

ORIGINAL

PIPING SPECIFICATION
FOR
STAINLESS STEEL PIPE

110GT-GM04, Rev. 0

NCK10

Prepared by the

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0	6/17/08	Initial Issue	<i>A. deQuay</i> 6/10/08	<i>R. Pollock</i> 6-17-08	<i>[Signature]</i>
Rev No.	Date	Description	Originator	Checked	Approved

Piping Specification
NCK10
Stainless Steel Pipe

Service: GH, GHe, GN, GO, H2O2, HA (Air), JP-4, JP-5, JP-7, JP-8, LH, LN, LO, RP-1
Design Pressure: 600 PSIG Max. (See Notes 7 and 8 for Uprating to 720 PSIG)
Design Temperature: -423° F to +100°F

<u>ITEM</u>	<u>DESCRIPTION (Note 1)</u>	<u>SPECIFICATION (Note 1)</u>
<u>TUBING</u>		
1/4" thru 1-1/2" (Note 4)	Corrosion-resistant Stainless Steel Steel, Seamless, 37 degree Flared Tubing (Note 2)	NASA/SSC SSTD-8070-0126
<u>PIPE</u>		
1" thru 6" (Note 4)	Sch. 10S, Electric fusion welded or seamless, Corrosion-resistant Stainless Steel, beveled ends (Note 5)	ASTM A312 TP304L (Note 6)
8" thru 16"	Sch. 40S, Electric fusion welded or seamless, Corrosion-resistant Stainless Steel, beveled ends (Notes 5, 7, 8)	ASTM A312 TP304L (Note 6)
<u>FITTINGS</u>		
1/4" thru 1-1/2" (Note 4)	Forged stainless steel, 37° flared tube fittings with SAE (AN/MS) straight thread patterned connections (Note 2, Note 3 for seals)	NASA/SSC SSTD-8070-0126
1" thru 6" (Note 4)	Sch. 10S, Wrought or Forged, Corrosion-resistant Stainless Steel, butt weld ends (Note 5)	ASTM A403 WP304L or ASTM A182 Gr. F304L (Note 6) ASME B16.9, B16.28
8" thru 16"	Sch. 40S, Wrought or Forged Corrosion-resistant Stainless Steel, butt weld ends (Notes 5, 7, 8)	ASTM A403 WP304L or ASTM A182 Gr. F304L (Note 6) ASME B16.9, B16.28
<u>WELD-O-LETS</u>		
1" thru 6"	Weld-O-lets, Sch. 10S, Forged, Corrosion-resistant Stainless Steel, butt weld ends	ASTM A182 Gr.F304L ASME B16.9
8" thru 16"	Weldolets, Sch. 40S, forged, Corrosion-resistant Stainless Steel, butt weld ends	ASTM A182 Gr.F304L ASME B16.9

ITEM	DESCRIPTION (Note 1)	SPECIFICATION (Note 1)
<u>FLANGES</u>		
1" thru 16" (Notes 4, 7, 8)	ASME B16.5 300# Class Weld Neck Raised Face Type, Forged Corrosion-resistant Stainless Steel, buttweld ends, 125 to 250 AARH or RMS face finish, bore for pipe schedule, with concentric 90 degree "V" groove rings in flange face.	ASTM A182 Gr.304L ASME B16.5 MSS SP-6
<u>GASKETS (Note 3)</u>		
All Sizes used w/ Pipe Flanges	304L or 316L Flexitallic Style CG, Class 300, Spiral wound with stainless steel and pure Virgin TFE filler 0.175" thick with 0.125" thick stainless steel inner and outer gauge rings. (Gaskets and compresses to 1/8" thickness.)	ASME B16.20 and ASME B16.20a
<u>BOLTING</u>		
All Sizes	Studs, full thread, Corrosion-resistant type 304 Stainless Steel	ASTM A320 Gr.B8 Cl.2 (Strain Hardened)
	Nuts, hex heavy, Corrosion-resistant type 304 Stainless Steel	ASTM A194 Gr.8
<u>VALVES</u>		
See Valve Summary and Data Sheets.		
<u>WELDING</u>		
Unless otherwise specified, welding shall be performed in accordance with Chapter V of ASME B31.3. No backup rings or consumable inserts will be allowed.		
<u>HANGERS</u>		
See contract drawings.		
<u>INSPECTION</u>		
100% visual inspection all joints. 100% radiographic weld inspection per ASME B31.3 on 100% percent of the welds accessible to this type of inspection. 100% dye-penetrant inspection at root and cover pass is required for all welds not accessible to radiographic inspection.		
<u>TESTING</u>		
<u>HYDROSTATIC</u>		
Prior to testing, disconnect all equipment from the piping. The hydrostatic test pressure of 900 psig shall be held for period required for inspection of all joints with no loss in gage pressure or 10 minutes whichever is greater. Each piping segment shall be individually hydrostatically tested in the fabricator's shop. Repair all leaks at atmospheric pressure. Retest.		
<u>CLEANING</u>		
Unless otherwise specified, all piping shall be cleaned in accordance with requirements of NASA/SSC Standard 8070-0089-FLUIDS to the level indicated on the drawings.		

