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COMPLIANCE IS MANDATORY

John C. Stennis Space Center STANDARD FOR QUALIFYING WELDERS AND WELDING PROCEDURES

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Document History Log

Revision	Date	Originator/ Phone	Description
Basic	10/5/04	R. Nyberg/ 8-1502	<p>Initial Release – supersedes SSC-34-006 Rev. K with the following changes:</p> <p>New document number and format per SPG 1400.1.</p> <p>Added/specified sections per SPG 1400.1 where appropriate throughout the document.</p> <p>In Retests section, deleted sentence “re-qualification will be allowed on three test assemblies, any one of which passes will re-qualify without retest penalty.”</p> <p>In 3.0 added references to SSC Standards.</p> <p>In Criteria for Welder section, specified that records of qualifications shall be retained in the individual’s personnel certification file in the FOS Contractor’s S&MA office and that they would be available to individuals authorized to examine them.</p> <p>In Welding Procedure Qualification section, specified that WPS/PQR records shall be provided by Quality Assurance to Central Engineering Files for each welding procedure and they shall be available to those authorized to examine them and specified welding procedure qualification test per ASME and AWS standards.</p> <p>Changed Table Notes section to “NOTES”.</p> <p>Added Records and Forms section per SPG 1400.1.</p> <p>Added Acronyms and Abbreviations list.</p> <p>Deleted Table 1 - Test for Welder Qualification.</p> <p>In 6.1.A.2 – Plate – deleted weld position 2G.</p> <p>In NOTE 1: deleted weld position 2G.</p> <p>In Sections 7.A.2 and 7.B, changed the amount of time (from 12 months to 6 months) allowed in which a specific weld has not been performed before a welder must be re-qualified.</p>
A	1.19.10	Doug Dike x8-2803	<p>Formatted in accordance with SPR 1400.1. Updated referenced documents. Sections 1.0, 4.0.a.2 and 4.0.a.3: Braze reference removed. Section 5.0: Added “welder must have correctable 20/20 vision. Section 6.2.1a and b: Added requirements referenced in STP-8810-0012,</p>

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			STP-8810-0013, and SSTP-8810-0028. Section 6.2.1d: Added how number is determined. Section 6.2.1.3: Changed reference for bend tests from QW-161.3 to QW-160. Section 7.0c.1 Updated immediate retest. Section 8.3: Qualification updated. Section 8.4: deleted NOTE 1: For tests in the 3G and 4G positions (plate), mechanical testing or radiographic testing shall be per AWS D1.1 or ASME Section IX. NOTE 2: For tests made on pipe in the 2G and 5G or in the 6G position, mechanical testing or radiographic testing shall be per ASME Section IX. NOTE 3: For T-1 steel, two (2) tensile specimens shall be taken from each test assembly welded, in addition to the other qualification tests. NOTE 4: When a welder is to be qualified to weld on stainless steel (P-8 base material), carbon steel plates or pipes of P-1 material may be substituted for the performance test and welded with austenitic electrodes (A-8 or A-9 of table QW-442 ASME Section IX). NOTE 5: When a welder is required to weld on material of lesser or greater thickness, the welder and welding procedure must be re-qualified per the applicable code.
B	1.06.15	Doug Dike X8-2803	Five-year review. Updated references and acronyms. Administrative changes required. Responsible Organizations reflected on the cover sheet have been revised as follows: Safety and Mission Assurance, Responsible Organization, with concurrence by Project Management Division, Operations and Maintenance Division, and Engineering and Test Directorate. 6.2.1.d.1, Weld Shop Supervisor among those approved to assign sequential number on the process plan to be stamped on the test coupon by the Inspector. 6.2.2.4, added Welder Continuing Proficiency requirement. "FOSC" changed to "NASA or its designee" in all references throughout document.
B-1	02.12.16	R. Carol Wolfram X8-1164	Administrative change. Replaced "FOSC" and "NASA or its designee" with "SACOM" throughout document.

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C	03.10.20	Doug Dike X8-2803	<p>Five-year update.</p> <p>Updated directorate titles on cover sheet and header as necessary. Updated references and acronyms. Minor administrative changes.</p> <p>4.0.a.1-i: Added clarification for the exclusion of the 6GR position.</p> <p>4.0.a.1-ii: Added 6GR qualification requirement.</p> <p>6.2-b: Added “AWS D1.1 as code requirement” reference.</p> <p>6.2.1-f: Added “produce and maintain WPQs for all qualification welding,” and added the sentence that begins, “Each WPQ for each welder/welding operator shall specify which WPS(s) applies...”</p> <p>6.2.2.1: Added “produced by the respective welder” and added two sentences that began with “When producing test assemblies, the requirements for welding positions and qualifications...”</p> <p>6.2.2.4: Added “or SACOM Quality Assurance Supervisor” for review/approval.</p>
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1.0 PURPOSE AND APPLICABILITY

This standard specifies the methods to be used for qualifying welding procedures and personnel required to perform welding at John C. Stennis Space Center (SSC) and the responsibilities for retention of these qualification records. This SSC standard (SSTD) applies to Synergy Achieving Consolidated Operations and Maintenance (SACOM) and their subcontractors.

