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RECORD OF REVISIONS

Rev	Date	Description	POC	OIC
0	8/16/04	Initial issue.	Kelly Bingham, <i>FWO-DECS</i>	Gurinder Grewal, <i>FWO-DO</i>
1	10/27/06	Administrative changes only. ISD number changes based on new Conduct of Engineering IMP 341. Other administrative changes.	Kelly Bingham, <i>FM&E-DES</i>	Kirk Christensen, <i>CENG</i>

Contact the Welding Standards POC for upkeep, interpretation, and variance issues

WFP 2-10	<u>Welding POC/Committee</u>
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WFP 2-10 NON-CODE WELDING

1.0 PURPOSE AND SCOPE

- A. This welding procedure shall govern the Non-Code welding of SSC. Typical non-code welding activities involve items such as barricades, welds not addressed by codes, non-code piping (e.g., non-Uniform Plumbing Code and meeting ASME B31 code exclusions), maintenance of heavy mechanical equipment such as cranes (excluding lifting components) or trucks.
- B. The use of this non-code standard welding procedure specification shall be in accordance with GWS 1-02, *Administrative Control of Welding*.

2.0 REFERENCES

- 1. ASME Section IX, “Welding and Brazing Qualifications”
- 2. AWS D1.1, “Structural Welding”

3.0 WELDER QUALIFICATION

- A. Welder/welding operators shall be currently certified, having performed qualification tests in accordance with GWS 1-05, *Welder Performance Qualification & Certification*.

4.0 WELDING PREREQUISITES

- A. All welding shall comply with the requirements specified on the Non-Code Welding Technique Sheet (WTS) or a comparable ASME or AWS Welding Procedure Specification (WPS).
- B. Welding shall not be performed when the ambient temperature in the immediate vicinity of the weld is lower than 0° F or when surfaces are wet or exposed to rain, snow, dust, or high wind. Enclosures may be required to protect the welder and items being welded from adverse weather condition.

5.0 MATERIALS

- A. Base Materials
 - 1. Only the materials specified on the Non-Code WTS or a comparable ASME or AWS WPS may be welded using this procedure.
- B. Filler Materials
 - 1. Welding filler materials to be used with this procedure are specified in the WPS or WTS. A listing of applicable welding filler materials is provided in GWS 1-07, *Material Specifications*.
 - 2. Requirements for the purchase and control of welding filler material shall be in accordance with GWS 1-03, *Welding and Brazing Material Procurement and Control*.

6.0 BASE MATERIAL JOINT PREPARATION

- A. Surfaces and edges to be welded should be smooth, uniform, and free from fins, tears, cracks, and other discontinuities that would adversely affect the quality or strength of the weld.
- B. Members to be joined may be cut to shape and size by machining, shearing, chipping, grinding, thermal cutting, or air carbon arc gouging. Kerf or gouge marks on the joint bevel deeper than 1/8" (0.125) shall be repaired prior to fit-up and tack welding.

7.0 BASE MATERIAL JOINT CLEANING

- A. Prior to welding, surfaces for welding should be clean and free from paint, oil, rust, scale, slag, grease, and other foreign materials that are detrimental to welding.
- B. Solvents may be used for cleaning the area to be welded. Approved examples for use are methyl alcohol, ethyl alcohol, isopropyl alcohol, acetone, methyl ethyl ketone, toluene, Varson 4, Dowanol EB, and Stoddard solvents.

8.0 JOINT FIT-UP AND ALIGNMENT

- A. The root opening and fit-up tolerances is specified in GWS 1-06, *Weld Joint Design*. If the tolerances cannot be achieved, the end preparations may be built up by welding or re-prepared by machining or grinding.
- B. The parts to be joined by a tee or fillet weld shall be brought into as close contact as is practicable. The recommended maximum gap between these parts should not exceed $3/16$ inch. If the separation is greater than $1/16$ inch, each leg of the fillet weld should be increased by the amount of separation.
- C. Parts to be joined by butt welding should be carefully aligned to maintain an offset not to exceed $1/8$ inch. In correcting misalignment in such cases, the parts may be correct as described in 8A above.
- D. The parts to be joined by partial penetration groove welds parallel to the length of the member should be brought into as close contact as practicable. The recommended gap between parts should not exceed $3/16$ inch.

9.0 PREHEAT

- A. When the base material temperature is below 32° F the base material shall be heated to or above the minimum preheat temperature specified in the Non-Code WTS or a comparable ASME or AWS WPS prior to welding.

