



August 15, 2019

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69
NRC Docket Nos. 50-317 and 50-318

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

LaSalle County Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Nine Mile Point Nuclear Station, Unit 2
Renewed Facility Operating License Nos. DPR-63 and NPF-69
NRC Docket Nos. 50-220 and 50-410

Subject: Proposed Alternative to Utilize Code Case N-879

1. Letter from J. Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Proposed Alternative to Utilize Code Case N-879," date April 30, 2019
2. Letter from B. Purnell (U.S. Nuclear Regulatory Commission) to B. Hanson (Exelon Generation Company, LLC), Supplemental Information Needed to Support Request for Withholding Information Regarding Proposed Alternative to Use ASME Code Case N-879 (EPID L-2019-LLR-0037), date July 19, 2019

In the Reference 1 letter, in accordance with 10 CFR 50.55a(z)(1), Exelon Generation Company, LLC (Exelon) requested a proposed alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," on the basis that the proposed

alternative provides an acceptable level of quality and safety, equivalent to compliance with ASME Section III and XI requirements.

Specifically, this proposed alternative concerns the use of Code Case N-879, "Use of Micro-Alloyed Carbon Steel Bar in Patented Mechanical Joints and Fittings, Classes 1, 2, and 3 Section III, Division 1." This Code Case permits use of a material that does not comply with the limitations on material specifications and grades mandated by ASME Section III, NB/NC/ND-2121(a).

Reference 2 requested additional information concerning the proprietary documents contained in Reference 1. Attached are the updated markups.

Attachments 1, 2, 3, 4, and 5 contain information proprietary to Lokring Technology, LLC (Lokring). Lokring requests that these documents be withheld from public disclosure in accordance with 10 CFR 2.390(b)(4). Affidavits supporting this request are contained in each Attachment. Non-proprietary versions of these documents are contained in Attachments 6, 7, 8, 9, and 10.

There are no regulatory commitments contained in this letter.

If you have any questions, please contact Tom Loomis (610) 765-5510.

Respectfully,



David T. Gudger
Senior Manager - Licensing and Regulatory Affairs
Exelon Generation Company, LLC

- Attachments:
- 1) Affidavit and "Impact Test Results" (Proprietary Version)
 - 2) Affidavit and "Welding Procedure and Qualification Record" (Proprietary Version)
 - 3) Affidavit and "Metallurgical Test Report" (Proprietary Version)
 - 4) Affidavit and "HAZ Hardness Testing" (Proprietary Version)
 - 5) Affidavit and "Elevated Temperature Tensile Testing" (Proprietary Version)
 - 6) "Impact Test Results" (Non-Proprietary Version)
 - 7) "Welding Procedure and Qualification Record" (Non-Proprietary Version)
 - 8) "Metallurgical Test Report" (Non-Proprietary Version)
 - 9) "HAZ Hardness Testing" (Non-Proprietary Version)
 - 10) "Elevated Temperature Tensile Testing" (Non-Proprietary Version)

cc: Regional Administrator - NRC Region I
Regional Administrator - NRC Region III
NRC Senior Resident Inspector - Braidwood Station
NRC Senior Resident Inspector - Byron Station
NRC Senior Resident Inspector - Calvert Cliffs Nuclear Power Plant
NRC Senior Resident Inspector - Clinton Power Station
NRC Senior Resident Inspector - LaSalle County Station

ATTACHMENT 6

"Impact Test Results" (Non-Proprietary Version)

A DIVISION OF J.T. ADAMS Co., INC.



4520 WILLOW PARKWAY
CLEVELAND, OHIO 44125
PHONE: (216) 641-3290
FAX: (216) 641-1223
www.tensile.com

CERTIFIED TEST REPORT

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Lokring
38376 Apollo Parkway
Willoughby OH 44094

Job No.: 1812-21-1550**Date:** 1/7/2019**Cust. PO#:** 29867-00

*This report is amended on 1/28/2019

Description: 1 Sample(s) Round Bar 15V24 Bar 1.750" Dia.

Part#	ID#
1020237	@+70F

Material: 15V24 Heat# LOK180233**Spec:** LMS 92-10C**TEST RESULTS**

Part#	Charpy Type	Charpy Size	Dir	Test Temp. (°F)	Item	Energy (ft-lbs) (ft-lbs)	Lat. Exp. (Mils)	% Shear (%)
1020237	V-Notch	Full	Long	+70	1	[-]
					2	[-]
					3	[-]
					Avg.	[-]

Test Method:

ASTM E23-18, Type A, Striker Radius 8mm

*Amendment: Description, Heat#, Part#



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Quality Supervisor

This Report May Not Be Reproduced Except In Full

This report represents Tensile Testing interpretation of the results obtained from the test and is not to be construed as a Guaranty or Warranty of the condition of the materials tested. Tensile Testing shall not be held liable for misinterpretation of conditions, loss, damage, injury or death arising from or attributable to delay preceding a test or subsequent to performance of a test. Unless otherwise noted, all testing reported herein was done at room temperature. All work performed in accordance with TTML QA Manual Rev D 02/15/07.

A DIVISION OF J.T. ADAMS Co., INC.



**4520 WILLOW PARKWAY
CLEVELAND, OHIO 44125
PHONE: (216) 641-3290
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www.tensile.com**

CERTIFIED TEST REPORT

Job No.: 1812-21-1550

Date: 1/7/2019

Cust. PO#: 29867-00

*This report is amended on 1/28/2019

Lokring
38376 Apollo Parkway
Willoughby OH 44094

Description: 1 Sample(s) Round Bar 15V24 Bar 1.750" Dia.

Part#	ID#
1020237	@-20F

Material: 15V24 Heat# LOK180233

Spec: LMS 92-10C

TEST RESULTS

Part#	Charpy Type	Charpy Size	Dir	Test Temp. (°F)	Item	Energy (ft-lbs) (ft-lbs)	Lat. Exp. (Mils)	% Shear (%)
1020237	V-Notch	Full	Long	-20	1			
					2			
					3			
					Avg.			

Test Method:

ASTM E23-18, Type A, Striker Radius 8mm

***Amendment: Description, Heat#, Part#**



Quality Supervisor

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4520 WILLOW PARKWAY
CLEVELAND, OHIO 44125
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CERTIFIED TEST REPORT**Job No.:** 1812-21-1550

[]

Lokring
38376 Apollo Parkway
Willoughby OH 44094

Date: 1/7/2019**Cust. PO#:** 29867-00

*This report is amended on 1/28/2019

Description: 1 Sample(s) Round Bar 15V24 Bar 1.750" Dia.

Part#	ID#
1020237	@-40F

Material: 15V24 Heat# LOK180233**Spec:** LMS 92-10C**TEST RESULTS**

Part#	Charpy Type	Charpy Size	Dir	Test Temp. (°F)	Item	Energy (ft-lbs) (ft-lbs)	Lat. Exp. (Mils)	% Shear (%)
1020237	V-Notch	Full	Long	-40	1	[]		
					2	[]		
					3	[]		
					Avg.	[]		

Test Method:

ASTM E23-18, Type A, Striker Radius 8mm

*Amendment: Description, Heat#, Part#



[]

Quality Supervisor

This Report May Not Be Reproduced Except In Full

This report represents Tensile Testing interpretation of the results obtained from the test and is not to be construed as a Guaranty or Warranty of the condition of the materials tested. Tensile Testing shall not be held liable for misinterpretation of conditions, loss, damage, injury or death arising from or attributable to delay preceding a test or subsequent to performance of a test. Unless otherwise noted, all testing reported herein was done at room temperature. All work performed in accordance with TTML QA Manual Rev D 02/15/07.



CERTIFIED MILL TEST REPORT

R481734

Alton Steel Test Lab
#5 Cut Street
Alton, IL. 62002-9011
(618) 463-4490 EXT 2486
(618) 463-4491 (Fax)

BILL TO

EMJ Company
2060 Enterprise Pkwy
Twinsburg, OH 44087

SHIP TO

EMJ Company
2060 Enterprise Pkwy
Twinsburg, OH 44087

Date	05/21/2018	Customer PO	P856652-429	Specifications
ASI Ord No.	91367	Customer PT.	546272	SAE 15V24
ASI Ord Line Item	1			ASTM A29-16, ASTM A576-90b (12)

Item Description

Steel Bar, Hot Rolled, 1.7500, 20' 0"

Strand Cast, RR =20.37:1

Heat Number	Yield PSI	Tensile PSI	% Elongation	% ROA	BHN
188400					

CHEMICAL ANALYSIS TEST METHODS ASTM E-419 & E-10X9

Heat #	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Sn	Al	Nb/Cb	V	B	Ti	N	Ph	Ca
1						0.25	0.097	0.154	0.028	0.011	0.003	0.003		0.003	0.0016		0.0050	0.0026

JOMINY HARDENABILITY USING ASTM A-255 CALCULATED FROM CHEMICAL DI

Heat Number	SS	DI
188400	8	2.08

SPECIAL TEST RESULTS

ADDITIONAL COMMENTS

conforms to LMS 92-10

No mercury, lead, radium, or alpha containing material or equipment is used or deliberately added in the production of this steel. No weld or weld repairs were performed on this material. This Steel is 100% Electric Arc Furnace Melted and Rolled in the U.S.A. Material qualifies as NAFTA origination.

Alteration or reproduction of this report, except in full, is not allowed without written approval by a representative of Alton Steel Incorporated.

I hereby certify that the above tests are correct as contained in the records of ALTON STEEL INCORPORATED

Subscribed and sworn to before me, a Notary Public, in and for the county of Madison, State of Illinois

this _____ Day of _____

My commission expires _____

(Notary Public)

CERTIFIED TRUE COPY OF ORIGINAL MTR
ID NUMBER Lok 180233
PART NUMBER 1020237
P/O# 28754 LMS []
VENDOR EMJ
DATE 7-10-18 PMIV & QA Wan

ATTACHMENT 7

“Welding Procedure and Qualification Record” (Non-Proprietary Version)



LOKRING MATERIAL SPECIFICATION

[

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The figure is a large, empty rectangular area, likely a drawing or plotting space. It is bounded by a coordinate grid. The horizontal axis (top and bottom) is labeled with numbers 1 through 8, decreasing from right to left. The vertical axis (left and right) is labeled with numbers 1 through 8, increasing from bottom to top. A small rectangular box is located in the top right corner, containing the word "REVISIONS".

**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD
(PQR)**

(See QW-200.2, Section IX, ASME Boiler & Pressure Vessel Code)

Page 1 of 2

Record Actual Conditions to Weld Test Coupon

Company Name		LOKRING TECHNOLOGY					
Procedure Qualification Record No.		LOK CS002		Revision		A	
Date		9/8/2014					
Welding Process(es)		GTAW-P		Type(s)		MACHINE	
BASE METAL (QW-403)				POST WELD HEAT TREATMENT (QW-407)			
Material Specification		ASTM A 106 (LOK090107)		Temperature		No PWHT Permitted	
Type or Grade		ASTM A106 Grade B		Time		None	
P-No.		1		To P-No.		1	
Material Specification		LOKRING LMS 92-10 (LOK140277)		Other			
Type or Grade		ASTM A 576 Grade 1524		Type		Gas(es)	
P-No.		Unassigned		To P-No.		Unassigned	
Thickness of Coupon		.147"		Shielding		ARGON	
Diameter of Coupon		.840"		Trailing		ARGON	
Other		NONE		Backing		ARGON	
FILLER METALS (QW-404)				GAS (QW-408)			
SFA SPECIFICATION No.		A5.18		Mix in %		Flow Rate	
AWS Classification		ER70 (Solid Wire)		100%		35 CFH	
Filler Metal F No(s).		F6		28%		0 CFH	
Weld Metal A No.		A1		65%		15 CFH	
Filler Metal Size		0.0625		Electrode Size		1/8"	
Other		Autogenous welding not permitted		Electrode Type		1.5% Lanthanated	
Weld Metal Thickness		.062" - .240"		Torch Type		Hot Wire Voltage	
POSITION (QW-406)		1G ROTATED		500 amp water cooled		Torch offset	
Other		NONE		Top Dead Center		Electrode angle	
PREHEAT (QW-406)		~70° F		Wirefeed angle		10° - 35°	
Interpass Temperature (Minimum)		N/A		TECHNIQUE (QW-410)			
Other		Ref. WI-WELD-001 Section 5.1 & 9.0		Travel Speed		3 RPM	
Additional Requirements:				Stringer or Weave		STRINGER	
Equipment: Gentec Weld Lathe, w/Miller Maxstar 350 weld machine		Rev A - PQR reflects use of unassigned material		Torch Oscillation		NONE	
				Multiple or single pass		MULTIPLE	
				Multiple or Single Electrode		SINGLE	
				Other		Two pass weld performed continuously in one operation.	

FORM QW-483 (Back)					PQR No. <u>LOK CS002</u>	
Tensile Test (QW-150)						
Page 2 of 2						
Specimen No.	Width	Thickness	Area	Ultimate Total Load	Ultimate Unit Stress	Type of Failure and Location
6302A		0.147	0.3191	25,700	80,539	Ductile Weld
6302B		0.147	0.3191	25,900	81,166	Ductile Weld

Type and Figure No.		Results
Root Bend 1		Acceptable
Face Bend 2		Acceptable
Root Bend 3		Acceptable
Face Bend 4		Acceptable

Toughness Tests (QW-170)							
Specimen No.	Notch Location	Specimen Size	Test Temp	Impact Values			Drop Weight Break (Y/N)
				ft-lb or J	% Shear	Mils (in.) or mm	

Comments Visual Results Acceptable

Fillet-Weld Test (QW-180)	
Results-Satisfactory: Yes <input type="checkbox"/> No <input type="checkbox"/>	Penetration into parent Metal: Yes <input type="checkbox"/> No <input type="checkbox"/>
Macro - Results _____	
Other Test	
Type Test _____	
Deposit Analysis _____	
Other _____	

Welder's Name _____	Clock No. <u>310</u> Stamp No. <u>L4</u>
Test Conducted By [_____]	Laboratory Test No. <u>1412-6302-1</u>
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 Boiler and Pressure Vessel Code.	
Organization <u>Lokring Technology LLC.</u>	
Date <u>12/16/2014</u>	Certified by [_____]
(Detail of record of test are illustrated only and may be modified to conform to the type and number of tests required by the Code.)	

