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GIS 43-311

Longitudinal or Helical Seam Submerged Arc Welded Linepipe in Grades up to X80 – Supplement to API 5L, 43rd Edition

Group Instruction for Supply

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This revision of Engineering Technical Practice (ETP) BP GIS 43-311 incorporates:

Recognition of GIS 43-317 for application to line pipe for bends.

Inclusion of BP references in Normative references clause.

Addition of aluminium to Table 2B.

Deletion of CE (IIW) limits from Table 2C and clause P.6.1.1.

Addition of pipe loading and transportation requirements in clause 13.

Addition of cold expansion and X70 limit requirements for sour service in clause P.5.

Other minor corrections.

This Group Instruction for Supply (GIS) is not based on heritage documents from the merged BP companies. This GIS is not to be used as a standalone document. It is to be used in accordance with GP 43-31 and PR 43. BP Group Standards (gHSEr, Integrity Management Functional Standard, etc.) dictate requirements that are to be satisfied in addition to these ETP documents. This GIS is to be used in conjunction with DS 43-311, Data Sheet for Line Pipe (SAW), detailing the design conditions and mechanical property requirements.

The structure of the GIS has been arranged such that the base GIS (without Appendices P, Q, and R) is applicable to linepipe for the land based transmission of sweet crude oil and condensate with design temperatures between 14°F and 212°F (–10°C and 100°C). For specific applications where the design temperatures are outside this range, additional impact and tensile testing requirements may be defined.

If service conditions other than those outlined above apply, the base GIS is to be extended or modified by the application of the appropriate appendix or appendices. Appendices contained herein are available for:

Appendix P Sour service conditions.

Appendix Q Submarine pipelines.

Appendix R High pressure gas transmission.

The fundamental requirements of BP are to insure that the linepipe has good weldability and close dimensional tolerances at welding ends to facilitate possible mechanised welding during pipeline installation.

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Introduction

- a. Requirements for longitudinal or helical seam submerged arc welded linepipe in grades up to X80 with a maximum thickness of 1.38 in (35 mm) in accordance with PSL 2 is based on API Specification 5L, Specification for Line Pipe, forty-third edition, 2004.
- b. Statements of this GIS are modifications to API Spec 5L.
- c. Modifications to API Spec 5L are identified as Add, Modify to Read, or Delete.
- d. Paragraph numbers in this specification correspond to API Spec 5L.
- e. Paragraphs of API Spec 5L that are not revised remain applicable.
- f. If conflicts arise between this GIS and API Spec 5L, those defined in this GIS shall apply.



1 Scope

1.1 Purpose and coverage

Add to First Paragraph

The pipe is for use in the construction of long distance, land based pipelines that have design temperatures between 14°F and 212°F (–10°C and 100°C). Except as modified by GIS 43-317, this Specification may also be used to define the requirements for mother pipe for the subsequent manufacture of hot formed bends for similar applications. Additional requirements for service conditions other than those above are defined in the appendices to this document.

Modify Second Paragraph to Read

This specification covers plain-end, submerged-arc welded and combination gas metal-arc welded and submerged-arc welded steel line pipe.

1.2 Product specification level (PSL)

Add

Pipe shall meet the requirements of PSL 2.

Add

1.6 Quality Assurance

The Supplier, Steelmaker, Plate Mill and Pipemill shall operate a quality system that ensures that requirements of this GIS can be met reliably and consistently.

The Supplier's Quality System shall include provision for the QA of raw materials, intermediate products, pipe manufacture, and final inspections. The plan shall be subject to approval by BP before manufacture.

The effectiveness of the QA System shall be subject to monitoring by BP and may be audited following an agreed period of notice.

The linepipe shall be made in accordance with the Manufacturing Procedure agreed and qualified before contract between the Supplier and BP.

If required by the Purchase Order, the Steelmaker and Pipemill shall carry out a Manufacturing Procedure Qualification in accordance with Appendix O. The qualification will be witnessed by an authorised representative of BP. No change shall be made to a successfully qualified Manufacturing Procedure without the approval of the BP Technical Representative. After such approval, BP may require appropriate procedure qualification to be carried out on the new Manufacturing Procedure.

