

Welding Services for Equipment Used in the Petroleum and Natural Gas Industry

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Welding Services for Equipment Used in the Petroleum and Natural Gas Industry

1 Scope

1.1 Purpose

This standard specifies requirements for the qualification of suppliers of welding services used in the manufacturer of equipment for the petroleum and natural gas industries.

1.2 Applicability

The requirements of this standard apply to welding operations performed in a welding facility or in the field. Included are pressure-containing, pressure-controlling, overlay, and structural welds.

NOTE This standard does not limit the responsibility of any manufacturer of commercial products using welding services and manufactured to an API standard from its responsibility for compliance with all applicable requirements of that API standard.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies, except that new editions may be used on issue and become mandatory upon the effective date specified by the publisher or six months from the date of the revision (where no effective date is specified).

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

API Standard 20D, *Nondestructive Examination Services for Equipment Used in the Petroleum and Natural Gas Industry*

API Standard 20H, *Heat Treatment Services—Batch Type for Equipment used in the Petroleum and Natural Gas Industry*

ASME¹ Boiler and Pressure Vessel Code Section II—Materials, Part C, Specifications for Welding Rods, Electrodes and Filler Metals

ASME. BPVC Section IX—Welding, Brazing, and Fusing Qualifications

AWS² A5.01, *Welding Consumables—Procurement of Filler Metals and Fluxes*

AWS D1.1, *Structural Welding Code—Steel*

AWS QC1, *Specification for AWS Certification of Welding Inspectors*

ISO³ 9001, *Quality management systems*

ISO 9606-1, *Qualification testing of welders – Fusion welding – Part 1: Steels*

¹ American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016, www.asme.org.

² American Welding Society, 8669 NW 36th Street, #130, Miami, FL 33166, www.aws.org.

³ International Organization for Standardization, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, www.iso.org.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 15607, *Specification and qualification of welding procedures for metallic materials – General rules*

ISO 15609, *Specification and qualification of welding procedures for metallic materials – Welding procedure specification*

ISO 15614-1, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

3 Terms, Definitions, Acronyms, and Abbreviations

3.1 Terms and Definitions

For purposes of this standard, the following terms, definitions, and acronyms apply.

3.1.1

acceptance criteria

Defined limits placed on characteristics of materials, processes, products, or services.

3.1.2

calibration

Comparison and adjustments of an instrument using an appropriate reference standard, to obtain or establish a known and reproducible response. This is usually performed prior to an examination; however, it can be performed any time there is concern about the examination or instrument response.

3.1.3

familiarity

The state of being familiar with something; possessing a basic understanding of a topic but not being experienced, practiced, or skilled in a topic.

3.1.4

knowledge

Information, understanding, or skill gained from experience or education; greater understanding than familiarity, but not equivalent to a subject-matter expert (SME).

3.1.5

nondestructive examination

NDE

A method used to check the soundness of a material or part without impairing or destroying the usability of the part.

3.1.6

procedure qualification record

PQR

A record of welding variables used to produce an acceptable test weldment and the results of tests conducted on the weldment to qualify a WPS.

3.1.7

router

A process control document that details the steps required to complete required tasks.

3.1.8**subject-matter expert****SME**

A person who, by possession of a recognized degree or professional standing or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to specific subject matter.

3.1.9**traceability**

The ability to verify the history, location, or application of an item by means of documented recorded identification.

3.1.10**welding procedure specification****WPS**

A document providing the required welding variables for a specific application to ensure repeatability by properly trained welders and welding operators.

3.1.11**welding services supplier****WSS**

An organization that provides services for welding of materials and equipment used in the petroleum and natural gas industry.

3.2 Abbreviations

AVL	approved vendor list
CRA	corrosion-resistant alloy
FCAW	flux cored arc welding
GMAW	gas metal arc welding
GTAW	gas tungsten arc welding
MTR	material test report
PQR	procedure qualification record
PWHT	post-weld heat treatment
pWPS	preliminary welding procedure specification
QMS	quality management system
SAW	submerged arc welding
SMAW	shielded metal arc welding
SME	subject-matter expert
sWPS	standard welding procedure specification
WPQ	welder performance qualification
WPS	welding procedure specification
WSS	welding service supplier

4 Welding Services Supplier Qualification**4.1 General**

The welding service supplier (WSS) shall implement and maintain required controls to ensure the product and services meet specified customer requirements and industry standards.