Total Quality Testing, Inc.

Lokring Technology LLC
38376 Apollo Pkwy.
Willoughby, OH 44094

Page 1 of 1
P.O. No.: 19693-00
TQT File No.: 1412-6302-1
Reported: 12-5-14
Revised: 12-16-14

Sample Description: ASME: Boiler & PVC, Section IX
WPS: LOK CS002
MATERIAL: ASTM A106 Gr. B to Lokring LMS 92-10
.840" DIA. X .147" WALL

TENSILE RESULTS:

Sample ID	Thick	DIA	Area (sq. in.)	Load (lbs)	Ultimate Tensile	TYPE
6302A	.147	.838	.3191	25,700	80,539	Ductile Weld
6302B	.147	.838	.3191	25,900	81,166	Ductile Weld

Bond Test Results:

Root Bend 1	Acceptable	No Defects
Face Bend 2	Acceptable	No Defects
Root Bend 3	Acceptable	No Defects
Face Bend 4	Acceptable	No Defects

Visual Results: Acceptable

By: [Signature] Date: 12-16-14
SNT-TC-1A NAS 410/LEVEL III
CWI #92060761

CERTIFICATE OF TEST

Page 01 of 02

Certification Date
1-AUG-2014CUSTOMER ORDER NUMBER
✓ 15715-00

EARLE M. JORGENSEN COMPANY

Invoice Number
S956610CUSTOMER PART NUMBER
✓ 1050400 LMS 92-102060 ENTERPRISE PKWY.
TWINSBURG OH 44087

SOLD TO:	LOKRING TECHNOLOGY CORP	SHIP TO:	LOKRING TECHNOLOGY CORP
	38376 APOLLO PARKWAY		38376 APOLLO PARKWAY
	WILLOUGHBY OH 44094		WILLOUGHBY OH 44094

Description: 15V24 HR LMS 92-10 REV C
 ✓ 1-3/4 RD S/C 0'2.55" (2.55")
 HEAT: 132895 ITEM: 546272 Line Total: 347.905 LB

Specifications:
 LMS 92-10 ASTM A29 12 ASTM A576 12

CHEMICAL ANALYSIS

[C / S]				CU	NI	CR
				0.20	0.076	0.133
MO	BN	AL	NB	[V]	B	TJ
0.023	0.011	0.001	0.002		0.0003	0.0012 [^ N /]
CA						
0.0015						

RCPT: R304850
 ✓ VENDOR: ALTON STEEL INC (SBQ) ✓ COUNTRY OF ORIGIN

MECHANICAL PROPERTIES

DESCRIPTION	YLD STR PSI	ULT TEN PSI	%ELONG IN 02 IN	%RED IN AREA	HARDNESS BHN
-------------	----------------	----------------	--------------------	-----------------	-----------------

IDEAL DIAMETER : 1.84 IN GRAIN SIZE : 8

ID NUMBER LOK 190272
 PART NUMBER ~~1050400~~ 1050400
 P/O NUMBER 15715 LMS 92-10
 VENDOR EMJ
 DATE 8/4/14 QA JLC

The above data were transcribed from the manufacturer's Certificate of Test after verification for completeness and specification requirements of the information on the certificate. All test results remain on file subject to examination.

We hereby certify that the material covered by this report will meet the applicable requirements described herein, including any specification forming a part of the description.

The willful recording of false, fictitious, or fraudulent statements in connection with test results may be punishable as a felony under Federal statutes.

Material did not come in contact with mercury while in our possession.

MANAGUR, QUALITY ASSURANCE

CERTIFICATE OF TEST



Page 02 of 02

Certification Date
1-AUG-2014CUSTOMER ORDER NUMBER
✓ 18715-00

EARLE M. JORGENSEN COMPANY

Invoice Number
8956610CUSTOMER PART NUMBER
✓ 1050400 LMS 92-102060 ENTERPRISE PKWY.
TWINSBURG OH 44087SOLD TO: LOKRING TECHNOLOGY CORP
38376 APOLLO PARKWAY
WILLOUGHBY OH 44094

SHIP TO:

LOKRING TECHNOLOGY CORP
38376 APOLLO PARKWAY
WILLOUGHBY OH 44094Description: 15V24 HR LMS 92-10 REV C
✓ 3/4 RD S/C 0'2.55" (2.55")
WEIGHT: 132895

ITEM: 546272

Line Total: 347.905 LD

MATERIAL IS FREE FROM MERCURY CONTAMINATION
NO WELD REPAIR PERFORMED ON MATERIAL

RAW MAT'L MTH
ID NUMBER LOK 140275
PART NUMBER 1050400
P/O NUMBER 8715 LMS 92-10
VENDOR EMJ
DATE 8/6/14 QA OK

The above data were transcribed from the manufacturer's Certificate of Test after verification for completeness and specification requirements of the information on the certificate. All test results remain on file subject to examination.

We hereby certify that the material covered by this report will meet the applicable requirements described herein, including any specification forming a part of this description.

We warrant recording of false, fictitious, or fraudulent statements in connection with test results may be punishable as a felony under Federal statutes.

Material did not come in contact with mercury while in our possession.

THE BOARD

[

]

MANAGER, QUALITY ASSURANCE

THIS CERTIFICATE MUST NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF STELPIPE LTD./LE PRESENT CERTIFICAT NE PEUT ÊTRE REPRODUIT QU'EN SA VERSION INTÉGRALE ET SANS L'AUTORISATION ÉCRITE DE STELPIPE LTD



Element Materials Technology
5405 E Schaaf Road
Cleveland, OH
44131-1337 USA

P 216 524 1450
F 216 524 1459
T 888 786 7555
info.cleveland@element.com
element.com

[
Lokring Technology Corp.
38376 Apollo Pkwy
WILLOUGHBY, OH 44094

TEST REPORT — EAR-CONTROLLED DATA

Date: 10/19/2018
P.O. No.: 29413-00
W/O No.: LOK003-18-10-96579-1
Date Received: 10/15/2018

Sample Description: Two (2) Test Pieces, Dwg. 8060643 Rev C, ASME BPVC IX-2017 Figure QW-462.12, QW-185.3

MICROSTRUCTURAL EVALUATION PER ASTM E 3, ASTM E 7, ASTM E 407

Direction	Transverse	Location	As Noted	Etchant	Nital
Magnification	100x			Mount #18J-333	

WELD A	Weld Top	Weld Center	Weld Bottom
Penetration	100%		
Cracks	None Observed	None Observed	None Observed
Fusion	Complete	Complete	Complete
Porosity	None Observed	None Observed	None Observed

WELD B	Weld Top	Weld Center	Weld Bottom
Penetration	100%		
Cracks	None Observed	None Observed	None Observed
Fusion	Complete	Complete	Complete
Porosity	None Observed	None Observed	None Observed

HARDNESS PROFILES PER ASTM E92

WELD A	
Location	Hardness HV10
Weld Top	Base metal
	HAZ
	Weld Metal
	HAZ
Weld Center	Base Metal
	Base metal
	HAZ
	Weld Metal
Weld Bottom	HAZ
	Base Metal
	Base metal
	Weld Metal

The above testing was performed in accordance with the latest revision of the applicable commercial, military and/or International test method unless otherwise noted. The above services were performed in accordance with Element Materials Technology Cleveland's Quality Manual, Edition 1, Revision 5, dated August 16, 2012. Information and statements in this report are derived from material, information and/or specifications furnished by the client and exclude any expressed or implied warranties as to the fitness of the material tested or analyzed for any particular purpose or use. This laboratory does not perform sampling as sampling is done by the customer. The results of all tests reported apply only to the sample material(s) received and tested. This report is the confidential property of our client and may not be used for advertising purposes. This report shall not be reproduced except in full, without written approval of this laboratory. The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes. Sample remnants are held for a minimum of 6 months following issuance of test results, at which point they will be discarded unless notified in writing by the client. This material was not contaminated by mercury or chlorinated solvents during the handling and processing at Element Materials Technology Cleveland.

[
Quality Administrator
]



Element Materials Technology
5405 E Schaaf Road
Cleveland, OH
44131-1337 USA

P 216 524 1450
F 216 524 1459
T 888 786 7555
Info.cleveland@element.com
element.com

[
Lokring Technology Corp.
38376 Apollo Pkwy
WILLOUGHBY, OH 44094

TEST REPORT — EAR-CONTROLLED DATA

Date: 10/19/2018
P.O. No.: 29413-00
W/O No.: LOK003-18-10-96579-1
Date Received: 10/15/2018

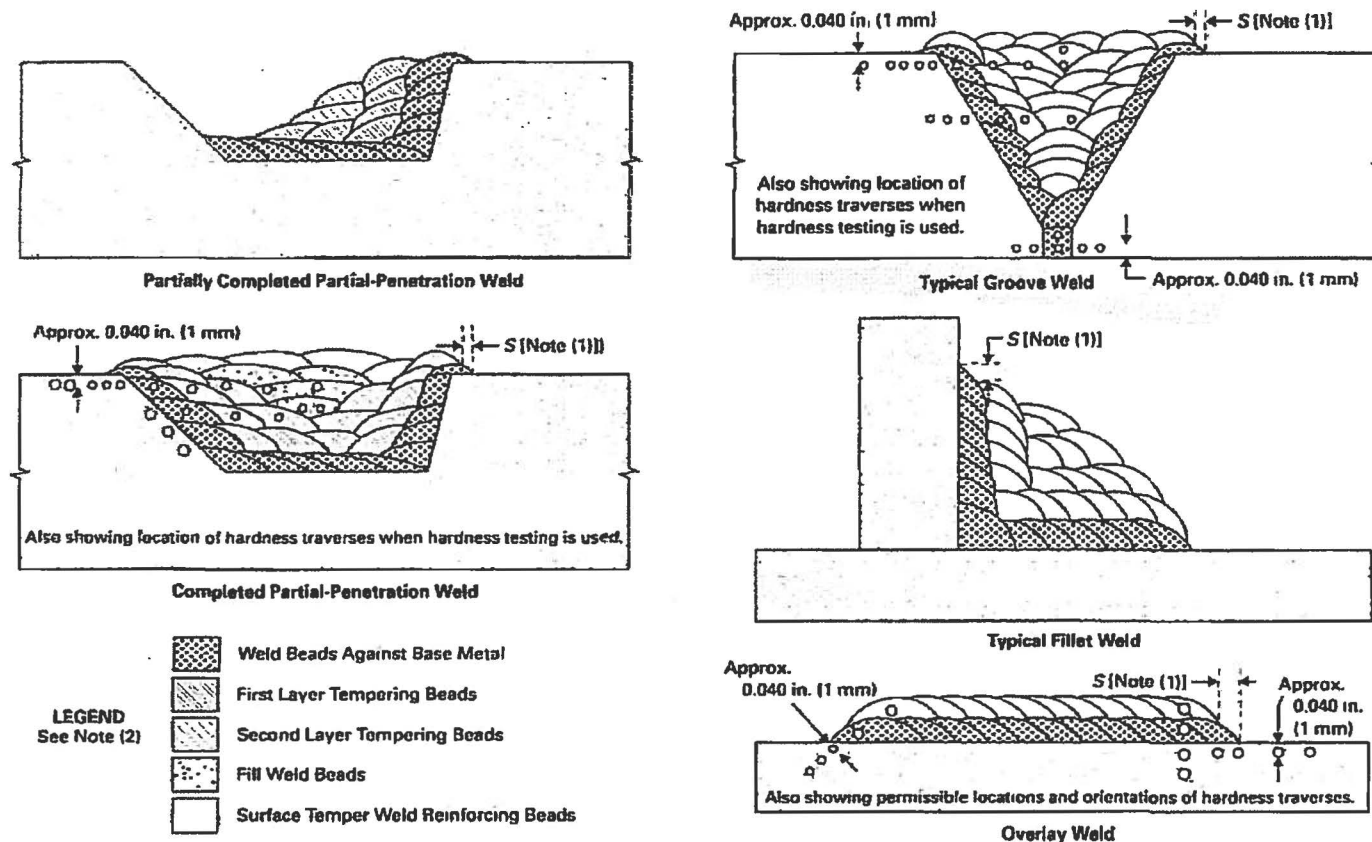
WELD B	
Location	Hardness HV10
Weld Top	Base metal
	HAZ
	Weld Metal
	HAZ
Weld Center	Base Metal
	Base metal
	HAZ
	Weld Metal
Weld Bottom	HAZ
	Base Metal
	Weld Metal
	HAZ
	Base Metal

This document contains technical data whose export and re-export/retransfer is subject to control by the U.S. Department of Commerce under the Export Administration Act and the Export Administration Regulations. The Department of Commerce's prior written approval may be required for the export or re-export/retransfer of such technical data to any foreign person, foreign entity or foreign organization whether in the United States or abroad.

The above testing was performed in accordance with the latest revision of the applicable commercial, military and/or International test method unless otherwise noted. The above services were performed in accordance with Element Materials Technology Cleveland's Quality Manual, Edition 1, Revision 5, dated August 16, 2012. Information and statements in this report are derived from material, information and/or specifications furnished by the client and exclude any expressed or implied warranties as to the fitness of the material tested or analyzed for any particular purpose or use. This laboratory does not perform sampling as sampling is done by the customer. The results of all tests reported apply only to the sample material(s) received and tested. This report is the confidential property of our client and may not be used for advertising purposes. This report shall not be reproduced except in full, without written approval of this laboratory. The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes. Sample remnants are held for a minimum of 8 months following issuance of test results, at which point they will be discarded unless notified in writing by the client. This material was not contaminated by mercury or chlorinated solvents during the handling and processing at Element Materials Technology Cleveland.

[
Quality Administrator
]

Figure QW-462.12
Nomenclature for Temper Bead Welding



GENERAL NOTES:

- (a) Weld beads shown above may be deposited in any sequence that will result in placement of the beads as shown.
- (b) Surface temper reinforcing beads may cover the entire weld surface, or may only be placed at the toe of the weld; they may or may not be mechanically removed.

NOTES:

- (1) The distance, *S*, is measured from the toe of the weld to the edge of the temper beads. Measurements shall be made parallel to the base metal surface.
- (2) Beads near the finished surface may be both tempering beads and surface temper reinforcing beads.

