

DEP SPECIFICATION

**LINE PIPE FOR CRITICAL SERVICE
(AMENDMENTS/SUPPLEMENTS TO ISO 3183:2012 AND
API SPEC 5L 45th EDITION)**

DEP 31.40.20.37-Gen.

February 2017

DESIGN AND ENGINEERING PRACTICE

DEM1



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These views are based on the experience acquired during involvement with the design, construction, operation and maintenance of processing units and facilities. Where deemed appropriate DEPs are based on, or reference international, regional, national and industry standards.

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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.

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PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the manufacture and supply of carbon and low-alloy steel line pipe for use in pipelines in critical service.

Guidance on the evaluation of pipeline service criticality and line pipe selection is given in DEP 31.40.00.10-Gen.

See (Part II 1.2) for applications of this DEP.

This DEP is applicable only to grades L245 up to L555 (X80) as designated in ISO 3183:2012 and API SPEC 5L 45th Edition.

This DEP is based on ISO 3183 Third Edition 2012 and API SPEC 5L 45th Edition. Part III of this DEP amends, supplements and deletes various clauses of ISO 3183 and API SPEC 5L (PSL2). Part III follows the clause numbering of ISO 3183 and API SPEC 5L (PSL2) for easy reference.

The amendments and supplements in this DEP apply equally to API SPEC 5L, 45th edition (PSL2), which contains the identical section numbers and content, with the exception of minor deviations listed in Annex M, N and O.

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 2013; 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. In ISO 3183:2012 and API SPEC 5L 45th Edition the term **Manufacturer** is used. In this DEP, the term Manufacturer/Supplier is considered to be equivalent to Manufacturer.

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 ISO 3183:2012 and API SPEC 5L 45th Edition the term **Purchaser** is used. In this DEP, the term Purchaser is considered to be equivalent to 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
Critical Line Pipe	Line pipe that meets any of the criteria of (Part II 1.2)
Not Very Toxic	Refer to Part III of DEP 01.00.01.30-GEN.
Non-Critical Line Pipe	Line pipe that does not meet any of the criteria of (Part II 1.2)
Rich Gas	(Need a definition for section 9.8.3)

1.3.3 Abbreviations

Term	Definition
MPQ	Manufacturing Procedure Qualification

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 2013. The changes followed a requirements quality review and were not a full technical update. The following are the main, non-editorial changes.

Section/Clause	Change
All	Restructured and clarified requirements, enforced use of shall/should/may for normative statements.
Part II 1.2 Application	List of DEP applications demoted from Shall [PS] to "shall" in line with DEP 31.40.00.18 (8.2.1) and since intent is only to list application of the DEP. Individual Shall [PS] statements stand alone later in the DEP.
Part III 2 Conformance	Quality Assurance System demoted from Shall [PS] to "shall" which aligns with other DEPs.
Part III 10.2.5.3	Magnification requirement for metallographic examination of HFW pipe has been separated from the parent Shall [PS] requirement and stated as a "shall" requirement.

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 REQUIREMENTS

1.1 GENERAL

Part III of this DEP is written as amendments and supplements to ISO 3183:2012 and API SPEC 5L 45th edition. Wherever reference is made to ISO 3183:2012 and/or API SPEC 5L 45th edition, it shall be understood to mean ISO 3183:2012 and/or API SPEC 5L 45th edition as amended/supplemented by this DEP.

For ease of reference, the clause numbering of ISO 3183:2012 and API SPEC 5L 45th edition have been used throughout Part III of this DEP.

Clauses in ISO 3183:2012 and API SPEC 5L 45th edition which are not mentioned in this DEP shall remain valid as written.

Tables and figures in this DEP not replacing the corresponding item in ISO 3183:2012 and API SPEC 5L 45th edition are numbered related to the DEP section they are contained in (e.g., Figure 10.2.5.3).

