



Education and Culture

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Course: Quality Assurance
Module 2

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MODULE 2

Objective:

Have knowledge about the function of Quality Assurance (QA) in welding.

Scope:

- *Role of inspection and Quality control*
- *Key role of welders in assuring weld Quality*
- *Introduction of ISO 3834: Quality Requirements for Welding*
- *Introduction of ISO 14731: Welding Co-ordination and relationship to IIW qualifications*

Expected results:

- *Explain the need for quality assurance in welding.*
- *Identify the position of ISO 3834 in connection with the standards for welding personnel and welding procedures.*

Quality

The word quality comes from Latin and means state or nature. Quality is a word that describes the characteristics of a product or service. The meaning of the word quality differs depending on who you ask and which product or service that is being referred to. The right quality is when the demands put on a product or service is fulfilled. Substandard quality is only when the demands put on a product or service are not fulfilled. Above standard quality is when a product or service fulfils more than what is demanded.

As an example..... The demands put on a car used for short trips between your home and your place of work is, for most people, that is reliable and cheap to run. A Rolls Royce fulfils the demand on reliability by a long way and is also very comfortable. In this particular case, the quality of a Rolls Royce is above standard. However, it does not fulfil the requirement of being cheap in mileage costs as the initial purchase price, fuel consumption and insurance together will give a high mileage cost. On the other hand a car that is 15 - 20 years old and has gone more than 200.000 km can be very charming but could not be called reliable and will therefore represent substandard quality. A car buyer's choice, that is to say the one with the right quality in this case, would probably be a small car, perhaps just a few years old but reliable and inexpensive in fuel consumption.

A standardized definition of quality is: "**All the combined characteristics and properties of a given product that gives it the ability to satisfy expressed or implied needs**"

Another definition could be: "The quality has two dimensions: "must-be quality" "Conformance to specifications" or "fitness for use" (defined by the customer) or and "attractive quality". The latter is what the customer would love, but has not yet thought about. "

Quality policy

A quality policy describes the company's aims and intentions with regard to quality. The executive management of a company establishes and signs the company's quality policy. This is a requirement specified in the ISO 9000 quality system. A company's quality policy is often briefly described using one or more phrases. For example:

- *We will abide by principles resulting from valid legislation and develop the applied system of quality control at all activities, which are connected with the implementation of company products.*
- *We will use up-to-date experience and methods, which ensure quality and reliability increase of supplied products to ensure permanent improvement of the system of quality control. Further we will use feedback as regards information of the quality of operated products and plants, acquired from customers and employees of ZVVZ a.s.*

A company's quality policy is the foundation and guideline of its quality operations.

Definitions

Quality control

A system for verifying and maintaining a desired level of quality in a product or process by careful planning, use of proper equipment, continued inspection, and corrective action as required.

The operations of a company are controlled to give products the right level of quality. This means that the daily activities follow the company's quality system, applying the directions contained in the quality manual and the instructions that are to be available at each workplace.

Quality assurance

A standard definition is that quality assurance is "all planned and systematic activities to give sufficient confidence that a product will fulfil given demands on quality"

Quality Assurance covers all activities from design, development, production, installation, servicing and documentation, this introduced the rules: "fit for purpose" and "do it right the first time". It includes the regulation of the quality of raw materials, assemblies, products and components; services related to production; and management, production, and inspection processes.

Quality system.

A company's quality system gives guidelines to how the business should be organized, managed and controlled as well as how responsibility is to be distributed. The objective of a company's business is to provide products or services with the right level of quality. A quality system describes the procedures, methods and processes that are to be applied.

Quality manual

All the documents describing the quality system in a company must be entered into a quality manual. The

contents and appearance of the quality manual usually varies from company to company. The quality manual describes everything from the company's quality policy to the procedures and processes used to attain the quality objectives.

Certification

Company.

In order to prove they have a working quality system, a company can apply to be certified. A certification involves an inspection to ensure that the requirements applying to the quality concerned are fulfilled. Such an inspection is called quality audit.

Certifications may be perpetual, may need to be renewed periodically, or may be valid for a specific period of time (e.g. the life-time of the product upon which the individual is certified).

Certifications are offered through a *certification body*. This is usually a business organization. Sometimes, the organization's business is directly related to the certification, In other cases, an organization (often a not-for-profit organization) exists wholly, or in large part, to offer a particular certification. Whatever its nature, the certifying body determines the policies of the *certification program*. Potential consumers of a certification wish to understand the nature of the certifying body and the certification process.

Personnel

The ability to follow verbal or written instructions and testing of the skill are important factors in ensuring the quality of a welded product. Testing of the skill will be done according the relevant standard or guideline. Such a test will then lead to a certificate or a diploma.

Although it is common in regards to certificates and diplomas, sometimes as part or whole of the renewal of an individual's certification, the individual must show evidence of continual learning — often termed continuing education or life-long-learning.

Accredited certification

Certification carried out according an accredited certification body. An accredited certification body has received an accreditation from the National accreditation body.

Inspection.

To ensure that a product has the right level of quality, some form of inspection is often required. This can involve such things as measuring the dimensions of a welded part, destructive or none-destructive testing and so forth.

A standard definition of Inspection is: " Measurement, investigation, testing or other classification of one or more characteristics or properties of a product and the comparison of the results with the set requirements to determine whether they are fulfilled."

Welding coordination

ISO 14731 "Welding Coordination - Tasks and Responsibilities" is the standard that covers supervision of welding processes and thereby the role and competence of the welding coordinator.

Welding is a special process which requires the coordination of welding operation in order to establish confidence in welding fabrication and reliable performance in service. The tasks and responsibilities of personnel involved in welding and related activities, e.g. planning, executing, supervising and inspection, should be clearly defined.

