



INDUSTRIAL NUCLEAR CO., INC.

April 6, 2016

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington DC 20555  
**COPY TO:** Ms. Patricia Silva, Chief,  
Inspections and Operations Branch  
Division of Spent Fuel Management  
Office of Nuclear Material Safety and Safeguards

SUBJECT: Docket 710062/2016-201  
Response to Level IV Notice of Violation (NOV)

Dear Ms. Silva:

Industrial Nuclear Company (INC) provides the following response to the NOV identified in Docket 710062/2016-201:

This NOV identified that INC did not properly dedicate weld wire that was purchased as commercial grade; used weld wire that was not included in a Procedure Qualification Record and/or Weld Procedure Specification; and that INC does not have a form to document that all critical characteristics of a commercial grade item have been verified. INC performed the following investigative, remedial and preventative corrective actions:

INC issued NCR 0053 (Attachment 2) that identified the use of ER308L Si weld wire instead of ER308L. This NCR affected 67 IR100s of which 31 remained in stock and were placed on hold. INC forwarded the NCR to INC's design and package testing consultant, Areva, for review of impact on design qualification testing of the IR100. The Engineering Evaluation and related technical information is included as part of Attachment 2. The Engineering Evaluation concluded that there was no impact on design qualification testing, and NCR 0053 was closed.

INC issued Corrective Action Report 16-004 (Attachment 1) to identify the programmatic concern that INC did not have one form that captured completion of verification of all critical characteristics following dedication activities. INC issued Quality Procedure 3.2, "Commercial Grade Item Dedication," Revision 5, February 1, 2016, Attachment 3.2.B, "Verification of Critical Characteristics" form (Attachment 4). Training of all cognizant personnel to QP 3.2, Revision 5 was completed as shown on Attachment 5. All actions required by CAR 16-004 were completed and the CAR was closed.

INC's American Welding Society Certified Welding Inspector reviewed INC's PQRs and created a new Welding Procedure Specification to include all sizes and types of weld wire in use at INC. WPS-LSC-001 and all related American Society of Mechanical Engineers (ASME) Code references for creation of this WPS are included as Attachment 3.

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NM5501

INC has completed all investigative, remedial and preventative actions related to this NOV. If you should have any questions, please feel free to contact me, Mike Rose, at 510.352.6767.

Sincerely,



Mike Rose  
Quality Assurance Manager, Industrial Nuclear Company

Attachments:

- 1) Corrective Action Report 16-004, Pages 1-2.
- 2) Nonconformance Report 0053, Pages 1-8.
- 3) Welding Procedure Specification WPS-LSC-001 and ASME justifications, Pages 1-8
- 4) QP 3.2, Attachment 3.2.B, Page 1.
- 5) INC Training Records, Pages 1-3.

Attachment 16.1.A  
**CORRECTIVE ACTION REPORT**

- 1. CAR NUMBER : 16-004                      2. DATE: 1/29/2016
- 3. REQUIREMENT REFERENCE: QP 7.1 Rev 5 Paragraph 3.1 and 8.1
- 4. DESCRIPTION OF CONDITION : QP 7.1 Rev 5 Paragraph 3.1 requires the QAM to develop a program to assure that ITS items conform to the applicable design drawing. Paragraph 8.1, "Dedication of Commercial Grade Items" requires quality verification measures be performed to the extent necessary to verify the acceptability and conformance of an item to the design requirements. Contrary to these requirements, the verification activities for commercially procured weld wire were not sufficient to identify the receipt, testing and use of an unspecified weld material in a Category A application. Programmatically, there is no form that provides objective evidence that all of the dedication activities were completed and were acceptable.
- 5. POTENTIALLY REPORTABLE UNDER 10CFR PART 21: YES  NO
- 6. SIGNIFICANT CONDITION ADVERSE TO QUALITY: YES  NO
- 7. RECOMMENDED CORRECTIVE ACTION (include investigative, remedial, and to prevent recurrence) 1) Issue an NCR to identify the nonconforming IR100s related to this incident and place those in stock on hold pending engineering evaluation. 2) Notify customers as required by 10CFR 71.95. 3) Develop a work instruction to establish adequate measures for the procurement, receipt inspection, internal and external testing, and final acceptance for use of the product. 4) Identify all nonconforming weld material and control per QP 15.1. 5) Review all welding procedures and revise as necessary to comply with the controlling code and approved design. 6) Develop a form for each dedication plan that provides evidence that all dedication activities have been complete satisfactorily. 7) Train all individuals involved in these activities to the new work instruction requirements.
- 8. STOP WORK ORDER ISSUED: YES  NO
- 9. QAM/DATE: DWB 1/29/2016

