

DEP SPECIFICATION

**WELDING ON PRESSURIZED PIPES
(AMENDMENTS/SUPPLEMENTS TO API STANDARD 1104)**

DEP 30.10.60.30-Gen.

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DESIGN AND ENGINEERING PRACTICE

DEM1



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PART I INTRODUCTION AND GENERAL REQUIREMENTS

1 INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the welding of fittings, sleeves, branches or attachments onto pressurised carbon steel pipelines (X70 or lower strength) and on-plot piping using SMAW welding only.

This DEP is not applicable to tanks or vessels, or to pipelines and piping transporting category A fluids operating below 10 bar (ga) (150 psig).

Part II of this DEP provides amendments and supplements to clauses of API Standard 1104.

For definition of fluid categories reference is made to DEP 31.40.00.10-Gen.

Design verification and safety aspects of welding on pressurised pipes are addressed in DEP 31.38.60.10-Gen, including pipeline and piping operating limits.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM 1) – Application of Technical Standards.

This is a revision of the DEP of the same number dated February 2011; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The lower-case word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Batch	Equivalent term for lot of electrodes (used by AWS)
Buttering	Weld metal deposited on the surface(s) of the parent material(s) to give build-up
Company	Term used in API Standard 1104 which shall be taken to mean the Principal
Run pipe	The pressurised pipe to which a fitting, sleeve, branch, or attachment will be welded.

1.3.3 Abbreviations

Term	Definition
AWS	American Welding Society
BGAS	British Gas Approval Scheme
CSWIP	Certification Scheme of Welding Inspection Personnel
HAZ	Heat-Affected Zone
NDT	Non-Destructive Testing
OD	Outside Diameter
pWPS	Preliminary Welding Procedure Specification(s)
SMAW	Shielded Metal Arc Welding
SMYS	Specified Minimum Yield Strength
WPQR	Welding Procedure Qualification Record(s)
WPS	Welding Procedure Specification(s)

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (Part IV).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2011. The following are the main, non-editorial changes.

Section/Clause	Change
All	Changes to requirements in line with DEP500 review.
B.9	Remove requirements from notes within Figures.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://swwww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

PART II GENERAL REQUIREMENTS

2.1 GENERAL

Part III of this DEP amends and supplements API Standard 1104, 20th edition, October 2005, including:

- a. Errata/Addendum, July 2007,
- b. Errata 2, December 2008,
- c. Reaffirmed, April 2010.

The requirements herein are supplementary to those in Appendix B and therefore sections of this DEP will reference the body of API Standard 1104 as well as Appendix B.

For ease of reference, the clause numbering in of API Standard 1104 has been used throughout Part III of this DEP. Clauses of API Standard 1104 that are not mentioned in this DEP remain applicable as written.

2.2 INFORMATION TO BE SUPPLIED BY THE PRINCIPAL

1. The following information shall be supplied by the Principal to the Contractor at the enquiry stage of the order:
 - a. location of the welding operation.
 - b. fluid and process conditions in the pipeline or piping.
 - c. specification of pipe, fittings, and repair materials.
 - d. applicable safety regulations.
 - e. which of the Contractor's quality system procedures and records will be subject to agreement (Part III, Section 2.1 of this DEP).
 - f. whether the Contractor's selected welding electrodes are to be agreed.
 - g. whether pre-qualified procedures and welders may be used, or contract-specific qualifications have to be completed. (Part III, Section 2.1 of this DEP).
 - h. whether qualification welding and/or production welding will be witnessed by the Principal.
 - i. whether thermocouple locations for qualification welding are to be agreed.
 - j. whether the Contractor's welding inspection personnel may be certificated by specific alternative agencies (Part III, 5.6 of this DEP).
 - k. the specific documentation to be submitted upon completion of the work (Part III, Section B.8 of this DEP).
 - l. critical welds shall be identified.
 - m. define witnessing requirements for qualification welding, NDT and destructive testing.
 - n. previously qualified welding procedure specifications of the Contractor may be used without re-testing.

PART III AMENDMENTS/SUPPLEMENTS TO API Standard 1104**1 GENERAL****1.1 SCOPE**

Add the following:

1. Only the SMAW welding process shall be used for welding governed by this DEP.

2 NORMATIVE REFERENCES

Add the following:

1. See Part IV of this DEP.

Add the following new section:

2.1 QUALITY ASSURANCE SYSTEM

1. The Contractor's contract-specific quality plan shall be submitted for review and will be subject to approval of the Principal prior to the commencement of welding.

