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# Harmonised Recognition of Prior Learning Scheme for the European Destructive Testing Technician

Intellectual Output 5 Development of RPL Tools

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# 1. Introduction

The harmonised Recognition of Prior Learning (RPL) scheme, being used in the TRUST project, has per base the RPL scheme conceived in the MAKE-IT project (www.http://makeitproject.eu/). In this previous project to TRUST, a European sector-oriented qualification system, based in the Learning Outcomes (LOs) approach was developed and a European harmonised scheme for RPL for the Welding sector was established. In the design of this RPL scheme specific stages and tools for recognition were defined, which will be considered as guiding references behind the work being developed in the TRUST project, for the harmonised RPL scheme for the European Destructive Testing Technician.

The adoption of an RPL scheme in the welding sector allows professionals across Europe, and worldwide, to enter and achieve a Qualification, without needing to leave work to dedicate months to training in a conventional way. The RPL can be used for personal or career development, allowing professionals to have their know-how and skills recognized in a harmonised European Qualification system, thus reinforcing the concept of lifelong learning.

The adoption of a recognition and validation of competencies model for the European Destructive Testing Technician, undertaken in the TRUST project, will allow experienced professionals already working in the destructive testing field, without holding a diploma or certificate, to show evidences of their know-how and skills previously acquired in a diversity of contexts, namely formal (happening in an organised learning environment - education or training institution or job), informal (happening in a non-structured environment – daily activities related to work, family or leisure) and non-formal (happening in planned activities not explicitly designated as training providers).

The European Welding Federation (EWF) alternative route to training, targets individuals who may already have experience in the job function at a particular level without holding the appropriate qualification diploma. These individuals can demonstrate their capability to proceed to examination either directly without compulsory attendance of an approved training course or by attending only part of such a course. Still, the alternative requires the support and development of specific tools to enable the identification, recognition, and validation of knowledge and skills. The RPL model and tools, being developed in the TRUST project, intends to be flexible and transparent in the way the prior experience is assessed. This will be achieved through the clear definition of stages, tools and actors involved in the

process, as well as the development of harmonised tools that will support the implementation of the model across Europe. This way the following aims are expected to be attained: -Introduce this innovative European Destructive Testing qualification among new EU partners; -Reinforce the use of the RPL model among EU partners that are already providing training, but do not have established processes for recognition of work-based learning and validation of qualifications; -Enhance skills and competences of trainers in the welding sector, and specifically in Destructive Testing, by promoting the exchange of successful pedagogical methods and practices between teachers and trainers from VET; -Develop an EU Network to stimulate future cooperation and mobility in the field of education and work and promote the project results as a best practice to other technological fields.

## 2. Stages of the validation process

The process of validation has four stages (according to the Recommendation of the Council of the EU, 2012):

a) Identification
b) Documentation
c) Assessment
d) Certification

In the EWF Education, Training and Qualification System an important clarification is needed between the concepts of **Certification and Qualification:**

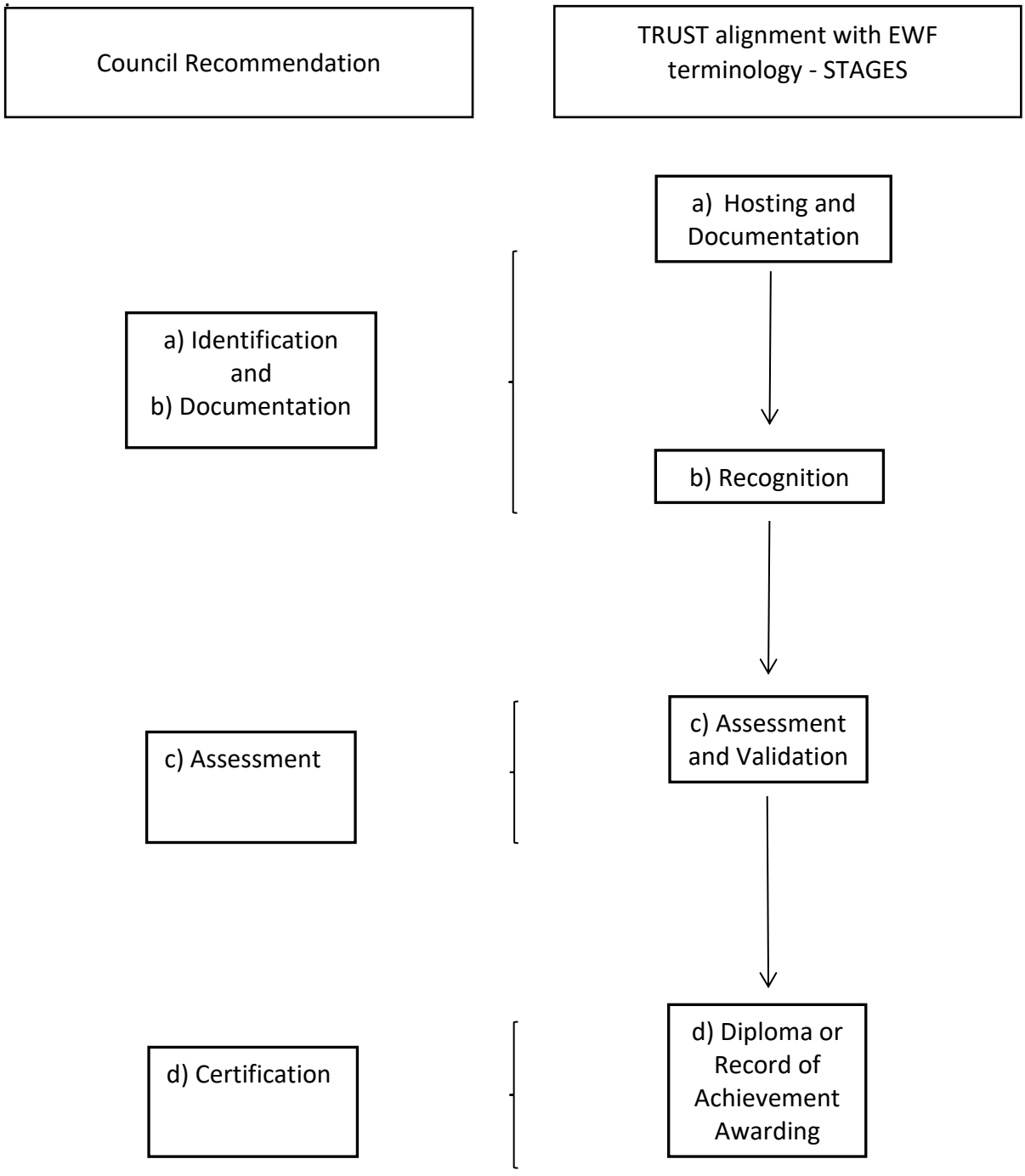
- EWF Certification of Welding Personnel refers to the process of assessing and recognising welding job competences in Welding Coordination, Plastics Welder and Welder, Welding Operators and Brazers. This process leads to the issuing of a Certificate with a validity period. As Certification is an industry requirement, certified personnel have to apply for renewal well before the expiry date in order to ensure continuity of certification.
- Qualification of Welding Personnel refers to the process of providing training according to specific guidelines, thus covering all professional's levels in welding and related areas, such as Thermal Spraying, Adhesive Bonding, Plastics Welding and Underwater Welding. The EWF Qualification System assures harmonised knowledge, skills and competence for any holder of a diploma in any region of the world.

Thus, the EWF concept of Certification is distinct from the Certification phase of the Validation process. To avoid misunderstanding only the Council Recommendation definition will be used from now on when referring to the certification stage.

For the purpose of this document, it was necessary to adapt the four stages to the context of sectoral performance, as presented below in Figure 1, so the following designations have been adopted instead:

a) Hosting and Documentation
b) Recognition
c) Assessment and Validation
d) Diploma Awarding

Figure 1 - Four stages and its relationship with the sectoral context (e.g., welding and destructive testing field)



## 2.1. Hosting and Documentation

This stage of hosting and documentation is very important for the candidates to make an informed decision about their participation in the process and to feel accompanied from the beginning. The information to be made available at this stage should include, among other elements:

- Information on the European Destructive Testing Technician (EDTT)
- Information on the EWF routes for Qualification
- The advantages of the process
- The requirements for applying to the EDTT RPL Process
- The rights and duties of the candidate
- The steps that make up the process
- The associated cost

In this stage, the candidate is informed about the requirements that he/she needs to comply with in order to start the RPL Process. There are some tools that can support the hosting and documentation stage. The Portfolio is the preferred tool at this stage. It should include the information gathered with the Professional and Training Registration Form; the Interview Guide (optional) and the Self-assessment Grid, with the relevant Certificates and Diplomas related to Destructive Testing. With these forms, the candidate will be able to provide evidence of his/her professional achievements, including employer details, duration, roles, and responsibilities, as well as the relevant qualifications, education, and training paths. The combination of these different instruments is an added value for the identification of the knowledge, skills, and competencies previously acquired by the individual. The actors involved in the hosting and documentation phase are the ATB – EWF Authorised Training Body – and the candidate. The ATB will receive the candidate's application and provide detailed information about EDTT qualification and remaining European Qualifications foreseen in the EWF harmonized qualification system.

