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Space Administration

**John C. Stennis Space Center**  
Stennis Space Center, MS  
39529-6000

**SSTD-8070-0122-WELD**  
**Rev. C**  
**OCTOBER 2019**

# COMPLIANCE IS MANDATORY

## John C. Stennis Space Center PROCEDURE FOR GTAW OF 625 ALLOY TO 300 SERIES STAINLESS STEEL

### Original signed in DDMS by

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### Issued by

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## Document History Log

Change/ Revision	Change Date	Originator/ Phone	Description
Basic	9/4/02	L. de Quay 8-1956	Initial Release
A	6/16/09	D. Dike 8-2803	Changed Scope section to Purpose and added Applicability section. Updated references throughout document. Added section for abbreviations and acronyms in document. Updated attached WPS, including Figure 1.
B	9/29/14	D. Dike 8-2803	Five-year revision. Updated references and acronyms. In section 5.2, added UNS N26010 and 26625 to the list of base metals for which this welding procedure may be used. Updated the ASME P-43 and ASME P-8 base metals listings of section 5.2.
C	10/04/19	D. Dike 8-2803	Five-year revision. Updated directorate titles on cover sheet as necessary. Updated references and acronyms. 5.1-c: Added, "and in accordance with ASME Boiler and Pressure Vessel Codes, Section IX, requirements." Updated WPS to SSC-937.

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## 1.0 PURPOSE

This John C. Stennis Space Center (SSC) standard (SSTD) provides a qualified American Society of Mechanical Engineers (ASME) weld procedure for Gas Tungsten Arc Welding (GTAW) of 625 Alloy (UNS N06625) to 300 Series Stainless Steel at SSC.

## 2.0 APPLICABILITY

This SSTD is applicable when welding is to be performed to the requirements of ASME Boiler and Pressure Vessel Code (BPVC) Section VIII, ASME Piping Code B31.3, or other codes, as required by Engineering.

## 3.0 REFERENCES AND APPLICABLE DOCUMENTS

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

- ASME Boiler and Pressure Vessel Code, Section II, *Materials*
- ASME Boiler and Pressure Vessel Code, Section IX, *Welding, Brazing and Fusing Qualifications*
- ASME B31.3, *Process Piping*
- ASTM A182, *Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service*
- ASTM A213, *Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes*
- ASTM A240, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications*
- ASTM A249, *Standard Specification for Welded Austenitic Steel Boiler, Superheater, Heat-Exchanger, and Condenser Tubes*
- ASTM A269, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*
- ASTM A270, *Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing*
- ASTM A276, *Standard Specification for Stainless Steel Bars and Shapes*
- ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*
- ASTM A314, *Standard Specification for Stainless Steel Billets and Bars for Forging*
- ASTM A351, *Standard Specification for Castings, Austenitic, for Pressure-Containing Parts*
- ASTM A358, *Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General Applications*
- ASTM A376, *Standard Specification for Seamless Austenitic Steel Pipe for High-Temperature Service*
- ASTM A403, *Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings*

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- ASTM A409, *Standard Specification for Welded Large Diameter Austenitic Steel Pipe for Corrosive or High-Temperature Service*
- ASTM A451, *Standard Specification for Centrifugally Cast Austenitic Steel Pipe for High-Temperature Service*
- ASTM A473, *Standard Specification for Stainless Steel Forgings*
- ASTM A479, *Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels*
- ASTM A480, *Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip*
- ASTM A484, *Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings*
- ASTM A511, *Standard Specification for Seamless Stainless Steel Mechanical Tubing and Hollow Bar*
- ASTM A554, *Standard Specification for Welded Stainless Steel Mechanical Tubing*
- ASTM A632, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service*
- ASTM A666, *Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar*
- ASTM A688, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Feedwater Heater Tubes*
- ASTM A743, *Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application*
- ASTM A744, *Standard Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service*
- ASTM A774, *Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures*
- ASTM A778, *Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products*
- ASTM A793, *Standard Specification for Rolled Floor Plate, Stainless Steel*
- ASTM A813, *Standard Specification for Single- or Double-Welded Austenitic Stainless Steel Pipe*
- ASTM A814, *Standard Specification for Cold-Worked Welded Austenitic Stainless Steel Pipe*
- ASTM A908, *Standard Specification for Stainless Steel Needle Tubing*
- ASTM A943, *Standard Specification for Spray-Formed Seamless Austenitic Stainless Steel Pipes*
- ASTM A959, *Standard Guide for Specifying Harmonized Standard Grade Compositions for Wrought Stainless Steels*
- ASTM A965, *Standard Specification for Steel Forgings, Austenitic, for Pressure and High Temperature Parts*
- ASTM A988, *Standard Specification for Hot Isostatically-Pressed Stainless Steel Flanges, Fittings, Valves, and Parts for High Temperature Service*

