Welspun CORP	WELSPUN	Format No.	WCL/PPC/F/10 Rev 02
		Document No.	HFW-I/Gerab Farha oil -10inch
		Revision	01
	Production Planning & Control	Date	12.11.2026
		Page	1 of 39
Document	**Process Chart**		
Plant	**HFW- I**		
Manufacturer and Location: Welspun Corp Ltd., Anjar, Gujarat, India			

PROCESS PARAMETERS VERIFIED AND RELEASE FOR PIPE MANUFACTURING

Record of Revision-

Rev. No.	Date	Clause No.	Description of change
00	07.10.2026		
01	12.11.2026	7.2 & 8.0	Mill Parameter updated after FDPT for Size: OD 273.1 x 7.80mm WT

Clause	Responsibility (PPC/QC/OPN)	Parameter	Description
1.1	**PPC**	**Scope**	Carbon steel HFW, Onshore Sour pipes as per API 5L 46th Edition, April 2018 & Errata 1 Dated May 2018 & Client specifications QSF-FSW-4620000222-LA-7880-0001-02 Rev.02=Dated 16/10/2024SP-2347 Version 2.0 Dated March 2025 and Client PO.
1.2	**PPC**	**Client Name**	Gerab national enterprises L.L.C / Arab Desert
1.3	**PPC**	**Owner**	----
1.4	**PPC**	**Client Purchase Order No.**	As per Table -1
1.5	**PPC**	**Project Name**	EPCC of Farha SW Oil Export System Project
1.6	**PPC**	**Sales Order No.**	As per Table -1
1.7	**PPC**	**Sales Order Item No.**	As per Table -1
1.8	**PPC**	**SAP Production Order No.**	As per Table -1
1.9	**PPC**	**Pipe Size & Grade**	As per Table -1
1.10	**PPC**	**Technical Specification**	High Frequency Electric Welded (HFW) Steel Line Pipe as per: • Data sheet for Carbon steel Line Pipe Doc. No. QSF-FSW-4620000222-LA-7880-0001-02 Rev.02 Dated 16/10/2024 • Procurement Specification for Carbon Steel Line Pipe (Amendment / Supplementary Requirements to API 5L, 46th Edition), Doc. No. SP-2347 Version 2.0 Dated March 2025

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Clause	Responsibility (PPC/QC/OPN)	Parameter	Description
			• API 5L 46th Edition April 2018 & Errata 1 dated May 2018 [Applicable Annex/Sections: Annex A, B, C, E, H, K, O]
1.11	PPC	ITP No.	ITP/HFW/25-88(10 INCH)/01, Rev.03, dated 16/09/2026
1.12	PPC	Pipe Material Code	1310012
1.13	PPC	Pipe No.	HXX…… (XX is year of manufacturing)
1.14	PPC	Order Quantity	As per Table 1
1.15	PPC	Order Quantity Tolerance	-0/+12 meter each line items
1.16	PPC	Plate/Coil Size	As per Table -1
1.17	PPC	Plate/Coil Grade	As per Table -1
1.18	PPC	Plate/Coil Source	As per Table -1
1.19	PPC	Inspection Agency	WCL TPI- SGS, Client TPI- Astron
1.20	PPC	QMS Site	https://welspungroup.sharepoint.com/sites/anjardahejqms/Shared%20Documents/Forms/AllItems.aspx?CT=1776506611884&OR=OWA%2DNT%2DMail&CID=f4cad4ed%2D51ac%2D7e89%2D7de5%2D3cde16217838
1.21	PPC	Plant Document Site	NA
1.22	PPC	Product Statutory and Regulatory Requirements	• For Cranes and Compressor Factory Act 1948 • For Weight and Measurement Act 1985 • For lifting Machines, Ropes & Lifting Tackles, Hydro testing Pressure Vessel Gujarat Factories Rules 1963 • For Storage of gases the Static & Mobile Pressure Vessels (Unfired) Rules 1981 • For Gas Cylinder Gas Radiation Rules, 2004 Rule21 • For Radiation, the radiation protection rule, 1971

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Clause No.	Responsibility (PPC/QC/OPN)	Process/Activity Name (Δ)	Reference Work Instruction& Recording Format	Inspection/Test Frequency		Description	Acceptance Criteria			Inspection Client/TPI		
				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
2.0	**QC**	**Pre-Inspection Meeting**	-	-	-	Pre-Inspection meeting shall be done before start of Manufacturing Procedure Qualification.		-		H	H	R
2.1	**QC**	**Document Approval**	-	-	-	Approval of technical documents like ITP, MPS, NDT Procedures, HIC Test Procedure, SSC test procedure, Forming, Welding and Seam normalizing Procedure, Handling Procedure etc. as per VDRL.		-		R	A	A
3.0	**Raw Material Inspection & Testing:** The TMCP Steel Coils shall be used for manufacturing of pipe. Steel shall be made from clean steel practice using basic oxygen furnace or Electric Arc Furnace (EAF), fully killed and fine grained as per ASTM E112. The steel shall be vacuum degassed and calcium treated for inclusion shape control. Delivery condition shall be thermo mechanical rolled "M" as per Table-1 of API 5L.											
3.1	**Mill Control Test:**											
3.1.1	QC	**Visual, Identification & Dimensional Inspection of coils**	WCL/QA/WI/07 QC/F/001.	Selected coils	Each coil	Each coil shall be visually inspected from top side for imperfections like laminations slivers, scabs, dent, pits, scratches, gouges etc. Any imperfection noticed will be ground & thickness shall be checked for acceptance as per API 5L & SP-2347. Injurious imperfection such as cracks shall be the cause of	-		-	R/R	R/R	R/R

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Document	Process Chart
Plant	HFW- I

Clause No.	Responsibility (PPC/QC/OPN)	Process/Activity Name (Δ)	Reference Work Instruction& Recording Format	Inspection/Test Frequency		Description	Acceptance Criteria			Inspection Client/TPI		
				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						rejection. Physical verification of Coil No. & Heat No. according to RMTC & Dimension (Width & Thickness) shall be checked & recorded.						
3.1.2	QC	**Dimensional Inspection**	WCL/QA/WI/07 QC/F/001 and WCL/HFW/OPN/F/1	Selected coils	Each coil	Each coil shall be checked for thickness and width etc. Thickness: ±10% of nominal wall thickness.	Width (mm)	-0 / +20	-	R/R	R/R	R/R
							Thickness (mm)	**For-6.35 mm** 5.72-6.99 mm **For-7.80 mm** 7.02-8.58 mm				
3.1.3	QC	**Tensile Test** Transverse	WCL/HFW/QC/WI/11. QC/F/024.	1 Sample (coils) / Heat	1 Sample (coils) / Heat	-	Test results shall be for information and will be such that the finished pipes meet the specified requirements.			-	-	-
3.1.4	QC	**Chemical Analysis**	WCL/HFW/QC/WI/16. QC/F/030.	1 Sample (coils) / Heat	1 Sample (coils) / Heat	-	As per Table-2			-	-	-
4.0	PPC/ OPN	**Slitting**	WCL/HFW/OPN/WI/ 01. WCL/HFW/OPN/F/01	one/ mother coil	one/ mother coil	Slitted coil width: As per Table-1 Thickness: ±10% % of nominal wall thickness.	Width (mm)	± 1.0	-	-	-	-
							Thickness (mm)	**For-6.35 mm** 5.72-6.99 mm **For-7.80 mm** 7.02-8.58 mm				