## 2.2. Recognition

The documentation gathered in the Portfolio must be validated so that the candidate may start the RPL Process. In this stage the candidate shall present evidences that he/she fulfils

the requirements mentioned in the hosting and documentation phase so that they can start the RPL Process. A tool that can support the recognition stage is the Portfolio Checklist. This will be used by the candidate and ATB in order to verify the compliance with the requirements and the presentation of the mandatory and other relevant documents to the process. The main actor involved in this stage is the ATB that has the following tasks:

- verify if the candidate complies with the requirements
- verify if the candidate has valid evidence
- fill in the header table of the portfolio checklist in accordance with its decision

## 2.3. Assessment and Validation

The validation of professional competencies focusses on the analysis and assessment of the Portfolio according to the EDTT Learning Outcomes (LOs) Standards, plus the Technical Interview and the Examination. Based on this assessment, the competences to be validated and the competences still to be evidenced and/or developed are identified. More specifically, the following should be considered: the competence unit, the gathering of additional evidence of the competence, the comparison of the evidence with the corresponding standard, and the formulation of a judgment based on the evidenced competence. The standards of competencies are built for each qualification and follow the same basic structure, which is characterized as follows:

- A set of Competence Units (CUs)
- A set of subjects
- Each CU consists of one or more actions/achievements

Some tools can support the assessment and validation process, improve it and show evidence of the competences acquired, such as: Technical Interview and Practical Demonstrations. The actor involved in this phase is the ATB which is responsible for conducting the Portfolio Technical Review and the Technical Interview.

The results obtained by the candidate have then to be reported to the ANB – EWF Authorised Nominated Body - before the examination. Whenever the candidate shall demonstrate destructive testing skills, an authorised examiner approved by the ANB, which can be a destructive testing trainer, must be designated to evaluate the candidate. Impartiality of the trainer has to be guaranteed according to the European Destructive Testing specific

requirements addressed in Output 2 – European Destructive Testing Technician Profile Curricula. The development and implementation of the examination system is the responsibility of the Examination board, under the supervision of the ANB.

### 2.4. Diploma or Record of Achievement Awarding

The final stage of the RPL process consists of the awarding of the Diploma by the ANB to the candidate that has successfully passed the written and practical examination, thus fulfilling the intentionally established patterns, which reflect the demands of professional and individual performance. Based on the candidate's performance and the final decision of the Examination Board, two kinds of documents can be issued, both intended to be valid for life:

- A Diploma, addressing the full EDTT Qualification, whenever the candidate has successfully completed all the exams required to obtain a qualification
- A Record of Achievement, addressing Competence Units, whenever the candidate has successfully completed only specific CUs (e.g., parts of a qualification)

At this stage there is only one actor involved which is the ANB. The ANB is responsible for awarding the candidate's Diploma as the result of successfully completing the RPL Process for a Qualification or Competence Unit.

## 3. Tools

The tools used in the RPL process are very important to the quality, validity and reliability of the process. There is a wide range of tools that can be used either to extract evidences or documenting and presenting those evidence.

### 3.1. Tools to extract evidences

**Tests and examinations** – Tests and examinations can be more easily connected to education and training standards than other methods but in areas where practical skills and competences are important, the result of the test can be inconclusive regarding the extent of knowledge and learning.

**Conversational methods** – Interviews can be used to extract additional information about the knowledge, skills and competences that can be already documented. They can have an important role all through the RPL process, especially in the identification of acquired

competences. Interviews can be useful to lead the applicant to a more "structured guidance session". However, it is necessary to implement an adequate protocol in order to assure that the result is reliable and fair. The assessors need to follow a methodological guide so that they can get the relevant and appropriate information about the applicant.

**Declarative methods** – Based on individuals' independent identification and recording of competences and validated by a third party. However, it is important for the individuals to have a clear method or guideline to follow in the self-assessment of knowledge and skills. Guidance from the counsellors can help in giving more transparency and reliability to the process. ex: CV; self-assessment questionnaire on acquired professional skills.

**Observations** – Extracting evidence while the applicant is in the workplace. Observation can be a way of demonstrating the skills and competences otherwise difficult to validate.

**Simulations** – They are used when observation in the workplace is not possible. Simulations can solve part of the problems of observations undertaken at work as they can place individuals in various contexts and increase assessment validity.

**Evidence extracted from work or other practice** – A candidate gathers evidence of learning outcomes from work situations, voluntary activities, family, or other activities. The evidence is used in the validation process of competencies by the assessor.

## 3.2. Tools for documenting and presenting evidence

Some examples of additional tools of evidence and evaluation that can complement the CVs (Professional and Training Form) and/or Portfolios are presented in detail below.

**Professional and Training Registration Form**

The professional and training registration form is a general tool that must be used by all applicants who wish to recognise and validate their competencies. This is an additional document to the curriculum vitae, which allow to sum up the relevant professional career (e.g., workplaces, job functions, requirements for working, etc.) and training information (e.g., training actions attended). The form also includes a list indicating different types of documents which may constitute proof of performance of the required skills in practical training, and which aims to guide the candidate in gathering evidences. These certificates may include European Certificates, issued by the EWF recognised awarding bodies or by technical

colleges under careful control of the EWF awarding bodies, as well as other Certificates issued by recognised awarding entities not belonging to EWF. These supporting documents must allow the confirmation of the domain of specific destructive testing tasks/skills.

**Interview Guide (optional)**

The interview is an instrument that can be used in the various stages of the validation process, but with a greater incidence in the identification (hosting and documentation) and assessment. At the stage of hosting and documentation, the interview may come as a complement and confirmation of the information collected in the professional and training registration form, namely regarding the needs and expectations, the strategies used to deal with successes and failures, among other subjects. The interview must be individual and follow a guide adapted to each candidate considering the information previously collected. The interview is not a mandatory tool, and the guide may not necessarily be fully applied, as long as the information and the supporting documents are considered enough to validate specific information. According to the information previously collected, two types of interviews might be conducted:

- Semi-structured interview: to be used whenever there is few information on the candidate; suggesting topics should be provided leading the candidate to speak freely and the interviewer to ask more specific questions and draw conclusions
- Structured interview: to be used whenever there is sufficient information on the candidate; the questions on the interview guide should be asked, exploring the identified ambiguities and inconsistencies

The interview can be conducted in the candidate's workplace, whenever it is considered as an added value for the candidate to demonstrate his/her ability to perform a certain task, using examples of documents/work done.

**Self-assessment Grid**

The self-assessment-grid is a tool that might be used by the candidate during the hosting and documentation stage for self-diagnosis. Through this tool, the candidate can compare its own experience against the EDTT Learning Outcomes (LOs) Standards and identify the context in which skills and knowledge were acquired (e.g., if through the performance of professional

tasks or if through training). A detailed list and explanation of the evidences supporting its application should also be provided. The cross-referencing of the information recorded in the self-assessment grid with the evidence identified in the portfolio about the candidate is fundamental to reducing the subjectivity inherent to the self-assessment processes. It should be noted that the self-assessment grid does not have an effective evaluative role, since its completion never determines, on its own, the validation or non-validation of competence units.

**Portfolio and Portfolio Checklist**

The portfolio consists in the set of evidences and proofs regarding the acquired competences. The portfolio, as well as being an assessment element, is also the product of the whole process, which is constantly updated, since it not only integrates the evidence of competences previously acquired in training or professional contexts, but it also includes the reports that support the validation of the candidate's competences according to the professional skills reference. The portfolio begins to be created during the hosting and documentation stage, structuring itself with greater objectivity in the sequence of the information contained in the professional and training form. The completed professional and training form must always be a part of the candidate's portfolio. The results of the technical interview, as well as the practical demonstrations carried out in the assessment stage, should also be part of the portfolio, as they themselves constitute a way of demonstrating the domain of the execution of certain tasks/evidence of certain competences. In addition to these elements, reports, certificates and testimonies or other elements that justify the professional competence held, may also be attached. Together with the self-assessment grid, the portfolio is examined, and it is from this point on that the portfolio checklist can be completed. The analysis and further development of the information gathered with the portfolio checklist together with the data taken from interviews and the (self)completion of instruments will allow for validation according to the standard of professional competencies.

**Portfolio Technical Review**

If the candidate complies with the requirements, then the assessment begins with the technical review of the portfolio. This document has the same structure as the self-

assessment grid allowing the ATB to control the consistency between data of the self-assessment grid and the portfolio contents. The information collected with the portfolio technical review document is important to prepare a targeted technical interview for the candidate.

**Technical Interview**

The technical interview has a high evaluative role, in the sense that it confirms if the candidate has or not the required level of knowledge and skills to move to the next stage of the RPL process (validation through examination). This guide should be used in this context as a tool to support the ATB personnel to conduct the interview. At least 2 people are recommended to conduct the technical interview. To be approved in the interview the candidate has to score at least 70% in total, according to the different weights per Competence Unit (please refer to the 'interview scoring sheet' in the technical interview document). The criteria to be applied for scoring the candidate is the following:

- Wrong or incomplete answer – the score is 0
- Correct answer – correspondent maximum score (please refer to the 'interview scoring sheet' in the technical interview document).
- If the candidate passes the Technical Interview but not the Practical Demonstrations, he/she has to attend the practical part of the training.
- If the candidate achieves a score between 50% and 70%, in CU2, he/she is eligible to move on to the Practical Demonstrations, although he/she needs to attend the theoretical part of the training. In case the candidate passes the Practical Demonstrations, he/she doesn't need to attend the practical part of the training.
- If the candidate doesn't pass the Technical Interview, he/she doesn't pass to the Practical Demonstrations.

