

## **Inspection and Test Plan (ITP)**

REVISION INDEX

SHEET NO.	REVISION						SHEET NO.	REVISION						SHEET NO.	REVISION					
1							31							61						
2							32							62						
3							33							63						
4							34							64						
5							35							65						
6							36							66						
7							37							67						
8							38							68						
9							39							69						
10							40							70						
11							41							71						
12							42							72						
13							43							73						
14							44							74						
15							45							75						
16							46							76						
17							47							77						
18							48							78						
19							49							79						
20							50							80						
21							51							81						
22							52							82						
23							53							83						
24							54							84						
25							55							85						
26							56							86						
27							57							87						
28							58							88						
29							59							89						
30							60							90						

## Scope

This Inspection and Test Plan covers extent of inspection and test activities to be performed by EMPLOYER/EPC CONTRACTOR/ Third Party Inspection for Coil Tubing.

This ITP indicates minimum extent of inspection to be performed by company (EMPLOYER/EPC CONTRACTOR) and is to be incorporated into VENDOR'S / SUB-VENDOR'S own inspection procedure.

The extent of inspection and test activities for the equipment and materials which are not covered by this Inspection and Test Plan shall be decided after obtaining approval from parties prior to the start of fabrication.

If any conflict arises between this inspection & Test Plan and Purchase Order, Vendor shall submit its deviation list to Purchaser for approval.

## Definition

The following definition shall apply throughout the context of this specification.

EMPLOYER (E)

EPC CONTRACTOR (C)

VENDOR(V)

TPA (T)

H: (Hold) Point

Witness is mandatory. The VENDOR shall inform CONTRACTOR the activity date. The CONTRACTOR / THIRD PARTY inspector will arrange to be present for ongoing activity. VENDOR cannot proceed to the next step if inspector is not present. CONTRACTOR/ THIRD PARTY inspector shall be informed for testing time, 3 working days before testing date.

W: (WITNESS)

The VENDOR shall inform CONTRACTOR the activity date. The CONTRACTOR / THIRD PARTY inspector will arrange to be present at least for part of ongoing activity. VENDOR will proceed to the next step if inspector is not present provided controls and test records are made available to PURCHASER for review. CONTRACTOR/ THIRD PARTY inspector shall be informed for testing time, 3 working days before testing date.

RA: Review & Approval of Documents

Approval (The VENDOR has either to submit to EMPLOYER / EPC CONTRACTOR for comments and approvals the documents required prior to the performance of the dedicated activity or to transmit or make available for the approval of EMPLOYER / EPC CONTRACTOR the result of the controls and test conducted, as the case may be. VENDOR is not allowed to precede the work before receipt of EMPLOYER / EPC CONTRACTOR approval on the required documents.)

R: (REVIEW) –Review of Documents

Review of Documents (The VENDOR has either to submit to EMPLOYER / EPC CONTRACTOR for review and comments the documents required prior to the performance of the dedicated activity or to transmit or make available for the review of EMPLOYER / EPC CONTRACTOR the result of the controls and tests conducted, as the case may be)

SW: (SPOT WITNESS)

Spot Witness (denotes to random attendance (10%) of inspector. CONTRACTOR/ THIRD PARTY inspector shall be informed for testing time, 3 working days before testing date.

## **Reference**

In preparation of this procedure, the following documents have been used or referred to:

## **Code and Standards**

All work shall be completed following engineering codes and standards listed in the document:

Item	Inspection activity	Reference	Acceptance Criteria	Verifying document	Involved party				Remarks
					V	C	TPA	E	
1. Pre-Inspection Meeting									
1.1	PIM	P.O.	P.O.	MOM	H	H	R	H	
2. Before Manufacturing (Document Review)									
2.1	NDE Personnel Qualification Certificate	SNT-TC-1A, or eq. API 5ST clause 10.3	NDE Personnel Qualification Certificate	NDE Personnel Qualification Certificate	H	R	RA	R	
2.2	Welder/Welding Operator Qualification Certificate	API Standard 1104, ASME Sec IX	Welder/Welding Operator Qualification Certificate	Welder/Welding Operator Qualification Certificate	H	R	RA	R	
2.3	WPS & PQR	API Standard 1104, ASME Sec IX	WPS & PQR	WPS & PQR	H	R	RA	R	
2.4	NDT Examination Procedure	ASTM standards	NDT Examination Procedure	NDT Examination Procedure	H	R	RA	R	
2.5	Packing, Marking, Shipping Procedure	API 5ST	Packing, Marking, Shipping Procedure	Packing, Marking, Shipping Procedure	H	R	RA	R	
2.6	Welding Repair Procedure	API 5ST, API Standard 1104, ASME Sec IX	Welding Repair Procedure	Welding Repair Procedure	H	R	RA	R	
2.7	Heat Treatment Procedure	API 5ST	Heat Treatment Procedure	Heat Treatment Procedure	H	R	RA	R	
2.8	Hardness Test Procedure	ASTM Standards, API 5ST, 5C7, NACE MR 0175	Hardness Test Procedure	Hardness Test Procedure	H	R	RA	R	
2.9	Hydrostatic Test Procedure	API 5ST,	Hydrostatic Test Procedure	Hydrostatic Test Procedure	H	R	RA	R	
2.10	Calibration Certificate Review (Measurement Tools)	API 5ST clause 8.1	Calibration Certificate Review (Measurement Tools)	Calibration Certificate Review (Measurement Tools)	H	R	RA	R	
2.11	Traceability Procedure	API 5ST clause 5.5	Traceability Procedure	Traceability Procedure	H	R	RA	R	
3. Material Inspection									
3.1	Raw Material Inspection (coil, welding Consumable)	API 5ST, 5C7 Material Standard Specification NACE MR 0175	API 5ST, 5C7 Material Standard Specification NACE MR 0175 EN 10204 3.1	MTC review or lab report (1 sample per heat)	H	H	R	R	
3.2	Raw Material inspection (VT, DT)	API 5ST, Material Standard Specification	API 5ST, Material Standard Specification	Inspection Report	H	W	R	R	
3.3	Sampling for SSC/HIC test (if required)	NACE MR 0175 API 5C7	NACE MR 0175 API 5C7	Inspection Report	H	H	R	R	
3.4	Chemical analysis	API 5ST clause 6.1	API 5ST Table A.1 CT80 API 5ST clause 6.1	lab report	H	H	R	R	all skelp segments shall be analyzed.

			API 5ST clause 8.2.1 ASTM A751						
3.4	Storage of material (welding consumable)	Material Standard Specification	Manufacturer Datasheet	Inspection report	H	W	R	R	
<b>4. During Fabrication Inspection</b>									
4.1	Rolling and forming	QCP	QCP	Inspection Report	H	SW	R	R	
4.2	Welding (longitudinal)	QCP	WPS/PQR, QCP	Inspection Report	H	SW	R	R	
4.3	Heat treatment	QCP	QCP, Heat treatment procedure	Inspection Report	H	SW	R	R	
4.4	Welding (Skelp End)	QCP	WPS/PQR, QCP	Inspection Report	H	SW	R	R	
4.5	NDT of Skelp End Welds	API 5ST clause 10.5.2	API 5ST clause 10.5.2, 10.6 NDT procedure	NDT report	H	SW	R	R	Skelp end welds shall be inspected in skelp form by radiographic inspection in accordance with approved procedure. Other methods such as ultrasound, magnetic particle and liquid penetrant inspection shall be performed by agreement between the purchaser and the manufacturer, as stated on the purchase agreement.
4.6	NDT (UT or electromagnetic test) of seam welds	API 5ST clause 10.5.3	API 5ST clause 10.5.3, 10.7, 10.8, 10.9 NDT procedure	NDT report	H	SW	R	R	The location of equipment in the manufacturer's facility shall be at the discretion of the manufacturer.
4.7	General repair	API 5ST	API 5ST, NCR, repair procedure	Inspection Report	H	W	R	R	
4.8	Spooling	API 5ST	API 5ST Annex G, Table G.1	Inspection Report	H	SW	R	R	
<b>5. Final Inspection</b>									
5.1	Product Chemical Analysis	API 5ST clause 6.1	API 5ST Table A.1 CT80 API 5ST clause 6.1, 9.1, 8.2.2, 8.2.3, 12.1 ASTM A751	Inspection report including lab report	H	W	H	R	-When specified on the purchase agreement, one product analysis representing each heat of steel used in the production of a tubing string under this specification shall be performed.
5.2	Tensile Properties (Tensile, yield, Elongation)	API 5ST clause 6.2 ASTM E4 ASTM E83	API 5ST Table A.2, A.3 API 5ST clause 6.2.1.1, 6.2.1.2, 8.3.1, 9.2, 12.2 ASTM A370	Inspection report including lab report	H	W	H	R	The yield strength shall be determined by the 0.2 % offset method or the 0.5 % extension under load method by agreement between the purchaser and the manufacturer.
5.3	Hardness Test	API 5ST clause 6.2	API 5ST Table A.2 API 5ST clause 6.2.2, 8.7.3, 8.9.5, 9.3, 12.5	Hardness Test Report	H	W	H	R	

