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Jeanne.kingery@duke-energy.com Jeanne W. Kingery Associate General Counsel

VIA E-MAIL DELIVERY

August 4, 2020

Ohio Power Siting Board Theresa White, Executive Director Public Utilities Commission of Ohio 180 E. Broad Street Columbus, Ohio 43215

RE: Case No. 16-253-GA-BTX (Opinion, Order and Certificate; Condition No. 34)

Dear Ms. White:

This communication serves as confirmation, pursuant to Condition No. 34 of the Opinion, Order and Certificate issued by the Ohio Power Siting Board (hereafter "OPSB") that, at least two weeks prior to the preconstruction conference, Duke Energy Ohio, Inc., (Duke Energy Ohio) shall file notice with the OPSB so that welding qualifications, welding procedures, and nondestructive testing procedures may be reviewed in advance.

Duke Energy Ohio sets forth this communication to certify our adherence with Condition No. 34 of the OPSB's Opinion, Order and Certificate pertaining to Case No. 16-253-GA-BTX.

Sincerely,

/s/ Jeanne W. Kingery

Jeanne W. Kingery Associate General Counsel

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	Purpose

DUKE ENERGY.	Heat Sink Canacity Massurament	WEL-PR-1040
	Heat Sink Capacity Measurement	Revision Number: 1
	Walding	Effective Date: 05/01/2019
	Welding	Page 2 of 6

1. Purpose

The purpose of this procedure is to provide steps for calculating the heat sink capacity of an operating pipeline that will have in-service welding performed on it.

NOTE: <u>Measuring the heat sink capacity determines the cooling conditions of the pipe.</u> <u>Knowing the cooling conditions of the pipe will help to control the risk of hydrogen</u> <u>cracking in the weld.</u>

2. Governing Code and References

N/A

3. State Specific Requirements

N/A

4. Environmental Information

Refer to the Environmental Health and Safety Handbook or contact Duke Environmental Support at 1-800-527-3853.

5. Who

Gas Engineering

Major Projects

Gas Field Operations

Technical Field Operations

6. Task Summary

This procedure provides the necessary steps to calculate the heat sink capacity of an operating pipeline that would assist in the selection of the appropriate in-service welding procedure.

S. market	Heat Sink Canacity Measurement	WEL-PR-1040
DUKE	Heat Sink Capacity Measurement	Revision Number: 1
ENERGY.	Welding	Effective Date: 05/01/2019
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7. Safety Requirements

At Duke Energy, Health and Safety is a Core Company Value. Employees are responsible for maintaining the highest regard for safety while planning and conducting work. Employees are also responsible for ensuring a safe work environment exists for themselves, their coworkers, and their surrounding community.



NOTE: This icon raises awareness to important non-safety related information.

8. Definitions/Acronyms

Hydrogen Cracking - A condition, also known as hydrogen embrittlement, where the presence of hydrogen in a weld, on top of the weld having both a tensile stress acting on it and a crack susceptible microstructure, causes the weld to crack.

9. Tools, Materials, and Equipment

- Oxy-acetylene torch .
- Contact pyrometer

10. Procedures/Process

Step	Action	Answer
1	Determine the direction of flow.	
2	Draw six, 2-inch circles on the pipeline with any means that will not disappear at elevated temperatures. The circles may be on the same side of the pipe or on opposite sides of the pipe. If the pipe outside diameter is less than 2.375 inches, mark an area that has a 2 inch length that is parallel to the pipeline axis.	

DUKE ENERGY.

Heat Sink Capacity Measurement

WEL-PR-1040 Revision Number: 1

Welding

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3	Start with the downstream area and quickly heat the area with an oxy-acetylene torch to a temperature between 300°C (572°F) and 325°C (617°F) using a circular motion. If the pipe outside diameter is less than 2.375 inches than heat the area with a linear motion. It is important to start with short heating times and then increase the heating time until the temperature of the pipe reaches between 300°C (572°F) and 325°C (617°F) with a heating time between 15 to 20 seconds. The heating time can be controlled by the tip used to heat the area so smaller tips shall be used when heating small diameter, thinner walled pipe. Quickly remove the torch, apply a contact pyrometer to the center of the heated region, and measure the time that it takes for the pipe wall to cool from 250°C (482°F) to 100°C (212°F) using a stopwatch. Record the cooling time and then repeat at the next upstream area until six valid cooling times are recorded. If the pipe is still warm from the previous measurements, wait until normal temperature is restored.	СТ1 СТ2 СТ3 СТ4 СТ5 СТ6		
4	Calculate the average heat sink capacity time from the six recorded times.	Ave.		
5	Is the average time listed in Step 4 higher than the recorded heat sink time recorded on the in- service welding procedure?	Yes	No	

11. Contact

Gas Engineering

DUKE ENERGY.	Heat Sink Canacity Measurement	WEL-PR-1040
	Heat Sink Capacity Measurement	Revision Number: 1
	Walding	Effective Date: 05/01/2019
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12. Signature

Reviewed and Approved by:

Bost Bost (Apr 30, 2019) Randy L

C DUIKE	Heat Sink Canacity Measurement	WEL-PR-1040
DUKE	Heat Sink Capacity Measurement	Revision Number: 1
ENERGY.	Walding	Effective Date: 05/01/2019
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13. Revision Log

The table below documents the history of each revision issued and identifies the following: Revision Number, Date, Summary of Changes (including reason for change, and a list of Legacy Duke/Piedmont Documents used to integrate this document), Responsible Party (person or group facilitating changes).

Rev #	Date	Summary of Changes	Responsible Party
0	03/31/2019	 Initial Issue Legacy Documents incorporated into this procedure: CM-PL-4000 Appendix N: Heat Sink Capacity Measurement. 	Members of Work Process Integration Team
1	05/01/2019	 Revised the "WHO" section, added Gas Engineering, Gas Field Operations, and Technical Field Operations 	Work Process Integration Team



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1. Purpose

The purpose of this procedure is to provide a method for reducing or eliminating magnetization of pipelines that will be welded together.



CAUTION: <u>Welding onto magnetized pipe can result in arc blow. Arc blow can affect</u> the welder's ability to deposit a satisfactory weld leading to increased repairs.

The magnetic field tends to be higher in the weld joint root opening, therefore, the greatest risk of arc blow will be when depositing the root pass. Magnetism is measured in Gauss and shall be measured with a Gauss meter probe (Hall-effect Gauss Meter).

The Gauss level produced when joining two pipe sections together is generally ten (10) times higher than with the pipe sections separated. For example, two pipe sections averaging eight (8) Gauss will result in a magnetism of eighty (80) Gauss when butted together. The effect the magnetism has on the welding arc is dependent on the strength of the field. The relative field strength and associated welding problems are:

- 20 Gauss and below Welding can take place without concern.
- 21 30 Gauss The welding arc may be affected by magnetism.
- 31 100 Gauss The welding arc will likely be affected by magnetism, but may be manageable by the welder depending on their level of skill, amperage, arc length, diameter, and joint design.
- 100 Gauss and above The welding arc will be affected by magnetism and demagnetization efforts need to be taken to reduce the magnetic field.
- 150 300 Gauss Serious weld defects are likely, including weld induced cracked welds.
- 300 Gauss and above Welding will seem almost impossible at times combined with severe weld defects.
- 2. Governing Code and References

N/A

3. State Specific Requirements

N/A



Welding

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4. Environmental Information

Refer to the Environmental Health and Safety Handbook or contact Duke Environmental Support at 1-800-527-3853.

5. Who

Gas Engineering

Major Projects

Gas Field Operations

Technical Field Operations

6. Task Summary

This procedure provides the necessary steps to demagnetize pipe for welding.

7. Safety Requirements

At Duke Energy, Health and Safety is a Core Company Value. Employees are responsible for maintaining the highest regard for safety while planning and conducting work. Employees are also responsible for ensuring a safe work environment exists for themselves, their coworkers and their surrounding community.



Icon Key:

CAUTION: <u>This icon identifies possible safety hazards and/or serves as a reminder to</u> <u>take necessary precautions.</u>

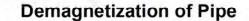
8. Definitions/Acronyms

Gauss - Unit of measurement of "magnetic induction" or "magnetic flux density".

Gauss Meter - Instrument for measuring electromagnetic fields, measured in Gauss units.

9. Tools, Materials, and Equipment

- Gauss Meter
- Welding Cable





- Welding Power Supply
- Commercially available demagnetization equipment (optional)

10. Procedures/Process

The demagnetizing procedure is based on using a welding power supply to alter the magnetic field; however, there is commercially available equipment specifically for demagnetization, which can be used in place of the following procedure. In most cases, the use of purpose built demagnetization equipment will result in demagnetization that is more effective with less guesswork on the part of the welder and inspector.

Step	Action
1	Align the weld joint per the requirements of the welding procedure.
2	Insert the Gauss meter probe into the weld joint and measure the magnetism around the entire circumference.
3	If the magnetism level is less than 100 Gauss around the circumference, stop this procedure and continue with welding. (If welding problems arise that appear to be caused by magnetism, steps 5-9 can be followed to reduce the level of magnetism).
4	If the magnetism is more than 100 Gauss at any place around the circumference, follow steps 5-9 to reduce the magnetic field to 30 Gauss or less prior to welding.
5	Make approximately 10 wraps of welding cable 3 to 6 inches (up to ½ the pipe diameter) from the weld joint on the pipeline side as shown in Appendix A. The wraps shall be laid side by side around the magnetized pipe and connected to the terminals of the welding machine.
6	Set the welding power supply on direct current (DC) only and adjust the amperage to the minimum setting. Start the welding power supply, insert the Gauss meter probe into the weld joint, and measure the magnetic field around the circumference. If the magnetism has increased, switch the welding machine terminals and repeat step 6.
7	While continuously checking the magnetic field, increase the welding current on the power supply until the readings around the circumference are 30 Gauss or less.

	Domagnotization of Ping	WEL-PR-1030
DUKE	Demagnetization of Pipe	Revision Number: 1
C' ENERGY	Welding	Effective Date: 05/01/2019
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	 a. Depending on the extent of the magnetism created, it may not be possible to get the err of the weld joint to the desired Gauss level a In this case, welding shall only be done in the weld joint where the Gauss level is accepta welding machine current level adjusted for of the weld is complete. Make sure the welding followed, including time between passes. b. At some point around the circumference, the magnetic field may switch, requiring the terr welding machine to be switched to obtain the followed. 	ntire circumference at the same time. The areas of the ble and then the other areas until g procedure is still e polarity of the minals of the
8	Weld the root pass around the circumference w magnetism is below 30 Gauss while continuing the pipe. In other words, one welding machine is and one is used to demagnetize the pipe.	to demagnetize
9	Once the root pass and hot pass are complete, will likely be reduced to an extent where the rer can be welded without further demagnetization cases where magnetism is severe, the process during subsequent passes as necessary to com	maining passes . However, in shall be repeated

11. Contact

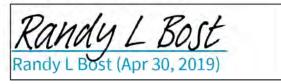
Gas Engineering

12. Appendices

Appendix A: Pipe Demagnetizing with a Welding Power Supply Procedure Schematic

13. Signature

Reviewed and approved by:



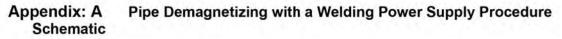
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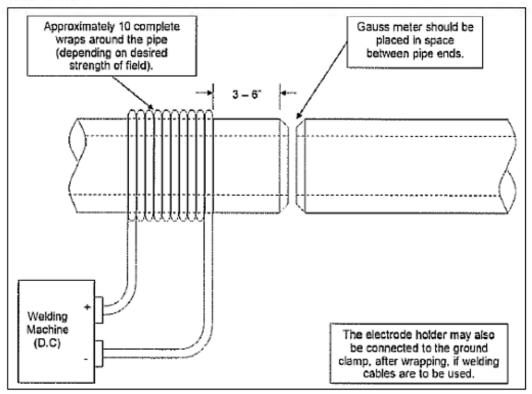
14. Revision Log

The table below documents the history of each revision issued and identifies the following: Revision Number, Date, Summary of Changes (including reason for change, and a list of Legacy Duke/Piedmont Documents used to integrate this document), Responsible Party (person or group facilitating changes).

Rev #	Date	Summary of Changes	Responsible Party
0	03/31/2019	 Initial Issue Legacy Documents incorporated into this procedure: CM-PL-4000 Appendix M: Demagnetization of Pipe 	Members of Work Process Integration Team
1	05/01/2019	 Revised the "WHO" section, added Gas Engineering, Gas Field Operations, and Technical Field Operations 	Work Process Integration Team









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Who

- Gas Engineering
- Major Projects
- Gas Field Operations
- Technical Field Operations

Test Number: 1-1 Date: 12/4/2014 Location: Klefner, Worthington, Ohio	API 1104	COUPON TE	ST REPO	RT			P	age:	1	of	2
Welder: Jeff Ellis, Piedmont Natural Gas Welding Process: Manual Oxy-Acetylene Welding Pipe Material: 2.375" diameter, 0.154" thick API 5L X42 to 2.375" diameter, 0.154" thick API 5L X42 Joint Design: No land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Uphill Filler Metai: RG60 Interpass Temperature: NR Preheat Temperature: Ambient (S8"F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Ine-up Clamps: None used Monetation of the acetylene was 8 CFH and the flow rate of the oxygen was 20 CFH WELDING PARAMETERS Pass: Root Cap Manufacture: MANUACUTE: NA NA NA Interpass Current/Polarity: NA NA Interpass Interpass Comments: NA NA Interpass Interpass FigURE 1 – BEAD SEQUENCE FIGURE 1 – BEAD SEQUENCE FIGURE 1 – BEAD SEQUENCE				Date:	12/4	/2014					
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Joint Design: No land, 1/16" gap, 70 degree bevel butt joint Position: SG, Fixed Welding Direction: Uphill Filler Metal: RG60 Time Between Passes: 31 minutes between root and hot pass Preheat Temperature: Ambient (58"F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 8 CFH and the flow rate of the oxygen was 20 CFH WELDING PARAMETERS Pass: Root Cap AWS Classification: NR NR Electrode Diameter: 3/32" 3/32" Current/Polarity: NA NA Current Range: NA NA Current S FIGURE 1 – BEAD SEQUENCE FIGURE 1 – BEAD SEQUENCE				12 + - 2 2	757 4:-		15 47	List A		12	
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Duke Energy	NGBU	Procedure	Qualification	Records
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Coupon Thickness:							
Coupon Area:	1.1.1)				
Maximum Load:							
Tensile Strength:							
Fracture Location:							
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Test Number: 1-2			Date:	12/4	/2014				
Location: Kiefner, Worthing				_					
Welder: Jeff Ellis, Piedmont	Natural Gas								
Malding Brown Manual		Malalana -							
Welding Process: Manual (Pipe Material: 2.375" diam			2 +0 2 27	E" dia	motor 0.2	10" thick		12	
loint Design: No land, 3/32				5 ula	neter, 0.2	16 UNICK	APISLA	42	
Position: 5G, Fixed	gap, /o degr	ee bever but			ction: L	Inhill			
Filler Metal: RG60			weiun	ig Dire		prim			
Time Between Passes: 31	minutes betwe	en root and	hot nass						
Preheat Temperature: Am					nperature	NR			
Post-weld Heat Treatment:			interp		perature				
Line-up Clamps: None use	111 - 47 -								
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	or the dectylen	e mas e em	und the	101110	te or the t	SAIBen W	IS LE ON		
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Pass:	Root	Сар							
AWS Classification:	RG60	RG60				_			
Manufacture:	NR	NR							
Electrode Diameter:	3/32"	3/32"							
Current/Polarity:	NA	NA							
Current Range:	NA	NA							
Voltage Range:	NA	NA							
Travel Speed Range, ipm:	0.8-0.9	0.5-0.6							
Comments:									
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	FIG	URE 1 - BE	AD SEOL	JENCE					
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Test Number: _	1-2		1 A. 4		Page:	2	of	2
		т	ENSILE STRENGTH	TEST			_	
Coupon Number:								
Coupon Width:					in a fill i			
Coupon Thickness:)					
Coupon Area:	-		· · · · · · · · · · · · · · · · · · ·					
Maximum Load:			(
Tensile Strength:	-							
Fracture Location:								
			BEND TEST					
Coupon Number:	W1 RB1	W1 RB2						
Type:	Root	Root						
Results:	Pass	Pass (1)						
			Martin and States	1				
Comment and the second	14/1	NB1	NICK-BREAK TE	ST				-
Coupon Number: Results:		INBT	W1 NB2 Pass					
Results:	Pa	155	Pass					-
		СН	ARPY TOUGHNES	S TEST				
Coupon Number:						1		-
Depth:								
Width:			- 10 K					
Notch Location:								
Test Temperature:								
Impact Energy:								
% Shear:								
Lateral Expansion:			1.1					
Same a			ine sacisti					
Comments: (1)	Indications	were present	but were within the	e acceptable limi	ts of API 110)4		
			OTHER TESTS					
Test Type:								
P								
		-					-	_
We certify that the	statement	s in this reco	rd are correct and t	hat the test weld	ds were pre	pared, w	elded,	and
			the requirements of				101100	