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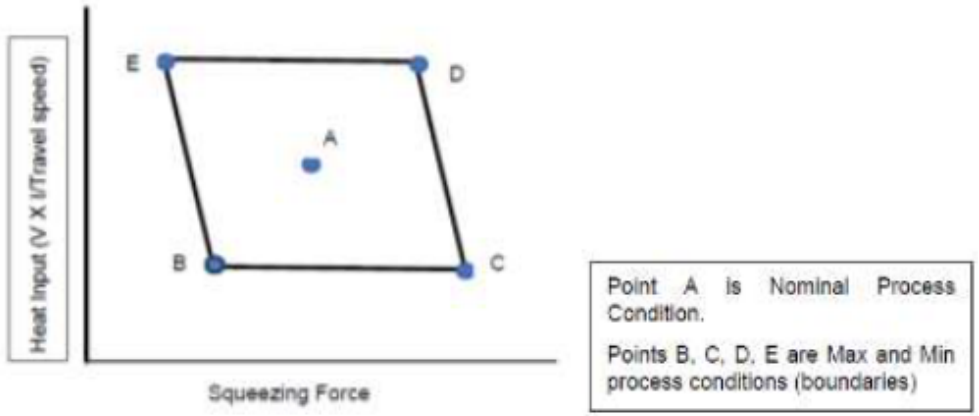
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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT /Regular	ARA MPQT/ Regular
4.0.1	OPN	**Decoiling and coil to coil joint**	WCL/HFW/OPN/WI/03 WCL/HFW/OPN/F/02	Each Coil	Each Coil	As per mill standard procedure.	-	-		-	-	-
5.0	**MPS Qualification (MPQ), Manufacturing Procedure Qualification Test (MPQT) & Regular Production:** **Shall be carried out for each size as reflected below:**											
5.1	**Establishing Process Boundary during MPS qualification(MPQ) [API 5L Annex B, SP-2347 Annex B]:** In addition to identified essential variable (as defined in MPS, Doc. No. MPS/HFW-I/25-88(10 INCH)/01), based on nominal settings for voltage, current, line speed, and squeeze roll force the manufacturer shall establish the maximum and minimum preliminary process limits for each diameter and wall thickness combination.									W/-	W/-	R/-

OD, Inch	OD, mm	WT, mm	Grade
10.75	273.1	6.35	API 5L L450MS / X65MS PSL2
10.75	273.1	7.80	API 5L L450MS / X65MS PSL2

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
		Total 15 (Fifteen) pipes, 3 pipes (First, Middle & Last pipe of each coil) shall be selected from 5 MPQ coils representing each of the weld conditions [parameter points (A, B, C, D, E) as per Fig. 2]. In case there is more than one heat, coils representing at least two heats shall be used during MPQ. All these 15 pipes shall be subjected to flattening test, root guided bend test, hardness test & metal flow (metallography) as per API 5L & SP 2347.				 SP-2347 Fig.2 Manufacturing Process Boundary Limits					
5.2	QC	**MPQT [API 5L Annex B, SP-2347 Annex B, Table B.1, B.5.2]:** On completion of successful establishment of process boundary as per Clause no. D.1 of this ITP, MPQT shall be carried out as per API 5L & SP-2347 on selected 5 pipes (one pipe from each condition of A, B, C, D & E). Destructive test on these selected pipes shall be carried out as per CL D.7 of this ITP. Final acceptance of pipe shall be deemed successful when all performed tests on selected pipe meet the specification (SP 2347) requirements and approved by the COMPANY. The tested pipes during MPQT shall also be considered as the test pipes required per heat or per lot. Regular Production shall be commenced only after successful completion of MPQT. However, regular production shall not be kept on hold for /long duration test (viz. HIC Test on pipe / SSC test on coil) at manufacturer risk and cost.							W/-	W/-	R/-

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Clause No.	Responsibility (PPC/QC/OPN)	Process/Activity Name (Δ)	Reference Work Instruction& Recording Format	Inspection/Test Frequency		Description	Acceptance Criteria			Inspection Client/TPI		
				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
		All essential variables/parameter shall be maintained within the specified limits as per approved Forming, Welding and Seam Normalizing Procedure, Doc. No. WCL/HFW/OPN/WI/25-88(10 INCH)/01 throughout the production. The final manufacturing process boundary limits (Figure 2 of SP 2347) represents the qualified process limits for the Manufacturing Procedure and combination of essential welding variables. Any operation shown to be outside of the Qualified Process Limits will require requalification, and any pipe produced outside this qualified boundary must be either rejected or held for further evaluation by Company If any set of specimens fails to meet the requirements above, adjust the variable settings accordingly and produce another coil. If necessary, continue adjustments until the desired limits of the process have been identified.										
6.0	QC	**Coil UT calibration Standard** (Δ)	WCL/HFW/NDT/25-88(10 INCH)/WI/01. QC/F/012	See Description		• At the start and end of the production run (When there is change of size, material). • The beginning of each operating shift (12 Hr. max.) • Once in between of each operating shift i.e. 3 to 4 hours after the first. • Before any planned shutdown of the ultrasonic equipment's during production. • Every time there is change in probes during testing or working condition of the UT machine. • When there is a malfunction of the inspection equipment found. • When equipment operation team changeover.	The calibration of equipment shall be carried out using a reference block of same width, thickness & same acoustic properties as the coil under test as per API 5L & Procedure of Coil UT, Doc. No. WCL/HFW/NDT/25-88(10 INCH)/WI/01.		W/ RW	RW/ RW	R/R

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Clause No.	Responsibility (PPC/QC/OPN)	Process/Activity Name (Δ)	Reference Work Instruction& Recording Format	Inspection/Test Frequency		Description	Acceptance Criteria			Inspection Client/TPI		
				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						• Every time the running of the system gives raise to doubt about in its efficiency. If the standardization verification is not found satisfactory even after increasing the test sensitivity by up to 3 dB all pipes tested since last standardization verification shall be rechecked.						
6.1	QC	**Coil Strip UT Edges** (100% coverage for minimum 25 mm width from the longitudinal edges except untested ends) **Body:** 100% of the coil surface [Except untested ends] (Δ)	WCL/HFW/NDT/25-88(10 INCH)/WI/01. QC/F/012	Selected Coil	Each coil	-	Acceptance as per SP-2347 Annex-E & K, API 5L Annex E & K and Procedure of Coil UT, Doc. No. WCL/HFW/NDT/25-88(10 INCH)/WI/01.			W/RW	W/RW	R/R
6.2	QC	**Manual UT (to reconfirm online coil UT indications)**	WCL/HFW/NDT/25-88(10 INCH)/WI/03	If any	If any	All the indication from the online coil UT shall be cross checked by manual UT using TR probe for their Evaluation	Acceptance & Procedure: As per Procedure of Manual UT (MUT) of Weld, HAZ, Pipe Body & Ends, Doc. No. WCL/HFW/NDT/25-88(10 INCH)/WI/03			W/RW	W/RW	R/R

