
KARBALA REFINERY FEED PROJECT
SCOP – IRAQ (Contract n° 2171)

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GENERAL

1.1 INTRODUCTION

This Specification defines the welding, post weld heat treatment, examination, and testing requirements for shop and field fabrication of process and utility piping within the scope of application of ASME B 31.3 and ASME B 31.1.

For licensed units, this specification will have to be applied together with applicable licensor specifications. The more stringent requirements shall govern.

Gas transmission and distribution Pipeline systems are excluded from this specification except for piping class B4A2B and B4A1C for which reference shall be made to APPENDIX 1.

During FEED stage, the use of this specification will be limited to the contractual framework and scope of work of Karbala FEED Project

1.2 DEFINITIONS

For the purposes of this Specification, the following definitions shall apply:

- 1.2.1 EPC CONTRACTOR/CONTRACTOR:** The party which carries out all or part of the design, engineering, procurement, for the EPC PROJECT
- 1.2.2 SUBCONTRACTOR/VENDOR:** the party, which carries out all or part of the design, engineering, procurement, of the Project.

2. CODES AND STANDARDS

The following codes and standards, to the extent specified herein, form a part of this Specification. When an edition date is not indicated for a code or standard, the latest edition in force at the time of VENDOR'S proposal submittal shall apply.

(ASME) AMERICAN SOCIETY OF MECHANICAL ENGINEERS

II, Part C	Welding Rods, Electrodes, and Filler Metals
V	Non-destructive Examination
IX	Welding and Brazing Qualifications
B31.3	Process Piping
B31.1	Power Piping
VIII DIV.1	Boiler & Pressure Vessel

(ASNT) AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING:

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SNT-TC-1A Recommended Practice for Nondestructive Testing
Personnel Qualification and Certification

(ASTM) AMERICAN SOCIETY FOR TESTING AND MATERIALS:

A833 Indentation Hardness of Metallic Materials by
Comparison Hardness Testers

E110 Standard Test Method for Indentation Hardness of
Metallic Materials by Portable Hardness Testers

E140 Standard Hardness Conversion Tables for Metals

EUROPEAN COMMITTEE FOR STANDARDIZATION

EN 10204 Metallic Products – types of Inspection Documents.

3. WELDING FILE

The SUBCONTRACTOR shall submit a detailed welding file to the CONTRACTOR at the time of WPS/PQR submittal. Fabrication shall not start until the welding book is returned with agreement to proceed. The welding file shall include, as a minimum, the following documents:

A cover sheet with title block dedicated to the Project.

A Weld Key form.

Welding Procedure Specifications (WPS).

Procedure Qualification Records (PQR).

3.1 WELD KEY FORM (QCFW11)

The weld key form shall provide the list of all WPS to be used with the following information:

- ◆ Supporting PQR and qualification range.
- ◆ Welding consumables brand and designation
- ◆ list of the piping classes covered by each WPS.
- ◆ Post Weld Heat Treatment requirement
- ◆ material grades
- ◆ minimum design metal temperature (MDMT)

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4. WELDING PROCEDURE SPECIFICATION (WPS) AND PROCEDURE QUALIFICATION RECORD (PQR)

Welding Procedure Specifications (WPS) and their supporting Procedure Qualification Records (PQR) shall conform to the requirements of ASME Section IX and to the requirements of this specification.

Each WPS shall be identified by a unique number and shall make reference to the applicable piping classes.

SUBCONTRACTOR/VENDOR can use its own WPS forms provided that complete welding data defines in ASME IX forms QW – 482, and following information are included:

- a. Welding process or processes when more than one is used in making a complete joint.
- b. Parent metal specification and thickness.
- c. Whether shop or field welding.
- d. Joint preparation (sketch).
- e. Cleaning, degreasing, etc.
- f. Welding position (including direction for vertical position).
- g. Brand name, AWS classification and size (diameter) of welding consumables.
- h. Pre-heating and interpass temperature, including method and control.
- i. Travel speed (automatic welding).
- j. Approximate number and arrangement of runs and weld dimensions (sketch).
- k. Welding sequence.
- l. Back gouging, if applicable.
- m. Gases, /Shielding/backing to include composition and flow rate.
- n. P.W.H.T. requirements including the detailed cycle of heat treatment, heating rate, cooling rate, holding time and temperature. The equivalent heat treatment cycle shall be shown on the PQR.
- o. When welding quenched and tempered steels, steel requiring impact testing, or alloy steels requiring ferrite control, the heat input in conjunction with the maximum interpass temperatures shall be restricted to the maximum values shown in the supporting PQR. Heat input values shall be specified on WPS and recorded on PQR.