**Examination**

The candidate examination is mandatory within the validation stage, in order to guarantee international harmonised and common standards to comply with the industry requirements. This stage can be carried out as follows:

- **Written Examination:** it can be carried out as a written test which consists of a series of essay questions or series of multiple-choice questions
- **Oral examination:** it can be an interview between the candidate and all members of the examination board
- **Practical examination:** the candidates' skills can be demonstrated by a practical demonstration.

The duration of the exam may vary according to the qualification standard, and the number of CUs being evaluated. At least 2 people are recommended to conduct the oral examination. Impartiality of the trainer has to be guaranteed to perform the practical examination, according to the European Destructive Testing Technician Profile Curricula.

# 4. How to implement the RPL model and tools for the European Destructive Testing Technician

## Stage 1 – Hosting and Documentation according to the requirements

Requirements for applying to the EDTT RPL Scheme:

1. At least 3 years of experience working with Destructive Testing (DT) of metallic materials and welded joints.
2. Be in possession of a certificate confirmed by a specialist physician stating that the applicant satisfies the requirements specified in EN ISO 17637 (latest version) in relation to:

– near vision acuity: making it possible to read characters of at least no. 1 on the Jaeger scale or N 4.5 of the Times Roman scale or equivalent letters (1.6-mm in height) from a distance not shorter than 30 cm, using one or both eyes

– chromatic vision: making it possible to recognise colours and distinguish chromatic contrast or greyscale used in a given DT specified by the employer.

Tools:

1. Professional and Training Registration Form (Annex 1)
2. Interview Guide (optional) (Annex 2)

Actors involved:

1. ATB (EWF Authorised Training Body)
2. Candidate

The ATB will receive the candidate's application and provide detailed information about EDTT qualification and remaining European Qualifications foreseen in the EWF harmonized qualification system.

## Stage 2 – Recognition

Recognition of relevant experience:

Criteria: Compliance with the EDTT RPL entry requirements (Stage 1 – Hosting and Documentation)

Tools:

1. Portfolio Checklist (Annex 3)
2. Self-assessment Grid (Annex 4)

Output: Portfolio (It should include the information gathered with the Professional and Training Registration Form; the Technical Interview and the Self-assessment Grid, with the relevant Certificates and Diplomas related to Destructive Testing).

Actors involved:

1. ATB (EWF Authorised Training Body) with the following tasks:

– verify if the candidate complies with the requirements

– verify if the candidate has valid evidence

– fill in the header table of the Portfolio Checklist in accordance with its decision

2. Candidate

## Stage 3 – Assessment and Validation

Assessment of relevant knowledge and skills:

Learning Outcomes: according to the European Destructive Testing Technician Profile Curricula (IO2)

Criteria: Technical Interview criteria and Practical Demonstration criteria

Tools:

1. Portfolio Technical Review (Annex 5)
2. Technical Interview (Annex 6)
3. Practical Demonstration (Annex 7)

Actors involved:

1. ATB (EWF Authorised Training Body) with the following tasks:

– conducting the Portfolio Technical Review and the Technical Interview

–report the results obtained by the candidate to the ANB (EWF Authorised Nominated Body) before examination

Validation of relevant knowledge and skills:

Learning Outcomes: according to the European Destructive Testing Technician Profile Curricula (IO2)

Examination:

Criteria: 60% performance

Weithning: for practical and theoretical training

Tools: Written and Practical Exam

## Stage 4 – Diploma or Record of Achievement Awarding

Diploma: Full qualification

Record of Achievement: Partial based on competence units' results

Actors involved:

1. ANB (EWF Authorised Nominated Body) with the following tasks:

– awarding of the Diploma to the candidate

Figure 2 – RPL scheme for the European Destructive Testing Technician

## 5. Key actors in the RPL process

The validation process should be developed by a group of professionals who work together. Some of these professionals assume a more central and structuring role in the process as described next.

**Authorized Training Body**

The ATB is an organisation that has been assessed and approved by an ANB in accordance with EWF rules for training organisations. By awarding ATB status, the ANB confirms that the ATB fulfils the requirements for delivering training in accordance with one or more EWF Guidelines. It shall be an organisation independent from the ANB or clearly separated from it. The ATB in charge with the RPL process must check the authenticity and validity of the evidence presented by the candidate, as well as the compliance with the access requirements. A designated technician with relevant knowledge in welding approved by the ANB, including EWF Qualification System and the RPL process, and a dedicated team of experimented welding trainers approved by the ANB will perform the assessment in each stage of the process.

**Authorized National Body**

The ANB is an organisation that has been assessed and authorised by EWF in accordance with EWF rules and is responsible for ensuring that the standards of implementation of the EWF education, examination and qualification systems are maintained. In the RPL process the ANB is responsible for ensuring the quality in the implementation of the RPL process, according to rules defined, for designating the Examination board, and for issuing the Diploma.

**Examination Board**

An examination board, acting on behalf of the ANB supervises the ATB national part of the examination process. In this way, independence, integrity, and fairness of the examination system are maintained. The examination board is composed of the following elements:

- chairman (ANB member and independent from the ATB(s));
- representatives from the industry;
- the representative from the ATBs and/or from the VET.

The team of examiners is appointed by the ANB and is composed by a minimum of two people. Examiners responsibilities are to:

- Organise the examination (written and practical)
- Set the examination questions (written and oral as applicable)
- Conduct and mark the written, practical and oral examinations
- Decide on borderline results
- Decide the result of the examination

Requirements to be examiners are:

- Be familiar with the EWF qualification scheme
- Have a thorough knowledge of the relevant examination methods and examination documents
- Have appropriate knowledge and competence in the field to be examined
- Be fluent, both in writing and orally, in the language of examination
- Be free from any interest so that they can make impartial and non-discriminatory judgments

# 6. Annex

## 6.1. ANNEX 1: PROFESSIONAL AND TRAINING REGISTRATION FORM

PROFESSIONAL AND TRAINING REGISTRATION FORM

1. PERSONAL DATA

Name_____
Identification Card Number _____
Valid until _____ / _____ /_____ , Issued by_____

2. IDENTIFICATION OF THE HIGHEST EDUCATION OR TRAINNG LEVEL

Qualification/Course_____
Grade Awarded _____
Level of Qualification (EQF)_____

3. IDENTIFICATION OF PROFESSIONAL TRAINING

(Describe the main training acquired. You should describe the training courses taken, both in training entities and companies, as well as internships, seminars, and other events that you deem relevant).

| Date of Realisation (*) | Name of the Training Activity/Course | Provider | Total Duration (in hours) | Grade Awarded | Acquired Knowledge | Evaluation Methods (e.g., project, tests) |
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***(*) From the most recent to the oldest.***

## 4. IDENTIFICATION OF PROFESSIONAL ACTIVITIES

(Describe all the jobs you have had so far, regardless of whether they are related to the application for certification. It is important that you describe your entire career path. In this field, you should mention only your employment experience).

| Period (*) | Duration (years/months) | Employer/Company (**) | Branch of Activity | Professional Category | Positions Held | Tasks/Responsibilities (***) |
|---|---|---|---|---|---|---|
| **From:____/____/____**<br>**To: ____/____/_____** | | | | | | |
| **From:____/____/____**<br>**To: ____/____/_____** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **From:____/____/____<br>To: ____/____/_____** | | | | | | |
| **From:____/____/____<br>To: ____/____/_____** | | | | | | |
| **From:____/____/____<br>To: ____/____/_____** | | | | | | |
| **From:____/____/____<br>To: ____/____/_____** | | | | | | |

***(*) From the most recent to the oldest.***
***(**) In this field you should also mention the self-employment experience.***
***(***) In this field you should include information about conditions of work performance: a) Information received to carry out the tasks - type of information, who gives it and how it is transmitted; b) Information transmitted to others in the course of their tasks - what kind of information it gives, whom, how and why it does it; c) Professional relations with the outside of the company, for example, with clients or suppliers; d) Control of your work (by whom, how and when this is done, who decides the organization of your work).***

## 5. IDENTIFICATION OF NON-PROFESSIONAL ACTIVITIES/ EXPERIENCES

(Indicate the information that you consider useful for the evaluation of your professional experience. You should mention in this field the activities/ tasks/ functions performed on a voluntary basis).

| Identification of work developed | Duration (years/ months) |
|---|---|
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## 6. OTHER RELEVANT INFO (E.G., LANGUAGES PROFICIENCY, CERTIFICATIONS, LICENSES, ETC)

| | |
|---|---|
| **Certifications/Licenses** | |
| **Other** | |

## 7. ATTACHMENTS (CHECKLIST OF EVIDENCES)

(You should seek to gather evidence to demonstrate that you are able to perform the tasks you have pointed out)

## 8. ANY OTHER REMARKS

## 6.2. ANNEX 2: INTERVIEW GUIDE (OPTIONAL)

| Interview guide |
|---|

-Explain the purpose of the interview (remark: the interviews should not be a stage of exhaustive collection of information).