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Location: Kiefner, Worthington, Ohio Welder: Jeff Ellis, Piedmont Natural Gas Welding Process: Manual Oxy-Acetylene Welding Pipe Material: 2.375" diameter, 0.154" thick API 5L X52 to 2.375" diameter, 0.154" thick API 5L X52 Joint Design: No land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Interpass Temperature: NR Preheat Temperature: Ambient (61°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Uphill Line-up Clamps: None used None used VelDING PARAMETERS Pass: Root Cap AWS Classification: RG60 MR Manufacture: NR NR NR Electrode Diameter: 3/32" 3/32" Image: None Image: None Current Range: NA NA NA NA Image: None Image: None	API 1104	COUPON TE	ST REPO	RT		Page:	1	of	2
Location: Kiefner, Worthington, Ohio Welder: Jeff Ellis, Piedmont Natural Gas Welding Process: Manual Oxy-Acetylene Welding Pipe Material: 2.375" diameter, 0.154" thick API 5L X52 to 2.375" diameter, 0.154" thick API 5L X52 Joint Design: No land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Interpass Temperature: NR Preheat Temperature: Ambient (61°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None WelDing PARAMETERS Pass: Root Cap Manufacture: Manufacture: NR NR NR Electrode Diameter: 3/32" 3/32" Interpase Main Voltage Range: NA NA NA Interpase Main Voltage Range: NA NA Interpase Main Interpase Main Comments: One Interpase Main Interpase Main Interpase Main Interpase Main Corrent Range: NA NA	Test Number: 1-3			Date:	12/4/2014				
Welder: Jeff Ellis, Piedmont Natural Gas Welding Process: Manual Oxy-Acetylene Welding Pipe Material: 2.375" diameter, 0.154" thick API SL X52 to 2.375" diameter, 0.154" thick API SL X52 Joint Design: No land, 1/16" gap, 70 degree bevel but joint Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (61"F) Interpass Temperature: Post-weld Heat Treatment: None Line-up Clamps: None used Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap AWS Classification: NR NR Manufacture: NA NA Electrode Diameter: 3/32" 3/32" Voltage Range: NA NA NA NA NA NA NA Interpase Comments: Current Range: NA NA Interpase Comments: <tr< td=""><td>Location: Kiefner, Worthing</td><td>gton, Ohio</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr<>	Location: Kiefner, Worthing	gton, Ohio							
Pipe Material: 2.375" diameter, 0.154" thick API 5L X52 to 2.375" diameter, 0.154" thick API 5L X52 Joint Design: No land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (61°F) Interpass Temperature: Post-weld Heat Treatment: None Line-up Clamps: None used Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap AWS Classification: NR NR Manufacture: NR NR Lorent/Polarity: NA NA Voltage Range: NA NA NA NA NA Image: NA NA NA Image: Image: Protectored Pagee: NA NA Image: Image: Corrent Range: NA NA Image: Image: Image: <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
Pipe Material: 2.375" diameter, 0.154" thick API 5L X52 to 2.375" diameter, 0.154" thick API 5L X52 Joint Design: No land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (61°F) Interpass Temperature: Post-weld Heat Treatment: None Line-up Clamps: None used Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap AWS Classification: NR NR Manufacture: NR NR Lurent/Polarity: NA NA Current Range: NA NA NA NA NA Image: NA NA NA Image: Image: Prost-cape dange, ipm: 0.9 – 1.3 0.9 Image: Image:									
No land, 1/16" gap, 70 degree bevel butt joint Prosition: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (61°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Line-up Clamps: None used Mumber 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS RG60 RG60 RG60 Manufacture: NR NR NR RG60 RG60 RG60 Current/Polarity: NA NA Interpase						45 47 11 1 1			
Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Time Between Passes: 30 minutes between root and hot pass Perheat Temperature: Ambient (61°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Impose Number 3 oxy-acetylene weld tip was used Mone used Interpass Temperature: NR Comments: Number 3 oxy-acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap Interpass 3/32 Interpass 3/32 AWS Classification: NR NR NR Interpass 3/32 Interpass 3/32 Current/Polarity: NA NA NA Interpass 3/32 <t< td=""><td></td><td></td><td></td><td></td><td>diameter, 0</td><td>.154" thick A</td><td>API 5L X</td><td>52</td><td>-</td></t<>					diameter, 0	.154" thick A	API 5L X	52	-
Filler Metal: RG60 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (61°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR NR Post-weld Heat Treatment: None used Mone used Interpass Temperature: NR Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH Pass: Root Cap Manufacture: Pass: Root Cap Manufacture: Manufacture: NR NR NR Electrode Diameter: 3/32" 3/32" Main Main Current Range: NA NA NA Main Voltage Range: NA NA NA Main Travel Speed Range, ipm: 0.9 0.9 0.9 0.9		o" gap, 70 degre	e bevel but		Disastian	Unbill			
Restaure 30 minutes between root and hot pass Preheat Temperature: Ambient (61°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Line-up Clamps: None used Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Root Cap Cap Pass: Root Cap Cap AWS Classification: NR NR RG60 RG60 Manufacture: NR NR NR Current/Polarity: NA NA Current Range: NA NA NA NA Interpass Temperature: NA NA Interpass Temperature: NR NR NR Interpass Temperature: NR NR Current Range: NA NA NA NA Interpass Temperature: NA NA Yoltage Range: NA NA NA NA Interpass Temperature: NA NA Interpass Temperature: NB Interpass Temperature: NB				weiding	Direction: -	Ophili			_
Preheat Temperature: Ambient (61°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Secondary Line-up Clamps: None used Number 3 oxy-acetylene weld tip was used Secondary Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap AWS Classification: RG60 RG60 Manufacture: NR NR Electrode Diameter: 3/32" Current/Polarity: Current Range: NA NA NA Voltage Range: NA NA Interpass Temperature: Comments: O.9 – 1.3 0.9 Interpass Temperature:	and a state of the	minutos hotwo	an root and	hot pass	_	_			
Post-weld Heat Treatment: None Line-up Clamps: None used Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap AWS Classification: RG60 RG60 Image: Classification: Manufacture: NR NR Image: Classification: NR NR Image: Classification: NA NA Image: Classification: NR NR NR NR NR					Temperatu	e NR			
Line-up Clamps: None used Comments: Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap Amount AWS Classification: RG60 RG60 Amount Manufacture: NR NR Amount Amount Electrode Diameter: 3/32" 3/32" Amount Amount Current/Polarity: NA NA NA Amount Amount Voltage Range: NA NA NA Amount Amount Comments: O.9 – 1.3 O.9 Image:				interpass	remperatu	. <u> </u>			
Number 3 oxy-acetylene weld tip was used The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap Cap AWS Classification: RG60 RG60 Cap Cap Manufacture: NR NR Cap Cap Cap Current/Polarity: NA NA NA Cap		1 7 3 5 4 7 8 5							
The flow rate of the acetylene was 7 CFH and the flow rate of the oxygen was 18 CFH WELDING PARAMETERS Pass: Root Cap Image: Colspan="2">Cap AWS Classification: RG60 RG60 Image: Colspan="2">Courrent/Polarity: Manufacture: NR NR Image: Courrent Range: NA NA Image: Range: NA NA Image: Range: NA NA Image: Range: NA NA Image: Range: Image: Range			tip was us	ed					
WELDING PARAMETERS Pass: Root Cap AWS Classification: RG60 RG60 Image: Composition of the state of the s					w rate of the	oxygen wa	s 18 CFF	+	_
Root Cap Image: Comments: Root Cap Image: Comments: Redouble comments: Redouble comments: Redouble comments: Image: Comments: Redouble comments: Redouble comments: Image: Comments: Redouble comments: Redouble comments: Image: Comments: Redouble								-	
AWS Classification: RG60 RG60 Manufacture: NR NR Electrode Diameter: 3/32" 3/32" Current/Polarity: NA NA Current Range: NA NA Voltage Range: NA NA Travel Speed Range, ipm: 0.9 – 1.3 0.9		w	ELDING PA	RAMETER	s				
RG60 RG60 RG60 Manufacture: NR NR Electrode Diameter: 3/32" 3/32" Current/Polarity: NA NA Current Range: NA NA Voltage Range: NA NA Travel Speed Range, ipm: 0.9 – 1.3 0.9	Pass:	Root	Cap						
Electrode Diameter: 3/32" 3/32" Image: Current/Polarity: NA NA NA Image: Current Range: Image: Current Range: Image: Current Range: Image: Current Range; <	AWS Classification:	RG60							
NA NA NA Current/Polarity: NA NA Current Range: NA NA Voltage Range: NA NA Travel Speed Range, ipm: 0.9 – 1.3 0.9 Comments:	Manufacture:	NR	NR						
NA NA NA Voltage Range: NA NA Travel Speed Range, ipm: 0.9 – 1.3 0.9 Comments:	Electrode Diameter:	3/32"	3/32"						
Voltage Range: NA NA Travel Speed Range, ipm: 0.9 – 1.3 0.9 Comments:	Current/Polarity:	NA	NA						
Travel Speed Range, ipm: 0.9 - 1.3 0.9 Comments:	Current Range:	NA	NA						
Comments:	Voltage Range:	NA	NA						
3	Travel Speed Range, ipm:	0.9 - 1.3	0.9						
FIGURE 1 – BEAD SEQUENCE	Comments:								
FIGURE 1 – BEAD SEQUENCE									
FIGURE 1 – BEAD SEQUENCE									
		FIGL	JRE 1 – BE	AD SEQUE	NCE				
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Coupon Width: Coupon Thickness: O.166 inch ² O.155 inch O.155 inch O.156 inch ² O.166 inch ² O.16	Test Number:	1-3					Page:	2	of	2
Coupon Width: Coupon Thickness: O.155 inch O.155 inch O.166 inch ² O.			TE	NSILE STR	ENGTH TH	ST				
Coupon Thickness: 0.155 inch	Coupon Number:	W	3 T1							
Coupon Area: 0.166 inch ²	Coupon Width:	1.07	'0 inch							
Maximum Load: 14,204 lb										
Tensile Strength: 85,565 psi Base Metal Base Metal BEND TEST Coupon Number: Noter Results: NICK-BREAK TEST Coupon Number: W3 NB1 W3 NB2 Pass Pass Coupon Number:										
Base Metal BEND TEST Coupon Number: W3 RB1 W3 RB2										
BEND TEST Coupon Number: W3 RB1 W3 RB1 Results: NICK-BREAK TEST Coupon Number: W3 NB1 W3 NB2 NICK-BREAK TEST Coupon Number: W3 NB1 W3 NB2 Pass Pass CHARPY TOUGHNESS TEST Coupon Number: O Depth: Mick-BREAK TEST Coupon Number: O Depth: Mick-BREY TOUGHNESS TEST Coupon Number: O Depth: Mick-BREY TOUGHNESS TEST Coupon Number: O Impact Energy: Impact Energy: Mick-BRE Energy: Mick-BRE Energy: Impact Energy: OTHER TESTS Comments: OTHER TESTS We certify that the statements in this record are correct and that the test welds were prepared, welded, a tested in accordance with the requirements o										
Coupon Number: W3 RB1 W3 RB2	Fracture Location:	Base	ivietai							
Results: Root Results: Pass Pass Pass Results: Results: Pass Pass Pass Pass Results: Result is in this record are correct and that the test welds were prepared, welded, at testeed in accor				BEND	TEST					
Results: Pass Pass NICK-BREAK TEST Coupon Number: W3 NB1 W3 NB2	Coupon Number:	W3 RB1	W3 RB2							
NICK-BREAK TEST Coupon Number: W3 NB1 W3 NB2 Pass Pass Pass CHARPY TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Depth: Impact Second	Type:	Root	Root							
Coupon Number: W3 NB1 W3 NB2 Results: Pass Pass CHARPY TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Depth: Image: Coupon Number: Image: Coupon Number: Width: Image: Coupon Number: Image: Coupon Number: Image: Coupon Number: Depth: Image: Coupon Number: Image: Coupon Number: Image: Coupon Number: Image: Coupon Number: Width: Image: Coupon Number: Image: Coupon Number: <t< td=""><td>Results:</td><td>Pass</td><td>Pass</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Results:	Pass	Pass							
Coupon Number: W3 NB1 W3 NB2 Results: Pass Pass CHARPY TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Depth: Image: Coupon Number: Image: Coupon Number: Width: Image: Coupon Number: Image: Coupon Number: Image: Coupon Number: Depth: Image: Coupon Number: Image: Coupon Number: Image: Coupon Number: Image: Coupon Number: Width: Image: Coupon Number: Image: Coupon Number: <t< td=""><td></td><td></td><td></td><td></td><td>AV TEST</td><td></td><td></td><td></td><td></td><td></td></t<>					AV TEST					
Pass Pass CHARPY TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Depth: Image: Component of the statements in this record are correct and that the test welds were prepared, welded, a tested in accordance with the requirements of the 21st Edition of API 1104.	Coupon Number:	W/3	NB1				Û			_
CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: Shear: Lateral Expansion: Comments: Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, a tested in accordance with the requirements of the 21st Edition of API 1104.	Construction of the second second									
Coupon Number:				C. S. S. M	10000					
Depth:			CH/	ARPY TOU	SHNESS T	EST	· · · · · ·			
Width:										
Notch Location:		1	- T. D							
Test Temperature: Impact Energy: Impact Energy: % Shear: Impact Energy: Impact Energy: Lateral Expansion: Impact Energy: Impact Energy: Comments: Impact Energy: Impact Energy: Test Type: Impact Energy: Impact Energy: Results: Impact Energy: Impact Energy: 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 the 21st Edition of API 1104.		<								
Impact Energy:			-							
% Shear:										
Lateral Expansion:Comments:COTHER TESTS Test Type:Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, a tested in accordance with the requirements of the 21st Edition of API 1104.										
Comments: OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, a tested in accordance with the requirements of the 21st Edition of API 1104.		1								
OTHER TESTS Test Type:			A.			1				
Test Type:	Comments:									
Test Type:				OTHER	TESTS					
Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, a tested in accordance with the requirements of the 21st Edition of API 1104.	Test Type:									
We certify that the statements in this record are correct and that the test welds were prepared, welded,										
tested in accordance with the requirements of the 21st Edition of API 1104.	Results:	C	0.670 - 0.	10000		1.20.00	3676-57		A.1.	
	Results:		s in this recor						velded	and
Date: 12/4/2014	We certify that the				monte of t	ho 21ct Edition	of ADI 110	4.		
	We certify that the			the require	ments of t	ne 21st Luition	101 API 110			
Test Conducted By: Jim Winigman, Kiefner	We certify that the te			the require	ments of t		101 API 110			

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est Number: 1-4			Date:	12/4/2014					
ocation: Kiefner, Worthing	ton, Ohio								
Welder: Jeff Ellis, Piedmont									
Welding Process: Manual (-2+- 2 27	-" diamatan	0.210	Abial A			
oint Design: No land, 3/32				5 diameter	, 0.218	THICK A	PI SL X	52	_
Position: 5G, Fixed	gap, 70 degre	e bever bu		g Direction:	Unhi	u .			
iller Metal: RG60			weiding	g Direction.	opin				_
ime Between Passes: 32	minutes betwee	en root and	hot pass						
Preheat Temperature: Am				ss Tempera	ture:	NR			
Post-weld Heat Treatment:	None	-6					-		
ine-up Clamps: None used	11-11-								
	acetylene weld	tip was us	ed				4.1		
	of the acetylene			flow rate of	f the oxy	/gen wa	s 20 CF	н	
	W	ELDING P	ARAMETE	RS					
Pass:	Root	Cap							
AWS Classification:	RG60	RG60							
Manufacture:	NR	NR							
lectrode Diameter:	3/32"	3/32"							
Current/Polarity:	NA	NA							
Current Range:	NA	NA							
/oltage Range:	NA	NA							
ravel Speed Range, ipm:	0.6-0.9	0.6							
Comments:									
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	FIGU	JRE 1 – BE	AD SEQU	ENCE					
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Coupon Width: 0.957 inch	Test Number:	1-4					Page:	2	of	2
Coupon Width: 0.957 inch		£	TE	INSILE STR	RENGTH	TEST				
Coupon Thickness: 0.218 inch		W	4 T1		-					
Coupon Area: 0.209 inch ²										_
Maximum Load: 16,355 psi				_						
Tensile Strength: 78,251 lb										
Weld (1) BEND TEST Coupon Number: W4 RB1 W4 RB2 Image: Colspan="2">Image: Colspan="2" Image: Colspa		-				_				
BEND TEST Coupon Number: Results: Pass Pass Pass NICK-BREAK TEST Coupon Number: W4 NB1 W4 NB2 Pass Pass Pass Pass Pass Pass Pass Pass Pass Pass CHARPY TOUGHNESS TEST Coupon Number: Pass Pass Pass Pass CHARPY TOUGHNESS TEST Coupon Number: Depth: Impact Energy: Impact En										
Coupon Number: W4 RB1 W4 RB2	Fracture Location:	vve								
Results: Root Root Root Root Root Root Root Result NICK-BREAK TEST Coupon Number: W4 NB1 W4 NB2 Pass Pa				BEND	TEST					
Results: Pass Pass NICK-BREAK TEST Coupon Number: W4 NB1 W4 NB2	Coupon Number:	W4 RB1	W4 RB2							
NICK-BREAK TEST Coupon Number: W4 NB1 W4 NB2 Image: Character of the statements in this record are correct and that the test welds were prepared, welded Coupon Number: CHARPY TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Coupon Number: Character of the statements in this record are correct and that the test welds were prepared, welded	Type:	Root	Root							
Wumber: W4 NB1 W4 NB2 Image: Character of the statements in this record are correct and that the test welds were prepared, welded Results: Pass Pass Pass Pass Pass Pass Pass CHARPY TOUGHNESS TEST Coupon Number: Pass Pass Depth: Image: Character of the pass Image: Character of the pass Image: Character of the pass Width: Image: Character of the pass Image: Character of the pass Image: Character of the pass Width: Image: Character of the pass Image: Character of the pass Image: Character of the pass Width: Image: Character of the pass Image: Character of the pass Image: Character of the pass We certify that the statements in this record are correct and that the test welds were prepared, welded Image: Character of the pass Image: Character of the pass	Results:	Pass	Pass						-	
Way NB1 Way NB2 Number: Pass Pass Pass Pass Pass Pass Pass CHARPY TOUGHNESS TEST Coupon Number: Depth: Image: Charper Street					EAV TEC	-				
Pass Pass CHARPY TOUGHNESS TEST Coupon Number: Depth:	Coupon Number:	10/4	NB1		100 2010 2010 P	1	Û	-		
CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: (1) The fracture surface passed the requirements of API 1104 5.6.3.3 OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded							-			
Coupon Number:				C.5.5.5	1.00					
Depth:			CH	ARPY TOU	GHNESS	TEST				
Width: Image: Constraint of the statements in this record are correct and that the test welds were prepared, welded Width: Image: Constraint of the statements in this record are correct and that the test welds were prepared, welded		1								
Notch Location:										
Test Temperature: Impact Energy: Impact Energy: Impact Energy: % Shear: Impact Energy: Impact Energy: Impact Energy: Lateral Expansion: Impact Energy: Impact Energy: Impact Energy: Comments: (1) The fracture surface passed the requirements of API 1104 5.6.3.3 Impact Energy: OTHER TESTS Test Type:			_	-						
Impact Energy:			-							
% Shear: Lateral Expansion: (1) The fracture surface passed the requirements of API 1104 5.6.3.3 OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded			-							
Lateral Expansion:										
Comments: (1) The fracture surface passed the requirements of API 1104 5.6.3.3 OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded										
OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded				100		1				
Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded	Comments: (1) T	he fracture	surface passe	ed the requ	irements	of API 1104 5.6	5.3.3			
Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded				OTUE	TECTO					
Results: We certify that the statements in this record are correct and that the test welds were prepared, welded	Test Type									
We certify that the statements in this record are correct and that the test welds were prepared, welded	Desulter									
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tested in accordance with the requirements of the 21st Edition of API 1104.									velded	and
	te	sted in acco	ordance with	the require	ements of	f the 21st Editio	on of API 110	94.		
Dete: 12/4/2014										
Date: 12/4/2014 Test Conducted By: Jim Winigman, Kiefner	D-1 12/4/2014									

Test Number: 2-1 Location: Kiefner, Worthingto								
		Date:	12/4/20	014				
	n, Ohio		1.00	2				
Welder: Jeff Ellis, Piedmont N	atural Gas							
Welding Process: Manual Ox	v-Acetylene Weldi	ng						
Pipe Material: 2.375" diameter			75" diame	ter, 0.154'	thick Al	PI 5L X	42	
Joint Design: Lap fillet joint w			7. 80.000.7					
Position: 5G, Fixed		Weldi	ng Directio	on: Uph	ill			
Filler Metal: RG60			0					
	nutes between roo	ot and hot pass						
Preheat Temperature: Ambie	THE NUMBER OF THE PARTY OF THE PARTY OF THE		ass Tempe	erature:	NR			
	lone		- se i citipe					
Line-up Clamps: None used								
Comments: Number 3 oxy-ad	etvlene weld tin v	was used					_	
	the acetylene was		flow rate	of the ovy	gon was	20 CE	-	
	the dectylene was	o ern una ene	nowrate	or the oxy	Senwas	20 011		
	WEIDI	NG PARAMET	FRS					
Pass:	Root	NO FARAIVIEI	LNJ	_	1			-
	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1	-		4			_
AWS Classification:	RG60				-	_		-
Manufacture:	NR				<u> </u>			
	3/32"				<u> </u>			
Current/Polarity:	NA				<u> </u>			
Current Range:	NA				<u> </u>			
Voltage Range:	NA							
Travel Speed Range, ipm:	0.8							
Comments:	and the second second							
	FIGURE 1	- BEAD SEQU	JENCE					
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			Page:	2 of 2
		TENSILE STRENGTH T	EST	
Coupon Number:				
Coupon Width:				
Coupon Thickness:		- ()		
Coupon Area:				
Maximum Load:				
Tensile Strength:				
Fracture Location:				
		BEND TEST		
Coupon Number:				
Type:				
Results:				
		NICK-BREAK TEST		
Coupon Number:	W5 NB1	W5 NB2	W5 NB3	W5 NB4
Results:	Pass	Pass	Pass (1)	Pass
Coupon Number:		CHARPY TOUGHNESS		
Width:				
Notch Location:				
Test Temperature:				
Impact Energy:				
% Shear:				
Lateral Expansion:				
Comments: (1) Indic	ations were pres	ent but were within the a	acceptable limits of API 11	04
<u></u>		and the second		
Test Type:		OTHER TESTS		
Decultor				
We certify that the sta	tements in this re	ecord are correct and that	it the test welds were pre the 21st Edition of API 11	

	COUPON TEST F	NEP OKI			Page:	1	of	2
Test Number: 2-2		Date:	12/4	1/2014				
ocation: Kiefner, Worthing	ton, Ohio			-				
Welder: Jeff Ellis, Piedmont	Natural Gas							
Welding Process: Manual C								
Pipe Material: 2.375" diame	eter, 0.218" thick AP	PI 5L X42 to 2.3	75" dia	meter, 0.2	18" thick A	PI 5L X	42	
oint Design: Lap fillet joint	with 1/16" gap					-		
Position: 5G, Fixed		Weld	ing Dire	ection: L	Jphill			
Filler Metal: RG60								
Time Between Passes: 32 r	ninutes between ro	ot and hot pas	s					
Preheat Temperature: Amb	pient (59°F)	Interp	bass Ter	nperature	: NR			
Post-weld Heat Treatment:	None			10000	1911			
.ine-up Clamps: None used								
	acetylene weld tip v	was used						
	of the acetylene was		flow ra	ate of the	oxygen was	5 20 CFI	H	
					10-110		-	
	WELDI	NG PARAME	TERS					
Pass:	Root						1	-
AWS Classification:	RG60						1.	-
Vanufacture:	NR							
Electrode Diameter:	3/32"	-						
Current/Polarity:	NA			<u> </u>				
Current Range:	NA							
/oltage Range:	NA							
Fravel Speed Range, ipm:	0.4 - 0.5						<u> </u>	
승규는 아이들은 것 같은 것 같은 것 같은 것 같은 것 같아요. 가지 않는 것	0.4 - 0.5			<u> </u>			L	
Comments:								
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	FIGURE	L – BEAD SEQ	UENCE	1				
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	TENSILE S	TRENGTH T	ST				
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	1	3	1				
	BE	ND TEST					
						_	
	-	-				-	
		_		-	-	1	
	NICK-	BREAK TEST					
W6 NB1	W	6 NB2	W6 NB	3	W	6 NB4	1.1
Pass	1	Pass	Pass			Pass	
			TCT				
	CHARPY IL	JUGHINESS I	51	1	- 1		
	1.02	1.000					
			1				
tements in this	record are co	rrect and that	t the test weld	ls were nren	ared v	velded	and
						venueu	, and
	Pass	BEI	BEND TEST BEND TEST BEND TEST BEND TEST NICK-BREAK TEST W6 NB1 W6 NB2 Pass CHARPY TOUGHNESS T CHARPY TOUGHNEST	NICK-BREAK TEST W6 NB1 W6 NB2 W6 NB Pass Pass Pass CHARPY TOUGHNESS TEST Image: Content of the state of the s	TENSILE STRENGTH TEST Image: Ima	TENSILE STRENGTH TEST Image: Colspan="2">Image: Colspan="2" Image: Colspa="2" Image: Colspan="2" Image: Colspan="2" Image: Col	TENSILE STRENGTH TEST Image: Strength Test BEND TEST BEND TEST MICK-BREAK TEST W6 NB1 W6 NB2 W6 NB3 Pass Pass CHARPY TOUGHNESS TEST OTHER TESTS OTHER TESTS

API 1104	COUPON TEST F	EPORI		Page: 1	L of	2
Test Number: 2-3	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	Date: 12	2/4/2014			
Location: Kiefner, Worthing						
Welder: Jeff Ellis, Piedmont	t Natural Gas					
	0					
Welding Process: Manual (Pipe Material: 2.375" diam			liamotor 0 1E4	"thick ADIE	I VE2	
Joint Design: Lap fillet join		152 852 10 2.575 0	liameter, 0.154		LAJZ	
Position: 5G, Fixed	t with 1/10 gap	Welding Di	rection: Up	hill		
Filler Metal: RG60						_
Time Between Passes: 32	minutes between ro	ot and hot pass				
Preheat Temperature: Am			emperature:	NR		
Post-weld Heat Treatment:	None					
Line-up Clamps: None use	d					
Comments: Number 3 oxy	-acetylene weld tip v	was used		1	1.0	
The flow rate	of the acetylene was	10 CFH and the flow	w rate of the o	xygen was 22	2 CFH	
		at Contra de		1.0		
	WELDI	NG PARAMETERS		_		
Pass:	Root					
AWS Classification:	RG60				_	
Manufacture:	NR					
Electrode Diameter:	3/32"					
Current/Polarity:	NA					
Current Range:	NA				<u> </u>	
Voltage Range:	NA					
Travel Speed Range, ipm: Comments:	0.8-0.9					
3						
	FIGURE 1	- BEAD SEQUEN	CE			
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Test Number: 2-3			Page	2 of 2
		TENSILE STRENGTH T	EST	
Coupon Number:				
Coupon Width:				
Coupon Thickness:				
Coupon Area:				
Maximum Load:				
Tensile Strength:				
Fracture Location:		-		
		BEND TEST		
Coupon Number:				
Type:		1		
Results:				
Coupon Number:	W7 NB1	NICK-BREAK TEST	W7 NB3	W7 NB4
Results:	Pass	Pass	Pass	Pass
	1 435	1 1000	1 455	1 0 3 3
		CHARPY TOUGHNESS	TEST	
Coupon Number:				
Depth:				
Width:		·		
Notch Location:				
Test Temperature:				
Impact Energy:				
% Shear:				
Lateral Expansion:				
Comments:				
		1.3.27 C.C.C.		
		OTHER TESTS		
Results:				
We certify that the sta	tements in this re	ecord are correct and that	t the test welds were p	repared, welded, and
		ith the requirements of		
1444				

