



SSP CNG PLUS Tubing
0.750" x 0.104" AW 316 SS PF
Prefabricated Welded Tube Lengths
CRTT3160750X104-CNG-PF tubing specification

- I. **Manufacturer:** Tubing manufacturer shall be ISO 9001-certified and have over 30 years of experience manufacturing tubing. Supplier shall also be compliant with other industry standards, including, but not limited to, Pressure Equipment Directive (PED). Tubing manufacturer shall be PED-certified in accordance with the requirements outlined in the Pressure Equipment Directive 97/23/EC and the Pressure Equipment Regulations 1999, UK Statutory Instrument 1999 No. 2001 and 2002 No. 1267.

- II. **Material:** Material shall be dual-certified UNS S31600 and UNS S31603 (TP 316) per ASTM A213 (Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes) and ASTM A269 (Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service).
 - a. **Mother Tubes:** Vendors shall be RoHS and REACH compliant. All mother tubes shall be high-quality cold-finished or hot-extruded. Hot-pierced mother tubes shall not be permitted.

 - b. **Chemical Composition:** Per table below. All composition limits [%s] are maximum unless otherwise specified. Product analysis shall be reported in the mill test certificate.

Composition Limits, %									
C	Mn	P	S	Si	Cr	Ni	Mo	Cu	N
.035	2.00	.045	.030	1.00	16.0-18.0	10.0-14.0	2.5-3.0	0.50	0.04

- III. **Welding:** All tube joining welds are fusion butt welds in accordance with API Standard 1104, Section IX ASME Boiler and Pressure Vessel Code and ASME B31.1. Welding is performed per an approved WPS (*Welding Procedure Specification*) and coupon qualification test results documented on a PQR (*Procedure Quality Record*).
 - a. **PQR** (*Procedure Quality Record*) - shall consist of a Tensile Test per ASTM E8-13a, Guided Bend Test per ATM E290, Micrographic Examination per ASTM E883, Hydrostatic Burst Test per ASTM F1387, Radiography Test per ASME Section IX QW-191.1 and Visual Inspection per ASME Section IX QW-194

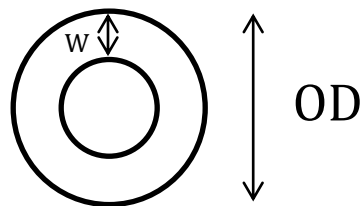
IV. Heat Treatment: All tubing shall be delivered in the solution-annealed condition per ASTM A269. Material shall be heat treated in a vacuum furnace and rapidly cooled by Nitrogen or Argon quench to avoid sensitization. Strand heat treatment shall not be permitted.

- a. System Accuracy Tests per AMS 2750 of the furnace temperature control system shall be performed weekly. The temperature control system must be capable of sustaining test temperature within a tolerance of $\pm 5^{\circ}\text{F}$.
- b. Temperature Uniformity Surveys per AMS 2750 of the furnace work zone shall be performed monthly. Temperature Uniformity results shall be within $\pm 25^{\circ}\text{F}$ of pre-determined testing temperatures.

V. Definition: The term “lot” applies to all tubes of the same nominal diameter and wall thickness, produced from the same heat of material and annealed in the same vacuum furnace load at the same temperature for the same amount of time.

- a. All material shall be processed to maintain lot traceability. Mixing of lots shall not be permitted.

VI. Dimension and Tolerances: Tubing shall be manufactured to 0.750" OD x 0.104" AW [19.05 x 2.64 mm AW] with the tolerances below. All dimensions shown below are in inches. Dimensions in millimeters are displayed in parentheses.



OD Tolerance	W Tolerance
+0.005"/-0 (+0.13/-0)	$\pm 10\%$

VII. Testing Requirements and Procedures

- a. **Positive Material Identification (PMI) Using Niton XL Analyzer:** 100% PMI shall be performed on all material at its finished size while in coil form. Internal documented company procedures shall be in place to ensure 100% PMI. Manufacturer shall have clearly defined equipment procedures for alloy identification using Niton XL Analyzer. This analyzer shall employ the principles of x-ray fluorescence to analyze metal samples, which is non-

destructive in nature. Operators of the Niton XL Analyzer shall be well-trained and certified in proper safety and measuring techniques.

