the work order to see if all relevant information's are available **General Learning outcomes: Knowledge** • Understand the basic terms of welding	

	• Know the range of welder's certificate • Know the basic requirements for a welder's test for certificate **Specific Learning Outcomes.** *Understand the validity of a welder's certificate *Understand the range of approval and the requirements for renewal of certificates * Understand which regulations will be required for the HMS **Competence.** The student will know how to: • Follow up the validity of the welder's certificate according to ISO9606 • Understand which standards that will be important for the job • Understand his/hers responsibility for reporting according ISO 6520 **Use of IQSIM** Not foreseen in this CU **Basic: A1 + A9**	
CU-3	**Title: Planning for starting the work order**	**Learning material: 18 pages, PDF format**
	General. Through this CU the students will carry out planning activities for the work-order that has been given. This will include both the welding equipment for the job as well as the welding parameters and how to define any defects as a result of the work **General Learning outcomes: Knowledge** • Basic knowledge of welding on steel structures and piping • Identifying materials according to ISO/TR 20172 • Define imperfections according to ISO 6520 • Learn the welding symbols according to ISO 2553 **Specific Learning Outcomes.** *The effect of welding parameters on the weld geometry *How to avoid magnetic arc blow *Know the different types of imperfections according to ISO 6520 *Describe the major components of the welding equipment	

	Competence. The student will know how to: • Define imperfections according to ISO 6520 • Report defects and imperfections according to ISO 6520 • Identify and verify materials according to ISO/TR 20172 • Read welding drawings and understand the meaning of welding symbols **Use of IQSIM** Will be used in this CU Material related questions and discussions **Basic: A2, A7, A8**	
3.1	Practical tasks Identify the plates and mark the different plates/pipes to be used. Test magnetic arc blow. Identify the major parts in the welding eqipment	
CU-4	**Title: Verification of HMS before starting the work**	**Learning material: 4 pages, PDF format**
	General. Through this CU the students will be able to verify the requirements for HMS on a personal level as well as the influence of the HMS for the working environment. the student should be aware of the HMS requirements for personal protection equipment, but also the need for protection of the workplace in order to ensure that the other employees are not affected by the work. **General Learning outcomes: Knowledge** * Know the dangerous situations that can arise from the use of the welding equipment * Know how to ensure that the workplace is safe with the necessary marking for escape routes and so forth * How to ensure that the other employees have a safe working environment based on the welding activities * Know how to work in confined spaces **Specific Learning Outcomes.** • Know the specific hazards in the working shop • Know the needs for ventilation • Know the measures to prevent noise hazards • Know how to prevent fire du to hot work • Know how to handle gas cylinders **Competence.** The student will know how to:	

	*Understand the hazards and basic safety regulations when welding *Perform welding operations in the workshop in a safe manner *Use personal protection equipment **Use of IQSIM** Will not be used in this CU **Basic: A3, A4**	
4.1	Practical tasks Test the different personal protection equipment. Test ventilation system. Test other HMS equipment to be used during the welding operation	
CU- 5	**Title: Preparing the welding equipment and filler**	**Learning material: 52 pages, PDF format**
	General. The students will learn how the basic functions of the welding equipment as well as how to handle the welding consumables. This includes how to dry and store consumables in a correct way according to the manufacturer's guideline. Learn to work with a WPS and the influence of the welding parameters to the results of the weld pool. **General Learning outcomes: Knowledge** ***** Know the use, types and function of the welding consumables * Know the different welding positions according to ISO 6947 * Know the different joints and the surface finish **Specific Learning Outcomes.** • Identify the fillet welds and its size and shapes • Identify undercut and overlap in fillet welds • Daily maintenance of the welding equipment • Handling of gas bottles **Competence.** The student will know how to: *Use a WPS in production *Perform welding operations in the workshop and to adjust the welding parameters *Maintain the welding equipment and report deviations * Handle gas bottles and safety procedures for gas equipment	

	Use of IQSIM Will be used in this CU Weld and joint details **Basic: A5, A2**	
5.1	Practical tasks Handling and secure gas bottles and regulators. Handle and storage of filler	
CU- 6	**Title: Assembly and tack welding**	**Learning material: 44 pages, PDF format**
	General The CU covers the topic of assembling the material and tack weld before final welding operations. The importance of correct assembly according to drawings and learn the consequences of a bad assembly will be covered. **General Learning outcomes: Knowledge** • Have the basic knowledge of welding consumables for MIG/MAG tack welding • Know the typical parameters for MIG/MAG • Know the basic safety requirements for MIG/MAG **Specific Learning Outcomes.** • Learn to know the different types of power sources and guns, earth cables and clamps • Learn to know the application of different wire sizes and gas • Selection of shielding gases • Verify that the tack weld has the same quality as the main weld **Competence.** The student will know how to: * Assemble the materials in a correct manner and learn the consequences of a bad fit-up *Perform tack welding operations in the workshop *Evaluate the safety procedures for the tack welding *Apply the correct HMS measures when tack welding	