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- ASTM B366, *Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Fittings*
- ASTM B443, *Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Plate, Sheet, and Strip*
- ASTM B444, *Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloys (UNS N06625 and UNS N06852) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Pipe and Tube*
- ASTM B446, *Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650) Rod and Bar*
- ASTM B564, *Standard Specification for Nickel Alloy Forgings*
- ASTM B704, *Standard Specification for Welded UNS N06625, UNS N06219 and UNS N08825 Alloy Tubes*
- ASTM B705, *Standard Specification for Nickel-Alloy (UNS N06625, N06219 and N08825) Welded Pipe*
- ASTM B751, *Standard Specification for General Requirements for Nickel and Nickel Alloy Welded Tube*
- ASTM B775, *Standard Specification for General Requirements for Nickel and Nickel Alloy Welded Pipe*
- ASTM B829, *Standard Specification for General Requirements for Nickel and Nickel Alloys Seamless Pipe and Tube*
- ASTM B834, *Standard Specification for Pressure Consolidated Powder Metallurgy Iron-Nickel-Chromium-Molybdenum (UNS N08367), Nickel-Chromium-Molybdenum-Columbium (Nb) (UNS N06625), Nickel-Chromium-Iron Alloys (UNS N06600 and N06690), and Nickel-Chromium-Iron-Columbium-Molybdenum (UNS N07718) Alloy Pipe Flanges, Fittings, Valves, and Parts*
- ASTM B924, *Standard Specification for Seamless and Welded Nickel Alloy Condenser and Heat Exchanger Tubes With Integral Fins*
- ASTM F899, *Standard Specification for Wrought Stainless Steels for Surgical Instruments*
- MIL-C-24707, *Castings, Ferrous, General Specification For*
- MIL-DTL-23195, *Steel Bars and Forgings, Corrosion Resistant, Austenitic (UNS S30400, S30403, S31600, S31603, S34700, and S34800)*
- MIL-DTL-23196, *Steel Plate, Corrosion Resistant (UNS S30400/S30403, S31600/S31603, S31703, S34700, and S34800)*
- MIL-E-21562E, *Electrodes and Rods - Welding, Bare, Nickel Alloy*
- MIL-T-8504, *Tubing, Steel, Corrosion-Resistant (304), Aerospace Vehicle Hydraulic Systems, Annealed, Seamless and Welded)*
- SAE AMS 5401, *Nickel Alloy, Corrosion and Heat-Resistant, Investment Castings, 62Ni - 21.5Cr - 9.0Mo - 3.6Cb (Nb) Vacuum Melted, Vacuum Cast, As Cast*
- SAE AMS 5402, *Nickel Alloy, Corrosion and Heat-Resistant, Investment Castings, 62Ni - 21.5Cr - 9.0Mo - 3.6Cb (Nb) As Cast*

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SAE AMS 5501, *Steel, Corrosion Resistant, Sheet, Strip, and Foil, 19Cr - 9.5Ni (304), Cold Rolled, 125 ksi (862 MPa) Tensile Strength*

SAE AMS 5507, *Steel, Corrosion and Heat-Resistant, Sheet, Strip, and Plate, 17Cr - 13Ni - 2.5Mo (SAE 30316L), Solution Heat Treated*

SAE AMS 5510, *Steel, Corrosion and Heat-Resistant, Sheet, Strip and Plate, 18Cr - 10.5Ni - 0.40Ti (SAE 30321), Solution Heat Treated*

SAE AMS 5511, *Steel, Corrosion-Resistant, Sheet, Strip, and Plate, 19Cr - 9.5Ni (304L), Solution Heat Treated*

SAE AMS 5512, *Steel, Corrosion and Heat-Resistant, Sheet, Strip, and Plate, 18Cr - 10.5Ni - 0.80Cb (SAE 30347), Solution Heat Treated*

SAE AMS 5513, *Steel, Corrosion-Resistant, Sheet, Strip, and Plate, 19Cr - 9.2Ni (SAE 30304), Solution Heat Treated*

SAE AMS 5524, *Steel, Corrosion and Heat-Resistant, Sheet, Strip and Plate, 18Cr - 13Ni - 2.5Mo (SAE 30316), Solution Heat Treated*

SAE AMS 5556, *Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing, 18Cr - 11Ni - 0.70Cb (SAE 30347), Solution Heat Treated*

SAE AMS 5557, *Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing, 18.5Cr - 10.5Ni - 0.40Ti (SAE 30321), Solution Heat Treated*

SAE AMS 5558, *Steel, Corrosion and Heat-Resistant, Welded Tubing, 18Cr - 10.5Ni - 0.70Cb (SAE 30347), Thin Wall, Solution Heat Treated*

SAE AMS 5559, *Steel, Corrosion and Heat-Resistant, Welded Tubing, 18Cr - 10.5Ni - 0.40Ti (SAE 30321), Thin Wall, Solution Heat Treated*

SAE AMS 5560, *Steel, Corrosion Resistant, Seamless Tubing, 19Cr - 10Ni (SAE 30304), Solution Heat Treated*

