

EWF Special Course Weld Imperfections for Non-Destructive Testing Personnel



Minimum Requirements for the Education,
Examination and Qualification



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Section I: Minimum Requirements for the Education

The use of this guideline is restricted to organisations approved by the Authorised National Body (ANB).

1 Introduction

This guideline for the European education and training on Weld Imperfections for Non-Destructive Testing Personnel has been prepared, evaluated and formulated by the Working Group "Special Course on Weld Imperfections" of the Technical Committee of EWF. It is designed to provide the supplementary education in welding technology required for job functions in non-destructive testing.

This first section of the guideline covers the minimum requirements for education and training, agreed upon by all national welding societies within the EWF in terms of objectives, keywords expected results and recommended times devoted to them. It will be revised periodically by the Technical Committee to take into account any changes which may affect the "state of the art". Students having successfully completed this course of education will be expected to be capable of applying non-destructive testing on welded joints as covered by this guideline. A subsequent section covers the examination and qualification.

The contents are given in the following structure:

Education	teaching hours
1. Introduction, Quality in welding	2
2. Welding processes and equipment	6
3. Materials and their behaviour in welding	6
4. Welding imperfections	6
5. Practical demonstrations	4
Total	24

A teaching hour will contain at least 50 minutes of direct teaching time. It is not obligatory to follow exactly the order of the topics given in this guideline and choice in the arrangements of the syllabus is permitted. The depth to which each topic is dealt with is indicated by the recommended number of hours allocated to it in the guideline. This will be reflected in the scope and depth of the examination. It is also allowed for a limited amount of teaching hours to be taken by distance learning (item 1-3; 14 hours). This learning shall be approved by the ANB. Item 5 and 6 may only be taught by classroom courses (10 hours).

2 Access to the Education

For the entry to the program, proper education according to eight years of primary and medium school or equivalent is recommended.

3 Theoretical supplementary education regarding Weld Imperfections

The module for Weld Imperfections aims at teaching technical knowledge in the specific field of weld imperfections of steels and aluminium alloys supplementary to existing basic knowledge in non-destructive testing.

The module deals with the following subjects:

<u>Subject</u>	<u>Hours</u>
<u>1.Introduction, Quality in welding.....</u>	minimum number of hours: 2

Objective:

To have knowledge of EWF, the basics of quality in welding and the job function of NDT experts, in relation to EN standards

Scope:

Information on EWF and survey on the contents of this course

Basic knowledge on quality system management to ISO 9001 and requirements for welding to EN 729,

Job function of the experts for Weld Imperfections in relation to EN 719 and EN 473

Expected result:

Know the basics of quality in welding as far as related to NDT.

Be aware of the function of EWF and work with the relevant ISO and EN standards.

2.Welding processes and equipmentminimum number of hours: 6

Objective:

To have knowledge on the basics of welding processes and equipment operating in the different fields of fabrication

Scope:

Schematic presentation and classification of welding processes according to ISO and EN standards

Basics of the main fusion welding processes, such as TIG, Plasma, MIG/MAG, Manual Metal Arc, Submerged Arc, etc.

Effects of welding parameters,

Types and effects of welding consumables,

Listing of typical process related weld imperfections, such as lack of fusion and penetration, slag inclusions, porosity and cavities, undercut, imperfect shape.

Expected result:

Know the most common welding processes and their performance and limits.

Identify typical imperfections for different welding process, parameters and consumables.

3. Materials and their behaviour during welding:.....minimum number of hours: 6

Objective:

To have knowledge of the specific properties of materials commonly used in welded constructions, like steels and aluminium alloys.

Scope:

Overview and designation of low alloy and alloy steels,

Structure and properties of low alloy and alloy steels,

Overview and designation of aluminium alloys,

Structure and properties of aluminium alloys,

The effect of heat on such materials, weldability,

Listing of typical metallurgical weld imperfections, such as cold cracking, lamellar tearing, hot cracking, reheat cracking.