Review by the Principal of a preliminary quality plan at the enquiry stage may assist the process.

2. The Contractor should maintain and operate a quality assurance system in accordance with ISO 9001 or ISO 9002.

- a. Subject to approval of the Principal, the Contractor may maintain and operate a quality assurance system based on an alternative standard.

Attention is drawn to the possible use of the complementary requirements of ISO 3834-2.

3 DEFINITION OF TERMS**3.2 DEFINITIONS****3.2.3 Company**

Delete this subsection and replace with the following:

1. This term is equivalent to Principal as defined in (1.3.1).

3.2.21 WPQR

WPQR is used to describe both the record of a qualification or the qualification welds and any acts associated with making the qualification welds.

3.2.22 Sour Service

Exposure to oilfield environments that contain H₂S and can cause cracking of materials by the mechanisms addressed in ISO 15156.

4 SPECIFICATIONS

4.1 EQUIPMENT

Delete from first sentence "both gas and arc".

Delete the 3rd sentence beginning "Gas welding equipment...."

Add the following:

1. The equipment shall comply with the local applicable safety standards to ensure no undue safety risks (eg. electric shock) exist towards the welders and associated personnel.

4.2 MATERIALS

4.2.2 Filler metal

4.2.2.1 Type and size

Delete this section and replace with the following:

1. Electrodes shall be of the basic coated low-hydrogen type: class EXX16 or EXX18 of AWS A5.5, or an equivalent alternative class and specification.
2. For sour service, the electrodes shall not deposit weld metal containing more than 1.0 wt% nickel (Ni).
3. The level of testing for all electrodes shall be Schedule J of AWS A5.01 plus chemical analysis for the particular electrode sizes that are not required to be chemically analysed by AWS A5.5, which results in a Schedule K AWS A5.01 classification.
4. For electrode sizes that are required to be chemically analyzed by AWS A5.5, the level of testing shall be at least the same as (4.2.2.1, item 3).
5. The batch classification of electrodes shall be C3 of AWS A5.01.
6. Electrode inspection certificates for each batch classification shall be in accordance with ISO 10474 3.1.B. (AWS classification in US)
7. For welds that contact the run pipe, the electrodes shall be suitable for downhill welding, and clearly stated in the Manufacturer/Supplier's datasheets.
8. For welds other than those that contact the run pipe, electrodes may be of the type normally used for uphill welding.
9. The electrodes shall have type approval by a certifying authority.
10. Each electrode shall have the AWS or other appropriate classification marked on the flux near the grip end.
11. Electrodes which do not have a classification marking shall be removed from the job site.
12. Buttering runs shall be deposited with small diameter electrodes.

In this context, small can be considered to be 2.4mm or below (3/32inch)

4.2.2.2 Storage and handling of filler metals and fluxes

Add the following:

1. Electrodes shall be stored in accordance with the Manufacturer's instructions in their original containers and be marked with the Manufacturer's name, the consumable trade name, and the batch number.
2. Electrodes in containers which are not identifiable and traceable shall be removed from the job site.
3. To limit electrode handling and the concerns over hydrogen control of these critical welds, vacuum packaged electrodes are recommended.
4. Electrodes shall be treated and handled in accordance with the Manufacturer's instructions to achieve the lowest practicable diffusible hydrogen content in the deposited weld metal.
5. Electrodes that can be baked out shall not be baked more than twice.

4.2.3 Shielding gases

Delete this section in its entirety.

5 QUALIFICATION OF WELDING PROCEDURES FOR WELDS CONTAINING FILLER METAL ADDITIVES

5.1 PROCEDURE QUALIFICATION

Add the following:

1. All welds SHALL [PS] be in accordance with an approved WPS and qualified by a WPQR.
2. Separate WPS shall be prepared for groove and fillet welds.
3. Use of pre-qualified weld procedures should be only approved by the Principal if a considerable track record with its use can be demonstrated.
Hot tapping is not generally a regular occurrence, therefore re-qualifying can be used to demonstrate welder competency.
4. Welders proposed by the Contractor to perform procedure qualification testing shall be experienced and, for pipeline work, have demonstrated prior welding performance using the selected type of electrode and welding direction.
5. The Contractor shall have maintained records of the proposed welders demonstrating satisfactory experience and performance.

5.2 RECORDS

Add the following:

1. Parameter records should be generated by an arc monitoring system with print-out capability.
2. Materials certificates for the test assembly shall form part of the records.
3. The final production WPS and supporting WPQR shall be subject to approval of the Principal prior to production welding.