

## Technical Specification

### 1. Scope

This specification describes the requirements for manufacture, inspection, testing, supply and safe delivery of various sizes Austenitic stainless-steel pipes of Grade SA 312 TP 316L. All the material of each size/item shall be from one heat lot only. **Two or more heat lot for one item is not acceptable. All pipes shall be solution annealed as per applicable code.**

### 2. Applicable standards

ASTM Standard A 312

ASTM Standard A 262

ASTM Standard A 370

ASME Standard B 36.10

### 3. Inspection and tests

3.1. The supplier shall provide all reasonable facilities to the purchaser's inspector satisfy him that the material is being furnished in accordance with the specification. The supplier shall conduct all tests (Mentioned in Attached Annexure-A) required to ensure that the pipes furnished conform to the requirements of the applicable codes and standards. **The Supplier shall quote for testing(Annexure-A) charges in inspection and testing charges column for each item in Price bid sheet. if Supplier quotes Zero against Testing charges column it means that he is agree to perform all tests mentioned in Annexure-A free of cost.**

#### 3.2. Chemical Composition

Chemical analysis shall be done for each lot/size shall meet the requirements to satisfy that the material furnished conforms to as per relevant code and the test certificates shall be furnished along with the material. The supplier shall produce mill certificate at the time of Pre-despatch inspection.

#### 3.3. Mechanical tests

The supplier shall produce mill certificate at the time of Pre-despatch inspection. In addition to the mill certificate Mechanical tests mentioned in Annexure-A of Technical specification shall be done as per the applicable standards and the certificates shall be furnished along with material. The mechanical properties as obtained from the above tests shall conform to the requirements of the specific grade of the material as per ASTM code.

#### 3.4. Inter Granular Corrosion testing

The IGC tests shall be done for each lot/size as per the ASTM A262 practice E from Govt. /NPCIL approved Lab and the certificates shall be furnished along with material with acceptance criteria of "no cracks as observed from 20X magnification". The sample will be randomly selected from the supplier lot and stamped by HWPK representative.

#### 3.5. Hardness Measurement

The supplier shall carry out the hardness measurement using one of the hardness measurement technique like Brinell, Rockwell or Vickers in government approved lab per size per lot. The maximum permissible value of hardness shall be 217 BHN only.

### 3.6. Thickness Measurement

The supplier shall carry out the Thickness measurement of all butt weld type fittings by UT thickness gauge (in presence of HWPk representative) at 3 Locations on 10% qty. The UT thickness gauge shall be calibrated with date of calibration not more than one year.

### 3.7. Metallography

Microstructure examination shall be carried out in minimum x200 magnification at 1 locations on minimum one sample from each heat of each size from Govt. /NPCIL approved Lab with acceptance criteria of “no residual stress as observed “and Grain Size ASTM No 5 and finer from Govt. /NPCIL approved Lab and the certificates shall be furnished along with material. The sample will be randomly selected from the supplier lot and stamped by HWPk representative. If possible the same sample for IGC may also be used.

### 3.8. Original Heat Treatment Chart

The material shall be solution annealed as per the code requirements. The supplier shall produce only the original Heat treatment charts for review by HWPk representative at the time of Pre-despatch inspection. The review of photocopied/scanned Charts, Charts without heat nos. etc. are not acceptable.

### 3.9. Quality surveillance inspection & testing

- (a) The supplier shall be an Indian manufacturer or authorised Dealer only. The suppliers shall submit certificate for the same during submission of tender.**
- (b) The Supplier shall submit previously executed purchase order copies for similar items.**
- (c) All inspection & testing covered under this specification shall be subjected to quality surveillance by the purchaser or his authorized representative.
- (d) Thickness measurement with ultrasonic thickness gauge at three points (at both the ends and centre of pipe) in 10% length of pipe will be witnessed by inspector at the time of inspection and if results are to be found unacceptable, the thickness gauging shall be extended to 100% of pipe lengths. Thickness Measurement will be cross check at our site also.
- (e) Test certificates shall indicate the actual values of test results obtained and the test conditions.
- (f) All other requirements such as tolerances on diameter, wall thickness, surface finish, marking etc. shall be as per the applicable ASTM specification

## 4. Marking

All the pipes shall be stamped with following data:

- (i) Size designations
- (ii) Material.
- (iii) Heat nos.
- (iv) Name of Manufacturer or brand
- (v) Thickness of pipe/ Schedule No.
- (vi) Hydrotest Pressure

Each length of pipe shall be legibly marked individually as per the applicable standards.

## 5. Packing

After hydraulic test the pipes shall be properly dried by blowing hot air and their ends shall be closed by plastic plugs, lasting covers or suitable wrappings to prevent ingress of foreign matter, dirt etc. after drying.