-What is the intended aim of the validation of skills previously acquired?

-Education background:

- Reasons for choosing the course;
- Areas/subjects of higher and/or lower preferences and their reasons;
- Areas/subjects with less or with greater difficulty of accomplishment and their reasons.

-Training activities, professional qualification courses, workshops, etc.

For each one of the courses attended, ask the candidate about:

- Reasons for attending the course;
- Reasons for dropping out of the course (if applicable);
- Usefulness of each of the training activities;
- Preferred tasks/subjects and their reasons;
- Tasks/ themes less preferred and their reasons;
- Tasks/ topics where you had /have greater difficulty of accomplishment and their reasons;
- Tasks/ topics where you had /have less difficulty of accomplishment and its reasons.

-Professional career

For each one of the professional positions, ask the candidate about:

- Reasons for choosing activity;
- Reasons for the completion of the activity;
- Preferred tasks/subjects and their reasons;
- Less preferred tasks/ themes and their reasons;
- Tasks/ themes where you had/ have greater difficulty of accomplishment and their reasons;
- Tasks/ topics where you had/ have less difficulty of accomplishment and their reasons;
- Concerning Destructive Testing:
    - Knowledge about DT;
    - Materials used (carbon steel, stainless steel, aluminium alloys, other);
    - Type of product used (plates, tubes, beams, other);
    - Type of weld used (fillet welds, but welds, branches).

-Non-professional activities/experiences

For each one of the activities/ experiences, ask the candidate about:

- Reasons for choosing that activity;

- Reasons for the completion of the activity;
- Preferred tasks/subjects and their reasons;
- Less preferred tasks/themes and their reasons;
- Tasks/ themes where you had/ have greater difficulty of accomplishment and their reasons;
- Tasks/topics where you had/have less difficulty of accomplishment and their reasons.

-Interests by area of activity

- Identifying areas of more and less interest (ask for concrete examples of daily life that support the self-assessment);
- Ask the candidate to rank the interests in order of preference.

-Competences

a) Information and Communication Technologies (ICT)

- Applications used and in which contexts;
- Classification as a user.

b) Foreign languages

- 1st language, 2nd language;
- Proficiency level and domains of application;
- Classification as a user (in the field of oral and written comprehension).

-Other data

## 6.3. ANNEX 3: SELF-ASSESSMENT GRID

| European Destructive Testing Technician (EDTT)<br>Learning Outcomes (LOs) Standard | | Self-assessment Grid | | | |
|---|---|---|---|---|---|
| To be used as a reference for the Recognition of Prior Learning (RPL) process | | Candidate Name and Surname:<br>Date and Place: | | | |
| **Competence Unit 1: Introduction to Destructive Testing** | | With my signature I confirm the authenticity of the information and attachments: | | | |
| SUBJECT | LEARNING OUTCOMES (LOs) | PROFESSIONAL EXPERIENCE | CERTIFICATE or DIPLOMA | N.A. | EVIDENCE |
| Introduction to Destructive Testing and Safety Rules in Destructive Testing | List the main DT used during tests of metallic materials and their welded joints, including their purpose and fields of applications | | | | |
| | Apply the appropriate safety rules to the performing task. | | | | |
| | Correctly use personal protective equipment when performing the test | | | | |
| | List hazards to personnel during DT | | | | |
| Design of Destructive Testing Machinery and Equipment | Match laboratory equipment with the type of DT | | | | |
| | Identify applicable DT according to the metallic material´s properties and the welding process used | | | | |

| European Destructive Testing Technician (EDTT)<br>Learning Outcomes (LOs) Standard | | Self-assessment Grid | | | |
|---|---|---|---|---|---|
| To be used as a reference for the Recognition of Prior Learning (RPL) process | | Candidate Name and Surname:<br>Date and Place: | | | |
| **Competence Unit 2: Mechanical Tests (Tensile Tests, Bend Test, Charpy Impact Strength Test, Fracture test, Hardness Test)** | | With my signature I confirm the authenticity of the information and attachments: | | | |
| SUBJECT | LEARNING OUTCOMES (LOs) | PROFESSIONAL EXPERIENCE | CERTIFICATE or DIPLOMA | N.A. | EVIDENCE |
| Tensile Tests of Metals at Room Temperature | Perform tensile tests to determine required properties according to standards | | | | |
| Tensile Tests of Welded Joints with Butt Welds, Cruciform Joints, Overlap Joints, and Joints with Fillet Welds | Perform tensile tests to determine required properties according to standards | | | | |
| Bend Tests of Metals and Welded Joints | Perform bend test of metals and welded joints to confirm material plastic properties | | | | |
| Charpy Impact Strength Test of Metals and Welded Joints | Perform impact test of metals and welded joint at ambient and lower temperatures to evaluate impact strength and percent shear fracture | | | | |
| Fracture Tests of Welded Joints | Perform fracture test and preserve fractured surface | | | | |
| Hardness Tests of Metals and Welded Joints | Perform measurements in metals and welded joints to evaluate hardness | | | | |

| | | | | | |
|---|---|---|---|---|---|
| TRANSVERSAL TO ALL SUBJECTS | Inspect the equipment to ensure that it is safe and suitable to use | | | | |
| | Identify the specimen to ensure traceability | | | | |
| | Use measuring equipment to determine all specimen essential dimensions | | | | |
| | Perform visual examination of specimen after test to analyse post test results | | | | |
| | Report/document test results according to the applicable standard | | | | |

| European Destructive Testing Technician (EDTT) Learning Outcomes (LOs) Standard | | Self-assessment Grid | | | |
|---|---|---|---|---|---|
| To be used as a reference for the Recognition of Prior Learning (RPL) process | | Candidate Name and Surname: | | | |
| | | Date and Place: | | | |
| **Competence Unit 3: Measurement Uncertainty** | | With my signature I confirm the authenticity of the information and attachments: | | | |
| SUBJECT | LEARNING OUTCOMES (LOs) | PROFESSIONAL EXPERIENCE | CERTIFICATE or DIPLOMA | N.A. | EVIDENCE |
| General methods of calculating uncertainties | To be able to realize a complete evaluation/calculate the type A and B uncertainty for Vickers hardness Test, Tensile Test, Charpy Impact Strength Test, and Bending Test | | | | |
| Measurement uncertainty for tensile test, impact test, and hardness test | | | | | |

## 6.4. ANNEX 4: PORTFOLIO CHECKLIST

| Portfolio checklist |
|---|

**Candidate name and surname:**_____

_____

| **Compliance with requirements for applying Recognition of Prior Learning Scheme (*[1]) *(to be filled in by the Authorised Training Body - ATB)*** | Yes | No |
|---|---|---|
| Min. 3 years' experience working with Destructive Testing | | |
| EN ISO 17637 (latest version) | | |
| The candidate fulfils the access requirements | | |
| ATB signature_____ | | |
| Date and place_____ | | |

***(*[1]) The ATB should verify the authenticity and validity of the evidence, as well as compliance with the entry requirements.***

| Type of documents | Yes | No |
|---|---|---|
| Professional and training registration form (*[2]) | | |
| Self-assessment grid | | |
| School diplomas (*[2]) | | |
| Diplomas for training courses (*[2]) | | |
| Diplomas of participation in seminars | | |
| Certification documents (*[2]) | | |
| Performance evaluations | | |
| Statements from previous employers | | |
| Previous job descriptions (*[2]) | | |
| Recommendation letters | | |
| Photography's/videos related with performed jobs | | |
| Awards/rewards | | |
| Result of the Technical Interview (*[2]) | | |
| *Others. Which?* _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ | | |