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Clause No.	Responsibility (PPC/QC/OPN)	Process/Activity Name (Δ)	Reference Work Instruction& Recording Format	Inspection/Test Frequency		Description	Acceptance Criteria			Inspection Client/TPI		
				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						and acceptance - same as mentioned for online coil UT. Calibration frequency: ▯ At the start and end of the new production. (When there is change of size, material). ▯ The beginning of each operating shift (12 Hr. max.) ▯ Once in between of each operating shift i.e. 3 to 4 hours after the first. ▯ Every time there is any change of probes during testing or working condition of the UT machine. ▯ Every time the running of the system is interrupted or gives raise to doubt about in its efficiency. ▯ When the personnel performing test is changed. ▯ When there is a malfunction of the inspection equipment found.						
7.0	OPN	**Slitting** (Machined	WCL/HFW/OPN/WI/03.	Each Coil	Each Coil	-	The Coils used shall be slitted (as applicable) in multiple daughter coils.			M/M	M/M	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
		Edge) / Edge Milling	WCL/HFW/OPN/F/04				The abutting edges of strip to be HFW welded shall be milled or machined. The slitted coils shall be free from wave, pitting, scabs, scales, scratches, Silvers dents, etc.					
7.1	OPN	**Pipe Forming** (Δ)	WCL/HFW/OPN/WI/25-88(10 INCH)/01 WCL/HFW/OPN/F/04	Each Coil	At least once per shift	-	As per mill standard procedure & Forming, Welding & Seam Normalizing Procedure, Doc. No. WCL/HFW/OPN/WI/25-88(10 INCH)/01. Width of strip will be monitored and recorded automatically through SCADA system.			M/M	M/M	R/R
7.2	OPN	**High Frequency Welding** (Δ)	WCL/HFW/OPN/WI/25-88(10 INCH)/01. WCL/HFW/OPN/F/04	At least once per coil	At least once per coil & **Note**	Welding parameters (Current, Voltage, speed, welding temperature) shall be demonstrated / established during MPQ/ MPQT and maintained within the established Manufacturing Process Boundary Limits (envelop) as per Forming, Welding and Seam Normalizing Procedure, Doc. No. WCL/HFW/OPN/WI/25-88(10 INCH)/01.	Current (A)	788-940	-	M/M	M/M	R/R
							Voltage (V)	294-364	-			
							Welding Temperature (°C)	1300-1330	-			
							Frequency (kHz)	255-281	-			
							Speed (MPM)	10.97-13.31	-			
							Squeeze Force Total (MT)	74.7-94.8	-			
							Heat Input (KJ/mm)	1.164-1.545	-			

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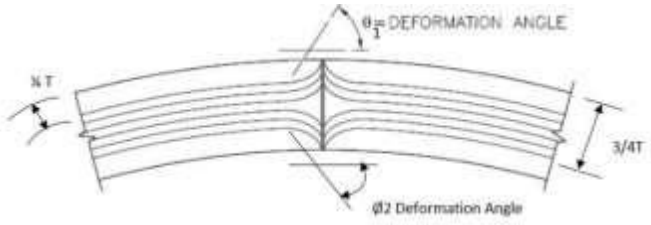
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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						Minimum Welding Frequency: 200 KHz (± 5% variation allowed on the Nominal observed parameter) Parameters shall be continuously monitored through SCADA. **Note:** Record Generated in Graph, except for Displacement (Squeezing/Girth Reduction) which is monitored manually at least once per Shift.						
7.3	QC	**Macrographic Examination of the longitudinal seam weld of welded pipes (Post Welding)**	WCL/HFW/QC/WI/13, WCL/HFW/QC/WI/14, QC/F/029 & QC/F/028	Each Selected coil & Note-1	Note-2	• Width of Fusion line & HAZ shall be recorded at the top, bottom & middle of the pipe across the wall thickness. • Deformation angles (Ø1 and Ø2 in Figure 10 of SP-2347) shall be measured metallographically at 1/4th and 3/4th wall thickness. The deformation angles of the metal flow (Ø1 and Ø2) must be within the qualified limits established during MPS, as measured with respect to the pipe wall centreline, perpendicular to the fusion line. The deformation angle shall be determined (four locations) near a position equivalent to one-fourth wall thickness and three-fourths wall thickness from the O.D. surface on both sides of the weld seam. • Deformation angle θ: 35°~60°.				W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						 **Note-1:** Average deformation angle for all O.D. angles and average deformation angle for all I.D. angles including the width of HAZ from MPQ/ MPQT coils shall recorded on control chart. Determine the standard deviation for all O.D. and I.D. angles combined and plot 3 sigma standard deviation as per ISO 8258. **Note-2:** At least once per shift (Max. 12 hrs.) plus whenever changes of grade, specified diameter or specified wall thickness are made plus whenever significant excursions from operating heat treatment conditions are encountered.						
8.0	OPN	**Seam Normalizing** (Weld & HAZ) **(Δ)**	WCL/HFW/OPN/WI/ 25-88(10 INCH)/01. WCL/HFW/OPN/F/04	Each Pipe (Weld Seam & HAZ)	Each Pipe (Weld Seam & HAZ)	The weld seam and the entire heat affected zone (HAZ) shall receive a normalizing heat treatment in order to control the structure so that no un -tempered martensite remain in the weld seam	Normalizing Temperature (°C)	950-1004	-	W/ RW	W/ RW	R/ R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						and the HAZ. Laser/optical auto seam tracking system facility shall be used for tracking of weld seam during online seam normalizing. Normalizing Temperature shall be demonstrated and established during MPQ / MPQT and shall be maintained within the established Manufacturing Process Boundary Limits (envelop) as per Forming, Welding and Seam Normalizing Procedure, Doc.No.WCL/HFW/OPN/WI /25-88(10 INCH)/01. Any deviation of parameters beyond permissible limits shall actuate spray painting and the pipe number to be recorded & pipe shall be rejected.						