			ASTM E384						
5.4	Grain Size	API 5ST clause 6.2	API 5ST clause 6.2.3, 9.4 ASTM E112, ASTM grain size 8 or finer	Inspection report including lab report	H	W	H	R	
5.5	Flattening Test	API 5ST clause 6.2	API 5ST clause 6.2.4, 12.3 API 5ST Table A.4 API 5ST clause 8.3.1	Inspection report including lab report	H	W	H	R	
5.6	Flaring Test	API 5ST clause 6.2	API 5ST clause 6.2.5, 12.4 API 5ST Table A.4 API 5ST clause 8.3.3	Inspection report including lab report	H	W	H	R	
5.7	Fracture Toughness Test	API 5ST clause 6.2	API 5ST clause 6.2.6, 9.5, 12.6 ASTM A370, ASTM E23	Inspection report including lab report	H	W	H	R	-This test is required where requested on the purchase order. - By agreement between the purchaser and manufacturer, alternate tests may be used if the above requirements cannot be met due to pipe geometry.
5.8	Metallographic Examination	API 5ST clause 6.2	API 5ST clause 6.2.7	Inspection report including lab report	H	W	H	R	- A metallographic examination of a weld cross section shall be performed on both ends of each milled length.
5.9	SSC and HIC test	API 5ST, 5C7 NACE MR 0175 NACE TM 0177 NACE TM 0284	API 5ST, 5C7 NACE MR 0175 NACE TM 0177 NACE TM 0284	Inspection report including lab report	H	W	H	R	
5.10	Length of Strings and Sections of Strings	API 5ST clause 7.2	API 5ST clause 7.2.1 API 5ST Table A.5 or A.6	Inspection report	H	W	H	R	-The preliminary length profile of a tapered coiled tubing string shall be specified by the purchaser following established criteria for the proposed service, and attached to the purchase agreement form. The final coiled tubing string length profile shall be by agreement between the purchaser and the manufacturer.
5.11	Diameter (Outside Diameter, Ovality)	API 5ST clause 7.3	API 5ST clause 7.3.1 (Outside diameter) API 5ST clause 7.3.2 (Ovality) API 5ST Table A.7	Inspection report	H	W	H	R	- Diameter measurements of coiled tubing shall be made with a caliper - Diameter measurements shall be made on both ends of each spooled length of coiled tubing on segments that have not been subjected to plastic deformation from spooling. - When agreed upon between the manufacturer and the purchaser the ovality of the tubing shall be measured within 150 ft (45.7 m) of the ends, as installed on the reel.