API 1104	COUPON T	EST REPOR	RT			Page:	1	of	2
Test Number: 2-4			Date:	12/4/20	014				
Location: Kiefner, Worthing	ton, Ohio			-					
Welder: Jeff Ellis, Piedmont									
Welding Process: Manual	Oxy-Acetylene	Welding							
Pipe Material: 2.375" diam			2 to 2 37	5" diame	ter 0.21	3" thick A		52	
Joint Design: Lap fillet join			2 10 2.07	o ululle	, 0.21	5 children in	11527		
Position: 5G, Fixed		P	Weldin	g Directi	on: Up	hill	_		
Filler Metal: RG60				0					
Time Between Passes: 34	minutes betwe	en root and	hot pass						
Preheat Temperature: Am				ss Temp	erature:	NR			
Post-weld Heat Treatment:									
Line-up Clamps: None use									
	-acetylene wel	d tip was use	ed		_	-			
	of the acetylen			flow rate	e of the o	xvgen wa	s 20 CF	H	
	or the dectylen	c mus 10 cm	in unite circ	non rac	e or the c	Alben ne	0 20 01		
	W	ELDING PA	RAMET	ERS					
Pass:	Root	Сар							
AWS Classification:	RG60	RG60							
Manufacture:	NR	NR							
Electrode Diameter:	3/32"	3/32"							
Current/Polarity:	NA	NA							
Current Range:	NA	NA							
Voltage Range:	NA	NA							
Travel Speed Range, ipm:	0.4-0.5	0.6-0.8							
Comments:	0.4 0.5	0.0 0.0						L	
	FIG	URE 1 - BE	AD SEQU	ENCE					
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	TENSILE STR	RENGTH TE	ST			
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	BENI	TEST				
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	NICK-BR	EAK TEST				
W8 NB1			W8 NB3	1	W8 NB4	
Pass	Pass	(1)	Pass	11	Pass (1)	
	CHARPY TOU	JGHNESS T	EST			
	-					
cations were prese	nt but were v	within the ac	ceptable limits of Al	11104		
	OTHE	RTESTS				
1.50.50.50		al cales	a dan san ta b	0.7.63	a anala	
					, welded, and	
l in accordance wi	th the require	ements of the	ne 21st Edition of Al	PI 1104.		
lim Winigman Kie	fner					
	Pass	BENI BENI BENI BENI BENI BENI NICK-BR W8 NB1 W8 I Pass Pass CHARPY TOL CHARPY TOL	BEND TEST CHARPY TOUGHNESS T CHARPY T	NICK-BREAK TEST W8 NB1 W8 NB2 W8 NB3 Pass Pass Pass CHARPY TOUGHNESS TEST Image: Charper test in this record are correct and that the test welds were in accordance with the requirements of the 21st Edition of AF	BEND TEST BEND TEST NICK-BREAK TEST W8 NB1 W8 NB2 W8 NB3 W8 NB3 Pass Pass Pass Mass CHARPY TOUGHNESS TEST CHARPY TOUGHNESS TEST <td col<="" td=""></td>	

Test Number: 3-1 Date: 10/16/2014 Location: Kiefner, Worthington, Ohio Welder: Jeff Ellis, Piedmont Natural Gas Welding Process: Manual SMAW Pipe Material: 2.375" diameter, 0.154" thick API 5L X42 to 2.375" diameter, 0.154" thick API 5L X42 Joint Design: 1/16" land, 1/16" gap, 70 degree bevel butt joint Position: 56, Fixed Welding Direction: Downhill Filler Metal: E6010 E6010 Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None Line-up Clamps: None Line-up Clamps: None used E6010 E6010 E6010 E6010 E6010 E6010 E6010 E6010 E010 E0101 Lincoln Lincoln Lincoln Lincoln Lincoln E0102	2		-	Page:			EST REPORT	COUPON TE	API 1104
Welder: Jeff Ellis, Piedmont Natural Gas Welding Process: Manual SMAW Pipe Material: 2.375" diameter, 0.154" thick API 5L X42 to 2.375" diameter, 0.154" thick API 5L X42 Joint Design: 1/16" land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 E6010 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (68°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Comments:					5/2014	ate: 10/10			
Welding Process: Manual SMAW Pipe Material: 2.375" diameter, 0.154" thick API 5L X42 to 2.375" diameter, 0.154" thick API 5L X42 Joint Design: 1/16" land, 1/16" gap, 70 degree bevel butt joint Position: 56, Fixed Welding Direction: Downhill Filler Metal: E6010 E6010 E6010 Time Between Passes: 30 minutes between root and hot pass Preheat Tremperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None WELDING PARAMETERS Comments:									
Pipe Material: 2.375" diameter, 0.154" thick API 5L X42 to 2.375" diameter, 0.154" thick API 5L X42 Joint Design: 1/16" land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (68"F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln E6010 E6010 E6010 E10 Current/Polarity: DCEP DCEP DCEP Current Range: 102 - 105 100 - 101 95 - 100 90 Voltage Range; 27 - 28 30 - 31 30 - 31 30 - 31 Travel Speed Range, ipm: 6.4 - 6.8 9.1 - 9.5 11.1 - 13.1 8.1 - 8.4 FigURE 1 – BEAD SEQUENCE								Natural Gas	/elder: Jeff Ellis, Piedmont
Pipe Material: 2.375" diameter, 0.154" thick API 5L X42 to 2.375" diameter, 0.154" thick API 5L X42 Joint Design: 1/16" land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (68"F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln E6010 E6010 E6010 E10 Current/Polarity: DCEP DCEP DCEP Current Range: 102 - 105 100 - 101 95 - 100 90 Voltage Range; 27 - 28 30 - 31 30 - 31 30 - 31 Travel Speed Range, ipm: 6.4 - 6.8 9.1 - 9.5 11.1 - 13.1 8.1 - 8.4 FigURE 1 – BEAD SEQUENCE									Indian Deserve Manual (
Joint Design: 1/16" land, 1/16" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (68°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments:		12		"thick Al	notor 0 154	2 275" dian	CK ADI SI VAD		
Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010		12	PI JL A4	LINCK AP	neter, 0.154				
Filler Metal: E6010 Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (68°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: VELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E6010 E6010 E010 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 1/8" 1/8" Current /Polarity: DCEP DCEP DCEP DCEP CUP CUP Current Range: 102 - 105 100 - 101 95 - 100 90 102 17 - 28 30 - 31 30 - 31 30 - 31 Comments: FIGURE 1 – BEAD SEQUENCE				nhill	tion: Dow		-	10 gap, 70 de	
Time Between Passes: 30 minutes between root and hot pass Preheat Temperature: Ambient (68°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Line-up Clamps: None used WELDING PARAMETERS Post-weld Heat Treatment: None Comments:				//////		erung Direc			
Preheat Temperature: Ambient (68°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Comments: Comments:						nass	en root and h	ninutes hetwo	the state of the s
Post-weld Heat Treatment: None Line-up Clamps: None used Comments:				NR	perature:				
None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E6010 E6010 E6010 E6010 Manufacture: Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 1/8" 1/8" Current/Polarity: DCEP <					perature.	icipado ren			
WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E6010 E6010 Image: 100 parts Manufacture: Lincoln Lincoln Lincoln Lincoln Image: 108" 1/8" 1/8" Image: 102 - 105 100 - 101 95 - 100 90 Image: 102 - 105 100 - 101 95 - 100 90 Image: 102 - 105 100 - 101 95 - 100 90 Image: 102 - 105 100 - 101 95 - 100 90 Image: 102 - 105 100 - 101 95 - 100 90 Image: 102 - 105 100 - 101 95 - 100 90 Image: 102 - 105 100 - 101 95 - 100 90 Image: 102 - 105 101 - 101 95 - 100 90 Image: 102 - 105 101 - 101 95 - 100 90 Image: 102 - 105 101 - 101 95 - 100 90 Image: 102 - 105 101 - 101 95 - 100 90 Image: 102 - 105									
Mass: Root Hot Pass Fill Cap AWS Classification: E6010 E6010 E6010 E6010 E6010 Manufacture: Lincoln Lincoln Lincoln Lincoln Eincoln									and the second sec
Root Hot Pass Fill Cap AWS Classification: E6010 E0101 E01011 E01011 E01011									
Root Hot Pass Fill Cap AWS Classification: E6010 E0101 E01011 E01011 E01011							10.00		
AWS Classification: E6010 E0101 E01010 E0101 E0101 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td>METERS</td> <td>ELDING PAR</td> <td>w</td> <td></td>						METERS	ELDING PAR	w	
Manufacture: Lincoln		1			Cap	Fill	Hot Pass	Root	ass:
Electrode Diameter: 1/8" 1/8" 1/8" 1/8" 1/8" Current/Polarity: DCEP DCEP DCEP DCEP DCEP Current Range: 102 - 105 100 - 101 95 - 100 90 90 Voltage Range: 27 - 28 30 - 31 30 - 31 30 - 31 10 - 31 Travel Speed Range, ipm: 6.4 - 6.8 9.1 - 9.5 11.1 - 13.1 8.1 - 8.4 10 FIGURE 1 - BEAD SEQUENCE						E6010	E6010	E6010	WS Classification:
DCEP DCEP <th< td=""><td></td><td></td><td></td><td>1</td><td>Lincoln</td><td>Lincoln</td><td>Lincoln</td><td>Lincoln</td><td>lanufacture:</td></th<>				1	Lincoln	Lincoln	Lincoln	Lincoln	lanufacture:
Current Range: 102 - 105 100 - 101 95 - 100 90 Voltage Range: 27 - 28 30 - 31 30 - 31 30 - 31 Travel Speed Range, ipm: 6.4 - 6.8 9.1 - 9.5 11.1 - 13.1 8.1 - 8.4 Comments: FIGURE 1 - BEAD SEQUENCE					1/8"	1/8"	1/8"	1/8"	ectrode Diameter:
Voltage Range: 27 - 28 30 - 31 30 - 31 30 - 31 Travel Speed Range, ipm: 6.4 - 6.8 9.1 - 9.5 11.1 - 13.1 8.1 - 8.4 Comments: FIGURE 1 – BEAD SEQUENCE				1	DCEP	DCEP	DCEP	DCEP	urrent/Polarity:
Travel Speed Range, ipm: 6.4 - 6.8 9.1 - 9.5 11.1 - 13.1 8.1 - 8.4 Comments:					90	95 - 100	100 - 101	102 - 105	urrent Range:
Comments:					30 - 31	30-31	30-31	27 – 28	oltage Range:
FIGURE 1 – BEAD SEQUENCE		[]	1.1		8.1 - 8.4	.1.1 - 13.1	9.1 - 9.5	6.4 - 6.8	ravel Speed Range, ipm:
		-							omments:
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Test Number:						Page:	2	of	2
		TE	NSILE ST	RENGTH	TEST				
Coupon Number:									
Coupon Width:									
Coupon Thickness:						1.111			
Coupon Area:	11								
Maximum Load:									
Tensile Strength:	-								
Fracture Location:	+								
			BEN	D TEST					
Coupon Number:	W9 RB1	W9 RB2						—	
Type:	Root	Root						1	
Results:	Pass	Pass							
a total and the				REAK TES	Г				_
Coupon Number:	W9		and the first state of the first	NB2		_			
Results:	Pa	ISS	Pas	s (1)					_
		CH		UGHNESS	TEST				
Coupon Number:				CONNESS		1	1		-
Depth:	1	-							
Width:									
Notch Location:			- 1 K						
Test Temperature:									
Impact Energy:	1								
% Shear:									
Lateral Expansion:									
Comments: (1)	ndications	were present	but were	within the	acceptable limit	s of API 11	104		
			OTHE	R TESTS					
Test Type:									
					Value and	· · · · ·	-		
We certify that the	statement	s in this reco	d are corr	ect and th	at the test weld	s were pr	epared, v	welded,	and
te	sted in acco	ordance with	the requir	ements of	the 21st Edition	of API 1	L04.		
Date: 10/16/2014	1								

Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Eincoln Eincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: Current Range: 75 – 77 100 – 110 105 – 112 100 – 105 Current/Polarity: Voltage Range: 24 – 27 25 – 28 25 – 29 25 – 29 25 – 29 Travel Speed Range, ipm: 3.5 – 5.7 4.1 – 5.5 3.1 – 4.4 2.9 – 4.8	API 1104	COUPON T	EST REPORT		P	age:	Т	of	2
Welder: Jeremy Didion, Apeks Fabrication Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" thick API 5L X42 to 12.75" diameter, 0.375" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: SG, Fixed Filler Metal: E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 2 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass AWS Classification: E6010 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Kir S/32" 5/32" 5/32" 2 Current/Polarity: DCEP DCEP DCEP CEP Voltage Range: 75 - 77 100 - 110 105 - 112 100 - 105 2 Tavel Speed Range, ipm: 3.5 - 5.7	Test Number: 3-2	5. Sta		Date: 10/1	6/2014				
Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" thick API 5L X42 to 12.75" diameter, 0.375" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 2 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Ine-up Clamps: Line-up Clamps: None used Comments: WELDING PARAMETERS E6010 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln E7010-P1 Manufacture: Uincoln Lincoln Lincoln E7010-P1 Current Polarity: DCEP DCEP DCEP CEP Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 25 - 29 Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8 Comm	Location: Kiefner, Worthing	ton, Ohio							
Pipe Material: 12.75" diameter, 0.375" thick API 5L X42 to 12.75" diameter, 0.375" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder Downhill E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 2 minutes between root and hot pass Preheat Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Jeast Treatment: None WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" C Current/Polarity: DCEP DCEP DCEP CEP C Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 2	Welder: Jeremy Didion, Ape	eks Fabrication							
Pipe Material: 12.75" diameter, 0.375" thick API 5L X42 to 12.75" diameter, 0.375" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder Downhill E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 2 minutes between root and hot pass Preheat Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Jeast Treatment: None WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Voltage Range: 24 - 27 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 - 29 25 -									
Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder			the test of				1.1.1		
Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder					meter, 0.375"	thick AP	15LX	42	
Wetal: E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 2 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None Weld Interpass Temperature: NR Comments: None used Vone Vone Vone Vone Pass: Root Hot Pass Fill Cap Vone		/32" gap, 70 de							
Time Between Passes: 1 hour, 2 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None				Welding Dire	ction: Dow	nhill			
Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Line-up Clamps: None used Comments: Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 – 77 100 – 110 105 – 112 100 – 105 Voltage Range: 24 – 27 25 – 28 25 – 29 25 – 29 Travel Speed Range, ipm: 3.5 – 5.7 4.1 – 5.5 3.1 – 4.4 2.9 – 4.8 Comments:									
Weight Post-weight Heat Treatment: None Line-up Clamps: None used Comments:						_			
Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln E Electrode Diameter: 1/8" 5/32" 5/32" 5/32" C Current/Polarity: DCEP DCEP DCEP DCEP CEP C Voltage Range: 24 - 27 25 - 28 25 - 29 <th< td=""><td></td><td></td><td></td><td>Interpass Ter</td><td>nperature:</td><td>NR</td><td></td><td></td><td></td></th<>				Interpass Ter	nperature:	NR			
Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln E Electrode Diameter: 1/8" 5/32" 5/32" C Current/Polarity: DCEP DCEP DCEP C Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 Z Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8 Comments:		C D D C C US							
Number Name Not Hot Pass Fill Cap Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Eiectrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Current Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8 Comments:		1							
Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" S/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8	Comments:								
Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8									
AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Incoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 – 77 100 – 110 105 – 112 100 – 105 Voltage Range: 24 – 27 25 – 28 25 – 29 25 – 29 Travel Speed Range, ipm: 3.5 – 5.7 4.1 – 5.5 3.1 – 4.4 2.9 – 4.8 Comments:		v	ELDING PAR	AMETERS					
AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 – 77 100 – 110 105 – 112 100 – 105 Voltage Range: 24 – 27 25 – 28 25 – 29 25 – 29 Travel Speed Range, ipm: 3.5 – 5.7 4.1 – 5.5 3.1 – 4.4 2.9 – 4.8 Comments:	Pass:	Root	Hot Pass	Fill	Cap				
Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8 Comments:	AWS Classification:	E6010	E7010-P1	E7010-P1			1		
Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8	Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln				
Current Range: 75 - 77 100 - 110 105 - 112 100 - 105 Voltage Range: 24 - 27 25 - 28 25 - 29 25 - 29 Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8 Comments:	Electrode Diameter:	1/8"	5/32"	5/32"	5/32"				
Voltage Range: 24-27 25-28 25-29 25-29 Travel Speed Range, ipm: 3.5-5.7 4.1-5.5 3.1-4.4 2.9-4.8 Comments:	Current/Polarity:	DCEP	DCEP	DCEP	DCEP				
Travel Speed Range, ipm: 3.5 - 5.7 4.1 - 5.5 3.1 - 4.4 2.9 - 4.8 Comments:	Current Range:	75 - 77	100 - 110	105 - 112	100 - 105				
Comments:	Voltage Range:	24 - 27	25 - 28	25 - 29	25 - 29				
	Travel Speed Range, ipm:	3.5 - 5.7	4.1 - 5.5	3.1 - 4.4	2.9-4.8			1	
FIGURE 1 – BEAD SEQUENCE	Comments:		1 T			0	-		
FIGURE 1 – BEAD SEQUENCE									
FIGURE 1 – BEAD SEQUENCE									
		FIG	URE 1 - BEAL	SEQUENCE					
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Test Number:	3-2					Pag	e: 2	of	2
			ENSILE STR	RENGTH TE	ST				
Coupon Number:	W	10 T1	W10	D T 2					
Coupon Width:		'0 inch	1.039) inch			<u></u>		
Coupon Thickness:		2 inch	0.374	and the second					
Coupon Area:	0.37	1 inch ²	0.389	inch ²					
Maximum Load:		872 lb	31,56						
Tensile Strength:		13 psi	81,15				di taman		
Fracture Location:	Base	Metal	Base	Metal					
			BEND	TEST					
Coupon Number:	W10 FB1	W10 FB2	W10 RB1	W10 RB2				1.	
Type:	Face	Face	Root	Root					
Results:	Pass	Pass	Pass (1)	Pass	11.2		1122		-
				EAK TEST					
Coupon Number:	W/10	NB1	W10	2 3 1 3 1 1 1 1 1 L - 3 2 M			1		-
Results:	Pass (1) Pass (1)								
Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: (1) 1	ndications	were preser	t but were w	vithin the ac	cceptable l	limits of API	1104		
Docultor			OTHER						
We certify that the	e statement sted in acco 4	s in this rec	ord are corre h the require	ect and that ements of th	the test v ne 21st Ed	welds were	1104.		, and

API 1104	4 COUPON TI	EST REPOR			Page:	1	of	2
Test Number: 3-3			Date: 10/1	6/2014				
Location: Kiefner, Worthing								
Welder: Jeff Ellis, Piedmon	t Natural Gas							
Molding Process Manual	CNAANA							
Welding Process: Manual Pipe Material: 10.75" diam		ick ADI SI VAT	to 10 75" dia	motor 0.844"	thick AD	151 V	12	
Joint Design: 3/32" land, 3				fieler, 0.044	LINCK AP	I JL A	+2	
Position: 5G, Fixed	/52 gap, 70 ue	-gree bever be	Welding Dire	ction: Dow	nhill			
Filler Metal: E6010 root, E7	7010-P1 remain	der	weiding bire					
Time Between Passes: 2 h			oot and hot pa	55				
Preheat Temperature: Am			Interpass Ten		NR			
Post-weld Heat Treatment:		•		-				
Line-up Clamps: None use					_			
Comments:								
								_
2		10.001						
	v	ELDING PAF	RAMETERS					
Pass:	Root	Hot Pass	Fill	Cap	1			
AWS Classification:	E6010	E7010-P1	E7010-P1	E7010-P1				
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln				
Electrode Diameter:	1/8"	5/32"	5/32"	5/32"				
Current/Polarity:	DCEP	DCEP	DCEP	DCEP				
Current Range:	107 - 113	134 - 141	120 - 143	108 - 115				
Voltage Range:	24 – 26	26-31	26 - 30	27 – 29				
Travel Speed Range, ipm:	5.1 - 8.8	7.2 - 14.3	4.5 - 10.7	4.0-8.3				
Comments:	C							
	FIG	URE 1 - BEA	D SEQUENCE					
			a second					
		and the second of						
	S. B. B. B. B. S.			ale all lighted a considerant, an				
		and the state of a state of the second state of the state						
	1 2 3 4 5	6789	1 2 3 4	5678	1			