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Document	Process Chart
Plant	HFW- I

Clause No.	Responsibility (PPC/QC/OPN)	Process/Activity Name (Δ)	Reference Work Instruction& Recording Format	Inspection/Test Frequency		Description	Acceptance Criteria			Inspection Client/TPI		
				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
9.0	OPN	**Pipe Sizing (Δ)**	WCL/HFW/OPN/WI/07 WCL/HFW/OPN/F/04	At least once per coil	At least once per shift	-	As per mill standard procedure. The Maximum Cold Sizing ratio for cold-sized pipe shall not be more than 0.015. Pipes shall be non-expanded. Jointers on pipes are not permitted.			M/M	M/M	R/R
10.0	**Pre-Visual and Dimensional Inspection**											
10.1	QC	**Dimensional Inspection**	WCL/HFW/QC/WI/02 QC/F/006	3 pipes/ coil	3 pipes/ coil	Pipe Body: ± 0.0075D but Max: ±3.2mm D = Specified outside diameter.	Diameter (Body)	-	271.1-275.1 mm	-	-	-
10.2	QC			3 pipes/ coil	3 pipes/ coil	Pipe End: ±0.005D but Max. ±1.6mm	Diameter (End)	-	271.8-274.4 mm	-	-	-
10.3	QC			3 pipes/ coil	3 pipes/ coil	**Body:** 0.020D max.	OoR Body (mm)	-	5.46 mm	-	-	-
10.4	QC			3 pipes/ coil	3 pipes/ coil	±10% of specified wall thickness	Thickness (mm)	**For-6.35 mm** 5.72 – 6.99 mm **For-7.80 mm** 7.02-8.58 mm		-	-	-
10.5	QC			3 pipes/ coil	3 pipes/ coil	Minimum Length: 9 m. Maximum Length: 18.10 m.	Length (m)	Mini. Length: 9 m. Maxi. Length: 18.10 m.		-	-	-

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						Minimum Average Length: 17.0 m.		Mini. Average Length: 17.0 m.				
10.6	QC			3 pipes/ coil	3 pipes/ coil	The total deviation from a straight line, over the entire pipe length, shall be ≤ 0.2 % of the pipe length,	Straightness	36 mm (Max)		-	-	-
10.7	QC			3 pipes/ coil	3 pipes/ coil	Height of Flash (Weld Bead or Weld Reinforcement)	The outside flash shall be trimmed to an essentially flush condition. The inside flush shall not extent above the contour of the pipe by more than 0.3 mm + 0.05t. The wall thickness at the trim shall not be less than the minimum permissible wall thickness. The depth of groove resulting from trimming the internal flash shall not exceed 0.40 mm. ID/OD Smoothness to be inspected and complied.			-	-	-
10.8	QC	**Flattening Test** 1 set = 1 set of two specimens (one specimen shall be flattened at 0° & other at 90°)]	WCL/HFW/QC/WI/09. QC/F/006	All pipes selected for MPQ / MPQT (one set Per pipe)	See Description	4 Samples / Coil (2 samples each from First and last end of the coil. The samples shall be flattened at 0° & 90°). In case of weld stop, 1 sample from each crop end shall be tested at 90°.	Flattening shall be carried out as per API 5L & Work Instruction of Flattening test, Doc. No. WCL/HFW/QC/WI/09. Specimen size: 60 mm minimum Acceptance shall be as follows: a. There shall be no opening of the weld before the distance between the plates is			W/ RW	W/ RW	R/ R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							less than 50 % of the original outside diameter. b. There shall be no cracks or breaks other than in the weld before the distance between the plates is less than 33 % of the original outside diameter. c. There shall be no evidence of lamination or burnt metal during the entire test before opposite walls of the pipe meet.					
11.0	OPN	**Bevelling**	WCL/HFW/OPN/WI/08. WCL/HFW/OPN/F/05	Each pipes	3 pipes/ shift	Pipe ends shall be free from burrs.	Bevel angle(Deg.)	-	30 - 35	-	-	-
							Root face (mm)	-	0.8 - 2.4			
							Squareness(mm)	-	1.6			

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
12.0	OPN/ QC	**Hydrostatic Test**	WCL/HFW/QC/WI/03 QC/F/005	Each Selected Pipe	Each pipe	-	Holding Time of Pressure: 10 Sec. minimum Hydro test pressure (HTP) shall be calculated at 95% of the SMYS using formula: $P=2*S*0.95*\ t_{min}\ /\ D$ Where, P=Hydro test pressure in MPa S= SMYS in MPa, D = Outside Diameter of pipe in mm t_{min}= Minimum specified wall thickness of pipe in mm OD, mm / Nom. WT, mm / Grade / $WT(t_{min})$, mm / Minimum HTP, MPa 273.1 / 6.35 / L450MS / 5.72 / 17.9 273.1 / 7.80 / L450MS / 7.02 / 22.0 End load compensation factor is not considered to determine the test pressure. Pressure gauge shall be calibrated prior to start of the production, thereafter at once per week with dead weight tester and the calibration record has to be appropriately maintained.			W/ RW	W/ RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
13.0	**NON DESTRUCTIVE EXAMINATION (NDE) :** **For UT, at least one Level III qualified inspector shall be available to the mill for overall supervision and all procedures of NDT to be reviewed by them.**											
13.1	QC	**Auto UT Calibration standard (Δ)**	WCL/HFW/NDT/25-88(10 INCH)/WI/02. QC/F/014 or QC/F/014C	• At the start and end of the production run (When there is change of size, material). • The beginning of each operating shift (12 Hr. max.) • Once in between of each operating shift i.e. 3 to 4 hours after the first. • Before any planned shutdown of the ultrasonic equipment's during production. • Every time there is change in probes and coaxial cable during testing or working condition of the UT machine. • When there is a malfunction of the inspection equipment found. • When equipment operation team changeover. • Every time the running of the system gives raise to doubt about in its efficiency. If the standardization verification is not found satisfactory all pipes tested since last standardization verification shall be rechecked by auto UT.			The calibration of equipment shall be carried out using a calibration pipe of same dia., thickness, same acoustic properties, same production and same surface finish as the pipe under test as per API 5L & Procedure for Auto Weld UT, Doc. No. WCL/HFW/NDT/25-88(10 INCH)/WI/02.	W/RW	W/RW	R/R
13.2	QC	**Automatic Ultrasonic Testing of Weld and HAZ (Δ)**	WCL/HFW/NDT/25-88(10 INCH)/WI/02 QC/F/014 or QC/F/014C	Each Pipe (Refer Description)	Each Pipe (Refer Description)	100% Weld Seam except untested 200 mm weld length. Untested portion of Auto UT shall be checked by Manual UT.	All indications producing signal higher than the reference standard shall be MUT checked.Acceptance shall be as per Procedure for Auto Weld UT, Doc. No.: WCL/HFW/NDT/25-88(10 INCH)/WI/02			W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
13.3	QC	**Manual UT calibration Standard (Δ)**	WCL/HFW/NDT/25-88(10 INCH)/WI/03 QC/F/014 or QC/F/014C	• At the start and end of the new production. (When there is change of size, material). • The beginning of each operating shift (12 Hr. max.) • Once in between of each operating shift i.e. 3 to 4 hours after the first. • Every time there is any change of probes during testing or working condition of the UT machine. • Every time the running of the system is interrupted or gives raise to doubt about in its efficiency. • When the personnel performing test is changed. • When there is a malfunction of the inspection equipment found. If verification of Standardization does not found satisfactory all pipes tested since last Standardization shall be retested as per Work instruction.			The calibration of equipment shall be carried out using a calibration pipe of same dia., thickness, same acoustic properties, same production and same surface finish as the pipe under test as per API 5L & Procedure of Manual UT Doc. No.: WCL/HFW/NDT/25-88(10 INCH)/WI/03			W/RW	W/RW	R/R
13.4	QC	**Manual UT (Δ)**	WCL/HFW/NDT/25-88(10 INCH)/WI/03 QC/F/014 or QC/F/014C	Each Pipe (See Description)	Each Pipe (See Description)	a) Each pipe at both ends: 1. 220 mm for Weld imperfection from both ends (including untested 200 mm weld length of Auto UT). 2. Full circumference of a wide zone of 100mm to	Acceptance shall be as per Procedure of Manual UT for body and weld, Doc. No. WCL/HFW/NDT/25-88(10 INCH)/WI/03			W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						detect laminar imperfections using TR probe [bevel portion at ends shall be inspected from inside surface and remaining portion from outside surface] b) Sprayed portion in AUT weld						
13.5	QC	**Magnetic Particle Inspection (Δ) [only for MPQT pipes]**	WCL/HFW/NDT/25-88(10 INCH)/WI/04 QC/F/017	Selected 5 MPQT pipes	--	-	MPI Shall be performed at bevel face at both ends and entire weld seam from OD surface and 200mm from inside weld surface of selected 5 MPQT pipes in accordance with ISO 10893-5 or ASTM E709. Any Indication in access of 3 mm shall be investigated and treated in accordance with API 5L Annex C CL C.2. Refer Procedure for Magnetic Particle Inspection, Doc. No. WCL/HFW/NDT/25-88(10 INCH)/WI/04.	W/-	W/-	R/--
13.6	QC	**Residual Magnetism Measurement**	WCL/HFW/NDT/25-88(10 INCH)/WI/05. QC/F/017	Each Selected pipe both ends	Each end of a pipe selected at least	-	Four readings shall be taken approximately 90° apart around the circumference of each end of the pipe. The average of the four residual magnetism readings shall be≤ 2.0 mT (20 Gs) with no	W/RW	W/RW	R/R		

