



Leonardo da Vinci

Course: Quality Assurance
Module 3

Table of Contents

MODULE 3.....	3
The work.....	3
Hours and Environment.....	4
Skills and Interests.....	4
Accredited and none-accredited certification.....	6
Maintenance and prolongation of certificates.....	6
Essential variables for the certificates.....	7

MODULE 3

Objective:

Know the basics of welder qualification according to ISO 9606.

Scope:

- ***The scope of work for welders (Definition of the responsibilities)***
- ***Objectives of qualification tests***
- ***Welders qualification standard (ISO 9606)***

Expected results:

- ***Identify the range of qualification in a welder's certificate.***
- ***Outline the essential variables for a welder qualification test.***

Key roles of welders in assuring weld Quality. Authority and responsibility.

The roles, authority and responsibilities is depending on the job specification and the company. However the following job description form UK may be used as a general overview of what a welder may face.

The work

Welders, often known as welder fabricators, cut, shape and join materials to make products and components in a wide variety of industries including construction, shipbuilding, engineering, transport, power, automotive, aerospace, and offshore oil and gas. They also work in these industries carrying out repair and maintenance of equipment and machinery.

Although welders primarily work with metals and alloys, they can also cut and join composite materials.

Welders use a range of welding and cutting techniques in their role. Some common methods include:

- *oxyacetylene – technique using a mixture of oxygen and acetylene*
- *MIG (metal inert gas) / MMA (manual metal arc) – also known as arc welding, is basic hand welding/cutting using electric arc equipment and a welding rod*
- *TIG (tungsten inert gas) – welding with nitrogen or carbon dioxide, in a tightly controlled manner, using the inert gas to shield the welding process and protect the strength of the metals being joined*
- *laser welding – using laser tools to produce very precise cuts/joins*
- *ultrasonic welding – using high frequency sound waves to melt composites or thermoplastic*

components, often found in automated assembly processes.

Typical tasks include:

- *selecting, laying out and positioning materials to be cut or joined, paying close attention to engineering drawings, templates and specifications*
- *using the appropriate methods outlined above to produce sections or make repairs*
- *inspecting and testing cuts, joins and tolerances using callipers, micrometers and other precision measuring instruments*
- *operating mechanised welding equipment, usually on high volume production lines.*

Welders would not be expected to be proficient in every type of weld, as different methods suit different industries and companies.

Hours and Environment

Welders normally work 37 to 40 hours a week. Shiftwork is common and overtime may be necessary to meet deadlines.

Many welders work in factory workshops, however, some working conditions may be cramped, for example, in the bottom of a ship's hull. Outdoor work may be required if welding sections of pipeline or processing plant.

Protective clothing including head-shield, overalls, apron and gloves are worn. In some situations they might need to use specialist safety equipment, for example breathing apparatus for underwater work, or safety harnesses if working at heights.

Skills and Interests

To be a welder you should:

- *have good hand-to-eye coordination*
- *be able to work very accurately and have good concentration levels*
- *have the ability to work without direct supervision*
- *have excellent technical knowledge and awareness of material properties under different conditions*
- *be able to understand technical plans and specifications*
- *have good near vision*
- *have good numeracy skills to calculate tolerances and measurements*
- *be aware of safe working practices.*

However if we combine the above general description with what has been said about quality assurance, then some basic responsibilities and authorities emerge:

The welder shall be able to:

- Review the work order and verify if this is correct
- Verify if the welding drawings are correct and complete with reference to weld details
- Identify possible cooperation and dependencies with other personnel or departments
- Verify and understand if I have the correct competence for the work, and if not, apply for required training and skills upgrade
- Verify if the welding equipment is maintained correctly and that it can be operated in a safe manner
- Identify if the work order contains correct WPS and time schedules
- Identify if the work requires special documentation or identifications or traceability
- Identify requirements for heat treatment and relevant heat treatment methods and control equipment
- Identify requirements for inspection and the consequences for the work
- Know how to identify non-conformance and how to carry out corrective actions
- Be able to work in a team with people with different backgrounds, knowledge and cultural heritage

Documentation of knowledge

A welder may document his/her qualifications through certificates or diplomas.

