



Group Instruction for Supply

GIS 43-311

Longitudinal or Helical Seam Submerged Arc Welded
Line Pipe in Grades up to X80 (API 5L or ISO 3183)

REVISION FOR REVIEW



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REVISION FOR REVIEW



Foreword

This revision of Engineering Technical Practice (ETP) BP GIS 43-311 addresses the rationalisation between the previous versions of API 5L and the international standard for line pipe, ISO 3183-1, ISO 3183-2, and ISO 3183-3, which coexisted prior to 2008.

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 GP 43-31 and PR 43. This GIS is to be used in conjunction with DS 43-311, detailing the design conditions and mechanical property requirements.

The structure of the GIS has been arranged such that the base specification (without annexes G, H, J, and K) is applicable to line pipe for the land based transmission of sweet crude oil and condensate with design temperatures from -10°C to 100°C (14°F to 212°F) or water injection lines. For specific applications in which the design temperatures are outside this range, additional impact and tensile testing requirements may be defined.

For applications other than those detailed above, additional requirements are defined in annexes that are to be used, as appropriate, for the intended service conditions of the line pipe. In this GIS, the annexes in the ISO 3183 or API 5L reference document have been revised and reassigned as follows:

- Annex E for nondestructive testing of line pipe for all applications other than line pipe for sour service.
- Annex F has been deleted, since it is not applicable to line pipe.
- Annex G for line pipe for gas service.
- Annex H for line pipe for sour service.
- Annex I has been deleted, since through the flowline (TFL) pipe is not addressed in this GIS.
- Annex J for line pipe for submarine service.
- Annex K for nondestructive testing of line pipe for sour service applications.

Annex N and Annex O apply only to API 5L.

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



Introduction

- a. Requirements for longitudinal or helical seam submerged arc welded line pipe in grades up to L555/X80 with a maximum thickness of 38,1 mm (1.50 in) in accordance with PSL 2 are based on API Specification 5L, Specification for Line Pipe, Forty-fourth edition, 2007, or ISO 3183:2007, (Modified) Petroleum and natural gas industries - Steel pipe for pipeline transportation systems.
- b. Requirements of this GIS are modifications to API Spec 5L or ISO 3183.
- c. Modifications to API Spec 5L or ISO 3183 are identified as Add, Modify to Read, or Delete.
- d. Paragraph numbers in this specification correspond to API Spec 5L or ISO 3183.
- e. Paragraphs of API Spec 5L or ISO 3183 that are relevant to the applicable pipe manufacturing process defined and that are not revised by this GIS remain applicable.
- f. Changes have been made to the areas of application of the following annexes:
 - Annex E now applies for all pipe other than that for sour service.
 - Annex G now applies to all pipe ordered for gas service.
 - Annex K now applies only for pipe for sour service applications.
- g. Annex N and Annex O apply only to API 5L.
- h. If conflicts arise between this GIS and API Spec 5L or ISO 3183, those defined in this GIS take precedence.



1 Scope

Modify to Read

- a. This GIS provides requirements for plain end submerged arc welded (SAW) and combination gas metal arc welded and submerged arc welded steel line pipe manufactured to product specification level (PSL) 2. References to PSL 1 in API 5L or ISO 3183 are not applicable.
- b. The pipe defined in the base specification is for use in the construction of long distance land based pipelines for the transportation of sweet oil, condensate, or water that have a design temperature from -10°C to 100°C (14°F to 212°F).
- c. Requirements of the base specification apply for all line pipe, regardless of the intended application.
- d. Additional requirements for service conditions other than in a. and b. are defined in the annexes.
- e. Except as modified by GIS 43-317, this GIS may also be used to define the requirements for mother pipe for subsequent manufacture of hot formed bends for similar applications.

2 Conformity

2.1 Units of measurement

Modify to Read

- a. Pipe may be specified using a combination of USC and SI units.
- b. In all cases the decimal separator shall be indicated by a dot on the line and a comma used as the thousands separator.

2.3 Compliance to this International Standard

Modify to Read

- a. Vendor, steel maker, plate mill, and pipe mill shall operate a quality management system (QMS) which ensures that requirements of this GIS can be met reliably and consistently.
- b. Vendor QMS shall include provision for the quality assurance (QA) of raw materials, intermediate products, pipe manufacture, and final inspections. The QA plan shall be subject to approval by the BP technical representative before manufacture.

[EDS Note: Commentary needed to explain "subject to approval".]

- c. The effectiveness of the QMS shall be subject to monitoring by BP and may be audited, following an agreed period of notice.
- d. The line pipe shall be made in accordance with the manufacturing procedure specification (MPS), which shall be subject to approval and qualified before contract between Vendor and BP.