1.2 APPLICATION

1. Carbon steel and low alloy line pipe shall be ordered using this DEP for any of the following applications:
 - a. all offshore pipelines;
 - b. all pipelines designed for sour service;
 - c. all pipelines subject to high strain above normal elastic design limits (more than 0.5%) in installation or service;
 - d. all line pipe ordered with resistance to ductile fracture propagation;
 - e. all line pipe with a maximum design pressure greater than 40 barg (580 psig);
 - f. all pipelines that have been designed with a design factor higher than 0.5;
 - g. all pipelines designed for the transportation of category D or category E fluids, as defined per ISO 13623 Section 5, Table 1;
 - h. all pipelines of a diameter greater than NB 10 inch (273 mm), unless in only Category A service;
 - i. all pipelines forming a part of a main transportation infrastructure;
 - j. the minimum pipeline design temperature is less than 0 °C (32 °F).
2. Line pipe not meeting any of the requirements listed in (Part II 1.2, item 1) may be ordered in accordance with ISO 3183 or API SPEC 5L PSL2 without amendment.
3. Line pipe for Category A fluids (e.g., water) with a maximum design pressure of 20 Barg (2900 psig) and a minimum design temperature greater than 0 °C (32 °F) and a NB of 20 inch (508 mm) or less may be ordered in accordance with ISO 3183:2012 or API SPEC 5L 45th edition PSL1.
4. Line pipe for Category A fluids meeting the requirements of (Part II 1.2 item 2) but is above NB 20 inch (508 mm) shall be ordered to PSL2.
5. SAWH line pipe should be used for onshore applications where the outer diameter and wall thickness requirements are within the manufacturing range for SAWH line pipe (above 610 mm (24 in)).

Below this size HFW is generally used.

6. SAWH line pipe shall not be used for any of the following applications:
 - a. where OD of the seam welds are at risk of corrosion due to water drop out;
SAWH pipe may be considered but requires analysis of the service conditions and potential for corrosion on a helical weld seam.
 - b. where the use of reliability-based limit state design principles is required to confirm design or operational integrity;
 - c. in sour service.
7. Prior to order placement, the pipe mill and all sources of coil shall be subject to approval by the Principal.

1.3 PRINCIPAL'S ACCESS AND ACTIVITIES

1. Principal's representatives shall be permitted to witness all chemical testing, mechanical testing, and equipment calibration, and to inspect all pipe.
2. Sufficient notice (at least 14 days) shall be given of the time at which the production run is to begin.
3. 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 pipe ordered.
This includes the steel mill and the pipe mill.
4. The Manufacturer shall make available to the Principal all reasonable facilities to inspect, measure, and test the pipe in all stages of production.
For example, this includes ultrasonic equipment for wall thickness confirmation.
5. The Principal shall have the option to examine all materials rejected for any reason.
6. The Principal's representative shall be informed of any pipe fractures occurring during hydrostatic testing and of any test specimen that fails to meet the requirements for any reason.
7. All failed materials shall be retained until examined by the Principal's representative.
8. The Manufacturer shall allow the Principal to inspect each length of pipe after manufacture and testing are completed but prior to loading for shipment.

1.4 PIPE FOR INDUCTION BENDS

1. This DEP shall apply to mother pipe intended for induction bending.
2. The composition, mechanical properties and dimensions of mother pipe intended for induction bending shall be dictated by the dimensions and delivery condition of the completed bends.
3. Refer to DEP 31.40.20.33-Gen for requirements for completed bends.
4. The composition, mechanical properties and dimensions of the mother pipe shall be by agreement between the Manufacturer and the Principal.

1.5 SMALL PIPE ORDER QUANTITIES

Where small quantities of pipe are required (less than a normal pipe mill order, e.g., for spools induction bend mother pipe, or risers), options to consider are:

- *place an order with small volume pipe mills. A number of pipe mills, using bending roll or press forming, mainly SAWL can often provide small quantities of pipe;*
 - *consider pipe in stock.*
1. Small pipe orders and those from stock shall be produced by a steel mill and pipe mill technically approved by the Principal.
 2. Pipe from stock shall be evaluated and a gap analysis undertaken from actual production data and the requirements of this DEP.
 3. Supplemental tests (e.g., NDT, mechanical, dimensional) deemed necessary from the gap analysis shall be performed to ensure compliance to this DEP.