ASME BPVC.IX-2017

QW-462.4(b) or Figure QW-462.4(c). The test coupon for plate-to-plate shall be cut transversely to provide a center section approximately 4 in. (100 mm) long and two end sections, each approximately 1 in. (25 mm) long. For pipe-to-plate or pipe-to-pipe, the test coupon shall be cut to provide two quarter sections test specimens opposite to each other. One of the test specimens shall be fracture tested in accordance with QW-182 and the other macro-examined to the requirements of QW-184. When qualifying pipe-to-plate or pipe-to-pipe in the 5F position, the test specimens shall be removed as indicated in Figure QW-463.2(h).

QW-181.2.1 Production Assembly Mockups. Production assembly mockups may be used in lieu of the fillet-weld test coupon requirements of QW-181.2.

(a) Plate-to-Shape

(1) The mockup for plate-to-shape shall be cut transversely to provide three approximately equal test specimens not to exceed approximately 2 in. (50 mm) in length. The test specimen that contains the start and stop of the weld shall be fracture tested in accordance with QW-182. A cut end of one of the remaining test specimens shall be macro-examined in accordance with QW-184.

(b) Pipe-to-Shape

(1) The mockup for pipe-to-shape shall be cut transversely to provide two quarter sections approximately opposite to each other. The test specimen that contains the start and stop of the weld shall be fracture tested in accordance with QW-182. A cut end of the other quarter section shall be macro-examined in accordance with QW-184. When qualifying pipe-to-shape in the 5F position, the fracture specimen shall be removed from the lower 90-deg section of the mockup.

QW-182 FRACTURE TESTS

The stem of the 4 in. (100 mm) performance specimen center section in Figure QW-462.4(b) or the stem of the quarter section in Figure QW-462.4(c), as applicable, shall be loaded laterally in such a way that the root of the weld is in tension. The load shall be steadily increased until the specimen fractures or bends flat upon itself.

If the specimen fractures, the fractured surface shall show no evidence of cracks or incomplete root fusion, and the sum of the lengths of inclusions and porosity visible on the fractured surface shall not exceed $\frac{3}{8}$ in. (10 mm) in Figure QW-462.4(b) or 10% of the quarter section in Figure QW-462.4(c).

QW-183 MACRO-EXAMINATION — PROCEDURE SPECIMENS

One face of each cross section of the five test specimens in Figure QW-462.4(a) or four test specimens in Figure QW-462.4(d), as applicable shall be smoothed and etched with a suitable etchant (see QW-470) to give a clear definition to the weld metal and heat-affected zone. The examination of the cross sections shall include only one

side of the test specimen at the area where the plate or pipe is divided into sections i.e., adjacent faces at the cut shall not be used. In order to pass the test

(a) visual examination of the cross sections of the weld metal and heat-affected zone shall show complete fusion and freedom from cracks

(b) there shall be not more than $\frac{1}{8}$ in. (3 mm) difference in the length of the legs of the fillet

QW-184 MACRO-EXAMINATION — PERFORMANCE SPECIMENS

The cut end of one of the end plate sections, approximately 1 in. (25 mm) long, in Figure QW-462.4(b) or the cut end of one of the pipe quarter sections in Figure QW-462.4(c), as applicable, shall be smoothed and etched with a suitable etchant (see QW-470) to give a clear definition of the weld metal and heat-affected zone. In order to pass the test

(a) visual examination of the cross section of the weld metal and heat-affected zone shall show complete fusion and freedom from cracks, except that linear indications at the root not exceeding $\frac{1}{32}$ in. (0.8 mm) shall be acceptable

(b) the weld shall not have a concavity or convexity greater than $\frac{1}{16}$ in. (1.5 mm)

(c) there shall be not more than $\frac{1}{8}$ in. (3 mm) difference in the lengths of the legs of the fillet

QW-185 DIFFUSION WELDING — PROCEDURE AND PERFORMANCE QUALIFICATION SPECIMENS

QW-185.1 The test block shall be a minimum of 8 in. × 8 in. (200 mm × 200 mm) and of a thickness such that there are at least 50 interface planes being welded.

QW-185.2 A minimum of three tension test specimens in accordance with the requirements of SA-370 shall be taken perpendicular to the interface planes and three parallel to the interface planes. The tension test results shall comply with QW-153.

QW-153 Microstructural evaluation shall be conducted in accordance with the requirements of ASTM E3 on a minimum of three cross-sections, one each from the top, center, and bottom one-third of the test coupon. The samples shall be polished, etched, and shall be free from cracks and shall show no incomplete bond or porosity on or adjacent to the bond lines. Size of each sample shall be that which can be mounted and polished to allow examination with an optical microscope at 50× to 100× magnification.

ATTACHMENT 8

“Metallurgical Test Report” (Non-Proprietary Version)



Metallurgical Testing Report

Metallography Report

Report Number: R-20181218-083 rev. 1

Prepared for:

[]

Lokring Technology LLC
38378 Apollo Parkway
Willoughby, OH 44094

P.O. #: 29874

Jan. 15. 2019



NSL Analytical Services, Inc.
NSL Metallurgical
4535 Renaissance Parkway
Cleveland, Ohio 44128
Phone: 216-475-9000
Fax: 216-475-9002





Contents

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Project Definition and Scope

Provide microphotographs of mounted samples.

Rev. 1 replaced images in Figure 14.

Sample Identification

Lokring Technology LLC submitted samples for evaluation. The NSL Metallurgical sample numbers, and the corresponding Lokring Technology LLC sample identifiers are listed in Table 1.

Table 1. Sample Identification

Sample Number	Client Label
S-181218-145	18J -333-1B
S-181218-146	18J -333-2A

Opinions and Interpretations

Microphotographs were taken of the mounts provided in the five areas described by customer during visit.

Sample S-181218-146 was mounted and repolished due to rounding of the sample.

Process Steps

Metallurgical preparations were made in accordance with ASTM E 3. The sample was rinsed with ethanol and acetone, pressure mounted with thermosetting epoxy resin, ground with silicon carbide abrasives, polished with diamond suspensions, and fine polished with alumina. Care was taken not to alter the microstructure during any of the above steps. Samples were microetched with 2% nital, per ASTM E 407

The evaluation was performed using optical microscopes and imaging system, per ASTM E 883. Client was present to select sites for digital microphotography.

Results

Photomicrographs of the mounted samples are contained in Figures 1-11 (S-181218-145) and Figures 12-24 (S-181218-146).

If you have any questions regarding these results, please contact us.

Report prepared by: Dave Kovarik, Metallurgist

Reviewed by: Rebecca Stawovy, Metallurgist

A handwritten signature in black ink, appearing to read 'Rebecca Stawovy'.

Figures

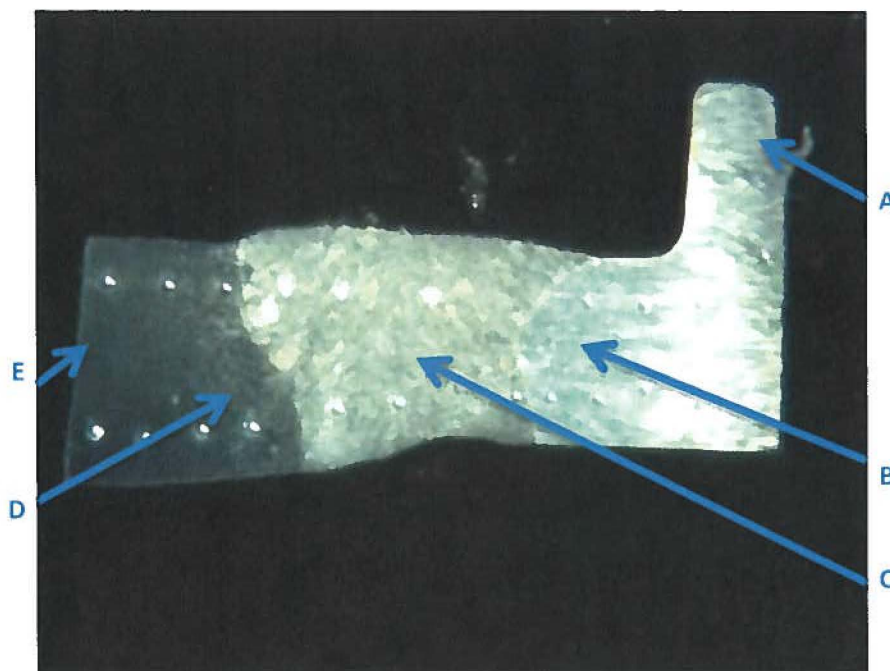


Figure 1. Macro photograph of mounted sample (S-181218-145).

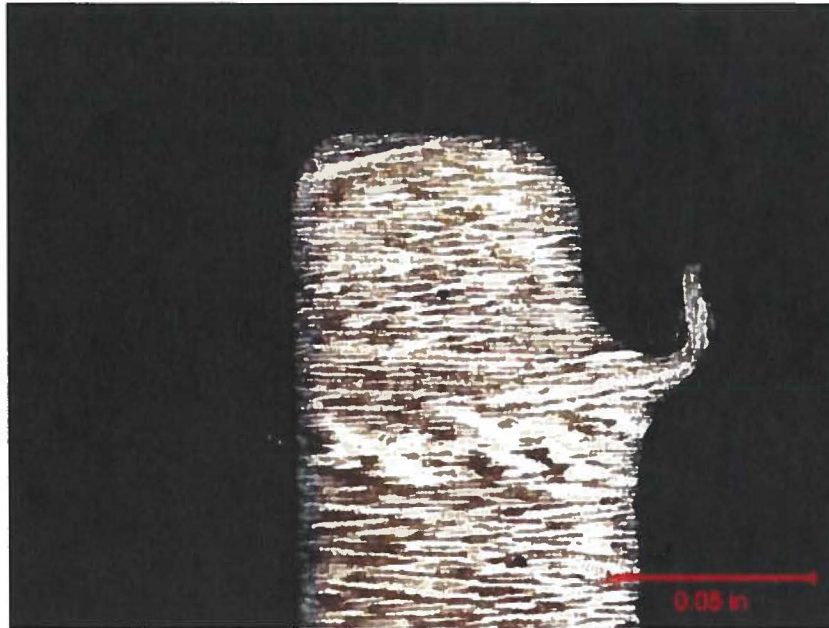


Figure 2. Macro photograph of mounted sample (S-181218-145), area A in Figure 1, 25x.

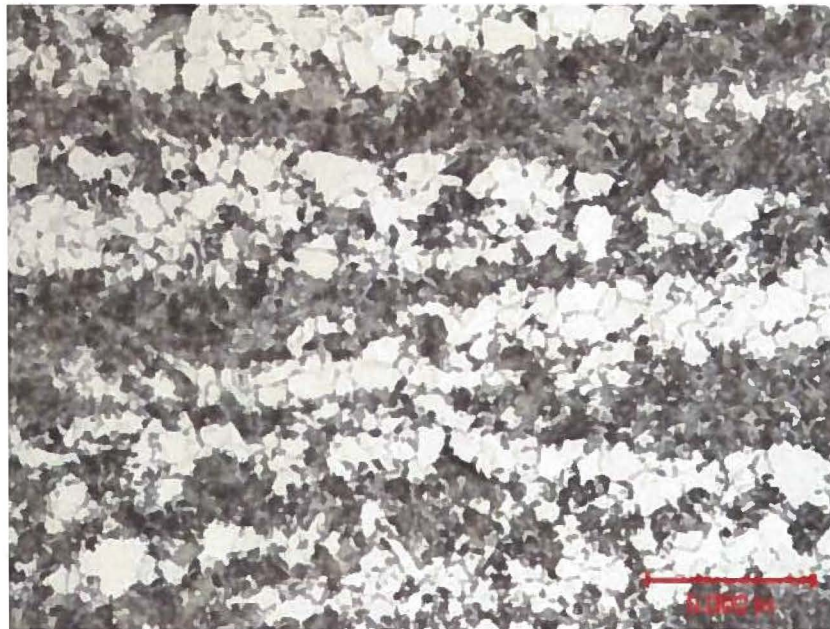


Figure 3. Macro photograph of mounted sample (S-181218-145), area A in Figure 1, 500x. Image is higher magnification photograph of the center of Figure 2.

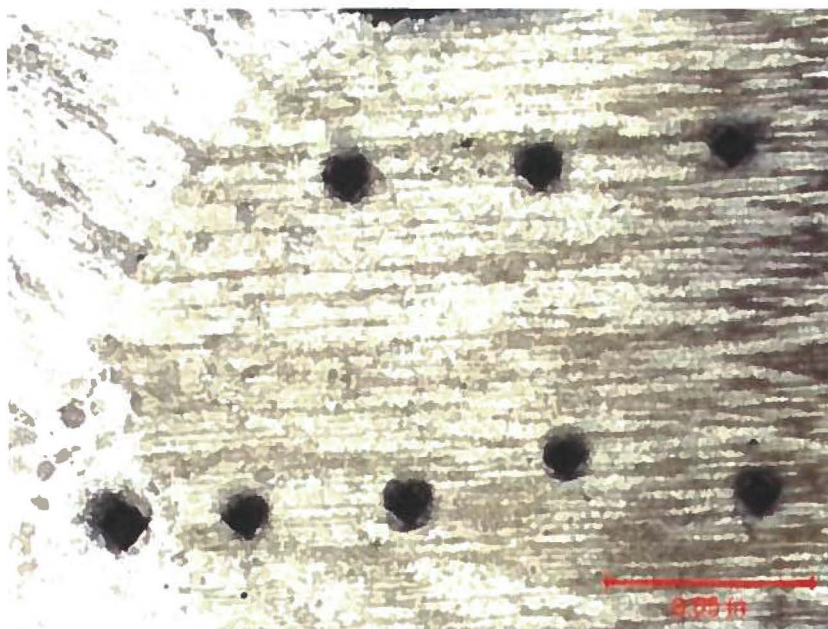


Figure 4. Macro photograph of mounted sample (S-181218-145), area B in Figure 1, 25x.