SAE AMS 5563, *Steel, Corrosion Resistant, Seamless or Welded Tubing, 19Cr - 9.5Ni (SAE 30304), Cold Drawn, ¼ Hard Temper*

SAE AMS 5564, *Steel, Corrosion Resistant, Tubing, 19Cr - 10Ni (SAE 30304), High-Pressure Hydraulic, Welded Plus Ultrasonically Tested or Seamless Cold Drawn, One Eighth - Hard Temper*

SAE AMS 5565, *Steel, Corrosion Resistant, Welded Tubing, 19Cr - 9.5Ni (SAE 30304), Solution Heat Treated*

SAE AMS 5566, *Steel, Corrosion Resistant, Seamless or Welded Hydraulic Tubing, 19Cr - 10Ni (SAE 30304), High Pressure, Cold Drawn*

SAE AMS 5567, *Steel, Corrosion Resistant, Seamless or Welded Hydraulic Tubing, 19Cr - 10Ni (SAE 30304), Solution Heat Treated*

SAE AMS 5570, *Steel, Corrosion and Heat-Resistant, Seamless Tubing, 18Cr - 11Ni - 0.40Ti (SAE 30321), Solution Heat Treated*

SAE AMS 5571, *Steel, Corrosion and Heat-Resistant, Seamless Tubing, 18Cr - 10.5Ni - 0.70Cb (Nb), Solution Heat Treated*

SAE AMS 5573, *Steel, Corrosion and Heat-Resistant, Seamless Tubing, 17Cr - 12Ni - 2.5Mo (SAE 30316), Solution Heat Treated*

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- SAE AMS 5575, *Steel, Corrosion and Heat-Resistant, Welded Tubing, 18Cr - 10.5Ni - 0.70Cb (Nb) (SAE 30347), Solution Heat Treated*
- SAE AMS 5576, *Steel, Corrosion and Heat-Resistant, Welded Tubing, 18Cr - 10.5Ni - 0.40Ti (SAE 30321), Solution Heat Treated*
- SAE AMS 5581, *Nickel Alloy, Corrosion and Heat-Resistant, Seamless or Welded Tubing, 62Ni - 21.5Cr - 9.0Mo - 3.7Cb (Nb) Annealed*
- SAE AMS 5584, *Steel, Corrosion and Heat Resistant, Seamless and Welded Hydraulic Tubing, 17Cr - 12Ni - 1.5Mo - C max Cold Drawn, One Eighth-Hard Temper*
- SAE AMS 5599, *Nickel Alloy, Corrosion and Heat-Resistant, Sheet, Strip, and Plate, 62Ni - 21.5Cr - 9.0Mo - 3.7 Cb (Nb), Solution Heat Treated*
- SAE AMS 5639, *Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 19Cr - 10Ni, Solution Heat Treated*
- SAE AMS 5645, *Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings, 18Cr - 10Ni - 0.40Ti, Solution Heat Treated*
- SAE AMS 5647, *Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 19Cr - 9.5Ni, Solution Heat Treated*
- SAE AMS 5648, *Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 17Cr - 12Ni - 2.5Mo, Solution Heat Treated*
- SAE AMS 5653, *Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 17Cr - 12Ni - 2.5Mo (0.030 Max C) (316L), Solution Heat Treated*
- SAE AMS 5654, *Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings, 18Cr - 11Ni - 0.60Cb (Nb) (347), Premium Aircraft Quality, Consumable Electrode Melted, Solution Heat Treated*
- SAE AMS 5666, *Nickel Alloy, Corrosion and Heat-Resistant, Bars, Forgings, Extrusions, and Rings, 62Ni - 21.5Cr - 9.0Mo - 3.65 (Cb [Nb]+Ta), Annealed*
- SAE AMS 5857, *Steel, Corrosion-Resistant, Bars and Wire, 19Cr - 10Ni (304), High Yield Strength, Solution Heat Treated and Cold Worked*
- SAE AMS 5868, *Steel, Corrosion-Resistant, Seamless and Welded Aircraft Tubing, 19Cr - 9.5Ni (SAE 30304), Cold Drawn, Half-Hard Temper*
- SAE AMS 5869, *Nickel Alloy, Corrosion and Heat-Resistant, Sheet, Strip, and Plate, 62Ni - 21.5Cr - 9.0Mo - 3.7Cb, Solution Heat Treated*
- SAE AMS 5896, *Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing, 18.5Cr - 10.5Ni - 0.55Ti (SAE 30321), Solution Heat Treated and Cold Drawn, 1/8 Hard Temper*
- SAE AMS 5897, *Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing, 18.5Cr - 11Ni - 0.80Cb (SAE 30347), Solution Heat Treated and Cold Drawn, One-Eighth Hard Temper*
- SAE AMS 5907, *Steel Sheet, Strip, and Plate, Corrosion and Heat Resistant, 17Cr - 12Ni - 2.5Mo (SAE 30316), Cold Rolled, 125 ksi (862 MPa) Tensile Strength*
- SAE AMS 5910, *Steel Sheet, Strip, and Plate, Corrosion-Resistant, 19Cr - 9.2Ni (SAE 30304) Cold Rolled, 125 ksi (862 MPa) Tensile Strength*