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Coupon Width: 1.167 inch 1.133 inch	Test Number:	3-3					Page:	2	of	2
Coupon Width: 1.167 inch 1.133 inch				TENSILE STF	RENGTH TES	т				
Coupon Thickness: 0.870 inch 0.826 inch	Coupon Number:	W	11 T1	W1	1 T2					_
Coupon Area: 1.015 inch ² 0.936 inch ² Maximum Load: 71,300 lb 72,600 lb Tensile Strength: 70,200 psi 77,600 psi Fracture Location: Base Metal Base Metal BEND TEST Coupon Number: W11 SB1 W11 SB2 W11 SB4	Coupon Width:	1.16	57 inch	1.133	3 inch					
Maximum Load: 71,300 lb 72,600 lb				343.5						
Tensile Strength: 70,200 psi 77,600 psi				-						
Base Metal Base Metal BEND TEST Coupon Number: W11 SB1 W11 SB2 W11 SB4 Type: Face Face Root Root Results: Pass Pass (1) Pass (1) Pass (1) NICK-BREAK TEST Coupon Number: W11 NB1 W11 NB2 Results: Pass (1) Pass (1) Pass (1) Pass (1) Coupon Number: W11 NB1 W11 NB2 Results: Coupon Number: W11 NB1 W11 NB2 Results: Depth: W11 NB1 W11 NB2 Results: Charpy TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Depth: Impact Energy: Impact Energy: Impact Energy: Width: Impact Energy: Impact Energy: Impact Energy: % Shear: Impact Energy: Impact Energy: Impact Energy: Kester Impact Energy: Impact Energy: Impact Energy: % Shear: Impact Energy: Impact Energy: Impact Energy: We certify that the statements in this record are correct and that the test welds were prepared, welded, tested	Maximum Load:			-						
BEND TEST Goupon Number: W11 SB1 W11 SB2 W11 SB2 W11 SB3 W11 SB4 Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Colspan="2">Image: Colspan="2">Image: Colspan="2" Colspan="2">Image: Colspan="2" C	Tensile Strength:									
Coupon Number: W11 SB1 W11 SB2 W11 SB3 W11 SB4	Fracture Location:	Base	Metal	Base	Metal					
Type: Face Face Root Root Image: Contract of the statements in this record are correct and that the test welds were prepared, welded, tested in accordance with the requirements of the 21st Edition of API 1104.				BENI	D TEST					_
Results: Pass Pass (1) Pass (1) Pass (1) NICK-BREAK TEST Coupon Number: Pass (1) Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number: Depth:	Coupon Number:	W11 SB1	W11 SB2	W11 SB3	W11 SB4					
NICK-BREAK TEST Coupon Number: W11 NB1 W11 NB2 Pass (1) Pass (1) Other CHARPY TOUGHNESS TEST Coupon Number: Depth: CHARPY TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Coupon Number: CHARPY TOUGHNESS TEST Coupon Number: Charper to the statements Depth: Charper to the statements in this record are correct and that the test welds were prepared, welded, a tested in accordance with the requirements of the 21st Edition of API 1104.	Type:	Face	Face	Root	Root					
Coupon Number: W11 NB1 W11 NB2 Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number:	Results:	Pass	Pass (1)	Pass (1)	Pass (1)					
Coupon Number: W11 NB1 W11 NB2 Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number:				NICK-BR	FAK TEST					
Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number:	Counon Number:	W11	NR1				1			
CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: (1) Indications were present but were within the acceptable limits of API 1104 OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, tested in accordance with the requirements of the 21st Edition of API 1104.	CONCLUSION AND AND ADDRESS							_		_
Coupon Number:			C	HARPY TOL	IGHNESS TE	ST				
Depth:	Coupon Number:				Onites Tes	1		- 1		_
Width:		1								
Test Temperature: Impact Energy: Impact Energy: % Shear: Impact Energy: Impact Energy: Lateral Expansion: Impact Energy: Impact Energy: Comments: (1) Indications were present but were within the acceptable limits of API 1104 OTHER TESTS Test Type: Results: Impact Energy: We certify that the statements in this record are correct and that the test welds were prepared, welded, tested in accordance with the requirements of the 21st Edition of API 1104.										
Impact Energy:	Notch Location:									
% Shear:	Test Temperature:									_
Lateral Expansion:										
Comments: (1) Indications were present but were within the acceptable limits of API 1104 OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, tested in accordance with the requirements of the 21st Edition of API 1104.	% Shear:	1								
OTHER TESTS Test Type: Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, tested in accordance with the requirements of the 21st Edition of API 1104.	Lateral Expansion:									
Test Type:	Comments: (1)	ndications	were preser	nt but were v	within the acco	eptable limits of	f API 110	4		
Test Type:				OTHE	RTESTS			-		
Results: We certify that the statements in this record are correct and that the test welds were prepared, welded, tested in accordance with the requirements of the 21st Edition of API 1104.	Test Type:									
We certify that the statements in this record are correct and that the test welds were prepared, welded, tested in accordance with the requirements of the 21st Edition of API 1104.										
tested in accordance with the requirements of the 21st Edition of API 1104.		Sec. Sec.	0.000.03	0.000	Market i k	20.00 A.M. 1	Chow Te		ALC:	
									velded,	, and
	te	sted in acco	ordance with	h the require	ements of the	21st Edition of	i API 110	4.		
Date: 10/16/2014										
Test Conducted By: Jim Winigman, Kiefner	Date: 10/16/2014	1								

Test Number: 4.1 Date: 10/16/2014 Location: Kiefner, Worthington, Ohio								
Welder: Jeremy Didion, Apeks Fabrication Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 52 minutes between root and hot pass Preheat Temperature: Ambient (73°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP CEP C Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 24 - 26 24 - 27	Location: Kiefner, Worthing			Date: 10/1	6/2014			
Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design:	internet) tretting	ton, Ohio		And the second second				
Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 52 minutes between root and hot pass Preheat Temperature: Ambient (73°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Comments:	Welder: Jeremy Didion, Ape	ks Fabrication	i					
Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 52 minutes between root and hot pass Preheat Temperature: Ambient (73°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Comments:		inter a second						
Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder				10 75"	0.075		VCO	
Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E7010-P1 remainder					neter, 0.375" 1	Thick API 5L	X60	
Weat: E6010 root, E7010-P1 remainder Time Between Passes: 1 hour, 52 minutes between root and hot pass Preheat Temperature: Ambient (73°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root AWS Classification: E6010 E6010 E7010-P1 Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Locan 1/8″ 5/32″ 5/32″ Current/Polarity: DCEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:		32 gap, 70 de			tion: Down	hill		
Time Between Passes: 1 hour, 52 minutes between root and hot pass Preheat Temperature: Ambient (73°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Line-up Clamps: None used Comments: Interpass Temperature: Interpass Temperature: Comments: None used VeltDING PARAMETERS Veltage State State State Pass: Root Hot Pass Fill Cap Cap State AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 1/8″ 5/32″ 5/32″ 5/32″ Current/Polarity: DCEP DCEP DCEP CP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Comments: Comments: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:		010-P1 remain		weiding Dire				
Preheat Temperature: Ambient (73°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Ocean Comments: VELDING PARAMETERS Pass: Root Hot Pass AWS Classification: E6010 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Image: Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Image:				ot and hot has	\$			
Weild Heat Treatment: None Line-up Clamps: None used Comments:						NR		
Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Eactor Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP DCEP DCEP DCEP Current State 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:				interpass ren				
Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:		Services and the last						
Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5								
Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5								
Root Hot Pass Fill Cap AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5								-
AWS Classification: E6010 E7010-P1 E7010-P1 E7010-P1 Manufacture: Lincoln Lincoln Lincoln I Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:		M	VELDING PAP	RAMETERS	2 - T T T			
Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 – 76 96 – 100 95 – 98 93 – 95 Voltage Range: 24 – 26 24 – 27 25 – 28 27 – 29 Travel Speed Range, ipm: 3.5 – 5.2 3.4 – 5.4 4.4 – 5.3 3.4 – 5.5	Pass:	Root	Hot Pass	Fill	Сар			
Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:	AWS Classification:	E6010	E7010-P1	E7010-P1	E7010-P1			
Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 93 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 100 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 100	Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln			
Current Range: 75 - 76 96 - 100 95 - 98 93 - 95 Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:								
Voltage Range: 24 - 26 24 - 27 25 - 28 27 - 29 Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:								
Travel Speed Range, ipm: 3.5 - 5.2 3.4 - 5.4 4.4 - 5.3 3.4 - 5.5 Comments:					the second s		-	
Comments:								
	것입니다. 이 것 같은 것 같은 것이 집 것 같이 없는 것 같이 많이 했다.	3.5 - 5.2	3.4 - 5.4	4.4 - 5.3	3.4 - 5.5		1	_
FIGURE 1 – BEAD SEQUENCE	Comments:							
FIGURE 1 – BEAD SEQUENCE								
FIGURE I – BEAD SEQUENCE		FIG						
		FIG	URE I - BEA	DSEQUENCE				
				Nillian .				
			-	5.5 C				
		- Andrews						
		ALC: NO						

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Test Number:	4-1					_ Page	: 2	of	2
			TENSILE STR	RENGTH TE	ST				
Coupon Number:	W	12 T1	W12	2 T2	6 F				
Coupon Width:	1.06	57 inch	1.023	inch					
Coupon Thickness:		57 inch	0.368						
Coupon Area:	0.39	2 inch ²	0.376	inch ²					
Maximum Load:	35,	340 lb	3198	34 lb					
Tensile Strength:		L54 psi	85,06			1.1			
Fracture Location:	Base	e Metal	Base	Metal		- 11			
			BEND	TEST					
Coupon Number:	W12 FB1	W12 FB2	W12 RB2	W12 RB2	1		11		
Type:	Face	Face	Root	Root	1	1	1		
Results:	Pass	Pass	Pass	Pass	1		1	1111	
				1.1.1.1.1					
Coupon Number:	14/12	2 NB1	NICK-BR W12	EAK TEST		_			-
Results:		ass	Pass						
Depth: Width: Notch Location: Test Temperature: Impact Energy:									
% Shear:									
Lateral Expansion:									
			nt but were w	RTESTS	ceptable lir	nits of API 1	104		
Results: We certify that the	statement	s in this rec		ect and that	the test w			welded	, and

API 1104	COUPON T	EST REPORT	r	P	Page: 1	1 of	2
Test Number: 4-2			Date: 10/1	6/2014			
Location: Kiefner, Worthing	ton, Ohio		Concerning and			-	
Welder: Jeremy Didion, Ape					_		
Welding Process: Manual S							
Pipe Material: 10.75" diamo				meter, 0.875"	thick API 5	L X60	
Joint Design: 3/32" land, 3,	/32" gap, 70 de						
Position: 5G, Fixed	1040 D1		Welding Dire	ction: Dow	nhill		
Filler Metal: E6010 root, E7			and hot n		_		
Time Between Passes: 18 Preheat Temperature: Am			Interpass Ten		NR		
Post-weld Heat Treatment:			Interpass ren	- nperature.	NR		
Line-up Clamps: None used							
Comments:	1						
-		100.000					
	W	VELDING PAR	AMETERS				
Pass:	Root	Hot Pass	Fill	Cap			
AWS Classification:	E6010	E7010-P1	E7010-P1	E7010-P1			
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln		a (harr	
Electrode Diameter:	1/8"	5/32"	5/32"	5/32"			
Current/Polarity:	DCEP	DCEP	DCEP	DCEP			
Current Range:	78 - 79	107 - 118	107 - 119	105 - 116		_	
Voltage Range:	24 - 26	26-30	20-31	27-31			
Travel Speed Range, ipm:	3.9 - 4.8	5.2 - 7.2	2.4 - 6.7	2.7-5.1			
Comments:							
3							
	FIG						
	FIG	UKE I - DEAL	D SEQUENCE				
			Contraction of the second	1			
	n muniti subra	an dia mana di	L du du au au	ىر ئىرى يالى ئىلى ئىرى			
			1234	5679	4		
	12345	56789	1 2 3 4				

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Test Number:	4-2					Page:	2	of	2
			TENSILE STR	RENGTH TES	т				
Coupon Number:	W	13 T1	W1	3 T2					
Coupon Width:	1.14	4 inch	1.128	3 inch					
Coupon Thickness:)5 inch		2 inch					
Coupon Area:	1.03	5 inch ²	-	linch ²					
Maximum Load:		060 lb		30 lb					
Tensile Strength:		000 psi	-	00 psi					
Fracture Location:	Base	Metal	Base	Metal					
			BENI	D TEST					
Coupon Number:	W13 SB1	W13 SB2	W13 SB3	W13 SB4					
Type:	Side	Side	Side	Side		- 1 h d			
Results:	Pass (1)	Pass (1)	Pass	Pass (1)				11	
				EAK TEST					
Coupon Number:	\A/12	NB1	W13			- f	_		_
Results:		s (1)	Pass				-		_
			0.000	100. ar	a				_
and the second		C	HARPY TOU	JGHNESS TE	ST			_	_
Coupon Number:									
Depth:	-	-							
Width:									
Notch Location: Test Temperature:									
Impact Energy:		-					_		
% Shear:									
Lateral Expansion:									
Comments: (1)	ndications	were presen	t but were v	vithin the acc	eptable limits	of API 110	4		
			OTHE	R TESTS					
Test Type:									
Doculto									
	Sec. 14		A20/03	diama.				444	
We certify that the								elded,	and
te	sted in acco	brdance wit	n the require	ements of the	e 21st Edition	OT API 110	4.		
Date: 10/16/2014	1								
		igman, Kiefi							

Test Number: 4-3 Location: Kiefner, Worthington Welder: Jeremy Didion, Apeks Welding Process: Manual SM Pipe Material: 12.75" diameter Joint Design: 3/32" land, 3/32 Position: 5G, Fixed	Fabrication		Date: 10/1	6/2014			
Welder: Jeremy Didion, Apeks Welding Process: Manual SM Pipe Material: 12.75" diameter Joint Design: 3/32" land, 3/32	Fabrication						
Welding Process: Manual SM Pipe Material: 12.75" diamete Joint Design: 3/32" land, 3/32							
Pipe Material: 12.75" diameter Joint Design: 3/32" land, 3/32							
Pipe Material: 12.75" diameter Joint Design: 3/32" land, 3/32	A 1 A /						
Joint Design: 3/32" land, 3/32							
				meter, 0.375" t	hick API 5L	X60	
Position: 5G Fived	2" gap, 70 de					-	
			Welding Dire	ction: Down	nill		
Filler Metal: E6010 root, E801							
Time Between Passes: 4 hour							
Preheat Temperature: Ambie			Interpass Ten	nperature:	NR		
Post-weld Heat Treatment: N	one						
Line-up Clamps: None used							
Comments:							_
-							_
	W	ELDING PAR	AMETERS				
Pass:	Root	Hot Pass	Fill	Cap		1	
AWS Classification:	E6010	E8010-P1	E8010-P1	E8010-P1			
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln			
Electrode Diameter:	1/8"	5/32"	5/32"	5/32"			
Current/Polarity:	DCEP	DCEP	DCEP	DCEP			
Current Range:	68 - 76	98 - 100	99 - 109	92 - 107			
Voltage Range:	22 - 26	24-27	24 - 26	24-28			
Travel Speed Range, ipm:	2.9-5.2	3.8 - 5.5	4.7 - 7.3	3.1-5.4		1	
Comments:						-	
							_
	FIG	URE 1 - BEAD	D SEQUENCE				
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			A State				
	- 23						
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Test Number:	4-3					Pag	ge: 2	of	2
			TENSILE STR	RENGTH TE	ST				
Coupon Number:	W	14 T1	W14	4 T2	14 1 T				
Coupon Width:	1.21	.5 inch	1.102	2 inch					
Coupon Thickness:	the second se	4 inch	0.370) inch					
Coupon Area:	0.45	4 inch ²	0.408	inch ²					
Maximum Load:	40,	575 lb	37,1	68 lb					_
Tensile Strength:		873 psi	+	97 psi					
Fracture Location:	Base	Metal	Base	Metal					
			BEND	TEST					
Coupon Number:	W14 FB1	W14 FB2	W14 RB2	W14 RB2	1				
Type:	Face	Face	Root	Root	L		1		
Results:	Pass (1)	Pass (1)	Pass (1)	Pass (1)	112		1111	1111	-
				FAN TEST					
Coupon Number:	\N/14	NB1	W14	EAK TEST			1		
Results:	1.	s (1)	Pass	. 1.4			-		
Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:									
			t but were v OTHEI	RTESTS			1104		
We certify that the	statement sted in acco 4	s in this rec	h the require	ect and that	the test v	velds were ition of AP		d, welded	l, and

		EST REPORT			age:	1	01	2
Test Number: 4-4			Date: 10/1	6/2014				
Location: Kiefner, Worthing	ton, Ohio							
Welder: Jeff Ellis, Piedmont								
Welding Process: Manual S								
Pipe Material: 10.75" diam				meter, 0.875"	thick API	5L X60)	
loint Design: 3/32" land, 3 Position: 5G, Fixed	/32" gap, 70 de			ction: Dow	nhill			
Filler Metal: E6010 root, E8	010 P1 romain		Welding Dire	ction: Dow	anill			
Time Between Passes: 6 h			ot and hot na	22				_
Preheat Temperature: Am			Interpass Ter		NR			
Post-weld Heat Treatment:				-				
Line-up Clamps: None use	11151/17							
Comments:								
			and the second					
	N	ELDING PAR	AMETERS					
Pass:	Root	Hot Pass	Fill	Cap				
AWS Classification:	E6010	E8010-P1	E8010-P1	E8010-P1	<u> </u>			
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln	<u> </u>			
Electrode Diameter:	1/8"	5/32"	5/32"	5/32"	<u> </u>			
Current/Polarity:	DCEP 99 - 108	DCEP 132 – 136	DCEP 121 – 152	DCEP 105 – 116	<u> </u>			
Current Range: Voltage Range:	24 - 25	25-27	25 - 29	27-31	<u> </u>	-	-	
Travel Speed Range, ipm:	7.6 - 11.5	8.2 - 12.6	2.4 - 6.7	4.6 - 14.5				
Comments:	1.0-11.5	0.2 - 12.0	2.4 - 0.7	4.0 14.5		_		
3								
	FIG	URE 1 – BEAD	SEQUENCE					
	Martin .	and the same	and protection					
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Test Number:	4-4				<u> </u>	Page:	2	of	2
		7	ENSILE STR	RENGTH TEST	Ċ.				
Coupon Number:	W	15 T1	W15	5 T2					
Coupon Width:	1.12	21 inch	1.087	inch					
Coupon Thickness:	0.89	97 inch	0.879						
Coupon Area:	1.00	6 inch2	0.955	inch ²					
Maximum Load:	-	800 lb	83,80						
Tensile Strength:		100 psi	87,70						
Fracture Location:	Base	e Metal	Base I	Metal					
			BEND	TEST					
Coupon Number:	W15 SB1	W15 SB2	W15 SB3	W15 SB4		1.1	_		
Type:	Side	Side	Side	Side					
Results:	Pass (1)	Pass (1)	Pass (1)	Pass					
				EAK TEST					
Coupon Number:	\\/15	5 NB1	W15			T.	_		_
Results:	and the second se	ass	Pass				_		-
				<u> </u>					
		C	HARPY TOU	GHNESS TES	бТ			_	
Coupon Number:									
Depth:									
Width:									
Notch Location:									
Test Temperature:									
Impact Energy: % Shear:									
% Snear: Lateral Expansion:		_							
Comments: (1)	ndications	were presen	t but were w	vithin the acce	ptable limits of	API 1104	4		
			OTHE	RTESTS					
Test Type:									
Decultor									
	Sec. 51.	0.620.03	0.0203	all controls to	2	les 1		ALLA	
We certify that the								elded, a	inc
te	sted in acco	ordance wit	h the require	ements of the	21st Edition of	API 1104	4.		
Date: 10/16/2014	1								
Test Conducted By:		ligman Kief	ner						
Lest Conducted BV [*]									

Test Number: 5-1 Location: Kiefner, Worthingt								
ocation: Kiefner Worthingt			Date: 10/1	6/2014				
Welder: Jeff Ellis, Piedmont	Natural Gas							
Welding Process: Manual S			1. 10 75" 4:	0.275"				
Pipe Material: 12.75" diame				meter, 0.375	THICK API	SL X	5	
loint Design: 3/32" land, 3/ Position: 5G, Fixed	32" gap, 70 de			stient Dow	abill			
	10 Pl romair		Welding Dire		1100			
Filler Metal: E6010 root, E80			ot and hat no	~	_			
Time Between Passes: 5 ho Preheat Temperature: Amb			Interpass Ten		NR			
Preneat Temperature: Amb Post-weld Heat Treatment:			interpass ren	-	NIN			
Line-up Clamps: None used	112 24 F 23				-			
Comments:								
5. <u></u>								
	M	ELDING PAR	AMETERS					
Pass:	Root	Hot Pass	Fills	Cap				
AWS Classification:	E6010	E8010-P1	E8010-P1	E8010-P1		-	1	
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln			1	
Electrode Diameter:	1/8"	5/32"	5/32"	5/32"				
Current/Polarity:	DCEP	DCEP	DCEP	DCEP				
Current Range:	106 - 113	141 - 145	131 - 137	114 - 119				
Voltage Range:	24 - 26	25-27	26-28	25 - 28				
Travel Speed Range, ipm:	7.0 - 11.2	8.0-11.4	5.7 - 8.5	4.3 - 6.0		1.1		
Comments:		1997 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 -						
	FIG	URE 1 - BEAD	D SEQUENCE					
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Test Number:	5-1					Page:	2	of	2
			TENSILE STR	ENGTH TES	т				
Coupon Number:	W	16 T1	W16	5 T2					
Coupon Width:	1.02	9 inch	1.073	inch) i			
Coupon Thickness:		0 inch	0.377	the second se					
Coupon Area:	0.38	1 inch ²	0.405	inch ²					
Maximum Load:	32,	841 lb	33,01	19 lb					
Tensile Strength:		L96 psi	81,53						
Fracture Location:	Base	Metal	Base	Metal					
			BEND	TEST					
Coupon Number:	W16 FB1	W16 FB2	W16 RB1	W16 RB2					
Type:	Face	Face	Root	Root				1	
Results:	Pass	Pass	Pass (1)	Pass			111		
				FAN TECT					
Coupon Number:	W16	NB1	W16	EAK TEST	_	1			_
Results:		s (1)	Pass				-		_
Depth: Width: Notch Location: Test Temperature: Impact Energy:									
% Shear:	1								
Lateral Expansion:			Y. 2						
Comments: (1)	ndications	were preser	nt but were w	ithin the acco	eptable limits	s of API 110	4		
Tost Tuno:				RTESTS					
Test Type: Results:									
We certify that the te				ect and that t ements of the				welded	, and

