STAINLESS INDIA
A HOUSE OF QUALITY

STANDARD MATERIAL SPECIFICATION

TECHNICAL DATASHEET
SS 347H – 180° ELBOW

1. SCOPE

This specification covers the minimum requirements of Wrought Seamless Stainless Steel pipe fittings

2. APPLICABLE CODES /STANDARDS

ASTM SA-403: Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASME A-960: Specifications for Common Requirements for Wrought Steel Piping Fittings
ASTM A751: Test methods, Practices, and Terminology for Chemical Analysis of Steel Products. ASTM E-112: Test methods for Determining Average Grain Size
ASTM E-165: Practice for Liquid Penetrant examination for General Industry
ASME B 16.9: Dimensions, tolerances, ratings, testing, and Markings for Wrought butt welding Fittings

3. MATERIAL DESCRIPTION, VISUAL AND DIMENSIONAL REQUIREMENTS

Material	ASTM SA-403: Specification for Wrought Austenitic Stainless Steel Piping Fittings
Service	Mild to moderate corrosive process services - flammable/non-flammable & non-lethal, Demineralised water (outside DM plant battery limits), Polished water, Polished condensate, chemical etc.
Dimensional Tolerances	Dimensional/ tolerances as per ASME B16.9
Ends	Beveled to ASME B 16.25
Manufacture	Raw material: Steel should be melted using one of the following methods: a. Electric furnace (with separate and refining optional), b. Vacuum furnace, c. One of the former followed by vacuum or electro-slag consumable re- melting. Forming process: ASTM A 403 -The finished part shall be manufactured from a forging or shaping operations may be performed by hammering, pressing, piercing, extruding, upsetting, rolling, bending, machining, or by a combination of two or more of these operations.
Surface Condition	All pipe fittings shall be free of scale, rust, dust and suitable for inspection.

Raw material should be chosen so that the final chemical composition and mechanical properties are not violated as mentioned in the standard.

A. Grain Size requirement

a) All H grades shall be tested for average grain size by Test Methods ASTM E112.
b) Grades F 304H, F 309H, F 310H, and F 316H shall have a grain size of ASTM No. 6 or coarser.
c) Grades F 321H, F 347H shall have a grain size of ASTM No. 7 or coarser.

B. Intergranular corrosion testing

a) All austenitic stainless steels shall pass intergranular corrosion tests performed in accordance with Practice E of Practices A 262.
b) For all H grades of austenitic stainless steel (like all H grades of SS309, 310, 316, 316) ASTM 262 Practice C with acceptance criteria of 15 mils/year shall have to be conducted
c) For the IGC test described above two sets of samples shall be drawn from each solution treatment lot; one set corresponding to highest carbon content and other corresponding to the highest rating/thickness.

C. Pickling and passivation to be carried out after forging.

4. NDT REQUIREMENTS

a. PMI testing of the fittings to be carried out.

b. Low chloride liquid penetrant testing on bevel edges to be carried-out (In accordance with the recommended practice of E-165)

c. Hardness testing to be carried out on all the austenitic stainless-steel grades and SA-213 material specification (Table-4) can be taken as reference for the acceptable criteria

d. Ultrasonic testing: Fitting shall be ultrasonically tested to determine its soundness in accordance with the practice of A388/A388M (For 10 % of the ordered quantity)

5. IBR REQUIREMENTS

For fittings, wherever approval under Indian Boiler Regulation-1950 is required as per PO requirements, manufacturer shall arrange to obtain IBR certificates in Form III C of Indian Boiler Regulations, duly accepted and submit the Form III-C (in original) along with the pipe fittings.

IBR material shall be inspected by IBR authority or IBR approved competent person or IBR approved well known maker.