PART III AMENDMENTS/SUPPLEMENTS TO ISO 3183:2012 and API SPEC 5L 45th EDITION

1 Scope

Replace the first paragraph with the following:

1. Refer to (Part I, Section 1.1).

2 Conformance

2.3 Compliance to this International Standard

Replace this clause with the following:

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

3 Normative references

Add the following:

1. See also (Part IV) of this DEP.

4 Terms and definitions

4.18 EW pipe

This section is 4.18 in ISO 3183:2012 and 4.17 in API SPEC 5L 45th edition.

Replace this clause with the following:

1. Tubular pipe having one longitudinal weld seam produced by high frequency electric current with a frequency equal to or greater than 100 kHz.

4.36 Manufacturer

Add the following:

1. Where pipe manufacturing and/or heat treatment are subcontracted, the pipe mill and/or the processor shall also be considered to be the Manufacturer/Supplier.

5 Symbols and abbreviated terms

5.2 Abbreviated terms

Add the following:

AUT	Automatic Ultrasonic Testing
FBE	Fusion Bonded Epoxy
GMAW	Gas Metal Arc Welding
SCR	Steel Catenary Riser
ToFD	Time of Flight Diffraction

6 Pipe grade, steel grade and delivery condition

6.1 Pipe grade and steel grade

6.1.1

Delete this clause.

6.2 Delivery condition

6.2.1

Table 1 Pipe Grades, steel grades and delivery conditions

Add the following note:

Pipes fabricated from thermomechanical rolled material may not be suitable for hot (induction) bending unless chemistry/strength is increased and/or specific post bend heat treatments are undertaken.

7 Information to be supplied by the purchaser

Add the following:

1. A standard line pipe order form is attached in (Appendix 5) which shall be used for initial technical enquiries with pipe mills.

7.1 General information

b. *Delete PSL1*

Add the following:

9. Minimum and maximum design and operating temperature (for determination of CVN, DWT and CTOD test temperature)
10. Intended service and installing method (e.g., reel installed gas or oil or dual phase for determination of need for resistance to ductile fracture propagation, sour service, high strain, and deep water)

7.2 Additional information

Add the following:

- a)10) . Diameter and out-of-roundness for pipes with $D/t > 75$

Information not applicable to this DEP:

a)9)

b)3), b)5), b)8), b)14)

c)2), c)5), c)7), c)13), c)14), c)18), c)19, c)25), c)31), c)44), c)45), c)53).

8 Manufacturing

8.1 Process of manufacture

Table 2 – Acceptable processes of manufacture and product specification levels

Delete, "Double-seam SAWL and Double-seam COWL"

Delete Note c.

Delete Note d and substitute:

SAWH is applicable for 610 mm OD (24 inch) and above when specifically approved by the Principal.

Add Note g:

HFW pipe with a wall thickness greater than 20.6 mm (0.8 in) shall be subject to approval by the Principal.

Add Note h:

The welding processes used for COW pipe shall be subject to approval by the Principal.

8.3 Starting materials

8.3.10

Add new clause:

1. The abutting edges of strip or plate to be HFW welded shall be milled or machined.
2. Rotary shearing shall not be considered as machining.
3. Where approved by the Principal, rotary shearing may be used only for pipe of 8 mm (0.315 in) wall thickness or less, with a diameter of pipe of 273 mm (10 in) or less, and with a pipeline design temperature of not less than -10 °C.

Add new clause:

8.3.11 Centerline segregation of slabs, plate and coil.

1. The procedure for evaluation of centerline segregation, including quality evaluation method and acceptance limits, shall be subject to approval of the Principal.

8.4 Tack welds

8.4.2

Replace this clause with the following:

1. Tack welds shall be:
 - a. made using a continuous single pass;
 - b. melted and coalesced into the final weld seam; and
 - c. removed by machining or treated in accordance with Clause C.2.