Manufacture: Lincoln	API 1104	COUPON T	EST REPORT	r	Р	age:	1	of	2
Welder: Jeff Ellis, Piedmont Natural Gas Welding Process: Manual SMAW Pipe Material: 24" diameter, 0.375" thick API 5L X70 to 24" diameter, 0.375" thick API 5L X70 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 24 hours between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: None Line-up Clamps: None Vone used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fills Cap E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln E8010-P1	Test Number: 6-1			Date: 10/1	6/2014				
Welding Process: Manual SMAW Pipe Material: 24" diameter, 0.375" thick API 5L X70 to 24" diameter, 0.375" thick API 5L X70 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 24 hours between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None Line-up Clamps: None used Comments: Comments: Comments: WELDING PARAMETERS Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CeP CeP Cap Z2 - 25 26 - 27 25 - 28 20 - 29 Tavel Speed Range, ipm: 6.1 - 11.3 5.9 - 8.7 4.8 - 9.3 4.4 - 7.5 Comments:	Location: Kiefner, Worthing	gton, Ohio							
Pipe Material: 24" diameter, 0.375" thick API 5L X70 to 24" diameter, 0.375" thick API 5L X70 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 24 hours between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Scassification: Root Hot Pass Fills Cap E6010 F8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln E010-P1 E8010-P1 E8010-P1 <t< td=""><td>Welder: Jeff Ellis, Piedmont</td><td>: Natural Gas</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Welder: Jeff Ellis, Piedmont	: Natural Gas							
Pipe Material: 24" diameter, 0.375" thick API 5L X70 to 24" diameter, 0.375" thick API 5L X70 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 24 hours between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Scassification: Moort Hot Pass Fills Cap Cap Manufacture: E6010 E8010-P1 E8010-P1 E8010-P1 Lincoln Lincoln Lincoln Lincoln Lincoln Manufacture: 1/8" 5/32" 5/32" C Current/Polarity: DCEP DCEP DCEP Cap Cap Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 22 – 25 26 – 27 25 – 28 20 – 29 Tavel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5 Comments:									
Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 24 hours between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fills Cap E6010 E8010-P1			in a sin				_		
Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder					0.375" thick A	API 5L X7	0		
Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 24 hours between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Comments:		/32" gap, 70 de	egree bevel bu						
Time Between Passes: 24 hours between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Comments: None used Comments: Cap Interpass Pass: Root Hot Pass Fills Cap Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP CCP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5 Comments:	the second s			Welding Dire	ction: Down	hill			
Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Line-up Clamps: None used Comments: Comments: WELDING PARAMETERS Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5 Comments:						1.1			
Post-weld Heat Treatment: None Line-up Clamps: None used Comments:	행동 김 영양 영양은 것을 가지 않는 것을 만큼 한다. 나는 것을 수 없는 것을 수 없다.			the second se		-			
Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" C/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Z Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Z Tavel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5 Z				Interpass Ten	nperature:	NR			
Comments: WELDING PARAMETERS Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Incoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: Current Range: 102 - 114 139 - 141 126 - 142 111 - 132 Incoln Voltage Range: 22 - 25 26 - 27 25 - 28 20 - 29 Incoln Electron Comments: Guments: 6.1 - 11.3 5.9 - 8.7 4.8 - 9.3 4.4 - 7.5 Incoln	Post-weld Heat Treatment:	None		A. 1. M. 1. 1. 1.	No. 1 No. 1				
WELDING PARAMETERS Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: Current Range: DCEP DCEP DCEP DCEP Voltage Range: 22 - 25 26 - 27 25 - 28 20 - 29 Travel Speed Range, ipm: 6.1 - 11.3 5.9 - 8.7 4.8 - 9.3 4.4 - 7.5	Line-up Clamps: None used	d							
Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Incoln Electrode Diameter: 1/8" 5/32" 5/32" S/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5	Comments:								
Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Incoln Electrode Diameter: 1/8" 5/32" 5/32" S/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5									
Pass: Root Hot Pass Fills Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Incoln Electrode Diameter: 1/8" 5/32" 5/32" S/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5			10.00 A						
AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5 Comments:		N	/ELDING PAP	RAMETERS					
Manufacture: Lincoln	Pass:	Root	Hot Pass	Fills	Сар				
Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5	AWS Classification:	E6010	E8010-P1	E8010-P1	E8010-P1			1	
Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 102 – 114 139 – 141 126 – 142 111 – 132 Voltage Range: 22 – 25 26 – 27 25 – 28 20 – 29 Travel Speed Range, ipm: 6.1 – 11.3 5.9 – 8.7 4.8 – 9.3 4.4 – 7.5	Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln			1	
Current Range: 102 - 114 139 - 141 126 - 142 111 - 132 Voltage Range: 22 - 25 26 - 27 25 - 28 20 - 29 Travel Speed Range, ipm: 6.1 - 11.3 5.9 - 8.7 4.8 - 9.3 4.4 - 7.5 Comments:	Electrode Diameter:	1/8"	5/32"	5/32"	5/32"				
Voltage Range: 22 - 25 26 - 27 25 - 28 20 - 29 Travel Speed Range, ipm: 6.1 - 11.3 5.9 - 8.7 4.8 - 9.3 4.4 - 7.5 Comments:	Current/Polarity:	DCEP	DCEP	DCEP	DCEP		(1	
Travel Speed Range, ipm: 6.1 - 11.3 5.9 - 8.7 4.8 - 9.3 4.4 - 7.5 Comments:	Current Range:	102 - 114	139 - 141	126 - 142	111 - 132				
Comments:	Voltage Range:	22 – 25	26-27	25 - 28	20 - 29				
	Travel Speed Range, ipm:	6.1 - 11.3	5.9 - 8.7	4.8 - 9.3	4.4 - 7.5			1.	
FIGURE 1 – BEAD SEQUENCE	Comments:								
FIGURE 1 – BEAD SEQUENCE									
FIGURE 1 – BEAD SEQUENCE									
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Test Number: _	6-1					- Page	: 2	of 2
	-		TENSILE ST	RENGTH T	EST			
Coupon Number:	W	L7 T1	W1	7 T2		7 T3	W1	7 T4
Coupon Width:		5 inch		3 inch		linch		1 inch
Coupon Thickness:		2 inch	the second se	3 inch		5 inch	A second s	2 inch
Coupon Area:		8 inch ²		inch ²		inch ²		inch ²
Maximum Load: Fensile Strength:		230 lb 22 psi	-	31 lb 75 psi	-	91 lb 35 psi		71 lb 16 psi
Fracture Location:		Metal	-	Metal		Metal		Metal
	Duse	metar	Duse	inclu	Buse	inclui	buse	inc tur
			BEN	D TEST				_
Coupon Number:	W17FB1	W17FB2	W17FB3	W17FB4	W17RB1	W17RB2	W17RB3	W17RB4
Type:	Face	Face	Face	Face	Root	Root	Root	Root
Results:	Pass (1)	Pass	Pass	Pass	Pass (1)	Pass	Pass	Pass
Results: Coupon Number: Depth: Width:	Pas	s (1) C	Pa		TEST			155
Notch Location:								
Notch Location: Test Temperature:	-							
Notch Location: Test Temperature: Impact Energy:								
Notch Location: Test Temperature: Impact Energy: % Shear:								
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: (1)	ndications		OTHE	R TESTS			104	
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: (1) Test Type:	ndications		OTHE	R TESTS			104	
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: (1) Test Type:	ndications		OTHE	R TESTS			104	
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: <u>(1)</u> Test Type: Results: We certify that the	ndications	s in this rec	OTHE	R TESTS	t the test w	elds were p	repared, we	elded, and
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: <u>(1)</u> Test Type: Results: We certify that the	ndications v e statement sted in acco	s in this rec	OTHE ord are corr	R TESTS	t the test w	elds were p	repared, we	elded, and

AFTIIO	COUPON T	LJI KLIOK			Page:	-	of	2
Test Number: 7-1			Date: 10/1	6/2014				
Location: Kiefner, Worthing								
Welder: Jeremy Didion, Ap	eks Fabrication							
nin en								
Welding Process: Manual							10	
Pipe Material: 12.75" diam				neter, 0.375"	thick A	PI 5L X	42	
Joint Design: 3/32" land, 3	/32" gap, 70 de	egree bevel bu						
Position: 5G, Fixed	7010		Welding Dire	ction: Uphi	11			
Filler Metal: E7016 root, E				1.0				_
Time Between Passes: 2 h			Interpass Ten		NR			
Preheat Temperature: Am Post-weld Heat Treatment:			interpass len	nperature:	NK			
	() () () () () () () () (
Line-up Clamps: None use	a							
Comments:								
	w	ELDING PAR	RAMETERS					
Pass:	Root	Hot Pass	Fill	Cap				
AWS Classification:	E7016	E7018	E7018	E7018		100		
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln				
Electrode Diameter:	3/32"	1/8"	1/8"	1/8"	-			
Current/Polarity:	DCEP	DCEP	DCEP	DCEP			1	
Current Range:	76 - 84	97 - 108	111 - 115	99 - 111				
Voltage Range:	20 - 25	20 - 22	21-23	20 - 22	1			
Travel Speed Range, ipm:	2.5 - 5.2	3.4 - 5.9	3.0-4.3	2.3 - 4.4	2	i i	1	
Comments:								
-								
	FIG	URE 1 - BEA	D SEQUENCE					
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Test Number:	7-1					Page:	2	of	2
		7	FENSILE STR	RENGTH TEST					
Coupon Number:	W1	L8 T1	W18	8 T2					
Coupon Width:	1.02	8 inch	1.016	5 inch					
Coupon Thickness:	the second se	4 inch	0.381						
Coupon Area:	0.38	4 inch ²	0.387	inch ²					
Maximum Load:	29,4	486 lb	29,73	33 lb					
Tensile Strength:	76,7	'87 psi	76,82	29 psi					
Fracture Location:	Base	Metal	Base	Metal					
			BEND	D TEST					
Coupon Number:	W18 FB1	W18 FB2	W18 RB1	W18 RB2				1	
Type:	Face	Face	Root	Root					
Results:	Pass	Pass	Pass	Pass					
Coupon Number: Results: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear:	W18 Pass		W18 Pass						
Lateral Expansion: Comments: (1)	ndications	were presen	- State	vithin the accept	table limits o	of API 110	4		
Test Type: Results:									

Test Number: 7-2 Date: 10/16/2014 Location: Klefner, Worthington, Ohio Welder: Jeremy Didion, Apeks Fabrication Welder: Jeremy Didion, Apeks Fabrication Welding Process: Manual SMAW Pipe Material: 10.75" diameter, 0.844" thick API 5L X42 to 10.75" diameter, 0.844" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt Joint Position: 55, Fixed Welding Direction: Uphill Filler Metal: E7016 root, E7018 remainder Time Between Passes: 22 hours, 55 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None Incoln Incoln Incoln Line-upt Clamps: None used Comments: E7018 E7018 E7018 Incoln Incoln Manufacture: 10.62 DCEP DCEP DCEP Incoln	API 1104	COUPON T	EST REPORT		F	Page:	1	of	2
Welder: Jeremy Didion, Apeks Fabrication Welding Process: Manual SMAW Pipe Material: 10.75" diameter, 0.844" thick API 5L X42 to 10.75" diameter, 0.844" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Postion: SG, Fixed Welding Direction: Uphill Filler Metal: E7016 foot, E7018 remainder Time Between Passes: 22 hours, 55 minutes between root and hot pass Preheat Temperature: Ambient (65"F) Interpass Temperature: NR Post-weld Heat Treatment: None Mone Line-up Clamps: None used Comments: Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap Maufacture: Lincoln Lincoln Lincoln E7016 E7018 E7018 Electrode Dameter: 3/32" 1/8" 1/8" 1/8" 1/8" 1/8" Current Polarity: DCEP DCEP DCEP CEP C C Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 21 - 24 22 - 23 21 - 24 21 - 23	Test Number: 7-2			Date: 10/1	6/2014				
Welding Process: Manual SMAW Pipe Material: 10.75" diameter, 0.844" thick API 5L X42 to 10.75" diameter, 0.844" thick API 5L X42 Joint Design: 3/32" gap, 70 degree bevel butt joint Posttion: 56, Fixed Welding Direction: Uphili Filler Metal: E7016 root, E7018 remainder Time Between Passes: 22 hours, 55 minutes between root and hot pass Preheat Temperature: Ambient (65"F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Comments: Comments: E7016 E7018 E7018 Current/Polarity: DCEP DCEP DCEP Current Polarity: DCEP DCEP DCEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9 Comments:	Location: Kiefner, Worthing	ton, Ohio							
Pipe Material: 10.75" diameter, 0.844" thick API 5L X42 to 10.75" diameter, 0.844" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed	Welder: Jeremy Didion, Ap	eks Fabrication							
Pipe Material: 10.75" diameter, 0.844" thick API 5L X42 to 10.75" diameter, 0.844" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed									
Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint Position: 5G, Fixed Welding Direction: Uphill Filler Metal: E7016 root, E7018 remainder Time Between Passes: 22 hours, 55 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap KULDING PARAMETERS Pass: Root Hot Pass Fill Cap KULDING PARAMETERS Pass: Root Hot Pass Fill Cap KULDING Lincoln Current Range: 79-82 104-110 110-119 109-119 Voltage Range: 21-24 22-23 21-24 21-23 L2.6-4.3 2.9-4.8 2.1-4.8 2.3-4.9 FIGURE 1 – BEAD SEQUENCE									
Position: <u>5G, Fixed</u> Welding Direction: <u>Uphill</u> Filler Metal: <u>F016 root, F7018 remainder</u> Time Between Passes: <u>22 hours, 55 minutes between root and hot pass</u> Preheat Temperature: <u>Ambient (65°F)</u> Interpass Temperature: <u>NR</u> Post-weld Heat Treatment: <u>None</u> Line-up Clamps: <u>None used</u> Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E7016 E7018 E7018 E7018 Manufacture: Uincoln Lincoln Lincoln Lincoln Current/Polarity: DCEP DCEP DCEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 Comments:					meter, 0.844"	thick A	PI 5L X	42	_
Filler Metal: E7016 root, E7018 remainder Time Between Passes: 22 hours, 55 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments:		/32" gap, 70 de							
Time Between Passes: 22 hours, 55 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None Weld Interpass Temperature: NR Line-up Clamps: None used Mone used Mone Mone Comments:				Welding Dire	ction: Uphi	11			
Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments:					14.55	_			
Post-weld Heat Treatment: None Unne used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E7016 E7018 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode DCEP DCEP DCEP Cap									
Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: Fronto E7016 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" I Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 79 – 82 104 – 110 110 – 119 109 – 119 Voltage Range: 21 – 24 22 – 23 21 – 24 21 – 23 E Comments: FIGURE 1 – BEAD SEQUENCE				Interpass Ter	nperature:	NR			
Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E7016 E7018 E7018 Manufacture: Electrode Diameter: 3/32" 1/8" 1/8" 1/8" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 2.5 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9 Comments:									
WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E7016 E7018 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" I/6" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 2 Travel Speed Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9		d							
Pass: Root Hot Pass Fill Cap AWS Classification: E7016 E7018 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" Image: Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 2 Travel Speed Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9	Comments:								_
Pass: Root Hot Pass Fill Cap AWS Classification: E7016 E7018 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" Image: Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 2 Travel Speed Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9									
Pass: Root Hot Pass Fill Cap AWS Classification: E7016 E7018 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" I/8" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 E2 Travel Speed Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9 E				AMETERS					
AWS Classification: E7016 E7018 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" 1/8" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 Travel Speed Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9 Comments: FIGURE 1 - BEAD SEQUENCE	Pace			1	Can				
Manufacture: Lincoln Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" 1/8" 1/8" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 109 - 119 100 - 119 100 - 119 100 - 110 100 - 119 100 - 110 100 - 119 100 - 119 100 - 119 100 - 119 100 - 110 100 - 119 100 - 119 100 - 110 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 110 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 119 100 - 110 100 - 119 100 - 110 100 - 110 100 - 119 100 - 119 100 - 110 100 - 119 100 - 110 110 - 119 100 - 110 100 - 110 100 - 110 100 - 110 100 - 110 100 - 110 100 - 110 100 - 110 100 - 110 100 - 110									
Electrode Diameter: 3/32" 1/8" 1/8" 1/8" 1/8" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 79 - 82 104 - 110 110 - 119 109 - 119 Voltage Range: 21 - 24 22 - 23 21 - 24 21 - 23 1 Travel Speed Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9 1 Comments:									-
Current/Polarity: DCEP DCEP <td></td> <td>and the second sec</td> <td></td> <td>A second s</td> <td></td> <td>-</td> <td></td> <td></td> <td></td>		and the second sec		A second s		-			
Current Range: 79-82 104-110 110-119 109-119 Voltage Range: 21-24 22-23 21-24 21-23 Travel Speed Range, ipm: 2.6-4.3 2.9-4.8 2.1-4.8 2.3-4.9 Comments: FIGURE 1 – BEAD SEQUENCE								-	
Voltage Range: 21-24 22-23 21-24 21-23 1 Travel Speed Range, ipm: 2.6-4.3 2.9-4.8 2.1-4.8 2.3-4.9 1							_		
Travel Speed Range, ipm: 2.6 - 4.3 2.9 - 4.8 2.1 - 4.8 2.3 - 4.9 Comments:								-	
Comments:			and the second sec				- 1		
FIGURE 1 – BEAD SEQUENCE	지수는 것은 아이들은 것이 같은 것을 가지 않는 것이 없다.	1	1 210 110	1.2	110 110		-		
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1 1 2 3 4 3 8 7 8 9 1 1 2 3 4 3 8 7 8					مد المعالية المالية المالية	Name of Street			
1 2		1 2 3 4 5	6 7 8 9		5678				

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Test Number:	7-2					P;	nge:	2	of	2
			TENSILE STR	ENGTH TE	ST					
Coupon Number:	W	19 T1	W19	T2						
Coupon Width:	0.99	1 inch	0.980	inch						
Coupon Thickness:		53 inch	0.866	the second s						
Coupon Area:	0.85	5 inch ²	0.849	inch ²						
Maximum Load:	66,	240 lb	67,47	70 lb			-			
Tensile Strength:		500 psi	79,50				10			
Fracture Location:	Base	Metal	Base M	Vletal			11			
			BEND	TEST						
Coupon Number:	W19 SB1	W19 SB2	W19 SB3	W19 SB4				1.1		
Type:	Face	Face	Root	Root	115		11			
Results:	Pass	Pass (1)	Pass	Pass	1.1		1.11			
				TAK TECT						
Coupon Number:	\\/10	NB1	W19	EAK TEST	_			-		-
Results:		ass	Pass					-		
Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:										
			nt but were w OTHEF	TESTS		imits of A	1110	4		
Results: We certify that the	statement	s in this rec	107.007	ect and that	the test v			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	welded	, and

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Test Number: 8-1	0.0		Date: 10/1	6/2014				
Location: Kiefner, Worthing	ton, Ohio							
Welder: Jeremy Didion, Ape	eks Fabrication							
Welding Process: Manual S								
Pipe Material: 12.75" diame				meter, 0.375"	thick AP	'I 5L X	60	
loint Design: 3/32" land, 3/	/32" gap, 70 de	egree bevel bu						
Position: 5G, Fixed			Welding Dire	ction: Uphi	11			
Filler Metal: E7016 root, E7								
Time Between Passes: 1 ho								
Preheat Temperature: Amb			Interpass Ter	nperature:	NR			
Post-weld Heat Treatment:	1115477				-			
Line-up Clamps: None used								
Comments:								_
	W	ELDING PAF	AMETERS					
Pass:	Root	Hot Pass	Fill	Cap				
AWS Classification:	E7016	E7018	E7018	E7018				
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln				
Electrode Diameter:	3/32"	1/8"	1/8"	1/8"				
Current/Polarity:	DCEP	DCEP	DCEP	DCEP				
Current Range:	78 - 89	96 - 102	106 - 109	100 - 118				
Voltage Range:	20 - 28	20-22	20-23	20-24				
Travel Speed Range, ipm:	2.5 - 6.0	3.7 - 5.3	3.2 - 4.5	2.6-6.5			1.	
Comments:						_		
	FIG	URE 1 - BEA	D SEQUENCE					
		(Carlotteres						

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Test Number:	8-1					_ Pag	e: 2	of	2
			TENSILE STR	RENGTH TE	ST				
Coupon Number:	W	20 T1	W20	0 T2	4.1				
Coupon Width:	1.06	57 inch	1.046	5 inch			<u></u>		
Coupon Thickness:	and the second se	59 inch	the second se) inch					
Coupon Area:	0.39	4 inch ²	0.387	inch ²					
Maximum Load:		143 lb	33,6						
Tensile Strength:		556 psi	86,84				1		
Fracture Location:	Base	e Metal	Base	Metal		_			
			BEND	TEST					
Coupon Number:	W20 FB1	W20 FB2	W20 RB1	W20 RB2	1		1		
Type:	Face	Face	Root	Root		1			
Results:	Pass	Pass (1)	Pass	Pass (1)	1.1	1		111	-
Coupon Number:	10/20	NB1	W20	EAK TEST			1		-
Results:		s (1)	Pass						
Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:									
			nt but were v OTHEI	R TESTS	ceptable li	mits of API	1104		
Results: We certify that the	statement sted in acco	ts in this rec		ect and that	the test w			welded	, and