EFW Diplomas

European Federation for Welding, Joining and Cutting, better known as EWF - European Welding Federation, established as an international non-profit association. The objective is to:

Act as the representative of the welding and joining community in Europe

- Prepare harmonised rules for the education and training of personnel involved in welding, joining and related technologies
- Liaise with Standardisation Bodies
- Provide for the exchange of scientific and technical information
- Encourage projects for co-operative research and contribute to the removal of technical barriers
- Facilitate technology transfer through "Eurojoin" Conferences

ANB

EWF designates an ANB (Authorised National Body) in each country that has the main responsibility for the welder training in that country (and also other welding personnel). The training is conducted by training bodies that are independent from the ANB itself. before a training organiser can start the EWF training course, the ANB must ensure that the curriculum, instructors, study material, premises and equipment fulfil EWF requirements.

Recurrent audits are also carried out. The ANB is also responsible for the examinations that are conducted during and after each course.

The ISO 9606- series of International Standards provides a scheme for qualification testing of welders, to evaluate their skill for limited ranges of welding conditions. It serves for quality assurance for a specific job, but does not provide an education and training programme. However, the industry needs welders with more skill for the sake of flexibility in production and this Guideline (IAB-089-2003/EWF-452-467-480-481/SV-01) provides a combination of comprehensive theoretical knowledge and high practical skills, assessed by tests of increasing difficulty, including ISO 9606 qualification tests and by theoretical examinations.

The IIW Harmonized Guideline takes care of both requirements and gives methods for practical training and theoretical education of fillet, plate and pipe welders. Where in this Guideline reference to ISO 9606 is made, EN 287 or any other equivalent regional standard may be used instead, upon decision of the ANB.

Certification according international standards

The testing of a welder's skill in accordance with EN 287-1 and the ISO 9606 series of standards depends on welding techniques and conditions used in which uniform rules are complied with, and standard test pieces are used.

The principle of EN 287-1 standard is that a qualification test qualifies the welder not only for the conditions used in the test, but also for all joints which are considered to weld easier on the presumption that the welder has received a particular training and/or has industrial practice within the range of qualification.

The qualification test can be used to qualify a welding procedure and a welder provided that all the relevant requirements, e.g. test piece dimensions, are satisfied.

Accredited and none-accredited certification

Within the European system, there are a number of standards (EN 45000 series) that include regulations for testing the ability of inspection organs to act as third party Body. Its aim is to ensure that the inspection organs acting in Europe carry out equivalent assessments so that the results can be approved by all the member countries. The inspection organs that are approved according to these requirements become accredited for a certain certification task.

A Manufacturer may be certified by a Accredited or a non-accredited Certification Body (national or international). Both accreditations are valid but the certification realized by an Accredited Certification Body has a much larger recognition.

Maintenance and prolongation of certificates

The welder's qualification test certificate issued is valid for a period of two years. This is providing that the welding coordinator or the responsible personnel of the employer can confirm that the welder has been working within the initial range of qualification. This shall be confirmed every six months.

Welder's qualification test certificates according to EN 287-1 (and 9606) standard can be prolonged every two years by an examiner/examining body.

Before prolongation of the certification takes place, 9.2 needs to be satisfied and also the following conditions

need to be confirmed:

- a) All records and evidence used to support prolongation are traceable to the welder and identifies the WPS that have been used in production;
- b) Evidence used to support prolongation shall be of a volumetric nature (radiographic testing or ultrasonic testing) or for destructive testing (fracture or bends) made on two welds during the previous six months. Evidence relating to prolongation needs to be retained for a minimum of two years;
- c) The welds satisfy the acceptance levels for imperfections as specified in clause 7;
- d) The test results shall demonstrate that the welder has reproduced the original test conditions, except for thickness and outside pipe diameter.

Essential variables for the certificates

The qualification of welders is based on essential variables. For each essential variable a range of qualification is defined. All test pieces shall be welded using the essential variables independently.

If the welder has to weld outside the range of qualification a new qualification test is required.

The essential variables are:

- welding process,
- product type (plate and pipe),
- type of weld (butt and fillet),
- material group,
- welding consumable,
- dimension (material thickness and outside pipe diameter),
- welding position,
- weld detail (backing, single side welding, both side welding, single layer, multi layer, leftward welding, rightward welding).