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COMPLIANCE IS MANDATORY

John C. Stennis Space Center LOW PRESSURE ALUMINUM PIPE SYSTEMS WITH PIPING DESIGNATOR “E”

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SUBJECT: Low Pressure Aluminum Pipe Systems with Piping Designator "E"		

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Basic	8.21.2015	Doug Dike, Ext. 8-2803	Initial release, superseding SSC-47-033. Updated references and acronyms. Corrected typographical and grammatical errors.

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1.0 PURPOSE

This John C. Stennis Space Center (SSC) standard (SSTD) specifies the materials and procedures for the construction of low pressure aluminum piping systems with Piping Designator "E" at SSC.

2.0 APPLICABILITY

- a. This standard shall be used for specifying materials and components to be incorporated into the low pressure aluminum piping systems with Piping Designator "E".
- b. Existing piping systems, piping system sections, and pipe spools that are modified, repaired, tested, or in operational service prior to the issue date of this standard are exempt from requirements of this standard. However, these existing piping systems, piping system sections, and pipe spools shall conform to this standard at specific locations where modifications and repairs are made and where new pipe and pipe fittings are installed into or joined to lines and components of these existing systems after the issue date of this standard.
- c. Existing Aluminum Alloy 3003 pipe and fitting material that is to be cut, ground, machined, welded, or modified in any way shall be removed and replaced with Aluminum Alloy 6061. For these cases where weld joints are cut, the heat affected zone of each existing weld joining Aluminum Alloy 3003 to Aluminum Alloy 6061 shall be completely removed from the Aluminum Alloy 6061 base metal before rewelding.

3.0 REFERENCES

All references are assumed to be the latest version unless otherwise indicated.

ASME B16.5, *Standards of Pipes and Fittings, Pipe Flanges and Flanged Fittings*

ASME B16.9, *Standards of Pipes and Fittings, Factory-Made Wrought Steel Buttwelding Fittings*

ASME Boiler and Pressure Vessel Code, Section II, Part C, *Materials, Specifications for Welding Rods, Electrodes, and Filler Metals*

ASME Boiler and Pressure Vessel Code, Section VIII, *Pressure Vessels*

ASME Boiler and Pressure Vessel Code, Section IX, *Welding, Brazing and Fusing Qualifications*

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ASME B31.3, *Process Piping*

ASTM A194, *Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both*

ASTM A320, *Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service*

ASTM B209, *Standard Specification for Aluminum-Alloy Sheet and Plate*

ASTM B241, *Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube*

ASTM B247, *Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings*

ASTM B345, *Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube for Gas and Oil Transmission and Distribution Piping Systems*

ASTM B361, *Standard Specification for Factory-Made Wrought Aluminum and Aluminum-Alloy Welding Fittings*

RPTSTD-8070-0001, *Surface Cleanliness Standard of Fluid Systems for Rocket Engine Test Facilities of the NASA Rocket Propulsion Test Program*

SPR 1440.1, *SSC Records Management Program Requirements*

SSC DWG 54000-GM00, *Specification for Procurement of Glass Filled Teflon Gasket Material*

SSTD-8070-0005-CONFIG, *SSC Preparation, Review, Approval, and Release of SSC Standards*

SSTD-8070-0013-WELD, *Classes of Welding Inspection*

SSTD-8070-0021-WELD, *Gas Tungsten Arc Welding (GTAW) of Aluminum (P-No. 23, Grade 6061 and 6063)*

4.0 RESPONSIBILITIES

- a. Users of this SSTD shall comply with its requirements, ensure use of the correct version of this Standard and the documents it references, and inform the appropriate organization of needed changes in accordance with SSC Standard SSTD-8070-0005-CONFIG.

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- b. Responsibilities for the use and control of this SSTD and for the review and approval of revisions or cancellation of this Standard shall be as specified in SSTD-8070-0005-CONFIG and the applicable documents referenced therein.

5.0 DESIGN REQUIREMENTS

Low pressure aluminum piping systems for liquid oxygen (dump) and liquid hydrogen (dump) will be designed to the following requirements: Design Pressure of 20 pounds per square inch gauge (psig); and Temperature Range, -420°F to +100°F.