For all tasks assigned, a welding coordination personnel shall be able to demonstrate adequate technical knowledge to enable such tasks to be performed satisfactorily. The following factors should be considered:

- general technical knowledge
- special technical knowledge relevant to the assigned tasks. This may be attained by a combination of theoretical knowledge, training and/or experience.

The extent of required manufacturing experience, education and technical knowledge should be decided by the manufacturing organization and will depend on the assigned tasks and responsibilities.

Authorized welding coordination personnel should normally be allocated from one of the following groups. This will depend on the nature and/or complexity of the production. Adequate manufacturing experience need not necessarily be longer than three years.

ISO 3834

For welded constructions to be effective and free from serious problems in production and in service, it is necessary to provide controls, from the design phase, through material selection, into fabrication and subsequent inspection.

For example, poor design for welding may create serious and costly difficulties in the workshop, on site, or in service. Incorrect material selection may result in welding problems, such as cracking. Welding procedures have to be correctly formulated and approved to avoid imperfections. Supervision needs to be implemented to ensure that the specified quality will be achieved.

For the manufacturing industries a set standards, ISO 3834, with appropriate guidelines have been developed. These guidelines are intended to be used for the following purposes:

- a) providing interpretation of the requirements in the EN ISO 9000 series of standards, as a guideline for specification and establishment of the part of the quality system related to control of welding as a "Special Process".
- b) providing guidelines to establish specifications and welding quality requirements where a quality system according to EN ISO 9001 and EN ISO 9003 is not involved
- c) assessment of the welding quality requirements mentioned in a) and b) above.

The applicable party of ISO 3834 (2, 3 or 4) for stand alone assessment and certification of welded operations and activities will depend on the nature of the welding activities required to meet the agreed specifications and influenced by how critical the welding operations are to the quality and fitness of the final

product.

Common to all three levels of ISO 3834;

- All welders must take a welding test in compliance with EN 287 or EN ISO 9606 series of standards.
- All welding operators must take a welding test in compliance with EN 1418.
- Welding Inspectors for NDT must be qualified in compliance with EN 473
- Demands on description (not ISO 3834-4) and maintenance of equipment such as welding power sources and heating chambers
- A WPS (Welding Procedure Specification) or a WI (Welding Instruction) is used to control the welding process(Not ISO 3834-4)
- Filler material must be handled in accordance to the manufacturer's instruction.

As can be seen above, even quality control of welding process in compliance with the simplest and least comprehensive standard, ISO 3834-4, demands the application of the most important parts of the new European standards.

Summary comparison of ISO 3834, Parts 2, 3 and 4

Criteria	ISO 3834-2	ISO 3834-3	ISO 3834-4
Requirements review	review required		
	record is required	record may be required	record is not required
Technical review	review required		
	record is required	record may be required	record is not required
Sub-contracting	treat like a manufacturer for the specific subcontracted product, services and/or activities, however final responsibility for quality remains with the manufacturer		
Welders and welding operators	qualification is required		
Welding co-ordination personnel	required		no specific requirement
Inspection and testing personnel	qualification is required		
Production and testing equipment	suitable and available as required for preparation, process execution, testing, transport, lifting in combination with safety equipment and protective clothes		
Equipment maintenance	required to provide, maintain and achieve product conformity		no specific requirement
	documented plans and records are required	records are recommended	
Description of equipment	list is required		no specific requirement
Production planning	required		no specific requirement
	documented plans and records are required	documented plans and records are recommended	
Welding procedure specifications	required		no specific requirement
Qualification of the welding procedures	required		no specific requirement
Batch testing of consumables	if required		no specific requirement
Storage and handling of welding consumables	a procedure is required in accordance with supplier recommendations		in accordance with supplier recommendations
Storage of parent material	protection required from influence by environment; identification shall be maintained through storage		no specific requirement

Note: Being certified gives a company a competitive edge. The fact that a company is certified is often used when marketing different products or it may be a prerequisite in order to deliver products. Some customers believe that a certificate is a guarantee of good quality. This is a misconception. A certificate does not say anything about the quality of the product or services, only that the company possesses a quality system that fulfils the requirements of the standard. Nevertheless, a working quality system does help to attain the desired product quality.

The European Welded Product Standards

It is up to the Manufacturer to decide which way to go through to fulfil the Directives' essential requirements, giving evidence of such a fulfilment. The simplest way, often from contractual point of view, is that of the European standards, either harmonised or not.

The European harmonised standards, provide a direct presumption of conformity to the corresponding Directives' essential requirements.

The European non harmonised standards, are however an agreed tool that can assure transparency and common understanding; consequently they are becoming a more and more applied reference in manufacturing contracts.

The most important applicable European standards, dealing with welding fabrication, are shown in the table:

Directive	Product Standard	Standard Title
87/404/EEC (SPVD)	EN 286	Simple unfired pressure vessels designed to contain air or nitrogen
97/23/EC (PED)	EN 13445 EN 13480 EN 12952 EN 12953	Unfired Pressure Vessels Metallic Industrial Piping Water-Tube Boilers and Auxiliary Installations Shell Boilers
99/36/EC (TPED)	EN 13530 EN 14025	Cryogenic Vessels – Large transportable vacuum insulated vessels Tanks for transport of dangerous goods
89/106/EEC (CPD)	pr EN 1090	Execution of steel and aluminium structures
01/16/EC (CRSD) 96/48/EC (HSRD)	pr EN 15085	Welding of railway vehicles and components

All these standards, when facing the welding fabrication process control, mention directly or indirectly the EN ISO 3834.