**CORRECTIVE ACTION**

- 10. CAUSE OF CONDITION: SEE ATTACHED
- 11. CORRECTIVE ACTIONS TAKEN (include investigative, remedial, and to prevent recurrence): SEE ATTACHED
- 12. CORRECTIVE ACTIONS COMPLETED BY/DATE: [Signature] 4/1/2016

**CORRECTIVE ACTION VERIFICATION:**

- 13. CORRECTIVE ACTIONS TAKEN OR VERIFIED: SEE ATTACHED
- 14. QAM/DATE: [Signature] 4/4/2016

## CORRECTIVE ACTION REPORT 16-004

10. CAUSE OF CONDITION: *Not required, this was not a significant condition adverse to quality.*

11. CORRECTIVE ACTIONS TAKEN (include investigative, remedial, and to prevent recurrence):

1) *NCR 0053 was issued and all IR100s in stock were red tagged and placed on hold.* 2) *Customer notification was deemed unnecessary based on completion of an Engineering Evaluation, performed by Areva (INC's design qualification testing consultant) and approved by INC's engineer.* 3) *QP 3.2 Revision 5, February 1, 2016 was issued to provide measures to assure that all critical characteristics of dedicated items are verified as required, and documented. QP 3.2 includes a new form, ATTACHMENT 3.2.B, "VERIFICATION OF CRITICAL CHARACTERISTICS," to implement this requirement.* 4) *All ER308l Si was placed on hold pending completion of the NCR 0053 Engineering Evaluation.* 5) *INC's American Welding Society Certified Welding Inspector consultant reviewed INC's PQRs and issued WPS-LSC-001 and provided all ASME Code justifications for issuance of this new WPS.* 6) *As noted in Item 3, QP 3.2 Revision 5, February 1, 2016 was issued to provide measures to assure that all critical characteristics of dedicated items are verified as required, and documented. QP 3.2 includes a new form, ATTACHMENT 3.2.B, "VERIFICATION OF CRITICAL CHARACTERISTICS," to implement this requirement. In order to prevent recurrence, all cognizant personnel were trained in the use of QP 3.2, "Verification of Critical Characteristics" form.*

13. *Verified issuance of NCR 0053 and the completed Engineering Evaluation; WPS-LSC-001 and ASME Code justifications; QP 3.2, Revision 5; and training to QP 3.2 Revision 5.*

Attachment 15.1  
INC NONCONFORMANCE REPORT

1. NCR NUMBER: 0053 2. DATE: 1/29/2016  
 3. ITEM/PRODUCT DESCRIPTION: IR100 Lock Box Weldment  
 4. REQUIREMENT REFERENCE: Design Drawing IR100 1B, Rev 2  
 5. DESCRIPTION OF NONCONFORMANCE: Contrary to Note 9 on the referenced drawing, GTAW filler material ER308L Si was used instead of the specified ER308L. IR100s Serial Numbers 7404 to 7501 were welded using the unspecified filler material. Thirty-one of the IR100s remain in stock, sixty-seven have been shipped to customers.  
 6. IDENTIFIED BY/DATE: [Signature] 1/29/2016  
 7. QAM/DATE: [Signature] 1/29/2016

## NCR DISPOSITION

- USE-AS-IS  REPAIR  REWORK   
 REJECT  SCRAP   
 RETURN TO VENDOR

8. DESCRIBE DISPOSITION: SEE ATTACHED ENGINEERING EVALUATION.

9. DISPOSITION BY/DATE: [Signature] 2/3/2016  
 10. APPROVED BY/DATE: [Signature] 2/3/2016

NOTE: USE-AS-IS AND REPAIR DISPOSITIONS REQUIRE ENGINEERING EVALUATION PER QP 15.1, PARAGRAPH 7.6. ATTACH TO NCR.

## REPORTABILITY REVIEW

11. POTENTIALLY REPORTABLE UNDER 10CFR PART 21: YES  NO   
 12. QAM/DATE: [Signature] 2/5/2016

## DISPOSITION COMPLETION

13. VERIFICATION OF COMPLETION OF DISPOSITION: see Attached Engineering EVALUATION.

14. VERIFIED BY/DATE: \_\_\_\_\_  
 15. QAM/DATE: [Signature] 2/5/2016

INC NCR Number 0053

Engineering Evaluation

The ASME specification number for weld filler materials ER308L and ER308LSi is SFA 5.9. With the exception of the silicon content, both filler materials have the exact same chemical composition requirements, as specified in Table 1 of ASME Boiler and Pressure Vessel (B&PV) Code, Section II, Part C, Subsection SFA-5.9/SFA-5.9M, with a F-number of 6. Per this table, the silicon composition range for ER308L and ER308LSi is 0.30-0.65 wt. % and 0.65-1.00 wt. %, respectively. The increased silicon in ER308LSi filler material increases the weld pool fluidity, which produces a mitre fillet weld in the completed weld joint.