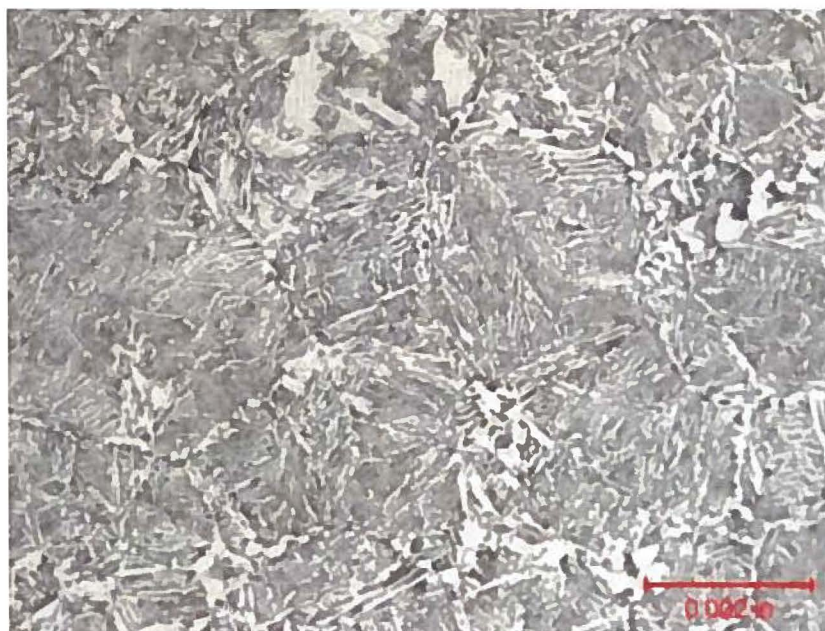


Figure 5. Macro photograph of mounted sample (S-181218-145), area B in Figure 1, 500x. Image is higher magnification photograph of the center of Figure 4.

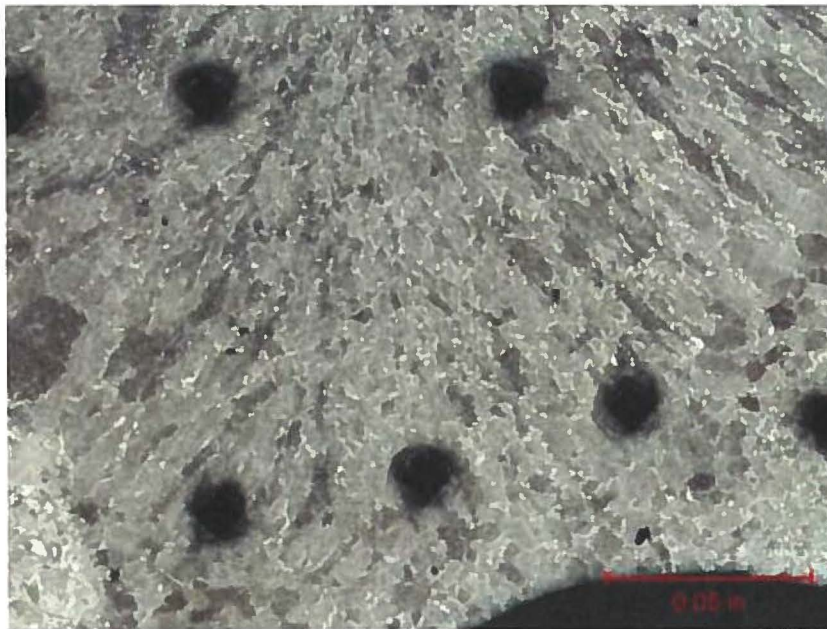


Figure 6. Macro photograph of mounted sample (S-181218-145), area C in Figure 1, 25x.

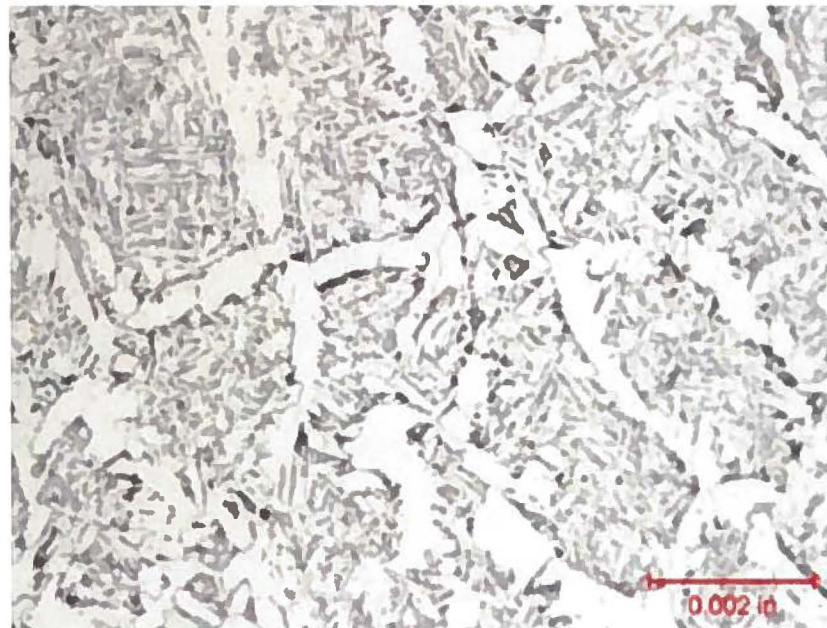


Figure 7. Macro photograph of mounted sample (S-181218-145), area C in Figure 1, 500x. Image is higher magnification photograph of the center of Figure 6.

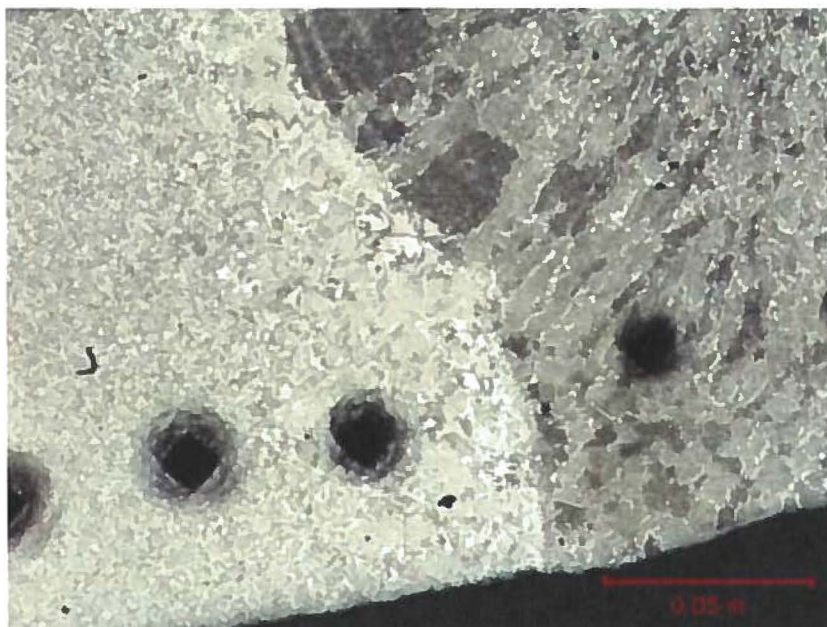


Figure 8. Macro photograph of mounted sample (S-181218-145), area D in Figure 1, 25x.

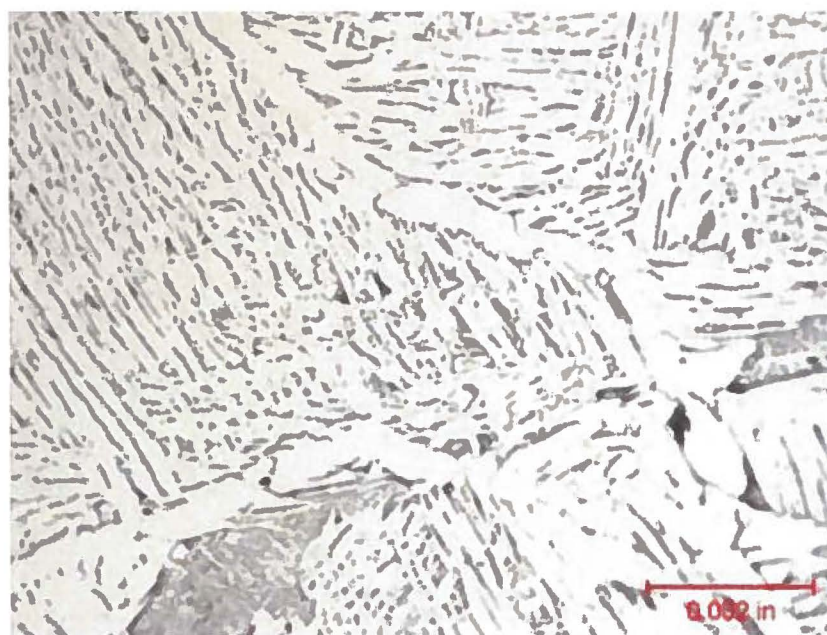


Figure 9. Macro photograph of mounted sample (S-181218-145), area D in Figure 1, 500x. Image is higher magnification photograph of slightly above the center of Figure 8.

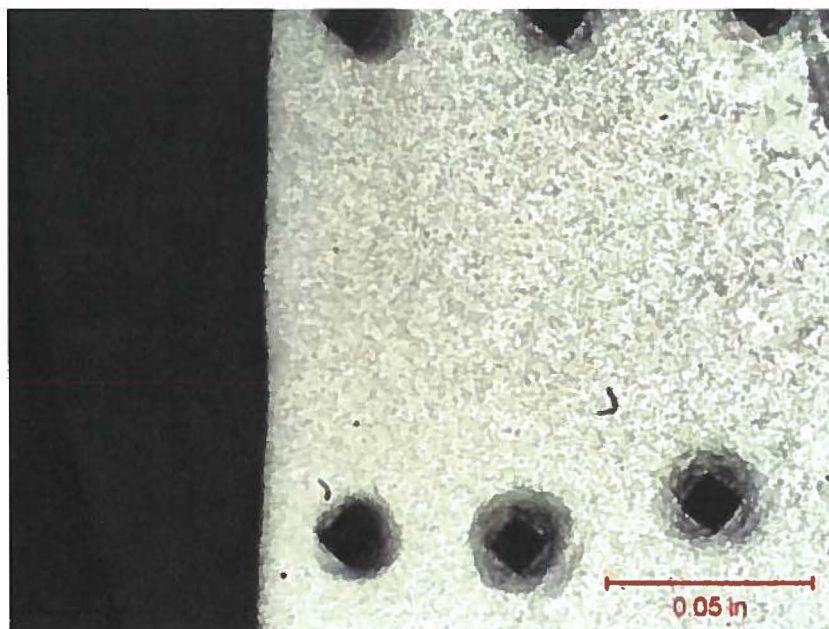


Figure 10. Macro photograph of mounted sample (S-181218-145), area E in Figure 1, 25x.

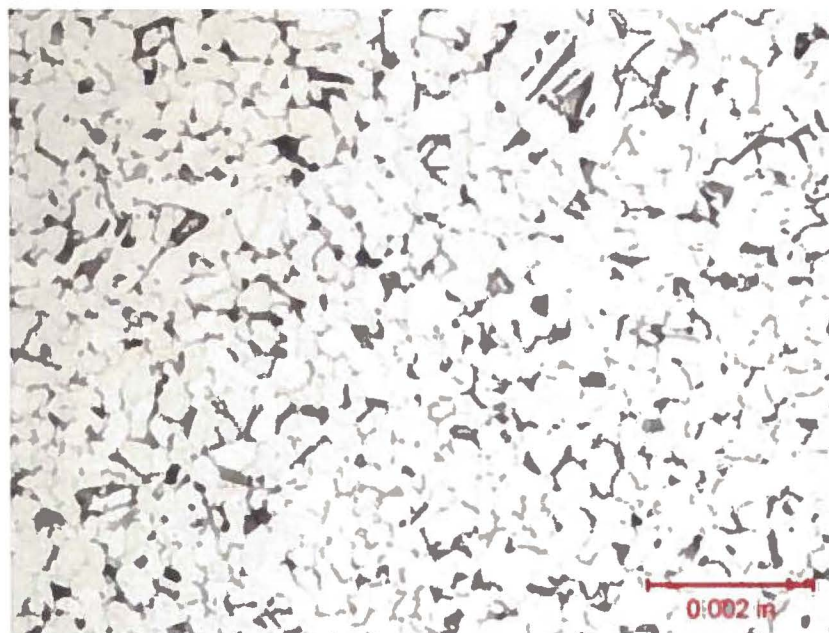


Figure 11. Macro photograph of mounted sample (S-181218-145), area E in Figure 1, 500x. Image is higher magnification photograph of the center of Figure 10.

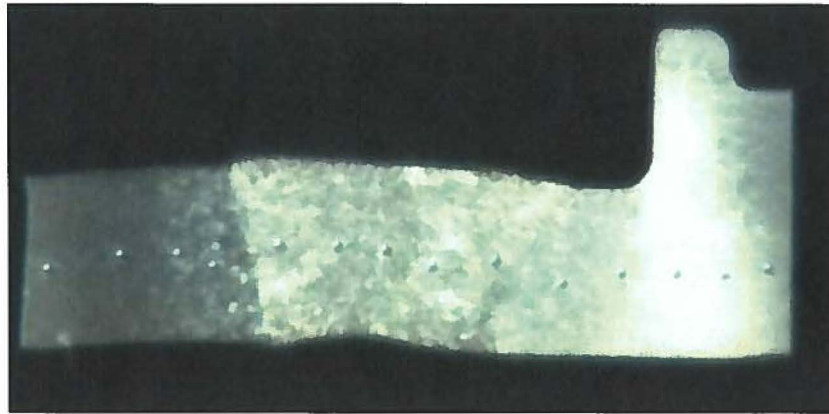


Figure 12. Macro photograph of mounted sample, as-received (S-181218-146).