API 1104	COUPON T	EST REPORT		F	Page:	1	of	2
Test Number: 8-2			Date: 12/4	/2014				
Location: Kiefner, Worthing	gton, Ohio		-	• • • • • • • • • • • • • • • • • • •				
Welder: Jeremy Didion, Ap								
Welding Process: Manual								
Pipe Material: 10.75" diam	eter, 0.875" th	ick API 5L X60	to 10.75" dia	meter, 0.875'	thick Al	PI 5L X	60	
Joint Design: 3/32" land, 3	/32" gap, 70 de	egree bevel bu	itt joint					
Position: 5G, Fixed			Welding Dire	ction: Uph	ill			
Filler Metal: E7016 root, E	7018 remainde	r						
Time Between Passes: 8 h	ours, 3 minute	s between roc	t and hot pas	s				
Preheat Temperature: Am	bient (43°F)		Interpass Ter	nperature:	NR			
Post-weld Heat Treatment:	None			0.01.00.02				
Line-up Clamps: None use	d							
Comments:								
								_
-		- 10 CT 1						
	W	ELDING PAR	AMETERS					
Pass:	Root	Hot Pass	Fill	Сар			1	
AWS Classification:	E7016	E7018	E7018	E7018				
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln			1	
Electrode Diameter:	3/32"	1/8"	1/8"	1/8"			1.	
Current/Polarity:	DCEP	DCEP	DCEP	DCEP	1			
Current Range:	68 - 75	101 - 108	120 - 137	120 - 130				
Voltage Range:	20-23	20-22	20-23	20-22				
Travel Speed Range, ipm:	2.7 - 4.3	2.6-4.4	2.0 - 5.0	2.0-4.1		1.1	1.	
Comments:								
	FIG	URE 1 - BEAD	SEQUENCE					
		5						
			The second s					
			and the second second					
			1					
			1					

Test Number: _	8-2					Pa	ge:	2	of	2
			TENSILE STR	ENGTH TE	ST					
Coupon Number:	W	21 T1	W21	1 T2	4.1					
Coupon Width:	1.12	20 inch	1.041	inch						
Coupon Thickness:		36 inch	0.887	and the second						
Coupon Area:	0.99	2 inch ²	0.923	inch ²						
Maximum Load:	87,	487 lb	77,8	11 lb			-			
Tensile Strength:		L92 psi	84,30				n bit			
Fracture Location:	Base	e Metal	Base	Metal			11	-		
			BEND	TEST						
Coupon Number:	W21 SB1	W21 SB2	W21 SB3	W21 SB4	11.1	-				
Type:	Side	Side	Side	Side	11.2					
Results:	Pass (1)	Pass	Pass (1)	Pass	122	1.1	11	1	1	-
Coupon Number:	14/21	NB1	W21	EAK TEST	_					-
Results:		ass	Pas			_		-		
Depth: Width: Notch Location: Test Temperature: Impact Energy:										
% Shear:	1									
Lateral Expansion:										
Test Type:			t but were w	RTESTS	ceptable I	imits of Al	9 110	4		
We certify that the	e statement sted in acco	s in this rec	ord are corre h the require	ect and that	the test v				welded	l, and

API 1104	COUPON T	EST REPOR	г		Page:	1	of	2
Test Number: 9-1	1.1.1		Date: 10/1	6/2014				
Location: Kiefner, Worthing	gton, Ohio		2.00 million					
Welder: Jeremy Didion, Ap	eks Fabricatior	1						
Welding Process: Manual						11		
Pipe Material: 2.375" diam				meter, 0.154	1" thick Al	PI 5L X	42	
Joint Design: 3/32" land, 3	/32" gap, 45 d	egree bevel b						
Position: 5G, Fixed			Welding Dire	ction: Do	wnhill			
Filler Metal: E6010								
Time Between Passes: 17					_			
Preheat Temperature: Am			Interpass Ter	nperature:	NR			
Post-weld Heat Treatment:								
Line-up Clamps: None use	d							
Comments:								
		VELDING PAI	DAMATTER					
Pass:	Root	Hot Pass	1	-	1			
AWS Classification:	E6010	E6010	Cap E6010	-	-			
Manufacture:	Lincoln	Lincoln	Lincoln		-		<u> </u>	
Electrode Diameter:	1/8"	1/8"	1/8"		-		<u> </u>	
Current/Polarity:	DCEP	DCEP	DCEP	-	-		<u> </u>	
Current Range:	65 - 71	85-89	84 - 90		-		<u> </u>	
Voltage Range:	24-26	25 - 28	25-28		-			
Travel Speed Range, ipm:	2.2 - 3.4	5.4 - 10.7	4.0 - 5.6	-	-			
Comments:	2.2 3.4	3.4 10.7	4.0 5.0			_	L	
	FIC		D SEQUENCE					
	FIG	UKE I - BEA	D SEQUENCE	1				
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Duke Energy	NGBU	Procedure	Qualification	Records
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Test Number: 9-1						Page:	2	of 2
			TENSILE S	TRENGTH T	EST			
Coupon Number:								
Coupon Width:			-) /					
Coupon Thickness:								
Coupon Area:								
Maximum Load:			-					
Tensile Strength:								
Fracture Location:								
1 S			BE	ND TEST				
Coupon Number:				-1				
Type:				1				
Results:				1				1
			NICK	BREAK TEST				
Coupon Number:	W22	NB1	-	22 NB2	W22	NB3	W2	2 NB4
Results:	Pass			Pass	Pas			ss (1)
Coupon Number:						- 18 (1 -		
Width:								
Notch Location:								
Impact Energy:		-						
% Shear:								
Lateral Expansion:								
Comments: (1) Indi	ications	were prese	ent but were	e within the a	cceptable lim	nits of API 110	4	
Tost Tuno.				IER TESTS				
Decultor								
We certify that the st	atement	s in this re	cord are co	rrect and tha	t the test we	lds were prep on of API 110	1	velded, and

API 1104	COUPON T	EST REPORT	r -		Page:	1	of	2
Test Number: 9-2			Date: 10,	/16/2014				
Location: Kiefner, Worthing	ton, Ohio							
Welder: Jeremy Didion, Apo								
Welding Process: Manual S	SMAW	to tottai	1.0.0			100		
Pipe Material: 6.625" diam					0" thick A	PI 5L X	42	
Joint Design: 3/32" land, 3	/32" gap, 45 d					2.2		
Position: 5G, Fixed			Welding Dir	rection: Do	wnhill			
Filler Metal: E6010 root, E7					100			
Time Between Passes: 18			root and hot	pass				
Preheat Temperature: Am			Interpass Te	emperature:	NR			
Post-weld Heat Treatment:	None							
Line-up Clamps: None used	Ь							
Comments:				_				
	v	ELDING PAR	AMETERS					
Pass:	Root	Hot Pass	Сар					
AWS Classification:	E6010	E7010-P1	E7010-P1				1	
Manufacture:	Lincoln	Lincoln	Lincoln	1.1		11	1	
Electrode Diameter:	1/8"	5/32"	5/32"	1			1	
Current/Polarity:	DCEP	DCEP	DCEP	12	= (1	
Current Range:	85 - 95	110-111	110 - 113				1	
Voltage Range:	24 - 28	26-28	26-28	100				
Travel Speed Range, ipm:	2.9 - 4.5	4.0 - 6.4	3.5 - 6.4			1.1		
Comments:					<i></i>			
-								
	FIG	URE 1 - BEAL	D SEQUENC	E				
		100						
		All all						
			-					
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	12343		പ്പം	4 3 8 7	0			
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Test Number: 9-2	2	51 A. F. 10A (T. 1	Page:	2 of 2
		TENSILE STRENGTH T	EST	
Coupon Number:				
Coupon Width:				
Coupon Thickness:				
Coupon Area:				
Maximum Load:		/		
Tensile Strength: Fracture Location:				
		BEND TEST		
Coupon Number:				
Type:				
Results:				
		NICK-BREAK TEST		
Coupon Number:	W23 NB1	W23 NB2	W23 NB3	W23 NB4
Results:	Pass	Pass	Pass	Pass
		CHARPY TOUGHNESS	TECT	
Coupon Number:		CHARPT TOUGHNESS		
Depth:				
Width:				
Notch Location:		1		
Test Temperature:				
Impact Energy:				
% Shear:				
Lateral Expansion:				
Comments:				
		OTHER TESTS		
Test Type:				
Deculter				
We certify that the st	atements in this re	ecord are correct and tha	t the test welds were pre	enared welded and
		ith the requirements of t		
		in the requirements of		

Pass:RootAWS Classification:E6010Manufacture:LincolnElectrode Diameter:1/8"Current/Polarity:DCEPCurrent Range:83 – 106Voltage Range:25 – 33Travel Speed Range, ipm:3.2 – 5.5Comments:	ick API 5L X60 egree bevel br nder utes between i	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	meter, 0.375" th cction:	111	X60	
Welder: Jeremy Didion, Apeks Fabrication Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" th Joint Design: 3/32" land, 3/32" gap, 45 d Position: 5G, Fixed Filler Metal: E6010 root, E7010-P1 remail Time Between Passes: 44 hours, 39 minily Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments: V Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current Range: 0CEP Voltage Range: 3.2 – 5.5 Comments: 3.2 – 5.5	ick API 5L X60 egree bevel br nder ites between i VELDING PAF Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	111	X60	
Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" th Joint Design: 3/32" land, 3/32" gap, 45 d Position: 5G, Fixed Filler Metal: E6010 root, E7010-P1 remail Time Between Passes: 44 hours, 39 minite Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments: V Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current Range: 0CEP Voltage Range: 25 - 33 Travel Speed Range, ipm: 3.2 - 5.5 Comments:	ick API 5L X60 egree bevel br nder ites between i VELDING PAF Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	111	X60	
Pipe Material: 12.75" diameter, 0.375" th Joint Design: 3/32" land, 3/32" gap, 45 d Position: 5G, Fixed Filler Metal: E6010 root, E7010-P1 remail Time Between Passes: 44 hours, 39 mint Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments:	VELDING PAF Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	111	X60	
Pipe Material: 12.75" diameter, 0.375" th Joint Design: 3/32" land, 3/32" gap, 45 d Position: 5G, Fixed Filler Metal: E6010 root, E7010-P1 remail Time Between Passes: 44 hours, 39 mint Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments:	VELDING PAF Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	111	X60	
Joint Design: 3/32" land, 3/32" gap, 45 d Position: 5G, Fixed Filler Metal: E6010 root, E7010-P1 remai Time Between Passes: 44 hours, 39 minu Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments: V Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current/Polarity: DCEP Current Range: 83 – 106 Voltage Range: 3.2 – 5.5 Comments:	VELDING PAF Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	111	X60	
Position: 5G, Fixed Filler Metal: E6010 root, E7010-P1 remai Time Between Passes: 44 hours, 39 min Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments:	VELDING PAR Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	Welding Dire	Cap E7010-P1 Lincoln 5/32"			
Filler Metal: E6010 root, E7010-P1 remail Time Between Passes: 44 hours, 39 minity Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments:	VELDING PAR Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	RAMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"			
Time Between Passes: 44 hours, 39 minition Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments:	VELDING PAR Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	R		
Preheat Temperature: Ambient (52°F) Post-weld Heat Treatment: None Line-up Clamps: None used Comments: V Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current/Polarity: DCEP Current Range: 83 – 106 Voltage Range: 3.2 – 5.5 Comments:	VELDING PAF Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	AMETERS Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	R		
Post-weld Heat Treatment: None Line-up Clamps: None used Comments: V Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current/Polarity: DCEP Current Range: 83 – 106 Voltage Range: 25 – 33 Travel Speed Range, ipm: 3.2 – 5.5 Comments:	VELDING PAF Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	Fill E7010-P1 Lincoln 5/32" DCEP	Cap E7010-P1 Lincoln 5/32"	R		
Line-up Clamps: None used Comments: Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current/Polarity: DCEP Current Range: 83 – 106 Voltage Range: 25 – 33 Travel Speed Range, ipm: 3.2 – 5.5 Comments:	Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	Fill E7010-P1 Lincoln 5/32" DCEP	E7010-P1 Lincoln 5/32"			
Comments: Pass: AWS Classification: Manufacture: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm: Comments:	Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	Fill E7010-P1 Lincoln 5/32" DCEP	E7010-P1 Lincoln 5/32"			
V Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current/Polarity: DCEP Current Range: 83 – 106 Voltage Range: 25 – 33 Travel Speed Range, ipm: 3.2 – 5.5 Comments:	Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	Fill E7010-P1 Lincoln 5/32" DCEP	E7010-P1 Lincoln 5/32"			
Pass: Root AWS Classification: E6010 Manufacture: Lincoln Electrode Diameter: 1/8" Current/Polarity: DCEP Current Range: 83 – 106 Voltage Range: 25 – 33 Travel Speed Range, ipm: 3.2 – 5.5 Comments:	Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	Fill E7010-P1 Lincoln 5/32" DCEP	E7010-P1 Lincoln 5/32"			
Pass:RootAWS Classification:E6010Manufacture:LincolnElectrode Diameter:1/8"Current/Polarity:DCEPCurrent Range:83 – 106Voltage Range:25 – 33Travel Speed Range, ipm:3.2 – 5.5Comments:	Hot Pass E7010-P1 Lincoln 5/32" DCEP 113 – 120	Fill E7010-P1 Lincoln 5/32" DCEP	E7010-P1 Lincoln 5/32"			
AWS Classification:E6010Manufacture:LincolnElectrode Diameter:1/8"Current/Polarity:DCEPCurrent Range:83 - 106Voltage Range:25 - 33Travel Speed Range, ipm:3.2 - 5.5Comments:	E7010-P1 Lincoln 5/32" DCEP 113 - 120	E7010-P1 Lincoln 5/32" DCEP	E7010-P1 Lincoln 5/32"			
Manufacture:LincolnElectrode Diameter:1/8"Current/Polarity:DCEPCurrent Range:83 – 106Voltage Range:25 – 33Travel Speed Range, ipm:3.2 – 5.5Comments:	Lincoln 5/32" DCEP 113 – 120	Lincoln 5/32" DCEP	Lincoln 5/32"			
Electrode Diameter:1/8"Current/Polarity:DCEPCurrent Range:83 - 106Voltage Range:25 - 33Travel Speed Range, ipm:3.2 - 5.5Comments:	5/32" DCEP 113-120	5/32" DCEP	5/32"			
Current/Polarity:DCEPCurrent Range:83 - 106Voltage Range:25 - 33Travel Speed Range, ipm:3.2 - 5.5Comments:	DCEP 113 - 120	DCEP	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
Current Range:83 - 106Voltage Range:25 - 33Travel Speed Range, ipm:3.2 - 5.5Comments:	113 - 120		DCEP			
Voltage Range: 25 – 33 Travel Speed Range, ipm: 3.2 – 5.5 Comments:		110 110	1			
Travel Speed Range, ipm: 3.2 – 5.5 Comments:	25 - 28	110 - 118	100 - 115			
Comments:		25 – 29	26-30			
	3.4 - 5.5	3.7 - 6.8	3.2 - 7.0		1	
FIG						
FIG						
FIG						
	URE 1 - BEA	D SEQUENCE				
		and the				
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和其他的时候要求到 700月17月	3 9 1 2 3 4	56789	-			

Duke Energy	NGBU	Procedure	Qualification	Records
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Test Number: 10-	-1			Pa	age: 2	of 2
		TENSILE	STRENGTH TH	ST		
Coupon Number:				4.0		
Coupon Width:						
Coupon Thickness:						
Coupon Area:						
Maximum Load:						
Tensile Strength:		-				
Fracture Location:	_					
2 See . 2		B	END TEST			
Coupon Number:						
Гуре:						
Results:						
		NICK	-BREAK TEST			
Coupon Number:	W24 NB1		24 NB2	W24 NB3	W24	NB4
Results:	Pass (1)		Pass	Pass (1)	Pa	
Coupon Number: Depth: Width:						
Notch Location:						
Test Temperature:						
mpact Energy: % Shear:						
ateral Expansion:				<u> </u>		
Comments:(1) Ind	ications were		re within the a	cceptable limits of A	PI 1104	
Fest Type:						
Results:						
We contify that the ct	atements in th			t the test welds wer he 21st Edition of A		lded, and

Welder: Jeremy Didion, Apeks Fabrication Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design: 3/32" land, 1/16" gap, 45 degree bevel branch groove Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 20 hours, 18 minutes between root and hot pass Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Use the second seco	API 1104	COUPON T	EST REPORT		Р	age:	1	of	2
Welding Process: Manual SMAW Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design: 3/32" land, 1/16" gap, 45 degree bevel branch groove Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 20 hours, 18 minutes between root and hot pass Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None VelLDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln E010 Electrode Diameter: 1/8" 5/32" 5/32" C Current Range: 75 – 98 115 – 123 116 – 122 Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Z Yoltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Z Z Z <th>Number: 10-3</th> <th>G. 10</th> <th></th> <th>Date: 10/1</th> <th>6/2014</th> <th></th> <th></th> <th></th> <th></th>	Number: 10-3	G. 10		Date: 10/1	6/2014				
Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 20 hours, 18 minutes between root and hot pass Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments:	ion: Kiefner, Worthingt	on, Ohio							
Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design: 3/32" land, 1/16" gap, 45 degree bevel branch groove Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 20 hours, 18 minutes between root and hot pass Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Scalar None used Comments: Comments: Comments: Cap Cap Manufacture: Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Cap Current/Polarity: DCEP DCEP DCEP DCEP CCP Cap C	er: Jeremy Didion, Apel	ks Fabrication							
Pipe Material: 12.75" diameter, 0.375" thick API 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 Joint Design: 3/32" land, 1/16" gap, 45 degree bevel branch groove Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 20 hours, 18 minutes between root and hot pass Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Post-weld Scassification: Moot Hot Pass Fill Cap Cap Manufacture: Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Lincoln Manufacture: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP CEP CEP CEP CEP CEP CEP CEP Z3 – 30 24 – 27 23 – 27 25 – 28 Comments: Comments: S2 – 5.5 3.4 – 5.6 3.8 – 9.3 3.3 – 6.2 Comments: Comments: <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>									
Joint Design: 3/32" land, 1/16" gap, 45 degree bevel branch groove Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder									
Position: 5G, Fixed Welding Direction: Downhill Filler Metal: E6010 root, E8010-P1 remainder					meter, 0.375"	thick API	5L X60)	
Filler Metal: E6010 root, E8010-P1 remainder Time Between Passes: 20 hours, 18 minutes between root and hot pass Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Line-up Clamps: None used Comments:		16" gap, 45 de							
Time Between Passes: 20 hours, 18 minutes between root and hot pass Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Comments:				Welding Dire	ction: Dowr	hill			_
Preheat Temperature: Ambient (74°F) Interpass Temperature: NR Post-weld Heat Treatment: None None Interpass Temperature: NR Line-up Clamps: None used None used Comments: Interpass Temperature: NR Pass: None WELDING PARAMETERS Veltain State Veltain State None AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 None Manufacture: Lincoln Lincoln Lincoln Lincoln Interpass Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 Interpass Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Interpass Interpass Comments:					2.01				_
Post-weld Heat Treatment: None Line-up Clamps: None used Comments:						ND			
Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current 3.116 – 122 Z				Interpass Ier	nperature: _	NR			
Comments: WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln I Electrode Diameter: 1/8" 5/32" 5/32" C Current/Polarity: DCEP DCEP DCEP C Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 C Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 C Travel Speed Range, ipm: 3.2 – 5.5 3.4 – 5.6 3.8 – 9.3 3.3 – 6.2 C		C & DAAYS							
WELDING PARAMETERS Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 Ocean Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Ocean Travel Speed Range, ipm: 3.2 – 5.5 3.4 – 5.6 3.8 – 9.3 3.3 – 6.2 Ocean	1	A day in the second							_
Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Travel Speed Range, ipm: 3.2 – 5.5 3.4 – 5.6 3.8 – 9.3 3.3 – 6.2	nents:								_
Pass: Root Hot Pass Fill Cap AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" Current/Polarity: Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Travel Speed Range, ipm: 3.2 – 5.5 3.4 – 5.6 3.8 – 9.3 3.3 – 6.2									
AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Travel Speed Range, ipm: 3.2 – 5.5 3.4 – 5.6 3.8 – 9.3 3.3 – 6.2 Comments:		W	ELDING PAR	AMETERS					
AWS Classification: E6010 E8010-P1 E8010-P1 E8010-P1 Manufacture: Lincoln Lincoln Lincoln Lincoln Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP CEP Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 Voltage Range: 23 – 30 24 – 27 23 – 27 25 – 28 Travel Speed Range, ipm: 3.2 – 5.5 3.4 – 5.6 3.8 – 9.3 3.3 – 6.2 Comments:					Сар				
Electrode Diameter: 1/8" 5/32" 5/32" 5/32" Current/Polarity: DCEP DCEP DCEP DCEP Current Range: 75 - 98 115 - 123 117 - 133 116 - 122 Voltage Range: 23 - 30 24 - 27 23 - 27 25 - 28 Travel Speed Range, ipm: 3.2 - 5.5 3.4 - 5.6 3.8 - 9.3 3.3 - 6.2 Comments:	Classification:			E8010-P1					
Current/Polarity: DCEP DCEP DCEP DCEP DCEP Current Current Range: 75 – 98 115 – 123 117 – 133 116 – 122 23 – 20 24 – 27 23 – 27 25 – 28 25 – 28 23 – 30 24 – 5.6 3.8 – 9.3 3.3 – 6.2 24 – 27 25 – 28 25 – 28 25 – 28 25 – 28 25 – 28 26 – 27 27 – 27 25 – 28 27 – 28 27 – 28 28 – 27 28 – 9.3 3.3 – 6.2 28 – 27 28 – 27 28 – 28	ufacture:	Lincoln	Lincoln	Lincoln	Lincoln				
Current Range: 75 - 98 115 - 123 117 - 133 116 - 122 Voltage Range: 23 - 30 24 - 27 23 - 27 25 - 28 Travel Speed Range, ipm: 3.2 - 5.5 3.4 - 5.6 3.8 - 9.3 3.3 - 6.2 Comments:	rode Diameter:	1/8"	5/32"	5/32"	5/32"				
Voltage Range: 23 - 30 24 - 27 23 - 27 25 - 28 Travel Speed Range, ipm: 3.2 - 5.5 3.4 - 5.6 3.8 - 9.3 3.3 - 6.2 Comments:	nt/Polarity:	DCEP	DCEP	DCEP	DCEP				
Travel Speed Range, ipm: 3.2 - 5.5 3.4 - 5.6 3.8 - 9.3 3.3 - 6.2 Comments:	nt Range:	75 – 98	115 - 123	117 – 133	116 - 122				
Comments:	ge Range:	23 - 30	24 - 27	23 - 27	25 - 28				
	I Speed Range, ipm:	3.2 – 5.5	3.4 - 5.6	3.8 - 9.3	3.3 - 6.2				
FIGURE 1 – BEAD SEQUENCE	nents:								
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Duke Energy	NGBU	Procedure	Qualification	Records
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Test Number: 10-	.3		Page:	2 of 2
		TENSILE STRENGTH T	EST	
Coupon Number:				
Coupon Width:			feet sector has a fe	
Coupon Thickness:				
Coupon Area:				
Maximum Load:				
Tensile Strength:				
Fracture Location:				
- S		BEND TEST		
Coupon Number:				
Type:				
Results:				
		NICK-BREAK TEST		
Coupon Number:	W26 NB1	W26 NB2	W26 NB3	W26 NB4
Results:	Pass (1)	Pass	Pass (1)	Pass
Coupon Number:		CHARPY TOUGHNESS		
Notch Location:				
Test Temperature:				
Impact Energy:				
% Shear:				
Lateral Expansion:				
Comments: (1) Indi	ications were pr	esent but were within the a	acceptable limits of API 11	04
		OTHER TESTS		
Toot Tumos				
		Sand Providence State	at the test welds were pre	pared, welded, and
Results:		s record are correct and that with the requirements of		
Results:				

