

GENERAL SPECIFICATION

PIPELINES - RISERS

GS EP PLR 245

Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical

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General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 2 of 36

Contents

1. Scope	5
2. Reference documents	5
3. General	7
3.1 Definitions	7
3.2 Quality Assurance/Quality Control	8
4. Project Particular Specification	9
5. Inspection by the Company	9
6. Tubes manufacture	10
6.1 General	10
6.2 Manufacturing	10
6.3 Process control	12
6.4 Chemical properties requirements	12
6.5 Mechanical properties requirements	12
6.6 Manufacturing Procedure Specification (MPS)	12
6.7 Manufacturing Procedure Qualification (MPQ) and reporting	13
6.8 Production tests	14
7. Dimensional and weight requirements	14
7.1 Diameters	14
7.2 Wall thickness	14
7.3 Out-of-roundness	15
7.4 Unit length	15
7.5 Straightness	15
7.6 Squareness of tube ends	15
7.7 Tube end preparation	15
7.8 Bulges, dents and flat areas	16
7.9 Pickling and passivation	16
8. Non destructive testing	16
8.1 Visual examination	16

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 3 of 36

8.2	Ultrasonic testing	16
8.3	Eddy current testing	17
8.4	Qualification of personnel.....	17
8.5	Non destructive testing acceptance limits.....	17
8.6	Anti mixing check	17
8.7	Residual magnetism	18
9.	Destructive tests	18
9.1	Chemical analysis	18
9.2	Mechanical tests	18
9.3	Pitting corrosion resistance	20
9.4	Weldability tests	21
9.5	Burst tests.....	21
9.6	Fatigue tests	21
9.7	Test failure	21
9.8	Storage of destructive test specimens.....	22
10.	Mill hydrostatic testing	22
10.1	Hydrostatic test	22
10.2	Eddy current testing	23
11.	Mill certificates	23
12.	Repair of defects	23
13.	Marking of tubes	23
14.	Protection of bevels	24
15.	Handling, transport and storage of tubes	24
15.1	General.....	24
15.2	Cleanliness	24
15.3	Handling and storage.....	24
15.4	Transport	25
16.	Documentation	25
16.1	When the bids are submitted.....	25
16.2	Upon completion of tube production.....	26

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 4 of 36

17. Fabrication of Tube History	27
Appendix 1 Chemical composition	28
Appendix 2 Mechanical tests requirements	29
Appendix 3 Frequency of tests	30
Appendix 4 Automatic Ultrasonic & Eddy Current examination	31
Appendix 5 Weldability tests	33
Appendix 6 Data Sheet	36

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 5 of 36

1. Scope

This specification defines the Company's requirements for the manufacture and supply of bare Superduplex stainless steel tubes to be used for the umbilical manufacturing.

This specification is applicable to **seam welded** tubes up to 2" (60.3 mm) ID in UNS number S32750/32760.

This Specification shall **always** be used in conjunction with a Project Particular Specification detailing the additional tests and requirements or the possible modifications to the present specification, based on the particular design conditions of the umbilical Project (see section 4).

Due to manufacturing and laying processes, tubes shall be suitable for cold forming operations induced by spooling, un-spooling, straightening and bending.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

The order of precedence of the applicable documents shall be:

- The Purchase Order/Requisition
- The Particular Specification
- The present General Specification
- The codes and standards in reference.

Applicable Codes and Standards that are to be used in conjunction with this specification are stated in paragraphs hereafter.

Unless otherwise specifically indicated in writing by the Company, the Supplier shall work in accordance with the requirements specified herein and the applicable requirements of the latest editions at date of Contract award of the referenced Codes and Standards, whenever asked in the present specification.

Where this specification states no overriding requirements, the referenced Codes and Standards shall apply in full.

Standards equivalent to those referred to herein shall not be substituted without written approval from the Company. Approval of equivalent standards will not, in any way, remove responsibility from Supplier to meet the requirements of the Standards referred and amended herein, in the event of conflict.

The Supplier shall equip himself with copies of all the reference specifications referred to in this specification and shall make them readily available to all fabrication, testing and inspection personnel involved on the work.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
API RP 578	Material Verification Program for New and Existing Alloy Piping Systems
API RP 5L1	Recommended Practice for Railroad Transportation of Line Pipe
API RP 5LW	Recommended Practice for Transportation of Line Pipe on Barges and Marine Vessels
ASME BPVC Section IX	Welding, Brazing, and Fusing Qualifications
ASME BPVC Section V	ASME Boiler and Pressure Vessel Code, Section V: Nondestructive Examination
ASTM A1016	Standard Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes
ASTM A370	Standard test methods and definitions for mechanical testing of steel products
ASTM A789/A789M	Standard specification for seamless and welded ferritic/austenitic stainless steel tubing for general service
ASTM A790/A790M	Standard specification for seamless and welded ferritic/austenitic stainless steel pipe
ASTM A923	Standard Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels
ASTM E1245	Standard Practice for Determining the Inclusion or Second-Phase Constituent Content of Metals by Automatic Image Analysis
ASTM E213	Standard Practice for Ultrasonic Testing of Metal Pipe and Tubing
ASTM E309	Standard Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation
ASTM E45	Standard Test Methods for Determining the Inclusion Content of Steel
ASTM E562	Standard test method for determining volume fraction by systematic manual point count
ASTM G48	Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution
EN 10204	Metallic products - Types of inspection documents
ISO 13628-5	Petroleum and natural gas industries - Design and operation of subsea production systems - Part 5: Subsea umbilicals