8.6 Weld seams in SAW pipe

Add the following:

1. The seam welding of SAWH pipe shall be carried out as a separate process from the forming operation (e.g., a 2 step mill where the welding speed is independent of the forming speed).

8.7 Weld seams in double-seam pipe

Delete this clause.

8.8 Treatment of weld seams in EW and LW pipes

8.8.1 PSL 1 EW Pipe

Delete this clause.

8.9 Cold sizing and cold expansion

8.9.2

Replace this clause with the following:

1. Cold expansion shall be performed by mechanical means only.
2. The sizing ratio for cold-expanded pipe shall not be less than 0.008 or more than 0.015.

8.10 Coil/plate end welds

Replace this clause with the following:

1. Pipe containing strip end welds shall not be supplied.

8.11 Jointers

Replace this clause with the following:

1. Jointers shall not be supplied.

8.12 Heat treatment

Add the following:

1. The Manufacture shall supply the following information concerning the heat treatment facility, subject to approval by the Principal:
 - a. type of furnace (e.g., batch, walking beam);
 - b. method of heating and fuel (if applicable);
 - c. number, position of thermocouples and controlled heating zones;
 - d. calibration frequency of the thermocouples;
 - e. arrangement of pipes with furnace;
 - f. identification and control of individual pipes throughout the heat treatment cycle.

8.13 Traceability

8.13.1

Delete this clause.

9 Acceptance criteria

9.1 General

9.1.2

Replace this clause with the following:

1. Pipe manufactured to a specific grade shall not be substituted for pipe ordered as a lower grade.

9.2 Chemical composition

9.2.1

Delete this clause.

9.2.2

Replace this clause with the following:

1. Annex J Table J1 shall apply for all pipe grades and for pipe with $t \leq 35$ mm (1.38 in) other than for sour service.
2. (Annex H Table H.1) shall apply for pipe with sour service.
3. Review ISO 3183 composition limits in Annex M.

9.2.3

Replace this clause by:

1. The composition limits of pipe with $t > 35$ mm (1.38 in) shall be by agreement or as stated in the purchase order.

Delete this table:

Table 4 Chemical composition for PSL 1 pipe with $t \leq 25.0$ mm (0.984 in)

Replace this table with Annex J Table J1:

Table 5 Chemical composition for PSL 2 pipe with $t \leq 25.0$ mm (0.984 in)

Add this clause:

9.2.6 Chemical Composition Tolerances

1. The Manufacturer/Supplier's target product analysis shall be shown in the Manufacturing Procedure Specification.
2. A single value target of CE_{iiw} or CE_{pcm} shall be stated.
3. The range of elements shall be such that the variation in the single value target CE_{iiw} does not exceed ± 0.03 units or CE_{pcm} does not exceed ± 0.02 units with the additional restrictions of Table 9.2.6.3:

Table 9.2.6.3 Element Restrictions

C	0.03 (HFW and SAW) 0.04 (SMLS)
Mn	0.30
Si	0.25
Ni	0.10
Cu	0.10
V	0.03
Nb	0.02
Al	0.04
Ti	0.015
Mo	0.05
Cr	0.05

The figures of Table 9.2.6.3 represent the total range and not a plus or minus tolerance.

4. There shall be no changes in the chemical composition (within the tolerances listed above) from the approved MPS composition.
 - a. No intentionally added elements shall be increased beyond the limits above or removed.
5. The chemical composition recorded for the pipes used in first-day production testing shall set the reference CE.
 - a. Where any of the elements in Table 9.2.6.3 is not intentionally added, the manufacturer may propose maximum values, subject to approval by the Principal.
6. If any part of any specific order is manufactured outside this range then additional MPQT, including weldability tests when applicable, shall be performed on three selected pipes from the heat.
7. The chemical analysis and reporting in inspection documents shall include all elements covered by the requirements of Annex J Table J1.

9.3 Tensile properties

9.3.1

Delete this clause.

Delete this table.