Test Number: <u>11-1</u> Location: <u>Kiefner, Worthingto</u> Welder: Jeremy Didion, Apek Welding Process: <u>Manual SN</u>			20 20 34					
Welder: Jeremy Didion, Apek Welding Process: Manual SN			Date: 10,	/16/2014				
Welding Process: Manual SN	s Ephrication		994 - 1 -9					
	3 rabiication							
	1AW		1000			1.1		
Pipe Material: 6.625" diamet	er, 0.280" th	ick API 5L X65	to 6.625" di	ameter, 0.28	0" thick Al	PI 5L X	65	
Joint Design: 3/32" land, 3/3	2" gap, 45 de	egree bevel br	anch groove			-		
Position: 5G, Fixed			Welding Dir	ection: Do	ownhill			
Filler Metal: E6010 root, E80	10-P1 remain	nder						
Time Between Passes: 3 hou	ırs, 14 minut	es between ro	oot and hot p	ass				
Preheat Temperature: Ambi	ent (61°F)		Interpass Te	emperature:	NR			
Post-weld Heat Treatment:	None			1.10.10				
Line-up Clamps: None used								
Comments:								
	W	ELDING PAF	RAMETERS					
Pass:	Root	Hot Pass	Сар		1			
AWS Classification:	E6010	E8010-P1	E8010-P1				1	
Manufacture:	Lincoln	Lincoln	Lincoln	1.			1.55	
Electrode Diameter:	1/8"	5/32"	5/32"	1.1	-			
Current/Polarity:	DCEP	DCEP	DCEP		-		1	
Current Range:	82 - 89	113-122	118 - 121					
Voltage Range:	25 - 29	24-28	24-26	201	1			
Travel Speed Range, ipm:	3.7 - 4.8	4.7 - 6.9	4.9 - 6.7		-	11	-	
Comments:	5.7 1.0	1.7 0.5	1.5 0.1			_		
3-								_
		URE 1 – BEAI		'E				
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Coupon Number: Coupon Width: Coupon Thickness: Coupon Area: Maximum Load:		TENSILE STRENGTH TE	ST	
Coupon Width: Coupon Thickness: Coupon Area: Maximum Load:				
Coupon Thickness: Coupon Area: Maximum Load:			1	
Coupon Area: Maximum Load:		+		
Maximum Load:				
Tensile Strength:			++	
Fracture Location:		<u> </u>		
			<u> </u>	
		BEND TEST		
Coupon Number:				
Type:		1.1.1.1		
Results:				
		NICK-BREAK TEST		
Coupon Number:	V28 NB1	W28 NB2	W28 NB3	W28 NB4
Results:	Pass	Pass (1)	Pass	Pass
Coupon Number: Depth: Width: Notch Location:				
Test Temperature:			<u> </u>	
Impact Energy:			<u> </u>	
% Shear: Lateral Expansion:			<u> </u>	
Construction Construction	ons were prese	and the second of	cceptable limits of API 11	04
Test Type:		OTHER TESTS		
Decultor				
We cortify that the statem	ents in this rea	ord are correct and that	t the test welds were pre	epared, welded, and

API 1104	4 COUPON TI	EST REPORT	Г	P	age:	1 0	of 2
Test Number: 12-1			Date: 10/1	6/2014			
Location: Kiefner, Worthing	gton, Ohio			0/202			
Welder: Jeff Ellis, Piedmont							
Welding Process: Manual		1122					
Pipe Material: 24" diamete				ter, 0.700" thi	ck F70		
Joint Design: 3/32" land, 3	/32" gap, 45 de						
Position: 5G, Fixed			Welding Dire	ction: Dow	nhill		
Filler Metal: E6010 root, E8							
Time Between Passes: 24					ND		
Preheat Temperature: Am Post-weld Heat Treatment:			Interpass Ten	nperature: -	NR		
Post-weid Heat Treatment: Line-up Clamps: None use							
Comments: None use	0						
	N	ELDING PAR	AMETERS				
Pass:	Root	Hot Pass	Fill	Cap			,
AWS Classification:	E6010	E8010-P1	E8010-P1	E8010-P1			
Manufacture:	Lincoln	Lincoln	Lincoln	Lincoln			
Electrode Diameter:	1/8"	5/32"	5/32"	5/32"			
Current/Polarity:	DCEP	DCEP	DCEP	DCEP			
Current Range:	88 - 106	106 - 109	117 – 145	114 - 124			
Voltage Range:	23 - 27	28 - 29	25 - 28	24-27			
Travel Speed Range, ipm:	5.1 - 14.9	8.2 - 9.6	6.6 - 10.6	5.3 - 6.9			
Comments:	C						
	FIG	JRE 1 - BEAI	D SEQUENCE				

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Test Number: 12-	1		Page:	2 of 2
		TENSILE STRENGTH T	EST	
Coupon Number:				
Coupon Thickness:				
Coupon Area: Maximum Load:				
Tensile Strength:				
Fracture Location:				
		and the second second		
Courses Numbers		BEND TEST	-	
Coupon Number:				
Type: Results:				
			1 1	
		NICK-BREAK TEST		
Coupon Number:	W29 NB1	W29 NB2	W29 NB3	W29 NB4
Results:	Pass	Pass	Pass	Pass
		HARPY TOUGHNESS	TEST	
Coupon Number:				
Depth:				
Width:		·		
Notch Location:		X)		
Test Temperature:				
Impact Energy:			<u> </u>	
% Shear: Lateral Expansion:				
Comments:				
		OTUED TEETS		
Test Type:		OTHER TESTS		
Desulter				
		and the state of the	And the second second	TO STATISTICS
			t the test welds were pr	
teste	d in accordance wi	th the requirements of	the 21st Edition of API 1	104.
Date: 10/16/2014				

Location: Kiefner, Worthington, Ohio Welder: Jeremy Didion, Apeks Fabrication Welding Process: Manual SMAW Pipe Material: 6.625" diameter, 0.280" thick API 5L X42 to 6.625" diameter, 0.280" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 45 degree bevel branch groove Position: 5.6, Fixed Welding Direction: Uphill Filler Metal: E7016 root, E7018 remainder Time Between Passes: 3 hours, 15 minutes between root and hot pass Preheat Teament: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: AWS Classification: Manufacture: Electrode Diameter: 3/32" 1/8" 1/8" Current Polamge: None UCEP DCEP DCEP Current Range: 21 - 25 20 - 22 20 - 22 Travel Speed Range, ipm: Z7 - 5.6 2.2 - 3.6 2.4 - 4.9 Comments: FIGURE 1 - BEAD SEQUENCE	API 1104	COUPON T	EST REPORT	ſ		Page:	1	of	2
Welding Process: Manual SMAW Pipe Material: 6.625" diameter, 0.280" thick API 5L X42 to 6.625" diameter, 0.280" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 45 degree bevel branch groove Position: 56, Fixed Welding Direction: Uphill Filler Metal: E7016 root, E7018 remainder Time Between Passes: 3 hours, 15 minutes between root and hot pass Preheat Temperature: Ambient (65"f) Interpass Temperature: NR Post-weld Heat Treatment: None None Emetal Comments:	Test Number: 13-1			Date: 10/	/16/2014				
Pipe Material: 6.625" diameter, 0.280" thick API 5L X42 to 6.625" diameter, 0.280" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 45 degree bevel branch groove Position: 5G, Fixed	Location: Kiefner, Worthing	gton, Ohio							
Pipe Material: 6.625" diameter, 0.280" thick API 5L X42 to 6.625" diameter, 0.280" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 45 degree bevel branch groove Position: 5G, Fixed Position: 5G, Fixed Post-weld Heat Treatment: Annie Line-up Clamps: None used Comments:	Welder: Jeremy Didion, Ap	eks Fabrication							
Pipe Material: 6.625" diameter, 0.280" thick API 5L X42 to 6.625" diameter, 0.280" thick API 5L X42 Joint Design: 3/32" land, 3/32" gap, 45 degree bevel branch groove Position: 5G, Fixed Position: 5G, Fixed Time Between Passes: 3 hours, 15 minutes between root and hot pass Preheat Temperature: Ambient (65"F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Cap WELDING DEP DCEP Uncent/Polarity: DCEP DCEP UCEP UCEP UCEP UCEP UCEP UCEP UCEP U									
Joint Design: 3/32" land, 3/32" gap, 45 degree bevel branch groove Position: 56, Fixed Welding Direction: Uphill Filler Metal: E7016 root, E7018 remainder Time Between Passes: 3 hours, 15 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Cap AWS Classification: Root Hot Pass Cap Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" Ourrent/Polarity: DCEP DCEP Cap Current Range: 75 - 81 99 - 102 100 - 104 Z Voltage Range: 21 - 25 20 - 22 20 - 22 Z Z FIGURE 1 – BEAD SEQUENCE FIGURE 1 – BEAD SEQUENCE									
Position: <u>5G, Fixed</u> Welding Direction: <u>Uphill</u> Filler Metal: <u>F7016 root, E7018 remainder</u> Time Between Passes: <u>3 hours, 15 minutes between root and hot pass</u> Preheat Temperature: <u>Ambient (65°F)</u> Interpass Temperature: <u>NR</u> Post-weld Heat Treatment: <u>None</u> Line-up Clamps: <u>None used</u> Comments: WELDING PARAMETERS Pass: Root Hot Pass Cap Manufacture: Lincoln Lincoln Mone Blectrode Diameter: 3/32" 1/8" 1/8" Quite Range: 75-81 99-102 100-104 Voltage Range 21-25 20-22 20-22 Comments: ErGURE 1 – BEAD SEQUENCE FIGURE 1 – BEAD SEQUENCE						0" thick Al	PI 5L X	42	
Filler Metal: E7016 root, E7018 remainder Time Between Passes: 3 hours, 15 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Cap AWS Classification: E7016 E7018 E7018 Manufacture: Lincoln Lincoln Eincoln Current Range: 75 – 81 99 – 102 100 – 104 Voltage Range: 21 – 25 20 – 22 20 – 22 Travel Speed Range, ipm: Z.7 – 5.6 2.4 – 4.9 EIGURE 1 – BEAD SEQUENCE		/32" gap, 45 de	egree bevel br						
Time Between Passes: 3 hours, 15 minutes between root and hot pass Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Line-up Clamps: None used Comments:				Welding Dir	ection: Up	hill			
Preheat Temperature: Ambient (65°F) Interpass Temperature: NR Post-weld Heat Treatment: None Interpass Temperature: NR Line-up Clamps: None used Omments: Interpass Temperature: NR Pass: None None None None None AWS Classification: Root Hot Pass Cap Interpass Interpass Manufacture: Lincoln Lincoln Lincoln Interpass Interpass Electrode Diameter: 3/32" 1/8" Interpass Interpass Interpass Current/Polarity: DCEP DCEP DCEP Interpass Interpass Interpass Yoltage Range: 75 - 81 99 - 102 100 - 104 Interpass					2.2				
Post-weld Heat Treatment: None Line-up Clamps: None used Comments:							_		
Line-up Clamps: None used Comments: WELDING PARAMETERS Pass: Root Hot Pass Cap AWS Classification: F7016 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" OCEP DCEP DCEP C Current/Polarity: DCEP DCEP D Voltage Range: 75 - 81 99 - 102 100 - 104				Interpass Te	emperature:	NR			
Comments: WELDING PARAMETERS Pass: Root Hot Pass Cap									
Rass: Root Hot Pass Cap Manufacture: E7016 E7018 E7018 Electrode Diameter: Uincoln Uincoln Uincoln Current/Polarity: DCEP DCEP DCEP Current Range: 75 - 81 99 - 102 100 - 104 Uincoln Yoltage Range: 75 - 81 99 - 102 100 - 104 Uincoln Uincoln Comments: 21 - 25 20 - 22 20 - 22 Uincoln Uincoln<		d				_			
Pass: Root Hot Pass Cap Image: Comparison of the state of	Comments:								
Pass: Root Hot Pass Cap Image: Comparison of the state of									
Pass: Root Hot Pass Cap Image: Comparison of the comparison of th									
AWS Classification: E7016 E7018 E7018 Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8" Current/Polarity: DCEP DCEP DCEP Current Range: 75 - 81 99 - 102 100 - 104 100 Voltage Range: 21 - 25 20 - 22 20 - 22 100 Travel Speed Range, ipm: 2.7 - 5.6 2.2 - 3.6 2.4 - 4.9 100 Comments: FIGURE 1 - BEAD SEQUENCE FIGURE 1 - BEAD SEQUENCE 100 100	20.00				1				
Manufacture: Lincoln Lincoln Lincoln Electrode Diameter: 3/32" 1/8" 1/8"						_		11	
Electrode Diameter: 3/32" 1/8" 1/8" 1/8" Current/Polarity: DCEP DCEP DCEP 0 Voltage Range: 75 - 81 99 - 102 100 - 104 0 Z1 - 25 20 - 22 20 - 22 0 0 Comments: 2.7 - 5.6 2.2 - 3.6 2.4 - 4.9 0 0 FIGURE 1 - BEAD SEQUENCE				A CALL STREET				1	
Current/Polarity: DCEP DCEP DCEP Image: D		and the second sec	the second second second second						
Current Range: 75-81 99-102 100-104 Image: Image: <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>									
Voltage Range: 21-25 20-22	The second se			3-04-0-5		-			
Travel Speed Range, ipm: 2.7 – 5.6 2.2 – 3.6 2.4 – 4.9 Comments: FIGURE 1 – BEAD SEQUENCE FIGURE 1 – BEAD SEQUENCE						_	_		
Comments:			and the second second second second			_			
FIGURE 1 – BEAD SEQUENCE		2.7 - 5.6	2.2 - 3.6	2.4 - 4.9					
	Comments:	C							
		FIG	URE 1 - BEA	D SEQUENC	E				
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				and the second					
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		1 2 3 4 5	6789	2	4 5 6 7	8			

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Test Number: 13	-1			Pag	e: 2 of 2
		TENSILE	STRENGTH TE	ST	
Coupon Number:					
Coupon Width:					
Coupon Thickness:					
Coupon Area: Maximum Load:					
Tensile Strength:					
Fracture Location:					+
		-	V. 4	1	_
		В	END TEST		
Coupon Number:					<u> </u>
Type:		-			· · · · · · · · · · · · · · · · · · ·
Results:			_		
		NICK	-BREAK TEST		
Coupon Number:	W30 NB1		/30 NB2	W30 NB3	W30 NB4
Results:	Pass		Pass	Pass	Pass
Coupon Number: Depth: Width:					
Notch Location:					
Test Temperature:					
Impact Energy:		1			
% Shear:					
Lateral Expansion:					
Comments:					
			UED TEOTO		
Test Type:			HER TESTS		
Deculter					
We certify that the st				t the test welds were he 21st Edition of API	prepared, welded, and 1104.
	ed in accordance				
	ed in accordance		terror all and a solution of		



Duke Energy NGBU Procedure Qualification Records

Welding Procedure

Revision Number: 1 Effective Date: 05/01/2019 Page 187 of 188

WEL-PR-1020

1. Signature

Reviewed and approved by:

Bost (Apr 30, 2019)



Duke Energy NGBU Procedure Qualification Records

WEL-PR-1020 Revision Number: 1

Welding Procedure

Effective Date: 05/01/2019 Page 188 of 188

2. Revision Log

The table below documents the history of each revision issued and identifies the following: Revision Number, Date, Summary of Changes (including reason for change, and a list of Legacy Duke/Piedmont Documents used to integrate this document), Responsible Party (person or group facilitating changes).

Rev #	Date	Summary of Changes	Responsible Party
0	03/31/2019	 Initial Issue Legacy Documents incorporated into this procedure: CM-PL-4000 PNG Welding Manual Attachment 2 – Piedmont Natural Gas Procedure Qualification Records PQR Legacy Duke documents Contributing JIP PQRs that correspond to WPS' (old #) 14 – 27 	Members of Work Process Integration Team
1	05/01/2019	 Revised the "WHO" section, added Gas Engineering, Gas Field Operations, and Technical Field Operations Legacy Documents incorporated into this procedure: PQRs Belonging to WPS' 1-13 (Attachment 1 of CM-PL-4000) 	Work Process Integration Team





OQ Test and Performance Evaluation Form

Covered Task: TNDTW001 Description: NDT-Radiographic Testing Vendor Company: ID#: Individual: DOB: Resource Center: Verification of Training This section This is an Initial Evaluation, or, MUST be · The individual's qualification has been expired for more than 90 days, or completed if: · The individual has lost their qualification due to poor performance or incident, or · There has been a significant change that impacts the way the task is performed CBT (Computer Based Training) Shadowing TrainingMethod: ILT (Instructor Lead Training) Other I acknowledge that this training was verified and in accordance with the learning objectives identified for this Covered Task. Evaluator/Instructor***PLEASE PRINT NAME **ID** Number Date Pre-Evaluation Testing CBT (Computer Based Training) D Written TestingMethod: Passed Pre-evaluation has been successfully completed by scoring 80% or greater. Failed The individual listed above has FAILED the pre-evaluation test by scoring less than 80% Test Administrator ***PLEASE PRINT NAME **ID** Number Date Performance Evaluation Initial □ Incident Subsequent PoorPerformance **Evaluation Reason:** Simulated Evaluation Field Evaluation **Evaluation Method:** Individual listed above has performed the evaluation steps in accordance to NGBU Policies Qualified:
Yes and Procedures. The individual listed above has FAILED to perform the evaluation steps in accordance to Qualified:
No NGBU Policies and Procedures. Please attach completed Qualification Suspension Form and email to address below. Evaluator Signature ***PLEASE PRINT & SIGN **ID** Number Date Individuals' Signature ***PLEASE PRINT & SIGN **ID** Number Date

Please sign and e-mail completed form and certifications to: <u>OQPEF@duke-energy.com</u> Only <u>LEGIBLE</u>, fully completed and signed forms will be accepted. You must verify all ID#'s are correct.

Evaluation Steps Complete NGBU Pre-Job Brief Form or Lone Worker Form	Satisfactory	Unsatisfactory	Evaluation Criteria: DOT: 192.241 / 192.243 WEL-ST-1060 API-1104 21 st Edition SNT-TC-1A NDT Level II Subsequent Qualification Interval: 36 Months
 Successful completion of Radiographic Testing Training and Certification. 			Must be certified at a minimum of Radiographic Level II Certification.
2. Perform Radiographic Testing			Follows steps outlined in Radiographic testing technique
 Individual demonstrated proper use of any applicable safety equipment and/or safety procedures 			Individual has available / utilizes all procedures and safety equipment
 4. Individual identified two task specific AOC's Examples include Unable to retract radiation source Unauthorized person(s) entering radiation area Uncontrolled ignition of gas Material defects Any potential hazard people, property or environment 			Follows procedures as outlined in NGBU Procedure manuals and/or training classes/instruction.
 5. Individual verbalized appropriate reaction to the task specific AOC's Make area safe Report Repair if qualified 			Individual has identified and described the Abnormal Operating Condition(s) that could be encountered while performing covered task.

Attach NDT Testing Certifications with this document



Duke Energy NGBU Welding Procedure Specifications

Welding Procedure

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*Please consult Table 2 in WEL-ST-1000 Duke Energy NGBU Welding Standard for details summarizing each welding procedure prior to locating the procedure in this document.