	Basic SM-1, SM-2, SM-3	
6.1	Practical task Assemble test plates for the different welding positions. Ensure that the plates are assembled according to drawing. Tack weld the plates to be used for CU-7 and verify that the tack weld has the same quality as the main weld Assemble tube to test plates for the different welding positions. Ensure that the plates are assembled according to drawing. Tack weld the plates to be used for CU-8 and verify that the tack weld has the same quality as the main weld **Use of IQSIM** Will be used in this CU Weld and joint details	
CU-7	**Title: Welding in position PA, PB, PG**	**Learning material: 77 pages, PDF format**
	General The CU covers fillet weld on plates in position PA, PB, PD, PF and PG This CU covers mainly practical tests and examinations on small plates in order to build competence in the welding process **General Learning outcomes: Knowledge** *Adjust the welding parameters according fillet weld in different positions * Create sound fillet welds with the appropriate characteristics specified in the WPS * Create both single run and multi-run fillet welds *Carry out visual inspection on the welds **Specific Learning Outcomes.** • Learn how the adjust the welding parameters to obtain the fillet weld profile • Learn how to measure the fillet weld to ensure it complies with the WPS requirements **Competence.** The student will know how to: • To carry out fillet welds on plates in the specified welding positions. • Carry out single pass as well as multi-pass fillet welds • Take appropriate actions if the fillet weld is not correct • Adjust the welding parameters according to the welding positions • **Use of IQSIM** Will be used in this CU Weld and joint details	

	Basic SM-4 M-2	
7.1	Practical task Weld the plates for this task. Carry out all necessary repairs before the final report is made	
CU-8	**Title: Welding in position PD, and tube to plate PB and PH**	**Learning material: 3 pages, PDF format**
	General. The CU covers fillet weld on tube to plates in position PB, PH and PD. The CU covers both single pass as well as multi-pass fillet weld Through this CU the students will get basic **General Learning outcomes: Knowledge** *Adjust the welding parameters according fillet weld in different positions * Create sound fillet welds with the appropriate characteristics specified in the WPS * Create both single run and multi-run fillet welds * Carry out visual inspection on the welds **Specific Learning Outcomes.** • Learn how the adjust the welding parameters to obtain the fillet weld profile • Learn how to measure the fillet weld to ensure it complies with the WPS requirements **Competence** The student will know how to: • To carry out fillet welds on plates in the specified welding positions. • Carry out single pass as well as multi-pass fillet welds • Adjust the welding parameters according to the welding positions • Take appropriate actions if the fillet weld is not correct **Use of IQSIM** Will be used in this CU Weld and joint details **Basic M-3, A7, B8, B9**	

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8.1	Practical task Weld tube to plate for this task. Verify that the tack weld has the same quality as the main weld	
CU- 9	**Title: Visual Inspection and Documentation before delivery**	**Learning material: 113 pages, PDF format**
	General The students will be able to visually inspect the fillet welds and report their own work and to document any deviations. They will be able to use the most common tools for visual inspection and verification of the fillet welds. Implications of failure and the product reliability will be highlighted. **General Learning outcomes: Knowledge** • Know why a weld will fail • Know the consequences of a failed weld • Know how to visually inspect a fillet weld **Specific Learning Outcomes.** • Create visual inspection ow the welds • Document the results of visual inspection • Learn to use the tools for visual inspection • Implication of failure and product liability **Competence** The student will know how to: • Carry out visual inspection on single-pass and multi-pass fillet welds • Create a visual report as well as non-conformance report of fillet welds **Basic C3**	
9.1	Practical task Visual inspection of own welds, both single-pass and multi-pass welds. Create a short report for the visual inspection Verify that the tack weld has the same quality as the main weld	
CU10	**Title: Course summary, examination**	

10	**General** Product delivery and acceptance This part of the course will be focusing on delivery of the product to the next production step It also focuses on how to create non-conformance notice and corrective actions. It will be a summary of the course and for the preparation of final assessment of the course itself **General Learning outcomes: Knowledge** * Understand the consequences of a product recall or reclamation. * Understand the knowledge and competence requirements for the final assessment **Specific Learning Outcomes.** • Be able to verify and document own work • Be able to report according requirements in a work order **Competence** The student will know how to: • Submit a set of welds according to specifications and drawings with the required quality • Create a set of documentation for own work Preparation for examination, both theoretical and practical tests Summary of course

Video material:

Video no Topic reference
No 1 Sorting of materials https://vimeo.com/827157365
No 2 Welding deformation in fit-up and tack welding https://vimeo.com/827158513
No 3 Avoiding welding deformation https://vimeo.com/827159114
No 4 Welding deformation shrikage https://vimeo.com/827159919
No 5 Tig process https://vimeo.com/827160523
No 6 HES thematics https://vimeo.com/827161477
No 7 Welding workplace https://vimeo.com/827162272
No 8 Use of WPS https://vimeo.com/827163003
No 9 Heat distortion https://vimeo.com/827163662
No 20 Wire distribution to the torch https://vimeo.com/user78287845
No 21 IQSIM what happens if https://vimeo.com/user78287845
No 22 Welding in position PF https://vimeo.com/user78287845