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SAE AMS 5911, *Steel Sheet and Strip, Corrosion-Resistant, 19Cr - 9.2Ni (SAE 30304), Cold Rolled, 150 ksi (1034 MPa) Tensile Strength*

SAE AMS 5912, *Steel Sheet and Strip, Corrosion Resistant, 19Cr - 9.2Ni (SAE 30304), Cold Rolled, 175 ksi (1207 MPa) Tensile Strength*

SAE AMS 5913, *Steel, Corrosion-Resistant, Sheet and Strip 19Cr - 9.2Ni (SAE 30304) Cold Rolled, Full Hard, 185 ksi (1276 MPa) Tensile Strength*

SAE AMS-QQ-S-763, *Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting*

SAE AMS-T-6845, *Tubing, Steel, Corrosion-Resistant (S30400), Aerospace Vehicle Hydraulic System 1/8 Hard Condition*

SAE J405, *Chemical Compositions of SAE Wrought Stainless Steels*

SAE J467, *Special Purpose Alloys ("Superalloys")*

SPR 1440.1, *Records Management Program Requirements*

SPR 8715.1, *SSC Safety and Health Program Requirements*

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

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

SSTD-8070-0014-WELD, *Qualifying Welders and Welding Procedures*

#### 4.0 RESPONSIBILITIES

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

#### 5.0 REQUIREMENTS AND PROCEDURES

##### 5.1 General

- a. All procedures shall be performed in compliance with applicable requirements in SPR 8715.1.
- b. If ever there is a conflict between this SSTD and the SPR, the requirements of the SPR shall supersede this SSTD.
- c. Items denoted as essential variables in the attached Weld Procedure Specification (WPS), WPS No. 8070-0122-WELD, shall not be altered when using the WPS. An alternate WPS may be used only if approved prior to use by the National Aeronautics and Space Administration (NASA) SSC Center Operations Directorate Project Management Division (PMD), the NASA SSC Center Operations Directorate Operations and Maintenance Division (OMD), the NASA SSC Engineering and Test Directorate (E&TD), the NASA SSC Safety and Mission Assurance (S&MA) Office, and in accordance with ASME Boiler and Pressure Vessel Codes, Section IX, requirements.

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- d. The attached Procedure Qualification Record (PQR) No. I625-304SS is the PQR for the original WPS in this SSTD. When performing new qualifications, a new approved PQR shall be completed showing all pertinent data and results of the weld procedure qualification.
- e. For each WPS, the minimum toughness test temperature under the supporting PQRs, per QW-170, shall be equal to or less than the minimum service temperature of the weldment, or -320°F, whichever is higher.
- f. Welders shall be qualified in accordance with SSTD-8070-0014-WELD.
- g. Inspection methods for welds shall be in accordance with SSTD-8070-0013-WELD.

## 5.2 Specification Compliances

This procedure may be used for welding UNS N06625, 26010 and 26625 (ASME P-43) base metals. Examples include but are not limited to:

ASME SB-366, SB-443, SB-444, SB-446, SB-564, SB-704, and SB-705

ASTM B366 B443, B444, B446 B564, B704, B705, B751, B775, B829, B834, B924.

MIL-E-21562E

SAE AMS 5401, AMS 5402, AMS 5581, AMS 5599, AMS 5666, AMS 5869.

The 300 series stainless steel (ASME P-8) base metals to be welded shall be UNS J92600, J92700, J92710, J92800, J92804, J92900, J92901, J92950, J92999, J93000, S30400, S30452, S31600, S31603, S31700, S31703, S32100, S34700, S34800, or S38100, conforming to one or more of the following specifications:

ASME SA-182, SA-213, SA-240, SA-249, SA-276, SA-312, SA-351, SA-358, SA-376, SA-403, SA-409, SA-451, SA-479, SA-480, SA-484, SA666, SA-688, SA-781, SA-813, SA-814, SA-965, and SA-985.

ASTM A182, A213, A240, A249, A269, A270, A276, A312, A314, A351, A358, A376, A403, A409, A451, A473, A479, A480, A484, A511, A554, A632, A666, A688, A743, A744, A774, A778, A793, A813, A814, A908, A943, A959, A965, A988, F899.

MIL-C-24707, MIL-DTL-23195, MIL-DTL-23196, MIL-T-8504.

SAE AMS 5501, AMS 5507, AMS 5510, AMS 5511, AMS 5512, AMS 5513, AMS 5524, AMS 5556, AMS 5557, AMS 5558, AMS 5559, AMS 5560, AMS 5563,

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AMS 5564, AMS 5565, AMS 5566, AMS 5567, AMS 5570, AMS 5571, AMS 5573, AMS 5575, AMS 5576, AMS 5584, AMS 5639, AMS 5645, AMS 5647, AMS 5648, AMS 5653, AMS 5654, AMS 5857, AMS 5868, AMS 5896, AMS 5897, AMS 5907, AMS 5910, AMS 5911, AMS 5912, AMS 5913, AMS-QQ-S-763, AMS-T-6845, J405, J467.