[EDS Note: Commentary needed to explain "subject to approval".]

- e. Manufacturing procedure qualification
 1. If required by the purchase order, the steel maker and pipe mill shall perform a manufacturing procedure qualification in accordance with Annex B.
 2. The qualification will be witnessed by an authorised representative of BP.
 3. No change shall be made to a successfully qualified MPS without approval of the BP technical representative.



[EDS Note: Commentary needed to explain “approval of BP technical representative”.]

4. If such approval is granted, BP may require appropriate procedure qualification to be performed on the new MPS.
- f. Qualification tests may be taken from a preproduction run or the first day production, subject to agreement with the BP technical representative. Pipe made from a successful preproduction run may be supplied as part of the order.

[EDS Note: Commentary needed to explain “subject to agreement”.]

- g. Test certificates and other formal documents shall use SI or USC units as defined in DS 43-311. Regardless of the actual units of measurement, measuring and testing equipment shall be calibrated and certified as part of the QMS.

3 Normative references

Add

BP

DS 43-311	Data Sheet for Line Pipe (SAW).
GIS 43-317	Carbon Steel Induction Bends for Pipelines in Grades up to X80 (ISO 15590-1).

American Petroleum Institute (API)

API RP 5L1	Railroad Transportation of Line Pipe.
API RP 5LW	Transportation of Line Pipe on Barges and Marine Vessels.

British Standards Institute (BSI)

BS 7448	Fracture Mechanics Toughness Tests.
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European Federation of Corrosion (EFC)

EFC 16	Materials Requirements for Carbon and Low Alloy Steels for H2S-Containing Environments in Oil and Gas Production.
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4 Terms and definitions

4.29 manufacturer

Modify to Read

A pipe mill accepting a purchase order or contract from BP to supply line pipe (in which case, manufacturer and Vendor are the same entity) or from a trading house or steel merchant to which BP has 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.

4.35 pipe mill

Modify to Read

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

Add

Note: Definitions 4.55 through 4.61 are used in API 5L, Annex N.

4.62 approve

As applied to BP, approve is used if BP requires notification and a written agreement before an action is implemented by Vendor. This does not imply that all details of a document have been considered by BP and does not mitigate the responsibilities of Vendor, which are covered separately by BP, as appropriate in the conditions of contract.

4.63 BP

BP p.l.c. and its associates.

4.64 BP inspection engineer

The BP representative, based at the manufacturing facility during plate and pipe production, with responsibility for ensuring that Vendor is working in accordance with the approved production and quality management procedures.

4.65 BP technical representative

A BP specialist engineer appointed to produce the line pipe specification appropriate for the pipeline design and application and to resolve queries concerning application and any issues that arise during pipe manufacture.

4.66 calibration

A term that is interchangeable with instrument standardisation as defined in 4.23.

4.67 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.

4.68 manufacturing procedure specification (MPS)

A document prepared by the manufacturer defining each stage of the manufacturing, inspection, and testing processes and the control parameters or acceptance criteria that apply to each activity. The minimum contents of the MPS are as defined in Annex B.

4.69 plate mill

The company rolling and/or heat treating steel plate from slab for supply to the pipe mill and the premises where these activities are performed.

4.70 quality assurance (QA)

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

4.71 quality management system (QMS)

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.



4.72 quality manual

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

4.73 quality plan

A document prepared by the manufacturer or Vendor that sets out the specific quality practices, resources, and activities relevant to a particular contract or order.

4.74 steel maker

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

4.75 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.

4.76 Vendor

A steel maker, pipe mill or its agent, or trading house acting on behalf of the manufacturer or pipe mill, to which an enquiry has been issued or to which a purchase order or contract to supply line pipe has been awarded.

4.77 will

Normally applies to an action by BP.

5 Symbols and abbreviated terms

5.2 Abbreviated terms

Add

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

GMAW	Gas metal arc welding.
MPI	Magnetic particle inspection.
MPS	Manufacturing procedure specification.
QA	Quality assurance.
QMS	Quality management system.
SAW	Submerged arc welding or submerged arc welded.
SMAW	Shielded metal arc welding.
SMYS	Specified minimum yield stress.
TMCP	Thermomechanical controlled processing.
TMCR	Thermomechanical controlled rolled.