Since both materials have essentially the same material strength properties (as noted in the table below), the use of GTAW ER308LSi filler material in lieu of the specified GTAW ER308L weld filler material for attaching the lock boxes to IR100 cameras does not affect the strength of the fillet weld joint. Therefore, the performance of the as-welded lock boxes on the IR100 cameras is unaffected by the use of the ER308LSi weld filler material.

**Typical Properties for ER308L and ER308LSi Weld Filler Materials**

Property	ER308L	ER308LSi
Typical Tensile Strength*	85,000 psi	86,000 psi
Typical Yield Strength*	58,000 psi	57,000 psi
Percent Elongation in 2 in.*	36	42

\* Reference: Pinnacle Alloys Data Sheets, 1114REV1

Gary A. Clark      2/4/16  
 PREPARED BY: GARY CLARK, AREVA      DATE

J. H. Clark      2/5/16  
 APPROVED BY INC EM      DATE



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**ER308L DATA SHEET**

**Pinnacle Alloys ER308L**

AWS CLASS ER308L

**CODE AND SPECIFICATION DATA:**

AWS A5.9 ASME SFA 5.9; UNS S30883

**DESCRIPTION:**

Pinnacle Alloys ER308L is designed with lower carbon content to reduce the possibility of chromium carbide precipitation. Pinnacle Alloys ER308L is utilized to weld base metals of similar composition, including AISI 301, 302, 304, 304L, 308, and 308L. It is well suited for welding chemical, food processing, brewery, and pharmaceutical equipments.

**DIAMETERS:** .023", .030", .035", .045", 1/16", 3/32", 1/8", 5/32", 3/16"

**TYPICAL CHEMICAL COMPOSITION (Wt %):**

Carbon (C)	0.02
Chromium (Cr)	20.5
Copper (Cu)	0.21
Iron (Fe)	Balance
Manganese (Mn)	1.70
Molybdenum (Mo)	0.30
Nickel (Ni)	10.5
Phosphorous (P)	0.02
Silicon (Si)	0.40

**TYPICAL MECHANICAL PROPERTIES (as welded):**

Tensile Strength (psi)	85,000 psi (587 MPa)
Yield Strength (psi)	58,000 psi (400 MPa)
Percent Elongation in 2"	36%

**TYPICAL GMAW PARAMETERS (Spray Transfer Welding with Bare Stainless Wire):**

Diameter	Type of Power	Amperage	Volts	Stickout	98% Ar/ 2% O <sub>2</sub> (cfh)
.030"	DCEP	130-200	23-27	3/8"-1/2"	35
.035"	DCEP	150-225	23-26	1/2"-3/4"	35
.045"	DCEP	200-325	24-28	1/2"-3/4"	35
1/16"	DCEP	300-350	24-27	1/2"-3/4"	35



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**TYPICAL GMAW PARAMETERS (Short-Circuiting Welding with Bare Stainless Wire):**

Diameter	Type of Power	Amperage	Volts	Stickout	90% He/ 7½% Ar/ 2½% CO <sub>2</sub> (cfh)
.030"	DCEP	50-150	14-20	3/8"-1/2"	25
.035"	DCEP	60-200	14-22	3/8"-1/2"	25
.045"	DCEP	75-225	15-23	3/8"-1/2"	25
1/16"	DCEP	100-250	16-23	3/8"-1/2"	25

**TYPICAL GTAW PARAMETERS (Welding with Stainless Cut-Lengths\*):**

Diameter	Metal Thickness	Number of Passes	Tungsten Size	Amperage	Travel Speed (in/min)
1/16"	1/16"	1	1/6"	35-60	12
3/32"	3/32"	1	1/16"	45-85	12
3/32"	1/8"	1	1/16"	55-100	12
1/8"	3/16"	1	3/32"	65-130	10

\*DCEN, Argon Shield, Tungsten Electrode

**TYPICAL SAW PARAMETERS:**

Diameter	Amperage	Volts	Flux
1/16"			Call SOWESCO
3/32"	275-350	28-33	
1/8"	350-450	29-32	
5/32"	400-550	30-33	

**NOTICE:** The results reported are based upon testing of the product under controlled laboratory conditions in accordance with American Welding Society Standards. Actual use of the product may produce different results due to varying conditions. An example of such conditions would be electrode size, plate chemistry, environment, weldment design, fabrication methods, welding procedure and service requirements. Thus the results are not guarantees for the use in the field. The manufacturer disclaims any warranty of merchantability of fitness for any particular purpose with respect to its products.