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 7 of 36

Reference	Title
ISO 148-1	Metallic materials - Charpy pendulum impact test - Part 1: Test method
ISO 4406	Hydraulic fluid power - Fluids - Method for coding the level of contamination by solid particles
ISO 9000	Quality management systems - Fundamentals and vocabulary
ISO 9445-1	Continuously cold-rolled stainless steel - Tolerances on dimensions and form - Part 1: Narrow strip and cut lengths
ISO 9712	Non-destructive testing - Qualification and certification of NDT personnel

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP PLR 160	Design, fabrication and testing of Subsea Umbilicals
GS EP PLR 423	Welding of Super-Duplex Stainless Steel Small Bore Tube for Umbilical
GS EP PVV 175	Cleaning of piping and vessels

3. General

3.1 Definitions

Company	TOTAL E&P or agents acting on its behalf, shall be referred to herein as the "Company".
Supplier	The Companies, or their agents including steel and tube Manufacturer, designated on the Purchase Order form or Contract as being. The selected supplier of the said materials and tubes shall be referred to herein as the "Supplier".
Inspection Agency	An independent inspection body (other than any inspection department of the Supplier or any Inspection Agency subcontract by him), or its members, who shall be appointed by Company and thus notified to Supplier.
Inspector	The Company representatives or members from the Company elected Inspection Agency for the time being or from time to time duly appointed in writing by the Company to act as its representatives for

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 8 of 36

the purpose of the contract shall be referred to herein as the "Inspector".

Mill	The plants, mills, workshops, laboratories or other locations where the fabrication, inspection and testing of steel and tubes are to be performed complete or in part, including storage areas shall be referred to herein as the "Mill".
Contract Documents	The material requisitions, material specifications, etc. issued by the Company and attached to the contract or the purchase order shall be referred to herein as the "Contract Documents".
Approval	Authorisation in writing given by Company to Supplier to proceed with the performance of a specific part of the work without releasing in any way Supplier from any of its obligations or liabilities under the contract or at law; Approve, Approved and Approval shall be construed accordingly.
PPS	Used to designate the Project Particular Specification.
Tubes	Means "Small Bore Tubes".
QCP/ITP	Quality Control Plan / Inspection tests Plan.
LSW	Long Seam Weld.
Checking	Means that inspection consists to verify that the said dimension is within the permitted tolerances (exact dimension is not required) e.g., go - no go gauge check.
Measurement	Means that an actual measurement is carried out and a precise figure is obtained as a result of it.
Recording	Means that the value of actual measurement as above is recorded and filed.
NDE	Non Destructive Examination.
May	Used to indicate that a provision is optional.
Shall	Used to indicate that a provision is mandatory.
Should	Used to indicate that a provision is not mandatory but is recommended as good practice

3.2 Quality Assurance/Quality Control

The Supplier shall operate a Quality Assurance system in accordance with [ISO 9000](#), or equivalent, approved by a recognized authority. The Quality Assurance Manual shall be submitted to Company.

Three weeks prior to start the tube manufacture, the Supplier shall prepare and submit to the Company a written QCP/ITP describing the inspections to be performed during the supply of tubes. The QCP/ITP shall set forth "witness", "hold", "review" and "monitor" points.

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 9 of 36

All necessary measures shall be taken, making use of suitable means, devices and qualified personnel, enabling Supplier to ensure permanent and effective control at each stage of manufacture.

All inspections carried out by Supplier during manufacturing shall be subject to constant updated reports. Reports shall be available for consultation by Inspector at any time.

Only tubes fully meeting the requirements of this specification shall be presented to Inspector for final acceptance.

4. Project Particular Specification

The Project Particular Specification (PPS) shall define:

- Grade
- Minimum Internal Diameter of tubes to be supplied
- Minimal individual and total length of tubes
- Any other information or particular tests to be carried out with related requirements (e.g. Weldability tests, bending tests, hydrotests, etc.).

The PPS shall include the tubes Data Sheet (see Appendix 6), if it is not included elsewhere in any other Project Specifications.