6.0 REQUIREMENTS

Size	1/2" thru 10"	12" thru 16"	18" thru 24"	30" and 36"
Pipe Material	ASTM B241 6061-T6 or ASTM B345 6061-T6	ASTM B209 6061-T6, ASTM B241 6061-T6, or ASTM B345 6061-T6	ASTM B209 6061-T6	ASTM B209 6061-T6
Pipe Details	Sch. 40, Seamless	0.188" wall		0.250" wall
Fitting Material	ASTM B361 WP6061-T6	ASTM B361 WP6061		
Fitting Details	ASME B16.9 (buttweld ends) Bore to match pipe I.D.			
Flange Material	ASTM B247 6061-T6	ASTM B247 6061-T6		
Flange Details	ASME B16.5 150# weld neck raised face (WNRF), 90° V-Groove ring serrations on face. Serrations shall be concentric or spiral (or as specified in the design). Concentric serrations are required for hydrogen service. Bore to match pipe I.D.			
Bolting	Studs: ASTM A320 Gr. B8 (AISI Type 304 Stainless Steel) Full Thread Nuts: ASTM A194 Gr. 8 (AISI Type 304 Stainless Steel) Hex; ASTM A194 Gr. 8F allowed prior to issue date of this standard. Insulating/dielectric spacers or grommets shall be used to prevent contact between dissimilar metals and galvanic corrosion			

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Gaskets	Must meet requirements of SSC Drawing 54000-GM00.
Welding	Weld per SSTD-8070-0021-WELD.
Inspection	All weld classification shall have 100% visual inspection of all joints. All longitudinal weld seams shall be 100% radiographed. Inspections shall be performed per SSTD-8070-0013-WELD, Class 1. All acceptance criteria shall be in accordance with Normal Service Conditions per ASME B31.3 unless otherwise specified. Dye penetrant inspection at root and cover pass is required for 100% welds not accessible to radiographic inspection.
Cleaning	Precision clean and verify cleanliness of all fluid media wetted surfaces in accordance with RPTSTD-8070-0001 VC-NDP for hydrogen service or RPTSTD-8070-0001 UV-NDP for oxygen service.
Pressure Test	All pressure testing shall be in accordance with ASME B31.3 (unless otherwise noted in the design). All tests shall be held for the period required for inspection of all joints with no loss in gage pressure or 10 minutes, whichever is greater. For pneumatic testing: Pneumostatic pressure tests are permitted only for cases where: 1. All safety precautions stated in ASME PCC-2, Part 5, Section 6.2 have been reviewed with supporting documentation and implemented to the maximum extent practicable and where they do not conflict with allowances and requirements of this standard, 2. All safety precautions mandated by ASME PCC-2, Part 5, Section 6.2, with the exception of Subsection 6.2(k), have been implemented and documented, and 3. The NASA/SSC safety organization has approved this type of test.
Leakage Test	Prior to placing line in service, an in-service pneumatic leak test is required to assure leak tightness of all welds and mechanical joints. For this test, pressurize to 1.1 times designated system pressure with test gas. <ul style="list-style-type: none"> • Test gas shall be helium for hydrogen service piping systems. • Test gas shall be nitrogen, helium, or nitrogen-helium mixture for piping systems in oxygen service. • There shall be no visible external leakage using Leak-Tec ® or equivalent soap solution. • There shall be no permanent deformations during and after tests. • Test pressure tolerance +/- 0.5 psig.
Code Compliance	ASME B31.3

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7.0 RECORDS AND FORMS

Records and forms required by the procedures of this standard shall be maintained in accordance with SPR 1440.1. All records and forms are assumed to be the latest edition unless otherwise indicated. Forms may be obtained from the SSC Electronic Forms repository or from the NASA SSC Forms Management Officer. Quality Records are identified in the SSC Master Records Index.

8.0 ACRONYMS AND ABBREVIATIONS

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
"	inch
I.D.	Inside Diameter
psig	Pounds per square inch gauge
NASA	National Aeronautics and Space Administration
NDP	No Dew Point Required
RPT	Rocket Propulsion Test
SORD	Site-wide Operational and Repair Documentation
SSC	John C. Stennis Space Center
SSTD	John C. Stennis Space Center Standard
SPR	Stennis Procedural Requirements
UV	Ultraviolet
VC	Visually Clean
WNRF	Weld neck raised face