Qualification tests may be taken from a pre-production run or the first day's production as agreed by BP. Pipe made from a successful pre-production run may be supplied as part of the order.

Test certificates and other formal documents shall use SI or US Customary units as defined in the Date Sheet for Line Pipe (SAW). If necessary, the conversion factors listed in Appendix M may be used to achieve this. Regardless of the actual units of measurement, measuring and testing equipment shall be calibrated and certified as part of the QA System.

Supporting data shall be supplied, demonstrating the suitability of the linepipe for field welding by either shielded metal arc welding (SMAW), or mechanized/semi-automatic welding, typically by the gas metal arc welding (GMAW) process, without post weld heat treatment. If such data does not exist, BP may require additional tests to demonstrate the weldability of the steel.



1.7 Symbols and abbreviations

For the purpose of this specification, the following symbols and abbreviations apply:

HAZ	Heat Affected Zone
HV	Hardness Vickers
MPI	Magnetic Particle Inspection
NDT	Non-Destructive Testing
SI	System International d'Unites

2 References

Add

American Society of Mechanical Engineers (ASME)

ASME BPVC Sec II Pt C Specifications for Welding Rods, Electrodes and Filler Metals.

BP

GP 43-32	Pipe Handling Logistics for Pipelines.
GIS 43-317	Carbon Steel Induction Bends for Pipelines in Grades up to X80 - Supplement to ISO 15590-1:2001.

International Organization for Standardization (ISO)

ISO 12094	Welded steel tubes for pressure purposes - Ultrasonic testing for the detection of laminar imperfections in strips/plates used in the manufacture of welded tubes.
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NACE International (NACE)

NACE TM0284	Evaluation of Pipeline Steels for Resistance to Stepwise Cracking.
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3 Definitions

3.9 Manufacturer

Modify to Read

A Pipemill accepting a Purchase Order or Contract from BP to supply linepipe (in which case Manufacturer and Supplier are one and the same entity) or from a trading house or steel merchant to whom BP have awarded a Contract. The duties of a Manufacturer may include responsibility for technical and quality matters relating to steelmaking and supply of plate from which the pipe is manufactured.

3.11 Pipemill

Modify to Read

The company manufacturing, testing, finishing, and supplying linepipe to BP and the facilities at which these activities are conducted.



Add**3.20 Approve**

As applied to BP, is used if BP wishes an action by the Supplier to be notified and agreed in writing, before the subject action is implemented. This does not imply that all details of a document have been considered by BP and does not mitigate the responsibilities of the Supplier, which are covered separately by BP, as appropriate in the Conditions of Contract.

3.21 BP

BP p.l.c. and their associates.

3.22 BP Technical Representative

A BP specialist engineer, appointed to produce the linepipe specification appropriate for the pipeline design and application and to resolve queries concerning application.

3.23 JCOE

Manufacturing process wherein pipe is made by forming and welding steel plate by bending it into a J shape, bending it into a C shape, bending it into an O shape, and Electrically welding the abutting ends.

3.24 Plate Mill

The company rolling and/or heat treating steel plate from slab for supply to the Pipemill and the premises where these activities are carried out.

3.25 Quality Assurance

The planned and systematic actions necessary to ensure (QA) quality and provide confidence that a product or service is fit for its intended purpose.

3.26 Quality Manual

A document setting out the general quality policies, procedures and practices of an organisation.

3.27 Quality Plan

A document prepared by the Manufacturer or Supplier, setting out the specific quality practices, resources and activities relevant to a particular contract or order.

3.28 Quality System

The organisation structure, responsibilities, activities, resources, and events that together provide organised procedures and methods of implementation to ensure the capability of an organisation to meet quality requirements.

3.29 Steelmaker

The company manufacturing, refining, and casting steel to slab for subsequent plate manufacture and the premises where these activities are carried out.

3.30 Supplier

A Tenderer, whose tender has been accepted and to whom a Purchase Order or Contract to supply linepipe has been awarded.



3.31 Tenderer

A Steelmaker, Pipemill or their agent, or trading house acting on behalf of the Manufacturer or Pipemill, to whom an enquiry has been issued.