TESTING-OPERATIONAL AND TEST REPORTS

Upon the completion of hydrostatic testing and cleaning, install a new gasket; reconnect all equipment, etc., to the piping system. Energize the entire system with dry nitrogen gas with a 5% helium gas tracer and a minimum dewpoint of -40°F, to design pressure and "Leak-Tek" test all final connections. Repair all leaks and retest as required. If repairs require welding, then hydro testing, cleaning, and retesting will be required. All tests shall be witnessed by an authorized representative of the Contracting Officer. The Contractor shall furnish a certificate of inspection and testing signed by his representative and those witnessing the test.

CERTIFICATION

Chemical analysis and tensile test as required by ASME B31.3 for ASTM A312 TP304L, ASTM A358 TP304L, ASTM A403 WP304L, ASTM A182 Gr. F304L, ASTM A351 Type CPF8, and ASTM A451 Type CPF8 materials.

NOTES

- Note 1: Unless noted otherwise, requirements of Specification 110GK-GMK1 (or Specification 55000-G10000 when released) apply to all pipe, pipe fittings, and pipe spools fabricated, inspected, tested, and repaired under this specification.
- Note 2: The use of threaded connections and fittings shall be limited to threaded boss connections, tube fittings, and connections to fluid components in tubing systems. Buttwelded adapter and boss fittings and blind flanges with SAE AS5202 (formerly MS33649) connections are required to transition from piping systems to tubing. Welded adapter and boss fitting materials and blind flange materials shall match the piping or pipe fitting material specification. Stainless Steel tubing systems shall be in conformance with NASA/SSC SSTD-8070-0126 except that the minimum wall thickness shall be no less than 0.035" for all tube sizes. All threaded connections shall have 16 RMS or smoother finish on all seal contact surfaces.
- Note 3: For piping and tubing systems in oxygen service, the TFE used in gaskets and seals shall be certified from the TFE manufacturer and in conformance with requirements of NASA/SSC Drawing 54000-GM30.
- Note 4: For all lines that are vacuum jacketed as specified in Piping Specification ACK10, tubing and tube fittings shall not be used for the inner lines and the minimum allowed line size is 1-inch nominal. Unless specified otherwise on design drawings, all lines that are not vacuum jacketed and that are 1.5-inch nominal size or smaller shall be 37 degree flared tubing and tube fittings with SAE (or the equivalent AN/MS) straight thread patterned connections fabricated in accordance with NASA/SSC SSTD-8070-0126.
- Note 5: 100% radiographic weld inspection per ASME B31.3 is required for all longitudinal seam welds on pipe and pipe fittings.
- Note 6: Cast pipe and fittings may be used provided that all requirements of ASME B31.3 are satisfied and provided that the material conforms and is certified to ASTM A351 Type CPF8 (for fittings) and ASTM A451 Type CPF8 (for pipe) except that carbon content shall not exceed 3.5% and the material shall have a casting quality factor of 1.00 in accordance with ASME B31.3 as established by machining and non-destructive examination. Furthermore, all materials must have the following guaranteed mechanical properties:

Ultimate Tensile Strength	70 ksi minimum
Yield Strength	25 ksi minimum
Elongation in 2-inches	35% minimum, both longitudinal and transverse

- Note 7: Upgrading individual pipe spools to 720 psig is permitted for 14" and smaller nominal pipe sizes if and only if all ASTM A182 type F304L stainless steel flanges used for pressure containing parts are certified and rated to allowed stresses of 20 ksi for ASTM A182 type F304 stainless steel. Material certification shall conform to applicable ASTM specifications for dual rated 304/304L stainless steel material and ASME B31.3 having a minimum yield stress of 30 ksi and a minimum ultimate tensile stress of 75 ksi. Furthermore, each pipe spool upgraded to 720 psig shall be hydrostatically proof tested at 1080 psig in accordance with test requirements specified herein and the respective spool shall be permanently marked with hydrostatic test pressure, the date of the test, and the 720-psig design pressure rating. All drawings, including process and instrumentation, schematic, plan and elevation, and isometric drawings, that depict "NCK10" piping shall show each and every spool that has been upgraded to 720-psig and the associated pressure rating breaks.
- Note 8: Upgrading 16" piping, pipe fittings, and pipe spools to 720 psig requires that either: 1.) wall thickness tolerance is +12.5%/-9.6%, or 2.) all ASTM A312, ASTM A182, ASTM A403, ASTM A351, and ASTM A451 type 304L stainless steel material used for pressure containing parts are certified and rated to allowed stresses of 20 ksi for ASTM A312, ASTM A182, ASTM A403, ASTM A351, and ASTM A451 type 304 stainless steel. Material certification shall conform to applicable ASTM specifications for dual rated 304/304L stainless steel material and ASME B31.3 having a minimum yield stress of 30 ksi and a minimum ultimate tensile stress of 75 ksi. All requirements stated in Note 7 above also apply.