Table 6 Requirements for the results of tensile tests for PSL 1 pipe

9.3.1

Replace this clause with:

1. For PSL 2 pipe, the tensile properties shall be as given in Annex J Table J2.

Use Annex J Table J2 in leu of Table 7.

Review if J2 should be applied with max tolerances.

9.4 Hydrostatic test

9.4.2

Delete this clause.

9.6 Flattening test

Replace this clause with the following:

1. No cracks or breaks shall occur in either weld or parent metal during flattening of the test specimen to 50% of the original OD.
2. The specimen shall be further flattened to 1/3 of original OD without cracks or breaks other than in the weld.

9.8 CVN impact test for PSL2 pipe

9.8.1.1 Consider the DNV criteria for sub sized specimen.

9.8.2 Pipe body tests

9.8.2.1

Replace this clause with the following:

1. The minimum average (of a set of three test pieces) absorbed energy for each pipe body test shall be as given in Table 8, based upon full-size test pieces.
2. The test temperature shall be lower than or equal to that specified in Table 9.8.2.1.

Table 9.8.2.1 Test temperature

Nominal wall thickness, t (mm)	Test Temperature (°C)	Maximum test temperature (°C)
$t \leq 20$	T_{min}	0
$20 < t \leq 30$	$T_{min} - 10$	0
$30 < t$	$T_{min} - 20$	0
Nominal wall thickness, t (in)	Test Temperature (°F)	Maximum test temperature (°F)
$t \leq 0.80$	T_{min}	32
$0.80 < t \leq 1.2$	$T_{min} - 18$	32
$1.2 < t$	$T_{min} - 36$	32

T_{min} is the minimum design temperature

9.8.2.2

Add to this clause:

1. Shear requirements on charpy specimen shall apply to base material only.

Replace Table 8 with the following:

1. No individual specimen shall be less than 60% of the specified value.

Table 8 CVN absorbed energy requirements for PSL2 pipe

Grade	Full-size CVN absorbed energy Minimum average value (of the set) J	Full-size CVN absorbed energy Minimum average value (of the set) ft-lbf
	Pipe body, Weld and HAZ	
L245 (B)	40	30
L290 (X42)	40	30
L320 (X46)	40	30
L360 (X52)	40	30
L390 (X56)	40	30
L415 (X60)	45	34
L450 (X65)	45	34
L450 (X65) >1219 mm (48 in) to 1422 mm (56 in) OD	54	40
L450 (X65) >1422 mm (56 in) OD	68	50
L485 (X70)	54	40
L485 (X70) >1219 mm (48 in) to 1422 (56 in) OD	68	50
L485 (X70) >1422 mm (56 in) OD	81	60
L555 (X80)	54	40
L555 (X80) >1219 mm (48 in) to 1422 mm (56 in) OD	68	50
L555 (X80) >1422 mm (56 in) OD	81	60

9.8.3 Pipe weld and HAZ tests

Replace this clause with the following:

1. The absorbed energy requirements for weld and HAZ tests SHALL [PS] be as specified in Table 8 of this DEP.
2. If any specimen displays a value less than 60% of the value in Table 8, the Manufacturer shall fully investigate the cause and advise the Principal.
3. For pipelines in rich gas or CO₂ service and pipelines subjected to high strain, the values in Table 8 may be increased on a project-by-project basis,
4. The test temperature shall be as specified for the pipe body.

9.9 DWT test for PSL2 welded pipe

9.9.1

Replace this clause with the following:

1. For each test (a set of two test pieces), the average shear fracture shall be $\geq 85\%$ with no individual specimen less than 50% shear area.
2. The test shall be performed at the minimum design temperature specified in the order form (Appendix 5).
3. Where it is not possible to test a full thickness specimen, the test temperature shall be adjusted in accordance with API RP3.

9.10 Surface conditions, imperfections and defects

9.10.5 Geometric deviations

9.10.5.2

Replace this clause with the following:

1. For dents, the length in any direction shall not exceed 25% of the pipe diameter.
2. All sharp gouges (with or without dent) of 1 mm (0.04 in) or greater depth shall be considered a defect.
3. Cold formed dents without sharp bottom gouges are acceptable to a maximum depth of 3.2 mm (0.125 in).