Note: Only Weld Wire/Rod qualified per SSTD 8070-0033-WELD will be used for qualification tests.

2.0 REFERENCES

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

ASME Boiler and Pressure Vessel Code (BPVC), Section VIII, Division 1, *Rules for Construction of Pressure Vessels*

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

AWS D1.1, *Structural Welding Code - Steel*

SPR 1400.1, *Document Preparation, Numbering, and Management*

SPR 1440.1, *Records Management Program Requirements*

STP-8810-0012, *John C. Stennis Space Center Technical Procedure for Magnetic Particle Examination - Dry Powder Method*

STP-8810-0013, *John C. Stennis Space Center Technical Procedure for Methods, Procedures and Qualifications in the Use of Liquid Penetrants (Visible Dye/Fluorescent Dye)*

STP-8810-0028, *John C. Stennis Space Center Test Procedure for Visual Examination*

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

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

SSTD 8070-0033-WELD, *Certified Welding of Electrodes and Rods*

3.0 RESPONSIBILITIES

Responsibilities for 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 herein.

4.0 CRITERIA FOR WELDER

- a. Trained, experienced, professional welders whose work scope includes welding shall be certified by meeting the following requirements:

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1. The welder shall qualify as prescribed by ASME BPVC, Section IX. If ASME BPVC, Section IX qualification is achieved, the welder will also be qualified in accordance with AWS D1.1 (excluding 6GR position).
 - i. Regarding the exclusion of the 6GR position, above, though the 6GR position is included within AWS code, it is not a position that is included within ASME code. The "R" within 6GR indicates that nothing but a restriction ring shall be included on the 6G positioned test coupon. Additionally, the 6GR position qualification of CJP groove welds T, Y and K joints are in tubular structural construction.
 - ii. In the event qualification for 6GR position is required, the welder shall be qualified in accordance with AWS D1.1.
2. For welding that requires Class I, II, III, or IV inspection (see SSTD 8070-0013-WELD), the welder shall be required to weld acceptable test assemblies as specified in this procedure.
3. The welder shall be required to pass the vision test specified below.
 - b. Records of qualifications shall be retained in the individual's personnel certification file in the SACOM Safety & Mission Assurance (S&MA) office.
 - c. These records and welding procedures shall be available to those authorized to examine them.

5.0 VISION TEST

- a. The vision test is an annual requirement for all qualified welders at SSC. The vision test will be performed by trained personnel at the SSC Medical Clinic using standard test methods for determining visual acuity. Welder's vision must be correctable to 20/20. Welders must also pass a color discrimination test.
- b. If at any time a vision test reveals that an operator needs visual aids, the operator shall be required to use them for all production-type work.
- c. The Medical Clinic shall forward a copy of all test applicants' eye test records to the welder's supervisor.

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6.0 WELDING AND INSPECTION OF OPERATOR CERTIFICATION TEST ASSEMBLIES

6.1 Welding Requirements

a. Welding Positions and Qualifications

1. Pipe

- a. Test assemblies shall be welded in the 2G and 5G positions, or in the 6G position, which shall qualify the welder for all positions.
- b. Welders shall be tested to qualify for all positions except when qualifying for one (1) position only; then the test assembly shall be welded in that position. (Reference ASME BPVC, Section IX.)

2. Plate

- a. Test assemblies shall be welded in the 3G and 4G positions, which shall qualify the welder for all positions.
- b. Welders shall be tested to qualify for all positions except when qualifying for one (1) position only; then the test assembly shall be welded in that position. (Reference ASME BPV, Section IX or AWS D1.1 code requirements.)

3. Qualification on pipe also qualifies on plate, but not vice versa.

4. Welder qualifications may be accomplished by welding coupons (test assemblies) as shown in this procedure or by in-process welding of a production weld with inspection per Class I of SSTD 8070-0013-WELD, which will qualify the welder for that position and thickness range.

5. An in-process weld which incurs a reject and requires a repair shall be repaired by a qualified welder in accordance with ASME BPVC, Section IX.

b. Repair Welding of Coupons

No qualification test coupon shall be repair welded. Welding defects that are detected by radiography, ultrasonic, magnetic particle, or liquid penetrant will remain in the first coupon, except for instructional purposes.