## 6.0 RECORDS AND FORMS

- a. Records required by the procedures of this SSTD shall be maintained in accordance with SPR 1440.1 and as specified in this SSTD.
- b. All records and forms are the latest version unless otherwise indicated.
- c. 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.
- d. The original, signed WPS and PQR forms and Certificates of Analysis (copies of which are provided in the Attachments of this SSTD) shall be maintained in Central Engineering Files (CEF).

## 7.0 ABBREVIATIONS AND ACRONYMS

<b>AISI</b>	American Iron and Steel Institute
<b>AMS</b>	Aerospace Material Specification
<b>ASME</b>	American Society of Mechanical Engineers
<b>ASTM</b>	American Society for Testing and Materials
<b>BPVC</b>	Boiler and Pressure Vessel Code
<b>CEF</b>	Central Engineering Files
<b>E&amp;TD</b>	Engineering & Test Directorate
<b>GTAW</b>	Gas Tungsten Arc Welding
<b>OMD</b>	Operations and Maintenance Division
<b>MIL</b>	Military
<b>NASA</b>	National Aeronautics and Space Administration
<b>PQR</b>	Procedure Qualification Record
<b>PMD</b>	Project Management Division
<b>SAE</b>	Society of Automotive Engineers
<b>SM&amp;A</b>	Safety Mission & Assurance
<b>SPR</b>	John C. Stennis Space Center Procedural Requirement
<b>SSC</b>	John C. Stennis Space Center
<b>SSTD</b>	John C. Stennis Space Center Standard
<b>UNS</b>	Unified Numbering System
<b>WPS</b>	Weld Procedure Specification

Stennis Standard	SSTD-8070-0122-WELD	C
	<i>Number</i>	<i>Rev.</i>
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## 8.0 ATTACHMENTS

### WPS/PQR

Attachment 8.1 - QW-482 WPS 8070-0122-WELD


Attachment 8.2 - QW-483 PQR I625-304SS, from the 2001 ASME Boiler and Pressure Vessel Code

### Certificate of Analysis

Attachment 8.3 - Report No. 341-2 (May 28, 2002)

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	<i>Number</i>	<i>Rev.</i>
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**ATTACHMENT 8.1: QW-482 Suggested format for WPS**  
(See QW-200.1, Section IV, ASME Boiler and Pressure Vessel Code)

 National Aeronautics and Space Administration John C. Stennis Space Center Stennis Space Center, MS 39529-6000		<b>ASME - WELDING PROCEDURE SPECIFICATIONS (WPS)</b>																																																									
Welding Procedure Specification Record Number 8070-0122-WELD		Date September 3, 2019	Revision Number 2																																																								
Qualified To ASME Boiler and Pressure Vessel Code		Company Name Syncom Space Services (S3)																																																									
Supporting PQR(s) 1625-304 SS		Reference Docs. SSTD-8070-0122-WELD																																																									
Scope GTAW 625 Alloy to 300 Series Stainless Steel		Joint See Weld Joint Design Sheet Attached Page 3 of 3.																																																									
<b>BASE METALS</b> Type Alloy P-no. 43 Grp-no. _____ Welded To Stainless Steel P-no. 8 Grp-no. 1 Backing Not Permitted P-no. _____ Grp-no. _____ Retainers N/A Notes See Note A.		<b>THICKNESS RANGE QUALIFIED</b> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">As-welded</th> <th colspan="2">With PWHT</th> </tr> <tr> <th>Min.</th> <th>Max.</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Complete Pen.</td> <td>.188"</td> <td>2.00"</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Complete Pen.</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Impact Tested</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Impact Tested</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Fillet Welds</td> <td>All</td> <td>_____</td> <td>N/A</td> <td>N/A</td> </tr> </tbody> </table> <b>DIAMETER RANGE QUALIFIED</b> <table border="1"> <thead> <tr> <th rowspan="2">Nominal Pipe Size</th> <th colspan="2">As-welded</th> <th colspan="2">With PWHT</th> </tr> <tr> <th>Min.</th> <th>Max.</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>All</td> <td>_____</td> <td>_____</td> <td>N/A</td> <td>N/A</td> </tr> </tbody> </table>					As-welded		With PWHT		Min.	Max.	Min.	Max.	Complete Pen.	.188"	2.00"	N/A	N/A	Complete Pen.	_____	_____	_____	_____	Impact Tested	_____	_____	_____	_____	Impact Tested	_____	_____	_____	_____	Fillet Welds	All	_____	N/A	N/A	Nominal Pipe Size	As-welded		With PWHT		Min.	Max.	Min.	Max.	All	_____	_____	N/A	N/A						
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All	_____	_____	N/A	N/A																																																							
<b>FILLER METALS</b> Process SFA Classification F-no. A-no. Chemical Analysis or Trade Name GTAW 5.14 43 ERNiCrMo-3 Cons. Insert _____ Flux _____		<b>THICKNESS RANGE QUALIFIED</b> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">As-welded</th> <th colspan="2">With PWHT</th> </tr> <tr> <th>Min.</th> <th>Max.</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>.188"</td> <td>2.00"</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>					As-welded		With PWHT		Min.	Max.	Min.	Max.	_____	.188"	2.00"	N/A	N/A	_____	_____	_____	_____	_____																																			
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Responsible Office: NASA SSC Center Operations Directorate Operations and Maintenance