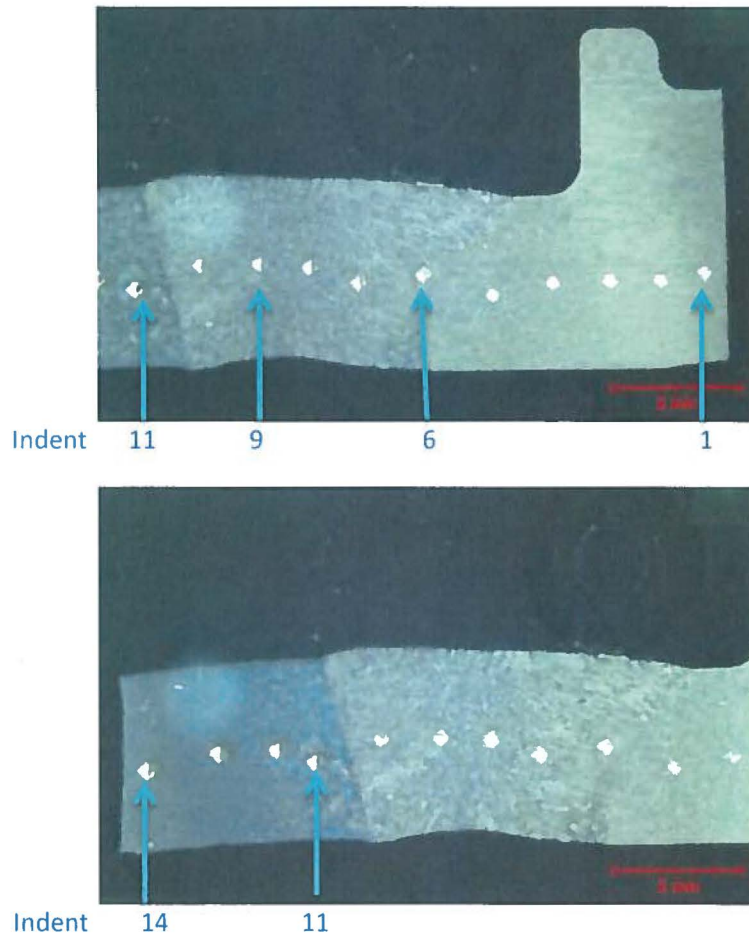


Figure 13. Macro photograph of mounted sample, as-received (S-181218-146). Indents are numbered right to left in these photos.

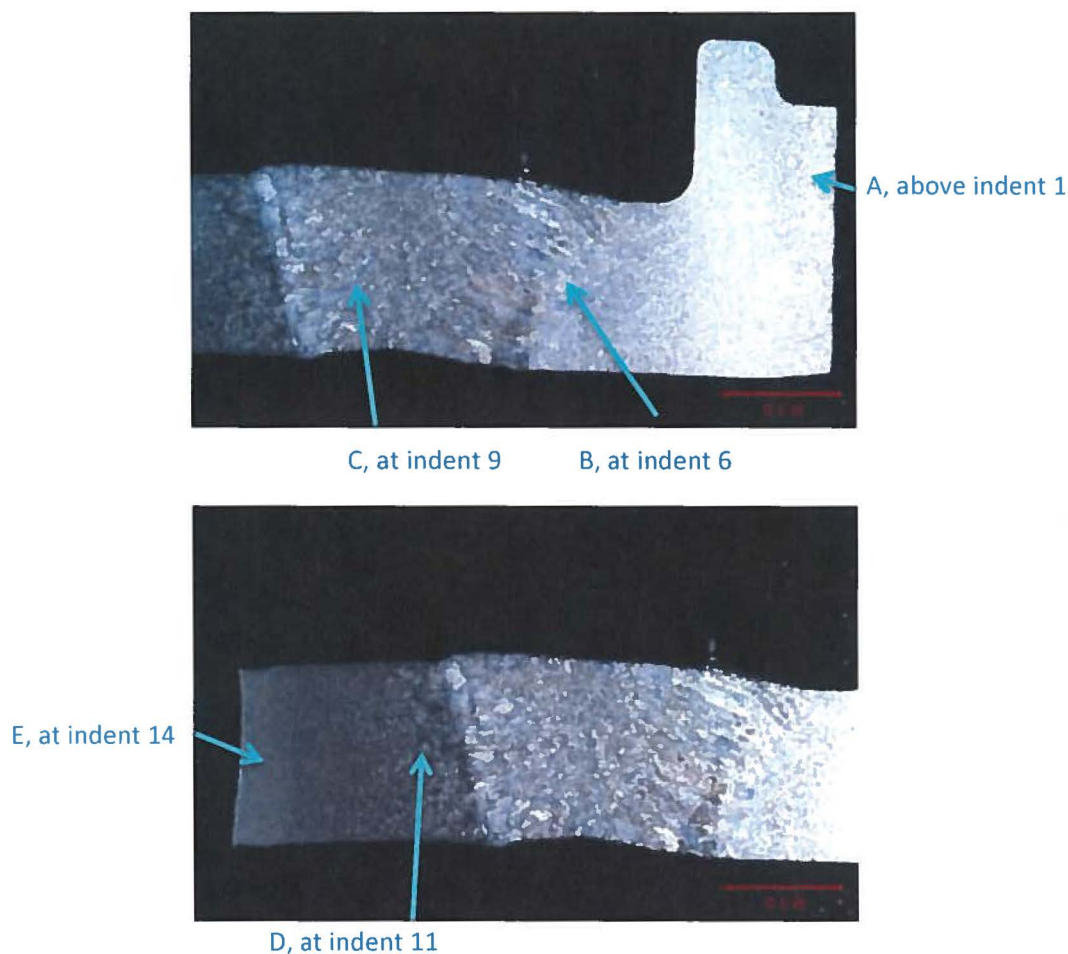


Figure 14. Macro photograph of remounted sample, as-received (S-181218-146). Arrows show approximate location where images in Figures 15-24 were taken.

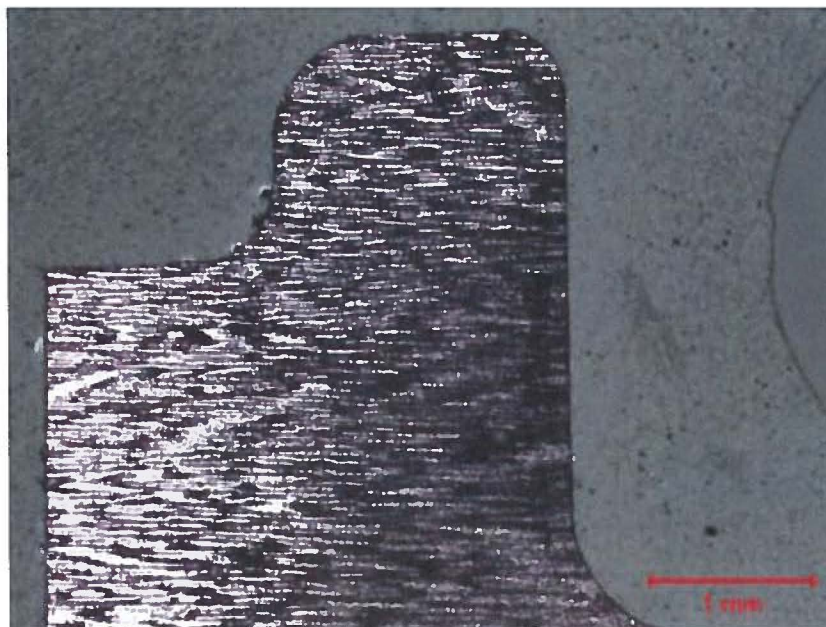


Figure 15. Macro photograph of mounted sample (S-181218-146), area A in Figure 14, 25x. (Camera optics are reversed from Figures 13 and 14).

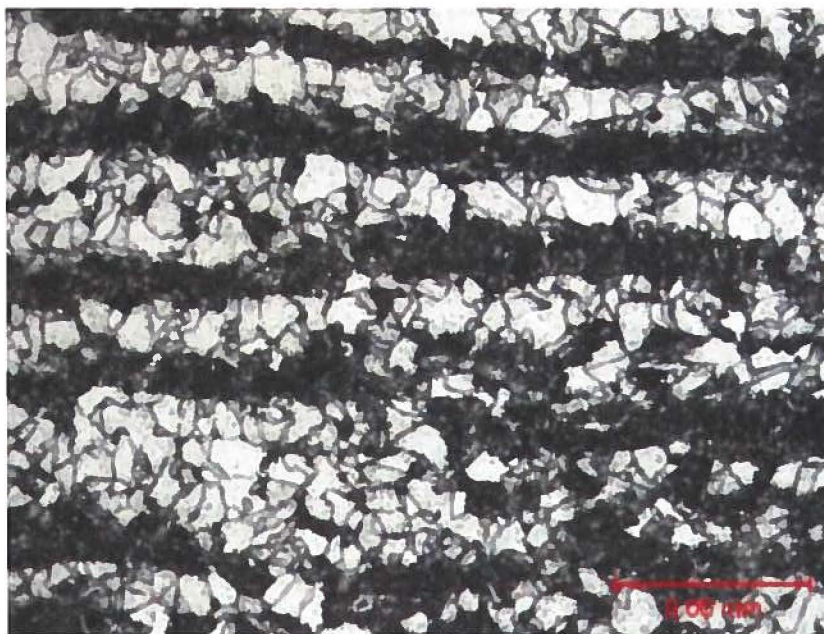


Figure 16. Macro photograph of mounted sample (S-181218-146), area A in Figure 14, 500x. Image is higher magnification image of center of Figure 15. (Camera optics are reversed from Figures 13 and 14).

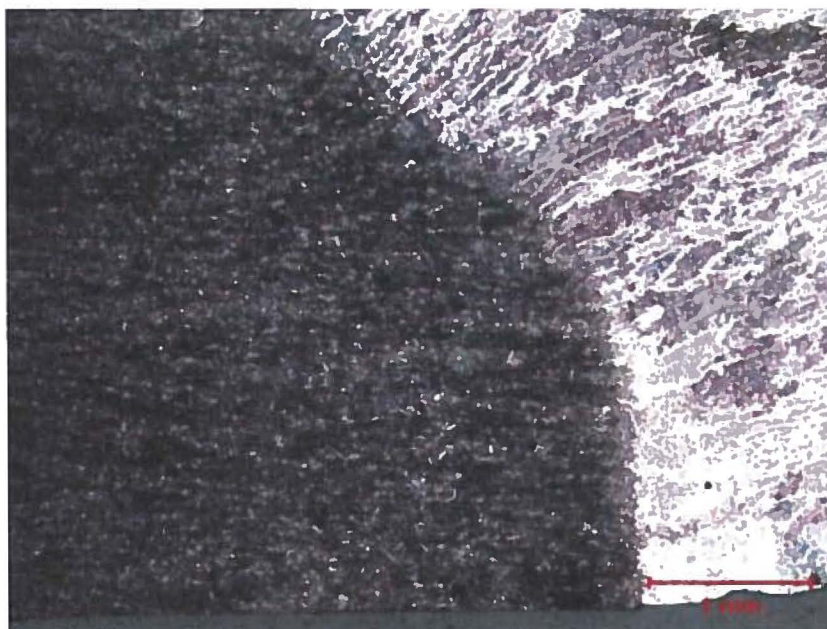


Figure 17. Macro photograph of mounted sample (S-181218-146), area B in Figure 14, 25x. (Camera optics are reversed from Figures 13 and 14).



Figure 18. Macro photograph of mounted sample (S-181218-146), area B in Figure 14, 500x. Image is higher magnification image of center of Figure 17. (Camera optics are reversed from Figures 13 and 14).

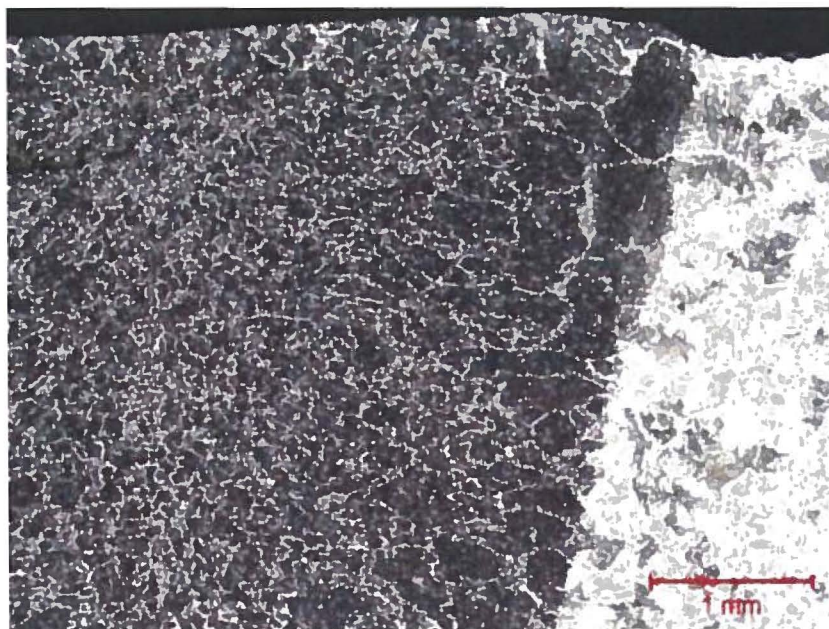


Figure 19. Macro photograph of mounted sample (S-181218-146), area C in Figure 14, 25x. (Camera optics are reversed from Figures 13 and 14).



Figure 20. Macro photograph of mounted sample (S-181218-146), area C in Figure 14, 500x. Image is higher magnification image of center of Figure 19. (Camera optics are reversed from Figures 13 and 14).

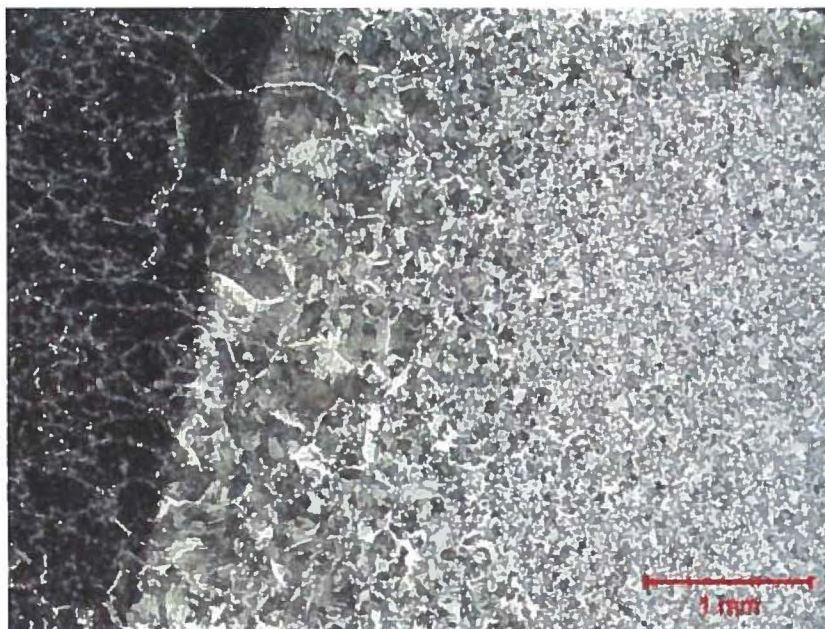


Figure 21. Macro photograph of mounted sample (S-181218-146), area D in Figure 14, 25x. (Camera optics are reversed from Figures 13 and 14).