***(*[2]) The presentation of these documents is mandatory.***

## 6.5. ANNEX 5: PORTFOLIO TECHNICAL REVIEW

| European Destructive Testing Technician (EDTT) Learning Outcomes (LOs) Standard | | Portfolio Technical Review | | |
|---|---|---|---|---|
| To be used as a reference for the Recognition of Prior Learning (RPL) process | | Authorised Training Body (ATB) identification: | | |
| | | Date and Place: | | |
| **COMPETENCE UNIT 1: INTRODUCTION TO DESTRUCTIVE TESTING** | | In the portfolio assessment, the ATB should identify the candidate's knowledge and skills in each Competence Unit | | |
| SUBJECT | LEARNING OUTCOMES (LOs) | YES | NO | REMARKS |
| Introduction to Destructive Testing and Safety Rules in Destructive Testing | List the main DT used during tests of metallic materials and their welded joints, including their purpose and fields of applications | | | |
| | Apply the appropriate safety rules to the performing task | | | |
| | Correctly use personal protective equipment when performing the test | | | |
| | List hazards to personnel during DT | | | |
| Design of Destructive Testing Machinery and Equipment | Match laboratory equipment with the type of DT | | | |
| | Identify applicable DT according to the metallic material´s properties and the welding process used | | | |

| European Destructive Testing Technician (EDTT) Learning Outcomes (LOs) Standard | | Portfolio Technical Review | | |
|---|---|---|---|---|
| To be used as a reference for the RPL process | | Authorised Training Body (ATB) identification: | | |
| | | Date and Place: | | |
| **COMPETENCE UNIT 2: MECHANICAL TESTS (TENSILE TESTS, BEND TEST, CHARPY IMPACT STRENGTH TEST, FRACTURE TEST, HARDNESS TEST)** | | In the portfolio assessment, the ATB should identify the candidate's knowledge and skills in each Competence Unit | | |
| SUBJECT | LEARNING OUTCOMES (LOs) | YES | NO | REMARKS |
| Tensile Tests of Metals at Ambient Temperature | Perform tensile tests to determine required properties according to standards | | | |
| Tensile Tests of Welded Joints with Butt Welds, Cruciform Joints, Overlap Joints, and Joints with Fillet Welds | Perform tensile tests to determine required properties according to standards | | | |
| Bend Tests of Metals and Welded Joints | Perform bend test of metals and welded joints to confirm material plastic properties | | | |
| Charpy Impact Strength Test of Metals and Welded Joints | Perform impact test of metals and welded joint at ambient and lower temperatures to evaluate impact strength and percent shear fracture | | | |
| Fracture Tests of Welded Joints | Perform fracture test and preserve fractured surface | | | |
| Hardness Tests of Metals and Welded Joints | Perform measurements in metals and welded joints to evaluate hardness | | | |
| TRANSVERSAL TO ALL SUBJECTS | Inspect the equipment to ensure that it is safe and suitable to use | | | |

| | | | | |
|---|---|---|---|---|
| | Identify the specimen to ensure traceability | | | |
| | Use measuring equipment to determine all specimen essential dimensions | | | |
| | Perform visual examination of specimen after test to analyse post test results | | | |
| | Report/document test results according to the applicable standard | | | |

| European Destructive Testing Technician (EDTT) Learning Outcomes (LOs) Standard | | Portfolio Technical Review | | |
|---|---|---|---|---|
| To be used as a reference for the RPL process | | Authorised Training Body (ATB) identification: | | |
| | | Date and Place: | | |
| **COMPETENCE UNIT 3: MEASUREMENT UNCERTAINTY** | | In the portfolio assessment, the ATB should identify the candidate's knowledge and skills in each Competence Unit | | |
| SUBJECT | LEARNING OUTCOMES (LOs) | YES | NO | REMARKS |
| General methods of calculating uncertainties | To be able to realize a complete evaluation/calculate the type A and B uncertainty for Vickers hardness Test, Tensile Test, Charpy Impact Strength Test, and Bending Test | | | |
| Measurement uncertainty for tensile test, impact test, and hardness test | | | | |

## 6.6. ANNEX 6: TECHNICAL INTERVIEW

<table>
<tr><th colspan="3">TECHNICAL INTERVIEW</th></tr>
<tr><td colspan="3">Date and Place:</td></tr>
<tr><td colspan="3">Evaluation Committee:</td></tr>
<tr><td colspan="3">After the Portfolio analysis, a Technical Interview is conducted with a focus on the key actions/themes addressed in each Competence Unit (CU). To be approved for the Interview the candidate has to score at least 70%, according to the following weighting by CU:</td></tr>
<tr><th>CU1: Introduction to Destructive Testing</th><th>CU2: Mechanical Tests (Tensile Tests, Bend Test, Charpy Impact Strength Test, Fracture Test, Hardness Test)</th><th>CU3: Measurement Uncertainty</th></tr>
<tr><td>1st subject = 12 questions</td><td>1st subject = 5 questions</td><td>1st subject = 12 questions</td></tr>
<tr><td>2nd subject = 6 questions</td><td>2nd subject = 4 questions</td><td>2nd subject = 6 questions</td></tr>
<tr><td>TOTAL: 18 questions</td><td>3rd subject = 6 questions</td><td>TOTAL: 18 questions</td></tr>
<tr><td>WEIGHING: 10%</td><td>4th subject = 6 questions</td><td>WEIGHING: 10%</td></tr>
<tr><td rowspan="6"></td><td>5th subject = 6 questions</td><td rowspan="6"></td></tr>
<tr><td>6th subject = 6 questions</td></tr>
<tr><td>7th subject = 6 questions</td></tr>
<tr><td>Transversal to all subjects = 15 questions</td></tr>
<tr><td>TOTAL: 54 questions</td></tr>
<tr><td>WEIGHING: 80%</td></tr>
<tr><td colspan="3">If the candidate passes the Technical Interview but not the Demonstrations, he/she has to do the practical part of the training.<br>If the candidate achieves a score between 50% and 70%, in CU2, he/she is eligible to move on to the Demonstrations, although he/she needs to do the theoretical part of the training. In case the candidate passes the Demonstrations, he/she doesn't need to do the practical part of the training.<br>If the candidate doesn't pass the Technical Interview, he/she doesn't pass to the Demonstrations.</td></tr>
</table>

| COMPETENCE UNIT 1: INTRODUCTION TO DESTRUCTIVE TESTING | | | | | | |
|---|---|---|---|---|---|---|
| SUBJECT | LEARNING OUTCOMES (LOs) | QUESTION | TYPE OF ANSWER | SCORING | WEIGHING | NEXT STEPS |
| Introduction to Destructive Testing and Safety Rules in Destructive Testing | List the main DT used during tests of metallic materials and their welded joints, including their purpose and fields of applications | **1.** List the main standards and requirements where is written that DT of welded joints are require. | Standards like:<br>• National standards, ISO, ASME and others e.g., ISO 15614 (all of them),<br>• ISO 4136,<br>• ISO 9606,<br>• Requirements from<br>• Classification societies e.g.,<br>• PRS, RINA, RINAVE, LRS, BV, DNV GL, ABS, TÜV. | | | |
| | | **2.** Make a list of tests and divide them on the basis of the typical testing speed adopted for each test (e.g., divide the tests in two groups: static and dynamic). | • Static tests: tensile test, bend test, hardness test<br>• Dynamic tests: impact test<br>• The fracture test is not actually a test from the point of DT because an NDT certification is required to perform visual tests on the fractures;<br>• therefore, depending on method<br>• selected to break the specimen, it could be related to the static tests, to the dynamic tests or both. | | | |
| | | **3.** Which DT could give a quantitative value of material toughness? | • Impact test and tensile test;<br>• Eventually other tests could also be referred such has hardness and bending but they are not quantitative, only qualitative. | | | |

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|---|---|---|---|---|---|---|
| | Apply the appropriate safety rules to the performing task | **1.** How you will react if you need to perform a bend test but the safety of the machine you are going to use doesn't work. | If the safety of the machine is not working the whole machine have to be considered as not working, therefore, the test can't be performed. | | | |
| | | **2.** When using an old impact machine without safety guards a colleague suggest that you position the specimens while he/she releases the pendulum to speed up the tests. Do you consider this a good practice? | No. In old manually operated machines the operator that position the specimen should be the same to release the pendulum to prevent someone being it by the pendulum, which might cause severe injuries. | | | |
| | | **3.** When mounting or dismounting a tensile test should you operate the machine in load or strain control? | Absolutely not. These types of control are very sensitive and could lead the machine to some unexpected movements. These, particularly in hydraulic machines, could be very fast and cause severe injuries, particularly to the hands and arms. | | | |
| | Correctly use personal protective equipment when performing the test | **1.** If for a specific test the use of gloves and protective glasses is recommended and such equipment is not available, how you will react? | Knowledge of the scope of the protective equipment related to each type of test.<br>Answer: if a protective equipment is suggested for the execution of a test, the test have to performed using such equipment; otherwise, no test will be executed. | | | |
| | | **2.** Are the gloves mandatory for all the mechanical tests? | No, there are different kind of gloves; some are useful to protect hands during the set-up of a machine but does not allow to use calipers and other fine instruments; therefore, the proper type of gloves | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | have to be used for each task (e.g., work gloves for set-up operations and tight lattice gloves for fine operations such as alignments, measurements and handling samples). | | | |
| | | **3.** Identify one mandatory item of personal protection gear in a DT laboratory. | Protective footwear. Even relatively small specimens or other items falling from waist or table level can cause injuries to the feet or lower portion of the legs. Besides some test jigs and accessories can be quite heavy. | | | |
| | List hazards to personnel during DT | **1.** Is the tensile test machine dangerous? | No if correctly used. E.g., it could be dangerous to stay close to a specimen during a tensile test or it could be dangerous to keep hands close to moving parts and gears (if not properly protected by safety barriers). | | | |
| | | **2.** Could you be at risk of burns in common DT (not at high temperatures)? | Yes, particularly impact tests have to be performed a very low temperatures for which cooling baths or liquid nitrogen is used . This very low temperatures can also cause burns. | | | |
| | | **3.** Indicate DT for which the use of protection goggles could be advis-able. | Tensile tests and impact tests can sometimes project specimens or pieces of them that might cause, among others eye injuries. In case the machines do not have safety barriers the use of goggles is very advisable. | | | |