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National Aeronautics and  
Space Administration  
John C. Stennis Space Center  
Stennis Space Center, MS 39529-6000

ASME - WELDING PROCEDURE SPECIFICATIONS (WPS)

Welding Procedure Specification Record Number  
8070-0122-WELD

Date  
September 3, 2019

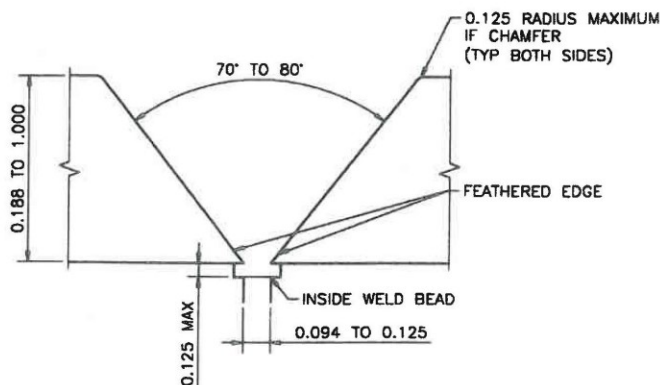
Revision Number  
2

Qualified To  
ASME Boiler and Pressure Vessel Code

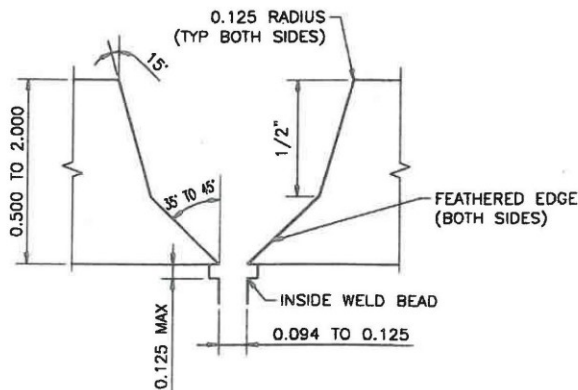
Company Name  
Syncom Space Services (S3)

FIGURE 1. TYPICAL BUTT WELD JOINT DETAILS  
(WPS 8070-0122-WELD)

ALL DIMENSIONS IN INCHES



**V-BEVEL: FOR 0.188 TO 1.0 INCH WALL THICKNESS**

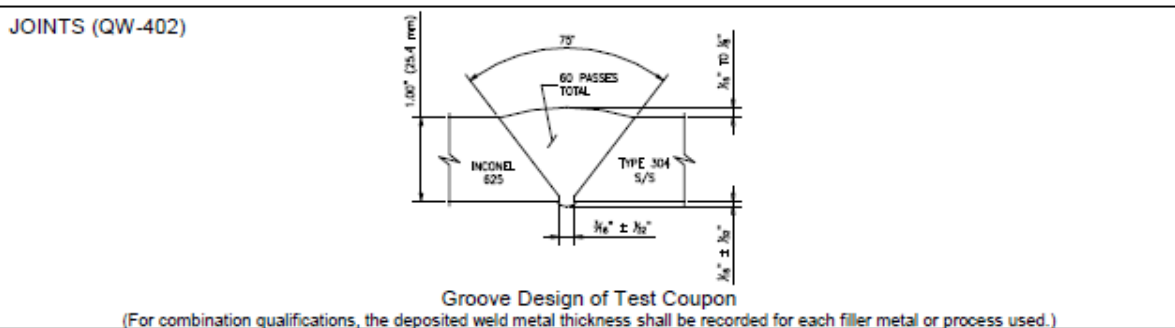


**U-BEVEL: FOR 0.500 TO 2.0 INCH WALL THICKNESS**

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**ATTACHMENT 8.2: QW-483 Suggested format for PQR**  
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)  
**Record Actual Conditions used to Weld Test Coupon.**

Company Name NASA Stennis Space Center  
Procedure Qualification Record No. 1625-304SS Date 9/04/2002  
WPS No. 8070-0122-WELD  
Welding Process(es) GTAW  
Types (Manual, Automatic, Semi-Auto) Manual