$$\text{Heat input in Joules / cm} = \frac{\text{Amperage} \times \text{Voltage} \times 60}{\text{Travel speed in cm/min}}$$

4.1 WELDING PROCEDURE QUALIFICATION TESTS

4.1.1 General

Shop welding procedure qualification for site application may be acceptable provided site's machine and associated equipment are identical to the one used for qualification.

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Welding procedures shall be qualified in accordance with the requirements of ASME IX.

Moreover Brinell testing and ferrite measurements shall be carried out as follows:

4.1.2 Brinell hardness tests

All welding procedure qualification subject to Post Weld Heat treatment shall be as well hardness tested by Brinell method after P.W.H.T.

Hardness tests shall consist of at least two surface measurements on the deposit weld metal. The Hardness check shall be performed when required in Attachment “1” (QCF W09).

4.1.3 Ferrite

When required in paragraph 7.3 of this specification, ferrite content shall be checked as follows.

4.1.3.1 Austenitic Stainless Steels:

Ferrite number shall be determined by chemical analysis and reference to WRC (Welding Researchs Council) diagram or by measurement with calibrated magnetic instruments as per AWS A 4.2 or ISO 8249.

5. WELDERS QUALIFICATION

If not otherwise specified by other Technip “MS” specification the following shall apply:

Welders and welding operators shall be qualified in accordance with ASME Section IX.

SUBCONTRACTOR shall submit to the review of CONTRACTOR a training and examination program of qualification of all welders and foremen.

All field welders and welding operators shall be requalified on site before beginning the works.

Welders and welding operators shall be qualified by a recognised Inspection Authority and/or by the SUBCONTRACTOR welding Engineer/Specialist.

Qualification certificate records shall be submitted to the review of the CONTRACTOR Inspector.

Welder performance registration

In order to control and maintain the validation of performance qualification, a welder performance register shall be kept up to date by the SUBCONTRACTOR.

This register should at least contain the following data:

- Welder’s name and stamp.
- Data of weld inspection and inspection results.
- Materials (base and consumable).
- Configuration data (diameter, wall thickness, etc.).
- Reference to WPS used.
- Position of welding.
- Purging records including repairs.

Welder identification stamps

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To each qualified welder and welding operator shall be assigned an identification code stamp in the form of a number or letters.

Welder/ welding operator code stamping shall be applied close to each pressure-retaining weld produced.

The use of low-stress stamps (e.g. needle or rounded stamps) shall be mandatory for low temperature carbon steel and ferritic alloy steels of P. N° 3 and above, Austenitic stainless steel may be marked either using low- stress stamp or vibro -etching marking.

Marking on all materials with thickness lesser than 5 mm shall be done with paint (without halogens and low melting element)

Control of welder/Operator quality

When required spot or random examination reveal a defect, progressive examination defined in ASME B31.3 Paragraph 341.3.4 shall be completed within 16 working hours of the first rejection, unless otherwise agreed by the CONTRACTOR.

Welders shall not be permitted to weld production joints of any type while waiting for results of examination.

6. WELDING PROCESSES

6.1 General:

Welding of retaining pressure welds shall be limited to the following processes:

Welding processes	AWS Designation
Shielded Metal - Arc Welding	SMAW
Gas Tungsten - Arc Welding	GTAW
Submerged Arc Welding	SAW
Flux Cored Arc Welding	FCAW (see 6.2.1)
Gas Metal Arc Welding	GMAW-GMAW STT (see 6.2.5)

Other application of welding processes on piping retaining pressure welds shall not be assumed acceptable by the SUBCONTRACTOR/VENDOR during bid preparation and would require CONTRACTOR prior approval. Any authorization would imply the evaluation of the specific application, additional qualifications and NDT requirements.

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Above limitations do not apply to non-pressure retaining welds.