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
					3time / 4 hours/ operating shift of 12 hrs max.		individual residual magnetism reading greater than 2.5 mT (25 Gs). Refer Procedure for Residual Magnetism Check, Doc. No. WCL/HFW/NDT/25-88(10 INCH)/WI/05.					
14.0	**Final Visual and Dimensional Inspection:** The repeatability of measuring equipment verification will be at least once per operating shift (12 hours maximum) and maintain record of the same in format QC/F/116											
14.1	QC	**Dimensional Inspection**	WCL/HFW/QC/WI/04 QC/F/009	Each Selected Pipe	Each Pipe	Pipe Body: ± 0.0075D but Max: ±3.2mm D = Specified outside diameter.	Diameter (Body)	-	271.1-275.1 mm	W/ RW	W/ RW	R/R
14.2	QC			Each Selected Pipe	Each Pipe	Pipe End: ±0.005D but Max. ±1.6mm	Diameter (End)	-	271.8-274.4 mm	W/ RW	W/ RW	R/R
14.3	QC			Each Selected Pipe	Each Pipe	**OOR** **End:** 0.015D max. **Body:** 0.020D max. Where, D = Specified outside diameter.	OoR Ends (mm)	-	4.1 mm	W/ RW	W/ RW	R/R
							OoR Body (mm)	-	5.46 mm			
14.4	QC			Each Selected Pipe	Each Pipe	±10% of specified wall thickness	Thickness (mm)	**For-6.35 mm** 5.72-6.99 mm **For-7.80 mm** 7.02-8.58 mm		W/ RW	W/ RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
14.5	QC			Each Selected Pipe	Each Pipe	Minimum Length: 9 m. Maximum Length: 18.10 m. Minimum Average Length: 17.0 m.	Length (m)	Mini. Length: 9 m. Maxi. Length: 18.10 m. Mini. Average Length: 17.0 m.		W/RW	W/RW	R/R
14.6	QC			Each Selected Pipe	Each Pipe	a) The total deviation from a straight line, over the entire pipe length, shall be ≤ 0.2 % of the pipe length, as shown in Figure 1 of API 5L. b) The local deviation from a straight line in the 1.5 m portion at each pipe end shall be ≤ 3.2 mm, as shown in Figure 2 of API 5L.	Straightness	36 mm (Max) The local deviation from a straight line in the 1.5 m portion at each pipe end shall be ≤ 3.2 mm		W/RW	W/RW	R/R
14.7	QC			Each Pipe	Each Pipe	Height of inside flash (mm) Inside and outside flash shall be removed along the entire length of pipe.	The outside flash shall be trimmed to an essentially flush condition. The inside flush shall not extent above the contour of the pipe by more than 0.3 mm + 0.05t.			W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							The wall thickness at the trim shall not be less than the minimum permissible wall thickness. ID/OD Smoothness to be inspected and complied.					
14.8	QC			Each Pipe	Each Pipe	The depth of groove	Depth of Groove (mm)	The depth of groove resulting from trimming the internal flash shall not exceed 0.40 mm. ID/OD Smoothness to be inspected and complied.		W/RW	W/RW	R/R
14.9	QC			Each Pipe	Each Pipe	Radial Offset of Strip / Plate Edges	The radial offset of strip / plate edges shall not cause the remaining wall thickness at the weld to be less than the minimum permissible wall thickness.			W/RW	W/RW	R/R
14.10	QC			Each Pipe	Each Pipe	Tolerance on standard mass Single pipe Length: +10%, - 3.5% Entire order quantity: -1.75%	Mass (kg)	**For-6.35 mm-** 363-831 kg **For-7.80 mm**- 444-1016 kg		W/RW	W/RW	R/R
14.11	QC			Each Pipe	Each Pipe	-	Bevel angle (Deg.)	-	30 - 35	W/RW	W/RW	R/R
14.12	QC			Each Pipe	Each Pipe	Pipe ends shall be free from burrs.	Root face (mm)	-	0.8 - 2.4	W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
14.13	QC			Each Pipe	Each Pipe	-	Squareness (mm)	-	1.6 Max	W/RW	W/RW	R/R
14.14	QC	**Visual Inspection**	WCL/HFW/QC/WI/04 QC/F/009	Each Pipe	Each Pipe	Visual Inspection	The pipe External & internal surfaces to the extent feasible shall be visually examined in a sufficiently illuminated area, minimum 300 lx and shall be free of defects.			W/RW	W/RW	R/R
14.14.1	QC			Each Pipe	Each Pipe	Cracks, Sweats and Leaks	All pipes shall be free from defects in the finished condition. All pipes shall be free from cracks, sweats, leaks and slivers. Pipe containing such defects shall be treated as per API 5L, Annex C.			W/RW	W/RW	R/R
14.15	QC			Each Pipe	Each Pipe	Lamination	Any laminations or inclusions extending into the face or bevel of the pipe and having a visually determined length in the circumferential direction more than zero shall be classified as defects. Pipes that contain such defects shall be rejected or cut back until no such lamination or inclusion is present at the pipe ends.			W/RW	W/RW	R/R
14.16	QC			Each Pipe	Each Pipe	Arc Burns & Contact Marks	Arc burns shall be classified as defects. Arc burns shall be treated in accordance with C.2, C.3 b), or C.3 c) of API 5L, except that they may be removed by grinding, chipping, or			W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							machining, provided that the resultant cavity is thoroughly cleaned and checked for complete removal of damaged material by etching with a 10 % solution of ammonium persulfate or a 5 % solution of nital.					
14.17	QC			Each Selected Pipe	Each Pipe	Other Surface imperfections	Other surface imperfections found by visual inspection shall be investigated, classified, and treated as follows. a) Imperfections that have a depth ≤ 0.125t and do not encroach on the minimum permissible wall thickness shall be classified as acceptable imperfections and shall be treated in accordance with C.1 of API 5L. b) Imperfections that have a depth > 0.125t and do not encroach on the minimum permissible wall thickness shall be classified as defects and shall be dressed-out by grinding in accordance with C.2 or shall be treated in accordance with C.3 of API 5L. c) Imperfections that encroach on the minimum permissible wall thickness shall be classified as defects and shall be treated in accordance with C.3 of API 5L.	W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							NOTE "Imperfections that encroach on the minimum permissible wall thickness" implies that the portion of the wall thickness that is beneath the surface imperfection is less than the minimum permissible wall thickness.					
14.18	QC			Each Selected Pipe	Each Pipe	Dent	• The length in any direction shall not exceed 25% of the diameter. • No sharp bottom dents are acceptable. • Cold formed dents without sharp bottom gouges are acceptable to a maximum depth of 3.2 mm. • Dent > 1.6 mm are not acceptable at the pipe ends i.e. within a length of 100 mm. • Any sharp bottom gauges shall be considered as defect. The section of pipe containing such defect shall be cut off within the limit of length or the entire pipe shall be rejected.	W/RW	W/RW	R/R