10.0 TACK WELDS

- A. Tack welds shall be made by a certified welder in accordance with the WTS or a comparable ASME or AWS WPS.
- B. Acceptable tack welds may be incorporated into the final weld.
- C. Defective tack welds shall be removed or repaired prior to welding.

11.0 BACKPURGES/GAS BACKING

No requirements.

12.0 INTER-PASS TEMPERATURE

No requirements.

13.0 WELD TECHNIQUE

- A. Welding voltage and amperage shall be in accordance with the limits specified on the WTS or a comparable ASME or AWS WPS.
- B. Cracks or other unacceptable defects that appear on the surface of a weld bead shall be removed by filing, grinding, chipping, or air carbon arc gouging before depositing the next bead.
- C. Before welding over previously deposited material, all slag and flux shall be removed, and the weld and adjacent base material shall be brushed clean.
- D. The recommended maximum size of single-pass fillet welds and root passes of multiple-pass fillet welds are:
 - $\frac{3}{8}$ inch in the flat position
 - $\frac{5}{16}$ inch in the horizontal and overhead positions
 - $\frac{1}{2}$ inch in the vertical position.
- E. The recommended maximum thickness of layers subsequent to root passes of groove and fillet welds is:
 - $\frac{1}{8}$ inch for the flat position
 - $\frac{3}{16}$ inch for vertical, overhead, and horizontal positions.
- F. Peening
 - 1. Peening of materials may be used to control distortion or to relieve residual stresses. Peening shall not be applied to cover passes until the weld is visually accepted.
- G. Control of Distortion and Shrinkage
 - 1. Members to be welded should be brought into correct alignment and held in position by bolts, clamps, wedges, other suitable devices or tack welded until welding has been completed. The use of jigs and fixtures is recommended where practicable.
 - 2. In assembling and joining parts or in welding reinforcing parts to members, the procedure and sequence used to minimize distortion and shrinkage.
 - 3. The welding sequence applied, in conjunction with the WTS or a comparable ASME or AWS WPS and overall fabrication methods, produce structures or components meeting the specified quality requirements.
- H. All welding processes shall be as specified on the WTS or a comparable ASME or AWS WPS.

14.0 INSPECTOR QUALIFICATION

- A. The Inspector who performs welding inspection for acceptance to this procedure shall be authorized by the LANL WPA.

15.0 ACCEPTANCE CRITERIA FOR COMPLETED WELDS

- A. Butt Welds
 - 1. As-welded surfaces are permitted; however, the surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, abrupt ridges, and valleys.
 - 2. Undercut shall not exceed 1/32 inch or encroach on the minimum required section thickness.
 - 3. Weld reinforcement shall not exceed $\frac{1}{8}$ inch in height and have gradual transition to the plane of the base material surface.
 - 4. Complete fusion shall be obtained.
 - 5. Weld joint penetration should be as specified by the engineering document.
- B. Fillet Welds
 - 1. As-welded surfaces are permitted; however, the surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, abrupt ridges, and valleys.
 - 2. Fillet welds may vary from concave to convex, with the recommended maximum convexity not to exceed 1/8 inch. The size of a fillet weld is determined as shown in Attachment 1 or 2.
 - 3. Visual acceptance criteria for fillet welds is as described in 15.A. 3, 15.A.4 and 15.A.5.
 - 4. Weld beads shall be continuous through high stress areas such as corners.
- C. Arc Strikes
 - 1. Cracks or blemishes outside of the area of welds resulting from arc strikes should be ground to a smooth contour but not below the section thickness.

16.0 WELD REPAIRS

- A. Weld repairs shall be performed using the original Non-Code WTS or an alternate repair WTS to restore a weld to an acceptable condition.
- B. Unacceptable portions of the weld may be removed by machining, grinding, chipping, or air carbon arc gouging. The resulting surfaces should be cleaned thoroughly before welding.
- C. The repaired weld to be reexamined by the method originally used, and the same technique and quality acceptance criteria shall be applied.

17.0 POST WELD HEAT TREATMENT

No requirements.

18.0 ATTACHMENT WELDS

No requirements.

19.0 ATTACHMENTS

Attachment 1: Weld Profiles and Sizes

Attachment 2: Minimum Fillet Weld Size

Attachment 3: Maximum Detailed Size of Fillet Weld Along Edges