Figure 22. Macro photograph of mounted sample (S-181218-146), area D in Figure 14, 500x. Image is higher magnification image of center of Figure 21. (Camera optics are reversed from Figures 13 and 14).

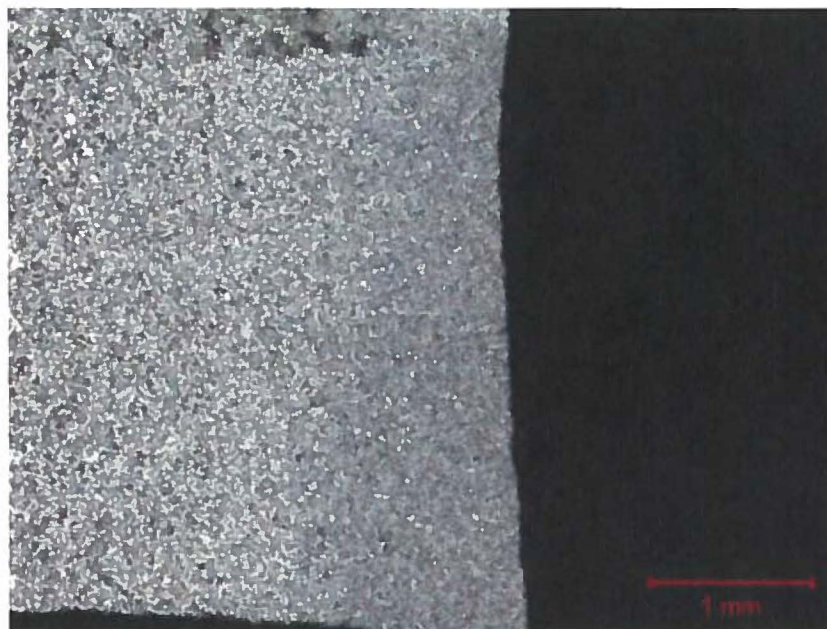


Figure 23. Macro photograph of mounted sample (S-181218-146), area E in Figure 14, 25x. (Camera optics are reversed from Figures 13 and 14).

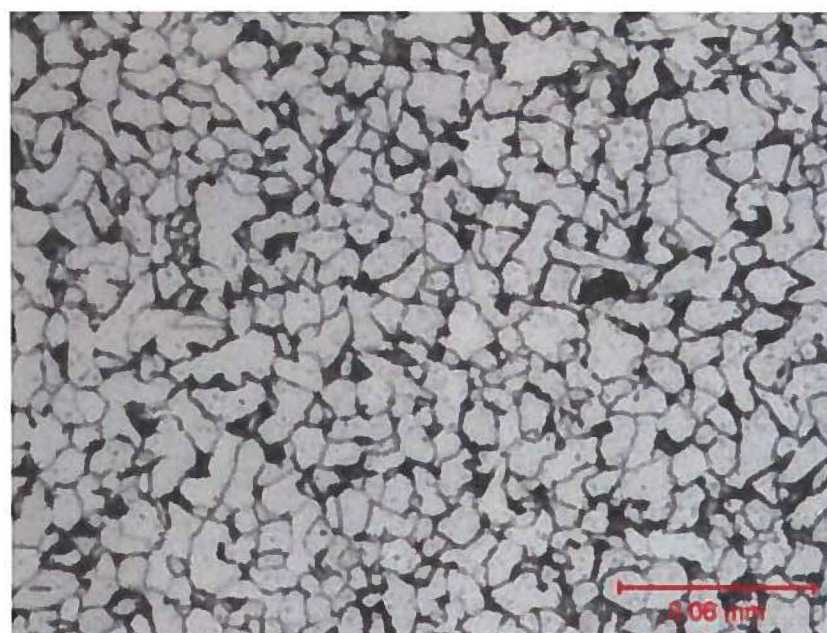


Figure 24. Macro photograph of mounted sample (S-181218-146), area E in Figure 14, 500x. Image is higher magnification image of center of Figure 23. (Camera optics are reversed from Figures 13 and 14).

ATTACHMENT 9

“HAZ Hardness Testing” (Non-Proprietary Version)



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WILLOUGHBY, OH 44094

TEST REPORT — EAR-CONTROLLED DATA

Date: 10/19/2018
P.O. No.: 29413-00
W/O No.: LOK003-18-10-96579-1
Date Received: 10/15/2018

Sample Description: Two (2) Test Pieces, Dwg. 8060643 Rev C, ASME BPVC IX-2017 Figure QW-462.12, QW-185.3

MICROSTRUCTURAL EVALUATION PER ASTM E 3, ASTM E 7, ASTM E 407

Direction	Transverse	Location	As Noted	Etchant	Nital
Magnification	100x			Mount #18J-333	

WELD A	Weld Top	Weld Center	Weld Bottom
Penetration	100%		
Cracks	None Observed	None Observed	None Observed
Fusion	Complete	Complete	Complete
Porosity	None Observed	None Observed	None Observed

WELD B	Weld Top	Weld Center	Weld Bottom
Penetration	100%		
Cracks	None Observed	None Observed	None Observed
Fusion	Complete	Complete	Complete
Porosity	None Observed	None Observed	None Observed

HARDNESS PROFILES PER ASTM E92

WELD A	
Location	Hardness HV10
Weld Top	Base metal
	HAZ
	Weld Metal
	HAZ
	Base Metal
Weld Center	Base metal
	HAZ
	Weld Metal
	HAZ
	Base Metal
Weld Bottom	Base metal
	HAZ
	Weld Metal
	HAZ
	Base Metal

The above testing was performed in accordance with the latest revision of the applicable commercial, military and/or International test method unless otherwise noted. The above services were performed in accordance with Element Materials Technology Cleveland's Quality Manual, Edition 1, Revision 5, dated August 16, 2012. Information and statements in this report are derived from material, information and/or specifications furnished by the client and exclude any expressed or implied warranties as to the fitness of the material tested or analyzed for any particular purpose or use. This laboratory does not perform sampling as sampling is done by the customer. The results of all tests reported apply only to the sample material(s) received and tested. This report is the confidential property of our client and may not be used for advertising purposes. This report shall not be reproduced except in full, without written approval of this laboratory. The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes. Sample remnants are held for a minimum of 6 months following issuance of test results, at which point they will be discarded unless notified in writing by the client. This material was not contaminated by mercury or chlorinated solvents during the handling and processing at Element Materials Technology Cleveland.

Quality Administrator



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Lokring Technology Corp.
38376 Apollo Pkwy
WILLOUGHBY, OH 44094

TEST REPORT — EAR-CONTROLLED DATA

Date: 10/19/2018
P.O. No.: 29413-00
W/O No.: LOK003-18-10-96579-1
Date Received: 10/15/2018

WELD B	
Location	Hardness HV10
Weld Top	Base metal
	HAZ
	Weld Metal
	HAZ
Weld Center	Base Metal
	Base metal
	HAZ
	Weld Metal
Weld Bottom	HAZ
	Base Metal
	Base metal
	Weld Metal
	HAZ
	Base Metal

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The above testing was performed in accordance with the latest revision of the applicable commercial, military and/or International test method unless otherwise noted. The above services were performed in accordance with Element Materials Technology Cleveland's Quality Manual, Edition 1, Revision 5, dated August 18, 2012. Information and statements in this report are derived from material, information and/or specifications furnished by the client and exclude any expressed or implied warranties as to the fitness of the material tested or analyzed for any particular purpose or use. This laboratory does not perform sampling as sampling is done by the customer. The results of all tests reported apply only to the sample material(s) received and tested. This report is the confidential property of our client and may not be used for advertising purposes. This report shall not be reproduced except in full, without written approval of this laboratory. The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes. Sample remnants are held for a minimum of 6 months following issuance of test results, at which point they will be discarded unless notified in writing by the client. This material was not contaminated by mercury or chlorinated solvents during the handling and processing at Element Materials Technology Cleveland.

Quality Administrator

LOKING
181896579
MOUNT # 185-333
WELD A

LOKING
181896579
MOUNT # 185-333
WELD B



LOKING MAF-3000 P12 (NPS 3/4") 45 degree & (60W).

Hardness Profile Per ASTM E92

Non-Confidential Information Submitted Under 10 U.S.C. 2390
Element Report LOC 003-18-18-96579-1

1" Weld A" Location: Weld Center
[]



Bilb. 9 45 degree Elbow
Heat E827

Weld Per
Looking WPS
Loc CS002

Looking Half Body
NAS 15V24
MTR Loc 170018

Hardness < Profile per ASTM E92

NON-CONFIDENTIAL INFORMATION SUBMITTED UNDER 10 CFR 2.390
Element Report LOK003-18-10-96579-1

"Weld A" Location: Weld "Top" and Weld "Bottom"