**CAUTION:** Consumers should be thoroughly familiar with the safety precautions on the warning label posted in each shipment and in the American National Standards A49.1, "Safety in Welding and Cutting," published by the American Welding Society, 550 NW LeJune Road, Miami, FL 33126: OSHA Safety and Health Standards 29 CRF 1910 is available from the U.S. Department of Labor, Washington, D.C. 20210.

Pinnacle Alloys MSDS sheet may be obtained at [www.pinnaclealloys.com](http://www.pinnaclealloys.com).





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## ER308LSi DATA SHEET

### Pinnacle Alloys ER308LSi

AWS CLASS ER308LSi

#### CODE AND SPECIFICATION DATA:

AWS A5.9 ASME SFA 5.9; UNS S30888

#### DESCRIPTION:

Pinnacle Alloys ER308LSi features a higher silicon content which delivers a smooth bead appearance and enhanced wetting action. This wire offers improved resistance to general and intergranular corrosion. Pinnacle Alloys ER308LSi is designed for general purpose GMAW welding. It is also suitable for joining 304 for service temperatures up to approximately 660°F. 308LSi provides a smooth weld profile for many GMAW applications involving stainless steel sheet and plate welding.

**DIAMETERS:** .023", .030", .035", .045", 1/16", 3/32", 1/8"

#### TYPICAL CHEMICAL COMPOSITION (Wt %):

Carbon (C)	0.02
Chromium (Cr)	20.0
Copper (Cu)	0.19
Iron (Fe)	Balance
Manganese (Mn)	1.60
Molybdenum (Mo)	0.30
Nickel (Ni)	10.0
Phosphorous (P)	0.025
Silicon (Si)	0.80
Sulfur (S)	0.015

#### TYPICAL MECHANICAL PROPERTIES (as welded):

Tensile Strength (psi)	86,000 psi (593 MPa)
Yield Strength (psi)	57,000 psi (393 MPa)
Percent Elongation in 2"	42%

#### TYPICAL GMAW PARAMETERS (Spray Transfer Welding with Bare Stainless Wire):

Diameter	Type of Power	Amperage	Volts	Stickout	98% Ar/ 2% O <sub>2</sub> (cfh)
.030"	DCEP	130-200	23-27	3/8"-1/2"	35
.035"	DCEP	150-225	23-26	1/2"-3/4"	35
.045"	DCEP	200-325	24-28	1/2"-3/4"	35
1/16"	DCEP	300-350	24-27	1/2"-3/4"	35



Pinnacle Alloys are products of SOWESCO

**TYPICAL GMAW PARAMETERS (Short-Circuiting Welding with Bare Stainless Wire):**

Diameter	Type of Power	Amperage	Volts	Stickout	90% He/ 7½% Ar/ 2½% CO <sub>2</sub> (cfh)
.030"	DCEP	50-150	14-20	3/8"-1/2"	25
.035"	DCEP	60-200	14-22	3/8"-1/2"	25
.045"	DCEP	75-225	15-23	3/8"-1/2"	25
1/16"	DCEP	100-250	16-23	3/8"-1/2"	25

**TYPICAL GTAW PARAMETERS (Welding with Stainless Cut-Lengths\*):**

Diameter	Metal Thickness	Number of Passes	Tungsten Size	Amperage	Travel Speed (in/min)
1/16"	1/16"	1	1/8"	35-60	12
3/32"	3/32"	1	1/16"	45-85	12
3/32"	1/8"	1	1/16"	55-100	12
1/8"	3/16"	1	3/32"	65-130	10

\*DCEN, Argon Shield, Tungsten Electrode

**NOTICE:** The results reported are based upon testing of the product under controlled laboratory conditions in accordance with American Welding Society Standards. Actual use of the product may produce different results due to varying conditions. An example of such conditions would be electrode size, plate chemistry, environment, weldment design, fabrication methods, welding procedure and service requirements. Thus the results are not guarantees for the use in the field. The manufacturer disclaims any warranty of merchantability of fitness for any particular purpose with respect to its products.

