

DEP SPECIFICATION

SEAMLESS SUPER DUPLEX TUBING MANUFACTURING SPECIFICATION FOR UMBILICALS AND SUBSEA DISTRIBUTION HARDWARE

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DESIGN AND ENGINEERING PRACTICE



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The information set forth in these publications is provided to Shell companies for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual Operating Units to adapt the information set forth in DEPs to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use DEPs, they shall be solely responsible for such use, including the quality of their work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will typically expect them to follow those design and engineering practices that will achieve at least the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal.

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All administrative queries should be directed to the DEP Administrator in Shell GSI.

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1. INTRODUCTION

1.1 SCOPE

This DEP specifies minimum requirements for manufacture of seamless super duplex stainless steel tube for umbilical service.

Transportation from Manufacturer/Supplier's premises or intermediate transfer point may or may not be included in Manufacturer/Supplier's scope. Details for packing and transportation of straight tube and/or spooled tube lengths shall be proposed by Manufacturer/Supplier in accordance with the requirements of this specification and for Principal approval.

Any concessions agreed between Manufacturer/Supplier and Principal during tender negotiations shall be listed in the Purchase Order. Requests for concessions thereafter must be in the form of a Technical Deviation Request (DR), submitted in writing to the Principal Representative.

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 offshore oil and gas production.

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 word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Procedure Qualification Record	Documents the qualification of a specific Weld Procedure Specification
Weld Procedure Specification	Defines and records all of the different elements, variables, and factors that are involved in producing a specific weld or weldment
Welder Performance Qualification	Documents the individual qualification of each welder for a specific Weld Procedure Specification

1.3.3 Abbreviations

Term	Definition
DDR	Design Deviation Request
DR	Deviation Request
DWP	Design Working Pressure
H	Hold
HAZ	Heat Affected Zone
HT	Heat Treatment
HTAR	Heat Treatment Approval Record
ID	Inner Diameter
ITP	Inspection and Test Plan
IQI	Image Quality Indicator
M	Monitor
MOC	Management of Change
MPS	Manufacturing Procedures and Specifications
NCR	Non-Conformance Report
NDE	Non-Destructive Examination
OD	Outer Diameter
PMI	Positive Material Identification
PO	Purchase Order
PRE	Pitting Resistance Equivalent
PTP	Production Test Piece
PQR	Procedure Qualification Record (also known as WPAR)
QP	Quality Plan
R	Review
W	Witness
WPAR	Weld Procedure Approval Record (also known as PQR)
WPQ	Welder Performance Qualification



Term	Definition
WPR	Welder Performance Qualification
WPS	Weld Procedure Specification
WT	Wall Thickness

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 (8).

1.5 SUMMARY OF MAIN CHANGES

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

Section/Clause	Change
1.5	Added table to Summary of Changes
1.6	Updated Feedback procedure
1.7	Added Dual Units section
4.2	Corrected reference in Note 2
6.9	Changed references to ASTM A450 to ASTM A1016
7.1.2	Changed reference in par. 1.
7.4.4	Removed elongation from tensile test report.
7.4.4	corrected dual units under corrosion test
8	Added DEP Feedback Form to Reference section

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.

2. PROJECT INSPECTION AND TEST PLAN

2.1 PROJECT DOCUMENTS

The Manufacturer/Supplier shall prepare a Project Document Register according to (Appendix 2) that shall include the documents and drawings listed in (4) and (Appendix 3).

The 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:

- a) Principal specification references
- b) Agreed technical clarifications/deviations to project specifications
- c) Manufacturing procedure references
- d) Inspection/test procedure references
- e) Percentage or proportion of items to be inspected
- f) Inspection/test frequency and quantity
- g) Acceptance criteria
- h) Retest criteria and procedure (if applicable)
- i) Rework procedure (if applicable)
- j) Type and content of paperwork completed prior to release
- k) 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 3).

2.2 PROJECT SCHEDULE

The 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:

- a) Issue of Pre-Production Documentation
- b) Heat Treatment Trial
- c) Melting
- d) Bar Production to Billets
- e) Extrusion
- f) Hollow Inspection
- g) Cold Rolling / Pilgering
- h) Heat Treatment
- i) NDE
- j) Final Visual Inspection
- k) Scheduled Public Holiday dates or Manufacturer/Supplier Holiday
- l) Manufacturing schedules for umbilical orders adjacent to the Principal's (see below)
- m) Issue of Close Out Report and Manufacturing Record Book

In addition the following activities pertaining only to straight tubes shall be included on the schedule:

- a) Tube consignment available for shipping to the umbilical Manufacturer for Weldability Trial
- b) Packing and marking of straight tubes for shipping
- c) Shipping of straight tubes

The following activities shall be included on the schedule for the supply of welded coils:

- a) Weldability Trial
- b) Release of tubes to weld line
- c) Preparation of WPS and perform PQR
- d) Qualification of Welders to PQR
- e) Production Welding
- f) Coil Flushing and Testing
- g) Packing and marking of coils for shipping
- h) Shipping of coils

3. PRE-PRODUCTION DOCUMENTATION

3.1 DOCUMENTATION FOR STRAIGHT TUBES

Pre-Production technical documentation shall comprise the following documents:

- a) Heat treatment (HT) trial procedure
- b) Sigma detector demonstration
- c) Quality plan (QP)
- d) Manufacturer/Supplier's Straight tube packing and marking procedures
- e) Material traceability plan, specific for PO

3.2 DOCUMENTATION FOR WELDED COILS

Pre-Production technical documentation shall comprise the following documents:

- a) HT trial procedure
- b) Sigma detector demonstration
- c) Material weldability trial procedure
- d) QP
- e) Welded coil end fitting specification
- f) Welded coil packing and marking specification
- g) Material traceability plan, specific for Purchase Order (PO)

3.3 HEAT TREATMENT TRIAL

A HT trial shall be performed prior to start of main production for all Principal orders. The HT trial may be waived at Principal discretion and tests below may be taken on 10 tubes from the first annealing batch when previously manufactured tube size has already been subjected to a HT trial by the Manufacturer/Supplier for the Principal and no major changes have been made to the process or plant equipment in the interim period.

The purpose of the trial shall be to establish the optimum furnace settings for achieving the specified material properties and to demonstrate that test specimens from the HT trial satisfy test acceptance criteria as outlined in (6.7).

Out of range alarms, both audible and visible, shall be required during testing. The alarms shall be witnessed by the Principal Inspector prior to planned start of the first annealing batch.

Tests on 10 tubes shall be taken from the HT trial or first annealing batch, as agreed between the Manufacturer/Supplier and the Principal. The following results shall be reported to the Principal in the form of a heat treatment approval record (HTAR) and shall be included in the QP:

- a) Tensile Test x 5 tubes
- b) Hardness Test x 5 tubes
- c) Corrosion Test x 10 tubes minimum or 50 % of batch size
- d) Microstructure x 10 tubes minimum or 50 % of batch size
- e) Ferrite Count x 10 tubes minimum or 50 % of batch size

The furnace zone temperature tolerances shall be documented and the sensitivity of the tube mechanical properties to the extremities shall be checked at the trial and the results reported together with the HTAR. The extremities shall be the basis for the furnace alarm set points (6.5).