Add new clause:

9.10.5.3 Surface condition – seamless pipe

1. The external surface of all seamless pipes shall be free from scabs, laps, shells, slivers, burrs, metallurgical tears and sharp edged discontinuities that may interfere with the application of thin film (e.g., FBE) coatings and multi-layer coatings where FBE forms the first layer.
2. Prior to manufacturing procedure qualification, the manufacturer shall submit, for approval by the Principal, acceptance criteria for the surface condition of all seamless pipe, together with historic evidence of the successful FBE coating of such pipe without excessive remedial work.
3. In the absence of historic data, seamless pipe shall undergo blast cleaning and examination of three pipes during manufacturing procedure qualification and one pipe per 10 test units during production.
4. The pipes shall be selected at random and heated to a minimum of 70 °C (160 °F).
5. The outside surface of the pipe shall be blast cleaned to a surface finish of SA2½ and the pipe then re-heated to 270 °C (520 °F).
6. Each pipe shall be examined visually over its entire surface for imperfections that could interfere with the FBE coating process.
7. If a seamless pipe(s) is rejected, the remaining pipes from the test unit, and one pipe from each subsequent test unit, shall be blast cleaned and examined.

9.11 Dimensions, mass and tolerances

9.11.3.1

Replace this clause with the following:

1. The diameter and out of roundness tolerances of Annex J Table J3, as amended by this DEP, shall apply to all pipe ordered for onshore service.

Replace this table with Annex J Table J3:

Table 10 Tolerances for diameter and out-of-roundness

9.11.3.2

Replace this clause with the following:

1. The tolerances for wall thickness shall be as given in Annex J Table J4.

9.11.3.3

Replace Table 12 with the following:

1. Length tolerance shall take into account the transportation and installation methods.

Table 12 Tolerance for random length pipe

Random length designation m	Minimum length m	Minimum average length for each order item m	Maximum length m
12	9	11.5	13.70
15	12	14.25	16.70
18	15	17.0	19.80
Random length designation ft	Minimum length ft	Minimum average length for each order item ft	Maximum length ft
40	30	38	45
50	40	47	55
60	50	56	65

9.11.3.4

Amend this clause as follows:

- a. The total deviation from a straight line, over the entire pipe length, shall be $\leq 0.15\%$ of the pipe length, as shown in Figure 1.
- b. The local deviation from a straight line at each end of 1 m (4 ft) section shall be ≤ 3.0 mm (0.12 in) as shown in Figure 2.

9.12 Finish of pipe ends

9.12.1 General

9.12.1.1

Delete this clause.

9.12.2 Threaded ends (PSL1 only)

Delete this clause.

9.12.3 Belled ends (PSL1 only)

Delete this clause.

9.12.4 Belled ends (PSL1 only)

Delete this clause.

9.12.5.4

Replace this clause with:

1. Internal machining or grinding shall not be done unless approved by the principal.
 - a. The specific procedure shall be subject to approval by the principal.
 - b. Machining or grinding for end dimensional tolerance shall be parallel with a 4:1 taper transistion.

9.12.5.5

Add to this clause:

1. Outside and inside at pipe ends shall be deburred within 2mm.

9.13 Tolerances for the weld seam

9.13.1 Radial offset of strip/plate edges

Replace Table 14 with the following:

Table 14 Maximum permissible radial offset for SAW and COW pipes

Specified wall thickness, T mm	Maximum radial offset mm
$T \leq 10$	1.0
$10 < T \leq 20$	0.1 T
$T > 20$	2.0
Specified wall thickness, T in	Maximum radial offset in
$T \leq 0.4$	0.04
$0.4 < T \leq 0.8$	0.1 T
$T > 0.8$	0.08

9.13.2.2

Add the following:

- b.
 - i. For SAWH weld beads, the weld cap profile shall exhibit minimal or no concavity.
 - ii. For SAW and COW, the cap profile shall be subject to approval by the Principal at MPS stage.
 - iii. For SAWH, a sample acceptable weld cross section macro shall be retained as a standard sample of acceptable cap profile.