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|---|---|---|---|---|---|---|
| Design of Destructive Testing Machinery and Equipment | Match laboratory equipment with the type of DT | **1.** Define what kind of grips you will use to perform a tensile test on a round specimen with threaded heads and on a dogbone specimen respectively. | Specific knowledge about the laboratory equipment and the type of specimens for the tensile test.<br>Answer: threaded grips for the threaded heads and wedge grips (hydraulic grips or mechanical grips) for the flat specimen (dogbone). The candidate has to know the dogbone specimen is basically a flat specimen. | | | |
| | | **2.** Explain why some standards require the control of the speed of testing (e.g., strain rate) during the test while others don't. | Some tests are designed to determine some specific parameters of materials and such parameters are related to the strain rate (e.g., an impact test can't be executed with the same strain rate of tensile test because it wouldn't be an impact no more). The tensile test standard, ISO 6892-1, specify the test speed to be applied on the basis of the selected test method (A or B) and on the basis of the parameter to be determined (Rm, Rp0.2 etc.). | | | |
| | | **3.** If the charpy pendulum is not working, would it be possible to perform the test by fixing the test piece in a vise and breaking it with a hammer? If not, do you think it would be better to use a tensile test machine? | No, a specific striker has to be used as described in ISO 148, furthermore if a hammer is used, the determination of the absorbed energy would be not possible.<br>A tensile test machine can't be used to. Even if one would succeed in mounting a charpy striker on a tensile test machine, it would be not possible to achieve the test speed | | | |

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|---|---|---|---|---|---|---|
| | | | required to simulate on impact, a high speed tensile testing machine could be used; however, the machine should be recalibrated to provide a reliable result of the absorbed energy. Therefore, the answers are no and no. | | | |
| | Identify applicable DT according to the metallic material´s properties and the welding process used | **1.** It is possible to perform a charpy impact test on specimens taken from welded plates with thickness equal to 2 mm? If not, it is because of the presence of the weld? | No, the minimum size of subsize charpy specimen is 2.5 mm of thickness which is greater than 2 mm. The presence of the weld is not relevant, the only limit is thickness in this case. | | | |
| | | **2.** Is it possible to perform an all-weld tensile test on a RSW sample? | No, the RSW nugget is too small to take a tensile specimen and typically around or less 10 mm of diameter and few mm of depth, therefore there is not enough amount of material to take a specimen with the dimensions suggested by ISO 6892-1; furthermore, ISO 5178 does not cover the extraction of tensile specimens from such type of welds. | | | |
| | | **3.** What kind of geometry you would expect from a tensile test specimen taken from an LBW sample? Explain your answer. | Flat or dogbone because, typically, LBW welds are performed on thin plates or sheets; therefore, taking a round specimen would be impractical. | | | |
| | CANDIDATE SCORE | | | | | |

| SUBJECT | COMPETENCE UNIT 1<br>INTRODUCTION TO DESTRUCTIVE TESTING | WEIGHING | VALIDITY OF EACH QUESTION | Nº CORRECT ANSWER | SCORING | % |
|---|---|---|---|---|---|---|
| | Introduction to Destructive Testing and Safety Rules in Destructive Testing | 10% | | | | |
| | Design of Destructive Testing Machinery and Equipment | | | | | |
| MAXIMUM POINTS | | | | | | |

| COMPETENCE UNIT 2: MECHANICAL TESTS (TENSILE TESTS, BEND TEST, CHARPY IMPACT STRENGTH TEST, FRACTURE TEST, HARDNESS TEST) | | | | | | |
|---|---|---|---|---|---|---|
| SUBJECT | LEARNING OUTCOMES (LOs) | QUESTION | TYPE OF ANSWER | SCORING | WEIGHING | NEXT STEPS |
| Tensile Tests of Metals at Ambient Temperature | Perform tensile tests to determine required properties according to standards | **1.** Indicate the difference between yield and proof strength | Yield strength is when metallic material exhibits a yield phenomenon, stress corresponding to the point reached during test at which plastic deformation occurs without any increase in the force. Proof strength, plastic extension, Rp is determined then when yield strength is not shown on the diagram. Then you have to determined it from the force-extension curve by drawing a line parallel to the linear portion of the curve and at a distance from it equivalent to the prescribed plastic percentage extension, e.g., 0.2 %. | | | |
| | | **2.** Describe how would you measure total extension at maximum force | Only possible with extensometer, method consist of determining the extension at maximum force on the force-extension curve and dividing it by extensometer gauge length. | | | |
| | | **3.** Describe the differences between Method A and B for testing rates | The difference between Method A and Method B is that the necessary testing speed of Method A is defined at the point of interest (e.g., $R_{p0.2}$), where the property has to be determined, whereas, in Method B, the necessary testing speed is set in elastic range before the property has to be determined. | | | |
| | | **4.** Describe how to perform a tensile test and list the main steps you will follow. | Dimensional check on the specimen to verify if it is in compliance with the tolerances of ISO 6892-1. | | | |

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| | | | Record the dimensional measures taken on the test piece (specimen).<br>Verify the machine is calibrated.<br>Select and mount on the machine the proper grips on the basis of the geometry of the test piece to be tested.<br>Configure the machine to perform the test according to test method (A or B) required by the working instructions provided with the specimen<br>Mount the specimen on the machine and execute the test.<br>When the specimen is ruptured, remove it from the machine and measure it to determine rupture elongation and reduction of area (if the specimen is round and if it required) and the position where the fracture is positioned to the define if the result is acceptable (e.g., the rupture has to be in the gage length to have an acceptable results); if you are testing a weld, the position of the rupture has to be recorded (e.g., parent metal or weld metal).<br>Examine the fracture surfaces to check any imperfections which could cause a lower result than expected. If required, take a picture of the fracture surface.<br>Use the software of the testing machine to determine the young modulus (if required), the yield strength and the tensile strength; otherwise: export the | | | |

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| | | | data and determine such parameters using a spreadsheet software.<br>Compile the test report with acquired results and information about the tests. | | | |
| | | **5.** What are acceptable methods for marking the original gauge length. Describe the different methods. | Line marks, scribed lines, punch marks but not by marks which could result in premature fracture. | | | |
| Tensile Tests of Welded Joints with Butt Welds, Cruciform Joints, Overlap Joints, and Joints with Fillet Welds | Perform tensile tests to determine required properties according to standards | **1.** According to standard ISO 5178 describe how to extract and prepare specimens for test. | The mechanical or thermal processes used to extract the test specimen shall not change the properties of the test specimen in any way. Shearing is excluded for thicknesses greater than 8 mm. If thermal cutting or other cutting methods which can affect the cut surfaces are used to cut the test specimen or from the test piece, the cuts shall be made at a distance greater than equal to 8 mm from the surfaces of the final parallel length of the test specimen. Thermal cutting shall not be used parallel to the original surface of the welded plate or of the test piece. | | | |
| | | **2.** Describe the process of Tensile test on cruciform joints. | The test pieces shall be prepared and welded in accordance with the relevant application standard. The dimension of the test specimens shall be in accordance with figures shown in standards. The weld axis shall remain perpendicular to the longitudinal direction of the specimen. The test specimen shall be loaded gradually and continuously in a direction | | | |

| | | | | | | |
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| | | | perpendicular to the weld axis until rupture occurs. After testing, the following shall be measured and/or the result/information recorded: The test temperature T, the fracture surfaces shall be examined and the existence of any imperfections, including their type, size and amount shall be recorded. If fisheyes are present, their location shall be recorded. Only central regions of fisheyes shall be considered as imperfections. | | | |
| | | **3.** Is the determination of yield strength is necessary during the tensile test of welded joints? Explain your answer. | This is due to the different material properties of the different weld zones, e.g., BM, HAZ, and weld zone. Each zone has a different stress state and deformation behaviour due to the different properties. | | | |
| | | **4.** Describe the surface preparation process for specimens according do ISO 4136. | The final stages of preparation shall be performed by machining or grinding, suitable precautions being taken to avoid superficial strain hardening or excessive heating of the material. The surfaces shall be free from scratches or notches transverse to the test specimen direction in parallel length Lc, except for undercut which shall not be removed unless required by the relevant application standard. The surface of the test specimens shall be machined in such a way that, unless specified otherwise in the relevant application standard, all excess weld metal is removed. | | | |

