

DEP SPECIFICATION

**PIPELINE FITTINGS
(AMENDMENTS/SUPPLEMENTS TO ISO 15590-2)
AND
LOW TEMPERATURE PROCESS PIPING FITTINGS**

DEP 31.40.21.30-Gen.

February 2013

ECCN EAR99

DESIGN AND ENGINEERING PRACTICE



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PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for fittings for use in oil and gas transmission pipelines in both non-sour and sour service. Part III of this DEP is based on ISO 15590-2, which applies to carbon steel seamless and welded fittings. Requirements for other materials are covered in Part IV and Part V as follows:

Part III	Amendments/Supplements to ISO 15590-2 (Carbon Steel Fittings)
Part IV	Low Temperature Carbon Steel Fittings
Part V	Duplex and Super Duplex Stainless Tees

Part III of this DEP amends, supplements and deletes various clauses of ISO 15590-2. Part III follows the clause numbering of ISO 15590-2 for easy reference. All clauses of ISO 15590-2 not modified by this DEP remain valid as written.

Part IV of DEP covers the low temperature carbon steel fittings which are used for piping applications to match ASTM A333 Grade 6 pipe.

This is a revision of the DEP of the same number dated June 2007 and supercedes Shell U.K. Exploration and Production (EPE) standard ES/222. 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 primarily intended for use in oil and/or gas transmission pipelines and related facilities. 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.

NOTE: In ISO 15590-2, the term **Vendor** is used. In this DEP, the term Vendor shall be understood to mean the Manufacturer/Supplier.

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.

NOTE: In ISO 15590-2, 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 word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Defect (in NDT)	a discontinuity or group of discontinuities whose indication(s) do not meet specified acceptance criteria.
Fitting bevel	the total weld preparation machined on the end of a fitting.
Heat	a batch of steel prepared in one steel making operation, resulting in one chemical composition.
Heat Treatment Batch (or Lot)	a set of identical fittings which have been produced from the same heat, have undergone the same heat treatment and, if applicable, have been welded in accordance with the same welding procedure.
Indication (in NDT)	evidence of a discontinuity that requires interpretation to determine its significance.
Minimum operating temperature	the minimum temperature to which the pipeline or section of pipeline may be exposed during normal operational activities, including start-up and shut-down operations and controlled blowdown, but excluding abnormal situations such as pipeline ruptures.
Pipeline	a system of pipes and other components used for the transportation of fluids, between (but excluding) plants. A pipeline extends from pig trap to pig trap (including the pig traps) or, if no pig trap is fitted, to the first isolation valve within the plant boundaries or a more inward valve if so nominated.
Plate	the material for manufacturing a welded fitting before being formed into the shape of a fitting.

1.3.3 Abbreviations

Term	Definition
ASNT	American Society of Non destructive Testing
HAZ	Heat Affected Zone
HIC	Hydrogen Induced Cracking
MPQ	Manufacturing Procedure Qualification
SAW	Submerged Arc Welding
SMAW	Shielded Metal Arc Welding
SMYS	Specified Minimum Yield Stress
ToFD	Time of Flight Diffraction
WPQR	Welding Procedure Qualification Record

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 V).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated June 2007. This is a major revision and the changes are too numerous to list here.

The base ISO standard, ISO 15590-2, has not undergone any revision since the 2003 edition.

This DEP was revised as part of a program to update the DEPs and retire all local/regional standards. In this respect, this DEP includes the requirements of the following former Shell U.K. Exploration and Production standards (now retired).

- EPE ES/222: Standard specification for low temperature carbon steel fittings.

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.

PART II GENERAL REQUIREMENTS

1.1 GENERAL

Part III of this DEP is written as amendments and supplements to ISO 15590-2. Wherever reference is made to ISO 15590-2, it shall be understood to mean ISO 15590-2 as amended/supplemented by this DEP.

For ease of reference, the clause numbering of ISO 15590-2 has been used throughout Part III of this DEP.

Clauses in ISO 15590-2, which are not mentioned in this DEP, shall remain valid as written.

Part IV of this DEP covers the low temperature carbon steel fittings which are used for piping applications to match ASTM A333 Grade 6 pipe.

1.2 PRINCIPAL'S ACCESS AND ACTIVITIES

The Principal's representatives shall be permitted to witness all chemical testing, mechanical testing, and equipment calibration, and to inspect all bends. Sufficient notice (at least 14 days) shall be given of the time at which the production run is to begin.

The Principal's representatives shall have free entry at all times to all parts of the Manufacturer's works that will concern the manufacture, testing, inspection, quality control and shipping of the bends ordered. This includes the steel mill and the pipe mill if the original material for bending is supplied by the Manufacturer and any sub-contract locations such as heat treatment facilities. The Manufacturer shall make available to the Principal's representatives, without charge, all reasonable facilities to inspect, measure, and test the pipe in all stages of production.

The Principal's representative shall have the option to examine all materials rejected for any reason. The Principal's representative shall be informed of any bend failures due to dimensions not meeting requirements and of any test specimen that fails to meet the requirements for any reason. All failed materials shall be retained until examined by the Principal's representative.

The Manufacturer shall allow the Principal's representative to inspect each pipe bend after manufacture and testing is completed but prior to loading for shipment.

PART III AMENDMENTS/SUPPLEMENTS TO ISO 15590-2 (CARBON STEEL FITTINGS)**1 Scope**

Replace the third paragraph of this clause with the following:

Since the Pipeline standards ISO 3183-1, ISO 3183-2 and ISO 3183-3 have been withdrawn and replaced by a single standard ISO 3183 in 2007, for this DEP, only Class C is relevant.