7.0 HEMICAL AND MECHANICAL PROPERTIES

7.1 CHEMICAL REQUIREMENTS

The pipe fittings to the A 403 specification shall meet the chemical composition as per the table given below:

	Composition, %									
Grad e	Carb on	Manganese	Phosphorus	Sulfur	Silicon	Nickel	Chromium	Molyb- denum	Titanium	Other Elements
WP 304	0.08	2.00	0.045	0.030	1.00	8.0 – 11.0	18.0 – 20.0	-	-	-
WP 316	0.08	2.00	0.045	0.030	1.00	10.0 – 14.0	16.0 – 18.0	2.00 – 3.00	-	-
WP 321	0.08	2.00	0.045	0.030	1.00	9.0 – 12.0	17.0 – 19.0	-	G	-
WP 347	0.08	2.00	0.045	0.030	1.00	9.0 – 12.0	17.0 – 20.0	-	-	I
WP 310S	0.08	2.00	0.045	0.030	1.00	19.0 – 22.0	24.0 – 26.0	-	-	-
WP 304L	0.03	2.00	0.045	0.030	1.00	8.0 – 11.0	18.0 – 20.0	-	-	-
WP 304H	0.04 - 0.10	2.00	0.045	0.030	1.00	8.0 – 11.0	18.0 – 20.0	-	-	-
WP 316L	0.03	2.00	0.045	0.030	1.00	10.0 – 14.0	16.0 – 18.0	2.00 – 3.00	-	-
WP 316H	0.04 - 0.10	2.00	0.045	0.030	1.00	10.0 – 14.0	16.0 – 18.0	2.00 – 3.00	-	-
WP 321H	0.04 - 0.10	2.00	0.045	0.030	1.00	9.0 – 12.0	17.0 – 19.0	-	H	-
WP 347H	0.08	2.00	0.045	0.030	1.00	9.0 – 12.0	17.0 – 20.0	-	-	J

G – Grade WP 321 shall have a titanium content of not less than five times the carbon content and not more than 0.70%
I- Grade WP 347 shall have a columbium content of not less than ten times the carbon content and not more than 1.10%
H – Grade WP 321H shall have a titanium content of not less than four times the carbon content and not more than 0.70%
J- Grade WP 347H shall have a columbium content of not less than eight times the carbon content and not more than 1.10%

7.2 MECHANICAL REQUIREMENTS

Mechanical properties shall be as per Table 5 of SSA-403 specification of ASME Sec. II Part-A.

8. HEAT TREATMENT REQUIREMENTS

Sub-sequent to the solution annealing required by clause 6.2, Grades 321, 321H, 347, 347H, 348 and 348H shall be subjected to additional stabilization heat treatment at 815 -870°C for a minimum of 2h/inch of thickness and then cooling in the furnace or in air.

Hardness testing to be carried out on all the austenitic stainless-steel grades and acceptable criteria shall be as per table 4 of the SA-213 specifications.

9. MANUFACTURER'S TEST CERTIFICATE

Manufacturer, with each order of fittings shall submit a test certificate confirming/stating that the fittings have been manufactured and tested in accordance with standard stipulated including the clauses mentioned herein and have duly met the requirements. The Test Certificate shall clearly furnish the following information:

a. P.O. number / Certificate number and date. (Certificates without the P.O. number on it shall not be acceptable.)
b. Product description/ Dimensions/relevant standards.
c. Starting material.
d. Heat number.
e. Chemical and mechanical test results including Tensile Test, hardness testing.
f. PMI testing reports
g. Hardness, UT results.
h. Heat treatment details (type / temperature)
i. Stabilization heat-treatment details for SS321, SS347, SS347H
j. Identification marking as per ASME SSA-403
k. IGC test reports
l. Grain size results for 'H' grade materials
m. Third party inspection certificate / release note shall accompany the delivery of every consignment.

10. MATERIAL STENCILLING AND PACKING

a. Product marking shall be as per clause 14.0 of the standard specifications SA-403.

MARKING

ASTM SA 403 WP347H
SIZE: XX NB SCH XX
HEAT NO: XXXXX