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6.2 Testing and Inspection of Assemblies

6.2.1 Inspection

- a. A qualified Inspector, per STP-8810-0028, shall witness the qualification test and will assure that the test plates are properly prepared, cleaned, fitted, and set up according to the accepted procedure for each qualification test.
- b. The Inspector shall use dye penetrant inspection for non-magnetic material, per STP-8810-0013, and magnetic particle inspection for ferromagnetic material, per STP-8810-0012, after the root pass on the qualification test or when there is a definite indication of poor weld quality.
- c. The test may be terminated at any stage of the testing procedure, whenever it becomes apparent to the Inspector conducting the test that the welder does not have the required skill to produce satisfactory results.
- d. The Inspector shall stamp the test coupon as follows:
 1. With a number, assigned sequentially on the process plan by the Weld Shop Supervisor or SACOM Quality Assurance, designating the test.
 2. With the welder's initials to designate the welder.
 3. When the plate or pipe is to be cut into samples for bend testing, each bend test specimen must be marked with the test number, the welder designation letter, and the type of bend test to be performed (SB = side bend, FB = face bend, RB = root bend).
 4. With the appropriate ASME weld position designation (see ASME BPVC, Section IX).
- e. If the test coupons pass the visual inspection, the Inspector will have the specimens tested as defined below.
- f. The welder's Supervisor shall produce and maintain Welder Performance Qualifications (WPQs) for all qualification welding performed by welders/welding operators. Each WPQ for each welder/welding operator shall specify which WPS(s) applies and shall only qualify the welder/welding operator for welds produced in accordance with the specified WPS(s).

6.2.2 Welder Qualification Testing

6.2.2.1 General

A welder may be qualified by radiography of a test assembly produced by the respective welder or by bend tests taken from a test assembly produced by the respective welder. When producing test assemblies, the requirements for welding

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positions and qualifications stated in Section 6.1 apply to each qualification of each welder. The qualification limits stated in this section also apply to each qualification of each welder.

6.2.2.2 Radiographic Examination

Weld qualification test assemblies tested by radiography shall be x-rayed 100 percent and shall conform to paragraph UW51 of ASME BPVC, Section VIII, Division 1.

6.2.2.3 Mechanical Testing

Weld qualification test assemblies tested by bend test shall meet the requirements of paragraph QW-160 of ASME BPVC, Section IX.

6.2.2.4 Welder Continuing Proficiency

Every six (6) months, the welder shall show proficiency in each process for which he is certified. The welder's Supervisor shall submit evidence of this continuing proficiency (SACOM Form 570) performed by welders/welding operators to the NDT Level III or SACOM Quality Assurance Supervisor for review/approval.

7.0 RETESTS

a. Renewal of qualification is required for the following reasons:

1. When there is a specific reason to question a welder's ability to make welds that meet the requirements.
2. After a period of six (6) months, during which a demonstration of proficiency has not been performed.

b. If the above proficiency demonstration has not been performed for six (6) months because the specific procedure has been inactive, it will not be necessary to re-qualify until that particular repair weld/production weld procedure is made active.

c. If a qualification test assembly is rejected for other reason(s), retesting shall be as follows:

1. Immediate Retest: The welder shall successfully weld two (2) test assemblies for each one that was rejected.
2. Retest Following Training: The welder may be allowed to weld one test assembly provided additional training has been received between the time the unacceptable assembly was made and the time allowed to weld retest assemblies for certification.

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8.0 WELDING PROCEDURE QUALIFICATION

8.1 General

- a. An ASME welding procedure qualification test may be welded in any position and qualifies the procedure for all positions. The welder making and passing the procedure qualification test is thereby qualified for the position tested.
- b. Records (Welding Procedure Specification/Procedure Qualification Records [WPS/PQRs]) of procedure qualification shall be provided by Quality Assurance to Central Engineering Files (CEF) for each welding procedure.
- c. Procedure qualifications shall be available to those authorized to examine them.

8.2 Pressure Vessels (Pipe and Other Pressure Containing Vessels)

Welding procedures shall be qualified per ASME BPVC, Section IX.

8.3 Structural Steel (Plate, Pipe, and Box Tubes)

Welding procedures shall be qualified per AWS D1.1 (See AWS D1.1 Table 4.1).

8.4 Repair

Weld procedures allow repair of welds by following the same procedure. This will only be attempted once and, should the weld still not pass inspection, Material Review Board (MRB) action is required. Under no circumstances will any one (1) weld receive more than three (3) total repairs without MRB action.

9.0 RECORDS AND FORMS

Records and forms required by the procedures of this standard shall be maintained in accordance with SPR 1440.1. For quality records, refer to the SSC Master Records Index. All forms are assumed to be the latest edition unless otherwise specified and may be obtained from the SSC Electronic Forms repository or from the National Aeronautics and Space Administration (NASA) SSC Forms Management Officer.

10.0 ACRONYMS AND ABBREVIATIONS

ASME	American Society of Mechanical Engineers
AWS	American Welding Society
BPVC	Boiler and Pressure Vessel Code

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CEF	Central Engineering Files
CJP	Complete Joint Penetration
FB	Face Bend
MRB	Material Review Board
NASA	National Aeronautics and Space Administration
NDT	Non Destructive Testing
PQR	Procedure Qualification Record
RB	Root Bend
S&MA	Safety & Mission Assurance
SB	Side Bend
SPR	John C. Stennis Space Center Procedural Requirement
SACOM	Synergy-Achieving Consolidated Operations and Maintenance
SSC	John C. Stennis Space Center/Stennis Space Center
SSTD	John C. Stennis Space Center Standard
STP	John C. Stennis Space Center Technical Procedure
WPQ	Welder Performance Qualification
WPS	Welding Procedure Specification