14.19	QC			Each Selected Pipe	Each Pipe	Hard Spots	Any hard spot larger than 50 mm (2.0 in.) in any direction shall be classified as a defect if its hardness exceeds below for individual indentation. • Wall thickness 9.5 mm and below : 275 HV10 • Wall thickness more than 9.5 mm :	W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							250 HV10 The section of pipe containing the hard spot shall be cut off within the limit of length or the entire pipe shall be rejected.					
14.20	QC			Each Selected Pipe	Each Pipe	Flat / Spots / Peaks	Maximum allowable depth for such defect is 3.2 mm. The section of pipe containing such defect shall be cut off within the limit of length or the entire pipe shall be rejected.			W/RW	W/RW	R/R
14.21	QC			Each Selected Pipe	Each Pipe	Repair(if any)	No repair by welding on parent metal or in the weld seam is permissible. Surface repair of external & internal HFW weld seam & pipe body shall be done by dressing with grinding and wall thickness checked after grinding.			W/RW	W/RW	R/R
15.0	**Laboratory Testing:**											
15.0.1	**QC**	**Sampling Plan**	QC/F/010	Each Heat	Each Heat	-	Sampling Plan for MPQT & Product Testing shall be as per SP-2347 & API 5L.			R	R	R
15.1	QC	**Tensile Test (Base Metal)** Orientation: 1T180 Transverse	WCL/HFW/QC/WI/11. QC/F/024.	1 sample /selected 5 MPQT pipes	See Description	1 pipe (1 sample/ pipe) / test unit of not more than 200 pipes for OD 273.1 mm.	**Properties** / **For L450MS** YS (0.5% EUL), MPa: 450 – 600 UTS, MPa: 535 - 760 YS(0.5% EUL)/UTS: 0.93 Elongation, Minimum (at 50 mm GL): As per Table H.2 footnote e			W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
15.1.1	QC	**Transverse Tensile Test** (Weld Metal) Rectangular strip type specimen [Orientation: Transverse]	WCL/HFW/QC/WI/11. QC/F/024.	1 sample /selected 5 MPQT pipes	See Description	1 pipe (1 sample/ pipe) / test unit of not more than 200 pipes for OD 273.1 mm.	UTS: 535 MPa minimum for grade L450MS. Both inside and outside weld bead (flash of weld) in excess of pipe wall thickness shall be removed from the test piece either by grinding or machining. Sampling for weld tensile test shall be such that the weld tensile test is performed at least once per week.			W/RW	W/RW	R/R
15.2	QC	**Macrographic Examination (macro etching) & Microscopic examination**	WCL/HFW/QC/WI/13, WCL/HFW/QC/WI/14, QC/F/029 & QC/F/028	All Selected pipes of MPQ /MPQT	Refer Description	At least once per shift (Max. 12 hrs.) plus whenever changes of grade, specified diameter or specified wall thickness are made plus whenever significant excursions from operating heat treatment conditions are encountered.	The following information shall be recorded: • Metallographic examination of the weld seam shall be carried out at a magnification of at least 200X. • Grain size shall be measured & reported for base & weld metal as per ASTM E112 at 100X. Grain size shall be ASTM No. 7 or finer. • The weld seam grain size should be acicular ferrite with no banding and inclusion in fusion line. Untempered martensite is not acceptable. **For MPQ/MPQT pipes:** Test shall be performed at one end of MPQ/MPQT pipes for upto 3 cross sections (At 0° for weld			W/RW	W/RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							& at 90° and 180° for base. These shall be polished and etched to show the metallurgical microstructure. The photograph of microstructure shall be supplied at minimum 3 locations i.e at below the ID and OD surface and at mid thickness.					
15.3	QC	**Vickers Hardness Test** Hardness Test [Base, weld & HAZ]	WCL/HFW/QC/WI/13. QC/F/026.	Each metallographic sample	1 pipe (1 sample/ pipe) / test unit of not more than 100 pipes	-	Vickers hardness test shall be carried out as per ASTM E92. Test piece shall be spaced by 90° (all four quadrants of the selected pipe) The maximum hardness of the pipe body, weld & HAZ shall be ≤ 230 HV10 (Average). Single hardness value shall not exceed 240HV10. • Hardness measurement on quadrant with weld shall be done as per Figure H.1.c of API 5L. • Hardness measurement on sample at 90°, 180° and 270° from weld shall be a total of 3 indentations i.e. 1.5 mm from top surface, 1.5 mm from bottom surface and at mid thickness.	W/ RW	W/ RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
15.4	QC	**Charpy V Notch Impact Test** [Transverse specimens for Base, weld(FL) & FL+2]	WCL/HFW/QC/WI/12. QC/F/025.	1 Set /selected 5 MPQT pipes	1 Set / pipes / Heat	1. Full / sub size specimen (as applicable) shall be used. 2. If Charpy value exceeded 80% of the machine capacity, then next sub-size specimen shall be taken for testing. 3. 1 set = 1 set of 3 specimens	Absorbed energy for full size specimen: Grade: L450MS — Minimum Avg. (1 set of 3 specimen), J: 40 — Minimum Ind., J: 30 — Test Temperature: 0°C **Shear Area (for Pipe Body):** Minimum Avg.(1 set of 3 specimens): 85% Minimum Ind.: 75% Non-flattened test pieces shall be used. Sampling for weld CVN test shall be such that the weld CVN Test is performed at least once per week.			W/ RW	W/ RW	R/R
15.5	QC	**Chemical analysis (Product – Base Metal)**	WCL/HFW/QC/WI/16. QC/F/030.	1 sample/ selected 5 MPQT pipes	2 samples / Heat (To be taken from separate pipes)	-	As per Table- 2			R/R	R/R	R/R
15.6	QC	**HIC Test** 1 set = Longitudinal Base at 90° (1 sample), Longitudinal	WCL/WI/HFW/HIC/25-88(10 INCH)/01. QC/F/052	1 Set /selected 5 MPQT pipes	1 set (1 pipe) from First 3 heats	-	HIC Test on pipe shall be carried out as per Procedure for Hydrogen Induced Cracking test, Doc. No. WCL/WI/HFW/HIC/25-88(10 INCH)/01. Test Duration: 96 Hours Test Solution: A			W/ RW	W/ RW	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
		Base at 180° (1 sample), Longitudinal Weld Section (1 sample)			(including MPQT heats) then one per 10 heats		One control sample shall be tested along with test specimen; the control sample shall exhibit CLR > 20%. Acceptance criteria: Crack Sensitivity Ratio (CSR) : 2% Max Crack Length Ratio (CLR) : 15% Max, Crack Thickness Ratio (CTR) : 5% Max Individual Crack length shall not be >5.0mm After HIC testing, if any section of the sample reveals vertical cracks (perpendicular to the rolling direction) greater than 0.5 mm, the shall be deemed to have failed.			
15.7	QC	**SSC Test [On one coil only during MPQT]**	WCL/WI/HFW/SSC-COIL/25-88(10 INCH)/01 QC/F/053	One set of 3 specimen from one selected MPQ Coil	-	-	SSC Test on Coil shall be carried out as per Procedure for Sulphide Stress Corrosion Cracking on coil, Doc. No. WCL/WI/HFW/SSC-COIL/25-88(10 INCH)/01 during MPQT only. Test method: NACE TM0177-2016 test solution A Four Point Bend Test in accordance with ASTM G-39. Test Duration: 720 Hours, Stress Level : 90% of Actual YS Acceptance Criteria: No cracks or rapture shall be accepted.	W/-	W/-	R/-