6 Pipe grade, steel grade and delivery condition

6.1 Pipe grade and steel grade

6.1.2 Modify to Read

For compliance with this GIS, pipe shall be cold formed and manufactured from plate or coil produced by the thermomechanical rolling process, with or without additional accelerated cooling. Thus, the steel name and delivery condition identifiers defined in Table 1 and Table 3 shall be disregarded and the pipe grade denoted by simple grade L or grade X designations (e.g., L415 or X60, L450 or X65, etc.).

7 Information to be supplied by the purchaser

Add

The information provided in the purchase order shall be as defined in API 5L or ISO 3183, except as modified by the requirements of this GIS.

8 Manufacture

8.1 Process of manufacture

Modify to Read

- a. Pipe shall be produced by UOE, JCOE, or roll bending process and shall have one longitudinal or helical welded seam.
- b. Pipe shall have plain ends or square ends in accordance with 9.12 or alternative end preparation as defined in the purchase order.

8.3 Starting material

8.3.2 Modify to Read

- a. Steel shall be fully killed and made in accordance with fine grain, low hydrogen practice.
- b. Vacuum degassing
 1. Steel for all pipe shall preferably be vacuum degassed.
 2. Steel for pipe with a wall thickness greater than 19,1 mm (0.75 in) shall be vacuum degassed.
- e. Vendors may offer alternative treatments to vacuum degassing, but acceptance shall be subject to approval by the BP technical representative.

[EDS Note: Commentary needed to explain "subject to approval".]

- c. If scrap other than recycled offcuts from previously produced line pipe 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.
- d. 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.
- e. Slab for plate rolling shall be produced by a continuous casting process that shall include precautions to minimise the occurrence of centreline segregation. Other casting processes may be offered for consideration by the BP technical representative.
- f. All surfaces of the slab shall be inspected visually for defects and scarfing shall be performed, if necessary, to produce an acceptable surface for rolling.



- g. The rolling and/or heat treating processes shall produce uniform and consistent mechanical properties and microstructure with high toughness and good weldability.
- h. After final rolling, the longitudinal edges of the plate shall be sheared or machined.
- i. Each plate shall be inspected visually and tested ultrasonically in accordance with Annex E or Annex K, as appropriate, to ensure freedom from laminations and/or major clusters of inclusions.

8.5 Weld seams in COW pipe

Modify to Read

- a. 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 SAW from inside and outside surfaces.
- b. The GMAW weld shall be completely remelted by subsequent SAW.

8.6 Weld seams in SAW pipe

Add

8.6.1 Nickel content

If line pipe application is shown on the data sheet as water injection, welding consumables for all welds shall have a nickel content of 0,7% to 1%.

8.6.2 Control of welding consumables and batch testing

- a. A satisfactory system for the control, issue, use, and systematic recording of welding consumables used for the production of pipe shall be demonstrated via the MPS and quality plan. Effective QA to ensure consistent quality of incoming welding consumables shall also be demonstrated.
- b. If welding electrodes of ASME II, SFA 5.5 classification Exxxx G, or welding wires in accordance with SFA 5.28 classification ERxxS G are to be used, consumables shall be of a consistent, nominally identical chemical composition.
- c. Batch testing of welding wire and weld metal analysis shall ensure control within the range specified in the MPS (see Annex B).

8.7 Weld seams in double-seam pipe

Delete

8.9 Cold sizing and cold expansion

Add

- 8.9.4 If applied, mechanical cold expansion of the finished pipe shall be performed over the full pipe length before hydrostatic testing.

8.10 Strip/plate end welds

8.10.2 Modify to Read

Unless approved otherwise by the BP technical representative, strip/plate end welds in helical pipe shall not be allowed.

[EDS Note: Commentary needed to explain "Unless approved otherwise".]



8.11 Jointers

8.11.1 Modify to Read

Jointers shall not be used.

9 Acceptance criteria

9.2 Chemical composition

9.2.2 Delete

9.2.3 Modify to Read

- The chemical composition in Table 5-1 shall apply for thickness up to 35 mm (1.38 in) for Grades up to L485/X70 and in Table 5-2 shall apply for thicknesses up to 19,1 mm (0.75 in) in Grade L555/X80.
- The steel maker shall nominate a preferred steel composition (heat and product analyses) within Table 5-1 or Table 5-2 limits, together with the tolerances applied to each element, subject to approval by the BP technical representative.

[EDS Note: Commentary needed to explain "subject to approval".]

- For thicknesses in excess of a. and b., revisions to the limits defined in Table 5-1 or Table 5-2 and 9.2.4 shall be subject to agreement with the BP technical representative and defined in the approved MPS.

[EDS Note: Commentary needed to explain "subject to agreement".]