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| | | | Unless specified otherwise the penetration bead shall be left intact inside full section pipes. | | | |
| Bend Tests of Metals and Welded Joints | Perform bend test of metals and welded joints to confirm material plastic properties | **1.** Describe what difficulties occur when bending dissimilar joints and how to overcome them | Dissimilar joints (joint with two different parent materials) can result in so called 'peaking' of test specimen. This is when the majority of the deformation takes place in the weaker material which means excessive localised deformation while almost no deformation occurs in the opposite material. To avoid 'peaking' of bent coupons the use of U-type jig or bend test with a roller is recommended. | | | |
| | | **2.** Describe how you select the diameter of the bending mandrel for the welded joint | The diameter of the bending mandrel shall be equal to 4 times thickness of specimen for parent metals with elongation A higher or equal 20%. For parent metal with elongation lesser than 20% the following formula shall be applied (unless otherwise specified): d=((100*ts)/A)*ts. | | | |
| | | **3.** Describe how the elongation is measured and calculated on the bend test. | A gauge length (L0) has to choose on the basis of the type of weld under examination:<br>Fusion welds: L0 = Ls or L0 = 2·Ls or L0 = Ls - ts<br>Pressure welds, electron beam welds and laser welds: L0 = ts or L0 = 2·ts<br>The elongation is calculated, as for the tensile test, like a percentage between the difference relative to the initial gage length between initial gage length (L0)and final gage length (Lf). | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Elongation = 100* (Lf-L0)/L0. | | | |
| | | **4.** Define when an imperfection makes the result not acceptable. | An imperfection is not acceptable when it is not placed on the corners of the specimen and when it measures an extension > 3 mm. | | | |
| Charpy Impact Strength Test of Metals and Welded Joints | Perform impact test of metals and welded joint at ambient and lower temperatures to evaluate impact strength and percent shear fracture | **1.** How you will act if, during a Charpy impact test at T = -20°C, the specimen you took from the bath fall down on the floor. | I will put the specimen in the cooling bath or in the cooling gaseous media again and I will start again to count the soaking time after the temperature is stable. | | | |
| | | **2.** What kind of check have to performed before to perform a charpy test. | Dimensional check of the specimens, visual check of the self-centring tongs; prior the first test of the day, the energy losses due to friction have to me calibrated. | | | |
| | | **3.** Describe what the shear fracture area is and define how to measure it. | The fracture shear area is the portion of the fracture area related to ductile fracture. It can be measured optically (e.g., with the software of an optical microscope), by comparison of reference fractured specimens with known shear fracture areas (e.g., the reference proposed by ISO 148-1) and finally the area can be measured using a calliper and adopting the table suggested by ISO 148-1 to determine the percentage of the shear fracture area on the basis of the measure in mm of the height and width of the shear are. | | | |
| Fracture Tests of Welded Joints | Perform fracture test and preserve fractured surface | **1.** In the case of you have to break a material with high ductility, what kind of operation is | It is suggested to cool the specimen. | | | |

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| | | suggested to limit plastic deformations during the rupture | | | | |
| | | **2.** Define what preserve fractured surface means. | It means to store the fracture surface with the purpose to not cause any damage due to strong oxidation, hammering, scratching, heating or deformation. | | | |
| | | **3.** Is the use of a hammer to brake specimens forbidden by ISO 9017? If not, explain why | No, it isn't forbidden.<br>ISO 9017 allows both hammer and stroke. | | | |
| Hardness Tests of Metals and Welded Joints | Perform measurements in metals and welded joints to evaluate hardness | **1.** A direct Vickers verification should be carried out at a temperature of: | 23 ± 5 °C | | | |
| | | **2.** Direct verification of a Vickers hardness test machine involves: | Calibration of the test force;<br>Verification of the indenter;<br>Calibration and -verification of the diagonal measuring system;<br>Verification of the testing cycle. | | | |
| | | **3.** Direct Vickers hardness verifications shall be performed: | According to a schedule, every 12 months. | | | |
| TRANSVERSAL TO ALL SUBJECTS | Inspect the equipment to ensure that it is safe and suitable to use | **1.** Name things to check before starting test. | Continuity of all hoses, cables, lines, wires etc.;<br>Completeness of all safety shields and guards. | | | |
| | | **2.** Is it necessary to calibrate instruments? why? | Yes, it is. Because without calibration the tolerances and the precision required by the standards test method can't be applied and verified. Therefore, without calibration, the tests can't be executed. | | | |

| | | | | | | |
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| | | **3.** If a machine does not work, what do you do? | I will check the whole machine searching for a problem; then I will notify the problem to my supervisor thus to solve it. | | | |
| | Identify the specimen to ensure traceability | **1.** A specimen can always test, it is just necessary to check if its dimensions are in compliance with the testing standard. True or false? Explain your answer | False, the identification of the specimen must correspond with the working instructions; furthermore, if the test is attended by TPIs (third part inspectors), also the stamp of the TPI have to be present on the specimen. Therefore, the traceability must be always verified and confirmed. | | | |
| | | **2.** The label on the specimen is not relevant because, every specimen can be renamed according to the need of the client. True or false? Explain your answer. | False. Changing the name of the specimens mean break the traceability. | | | |
| | | **3.** In the case two tensile specimens are identified by the same label:<br>a. will you perform the test on both? or<br>b. will you not perform the tests?<br>Choose an option and explain your choice. | The answer is b.<br>I will notify the problem and I will ask to my supervisor to verify the traceability of the specimens. | | | |
| | Use measuring equipment to determine all specimen essential dimensions | **1.** How can you confirm the accuracy of the measurement devices that are used in DT? | Check calibration certificate validity or perform a test using certified reference material (measuring blocks, hardness block etc.). | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **2.** Describe what are certified reference materials (CRM) and what are they used to? | Certified reference materials (CRMs) are 'controls' or standards used to check the quality and metrological traceability of products, to validate analytical measurement methods, or for the calibration of instruments. A certified reference material is a particular form of measurement standard. | | | |
| | | **3.** Describe the proper way of using calliper. | To properly use a caliper to measure dimensions, first ensure that the caliper is clean and zeroed out. Then, carefully position the object being measured between the jaws of the caliper and close them gently, being careful not to apply too much pressure. Finally, read the measurement from the caliper's display, taking note of any decimals or fractions. It's important to handle the caliper delicately and to ensure that the object being measured is not bent or damaged during the measurement process. | | | |
| | Perform visual examination of specimen after test to analyse post test results | **1.** What kind of imperfections can be identified on fractured surface after the tensile test of welded joints? | Imperfections on a fractured surface of a welded joint after a tensile test can include porosity, incomplete fusion, cracks, undercuts, lack of penetration, and overlapping. These imperfections can weaken the joint and identifying them helps improve the welding process to produce stronger joints. | | | |
| | | **2.** Bend test: is an | Yes. | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | imperfection of 3 mm on the corner of the specimen acceptable? | | | | |
| | | **3.** How will you react if you find a porosity on the fracture surface of a broken cross-weld tensile specimen? | I will report it on the test report. | | | |
| | Report/document test results according to the applicable standard | **1.** List the mandatory information to be contained in test report according to ISO 6892-1 standard. | Reference to ISO 6892-1;<br>Test piece identification;<br>Specified material, if known;<br>Type of test piece;<br>Location and direction of sampling if known;<br>Testing control mode and testing rate(s);<br>Test results. | | | |
| | | 2. On the impact test (Charpy) report:<br>is it mandatory to insert the information about the tensile properties of the specimens? Yes or No and Why? | No. are not relevant for the interpretations of the results. furthermore, ISO 148-1 does not require such information are stated on the test report.<br>Finally, the tensile properties are determined with a dedicated test method (ISO 6892-1), different from ISO 148-1. | | | |
| | | 3. The specimen thickness is not relevant and therefore is not necessary to state it on the test report; the main point is the mechanical properties (tensile properties, impact toughness, hardness) | False.<br>The size (thickness, width, gage length, etc) are fundamental to verify the reliability of the results and if the specimen dimensions were in compliance with requirements of the applied standard test method. | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | are in compliance with the requirements of the materials designation. True or False? Explain your choice. | | | | |
| | CANDIDATE SCORE | | | | | |

| SUBJECT | COMPETENCE UNIT 2<br>MECHANICAL TESTS (TENSILE TESTS, BEND TEST, CHARPY IMPACT STRENGTH TEST, FRACTURE TEST, HARDNESS TEST) | WEIGHING | VALIDITY OF EACH QUESTION | Nº CORRECT ANSWER | SCORING | % |
|---|---|---|---|---|---|---|
| | Tensile Tests of Metals at Ambient Temperature | 80% | | | | |
| | Tensile Tests of Welded Joints with Butt Welds, Cruciform Joints, Overlap Joints, and Joints with Fillet Welds | | | | | |
| | Bend Tests of Metals and Welded Joints | | | | | |
| | Charpy Impact Strength Test of Metals and Welded Joints | | | | | |
| | Fracture Tests of Welded Joints | | | | | |
| | Hardness Tests of Metals and Welded Joints | | | | | |
| MAXIMUM POINTS | | | | | | |

| COMPETENCE UNIT 3: MEASUREMENT UNCERTAINTY | | | | | | |
|---|---|---|---|---|---|---|
| SUBJECT | LEARNING OUTCOMES (LOs) | QUESTION | TYPE OF ANSWER | SCORING | WEIGHING | NEXT STEPS |
| General methods of calculating uncertainties | To be able to realize a complete evaluation/calculate the type A and B uncertainty for Vickers hardness Test, Tensile Test, Charpy Impact Strength Test, and Bending Test | **1.** The measurement uncertainty is: | A parameter associated with the result of a measurement, which characterizes the dispersion of true values that could reasonably be attributed to the measurand. | | | |
| Measurement uncertainty for tensile test, impact test, and hardness test | | **2.** The quantification of significant uncertainties can be done by: | Type A method: from the statistics of the repeated experiment; Type B method: by any other means (theory, certificates, judgment). | | | |
| | | **3.** Ideally, the following factors should be considered for the establishment of the tensile measurement uncertainty factors: | Test temperature;<br>Testing rates; Test piece geometry and machining; the method of gripping the test piece and the axiality of the application of the force; the testing machine characteristics (stiffness, drive and control mode)<br>human and software errors associated with the determination of the tensile properties. | | | |
| | CANDIDATE SCORE | | | | | |

| SUBJECT | COMPETENCE UNIT 3<br>MEASUREMENT UNCERTAINTY | WEIGHING | VALIDITY OF EACH QUESTION | Nº CORRECT ANSWER | SCORING | % |
|---|---|---|---|---|---|---|
| | General methods of calculating uncertainties | 10% | | | | |
| | Measurement uncertainty for tensile test, impact test, and hardness test | | | | | |
| MAXIMUM POINTS | | | | | | |