**CAUTION:** Consumers should be thoroughly familiar with the safety precautions on the warning label posted in each shipment and in the American National Standards A49.1, "Safety in Welding and Cutting," published by the American Welding Society, 550 NW LeJune Road, Miami, FL 33126: OSHA Safety and Health Standards 29 CFR 1910 is available from the U.S. Department of Labor, Washington, D.C. 20210.

Pinnacle Alloys MSDS sheet may be obtained at [www.pinnaclealloys.com](http://www.pinnaclealloys.com).

## MIDALLOY ER308L BARE WIRE

### CLASSIFICATION

- AWS 5.9 Class ER308L / ASME SFA 5.9 Class ER308L

### DESCRIPTION

- MIDALLOY ER308L stainless steel wire is used for GMAW, GTAW and SAW welding.

### APPLICATIONS

- MIDALLOY ER308L is used to weld metals with similar composition; such as 304L (UNS S30403), in wrought and cast forms. This product is melted to reduce levels of carbon, phosphorus, and sulfur to reduce micro-fissuring.

### TYPICAL CHEMISTRY

C	Si	Cr	Mn	P	Cu	S	N	Mo	Ni
.015	.48	20	1.85	.015	<.20	.010	<0.60	<.50	10.1

### TYPICAL MECHANICAL PROPERTIES

TENSILE STRENGTH	88,000 PSI
YIELD STRENGTH	57,500 PSI
ELONGATION IN 2"	35%
CHARPY IMPACT @-320° F	45 FT-LBS

### RECOMMENDED WELDING PARAMETERS

PROCESS	DIAMETER	VOLTAGE	AMPERAGE	GAS/FLUX*
TIG (GTAW)	1/16"	14-18	90-130	100% Ar
	3/32"	15-20	120-175	100% Ar
	1/8"	15-20	150-220	100% Ar
MIG (GMAW)	.035" SHORT ARC	16-26	70-160	69%Ar-30%He-1%O <sub>2</sub>
	.035" SPRAY ARC	26-31	150-230	92%Ar-8%Co <sub>2</sub> or
	.045" SPRAY ARC	28-32	180-280	98%Ar-2%O <sub>2</sub>
SUB ARC (SAW)	3/32"	28-30	275-350	Record IN or
	1/8"	29-32	350-450	Record IND 24

### PACKAGING

- TIG 10 lb. tube/60 lb. carton
- MIG 30 lb. spool
- SUB-ARC 60 lb. coil

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Office and Corporate Warehouse  
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*Midalloy*

**Class:** ER308LSI

**AWS:** A5.9

Conforms to Certification: AWS A5.9

ASME SFA A5.9

Weld Process Used for Tig (GTAW)

AWS Chemical Composition Requirements

C = 0.03 max

Cr = 19.5 – 22.0

Ni = 9.0 – 11.0

Mo = 0.75 max

Mn = 1.0 – 2.5

Si = 0.65 – 1.0

P = 0.03 max

S = 0.03 max

Cu = 0.75 max

Application

WW308LSI is suitable for joining stainless steels of the 304 type and 308 types.

Welding speed is higher than 308 or 308L due to improved weldability of the weld metal.

Deposited Chemical Composition % (Typical)

C = 0.016      Si = 0.85      Mn = 1.65

P = 0.016      S = 0.008      Cr = 20.65

Ni = 10.0

Mechanical Properties (R.T.)

Yield Strength      59,000 psi

Tensile Strength      87,000 psi

Elongation      39%

Reduction of Area      60%

Deposited All Weld Metal Properties

Data is typical for ER308LSI weld metal deposited by Tig using 100% Argon as the shielding gas.

Attachment 9.2.B  
Welding Procedure Specification

Company Name: Industrial Nuclear Company By: Mark Warzyniak #90120751

Welding Procedure Specification No: WPS-LSC-001 Date: 02-20-16

Supporting PQR's: PQR 17-98-001 and PQR-THC 001

Welding Process: GTAW Type: Manual

Joints

Joint Design Single V-Groove Butt/Tee/Edge - Fillet Edge/Tee/Lap

Backing material None

Sketch - All Grooves 45 degree included angle with Root opening 1/16"  
Fillet interference fit to 1/64" gap

