Los Alamos NATIONAL LABORATORY EST.1943

Blue Sheet
Engineering Division

DCN:

This Blue Sheet applies to:
☒ Individual Policy/Procedure Listed Below

LANL review date: 12/1/08

Policy/Procedure No:	**Rev. No.:**	**Date:**
# KSL – VT - Procedure- 16-30-008	0	1/27/06

Manual, Policy or Procedure Title:

Visual Weld Inspection for AWS D1.1

Reason for Revision (if complete revision is checked above)
Roll over of SSS contractor activities and work to LANL/LANS

Documents listed above will be reviewed and conformed to by:
All personnel qualified to perform Visual Inspection for acceptance of welding & related fabrications.

Description of Change:
1.0 Purpose – No change

2.0 Scope – Delete - ”Quality Control (QC) Department”

3.0 Definitions – No change

4.0 Responsibilities – Delete “QC in paragraph title
Modify to read - Personnel performing inspections shall be qualified and certified in accordance with ESM, Chapter 13 – Welding & Joining, Volume 1, GWS 1-11 Inspector Qualification.

5.0 Methodology - No Changes

6.0 Records – Modify to read
Welding Inspection records will meet the requirements of ESM, Chapter 13 – Welding & Joining, Volume 1,GWS1-02, Administrative Control of Welding & Brazing, Para. 5.8.A & B.

7.0 References – Delete –
16-30-001 Procedure for Qualification and Certification of NDE Personnel
http://intranet.ksl.lanl.gov/crypt/dept_ap/16-30-001.pdf
Add –
ESM, Chapter 13 – Welding & Joining, Volume 1, GWS 1-11 Inspector Qualification
Implementation Support Document ISD 330-5.0 – Special Processes

1.0 Attachments:
Delete – “Form 16-30-008.1 Weld Inspection Form”
Add – GWS 1-11 Attachment 3 Weld Inspection Record, - located at:
http://engstandards.lanl.gov/engrman/13weld/pdf/Vol1/GWS%201-02-Att.3R1.pdf

Date Revision Required: 12/1/10
Changes as marked
Reviewed by: ___Kelly Bingham_____ Date: ___12-3-08____ LANL Welding Program Administrator
Approved by: ____Signature on File_____ Date: 3/31/09____ ____ Signature on File____ Date: 3/31/09____ ES - DE Group Leader ES - DE Division Leader
MSS Policy/Procedures Review Team please forward original Blue Sheet to Luci Chavez upon approval

VISUAL WELD INSPECTION

16-30-008

IMPLEMENTATION

Affected Personnel: QC CWI CERTIFIED WELDING INSPECTORS

Training Decision: Access Briefing and Required Reading

Procedure Owner: Performance Assurance

Release Date: 1/25/06	**Next Revision Date:** 1/25/09
Procedure Type: Administrative Procedure	**Revision Number:** 0
Procedure Level: Department	**Effective Date:** 01/27/2006

DOCUMENT MODIFICATION HISTORY

Rev No.	Description of Modification
0	New QC Department procedure.

DOCUMENT REVIEW AND APPROVAL

Function	Name	Position Title	Date	Signature
Prepared by	Leslie Johnson	KSL Technical Writer	01/25/06	Signature On File
Reviewed by	Gerald Woodson	Quality Control Manager	01/25/06	Signature On File
	Richard Bingham	Fabrication Inspection Supervisor	01/25/06	Signature On File
Approved by	Mike Goodwin	Performance Assurance Director	01/27/06	Signature On File

TABLE OF CONTENTS

1.0 PURPOSE

This procedure will describe the process for visual and dimensional inspection of welds. This procedure meets the requirements of AWS D1.1-2002 for cyclically loaded non-tubular connections.

2.0 SCOPE

This procedure is applicable to Quality Control (QC) Department Welding Inspectors, and describes the qualifications for cyclically loaded non-tubular connections.

3.0 DEFINITIONS/ACRONYMS

AWS – American Welding Society

CWI – Certified Weld Inspector

QC – Quality Control

4.0 RESPONSIBILITIES

QC Weld Inspectors - Personnel performing visual and dimensional inspection of welds shall be certified and qualified to a Level II VT per KSL Procedure 16-30-001 and be certified by AWS as a Certified Weld Inspector (CWI).

5.0 METHODOLOGY

5.1 GENERAL INFORMATION

1. The lighting in the test area shall be a minimum of 100 foot-candles to allow for easy observation of indications on the test surface.
2. Visual inspection of the welds shall include the weld and 3 inches of the base material on either side of the weld.
3. Size and contours of welds shall be measured using standard measuring devices such as:
    - Fillet weld gauges
    - Scales
    - Calipers
    - Undercut gauges
    - Other weld inspection gauges or methods as necessary.
4. Surfaces of the weld and adjacent base metal to be inspected shall be cleaned prior to the inspection using wire brushes, wire wheels, grinding, chipping or other methods as required to remove slag, arc marks, spatter or other debris which would impair the inspection processes.