B316.9 45 degree Elbow
Heat E827

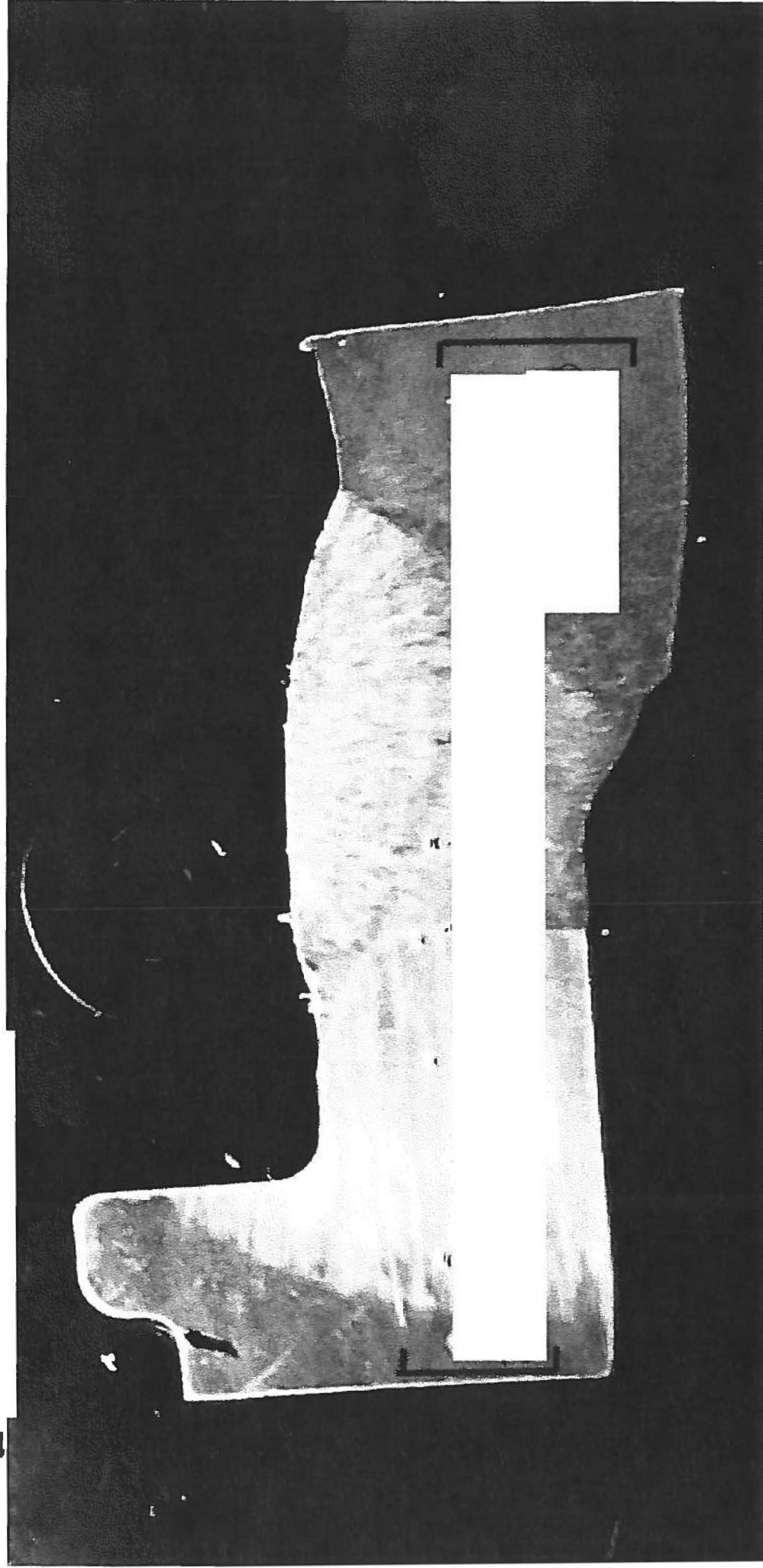
Weld per
Lohring WPS
Coke CS002

Lohring Half Body
MAF 15V24
MTR LOK170018

Hardness Profile per ASTM E92

"Weld B" Location: Weld Center

I



Lobring Hatt Body

WAS 15V24

MTR Lok 170018

Weld Per

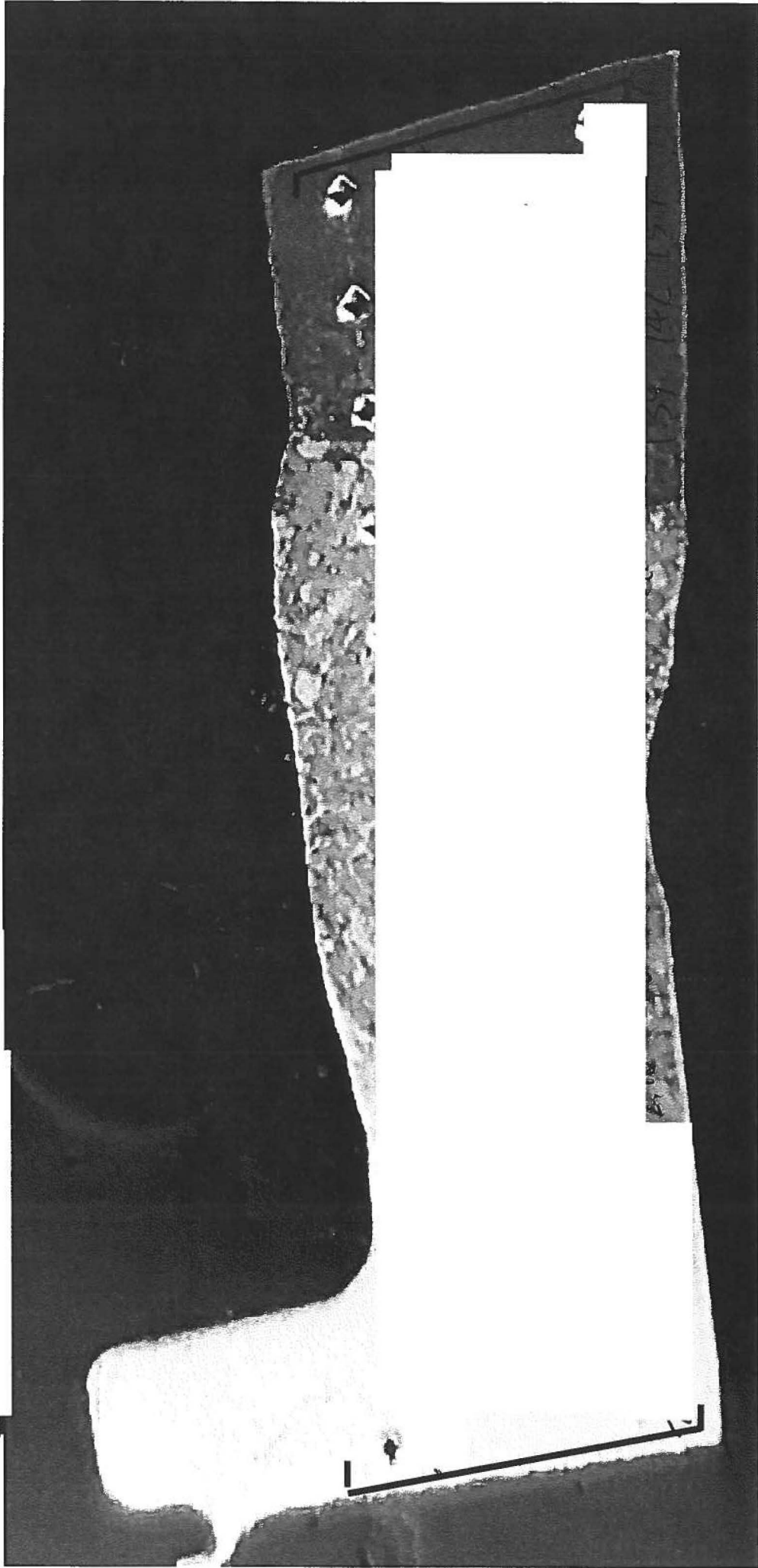
Lobring WPS

LokCS002

B16.9 45 degree Elbow

Heat E827

ii. Weld B" Location: Weld "Top" and Weld "Bottom"



Covering Half Body
WAS 15V24
MTR Lok 170018

Weld Per
Covering WPS
Lok CS002

\$16.9 - 45 degree Elbow
Heat E827



CERTIFIED MILL TEST REPORT

R137763

Alton Steel Test Lab
#5 Cut Street
Alton, IL 62002-9011
(618) 463-4490 EXT 2486
(618) 463-4491 (Fax)

BILL TO

EMJ Company
2060 Enterprise Pkwy
Twinsburg, OH 44087

SHIP TO

EMJ Company
2060 Enterprise Pkwy
Twinsburg, OH 44087

Date	01/09/2017	Customer PO	P761676-429	Specifications
AST Ord No.	83121	Customer PT.	546272 *	SAE 15V24
AST Ord Line Item	1			ASTM A 29-12, ASTM A 576-90b (12)

Item Description

Steel Bar, Hot Rolled, 1.7500, 20" Ø"

Strand Cast, RR =20.37:1

Heat Number

166426

Yield PSI

Tensile PSI

% Elongation

% ROA

BHN

CHEMICAL ANALYSIS TEST METHODS ASTM E-415 & E-1019

Heat Number	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Sn	Al	Nb/Cb	V	B	Ti	N	Cn
166426	✓	✓	✓	✓		0.23	0.074	0.157	0.027	0.010	0.003	0.005	✓			✓	0001

JOMINY HARDENABILITY USING ASTM A-255 CALCULATED FROM CHEMICAL DI

Heat Number	GS	DI
166426	8	2.01

SPECIAL TEST RESULTS

ADDITIONAL COMMENTS

conforms to LMS 92-10

No mercury, lead, radium, or alpha containing material or equipment is used or deliberately added in the production of this steel. No weld or weld repairs were performed on this material. This Steel is 100% Electric Arc Furnace Melted and Rolled in the U.S.A. Material qualifies as NAFTA origination.

Subscribed and sworn to before me, a Notary Public, in and for the county of Madison, State of Illinois

this _____ Day of _____

My commission expires _____

(Notary Public)

Alteration or reproduction of this report, except in full, is not allowed without written approval by a representative of Alton Steel Incorporated.

I hereby certify that the above tests are correct as contained in the records of ALTON STEEL INCORPORATED

Quality Lead: []

[]

CERTIFIED TRUE COPY OF ORIGINAL MTR

ID NUMBER L0K170018PART NUMBER 1020237PIOH 26099 LMS 92-10VENDOR EMJDATE 6-5-17 PMIV & QA TS

WELDBEND5600 South Harlem Avenue
Argo, IL 60501-1930*Material Test Report*1316 WELLS AVE
WILLOUGHBY, OH 44094
PO: 4375334

Quantity	Product	Heat Code	Heat Treatment Info	Steel Mill																
50	2" XS LR 90° Elbow	1M68254	Hot Formed	MICHIGAN SEAMLESS																
C 0.17	Mn 0.75	P 0.008	S 0.019	Si 0.19	Cu 0.14	Ni 0.05	Cr 0.15	Mo 0.010	V 0.00	Al 0.019	Ti -	B -	Cb 0.001	Tens. 78,500	Yield 39,900	Elong 42.00	ROA -	BHN 150	BHN2 149	A 234-10 Dimensional Specification: B16.9
CE (IIW): 0.340																				WPB
50	1" XS LR 90° Elbow	J4K5292	Hot Formed	NIPPON																
C 0.19	Mn 0.73	P 0.013	S 0.010	Si 0.19	Cu 0.03	Ni 0.02	Cr 0.05	Mo 0.010	V 0.00	Al 0.021	Ti -	B -	Cb 0.000	Tens. 67,443	Yield 39,900	Elong 55.00	ROA -	BHN 156	BHN2 159	A 234 WPB-13 Dimensional Specification: B16.9
CE (IIW): 0.327																				WPB
20	¾" XS LR 45° Elbow	E827	Heat Treat: Stress Relieved	PODBRE																
C 0.14	Mn 0.39	P 0.009	S 0.003	Si 0.26	Cu 0.15	Ni 0.06	Cr 0.08	Mo 0.000	V 0.00	Al -	Ti -	B -	Cb 0.000	Tens. 66,573	Yield 39,900	Elong 37.00	ROA -	BHN 144	BHN2	A 234-94 Dimensional Specification: B16.9
CE (IIW): 0.235																				WPB
30	2" XS Straight Tee	J4L1033	Heat Treat: Normalized	NIPPON																
Mn 0.67	P 0.023	S 0.006	Si 0.26	Cu 0.02	Ni 0.02	Cr 0.05	Mo 0.010	V 0.00	Al 0.025	Ti -	B -	Cb 0.000	Tens. 67,700	Yield 39,900	Elong 42.00	ROA -	BHN 135	BHN2 136	A 234-11 Dimensional Specification: B16.9	
CE (IIW): 0.316																				WPB

FITTING MTR**PART NUMBER** 8062205**HEAT NUMBER** E827**P/O NUMBER** 25360**VENDOR** MACOMB**DATE** 2-20-17 QA TS

- We hereby certify that the material meets the following:
- All fittings and flanges meet NACE MRO-175/ISO 15156-Latest Revision.
 - All fittings and flanges meet NACE MRO-103 - Latest Revision.
 - All non high-yield fittings meet the requirements of ASTM A-234 WPB (AND SA-234).
 - All fittings are seamless except as noted;
 - All non-high yield flanges meet the requirements of ASTM A-105 (AND SA-105)
 - Starting Material Seamless Pipe for elbows, tees and reducers;
 - Plate for caps and welded fittings.
 - Bars, Billets or Blooms for flanges and certain caps and tees.
 - Ladle chemistry reported.

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Cert #199601

Scan For Online
Report

We hereby certify that the material meets the following:

- ISO 9001:2008 CERTIFIED MANUFACTURER
- Test Results herein are correct as contained in test records retained by the company in accordance with EN 10 204 Para 3.1 in accordance with PED 97/23/EC, 7/2
- No Weld Repair Performed. No Lead Content. No Mercury Content
- Knowingly making false, fictitious, or fraudulent statements on a MTR may result in legal liability.
- Material has been manufactured/supplied and tested in accordance with the Weldbend Quality System Program 01/26/2015 Rev. 3

Generated by pmcginnis@weldbend.com

Page 1 of 1

ATTACHMENT 10

“Elevated Temperature Tensile Testing” (Non-Proprietary Version)

Request for ASME B31 Code Case for
Micro-Alloyed Carbon Steel Bar

Attachment 2
MATERIAL TEST RESULTS AT TEMPERATURE

Summary of Yield Strengths at Temperature (ksi)

Temperature	3-1/4" bar	1-7/8" bar	2-5/8" bar
Room	84.1	85.9	98.2
100°F	83.8	87.0	94.4
200°F	82.2	82.0	94.4
300°F	72.6	73.4	94.3
400°F	70.7	74.5	100.0
500°F	72.3	72.9	97.9
600°F	70.1	71.3	94.2
650°F	65.7	75.5	90.9
750°F	63.5	67.2	86.6

Summary of Tensile Strengths at Temperature (ksi)

Temperature	3-1/4" bar	1-7/8" bar	2-5/8" bar
Room	114.0	119.0	127.0
100°F	114.0	120.0	124.0
200°F	110.0	117.0	124.0
300°F	106.0	113.0	120.0
400°F	107.0	117.0	122.0
500°F	111.0	117.0	125.0
600°F	106.0	112.0	128.0
650°F	102.0	110.0	117.0
750°F	92.5	97.8	107.0

Anamet Laboratories, Inc.

3400 INVESTMENT BOULEVARD • HAYWARD, CALIFORNIA 94545-3811 • (510) 887-8811

Laboratory Number: 692.148
Purchase Order: P2060150
Date Submitted: June 23, 1992
Date Reported: June 29, 1992

[Lokring Corporation]

396 Hatch Drive
Foster City, CA 94404

SUBJECT

One bar was submitted for tensile testing. The sample was identified as 1 ea. 3-1/4" dia. x 6" bar, 15V24 Micro Alloyed Steel.

TENSILE TEST

Temperature
Dimensions of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Point (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

Temperature
Diameter of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Strength @
0.2% Offset (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

*Yield Point (psi)

Page 2

Lab. No. 692.148

TENSILE TEST

Temperature
Diameter of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Strength @
0.2% Offset (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

	<u>7</u>	<u>8</u>	<u>9</u>
	[]		

This testing was performed in accordance with the purchase order.

Submitted by:

[]

pa/153

Manager, Laboratory Operations

Anamet Laboratories, Inc.

3400 INVESTMENT BOULEVARD • HAYWARD, CALIFORNIA 94545-3811 • (510) 887-8811

Laboratory Number: 792.128
Purchase Order: P2070137
Date Submitted: July 21, 1992
Date Reported: August 4, 1992

[Lokring Corporation]
396 Hatch Drive
Foster City, CA 94404

SUBJECT

Two bars were submitted for tensile testing. The samples were identified as 15V24 Micro Alloyed Steel Bar, 1 7/8" dia. x 30" from Inland Steel and 2 5/8" dia. x 15" from North Star Steel.

TENSILE TEST

1 7/8" Diameter

6A

7A

9A

Temperature
Diameter of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Strength @
0.2% Offset (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

TENSILE TEST

1 7/8" Diameter

Temperature
Diameter of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Strength @
0.2% Offset (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

Page 2

Lab. No. 792.128

TENSILE TEST

1 7/8" Diameter

Temperature
Diameter of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Strength @
0.2% Offset (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

TENSILE TEST

2 5/8" Diameter

Temperature
Diameter of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Strength @
0.2% Offset (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

TENSILE TEST

2 5/8" Diameter

Temperature
Diameter of Specimen (in.)
Area (sq. in.)
Tensile Strength (psi)
Yield Strength @
0.2% Offset (psi)
Elongation in 2.0" Gage (%)
Reduction of Area (%)

4A

5A

8A

Page 3

Lab. No. 792.128

TENSILE TEST

2 5/8" Diameter

Temperature

Diameter of Specimen (in.)

Area (sq. in.)

Tensile Strength (psi)

Yield Strength @

0.2% Offset (psi)

Elongation in 2.0" Gage (%)

Reduction of Area (%)

7B

8B

9B

This testing was performed in accordance with the purchase order.

Submitted by:

[]

Manager, Laboratory Operations

mh/098

**Request for ASME B31 Code Case for
Micro-Alloyed Carbon Steel Bar**

**Attachment 3
MATERIAL CERTIFICATES OF COMPLIANCE**

Summary of Relevant Certificates of Compliance

Bar Size	Supplier	Heat No.
3-1/8" [Note 1]	Inland Steel	96959
1-7/8"	Northern Cross Steel	96960
2-5/8"	Northern Cross Steel	M39216

Note 1: In subsequent testing this bar size was referred to as 3-1/4".



TEST REPORT

REG., JOB, CONTRACT NO.

PURCHASE ORDER NO.

V
E
N
D
O
R

INLAND STEEL BAR COMPANY
QUALITY DEPARTMENT 4-446
3300 DICKEY ROAD
EAST CHICAGO, INDIANA 46312

SHIPPER'S NO.

10" MILL

MILL ORDER NO.

15/06 2

INVOICE DATE

INVOICE NO.