Base Metals: P-No 8 Grp 1 to P-No 8 Grp 1

45 Degree Single V-  
Included Angle  
Root Opening 1/16"  
Corner / Tee & V-Butt

Butt

Position All



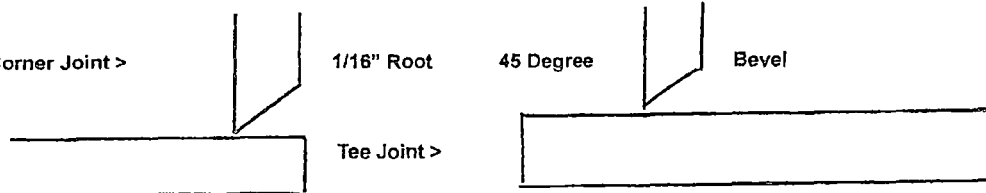
45 Degree Included

Corner Joint >

1/16" Root

45 Degree

Bevel



Tee Joint >

Material Spec and Grade: 304 and 304L

Thickness Range:

Base metal: Groove 1/16" to 1/2" Fillet 1/16" to 1/2"

Pipe Diameter Range: Groove 2-7/8" to Unlimited Fillet 1/16" to Unlimited

Other \_\_\_\_\_



Mark G Warzyniak  
CWI 90120751  
QC1 EXP. 12/1/2017

*Handwritten signature and date:*  
#90120751  
02-20-16

INDUSTRIAL NUCLEAR COMPANY  
QUALITY PROCEDURE 9.1  
"CONTROL OF THE WELDING PROCESS"

Attachment 9.2.B  
Welding Procedure Specification

\* Filler Metals (QW-404)

Spec. No. (SFA)	5.9	
AWS No. (Class)	308L / 308L (SI)	
F-No.	6	
A-No.	8	
Size of Filler Metals	3/32" and 1/32" and 1/16"	
Deposited Weld Metal	1/16" to 5/32"	
Thickness Range:		
Groove	0.0937 to 0.28	
Fillet	0.0937 to 0.28	
Electrode Flux (Class)		
Flux Trade Name	N/A	
Consumable Insert	N/A	
Other	N/A	

\* Each base metal-filler metal combination recorded individually.

POSITIONS (QW-405)

Positions of Groove ALL  
Progression (Up/Down) UP  
Positions of Fillet ALL

POST WELD HEAT TREATMENT (QW-407)

Temperature Range N/A  
Time Range N/A

PREHEAT (QW-406)

Preheat Temp. Min. 50 F  
Inter-Pass Temp Max. 350 F  
Preheat Maintenance NONE  
Shielding YES  
Trailing NO  
Backing YES

GAS (QW-408)

Percent Composition  
Gas Mixture FlowRate  
99.97% ARGON @ 20 TO 35 CFH  
NONE  
99.97% ARGON @ 20 TO 35 CFH

ELECTRICAL CHARACTERISTICS (QW-409)

AC or DC DC Polarity NEGATIVE (Straight) Amps and volts ranges each electrode size

AMP(Range) 120 TO 200 Volts (Range) 13 TO 15

Tungsten Electrode Size and type 3/32"  
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW N/A  
(Spray arc, short circuiting arc, etc.)

Electrode wire feed speed range N/A

TECHNIQUE (QW-410)

String or weave bead STRING Orifice or gas Cup size #7

Initial and Inter-Pass Cleaning (Brushing, Grinding, etc.) SS BRUSH / GRINDING

Method of Back Gouging N/A Oscillation YES

Contact Tube to Work Distance N/A Multiple or Single Pass per Side MULTIPLE

Travel Speed (Range) 4 IPM Peening None

Prepared by: [Signature] #90120751 Date 02-20-16

Approved by: [Signature] Date 03.28.2016



Mark G Warzyniak  
CWI 90120751  
QC1 EXP. 12/1/2017

QW 200-1(c)

*(c) Changes to the WPS.* Changes may be made in the nonessential variables of a WPS to suit production requirements without requalification provided such changes are documented with respect to the essential, nonessential, and, when required, supplementary essential variables for each process. This may be by amendment to the WPS or by use of a new WPS.

#### **QW-200.4 Combination of Welding Procedures**

*(a)* More than one procedure having different essential or nonessential variables may be used in a single production joint. Each procedure may include one or a combination of processes, filler metals, or other variables.

**QW-256**  
**WELDING VARIABLES PROCEDURE SPECIFICATIONS (WPS)**  
**Gas Tungsten-Arc Welding (GTAW)**

Paragraph	Brief of Variables	Essential	Supplementary Essential	Nonessential
QW-402 Joints	.1 $\phi$ Groove design			X
	.5 + Backing			X
	.10 $\phi$ Root spacing			X
	.11 $\pm$ Retainers			X
QW-403 Base Metals	.5 $\phi$ Group Number		X	
	.6 $\bar{T}$ Limits		X	
	.7 $\bar{T}/\bar{t}$ Limits > 8 in. (203 mm)	X		
	.8 $\phi$ $\bar{T}$ Qualified	X		
	.11 $\phi$ P-No. qualified	X		
.13 $\phi$ P-No. 5/9/10	X			
QW-404 Filler Metals	.3 $\phi$ Size			X
	.4 $\phi$ F-Number	X		
	.5 $\phi$ A-Number	X		
	.12 $\phi$ AWS class.		X	
	.14 $\pm$ Filler	X		
	.22 $\pm$ Consum. insert			X
	.23 $\phi$ Filler metal product form	X		
	.30 $\phi$ $t$	X		
	.33 $\phi$ AWS class.			X
.50 $\pm$ Flux			X	

