

DEP SPECIFICATION

WELDED AND SEAMLESS DUPLEX, SUPER DUPLEX AND WELDABLE MARTENSITIC STAINLESS STEEL LINE PIPE (AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC)

DEP 31.40.20.34-Gen.

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DESIGN AND ENGINEERING PRACTICE

DEM1



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PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the manufacture and supply of seamless weldable martensitic stainless steel, seamless and longitudinally welded duplex and super duplex stainless steel line pipe for use in oil and gas operations under both sour and non-sour service conditions.

Sour service is defined in ISO 15156-1, Clause 3.19.

This DEP is based on API Specification 5LC, Fourth Edition, October 2015. Part III amends, supplements and deletes various clauses of API Specification 5LC. Part III follows the clause numbering of API Specification 5LC for easy reference.

All clauses of API Specification 5LC not modified by this DEP remain valid as written.

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 2017. 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 authorization 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.

In API Spec 5LC, the term **Purchaser** is used. In this DEP, the term Purchaser shall be understood to mean the Principal.

The 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
Ambient temperature	Temperature surrounding the object under consideration.
Defect (in NDT)	An imperfection or group of imperfections whose indication(s) do not meet specified acceptance limits.
Electric-Welded	Term used in API Spec 5LC that is equivalent to High Frequency Welded (HFW).
Finished Pipe	Pipe passed through all stages of production and inspection.
Imperfection (in NDT)	An interruption in the physical structure or configuration of a pipe. It can be intentional or unintentional.
Indication (in NDT)	Evidence of an imperfection that requires interpretation to determine its significance.
Lot	A production quantity. When referred to pipe manufacture, a lot is defined as 100 units. When used in connection with the manufacture of fittings or spools, a lot is defined as components manufactured from the same materials during a single shift.
Pipe End	Complete pipe segment of 100 mm (4 in) length measured from the end face of the finished pipe.
Plate or Coil	The flat starting material for welded pipe before forming into the shape of a pipe.
Radiological	Term used in API Spec 5LC which has the same meaning as radiographic.

1.3.3 Abbreviations

Term	Definition
CP	Cathodic Protection
CRA	Corrosion Resistant Alloy
CTOD	Crack Tip Opening Displacement
DAC	Distanec Amplitude Curve
DN	Diameter Nominal
ERW	Electrical Resistance Welding
FBH	Flat Bottom Hole

Term	Definition
FL	Fusion Line
HAZ	Heat Affected Zone
HFW	High Frequency Welded
HISC	Hydrogen induced stress cracking
HV	Vickers Hardness
ID	Inside Diameter
IGSCC	Intergranular Stress Corrosion Cracking
MPQ	Manufacturing Procedure Qualification
MPQT	Manufacturing Procedure Qualification Test
MPS	Manufacturing Procedures and Specifications
N5	API N5, notch cut up to 5% of pipe wall thickness
NDT	Non-destructive Testing (also known as NDE)
OD	Outside Diameter
PQR	Procedure Qualification Record
PRE(N)	Pitting Resistance Equivalent (including nitrogen)
PT	Liquid Penetrant Testing
RDH	Radially Drilled Hole
RT	Radiographic Testing
SDH	Side Drilled Holes
SSRT	Slow Strain Rate Test
t	Wall Thickness
Tmin	Minimum Design Temperature
UNS	Unified Numbering System
UT	Ultrasonic Testing
WCL	Weld Centre Line
WMSS	Weldable Martensitic Stainless Steel
WPS	Welding Procedure Specification

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section 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 2017. The following are the main, non-editorial changes.

Section/Clause	Change
All	Merge DEP 31.40.20.36-Gen into this DEP
All	Updated in accordance to API 5LC Fourth Edition 2015
Part III	Removal of Suggestion for Order API CRA linepipe, reverting to standardized order form
	Table 2 amended to include weldable martensitic stainless steel.
	Removal of majority of SHALL [PS]
5.1	Added SHALL [PS]
5.3	Added SHALL [PS]
8.1	Testing is aligned to ISO 17781
	Revision of pipe OD/ID measurement clause.
	Revision of quality plan/MPS clause to include additional requirements.
	Revision to NDE standards and wording changes.

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://www.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

Part III of this DEP is written as amendments and supplements to API Specification 5LC, Fourth Edition, October 2015. Wherever reference is made to API 5LC, it shall be understood to mean API Specification 5LC as amended/supplemented by this DEP.

For ease of reference, the clause numbering of API 5LC has been used throughout Part III of this DEP.

Clauses in API 5LC, which are not mentioned in this DEP, shall remain valid as written.

1. A standard Shell line pipe order form shall be used as the basis for initial enquiries for CRA pipe.

PART III AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC**1 Scope****1.1 Coverage**

Delete the first two paragraphs of this clause and refer to (Part I, 1.1) of this DEP.

Add the following new clauses:

1.3 Quality System

1. The Manufacturer/Supplier shall maintain and operate a quality assurance system in accordance with ISO 9001.
 - a. The Manufacturer/Supplier may maintain and operate a quality assurance system based on an alternative standard subject to approval by the Principal.
 - b. The Manufacturer/Supplier shall be qualified as per one of the following: the TAMAP process.
 - i. the TAMAP process;
 - ii. as per NORSOK M-650/ISO 17782;
 - iii. through other Principal-approved qualification processes.

4 General Information**4.2 Measuring Devices**

Add the following to this clause:

1. The Manufacturer/Supplier shall control measuring devices within the requirements of ISO 10012.

4.4 Certification

Replace this clause with the following:

1. Inspection certificates shall be supplied in accordance with EN 10204 and ISO 10474, Type 3.1
2. Section SR 15 in Annex B of API 5LC shall be applied and the data provided to the Principal in an agreed electronic format.

4.5 Retention of Records

Replace this clause with the following:

1. Contract records, and any other records requiring retention, shall be retained by the Manufacturer/Supplier quality assurance system.
 - a. Contract records shall be made available to the Principal on request for a period of five years after completion of the order.

5 Process of Manufacture and Material**5.1 Process of Manufacture**

Add the following to the first paragraph of this clause:

1. WMSS line pipe SHALL [PS] be supplied as seamless.
2. All plate or coil material shall be visually inspected to ensure that no cracks, laps, laminations or other planar defects are present.

b) Welded Processes**1) Without Filler Metal**

Add the following to this clause:

- i. Use of the electric welding process shall be subject to approval by the Principal.
- ii. Autogenous welding shall be subject to approval by the Principal.

2) With Filler Metal

Add the following to this clause:

- iii. The longitudinal seam welds SHALL [PS] be full penetration and double sided welded using a qualified welding procedure specification applicable to one or more of the following welding processes.
 1. GTAW Gas Tungsten Arc Welding; or
 2. PAW Plasma Arc Welding; or
 3. SAW Submerged Arc Welding; or
 4. GMAW Gas Metal Arc Welding.

3) With or Without Filler Metal

Delete the following clause.

c) Pipe-making Processes (See Table 3)**Table 3 - Pipe Manufacturing Processes**

Delete the "Double Seam" column in Table 3.

Delete the "Centrifugally cast" from Table 3.

6) Combination Welding

Delete "or double" in this clause.

7) Double Seam

Delete this clause.

d) Tack Welding

Add the following to this clause:

1. Tack welds shall be made using a continuous single pass.