Each length of pipe shall be suitable wrappings to prevent ingress of foreign matter, dirt etc.

### Note: -

1. Material should be strictly as per relevant code, including inspection and testing requirements. MTC certificates shall be produced at the time of Pre-dispatch Inspection.
2. In addition to mill test certificate, supplier shall conduct Physical properties, Mechanical properties & Chemical Analysis Tests for each lot/size, at government approved laboratory as per annexure – A of this technical specification.
3. The successful bidder shall submit QAP prior to manufacturing of Pipes and only after approval from HWPK successful bidder can start manufacturing of Pipes.
4. Noncompliance and/or incomplete compliance to above notes may lead to ignorance of offer.

**Tests to be Witnessed By HWB/HWPK Representative**

<b>S. no.</b>	<b>Name of test</b>	<b>Material</b>	<b>Quantum of Check</b>	<b>Witness by HWB/HWPK Representative</b>
1	Chemical Analysis	A 312 TP 316L	One sample per size per heat Lot	Yes
2	Tensile Test	A 312 TP 316L	One sample per size per heat Lot	Yes
3	Bend Test (For 2" NB and Below Pipes)	A 312 TP 316L	One sample per size per heat Lot	Yes
4	Flattening Test (For 3" NB and 4" NB Pipes)	A 312 TP 316L	One sample per size per heat Lot	Yes
5	Inter granular corrosion testing	A 312 TP 316L	One sample per size per heat Lot	Yes
6	Metallography	A 312 TP 316L	One sample per size per heat Lot	Yes
7	Hardness Test (max. 217 BHN)	A 312 TP 316L	One sample per size per heat Lot	Yes
8	Hydrostatic Test	A 312 TP 316L	10% of Total Length of pipe	Yes
9	Thickness Measurement	A 312 TP 316L	10% of Total Length of pipe	Yes

Note: -

- All test sample shall be stamped and Witness by HWPK/HWB Representative. The test certificate must have the imprint of stamp mark
- All test results shall meet the Applicable Code Requirement.
- All Tests shall be carried out in NABL/NPCIL approved Lab.

Indent No.: - HWPK/Mech/2021/19 **QUALITY ASSURANCE PLAN Annexure-IV**

S.N	Components & Operation	Characteristics	Type of Check	Quantum of check	Ref.Doc.	Acceptance Norms	Form of Record	Insp.Agency		
								P	W	R
<b>Raw Material</b>										
1.	Material identification of pipes	Chemical /Mechanical	Full Chemical composition, Tensile & Yield, % Elongation, % reduction in area, Hardness etc.	One sample from each Heat	Tender Specification, Applicable Material Standard/Code	Tender Specification, Applicable Material Standard/Code	Original Material Test Certificates/ Lab TC	1,2	2	2,3
<b>In-Process</b>										
2.	Manufacturing	Profile/ Dia.	Visual	100%	Tender Specification, Applicable Material Standard	Tender Specification, Applicable Standard Code	Inspection & Testing Report/ Certificates, Heat treatment charts, Lab Reports	1,2	2	2,3
3.	Heat Treatment	Solution Annealing	Heat Treatment chart	100%	A 312 TP 316L A 370			1,2	2	2,3
4.	Product testing	Chemical	Full Chemical composition	100%				1,2	2	2,3
		Mechanical	Tensile & Yield, % Elongation, % reduction in area, Hardness etc.	100%						
<b>Final Inspection</b>										
5.	Dimensions and visual	Length/ Dia.	Visual and dimensions	100%		Applicable Standard Code	Inspection report	1,2	3	2,3
6.	Inter granular corrosion testing	Inter granular corrosion testing	IGC as per A262 practice E	One sample from each Heat	A262 practice E	No cracks	Lab report	1,2	2,3	2,3
7.	Metallography	Microstructure	Microstructure X200		Tender Specification	No residual stress & Grain size 5 and finer	Lab report	1,2	2,3	2,3
8.	Hardness test	Hardness	Hardness		Tender Specification	<217 BHN	Lab report	1,2	2,3	2,3
9.	Hydro static	Hydro static	Hydro static	100%	A 312	Applicable Standard Code	Inspection report	1,2	2,3 (10%)	2,3
10.	Thickness Measurement	Thickness Measurement	Thickness	100%	B 36.10	Applicable Standard Code	Inspection report	1,2	2,3 (10%)	2,3
11.	Final Documents	Review of Documents	Review	100%	Tender Specification, Approved Testing Standard, Approved QAP	Tender Specification, applicable Testing Standard, Approved QAP	Reports, Certificates, charts, etc	2	-	3

**LEGENDS:**

P = Performing Agency, W = Witnessing Agency, R = Review of documents, 1 = Sub-Vendor, 2 =Supplier/Manufacturer, 3 = HWP (K) representative.