**QW/QB-422 FERROUS P-NUMBERS AND S-NUMBERS**  
**Grouping of Base Metals for Qualification**

GENERAL NOTE: To convert from ksi to MPa, multiply tensile strength in table by 6.9.

Spec. No.	Type or Grade	UNS No.	Minimum Specified Tensile, ksi	Welding				Brazing		Nominal Composition	Product Form
				P-No	Group No.	S-No.	Group No.	P-No.	S-No.		
A 269	TP316	S31600	75	...	...	8	1	...	102	16Cr-12Ni-2Mo	Smts. & welded tube
A 269	TP316L	S31603	70	...	...	8	1	...	102	16Cr-12Ni-2Mo	Smts. & welded tube
A 269	TP304	S30400	75	...	...	8	1	...	102	18Cr-8Ni	Smts. & welded tube
A 269	TP304L	S30403	70	...	...	8	1	...	102	18Cr-8Ni	Smts. & welded tube
A 271	TP304	S30400	75	...	...	8	1	...	102	18Cr-8Ni	Smts. tube
A 271	TP304L	S30403	70	...	...	8	1	...	102	18Cr-8Ni	Smts. tube
SA-312	TP304L	S30403	70	8	1	...	...	...	102	18Cr-8Ni	Smts. & welded pipe
SA-240	Type 304	S30400	75	8	1	...	...	...	102	18Cr-8Ni	Plate, sheet & strip
SA-312	TP304	S30400	75	8	1	...	...	...	102	18Cr-8Ni	Smts. & welded pipe
SA-312	TP304L	S30403	70	8	1	...	...	...	102	18Cr-8Ni	Smts. & welded pipe



**QW-404.30** A change in deposited weld metal thickness beyond the range qualified in QW-451 for procedure qualification or QW-452 for performance qualification, except as otherwise permitted in QW-303.1 and QW-303.2. When a welder is qualified using radiography, the thickness ranges of QW-452.1 apply.

**QW-404.31** The maximum thickness qualified is the thickness of the test coupon.

QW-405 Positions	.1	+ Position			X
	.2	φ Position		X	
	.3	φ ↑↓ Vertical welding			X
QW-406 Preheat	.1	Decrease > 100°F (56°C)	X		
	.3	Increase > 100°F (56°C) (IP)		X	
QW-407 PWHT	.1	φ PWHT	X		
	.2	φ PWHT (T & T range)		X	
	.4	T Limits	X		
QW-408 Gas	.1	± Trail or φ comp.			X
	.2	φ Single, mixture, or %	X		
	.3	φ Flow rate			X
	.5	± or φ Backing flow			X
	.9	- Backing or φ comp.	X		
	.10	φ Shielding or trailing	X		

**QW-256**  
**WELDING VARIABLES PROCEDURE SPECIFICATIONS (WPS)**  
**Gas Tungsten-Arc Welding (GTAW) (CONT'D)**

Paragraph	Brief of Variables	Essential	Supplementary Essential	Nonessential
QW-400 Electrical Characteristics	.1 > Heat input		X	
	.3 ± Pulsing I			X
	.4 ∅ Current or polarity		X	X
	.9 ∅ I & E range			X
	.12 ∅ Tungsten electrode			X
QW-410 Technique	.1 ∅ String/weave			X
	.3 ∅ Orifice, cup, or nozzle size			X
	.5 ∅ Method cleaning			X
	.6 ∅ Method back gouge			X
	.7 ∅ Oscillation			X
	.9 ∅ Multi to single pass/side		X	X
	.10 ∅ Single to multi electrodes		X	X
	.11 ∅ Closed to out chamber	X		
	.15 ∅ Electrode spacing			X
	.25 ∅ Manual or automatic			X
	.26 ± Peening			X

Legend:

+ Addition      > Increase/greater than      ↑ Uphill      ← Forehand      ∅ Change  
 - Deletion      < Decrease/less than      ↓ Downhill      → Backhand

**QW-409      Electrical Characteristics**

**QW-409.1** An increase in heat input, or an increase in volume of weld metal deposited per unit length of weld, over that qualified. The increase may be measured by either of the following:

(a) Heat input [J/in. (J/mm)]

QW-409.1

2001 SE

$$= \frac{\text{Voltage} \times \text{Amperage} \times 60}{\text{Travel Speed [in./min (mm/min)]}}$$

(b) Volume of Weld Metal = an increase in bead size or a decrease in length of weld bead per unit length of electrode.

