

DEP SPECIFICATION

SEAM WELDED SUPER DUPLEX TUBING MANUFACTURING SPECIFICATION FOR UMBILICALS AND SUBSEA DISTRIBUTION HARDWARE

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements for manufacture, packaging, handling, and shipping of seam welded, super duplex stainless steel tube for umbilical service.

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 and gas handling. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process should 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 word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.4 ABBREVIATIONS

BM	Base Metal
CoC	Certificate of Conformance
DWP	Design Working Pressure
FAT	Factory Acceptance Test
GA	General Assembly
GTAW	Gas Tungsten Arc Welding
HAZ	Heat Affected Zone
ID	Inside Diameter
IQI	Image Quality Indicator
ITP	Inspection, and Test Plan
LBW	Laser Beam Weld
LSW	Longitudinal Seam Weld
MBR	Minimum Bend Radius
MOC	Management of Change
MPS	Manufacturing Procedures and Specifications
MTR	Material Test Report
NDE	Non-Destructive Examination
NDT	Non-Destructive Testing
OD	Outside Diameter
OW	Orbital Weld
PE	Professional Engineer
PO	Purchase Order
PQR	Procedure Qualification Report
QP	Quality Plan
SMYS	Specified Minimum Yield Strength
SSW	Strip Splice Weld check
TF	Transverse Face
TR	Transverse Root
UT	Ultrasonic Testing
WPQ	Welder Performance Qualification
WPS	Weld Procedure Specification
WT	Wall Thickness

1.5 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 (9).

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of “DEPs on the Web”, available through the Global Technical Standards web portal <http://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

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..

2. SCOPE OF WORK

The following project specific variables shall be specified in the Project Scope of Work:

- Inner diameter (ID) and wall thickness (WT) of tubes
- Specified minimum yield strength
- WT tolerances (minimum and maximum)
- Tube Design Working Pressure (DWP)
- Cleanliness requirements for tube
- Type, material, and rating of end/test fittings on each spool (consistent with tube tests on project test matrix)
- Total quantity of each tube size
- Duration for retention of records (appropriate for service life)

3. PROJECT ADMINISTRATION

3.1 PROJECT DOCUMENTS

Manufacturer/Supplier shall prepare a Project Document Register that shall include the documents and drawings listed in (Appendix 4).

Manufacturer/Supplier shall issue a project specific Inspection and Test Plan (ITP) for Principal's review and approval. The ITP shall include for all manufacturing stages:

- Principal specification references
- Agreed technical clarifications/deviations to project specifications
- Manufacturing procedure references
- Inspection/test procedure references
- percentage or proportion of items to be inspected
- Inspection/test frequency and quantity
- Acceptance criteria
- Retest criteria and procedure (if applicable)
- Rework procedure (if applicable)
- Type and content of paperwork completed prior to release
- Principal's required review, monitor, witness, and hold points

The quality plan (QP) or a separate project specific document shall capture sub-supplier quality surveillance and receipt inspection and testing. Document deliverables are listed in (Appendix 1 and Appendix 4).

Manufacturer/Supplier shall issue a project specific ITP for Principal's review and approval.

The ITP shall include for all manufacturing stages:

- Principal specification reference
- Agreed technical clarifications/deviations to Principal specifications
- Manufacturing, Inspection/test procedure reference
- Inspection/test frequency and quantity, acceptance criteria
- Retest and/or rework criteria and procedure (if applicable)
- Principal's required review, witness and hold points.

3.2 PROJECT SCHEDULE

Manufacturer/Supplier shall prepare a project schedule illustrating planned Purchase Order (PO) milestones and manufacturing activity start dates and durations. The schedule shall include the following main activities:

- Issue of Pre-Production Documentation
- Tube Qualification
- Tube Manufacture
- Non-Destructive Examination (NDE)
- Mechanical Testing
- Process Hydrostatic Test
- Final Visual Inspection
- Factory Acceptance Test
- Drying
- Packaging/Marking for shipment
- Scheduled Public Holiday dates or Manufacturer/Supplier Holiday
- Manufacturing schedules for umbilical orders adjacent to Principal's
- Issue of Close Out Report and Manufacturing Record Book

4. QUALIFICATION OF TUBE MATERIAL

Test data shall be available to Principal to demonstrate the following for each grade of material, heaviest WT and largest outside diameter (OD) tube. Additionally, the following shall apply:

- Strain history shall be documented for all test samples
- Welding and radiography shall be as per this document
- Material tracking record shall be maintained to illustrate where samples were taken from one or more mill coil, strip, or heat
- It should be specifically stated that the samples are NOT taken as adjacent samples from the mill coil and planned to be distributed from end to end to represent some variation

The following is the legend for Tables 1 and 2:

T : Test

S : # of samples

A : Test acceptance criteria

4.1 FATIGUE TESTING

Table 1 Fatigue Testing Criterial

Test	STrip Splice Weld (SSW)	LONGITUDINAL Seam Weld (LSW)	Orbital Weld (OW)
Low Cycle Fatigue			T: Bend back and forth (1 cycle) to minimum bend radius (MBR) 2% strain; bend to failure or 160 cycles S: 3, each with orbital weld in the middle A: 80 cycles without failure
High Cycle Fatigue	T: Bending or tension 30%, 50%, 70% specified material yield strength (SMYS) to 1.5x B-curve or failure S: 1 each A: Value exceeds B-curve	T: Bending or tension 30%, 50%, 70% SMYS to 1.5x B-curve or failure S: 1 each A: Value exceeds B-curve	T: Bending or tension 30%, 50%, 70% SMYS to 1.5x B-curve or failure S: 3 each, each with orbital weld in the middle A: Value exceeds B-curve