5. Inspection by the Company

Prior start of fabrication and at the latest prior the kick off meeting, the following data sheet and procedure shall be provided to Company for review and approval:

- Non Destructive Testing (Reference standards, X-RAY...)
- Heat Treatment (heating speed, soaking time, cooling speed...)
- Coiling
- Pressure testing
- P-WPS (Preliminary-WPS)
- P-ITP/QCP (Preliminary-ITP/QCP - without flow chart but numbering describing relevant production steps)".

All qualification tests shall take place under the supervision of the Company Inspector.

Company's Inspector shall be notified at least 2 weeks prior any qualification tests.

Supplier shall ensure that Inspector has full and free access to all parts of the Mill during all fabrication stages.

It shall be made available in the inspector office:

- Tracking system of production and inspection
- All data and results of mechanical tests, NDE results
- Strip coil/ tube output, rejections status with causes, repairs

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 10 of 36

- Forming & welding parameters
- Any other information considered pertinent by the inspector for his monitoring.

If during the main production, more than 7% of the tubes does not meet quality requirement, Inspector shall have the right to request to increase QCP/ITP program. When above rate attains 10%, tubes shall be put in quarantine for investigation together with Company's representative.

Company reserves the right to re-check tests carried out by Supplier. For this purpose, Company may request the delivery of samples or specimens for analyse in an independent laboratory chosen by Company.

6. Tubes manufacture

6.1 General

Tubes shall be manufactured in accordance with all the requirements of [ASTM A789](#) unless otherwise indicated in the present specification. All points not specifically mentioned or modified herein remains applicable.

Except as otherwise agreed between the Supplier and the Company, all inspections and tests required for tubes manufacturing procedure qualification shall be performed at the manufacturing Mill.

In case of some operation will be sub-Contracted, it shall be identified into the QCP/ITP. Sub-Contractor name, relevant procedure and ordering transmittal document shall be referenced.

6.2 Manufacturing

Tubes shall be manufactured by the cold rolling of strip coils process and longitudinally welded as stated above

6.2.1 Steel to strip manufacturing

Steel shall be made by electrical furnace and/or electric induction furnace, refining AOD / VOD. Continuous casting technique is also applied to obtain billet.

In case of Billets from ingots, top and bottom cut off are 30% minimum.

Chemical analysis is performed *for each heat and during casting* and shall be included into the certificate.

Strip shall be hot and cold rolled. Strip coil shall be delivered to pipe mill in annealed condition. Coil surface finish is Pickling with passivation.

Certificate is 3.1.b level. This certificate shall include melting and refining methods, chemical analysis, mechanical and corrosion properties.

The supply of butt welded strips at any stage of manufacture is forbidden.

The supply of 2 different strip suppliers in the same OD/WT is not authorized.

Tolerances on strip:

- Width shall not be more than + 0.50 mm
- Wall thickness shall not be more than + 5%

General Specification		GS EP PLR 245
Fabrication of Super Duplex stainless steel Small bore seam welded tubes for umbilical		
Rev.: 02	Effective date: 10/2016	Page: 11 of 36

- Camber shall be in accordance with [ISO 9445-1](#) (restrictive series)
- Edge waving is limited to 0.03 (h/l ratio).

6.2.2 Strip to tube manufacturing

Strip coil is exclusively coming from billets and hot & cold rolled. The strip is forming with a minimum of 10 passes.

Tubes shall be longitudinally welded (LSW) by Laser or GTAW processes but not combined.

LSW shall be qualified according to [GS EP PLR 423](#).

Welding gas composition shall be Ar, N₂ or a mixture, Helium gas can be added. Gas will be better than 99,999% with limited impurities as follow:

- H₂O < 10 ppm
- O₂ < 10 ppm
- CO₂ < 10 ppm
- HC < 5 ppm
- N₂ < 40 ppm (in case of argon).

The use of hydrogen in the shielding and purging gases shall not be acceptable.

The Mechanical and chemical properties of the welding consumables shall be fully compatible with the base metal.

All welding consumables shall be supplied with certification covering all chemical and physical properties, and shall be verified prior to starting any welding operation.

WPS shall be qualified prior to starting welding production onto the bulk of the project and in the production configuration.

All WPS shall be approved by Company before starting the qualification. WPS is prepared according to [ASME BPVC Section IX](#) Code form QW402 or equivalent.

All tests welds and samples processing including breaking is witness by Inspector. WPQR shall be establish and submitted to Company for approval. WPS and WPQR shall be available on site for Inspector review.

Strip start and stop (1 meter length minimum) shall not be included into the final tube length. Strip Weld is acceptable for production processing but shall not include into tubes length and shall be replace by Orbital Weld.

Unless otherwise indicated in the P.P.S. or agreed at bid stage, tubes shall be supplied heat-treated in solution annealed condition (Table 2 of [ASTM A789](#)).

The minimum heat treatment cooling speed shall be 200°C/min between 1000°C to 500°C. Cooling curve shall be recorded from annealing temperature. Supplier shall demonstrate the efficiency of cooling regarding metallurgical properties of the tube through ferrite ratio and precipitate.