**QW-404.33** A change in the SFA specification filler metal classification, or, if not conforming to an AWS filler metal classification, a change in the manufacturer's trade name for the electrode or filler metal. When optional supplemental designators, such as those which indicate moisture resistance (i.e., XXXXR), diffusible hydrogen (i.e., XXXX H16, H8, etc.), and supplemental impact testing (i.e., XXXX-1 or EXXXXM), are specified on the WPS, only filler metals which conform to the classification with the optional supplemental designator(s) specified on the WPS shall be used.

**QW-404.37** A change in the composition of the deposited weld metal from one A-Number in QW-442 to any other A-Number, or to an analysis not listed in the table. Each AWS classification of A-No. 8 or A-No. 9 analysis of QW-442, or each nonferrous alloy in QW-432, shall require separate WPS qualification. A-Numbers may be determined in accordance with QW-404.5.

**QW-404.38** A change in the nominal electrode diameter used for the first layer of deposit.

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ATTACHMENT 4  
Page 1 of 1

## ATTACHMENT 3.2.B VERIFICATION OF CRITICAL CHARACTERISTICS

Part Number: \_\_\_\_\_ Reference Drawing/Rev: \_\_\_\_\_

Part Description: \_\_\_\_\_ Part Classification: \_\_\_\_\_

### Critical Characteristics:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

### Acceptance Criteria:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

### INSTRUCTIONS:

Attach the following objective evidence of critical characteristic verification:

- Independent laboratory analysis: attach a copy of the report. Indicate acceptance of that report by signing and dating the report and referencing on the related line below.
- Alloy analysis: attach a copy of the report. Indicate acceptance of that report by signing and dating the report and referencing on the related line below.
- Dimensions: Using a copy of the current approved drawing for the item, mark the dimensions verified on the drawing by initial and date. Next to each measurement, identify the M&TE used.
- Weight: Document the as-found weight of the item and indicate acceptance by signature and date on the corresponding line.
- Other: Signify acceptance by signature and date on the corresponding line.

### Verification of Critical Characteristics

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

The dedication activities for this item are complete and all critical characteristics have been verified as acceptable. This item is released for use.

Approved By: \_\_\_\_\_ Date: \_\_\_\_\_  
QAM

# INDUSTRIAL NUCLEAR COMPANY TRAINING RECORD

SUBJECT: Quality Procedure 3.2.

BASIS: Commercial Grade Item Dedication.

PERSON(S) TRAINED:

Mike Rose.

TYPE OF TRAINING:

SELF STUDY

CLASSROOM

ON-THE-JOB TRAINING

DATE: 4-4-2016

COMMENTS:

INSTRUCTOR/DATE:

MW R

4.4.2016

# INDUSTRIAL NUCLEAR COMPANY TRAINING RECORD

SUBJECT: Quality Procedure 3.2.

BASIS: Commercial Grade Item Dedication.

PERSON(S) TRAINED: Charles Bollinger

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TYPE OF TRAINING:

SELF STUDY  CLASSROOM  ON-THE-JOB TRAINING

DATE: 4-4-2016

COMMENTS:

INSTRUCTOR/DATE: 

**INDUSTRIAL NUCLEAR COMPANY**  
**TRAINING RECORD**

SUBJECT: Quality Procedure 3.2.

BASIS: Commercial Grade Item Dedication.

PERSON(S) TRAINED:

Ron Monteforte.  
\_\_\_\_\_  
\_\_\_\_\_

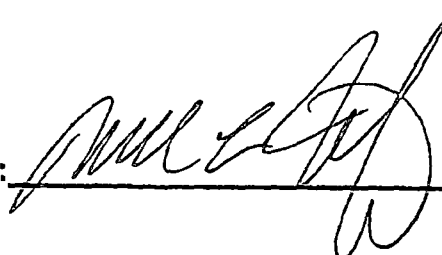
TYPE OF TRAINING:

SELF STUDY  CLASSROOM  ON-THE-JOB TRAINING

DATE: 2/1/2016

COMMENTS:

INSTRUCTOR/DATE:

 2/1/2016