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							Test results shall be assessed as per NACE TM 0177 & Procedure for Sulphide Stress Corrosion Cracking on coil, Doc. No. WCL/WI/HFW/SSC-COIL/25-88(10 INCH)/01					
15.8	QC	**Root Guided Bend Test**	WCL/SP-2, LSAW-2 & PBM/QC/WI/05 QC/F/033	One sample (Root GBT) from All Selected pipes of MPQ /MPQT	-	-	The test piece shall not: a) fracture completely; b) reveal any cracks or ruptures in the parent metal, HAZ, or Weld (FL) longer than 3.2 mm or deeper than 12.5 % of the specified wall thickness. Cracks that occur at the edges of the test piece during testing shall not be cause for rejection, provided that they are not longer than 6.4 mm.	W/-	W/-	R/R
15.9	QC	**Reprocessing & Retesting**	As per relevant Work instruction	If any		Retest if any shall be carried out in accordance with API 5L CL 10.2.12 & Client specification with prior approval from company / their appointed representative: • Chemical Re-test (Product analysis): As per API 5L CL 10.2.12.1 • Tensile Re-test: As per API 5L CL 10.2.12.2	As per relevant clause of this process chart.	W/W	W/W	R/R

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						• Flattening Re-test: As per API 5L CL. 10.2.12.3 • Root Guided Bend test: As per Pipe MPS. • Hardness Re-test: As per SP-2347 CL 6.4.4 & API 5L CL 10.2.12.7 • HIC Re-test: As per API 5L CL H.7.5. However, After HIC testing, if any section of the sample reveals vertical cracks (perpendicular to the rolling direction) greater than 0.5 mm, the shall be deemed to have failed. Retesting is not allowed. • SSC Re-test: As per SP-2347 CL H.4.5 Any formal disposition or retesting protocol following a primary HIC/SSC test failure requires direct technical approval from End-User (ARA Engineering).						

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Document	Process Chart
Plant	HFW- I

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
						Refer MPS, Doc. No. MPS/HFW-I/25-88(10 INCH)/01 for details.						
16.0	**Marking**											
16.1	QC	**Stencilling**	WCL/WI/HFW/MARKING/25-88(10 INCH)/01.	Each Selected Pipe	Each pipe	-	Marking detail as per Work Instruction for Marking on pipes, Doc. No. WCL/WI/HFW/MARKING/25-88(10 INCH)/01. Unless otherwise specified, Marking shall be in English Language using SI unit.			M/M	M/M	M/M
16.2		**Coating**	-	Each pipe	Each Pipe	-	Pipes which are required to be supplied in bare condition (external surface) i.e. without coating shall have one coat of varnish application at external surface. However, External 3LPE coated pipes shall be supplied as per Coating ITP: • ITP/CP/25-023(10 INCH)/01 (COMPANY Doc. No. QSF-230-472030508-ZV-L03-00004-0000)			M/M	M/M	M/M
16.3	QC	**Barcoding**	WCL/WI/HFW/MARKING/25-88(10 INCH)/01.	Each pipe	Each pipe	-	Each pipe shall be having Bar Code Sticker on both end of pipe on Inside surface at approximately 50 mm from the pipe ends for traceability after final inspection and before shifting from pipe plant to yard as			-/-	-/-	-/-