Expected result:

Know the designation of steels and aluminium alloys and their behaviour during welding.

Identify the typical imperfections for the common materials welded by different processes.

4. Weld imperfectionsminimum number of hours: 6

Objective:

To have a good understanding of the specific details for weld imperfections.

Scope:

Classification of joints (butt and fillet), according to ISO and EN standards,

Types of weld imperfections according to ISO 6520-1,

Shape, orientation and position of process-related weld imperfections,

Shape, orientation and position of metallurgical weld imperfections,

Weld imperfections levels according to EN 25817 and EN 30042,

Significance of imperfections in relation to service performance (static and dynamic loads, high and low temperature conditions),

Overview of different NDT methods and techniques and detectability of weld imperfections and acceptance levels according to ISO and EN standards, as EN 1289, EN 1291, EN 1712, EN 12517.

Expected result:

Identify the weld imperfection and their characteristic geometrical features.

Discuss performances and limits of different NDT methods and techniques and give examples of their application for detection and sizing of the common weld imperfections.

5. Practical demonstrations recommended number of hours: 4

Objective:

To be familiar with applied welding processes and specific weld details.

To demonstrate the ability of examining and reporting specific weld imperfections.

Scope:

Demonstrations of relevant welding processes, applied to various situations and materials,

Demonstrations of advantages and disadvantages of different NDT methods and techniques,

Demonstrations of reporting of specific weld imperfections.

Expected result:

Be aware of the detectability of different weld imperfections and be able to examine and report a specific weld imperfection.

Total hours:..... 24

Section II: Examination and Qualification

1 Introduction

This guideline seeks to achieve harmonisation and common standards in the education, training, and qualification of NDT personnel on weld imperfections in Europe.

The national welding organisations, being members of EWF, mutually acknowledge the "Record of achievement" awarded in any Member State to experts in Weld Imperfections, following examination conducted in accordance with this guideline.

Education must have followed this EWF guideline "Special Course on Weld Imperfections for Non-Destructive Testing Personnel" Section I, and the examination must have been conducted by the national body authorised by EWF for this purpose.

2 Requirements for Training and Examination centres

Requirements for teachers and instructors, examiners, training establishments, courses and examination / test centres are documented in EOTC/AG-15/97/001/416.

3 Board of Examiners

The Authorised National Body shall nominate the Chairman and the members of the Board of Examiners. The examining board shall consist of:

- a) The Chairman, who shall be a representative of the Authorised National Body, and he shall be independent from the training school;
- b) Main teacher(s) of the subjects;
- c) Experts from industry or other organisations may be invited.

The responsibilities of the Board of Examiners are given in the EOTC/ AG- 15/97/001/416.

4 Admission to the examination

Admission to the examination leading to the award of the qualification will be restricted to those who have participated in a course, approved by the Authorised National Body, according to this guideline.

Admission to the examination shall be denied for those who failed to attend 90 % of the training program. In case of special circumstances the board of examiners may use its discretion.

5 Examination procedures

The examination procedures described below are designed to simulate the different situations of NDT Personnel expert in weld imperfections active in industry. The examination shall cover all topics in this Guideline.

5.1 Written examination

At the discretion of the Board of Examiners the examination shall consist of:

- a) a series of essay questions covering the whole field of the subject, or
- b) a series of multiple choice questions covering the whole field of the subject, or
- c) a combination of a) and b) with equal marks allocated to each type.

The time devoted to the written examination shall be a minimum of 1.5 hours.

5.2 Oral examination

The oral examination will be optional at the discretion of the board of examiners except in borderline cases where it will be mandatory.

6 Evaluation of performance

In order to pass the examination candidates must achieve at least 60% of the maximum possible mark.

7 Re-examination and appeals procedure

Refer to Doc. EOTC/AG-15/97/001/416.

8 Record of achievement

After successful examination the Authorised National Body awards a "Record of achievement" to the candidate.