Selection item e)

- i. The outside weld bead shall be removed by grinding for a distance of at least 150 mm (6 in) from pipe end for all pipe ordered.

9.14 Tolerances for mass

9.14.1

Replace items a), b) and c) with the following:

For all pipes: +10.0%, -3.5%

9.14.3

Replace items a) and b) with the following:

For all grades: -1.75%

9.15 Weldability of PSL2 pipe

Add the following:

1. For all offshore pipelines and for other pipelines where specified in the order form, weldability trials shall be carried out.
2. The material shall be as qualified in the manufacturing procedure qualification (Annex B), within the limits specified in (B.5).

The requirements for weldability testing are given in (Appendix 2).

10 Inspection

10.1 Types of inspection and inspection documents

10.1.1.2

Replace this clause with the following:

1. Final inspection reports shall be supplied in both hard copy and searchable electronic versions (e.g., PDF).
2. Testing in which data curves are developed (e.g., Tensile, Compressive Stress-Strain, CTOD) shall be supplied as raw data formats such as can be imported into a spreadsheet file.

10.1.2 Inspection documents for PSL1 pipe

Delete this clause.

10.2 Specific inspection

10.2.1 Inspection frequency

10.2.1.1

Delete this clause and Table 17.

Replace Table 18 with the following:

Table 18 Inspection frequency for PSL 2 pipe

Type of inspection	Type of pipe	Frequency of inspection
Heat analysis	All pipe	One analysis per heat of steel
Product analysis	SMLS, HFW, SAW COW	Two analyses per heat of steel (taken from separate pipes)
Tensile testing of the pipe body	SMLS, HFW, SAW COW	Two tests per test unit ^(c) of pipe with the same cold expansion ratio ^(a) . One test for heats less than 100 tonnes (110 tons), but at least one test per 200 pipes. For pipe of D > 323.9 mm (12.75 in), at least one test per 100 pipes.
Tensile testing of longitudinal or helical weld	HFW, SAW, COW	Two tests per test unit of pipe with the same cold expansion ratio ^{(a),(b)} . One test for heats less than 100 tonnes (110 tons) but at least one test per 200 pipes. For pipe of D > 323.9 mm (12.75 in), at least one test per 100 pipes.
CVN impact testing of pipe body	SMLS, HFW, SAW COW	Two tests per test unit of pipe with the same cold expansion ratio ^(a) . One test for heats less than 100 tonnes (110 tons). For test temperature of -10 °C (14 °F) or below, one test for each 100 pipes.
CVN impact testing of longitudinal weld	HFW	At least once per shift. Whenever the pipe diameter or thickness changes. At least once per five coils. For test temperature of below -10 °C (14 °F), one test for each 100 pipes.
CVN impact of longitudinal or helical weld	SAW, COW	Two tests each for weld, fusion line, FL+2, FL+5 locations per test unit of pipe with the same cold expansion ratio ^{(a),(b)} . One test for heats less than 100 tonnes (110 tons). For test temperature below -10 °C (14 °F), one test for each 100 pipes.
DWT testing of the pipe body of welded pipe with D ≥ 406.4 mm (16 in) Applicable to gas pipelines only.	HFW, SAW, COW	Once per test unit with the same cold expansion ratio (a)
Guided-bend testing of the longitudinal or helical seam weld of welded pipe	HFW, SAW, COW	At least one test for not less than 50 lengths of pipe with the same cold expansion ratio (a). except for HFW pipe one test per 100 lengths of pipe with the same cold expansion ratio (a).
Flattening test of welded pipe	HFW	As shown in Figure 6, but applicable to all pipe diameters.
Hardness test on body and seam weld	SMLS, HFW, SAW, COW	One test per test unit (c)
Hardness testing of hard spots in cold-formed welded pipe	HFW, SAW, COW	Any hard spot