## 6.7. ANNEX 7: PRACTICAL DEMONSTRATIONS

| NQF level: / EQF level: | Qualification: European Destructive Testing Technician | |
|---|---|---|
| Candidate name: | | |
| **Practical exercise to be used during the demonstration** | | |
| **Description of the demonstration**<br>A practical exercise for demonstrating a tensile test of a metallic material involves participants setting up and conducting the test themselves, including verifying and preparing the specimen and the machine for the test, attaching it to grips and measuring force and elongation during the test using universal tensile testing machine. This exercise aims on evaluation of candidates' understanding of the testing process and their ability to execute it correctly. Evaluation includes factors such as accuracy of pre-test and post-test measurements and calculations, proper usage of equipment and ability to interpret test data. Furthermore, some stress-strain data will be provided to verify the ability to calculate the Elastic Modulus. | | |
| 1. GOAL | Perform tensile test of metallic material | |
| 2. DURATION | 30 minutes | |
| 3. RESOURCES<br>(equipment, materials, tools, etc) | Callipers, tensile test machine, paint marker, hammer and centre punch or marking machine, test specimen, safety equipment (safety glasses, gloves etc.), test order (containing some information about material to be tested etc.). | |
| 4. INSTRUCTIONS<br>(these instructions can/or not be available for the candidate) | Read test order; Measure specimen to check the dimensional tolerances are in compliance with the standard test method and to determine cross-section area; Determine gauge length $L_0$; Mark gauge length on the specimen; Check tensile test machine; Perform tensile test; Perform post-test evaluation: measure final gauge length after fracture and the final diameter (on round specimens); calculate elongation after fracture and reduction of area Report final results. | |
| 5. ASSESSMENT GRID<br>(performance during the demonstration) | WEIGHTING (100/100) | **YES/NO** |
| | 1. Compliance with health and safety rules | |
| | 2. Operative decision | |
| | 3. Work planning | |
| | 4. Compliance with the appropriate sequence of work | |
| | 5. Adequate demonstration of conceptual and technical knowledge | |
| | 6. Skill to perform the task | |
| | 7. Quality of the final product/result | |

*Table 1 TENSILE TEST PRACTICAL DEMONSTRATION*

| | | |
|---|---|---|
| NQF level:<br>EQF level: | Qualification: European Destructive Testing Technician | |
| Candidate name: | | |
| Practical exercise to be used during the demonstration | | |
| **Description of the demonstration**<br>A practical exercise for demonstrating a bend test of welded joint involves candidate setting up and conducting the test themselves, including verifying and preparing the specimen and the machine for the test, mounting specimen in test machine and performing the test and execute the post-test analyses on the specimen. This exercise aims on evaluation of candidates' understanding of the testing process and their ability to execute it correctly. Evaluation includes factors such as accuracy of measurements and calculations, proper usage of equipment and ability to interpret test data. | | |
| 1. GOAL | Perform bend test of welded joint | |
| 2. DURATION | 30 minutes | |
| 3. RESOURCES<br>(equipment, materials, tools, etc) | Callipers, bend test machine, paint marker, hammer and centre punch or marking machine, test specimen, safety equipment (safety glasses, gloves etc.), test order (containing some information about material to be tested etc.). | |
| 4. INSTRUCTIONS<br>(these instructions can/or not be available for the candidate) | Read test order; Pick bend test method; Identify specimen and check if properly machined (dimensional check); Measure specimen to determine diameter of bending mandrel; Calculate mandrel diameter and any other parameters if necessary (depending on picked method); Check bend test machine; Perform bend test; Perform post-test evaluation (check surface for cracks); Report final results. | |
| 5. ASSESSMENT GRID<br>(performance during the demonstration) | WEIGHTING (100/100) | **YES/NO** |
| | 1. Compliance with health and safety rules | |
| | 2. Operative decision | |
| | 3. Work planning | |
| | 4. Compliance with the appropriate sequence of work | |
| | 5. Adequate demonstration of conceptual and technical knowledge | |
| | 6. Skill to perform the task | |
| | 7. Quality of the final product/result | |

*Table 2 BEND TEST PRACTICAL DEMONSTRATION*

| | | |
|---|---|---|
| NQF level:<br>EQF level: | Qualification: European Destructive Testing Technician | |
| Candidate name: | | |
| Practical exercise to be used during the demonstration | | |
| **Description of the demonstration**<br>A practical exercise for demonstrating an impact test at room temperature involves candidate setting up and conducting the test themselves, including verifying and preparing the specimen for the test, check the machine, using a cooling device to cool down the specimen (if necessary), mounting specimen in test machine and performing the test using Charpy Impact Pendulum. This exercise aims on evaluation of candidates' understanding of the testing process and their ability to execute it correctly. Evaluation includes factors such as proper usage of equipment and ability to interpret test data. | | |
| 1. GOAL | Perform impact test at room temperature | |
| 2. DURATION | 30 minutes | |
| 3. RESOURCES<br>(equipment, materials, tools, etc) | Callipers, Charpy impact test pendulum, cooling device (e.g., cooling bath or temperature chamber), paint marker, hammer and centre punch or marking machine, test specimens, safety equipment (safety glasses, gloves etc.), software image analyses or other tool to measure the fracture surface (not mandatory), test order (containing some information about material to be tested etc.). | |
| 4. INSTRUCTIONS<br>(these instructions can/or not be available for the candidate) | Read test order; Identify specimen; Measure specimen to validate dimensions; Check impact test pendulum; Perform Charpy impact test; Perform post-test evaluation; Report final results. | |
| 5. ASSESSMENT GRID<br>(performance during the demonstration) | WEIGHTING (100/100) | **YES/NO** |
| | 1. Compliance with health and safety rules | |
| | 2. Operative decision | |
| | 3. Work planning | |
| | 4. Compliance with the appropriate sequence of work | |
| | 5. Adequate demonstration of conceptual and technical knowledge | |
| | 6. Skill to perform the task | |
| | 7. Quality of the final product/result | |

*Table 3 CHARPY IMPACT STRENGTH TEST PRACTICAL DEMONSTRATION*

<table>
<tr><td>NQF level:<br>EQF level:</td><td colspan="2">Qualification: European Destructive Testing Technician</td></tr>
<tr><td colspan="3">Candidate name:</td></tr>
<tr><td colspan="3">Practical exercise to be used during the demonstration</td></tr>
<tr><td colspan="3">Description of the demonstration<br>A practical exercise for demonstrating hardness measurements on welded joint involves candidate setting up and conducting the measurements themselves, including verifying and preparing the specimen, verifying and preparing the machine, mounting specimen in test machine, determining measurement points locations and performing the measurements using Vickers hardness tester. This exercise aims on evaluation of candidates' understanding of the testing process and their ability to execute it correctly. Evaluation includes factors such as accuracy of measurements, proper usage of equipment and ability to interpret test data.</td></tr>
<tr><td>1. GOAL</td><td colspan="2">Perform hardness measurements on welded joint</td></tr>
<tr><td>2. DURATION</td><td colspan="2">30 minutes</td></tr>
<tr><td>3. RESOURCES<br>(equipment, materials, tools, etc)</td><td colspan="2">Callipers, hardness tester, paint marker, hammer and centre punch or marking machine, test specimen, safety equipment (safety glasses, gloves etc.), test order (containing some information about material to be tested etc.).</td></tr>
<tr><td>4. INSTRUCTIONS<br>(these instructions can/or not be available for the candidate)</td><td colspan="2">Read test order; Identify specimen; Determine number of measurements lines and points; Determine measurement points location; Check hardness tester; Perform hardness measurements; Calculate hardness value from the size of the indentation, Report final results.</td></tr>
<tr><td rowspan="8">5. ASSESSMENT GRID<br>(performance during the demonstration)</td><td>WEIGHTING (100/100)</td><td>YES/NO</td></tr>
<tr><td>1. Compliance with health and safety rules</td><td></td></tr>
<tr><td>2. Operative decision</td><td></td></tr>
<tr><td>3. Work planning</td><td></td></tr>
<tr><td>4. Compliance with the appropriate sequence of work</td><td></td></tr>
<tr><td>5. Adequate demonstration of conceptual and technical knowledge</td><td></td></tr>
<tr><td>6. Skill to perform the task</td><td></td></tr>
<tr><td>7. Quality of the final product/result</td><td></td></tr>
</table>

*Table 4 HARDNESS TEST PRACTICAL DEMONSTRATION*