5.12	Wall Thickness	API 5ST clause 7.4	API 5ST clause 7.4.1, 7.4.2, API 5ST Table A.8	Inspection report	H	W	H	R	-The remaining wall at locations of complete imperfection removal shall be agreed between the manufacturer and the purchaser, and stated in the purchase agreement.
5.13	Visual Inspection	API 5ST clause 7.7	API 5ST clause 7.7.2 (Dents) API 5ST clause 7.7.3 (Offset Skelp Edges) API 5ST clause 7.7.4 (Height of Outside Seam Weld Flash) API 5ST clause 7.7.5.1 (Flash Height) API 5ST clause 7.7.5.2 (Trim of Inside Flash) API 5ST Table A.9 API 5ST clause 7.7.9 (Undercuts) API 5ST clause 7.7.12 API 5ST clause 10.5.1 (Surface Inspection)	Inspection report	H	W	H	R	- By agreement between the manufacturer and the purchaser, and when specified on the purchase agreement, the inside seam weld flash shall be trimmed.
5.14	End Finishes	API 5ST clause 7.8	API 5ST clause 7.8	Inspection report	H	W	H	R	- Tubing shall be furnished with unfinished or plain ends, unless otherwise specified on the purchase agreement. When a connection is required, the purchaser shall specify the connection.
5.15	Hydrostatic Tests	API 5ST clause 8.4	API 5ST clause 8.4 Table A.5 or A.6	Hydrostatic test report report	H	H	H	R	- An intermediate or higher pressure at the discretion of the manufacturer unless specifically limited by the purchaser, or a higher pressure as agreed between the purchaser and the manufacturer may be employed.
5.16	Full Body Inspection After Hydrostatic Test	API 5ST clause 10.5	API 5ST clause SR37 (Annex D)	Inspection report	H	W	H	R	-By agreement between the purchaser and the manufacturer, and when specified on the purchase agreement, the tubing shall be nondestructively inspected - When specified on the purchase agreement, the entire tube shall be inspected full length for surface and subsurface defects by either automated ultrasonic or electro-magnetic methods.
5.17	Drift (Gauge Ball) Testing	API 5ST clause 8.5	API 5ST clause 8.5 Table A.10	Inspection report including lab report	H	W	H	R	- Unless otherwise specified on the purchase agreement, each



									completed string of coiled tubing shall be drift tested - Unless otherwise agreed between the purchaser and the manufacturer, and stated on the purchaser agreement, the drift (gauge) ball shall be manufactured from nylon or steel.
<b>6. Documentation</b>									
6.1	Packing and Marking	API 5ST clause 13, 14	API 5ST clause 13, 14.2 Marking, shipping procedure	Inspection report	H	W	H	R	
6.2	Loading and Shipping	API 5ST, P.O.	API 5ST, P.O.	Inspection report	H	W	W	R	
6.3	Certificate of Compliance	API 5ST clause 15.2	API 5ST clause 15.2, P.O.	COC	H	R	R	R	
6.4	Mill Certificates	P.O., API 5ST	MTC, EN 10204 3.1	MTC	H	R	R	R	
6.5	Inspection Release Note (IRN)	-	Packing List	IRN	-	R/A	H	R	
6.6	Final Vendor Data Book	P.O.	P.O. API 5ST clause 15	Final Data Book	H	R/A	R/A	R/A	

Information	Reference
Specification	API Specification 5ST
Grade	Tables A.1, A.2
Method for yield strength	6.2.1.3
Preliminary String Length Profile	7.2
Length(s)	7.2
Diameter	7.3, 7.4, Table A.5
Wall thickness(es)	7.4
Tubular Ends	7.8
Product Analysis	8.2.2
Drying procedure	8.4.6
Alternate Drift Ball Material	8.5.2
NDE Reference Indicators	10.8.2, 10.8.2.2
Certificate of compliance	15.2
Tensile retest	12.2
Documentation	15.2.1
Additional NDE	Annex D
Coiled Tubing Shipping Reels	Annex G
Delivery date and shipping instructions	

Information	Reference
Chemical composition *	6.1
Additional Hardness Tests *	6.2.2
Fracture toughness tests	6.2.6
Final string length profile *	7.2.2
Ovality measurement	7.3.2
Minimum remaining wall thickness *	7.4.2.2
Tube-to-tube welds *	7.6, Annex B and Annex C
Trim of Inside Flash *	7.7.4
End finish and connection *	7.8
Tensile Test Sample Width *	8.3.1
Alternate Hydrostatic pressure *	8.4.4
Demonstration of NDE standard	10.2
Additional skelp end weld inspection *	10.5.2, 10.7
Additional tube-to-tube weld inspection *	10.5.4, 10.7
Alternate Image Quality Indicators (IQIs)*	10.6.2
NDE Reference Indicators *	10.8.2, 10.8.2.2
Grain size determination	9.4
Markings in SI units	13.1
External coatings	14.1, 14.2
Internal coatings	14.2.3
Documentation to be Supplied	15.2.2
Supplementary requirements *	Annex D
Purchaser inspection	Annex E
Marking requirements and Monogram * (see Note 2)	Annex F
Shipping reel dimensions *	Annex G