<b>BASE METALS (QW-403)</b> Material Spec. <u>SB443 to SA240</u> Type or Grade <u>UNS N06625 to 304</u> P-No. <u>43</u> to P-No. <u>8</u> Thickness of Test Coupon <u>1.00" (25.4 mm)</u> Diameter of Test Coupon <u>N/A (plate used)</u> Other _____ _____ _____	<b>POSTWELD HEAT TREATMENT (QW-407)</b> Temperature <u>N/A</u> Time <u>N/A</u> Other _____ _____ _____
---	---

<b>GAS (QW-408)</b> <table border="1"> <thead> <tr> <th></th> <th>Gas(es)</th> <th>Percent Composition (Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>Argon</u></td> <td><u>99.99%</u></td> <td><u>20 to 35 CFH</u></td> </tr> <tr> <td>Trailing</td> <td><u>N/A</u></td> <td><u>N/A</u></td> <td><u>N/A</u></td> </tr> <tr> <td>Backing</td> <td><u>Argon</u></td> <td><u>99.99%</u></td> <td><u>20 to 35 CFH</u></td> </tr> </tbody> </table>		Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	<u>Argon</u>	<u>99.99%</u>	<u>20 to 35 CFH</u>	Trailing	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	Backing	<u>Argon</u>	<u>99.99%</u>	<u>20 to 35 CFH</u>
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Trailing	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>													
Backing	<u>Argon</u>	<u>99.99%</u>	<u>20 to 35 CFH</u>													

<b>FILLER METALS (QW-404)</b> SFA Specification <u>5.14</u> AWS Classification <u>ERNiCrMo-3</u> Filler Metal F-No. <u>43</u> Weld Metal Analysis A-No. _____ Size of Filler Metal <u>1/8" and 3/32"</u> Other _____ _____ _____	<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current <u>DC</u> Polarity <u>DCEN(-)</u> Amps. <u>80-120</u> Volts <u>12-16</u> Tungsten Electrode Size <u>1/8" &amp; 3/32" (3.2mm &amp; 2.4mm)</u> Other _____ _____ _____
--	--

<b>POSITION (QW-405)</b> Position of Groove <u>1G</u> Weld Progression (Uphill, Downhill) <u>Flat</u> Other _____ _____ _____	<b>TECHNIQUE (QW-410)</b> Travel Speed <u>5 to 10 i.p.m. (12.7 - 25.4 mm/min.)</u> String or Weave Bead <u>either</u> Oscillation <u>N/A</u> Multipass or Single Pass (per side) <u>Multiple</u> Single or Multiple Electrodes <u>Single</u> Other _____ _____ _____
--	--

<b>PREHEAT (QW-406)</b> Preheat Temp. <u>60°F minimum</u> Interpass Temp. <u>350°F maximum</u> Other _____ _____ _____
---

This form (E00007) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300



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**QW-483 (Back)**

PQR No. I625-304SS

Tensile Test (QW-150)

Specimen No.	Width	Thickness	Area	Ultimate Total Load lb.	Ultimate Unit Stress psi	Type of Failure & Location
T-1	0.778	1.020	0.794	68,700	86,524	Base 304SS
T-2	0.765	1.015	0.776	66,900	86,211	Base 304SS

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
Side Bend SB-1 QW-462.2	180° Satisfactory
Side Bend SB-2 QW-462.2	180° Satisfactory
Side Bend SB-3 QW-462.2	180° Satisfactory
Side Bend SB-4 QW-462.2	180° Satisfactory

Toughness Tests (QW-170)

Specimen No.	Notch Location	Specimen Size (mm units)	Test Temp.	Impact Values			Drop Weight Break (Y/N)
				Ft. lbs.	% Shear	Mils	
1 B1	Filler	10x10x55	-325°F	79	100	54	
1 B2	Filler	10x10x55	-325°F	73	100	42	
1 B3	Filler	10x10x55	-325°F	64	100	34	
1 H1	I625 HAZ	10x10x55	-325°F	57.5	95	32	
1 H2	I625 HAZ	10x10x55	-325°F	57	95	21	
1 H3	I625 HAZ	10x10x55	-325°F	57.5	95	18	
1 H4	304SS HAZ	10x10x55	-325°F	116	100	45	
1 H5	304SS HAZ	10x10x55	-325°F	141	100	64	
1 H6	304SS HAZ	10x10x55	-325°F	150	100	60	

Fillet-Weld Test (QW-180)

Result – Satisfactory: Yes \_\_\_\_\_ No \_\_\_\_\_ Penetration into Parent Metal: Yes \_\_\_\_\_ No \_\_\_\_\_

Macro – Results \_\_\_\_\_

**Other Tests**

Type of Test \_\_\_\_\_

Deposit Analysis \_\_\_\_\_

Other \_\_\_\_\_

Welder's Name Douglas Ncaise Clock No. 10403 Stamp No. 28

Tests conducted by: Techweld, Inc.; Pascagoula, MS Laboratory Test No. 341-0502-1

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer Mississippi Space Services


Date 09/04/2002

By R. Nyberg

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

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**ATTACHMENT 8.3: Certificate of Analysis, Report No. 341-2 (May 28, 2002)**