5.2 DIRECT VISUAL EXAMINATION

1. Direct visual examination shall be performed when access is sufficient to place the eye within 24 inches of the surface to be examined and at an angle not more than 60 degrees from perpendicular of the surface to be examined.

2. Mirrors may be used to improve the angle of vision, and aids such as a magnifying lens may be used to assist examinations.

5.3 REMOTE VISUAL EXAMINATION

1. When the requirements for direct visual examination cannot be met, remote visual examination shall be substituted for direct examination.
2. Remote visual examinations shall utilize visual aids such as borescopes, video probes, fiberscopes, cameras, or other suitable instruments.
3. Remote visual systems used shall have a resolution capability at least equivalent to that obtainable by direct visual observation.

5.4 WELD INSPECTION REQUIREMENTS

1. Alignment of butt joints shall be such that the maximum offset of the finished weld will not be greater than the applicable amount listed in Section 5.4.4.
2. Any offset within the allowable tolerance named in section 5.4.4 shall be faired at a three to one taper over the width of the finished weld or, if necessary, by adding additional weld metal beyond what would otherwise be the edge of the weld.
3. Cracks are prohibited. Any crack shall be unacceptable regardless of size or location.
4. Thorough fusion shall exist between adjacent layers of weld metal and between weld metal and base metal.
5. All craters shall be filled to provide the specified weld size, except for the ends of intermittent fillet welds outside of their effective length.
6. Weld profiles shall be in conformance with AWS D1.1- 2002, Section 5, Paragraph 5.24.
7. Visual inspection of welds shall be performed after a 72 hour wait time following completion of welding.
8. Fillet welds shall meet or exceed the size specified. The maximum convexity shall not exceed the values specified in AWS D1.1- 2002, Section 5, Figure 5.4.

5.4.2 Undercut

In primary members, undercut shall be no more than 0.01 in. deep when the weld is transverse to tensile stress under any design loading condition. Undercut shall be no more than 1/32 in. deep for all other cases.

NOTE: Nozzle welds and circumference welds are considered primary members and the welds are transverse to the tensile stress.

5.4.3 Porosity

1. The frequency of piping porosity in fillet welds shall not exceed 1 in each 4 inches of weld length and the maximum diameter shall not exceed 3/32 inch.
2. Complete joint penetration groove welds in butt joints transverse to the direction of computes tensile stress shall have no piping porosity. For all other groove welds, the frequency of piping porosity shall not exceed one in 4 inches of weld length and the maximum diameter shall not exceed 3/32 inch.

5.4.4 Butt Welds

NOTE: Reinforcement of butt welds shall not exceed 1/8 inch.

Maximum Allowable Offset in Finial Butt Welded Joints

Section Thickness, inches	Longitudinal/ Radial Welds	All Other Welds
Up to 1/2, inclusive	1/4 t	1/4 t
Over 1/2 to 3/4 , inclusive	1/8 in.	1/4 t
Over 3/4 to 1-1/2, inclusive	1/8 in.	3/16 in.
Over 1-1/2 to 2, inclusive	1/8 in.	1/8 t
Over 2	1/16 t (3/8 in. max)	1/8 t (3/4 in. max)

t= nominal thickness of the thinner section of the joint

6.0 RECORDS

All records will be maintained in an auditable and retrievable fashion.

7.0 REFERENCES

1. AWS D1.1-2002
2. AWS QC1- Standard and Guide for Certification and Qualification of Welding Inspectors
3. 16-30-001 Nondestructive Examination (NDE) Personnel Qualification and Certification. http://intranet.ksl.lanl.gov/crypt/dept/qs/procs/16-30-001.pdf

8.0 ATTACHMENTS

16-30-008.1, Weld Inspection Form

Weld Inspection form

PROJECT	WORK ORDER	DATE:
DCP NO. / FCR NO.	CODE OR SPECIFICATION	TYPE OF MATERIAL
WELD PROCEDURE	BASE METAL Heat No.	FILLER METAL HEAT/LOT No.
LOCATION	Welders signatures	
		ADDITIONAL WELDERS SIGN BACK

IDENTIFICATION	Welders Identifacation	INITIAL INSPECTION	REPAIR WELD INSPECTION	FINAL INSPECTION	WELDING PROCEDURE	WELDER QUALIFACATION	MATERIAL CONTROL	WELD SIZE /PROFILE	WELD LOCATION	CRACKS	INCOMPLETE PENETRATION	INCOMPLETE FUSION	POROSITY	BURN THROUGH	UNDER CUT	ARC STRIKES	WELD REINFORCEMENT	SUCKBACK			SATISFACTORY	UNSATISFACTORY	REMARKS

X=Atributes Inspected
X=SATISFACTORY/UNSATISFACTORY

ADDITIONAL NOTES

INSPECTOR SIGNATURE

LEVEL ☐ CAWI ☐ CWI ☐ SCWI

FOREMAN SIGNATURE

DATE

DATE