Delete Table 5

Add

Table 5-1 - Chemical composition for PSL2 pipe in Grades up to L485/X70

Element	Weight	Element	Weight
Carbon	0,10% max	Copper	0,25% max
Manganese	0,80% to 1,70%	Nitrogen	0,008% max
Silicon	0,05% to 0,35%	Niobium	0,05% max
Phosphorus	0,015% max	Calcium	0,006% max
Sulphur	0,005% max	Boron	0,000 5% max
Vanadium	0,08% max	Chromium	0,20% max
Titanium	0,03% max	Molybdenum	0,20% max
Aluminium (total)	0,015% to 0,055%	Nickel	0,30% max
Nickel plus copper	0,45% max	Chromium plus molybdenum	0,30% max
Vanadium plus niobium	0,12% max	Aluminium: nitrogen	2,0% min

Notes:

- No other element shall be added to the steel without approval of the BP technical representative.
- If the MPS defines the steelmaking process as electric arc furnace or if large volumes of nonline pipe scrap are used, additional analyses for arsenic, antimony, tin, lead, and bismuth shall be performed. The maximum content for these residual elements shall be 0,03% As, 0,01% Sb, 0,02% Sn, 0,01% Pb, and 0,01% Bi.
- The BP technical representative shall be advised of any deviations from the limits placed on heat and product analyses in the MPS. If the deviations are considered significant, further qualification of a modified MPS may be required.
- One of the two product analyses shall be performed on the first pipe rolled from each heat of steel.
- If any part of the product analysis fails to meet the requirements, either the whole heat shall be rejected, or each individual plate shall be fully analysed, and plates failing to meet the requirements shall be rejected.
- Samples for recheck analysis shall be taken in the same location as specified for product analysis samples.

[EDS Note: Commentary needed to explain "without approval" (see Note 1).]

Add**Table 5-2 - Chemical composition for PSL2 pipe in Grade L555/X80 with wall thickness up to 19,1 mm (0.75 in)**

Element	Weight	Element	Weight
Carbon	0,12% max	Copper	0,35% max
Manganese	1,20% to 2,00%	Nitrogen	0,008% max
Silicon	0,05% to 0,35%	Niobium	0,05% max
Phosphorus	0,015% max	Calcium	0,006% max
Sulphur	0,005% max	Boron	0,000 5% max
Vanadium	0,08% max	Chromium	0,25% max
Titanium	0,03% max	Molybdenum	0,25% max
Aluminium (total)	0,015% to 0,055%	Nickel	0,35% max
Vanadium plus niobium	0,12% max	Aluminium: nitrogen	2,0% min

Notes:

1. No other element shall be added to the steel without approval of the BP technical representative.
2. If the MPS defines the steelmaking process as electric arc furnace or if large volumes of nonline pipe scrap are used, additional analyses for arsenic, antimony, tin, lead, and bismuth shall be performed. The maximum content for these residual elements shall be 0,03% As, 0,01% Sb, 0,02% Sn, 0,01% Pb, and 0,01% Bi.
3. The BP technical representative shall be advised of any deviations from the limits placed on heat and product analyses in the MPS. If the deviations are considered significant, further qualification of a modified MPS may be required.
4. One of the two product analyses shall be performed on the first pipe rolled from each heat of steel.
5. If any part of the product analysis fails to meet the requirements, either the whole heat shall be rejected, or each individual plate shall be fully analysed, and plates failing to meet the requirements shall be rejected.
6. Samples for recheck analysis shall be taken in the same location as specified for product analysis samples.

[EDS Note: Commentary needed to explain "without approval" (see Note 1).]9.2.4 Add

The carbon equivalent (CE_{Pcm}) limits, based on the product analysis and as given in Table 5-1 and Table 5-2, shall be revised in accordance with the following:

Grade	CE_{Pcm} max.
For Grades up to and including L415/X60	0,21
For Grade L450/X65	0,20
For Grade L485/X70, w.t. ≤ 19,1 mm (0.75 in)	0,20
For Grade L485/X70, w.t. > 19,1 mm (0.75 in)	0,21
For Grade L555/X80, w.t. ≤ 19,1 mm (0.75 in)	0,22

Modify "(see Table 5)" to Read "(see Table 5-1 and Table 5-2)"9.2.5 Modify "(see Table 5)" to Read "(see Table 5-1 and Table 5-2)"Add9.2.6 **Elements analysed**

Each required analysis shall include the determination of each of the elements listed in 9.2, together with the analysis for other elements whose addition has been approved by the BP technical representative.

9.2.7 **Product analysis variation**

Product analysis variation shall be as agreed in the MPS.