VEHICLE IDENTIFICATION

We hereby certify that the analysis and/or test results shown are correct as contained in the records of the company.

George Osan
Section Manager - Quality



SOLD TO

LOKRING CORP

396 HATCH DRIVE

SHIP TO

LOKRING CORP

396 HATCH DRIVE

FOSTER CITY CA 94404

FOSTER CITY CA 94404

SPECIFICATION

INLAND CMS (REG. TM) HOT ROLLED ROUNDS, AISI 15V24 MICROALLOY

STATE OF INDIANA
COUNTY OF LAKE

Subscribed and sworn to before me this

day of

A.D., 19

Notary Public

MY COMMISSION EXPIRES:



Inland Steel Company Chemical and Metallurgical Labs are accredited by the American Association for Laboratory Accreditation (or AZLA) in the chemical, mechanical, and environmental fields of testing, as listed in the current AZLA Directory of Accredited Laboratories.

ITEM NO.	MATERIAL DESCRIPTION	QUANT.	WEIGHT	HEAT NO.	TEST OR PC. ID. NO.	TEST RESULTS		
						YLD PT LBS./SQ. IN.	TEN STR LBS./SQ. IN.	ELONG IN. %
RND 3-1/8 IN				96959		86,100	120,700	2 21%

1ST BATCH OF MATERIAL (C')
USED FOR DEVELOPMENT

HEAT ANALYSIS	HEAT NO.	C	Mn	P	S	SI	Cu	NI	Mo	Cr	Cb	V	Al	N
	96959	.24	1.57	.005	.008	.25	.06	.05	.05	.08		.15	.019	.019

C7432

No. _____

NORTHERN CROSS STEEL COMPANY

Producers of fine cold finished steel bars

17382 FOLTZ INDUSTRIAL PARKWAY • STRONGSVILLE, OHIO 44136



PHONE: (216) 572-0550

FAX: (216) 572-9682

SOLD TO:

LOKRING CORPORATION
 396 HATCH DRIVE
 FOSTER CITY CA 94404

SHIP TO:

WILL ADVISE

CUSTOMER ORDER NO.	DATE SHIPPED	DATE PROMISED	DATE ENTERED	SALESMAN	NUMBER BUNDLES
P2070031	07/15/92	SEE BELOW	07/09/92	House	1(5 Bars)
CARRIER		ITEM		TERMS	COMPETITIVE FREIGHT FROM
ABF Freight	*	1 OF 1			
PPD	0				
QTY. ORDERED	SIZE	GRADE	CONDITION	LENGTH	QTY. SHIPP
1,013# 4pcs	2-1/8" Rd.	15V24	HR	20'-8"	1,846
195# 1pc.	1-7/8" Rd.	15V24	HR	20'-8"	
1,440# 3pcs	3" Rd.	15V24	HR	20'-8"	
405# 1pc.	2-5/8" Rd.	15V24	HR	22'	
Date Promised: RUSH					
HEAT					
96960					
96959					
M 39216					
PARTIAL SHIPMENT					

CHEMICAL ANALYSIS

HEAT	CARBON	MANGANESE	PHOSPHORUS	SULPHUR	SILICON	NICKEL	CHROMIUM	MOLYBDENUM	COPPER	LEAD	Alum.	Van.
96960							.180	.050	.050		.023	
96959							.180	.050	.060		.019	
M39216							.120	.100	.110		.031	

CERTIFICATE OF TESTS

MECHANICAL:		CERTIFICATE OF TESTS								
HEAT	YIELD STRENGTH P.S.I.	TENSILE STRENGTH P.S.I.				EL. % 2"	RED. AREA	HARDNESS	GRAIN	
96960	[
96959										
M39216										
JOMINY HARDENABILITY:										
HEAT	1	2	4	8	12	16	20	24	28	32
96960	NA	NA	NA	NA	NA	NA	NA	NA	NA	
96959	NA	NA	NA	NA	NA	NA	NA	NA	NA	
M39216	NA	NA	NA	NA	NA	NA	NA	NA	NA	

CHEMICAL, MECHANICAL, AND PHYSICAL TESTS REPORTED ABOVE ARE CORRECT AS CONTAINED IN OUR RECORDS.

NORTHERN CROSS STEEL COMPANY

[]

[]

[]

**Request for ASME B31 Code Case for
Micro-Alloyed Carbon Steel Bar**

**Attachment 4
MATERIAL CHEMICAL ANALYSIS REPORT**

Anamet Laboratories, Inc.

3400 INVESTMENT BOULEVARD • HAYWARD, CALIFORNIA 94545-3811 • (510) 887-8811

Laboratory Number: 792.186
Purchase Order: P2070136
Date Submitted: July 30, 1992
Date Reported: August 5, 1992

Lokring Corporation

396 Hatch Drive
Foster City, CA 94404

SUBJECT

Four coupons were submitted for chemical analysis. The samples were identified as steel bar, 3", 2-5/8", and 1-7/8" dia.

SPECTROCHEMICAL ANALYSIS

(Reported as Wt. %)

	<u>3"</u>	<u>2-5/8"</u>	<u>1-7/8"</u>
Aluminum (Al)	[]
Carbon (C)			
Chromium (Cr)			
Copper (Cu)			
Manganese (Mn)			
Molybdenum (Mo)			
Nickel (Ni)			
Phosphorus (P)			
Silicon (Si)			
Sulfur (S)			
Titanium (Ti)			
Vanadium (V)			

This testing was performed in accordance with the purchase order.

Submitted by:

[

]

Manager, Laboratory Operations

ch\156

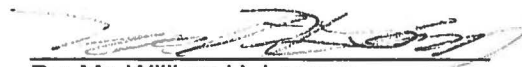
ATTACHMENT Reference 1

AFFIDAVIT

I, William H. Lennon, the sole Member and Chief Executive Officer of Lokring Technology, LLC do hereby affirm and state:

1. I am the sole Member and the Chief Executive Officer of Lokring Technology, LLC, and I am authorized to execute this affidavit on its behalf. I am further authorized to review information submitted to the Nuclear Regulatory Commission (NRC) and apply for the withholding of information from disclosure.
2. Lokring Technology, LLC is providing information pursuant to 10 CFR 50.55a, which constitutes proprietary trade secret information that should be held in confidence by the NRC pursuant to the policy reflected in 10 CFR 2.390(a)(4), because:
 - i. This information Reference 1 Impact Test Results is and has been held in confidence by Lokring Technology, LLC.
 - ii. This information is of a type that is held in confidence by Lokring Technology, LLC and there is a rational basis for doing so because the information contains sensitive trade secret information concerning detailed design and testing details.
 - iii. This information is being transmitted to the NRC in confidence.
 - iv. This information is not available in public sources and could not be gathered readily from other publicly available information.
 - v. Public disclosure of this information would create substantial harm to the competitive position of Lokring Technology, LLC by disclosing Lokring Technology, LLC design and testing details to other parties whose commercial interests may be adverse to those of Lokring Technology.
3. Accordingly, Lokring Technology, LLC requests that the designated documents be withheld from public disclosure pursuant to the policy reflected in 10 CFR 2.390(a)(4) and that prompt written notice be provided to Lokring Technology, LLC of any request for disclosure of Lokring Technology, LLC trade secret or confidential information, as well as the maximum amount of time available under the applicable statute to object in writing to any disclosure of such information.

Lokring Technology, LLC

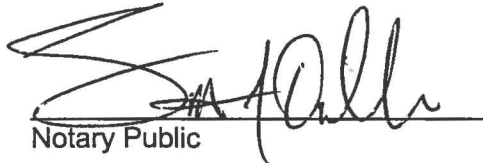


By: Mr. William H. Lennon
Its: Sole Member and Chief Executive Officer
Lokring Technology, LLC

STATE OF OHIO)
) ss.
COUNTY OF LAKE)

Before me, a Notary Public, in and for said County and State, personally appeared **MR. WILLIAM H. LENNON**, who acknowledged that he did execute the foregoing Affidavit and such execution is his free act and deed.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal at Willoughby
Ohio, this 15 day of March, 2019.


Notary Public



SCOTT J. ORILLE
Attorney
Notary Public, State of Ohio
My Commission Has No
Expiration Date
Section 147.03 R.C.

ATTACHMENT Reference 2

AFFIDAVIT

I, William H. Lennon, the sole Member and Chief Executive Officer of Lokring Technology, LLC do hereby affirm and state:

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2. Lokring Technology, LLC is providing information pursuant to 10 CFR 50.55a, which constitutes proprietary trade secret information that should be held in confidence by the NRC pursuant to the policy reflected in 10 CFR 2.390(a)(4), because:
 - i. This information Reference 2 Welding Procedure and Qualification Record is and has been held in confidence by Lokring Technology, LLC.
 - ii. This information is of a type that is held in confidence by Lokring Technology, LLC and there is a rational basis for doing so because the information contains sensitive trade secret information concerning detailed design and testing details.
 - iii. This information is being transmitted to the NRC in confidence.
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Lokring Technology, LLC

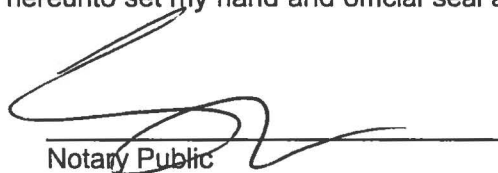


By: Mr. William H. Lennon
Its: Sole Member and Chief Executive Officer
Lokring Technology, LLC

STATE OF OHIO)
) ss.
COUNTY OF Lake)

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Notary Public



SCOTT J. ORILLE
Attorney
Notary Public, State of Ohio
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Expiration Date
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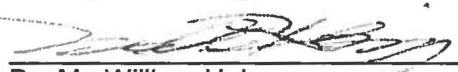
ATTACHMENT Reference 3

AFFIDAVIT

I, William H. Lennon, the sole Member and Chief Executive Officer of Lokring Technology, LLC do hereby affirm and state:

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2. Lokring Technology, LLC is providing information pursuant to 10 CFR 50.55a, which constitutes proprietary trade secret information that should be held in confidence by the NRC pursuant to the policy reflected in 10 CFR 2.390(a)(4), because:
 - i. This information Reference 3 Metallurgical Test Report is and has been held in confidence by Lokring Technology, LLC.
 - ii. This information is of a type that is held in confidence by Lokring Technology, LLC and there is a rational basis for doing so because the information contains sensitive trade secret information concerning detailed design and testing details.
 - iii. This information is being transmitted to the NRC in confidence.
 - iv. This information is not available in public sources and could not be gathered readily from other publicly available information.
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Lokring Technology, LLC

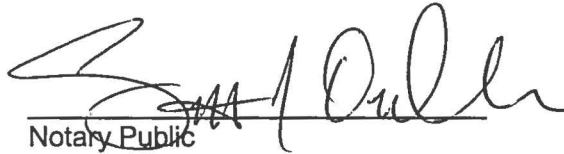


By: Mr. William H. Lennon
Its: Sole Member and Chief Executive Officer
Lokring Technology, LLC

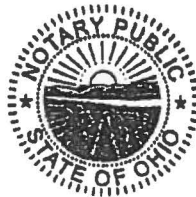
STATE OF OHIO)
) ss.
COUNTY OF Lake)

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Notary Public



SCOTT J. ORILLE
Attorney
Notary Public, State of Ohio
My Commission Has No
Expiration Date
Section 147.03 R.C.

ATTACHMENT Reference 4

AFFIDAVIT

I, William H. Lennon, the sole Member and Chief Executive of Lokring Technology, LLC do hereby affirm and state:

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2. Lokring Technology, LLC is providing information pursuant to 10 CFR 50.55a, which constitutes proprietary trade secret information that should be held in confidence by the NRC pursuant to the policy reflected in 10 CFR 2.390(a)(4), because:
 - i. This information Reference 4 HAZ Hardness Testing is and has been held in confidence by Lokring Technology, LLC.
 - ii. This information is of a type that is held in confidence by Lokring Technology, LLC and there is a rational basis for doing so because the information contains sensitive trade secret information concerning detailed design and testing details.
 - iii. This information is being transmitted to the NRC in confidence.
 - iv. This information is not available in public sources and could not be gathered readily from other publicly available information.
 - v. Public disclosure of this information would create substantial harm to the competitive position of Lokring Technology, LLC by disclosing Lokring Technology, LLC design and testing details to other parties whose commercial interests may be adverse to those of Lokring Technology.
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Lokring Technology, LLC

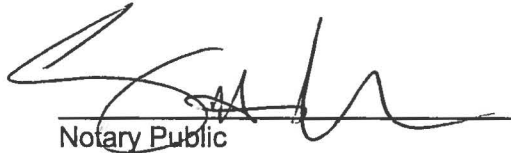


By: Mr. William H. Lennon
Its: Sole Member and Chief Executive Officer
Lokring Technology, LLC

STATE OF OHIO)
COUNTY OF Lake) ss.
)

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Notary Public



SCOTT J. ORILLE
Attorney
Notary Public, State of Ohio
My Commission Has No
Expiration Date
Section 147.03 R.C.

ATTACHMENT Reference 5

AFFIDAVIT

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2. Lokring Technology, LLC is providing information pursuant to 10 CFR 50.55a, which constitutes proprietary trade secret information that should be held in confidence by the NRC pursuant to the policy reflected in 10 CFR 2.390(a)(4), because:
 - i. This information Reference 5 Elevated Temperature Tensile Testing, is and has been held in confidence by Lokring Technology, LLC.
 - ii. This information is of a type that is held in confidence by Lokring Technology, LLC and there is a rational basis for doing so because the information contains sensitive trade secret information concerning detailed design and testing details.
 - iii. This information is being transmitted to the NRC in confidence.
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Lokring Technology, LLC



By: Mr. William H. Lennon
Its: Sole Member and Chief Executive Officer
Lokring Technology, LLC

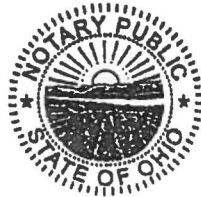
STATE OF OHIO)
) ss.
COUNTY OF LAKE)

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IN WITNESS WHEREOF, I have hereunto set my hand and official seal at Willoughby
Ohio, this 15 day of March, 2019.



Notary Public



SCOTT J. ORILLE
Attorney
Notary Public, State of Ohio
My Commission Has No
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Section 147.03 R.C.