Replace Table 1 with the following:

Table 1 — Fitting class and corresponding pipe standard

Fitting class	Corresponding pipe standard
Class C	DEP 31.40.20.37-Gen.

2 Normative references

Replace ISO 3183-1, 3183-2 and 3183-3 with the following:

ISO 3183, Petroleum and natural gas industries — Steel pipe for pipeline transportation systems - Second Edition.

Add the following note:

ISO 3183-1, ISO 3183-2 and ISO 3183-3 have been replaced by a single standard ISO 3183 in 2007.

6 Pressure rating and design**6.2 Tees and headers**

Add the following:

Design of barred tees

Barred tees shall have a configuration of bars as indicated in Figure G. The bars shall be made of mild steel and shall be welded with full penetration welds.

Design of sphere tees

The number and the area of the slots in the through-pipe of a sphere tee shall be such, that their total area equals the flow area of the branch outlet of the sphere tee.

The slots shall have rounded edges. The through-pipe in the sphere tee shall have small holes next to the slots to allow the sphere to be pushed past the slots if the flow is taken off through the bypass.

The thickness of the through-pipe shall not be less than that of the matching line pipe.

Sphere tees shall be equipped with a 50 mm (2 in) diameter drainage point. The position of the drainage point shall be specified by the Principal.

The actual length of the sphere tee shall be advised by the Supplier in the bid.

7 Information to be supplied by the purchaser**7.2 Supplementary information**

Add new bullet to this section:

- w) additional test rings requirements for welding operations. WPQR test rings shall be supplied to the requirements of DEP 61.40.20.30-Gen. Test rings should be in a similar manufactured condition as the fittings they are to represent.

8 Manufacturing

8.2 Starting material

Replace paragraph 1 of this clause with the following:

The starting material shall be blooms, billets, slabs, forging quality bar, plate, fusion welded with filler metal or seamless tubular products, produced from fully killed steels. It shall have a grain size of ASTM 7 or finer, as defined in ASTM E112.

For forged items, the minimum forging ratio shall be 4:1 unless otherwise approved by the Principal and demonstrated as acceptable in the MPQ.

For pipeline fittings the Manufacturer should undertake a Manufacturing Procedure Qualification. This may be historical or new. In both the cases the MPQ should be approved by the Principal.

The Manufacturer/Supplier shall maintain and operate a quality assurance system in accordance with ISO 9001 or an alternative standard approved by the Principal.

8.3 Fitting manufacture

8.3.2 Welding

Add:

Weld repairs are only permitted to welds. Repair to the base material is not permitted.

8.3.3 Heat treatment

Replace:

“A record shall be maintained of each heat treatment” *by*

“A record shall be maintained of each heat treatment batch”

8.3.4 End preparation

Add to this section:

Taper angles shall be restricted between an angle of 14 - 20 degrees.

If SMYSs of the sections to be joined are equal, then t_b shall equal t .

9 Testing and inspection

9.2 Extent of testing and inspection

Add to first paragraph:

Fittings Class C is relevant for this DEP.

Replace the fourth paragraph of this section with the following:

For welded fittings, weld tensile specimens shall be taken from the fitting as shown in Figures A to D. The specimen shall be taken transverse to the axis of the weld seam. For arc welded fittings, an all weld metal tensile test should also be performed. Tests shall be performed at the same frequency as for base material except that a change in welding procedure shall require an additional test.

9.4 Mechanical testing

9.4.3 Charpy V-notch impact testing

9.4.3.1 Test pieces

Add to fourth paragraph:

One set of three specimens shall be taken from the mid-thickness location in the fitting wall at the following positions, see Figures A, B, C, D, E1 and E2:

Seamless fittings	Fitting body
Welded fittings	Fitting body at 90 degrees to the weld
	Weld centreline
	Fusion line
	Fusion line + 2 mm
	Fusion line + 5 mm

9.4.3.2 Test method

Replace second paragraph with:

Charpy V-notch impact testing shall be in accordance with ISO 148. Shear area of the fracture surface shall be reported.

Change the second to last row in Table 5 with the following:

For a nominal wall thickness of $T > 25$, Test Temperature 'Class C', $t_{d, min} = -30$.

9.4.4 Through-thickness hardness testing

9.4.4.1 Test method

Replace second paragraph with:

For welded fittings, a series of Vickers hardness tests (HV10) shall also be made on a cross-section removed from the test fitting. These series of readings shall extend from unaffected base metal on one side across the weld to unaffected base metal on the other side. Three traverses shall be made, one 2 mm from the outer edge, the second across the centre and the third 2 mm from the inner edge. The spacing between the hardness impressions shall be 0.75 mm. The location of the hardness impressions for SAW fittings is shown in Figure F. The hardness impressions nearest the fusion line shall be within 0.5 mm of the fusion line.

9.4.7 HIC testing

Replace this section with the following:

If HIC testing is specified, the test procedures and acceptance criteria shall be in accordance with NACE TM0284 as amended by DEP 30.10.02.16-Gen.

Add the following Figures at the end of Section 9.4:

Figure A	Orientation of test specimens taken from extruded tees
Figure B	Orientation of test specimens taken from bends
Figure C	Orientation of test specimens taken from reducers
Figure D	Orientation of test specimens taken from caps
Figure E1	Location of Charpy V notch specimens in fitting welds
Figure E2	Detail of fusion line Charpy notch location
Figure F	Weld Hardness Survey
Figure G	Design of barred tees