6.2 Requirements for specific welding process:

6.2.1 Flux cored arc welding:

FCAW process shall not be used for socket welds.

FCAW may be used for carbon steel of rating up to 600Lbs provided that following conditions are fulfilled:

- ◆ SUBCONTRACTOR/VENDOR can provide evidence of successful previous experience with this process.
- ◆ The flux-cored arc welding process is combined with an external shielding gas.
- ◆ Welding is carried using automatic machine equipment.

Other application of FCAW process on piping retaining pressure welds shall not be assumed acceptable by the CONTRACTOR/VENDOR during bid preparation and would require CONTRACTOR prior approval.

Flux cored arc welding may be used for welding non-pressure containing parts and non-pressure containing attachments to pressure containing parts.

Flux cored arc welding procedures shall be requalified whenever a change is made in filler metal from one manufacturer to another or to a different brand or type from the same manufacturer.

6.2.2 Submerged Arc Welding Process:

Solid wires for automatic-welding processes shall contain the principal elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal elements from the flux (Alloy flux as defined by ASME section II, Part C SFA 5.17 or 5.23).

Fluxes that the flux Manufacturer recommends for single pass welds shall not be used for multiple pass welds. Active fluxes are not permitted as defined by ASME section II, Part C SFA 5.17 or 5.23.

The brand name and grade of flux and wire used for production of submerged arc welds shall be the same as used in the relevant procedure qualification test.

Welding procedures for submerged arc welding shall be requalified whenever the welding flux or wire is changed from one manufacturer to another or from one grade to another grade from the same manufacturer. Equivalence under ASME section II, Part C shall not be considered adequate for substitution without requalification.

Only neutral fluxes shall be used.

6.2.3 Gas Tungsten Arc Welding

Single sided groove welds in P-Number 3 and greater materials shall have the root pass made with the GTAW process.

GTAW process shall be used to deposit the root pass in butt welds of NPS 2 and smaller, and for root pass of socket welds NPS 1 and smaller.

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The use of consumable inserts shall be subject to CONTRACTOR prior approval.

Shielding and backing Gases for GTAW:

SUBCONTRACTOR shall submit to the acceptance of CONTRACTOR a “Purging procedure “ detailing the method of back purging, and associated inspection procedure to be implemented during piping pre-fabrication and field welding including final closing welds and local repairs.

Inert (Argon) backing gas is required for Base Material P-Number 4 and greater which shall be maintained for a minimum of two passes.

The use of nitrogen as backing gas for stainless steels shall require CONTRACTOR prior approval.

6.2.4 Shielded metal arc welding:

When using low hydrogen electrodes, only uphill progression shall be allowed.

6.2.5 Gas Metal Arc Welding (GMAW and GMAW-STT)

GMAW process shall not be used for socket welds.

GMAW in the “short circuiting” transfer mode shall not be used except for:

- tack welds where the weld metal is completely removed
- structural attachment to the outside surface of the pipe

The use of GMAW-STT shall be allowed on carbon steel piping on root pass.

7. WELDING CONSUMABLES

7.1 GENERAL

Filler metal shall be as specified in ASME Section II Part C or equivalent, AWS Specification. Certified Material Test Reports (CMTR’s) corresponding to the level of testing Schedule “T” as defined in SFA 5.01 are required for all welding consumables. CMTR’s shall be supported by type 3.1.certificate according to EN 10204.

Electrodes and/or filler metals shall be selected such as:

The strength of deposited weld metal is at least equal to the specified minimum mechanical properties of the materials being welded.

Chemical composition of the principal elements in deposited weld metal shall match as closely as possible to the nominal composition of the base metal.

However, this shall not preclude the use of welding materials containing alloying elements of different types or in different amounts than those in the base materials provided there is no evidence that such elements are not harmful or are beneficial from standpoint of achieving desirable weld metal properties, such as adequate tensile strength after post weld heat treatment or adequate impact toughness at low temperatures.

For weld procedures requiring impact testing, the brand name of welding consumables (electrodes, rods, wire, flux cored, flux) shall be the same as used in the welding procedure qualification test.

以上内容仅为本文档的试下载部分，为可阅读页数的一半内容。如要下载或阅读全文，请访问：<https://d.book118.com/565022200130011214>