3.32 UOE

Manufacturing process wherein pipe is made by forming and welding steel plate by bending it into a U shape, bending it into an O shape, and Electrically welding the abutting ends.

3.33 Will

Normally applies to an action by BP.

5 Process of manufacture and material**5.1 Process of manufacture**Add

Pipe shall be produced by the UOE/JCOE or roll bending process and shall have one longitudinal or helical welded seam.

5.1.3 Types of pipe**5.1.3.5 Longitudinal seam submerged-arc welded pipe**Add

This definition shall not preclude the deposition of a single intermittent or continuous tack weld after forming the pipe to the 'O' profile but before submerged arc welding from both the outside and inside surfaces of the pipe.

5.1.3.7 Combination gas metal-arc and submerged-arc welded pipeAdd

Combination GMAW/SAW pipe may be offered, subject to the GMAW element consisting of a single root pass only, applied after forming, and followed by submerged arc welding from inside and outside surfaces. The GMAW weld shall be completely re-melted by subsequent SAW.

5.2 Cold expansionAdd

If applied, mechanical cold expansion of the finished pipe shall be used to impart a strain not exceeding 1.5% and should, unless otherwise agreed by the BP Technical Representative, be performed over the full pipe length before hydrostatic test.

5.3 MaterialAdd**5.3.3 Steel characteristics and identification**

Steel shall be fully killed and made to fine grain, low hydrogen practice. Vacuum degassed steel is preferred for all pipe but shall be mandatory for pipe with a wall thickness greater than 0.75 in (19.1 mm). Tenderers may offer alternative treatments to vacuum degassing, but acceptance shall be subject to approval by the BP Technical Representative.



If scrap other than recycled off-cuts from previously produced linepipe steels is used, the proportion of such scrap shall be stated in the MPS and the chemical analyses shall include determination of additional residual elements.

If the steel, slabs, plate, and pipe are not processed in an integrated facility, the name and location of each manufacturing plant involved shall be declared in the bid.

5.3.4 Slab and plate quality

Slab for plate rolling shall be produced by a continuous casting process that shall include precautions to minimise the occurrence of centre-line segregation. Other casting processes may be offered for consideration by the BP Technical Representative.

All surfaces of the slab shall be inspected visually for defects and scarfing shall be carried out, if necessary, to produce an acceptable surface for rolling.

The rolling and/or heat-treating processes shall produce uniform and consistent mechanical properties and microstructure with high toughness and good weldability.

After final rolling, the longitudinal edges of the plate shall be sheared or machined.

Each plate shall be inspected visually and tested ultrasonically to ensure freedom from laminations and/or major clusters of inclusions. The coverage, sensitivity and acceptance levels for ultrasonic examination shall be as follows.

Plate Edges.

All four edges of the plate, after cutting to final size for pipe forming, shall be examined for laminations and inclusion clusters along a band 75 mm wide using techniques in accordance with ISO 12094. Acceptance criteria shall be:

- | | |
|---|-----------------------|
| a) Minimum length of any indication that is to be considered | 10 mm. |
| b) Maximum width of any indication: | 6 mm. |
| c) Maximum acceptable length of any indication | 20 mm. |
| d) Maximum permitted defective area | 100 mm ² . |
| e) Maximum population density of indications with a dimension above the minimum that has to be considered shall be 3 in any 1 linear metre of plate edge. | |

Plate Body.

The plate body shall be ultrasonically scanned in accordance with the techniques defined in ISO 12094 using a maximum scan line separation of 35 mm. Laminations and inclusion clusters greater than 300 mm² shall be considered and the acceptance criteria shall be:

- | | |
|---|-------------------------|
| a) Maximum individual imperfection | 1 000 mm ² . |
| b) Maximum number of imperfection per m ² of plate surface | 10. |

5.5 Skelp end welds in helical seam pipe

Modify to Read

Unless otherwise approved by the BP Technical Representative, skelp end welds in helical pipe are not permitted.



6 Material requirements

6.1 Chemical properties

6.1.1 Chemical composition

Add

The Steelmaker shall nominate a preferred steel composition (heat and product analyses) within the Table 2B limits for approval by the BP Technical Representative. The proposed analysis and the tolerances applied to each element shall also be subject to approval by the BP Technical Representative.