P.O. Box 1900 PASCAGOULA, MS 39568-1900  
OFFICE: 228-762-2890 FAX: 228-769-5219

### CERTIFICATE OF ANALYSIS

Report No. 341-2  
 Page 1 of 2  
 Date 5/28/02  
 Lab No. 341-0502-1

Material	Inconel 625	Thickness	1.0"	Dia.	----	HMID No.	----
Material	Type 304 S.S.	Thickness	1.0"	Dia.	----	HMID No.	----
Process	Gtaw	Filler Metal	----	Position	----	ID	----
WPS	----	Welder	----	Other	SWR#	H3255P5302	
From	Mississippi Space Services	PO	32950	Test Date	5/28/02		
Test For	Guided Bend & Tension Test					Machine Model & Serial No.	Tinus-Olsen Universal Tester #31193
Calibration Certified By	Mobile Calibration Service					Date	7/31/01
Specification Followed	ASTM E-74 and E-4						

THIS CERTIFICATE MAY NOT BE ALTERED, DELETED FROM, PUBLISHED AND/OR USED EXCEPT IN FULL

#### GUIDED BEND TEST

Type	Figure No.	Results
Side Bend SB-1	QW 462.2	180° Satisfactory
Side Bend SB-2	QW 462.2	180° Satisfactory
Side Bend SB-3	QW 462.2	180° Satisfactory
Side Bend SB-4	QW 462.2	180° Satisfactory


#### TENSION TEST

Spec. No.	Width (in.)	Thickness (in.)	Area (in <sup>2</sup> )	Load at Fracture (lbs.)	Tensile Strength (psi)	Failure Location
T-1	.778	1.020	.794	68,700	86,524	Base 304 S.S.
T-2	.765	1.015	.776	66,900	86,211	Base 304 S.S.

We certify that the statements in this record are correct and that the test samples were prepared and testing accordance with the requirements of Techweld PMT Procedure No. 1, ASTM E-8 and Asme Section IX, 2001 Edition.

Test materials will be discarded after 90 days unless prior written notification is received.

Certified By John C. Taylor



JOHN C. TAYLOR  
QC 1  
Techweld, Inc.

Date 5-28-02

Stennis Standard	SSTD-8070-0122-WELD	C
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P.O. Box 1900 PASCAGOULA, MS 39568-1900

OFFICE: 228-762-2890 FAX: 228-769-5219

**CERTIFICATE OF ANALYSIS**

Report No. **341-2**  
Page **2 of 2**  
Date **5/30/02**  
Lab No. **341-0502-1**

Material	<b>Inconel 625</b>	Thickness	<b>1.0"</b>	Dia.	<b>----</b>	Ht/ID No.	<b>----</b>
Material	<b>Type 304 S.S.</b>	Thickness	<b>1.0"</b>	Dia.	<b>----</b>	Ht/ID No.	<b>----</b>
Process	<b>Gtaw</b>	Filler Metal	<b>----</b>			Position	<b>----</b>
WPS	<b>----</b>			Welder	<b>----</b>	ID	<b>----</b>
From	<b>Mississippi Space Services</b>			PO	<b>32950</b>	Other	<b>SWR# H3255P5302</b>

Test For	<b>Charpy Impact</b>		Test Date	<b>5/30/02</b>
Machine Model & Serial No.	<b>Satec Systems (Baldwin) SI-1-C No. 1280</b>			
Calibration Certified By	<b>Natl Institute of Stds and Tech.</b>			Date <b>4/26/02</b>
Specification Followed	<b>ASTM E-23 Figure 1 Type A</b>			
Orientation of Specimens	<input type="checkbox"/> Transverse	<input checked="" type="checkbox"/> Longitudinal	Size	<b>10mm X 10mm X 55mm</b>

**CHARPY IMPACT TEST RESULTS**

Specimen No.	Notch Location	Notch Type	Test Temperature	Impact Values (ft. lbs.)	% Shear	Mil Lateral Exp.	Joules
1 B 1	Base	V	-325 °F	79	100	54	----
1 B 2		V	-325 °F	73	100	42	----
1 B 3		V	-325 °F	64	100	34	----
1 H 1	Inconel 625	V	-325 °F	57.5	95	32	----
1 H 2		V	-325 °F	57	95	21	----
1 H 3		V	-325 °F	57.5	95	18	----
1 H 4	Type 304 S.S.	V	-325 °F	116	100	45	----
1 H 5		V	-325 °F	141	100	64	----
1 H 6		V	-325 °F	150	100	60	----

We certify that the statements in this record are correct and that the test samples were prepared and testing accordance with the requirements of Techweld PMT Procedure No. 1, ASTM E-23 and Asme Section IX, 2001 Edition.

Test materials will be discarded after thirty (30) days unless prior written notification is received.

Certified By

*John C. Taylor*  
**JOHN C. TAYLOR**  
84040411  
Techweld, Inc. CWI

Date **5-30-02**