- b. **Non-Destructive Testing:** Manufacturer shall perform 100% hydrostatic testing of all finished material at 8,250 psi [57 MPa] per procedure outlined below.
 - i. Fill coils with deionized water.
 - ii. Pressurize tubing and hold for one minute.
 - iii. After one minute, vent tubing and re-pressurize.
 - iv. Vent, pressurize again hold pressure for five minutes.
 - v. Tubing shall show no bulges, leaks, pinholes, cracks or other defects when subjected to the calculated hydrostatic test pressure.
- c. **Hardness Testing:** Tubing shall be hardness tested. All requirements of ASTM Specification E-18 (*Standard Test Method for Rockwell Hardness and Wilson Superficial Hardness of Metallic Material*) are binding. This specification serves to gather, for convenience, details from the ASTM Specification and some specific requirements.
- d. **Tensile Testing:** Tensile testing shall be carried out per ASTM E8 (*Standard Test Methods for Tension Testing of Metallic Materials*). Specimen preparation, equipment operation and data presentation are described therein.
- e. **Micrographic Examination:** The microstructure shall be examined at a minimum magnification of 100X on a suitably etched specimen prior to shipment. Specimens shall not show any abnormalities or any signs of sensitization.
- f. **Butt Weld Testing:** All fusion welds shall be radiographed in accordance with ASME Section IX QW-191.1 and Visual Inspected per ASME Section IX QW-194. Additionally, the welder shall perform 100% hydrostatic testing of all finished welded material at 8,250 psi [57 MPa] per procedure outlined below.
 - i. Fill coils with deionized water.
 - ii. Pressurize tubing and hold for one minute.
 - iii. After one minute, vent tubing and re-pressurize.
 - iv. Vent, pressurize again hold pressure for five minutes.
 - v. Tubing shall show no bulges, leaks, pinholes, cracks or other defects when subjected to the calculated hydrostatic test pressure.



VIII. **Sample Retention:** Supplier shall retain random samples from each lot of material. Samples shall be retained as a standard practice for a period of no less than five years and made available for future testing if requested by the buyer.

IX. **Marking:** Marking: The marking shall be as follows to ensure full traceability to melt and heat treatment lot.

- a. SSP CNG PLUS TUBING 0.750" OD X 0.104" AW TP 316 (2.5% MIN. MOLY) BRIGHT ANNEALED SMLS COLD DRAWN MADE IN USA ASME SA 213 ASTM A 213 / A 269 HEAT # LOT # WOID # CRTT3160750X104-CNG MAWP 5500 PSI / 379 BAR AT -425 TO 300 DEG F.

X. **Material Test Reports:** Tubing manufacturer shall furnish the material test certificate outlining the testing and results mentioned in Section VII above in accordance with ASTM A1016 (*Standard Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes*). Results of mechanical testing shall fall within the ranges set forth in the table on the following page.

Min. Tensile Strength, ksi [MPa]	Min. Yield Strength (0.2% offset), ksi [MPa]	Min. Elongation in 2 in. (50 mm) [%]	Hardness, max. [HRB]
75 [515]	30 [205]	35	80

XI. **Lengths:** All material shall be high-integrity seamless tubing with no longitudinal or orbital welds. No welded or welded-and-drawn "seam-free" tubing shall be permitted. Coils shall be 270 feet or longer.

XII. **Packaging:** All material shall be high-integrity seamless tubing with no longitudinal or orbital welds. No welded or welded-and-drawn "seam-free" tubing shall be permitted. All wooden packaging materials, such as reels and pallets, when required, shall be heat-treated and stamped with the IPPC mark per ISPM No. 15, "Guidelines for Regulating Wood Packaging Material in International Trade." Material shall be packaged to maintain traceability. Mixing of lots shall not be permitted.

To eliminate waste caused by shorter lengths, only one continuous coil shall be wound per reel. Tube ends shall be protected by caps to ensure no internal contamination is introduced during transit and storage. The outsides of the reels shall be protected with stretch wrap.

XIII. **Note:**



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- a. All specifications mentioned above shall be the current revision.
- b. Exceptions and deviations to this document are subject to approval by manufacturer. Formal requests for exception or deviation shall be made in writing.
- c. This document is subject to revision without notice.



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Revision History

Revision	Date	Description
0	7/8/2014	Created