4.2 Facilities and Equipment

To conform to this standard, the WSS shall have the following capabilities:

- equipment to perform required welding activities;
- a facility to store required equipment and to maintain required documents and retain records;
- appropriate handling and lifting equipment (as applicable); and
- inspection and test equipment (as applicable).

4.3 Welding Services Supplier Quality Management System (QMS)

The WSS shall establish, document, implement, and maintain a QMS and associated processes. The QMS shall be in conformance with this standard and API Specification Q1 or ISO 9001. The WSS shall determine the processes needed for the quality management system and their application through all operations.

The WSS shall define the audit requirements for processes covered by this standard, including welding, weld NDE, and post-weld heat treatment (PWHT) to ensure that these processes achieve planned results. Internal audits shall be performed at least every 12 months, covering all on-site areas and shifts.

4.4 Technical Review Requirements

The WSS shall maintain procedure(s) to ensure that technical requirements are reviewed prior to acceptance of the order.

The WSS shall maintain records of this review, including:

- applicable customer or governing design and construction specifications/standards;
- material specifications;
- acceptance criteria for welds;
- qualification of welding procedures;
- qualification of welding personnel;
- outsourced services;
- inspection and testing requirements, including third-party verification;
- identification and traceability (see 7.4);
- special welding requirements;
- requirements for use of special methods.

5 Personnel Training and Competency Requirements

Personnel shall be competent to carry out assigned tasks/responsibilities based on the appropriate education, training, skills, and experience needed to meet product and customer requirements. A written procedure shall define personnel competency and identify training and qualification requirements.

The WSS shall identify:

- roles that require familiarity with welding and testing;
- roles that require a knowledge of welding and testing;
- methods required for personnel training qualifications;
- knowledge and training necessary to address specific customer requirements;
- qualifications required for personnel performing processes that require validation;
- method(s) used to verify the competency of personnel.

The WSS shall maintain evidence of conformity to the above requirements.

6 Weld Processes, Equipment, and Qualification Requirements

6.1 General

The WSS shall maintain a system of written procedures for each welding support service performed. Welding procedure specifications (WPS) shall comply with the applicable nationally or internationally recognized standards.

The development of a weld practice shall comply with the QMS. Individual(s) other than the person or persons who developed the procedure shall approve the final procedure. Changes to procedures shall require the same controls as the original documentation.

6.2 Equipment Inventory (Welding, Inspection, Heat Treatment, NDE, Monitoring)

The WSS shall maintain an inventory of all available welding and support equipment, with the following information noted:

- name of the manufacturer;
- equipment model and serial number;
- calibration requirements, current software, etc.;
- range of operation and range of calibration;
- traceability of calibration records to a recognized international standard used for calibration;
- frequency of calibration;
- allowable tolerances or maximum sensitivity.

6.3 Calibration and Verification

6.3.1 General

Equipment used to inspect, test, or examine material or other equipment shall be identified, controlled, calibrated, and adjusted at specified intervals in accordance with documented manufacturer instructions, and consistent with nationally or internationally recognized standards. Records of all calibration shall be maintained.

6.3.2 Measuring and Testing Equipment

The WSS shall maintain a documented procedure to ensure that testing, measurement, and monitoring equipment is calibrated and maintained, and that the equipment is used in a manner that is consistent with monitoring

and measurement requirements. Calibration shall conform to and be traceable to nationally or internationally recognized standards, as applicable.

6.3.3 Welding Equipment

Welding machines and welding control equipment shall be calibrated as specified by the manufacturer. The frequency of calibration shall be at least annual. In addition, the following shall be checked during calibration:

- condition of volt meters, amp meters, and gas flow meters (if equipped);
- condition of cables;
- condition of hoses (if equipped);
- condition of wire feeders (if equipped).

6.3.4 Calibration Identification

Calibration status of equipment shall be available in a log that provides traceability to the specific piece of equipment. Equipment shall be uniquely identified by a label, etching, or tag.

6.3.5 Calibration Records

The WSS shall specify how calibration records are maintained on each item of equipment used. The record shall include the following:

- type of equipment;
- serial number;
- calibration frequency;
- calibration tolerance;
- date calibrated;
- next calibration due date;
- as-found condition;
- as-left condition;
- standard(s) used;
- calibration procedure or method.

7 Material Preservation and Control

7.1 General

The WSS shall maintain a written procedure that details the system of material preservation and control. Controls, including those for identification and traceability, shall be established to ensure the integrity of base materials and consumables during receipt, handling, storage, and usage.