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Plant	HFW- I

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
							per Work Instruction for Marking on pipes, Doc. No. WCL/WI/HFW/MARKING/25-88(10 INCH)/01.					
17.0	QC	**End Protection**	-	Each pipe	Each pipe	-	Both ends of pipe bevel shall be protected by Metallic bevel Protector along with Plastic end Plugs to protect the bevel ends.	M/M	M/M	M/M		
18.0	QC	**Pipe Loading**	WCL/LOG/WI/GERAB(10 INCH)/13/26-27	Each Pipe	Each Pipe	-	Loading arrangements shall be made as per procedure for & Storage of bare/coated pipes, Doc. No. WCL/LOG/WI/GERAB(10 INCH)/13/26-27.	M/M	M/M	M/M		
19.0	QC	**Documentation & Inspection Certificates**	-	Each Pipe	Each Pipe	-	All stage test results, dimensions, workmanship inspection reports. Inspection Certificates shall be as per EN 10204: 2004 type 3.2 & Production report and approved tally sheets and rejected pipes list.	R/R	R/R	R/R		
20.0	QC	**Inspection Release Note**		Each Pipe	Each Pipe		Inspection Release Notes shall be issued by appointed representative of GERAB/BOGS.	H	H	H		
21.0	QC	**MRB Dossier**	WCL/MRB INDEX/25-88(10 INCH) /01.	Each Pipe	Each Pipe		MRB dossier shall be as per MRB Index, Doc. No. WCL/MRB INDEX/25-88(10 INCH) /01.	R	R	R		
22.0	QC	**Unit of Measurement**	-	-		-	SI system of units shall be used for all inspection & test documents and marking sequence.	-		-		
23.0	QC	**Outsourcing Activities (if any)**	WCL/QA/WI/10	-		-	Below are the listed Outsourced activities for the Project: • Externally Provided Calibration	-		-		

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular
		(β)					• Externally Provided Transport Services (as applicable) • Externally Provided Inspection (as applicable) Refer Work Instruction for Outsourcing Control, Doc. No. WCL/QA/WI/10 for details.					

Notes: "Test unit" is as defined: A test unit is a prescribed quantity of pipe that is made to the same specified outside diameter and specified wall thickness, by the same pipe-manufacturing process, from the same heat, and under the same pipe-manufacturing conditions.

Legends/ Abbreviations:
H- Hold, W- Witness, M- Monitor, R- Document Review, RW - Random Witness, P- Perform, C-Certify, RM – Random monitor TPIA-Third Party Inspection Agency, WI- Work Instruction, Min-Minimum, Max- Maximum, mm- Millimeter, MPa- Mega Pascal, PSI- Pound Square Inch, OD – Outside Diameter, WT – Wall Thickness, CE – Carbon Equivalent, CL – Clause, Avg. – Average, Ind. –Individual, WCL – Welspun Corp Ltd, VDIR - Visual & Dimensional Inspection Report**,** WPS - Welding Parameter Sheet, MPQ – MPS Qualification, MPQT – Manufacturing Procedure Qualification Test, HTP – Hydrostatic Test Pressure, 3LPE – 3 layer Polyethylene, IE – Internal Epoxy.

Review (R) - Supplier has to prepare documents which are required by TPIA or CLIENT for review and approval.
Monitor (M) - Production can precede without the presence of TPIA or CLIENT However TPIA or CLIENT reserve the right to attend the production stage at any time.
Witness (W) - TPIA and CLIENT will be informed the time and location of production step. The production step may be preceded without the presence of TPIA and Client. **Hold (H)** – Work shall not proceed without the presence of TPIA or CLIENT to witness the production step.

(Δ)- Indicates special process which requires validation.
(β) – Indicates Out Source Process / Activity

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Clause No.	Responsibility (PPC/QC/OPN)	Process/Activity Name (Δ)	Reference Work Instruction& Recording Format	Inspection/Test Frequency		Description	Acceptance Criteria			Inspection Client/TPI		
				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular

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TABLE- 1

PO No.	OD (mm)	OD (inch)	WT (mm)	Specification & Grade	SO	SO line item	Order Qty. Mtr.	Order Qty. Nos.	Order Qty. MT	Prod order	Coil size& Grade	Slitting Width	Type	Coil Source
1101PO002158 Date 16-July-26	273.1	10.75	6.35	API 5L PSL2 X65MS	4150000051	10	60,480	3,360	2,526	1500000164	COIL API_5L_PSL2 X65MS 1,727 mmX6.350 mm	861 mmx 6.35 mm	EXT.	TISCO
	273.1	10.75	6.35	API 5L PSL2 X65MS	4150000051	70	72	4	3		COIL API_5L_PSL2 X65MS 1,727 mmX6.350 mm	861 mmx 6.35 mm	BARE	TISCO
	273.1	10.75	7.80	API 5L PSL2 X65MS	4150000051	20	17,460	970	891	1500000167	COIL API_5L_PSL2 X65MS 1,715 mmX7.800 mm	855 mmx 7.8 mm	EXT.	TISCO
	273.1	10.75	7.80	API 5L PSL2 X65MS	4150000051	80	1,548	86	79		COIL API_5L_PSL2 X65MS 1,715 mmX7.800 mm	855 mmx 7.8 mm	BARE	TISCO

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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular

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TABLE-2

ANNEXURE- B (CHEMICAL COMPOSITION)

Elements	API 5L L450MS/ X65MS PSL2	Permissible variation from target Chemistry
	Max., wt %	
C Note 3	0.10	0.03 Note 6
Mn Note 3	1.60	0.30 Note 6
Si	0.45	0.25 Note 6
P	0.020	--
S Note 4	0.002	--
V Note 5	0.10	0.03 Note 6
Nb Note 5	0.08	0.02 Note 6
Ti Note 5	0.06	0.015 Note 6
Al (total)	0.06	0.04 Note 6
Cr	0.30	0.05 Note 6
Mo	0.15	0.05 Note 6
Cu	0.35	0.10 Note 6
Ni	0.30	0.10 Note 6
N	0.012	--
Al(Total)/N	2 min.	--
B	0.0005	--
Ca Note 4	0.006	--
Ca/S	Refer Note 4	--
CE_{Pcm} Note 1, 2	0.22	± 0.02

Notes:

1. The CEPcm limits apply if C ≤ 0.12 %.
2. CE(Pcm) = C+ Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B
3. For each reduction of 0.01% below the specified maximum for C, an increase of 0.05% above the specified maximum of Mn is permissible, upto a maximum of 0.20%.
4. Where the Calcium is intentionally added, unless otherwise agreed, Ca/S ≥ 1.5 if S>0.0015; Ca ≤ 0.006 %
5. Nb+V+Ti ≤ 0.15%
6. The values represent the total range and not a plus or minus tolerance. These values are the range from the target chemistry which shall not exceed the values specified herein.

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Welspun CORP	WELSPUN	Format No.	WCL/PPC/F/10 Rev 02
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				MPQT	Regular		Characteristic	MAC	DAC	WCL TPIA MPQT/Regular	BOGS TPIA MPQT/Regular	ARA MPQT/Regular

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