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Who

- · Gas Engineering
- · Major Projects
- Gas Field Operations
- Technical Field Operations

API 1104 WELDIN	IG PROCEDURE SPECIFI	CATION Pa	age: 1 of 1
WPS Number: 10		Rev: 1 Dat	
PQR-Number: 1-1, 1-2, 1			
Welding Process: Manual O		motorial	
Pipe or Fitting Material: API Pipe or Fitting Diameter: 2.3	· · · · · · · · · · · · · · · · · · ·	or Fitting Wall Thickness:	0.218 inch or less
Joint Design: Figure 1 and a			
	is not intended to show all b		
그는 것이 있는 것이 같은 것이 같은 것이 같은 것이 가지 않는 것이 없는 것이 없는 것이 없다.	thickness	eau sequences and the hun	iber of beaus will vary
and the second	ringer or weave beads with t	the maximum weave heing	S times the rod diameter
:	inger of weave beaus with	the maximum weave being .	s times the rod diameter
Position: All fixed		Welding Direction: Uphill	or Horizontal
Time Between Passes: 15 m	ninutes between the root an		
	end of the day. If you can't		
	e required		
Post-weld Heat Treatment:	None	Interpass Temperature:	N/A
Line-up Clamps: None requi	red but if used should comp	ly with the Duke Energy NG	BU Welding Standard
Cleaning: The surface shall b	pe free from any detrimenta	I conditions and the weld sh	all be cleaned between
passes with power	r or hand tools		
Comments: The weld should	d be allowed to air cool prio	r to inspection	
Number 0 to Nu	umber 4 oxy-acetylene weld	ing tips are permitted and s	hould be based on wall
thickness			
		Norman D.	
Dest	WELDING PAR		
	WELDING PAR	All	
AWS Classification:		All RG60 or RG65	E /2 7#
AWS Classification: Rod Diameter:	3/32"	All RG60 or RG65 1/8"	5/32″
AWS Classification: Rod Diameter: Welding Gas:	3/32" Oxygen/Acetylene	All RG60 or RG65 1/8" Oxygen/Acetylene	Oxygen/Acetylene
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH:	3/32" Oxygen/Acetylene 2 – 25	All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25	Oxygen/Acetylene 2 – 25
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi:	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type:	3/32" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type:	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm:	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm:	3/32" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm:	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Fl	3/32" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0 IGURE 1 – JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0	Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Fl	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 IGURE 1 - JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 AND BEAD SEQUENCE	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Fl	3/32" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0 IGURE 1 – JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Fl	3/32" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0 IGURE 1 – JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0 AND BEAD SEQUENCE	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm:	3/32" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0 IGURE 1 – JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0 AND BEAD SEQUENCE	Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Flame Type:	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 IGURE 1 - JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0 AND BEAD SEQUENCE	Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Flow Strategy of the second	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 IGURE 1 - JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0 AND BEAD SEQUENCE	Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Fl	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 IGURE 1 - JOINT DESIGN	All RG60 or RG65 1/8'' Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0 AND BEAD SEQUENCE 4 3 2 1	Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0
AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFH: Gas Pressure, psi: Flame Type: Travel Speed Range, ipm: Flow Strain S	3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 IGURE 1 - JOINT DESIGN	All RG60 or RG65 1/8'' Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0 AND BEAD SEQUENCE 4 3 2 1	Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0

DUKE ENERGY.		1.2.2.	1
THE SEA SEA STORE STORE	ELDING PROCEDURE SPECIF		Page: 1 of 1
WPS Number: 20 PQR-Number: 2-1	1, 2-2, 2-3, 2-4	Rev: <u>1</u> Da	ate: 10/01/2018
PQR-Number:	1, 2-2, 2-3, 2-4		
	anual Oxy-Acetylene Welding		
	I: API 5L X52 or less or equivalen	t material	
Pipe or Fitting Diamete			
Pipe or Fitting Wall Thi	expanded pipe end	n pipe with slightly larger d	iameter permitted for the
	welds, Figure 1		
w	igure 1 is not intended to show all vall thickness and the fillet weld size tandard.		
Technique: Beads ma	ay be stringer or weave beads with	the maximum weave being	3 times the rod diameter
Position: All fixed		Welding Direction: Uph	
Time Between Passes:			
	the end of the day. If you can't	start before the end of the	day, see WEL-ST-1010.
Preheat Temperature:	and a second		
Post-weld Heat Treatm		Interpass Temperature:	
	ne required but if used should comp e shall be free from any detriments		
Comments: The wel	r or hand tools d should be allowed to air cool pric		
Comments: The wel Number	d should be allowed to air cool pric r 0 to Number 4 oxy-acetylene welc n wall thickness	ding tips are permitted and	tip selection should be
Comments: The wel Number based o	d should be allowed to air cool pric r 0 to Number 4 oxy-acetylene weld	ding tips are permitted and	tip selection should be
Comments: The wel Number based o	d should be allowed to air cool pric r 0 to Number 4 oxy-acetylene welc n wall thickness	ding tips are permitted and RAMETERS All	tip selection should be
Comments: The wel Number based o Pass: AWS Classification:	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene weld n wall thickness WELDING PA	ding tips are permitted and RAMETERS All RG60 or RG65	
Comments: The wel Number based o Pass: AWS Classification: Rod Diameter:	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene weld n wall thickness WELDING PA	All RG60 or RG65 1/8″	5/32"
Comments: The wel Number based o Pass: AWS Classification: Rod Diameter: Welding Gas:	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene welc n wall thickness WELDING PA 3/32" Oxygen/Acetylene	All RAMETERS All RG60 or RG65 1/8″ Oxygen/Acetylene	5/32" Oxygen/Acetylene
Comments: The wel Number based o Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, C	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene weld n wall thickness WELDING PA 3/32" Oxygen/Acetylene 2 - 25	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25	5/32″ Oxygen/Acetylene 2 – 25
Comments: The well Number based o Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, C Gas Pressure, psi:	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene welc n wall thickness WELDING PA 3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7	5/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7
Comments: The well Number based o Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, C Gas Pressure, psi: Flame Type:	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene weld n wall thickness WELDING PA 3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25	5/32″ Oxygen/Acetylene 2 – 25
Comments: The wel Number	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene weld n wall thickness WELDING PA 3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral m: 0.5 - 2.0	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0	5/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral
Comments: The well Number based o Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, C Gas Pressure, psi: Flame Type:	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene welc n wall thickness WELDING PA 3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0	5/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral
Comments: The well Number based o Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, C Gas Pressure, psi: Flame Type: Travel Speed Range, ip	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene welc n wall thickness WELDING PA 3/32" 0xygen/Acetylene 2-25 3-10/3-7 Neutral m: 0.5-2.0 FIGURE 1 – JOINT DESIGN Not less than t	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 AND BEAD SEQUENCE	5/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0
Comments: The well Number based o Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, C Gas Pressure, psi: Flame Type: Travel Speed Range, ip	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene welch n wall thickness WELDING PA 3/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral m: 0.5 - 2.0 FIGURE 1 - JOINT DESIGN	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 AND BEAD SEQUENCE	5/32'' Oxygen/Acetylene $2 - 25$ $3 - 10/3 - 7$ Neutral $0.5 - 2.0$ Ninal we wall
Comments: The well Number based o Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, C Gas Pressure, psi: Flame Type: Travel Speed Range, ip	d should be allowed to air cool prio r 0 to Number 4 oxy-acetylene welc n wall thickness WELDING PA 3/32" 0xygen/Acetylene 2-25 3-10/3-7 Neutral m: 0.5-2.0 FIGURE 1 – JOINT DESIGN Not less than t	All RAMETERS All RG60 or RG65 1/8" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 AND BEAD SEQUENCE	5/32" Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0

	ELDING PROCED	URE SPECIF			age: 1	of 1	
WPS Number: 30	2 2 2 2 4 742 470	2 242 154 1	Rev: 1	Da	te: 10/01/	2018	
PQR-Number: 3-1	, 3-2, 3-3, 1-X42-179	, 2-842-154, 1	.2-842-219, 20	-GKB-250			
	inual SMAW						
Pipe or Fitting Material							
Pipe or Fitting Diameter			ng Wall Thickn	Vela Vela Vela Vela Vela Vela Vela Vela		C:	
Joint Design: Figure 1 Number of Beads: Fig	gure 1 is not intende						
	ith wall thickness but					will vary	
Technique: Beads ma						od diameter	
Position: All fixed	1	Welding Direc					
Time Between Passes: 15 minutes between the root and second pass. Remaining passes should start before							
the end of the day. If you can't start before the end of the day, see WEL-							
Preheat Temperature:	None required un						
	200°F or the wall t		5 inch or great	er the joint sh	all be heated	to 250°F by	
	any suitable mean	IS		an bac London		1	
Post-weld Heat Treatm Line-up Clamps: Non		d chould as	Interpass Ter	the second second second second	N/A	tandard	
	e shall be free from a						
	power or hand tool			nu the weld s	indif De cleaffe	a between	
	d should be allowed		or to inspection	n			
	es with P1 designation						
	v	VELDING PA	RAMETERS				
	-	luding backw	CH 3211 099 2519 25	All (inc	luding backwo	elding*)	
Pass		adding backwi				Siding /	
		E6010	the second second second		E7010		
AWS Classification:	3/32"	-	5/32"	1/8"		3/16"	
AWS Classification: Electrode Diameter:	3/32" DCEP	E6010 1/8" DCEP	5/32" DCEP	1/8" DCEP	E7010 5/32" DCEP	3/16" DCEP	
AWS Classification: Electrode Diameter: Current/Polarity:		1/8"	-		5/32"	1	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	DCEP	1/8" DCEP	DCEP	DCEP	5/32" DCEP	DCEP	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	DCEP 50 - 70 20 - 32	1/8" DCEP 65 - 130	DCEP 100 - 165	DCEP 65 – 130	5/32" DCEP 90 - 165	DCEP 130 - 210	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	DCEP $50 - 70$ $20 - 32$ $2 - 16$ *Backwelding a	1/8'' DCEP 65 - 130 19 - 32 2 - 20 allowed on 20'' O	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16	5/32" DCEP 90 - 165 20 - 32	DCEP 130 - 210 20 - 32	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	DCEP 50 - 70 20 - 32 m: 2 - 16	1/8'' DCEP 65 - 130 19 - 32 2 - 20 allowed on 20'' O	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16	5/32" DCEP 90 - 165 20 - 32	DCEP 130 - 210 20 - 32	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	DCEP $50 - 70$ $20 - 32$ $2 - 16$ *Backwelding a	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16	5/32" DCEP 90 - 165 20 - 32	DCEP 130 - 210 20 - 32	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP $50 - 70$ $20 - 32$ $2 - 16$ *Backwelding a FIGURE 1 - JC	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16	5/32" DCEP 90 - 165 20 - 32	DCEP 130 - 210 20 - 32	
Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP $50 - 70$ $20 - 32$ $2 - 16$ *Backwelding a FIGURE 1 - JC	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	DCEP 130 - 210 20 - 32	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP $50 - 70$ $20 - 32$ $2 - 16$ *Backwelding a FIGURE 1 - JC	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	DCEP 130 - 210 20 - 32	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP $50 - 70$ $20 - 32$ $2 - 16$ *Backwelding a FIGURE 1 - JC	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	DCEP 130 - 210 20 - 32	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	DCEP 130 - 210 20 - 32	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC Approximately	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	DCEP 130 - 210 20 - 32 2 - 16	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC Approximately	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65 - 130 20 - 32 2 - 16 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	DCEP 130 - 210 20 - 32 2 - 16	
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipr	DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC Approximately 1/16" ± 1/32"	1/8" DCEP 65 - 130 19 - 32 2 - 20 allowed on 20" O DINT DESIGN	DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	DCEP 65-130 20-32 2-16 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	DCEP 130 - 210 20 - 32 2 - 16	

API 1104 WELD	ING PROCED		ICATION	P	age: 1	of 1
WPS Number: 40	ING TROCED		Rev: 1	Da		
	, 4-3, 4-4, 12-X6	0-375, 12-X52			10/01/	2010
Welding Process: Manua	ISMAW					
Pipe or Fitting Material:		51 X42 to less	than API 5LX	65 or equivale	ent material	
	All		g Wall Thickn		inch or greate	r
Joint Design: Figure 1 and	1 Martin		-		-	
	1 is not intende					
	all thickness but					1000 C
Technique: Beads may be						od diameter
Position: All fixed			Welding Direc			
Time Between Passes: 1	5 minutes betwe	en the root a	nd second pas	s. Remaining	passes should	start before
	ne end of the day					
	one required unl					
	00°F or the wall t					
ar	ny suitable mean	S		de la cheranea	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
Post-weld Heat Treatment:	None		Interpass Ter	nperature:	N/A	
Line-up Clamps: None red	quired but if use	d should com	ply with the Du	ke Energy NG	BU Welding	Standard
Cleaning: The surface sha	Ill be free from a	ny detrimenta	al conditions a	nd the weld s	hall be cleane	d between
passes with pow	wer or hand tool	s				
	ould be allowed		or to inspection	n		
Comments: The weld sho		to air cool prio		n		
Comments: The weld sho	ould be allowed t ith P1 designation	to air cool prio on are recomr	mended	n		
Comments: The weld sho	ould be allowed t ith P1 designation	to air cool prio on are recomr VELDING PA	mended			
Comments: The weld sho Electrodes w Pass:	ould be allowed t ith P1 designation	to air cool prio on are recomr VELDING PA Root or All	mended	Remainder	(including ba	
Comments: <u>The weld sho</u> Electrodes w Pass: AWS Classification:	ould be allowed t ith P1 designatio V	to air cool prid on are recomm VELDING PA Root or All E6010	nended	Remainder	7010 or E801	.0
Comments: <u>The weld sho</u> Electrodes w Pass: AWS Classification: Electrode Diameter:	vild be allowed to th P1 designation V 3/32"	to air cool prio on are recomm VELDING PA Root or All E6010 1/8"	nended RAMETERS 5/32"	Remainder 1/8"	7010 or E801 5/32"	.0 3/16"
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity:	vith P1 designation V 3/32" DCEP	VELDING PA Root or All E6010 1/8" DCEP	nended RAMETERS 5/32″ DCEP	Remainder I 1/8" DCEP	7010 or E801 5/32" DCEP	.0 3/16" DCEP
Comments: <u>The weld show</u> Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	vith P1 designation 3/32" DCEP 50 – 70	to air cool prio on are recomm VELDING PA Root or All E6010 1/8"	nended RAMETERS 5/32"	Remainder 1/8" DCEP 65 – 140	7010 or E801 5/32"	0 3/16" DCEP 130 - 210
Comments: <u>The weld show</u> Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	Second description V 3/32" 0 50 - 70 20 - 32	to air cool prio on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32	Remainder 1/8" DCEP 65 – 140 18 – 32	7010 or E801 5/32" DCEP 90 - 165 20 - 32	0 3/16" DCEP 130 - 210 20 - 32
Comments: <u>The weld show</u> Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32 2 – 16	Remainder 1/8" DCEP 65 – 140	7010 or E801 5/32" DCEP 90 – 165	0 3/16" DCEP 130 - 210
Comments: <u>The weld show</u> Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32	Remainder 1/8" DCEP 65 – 140 18 – 32	7010 or E801 5/32" DCEP 90 - 165 20 - 32	0 3/16" DCEP 130 - 210 20 - 32
Comments: <u>The weld show</u> Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" Of	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20	7010 or E801 5/32" DCEP 90 - 165 20 - 32	0 3/16" DCEP 130 - 210 20 - 32
Comments: <u>The weld show</u> Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	V ith P1 designation V 3/32" DCEP 50 – 70 20 – 32 2 – 16 *Backwelding a	to air cool prio on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 20 – 32 2 – 20 illowed on 20" OD DINT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20	7010 or E801 5/32" DCEP 90 - 165 20 - 32	0 3/16" DCEP 130 - 210 20 - 32
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V ith P1 designation V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC → ← Approximately 1/3	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20	7010 or E801 5/32" DCEP 90 - 165 20 - 32	0 3/16" DCEP 130 - 210 20 - 32
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V ith P1 designation V 3/32" DCEP 50 – 70 20 – 32 2 – 16 *Backwelding a FIGURE 1 – JC	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V ith P1 designation V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC → ← Approximately 1/3	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V ith P1 designation V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC → ← Approximately 1/3	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC ↓ ↓ ↓	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32 2 - 16
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V ith P1 designation V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC → ← Approximately 1/3	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC V V V V V V V V V V V V V	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32 2 - 16
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC V V V V V V V V V V V V V	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32 2 - 16
Comments: The weld sho Electrodes w Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC V V V V V V V V V V V V V	to air cool prid on are recomm VELDING PA Root or All E6010 1/8" DCEP 65 – 130 20 – 32 2 – 20 illowed on 20" OF INT DESIGN	Solution 5/32" DCEP 100 - 165 20 - 32 2 - 16 D and larger only.	Remainder 1/8" DCEP 65 – 140 18 – 32 2 – 20 EQUENCE	5/32" DCEP 90 - 165 20 - 32 2 - 16	0 3/16" DCEP 130 - 210 20 - 32 2 - 16

DUKE ENERGY,						
API 1104 WELDI	NG PROCED	JRE SPECIF	ICATION	Ρ	age: 1	of 1
WPS Number: 50			Rev: 1	Da	te: 10/01/	2018
PQR-Number: 5-1, 16-X	65-375					
Welding Process: Manual S	SMAW					
Pipe or Fitting Material: AP					N	A
Pipe or Fitting Diameter:			g Wall Thickne		inch to 0.75 ir	
oint Design: Figure 1 and a						
	is not intended					will vary
	ll thickness but					
echnique: Beads may be s	tringer or weav					
Position: All fixed			Welding Direc			
	minutes betwe			-	• 1 * 1 * 1 0 * * * * * * * * * * * *	
the second s	end of the day				day, see WEL-	ST-1010.
	nimum tempera	ture of 250°F				
Post-weld Heat Treatment:	None		Interpass Ter		N/A	
ine-up Clamps: None requ						
Cleaning: The surface shall			al conditions a	nd the weld s	hall be cleane	d between
passes with power						
Comments: The weld sho	uld be allowed	to air cool pri	or to inspectio	on		
	M	ELDING PA	RAMETERS			
Pass:		Root		Remainder	(including ba	ckwolding*)
AWS Classification:	-	E6010		nemanuer	E8010-P1	coveruing)
Electrode Diameter:	3/32"	1/8″	5/32″	1/8″	5/32"	3/16"
Current/Polarity:	DCEP	DCEP	DCEP	DCEP	DCEP	DCEP
Current Range:	50 - 70	65 - 130	100 - 165	65-130	90 - 165	130 - 210
Voltage Range:	20 - 32	20-32	20 - 32	20 - 32	20-32	20-32
Travel Speed Range, ipm:	2-16	2 - 20	2 - 16	2 - 20	2-16	2-16
in the shoest in the point) and larger only.	2 20	- 10	2 10
	FIGURE 1 – JO			EQUENCE		
**************************************		ely 1/16"				
		/32"- 1/16"				1
			<u>↑</u> [4	5	↓
	$\sum \uparrow$		÷ζ	3	\mathcal{N}_{-}	
\uparrow			! >	2	\sim	21
				\sim		
			<u>↓</u> 1			provimately 1/0"
	↓ ↓ 1/16" ± 1/	-	↓1		Ap	proximately 1/8"
Approximately 1/8"	-	132"	↓1		Ap	proximately 1/8"
	-	'12"	<u>↓</u> 1		App App Date:	proximately 1/8"

Duke Energy NGBU Welding Procedures

				0.00		
API 1104 WELDI	NG PROCED		친구 옷을 가격하는 것		age: 1	of 1
WPS Number: <u>60</u> PQR-Number: 6-1			Rev: 1	Da	te: 10/01/	2018
Welding Process: Manual S	SMAW					
Pipe or Fitting Material: AP		uivalent mater	rial			
Pipe or Fitting Diameter: A			g Wall Thickne	ess: 0.188	inch to 0.75 ir	nch
loint Design: Figure 1 and a	additional butt	groove design	ns permitted b	y Welding Pro	cedure Qualit	fier.
Number of Beads: Figure 1	is not intende	d to show all b	pead sequence	s and the nur	nber of beads	will vary
	ll thickness but					
Technique: Beads may be s	tringer or weav					
Position: All fixed			Welding Direc		and the second	
	minutes betwe				A CALL POINT CONTRACTOR	
	end of the day				day, see WEL-	ST-1010.
	nimum tempera	ature of 250°F				
Post-weld Heat Treatment:	and a set of the second s	d should as	Interpass Ter		N/A	tandard
Line-up Clamps: <u>None requ</u> Cleaning: The surface shall						
Cleaning: The surface shall passes with power			al conditions a	na the weld si	lan be cleane	a between
Comments: The weld show			or to inspection	0		
	in be unoffed	to an coorprie	or to mopeetion			
	V	VELDING PA	DANAFTERS			
			RAIVIELERS			
Pass			RAIVIETERS	Remainder	(including ba	ckwelding*)
		Root E6010	RAIVIETERS	Remainder	(including bar E8010-P1	ckwelding*)
AWS Classification:		Root E6010			E8010-P1	
AWS Classification: Electrode Diameter:	3/32″ DCEP	Root	5/32″ DCEP	Remainder 1/8" DCEP	the second second second second	ckwelding*) 3/16″ DCEP
AWS Classification: Electrode Diameter: Current/Polarity:	3/32"	Root E6010 1/8"	5/32″	1/8"	E8010-P1 5/32"	3/16" DCEP
AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	3/32" DCEP	Root E6010 1/8" DCEP	5/32″ DCEP	1/8" DCEP	E8010-P1 5/32" DCEP	3/16" DCEP
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	3/32" DCEP 50 - 70	Root E6010 1/8" DCEP 65 – 125	5/32" DCEP 100 - 165	1/8″ DCEP 65 – 120	E8010-P1 5/32" DCEP 90 – 165	3/16″ DCEP 130 – 210
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	3/32" DCEP 50 - 70 20 - 32 2 - 16	Root E6010 1/8" DCEP 65 - 125 20 - 32 2 - 16	5/32" DCEP 100 - 165 20 - 32	1/8" DCEP 65 - 120 20 - 32	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16	Root E6010 1/8" DCEP 65 - 125 20 - 32 2 - 16 allowed on 20" OF	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a	Root E6010 1/8" DCEP 65 - 125 20 - 32 2 - 16 allowed on 20" OF	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a	Root E6010 1/8" DCEP 65 - 125 20 - 32 2 - 16 allowed on 20" OF DINT DESIGN	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	Root E6010 1/8" DCEP 65 - 125 20 - 32 2 - 16 allowed on 20" OF DINT DESIGN	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32 2 - 16	3/16" DCEP 130 - 210 20 - 32 2 - 16
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN 1/32"- 1/16"	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32 2 - 16	3/16" DCEP 130 - 210 20 - 32
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN 1/32"- 1/16"	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32 2 - 16	3/16" DCEP 130 - 210 20 - 32 2 - 16
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC → Approxima ↓ 1/16" ± 1	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN 1/32"- 1/16"	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32 2 - 16	3/16" DCEP 130 - 210 20 - 32 2 - 16
AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC → Approxima ↓ 1/16" ± 1	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN 1/32"- 1/16"	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16	E8010-P1 5/32" DCEP 90 - 165 20 - 32 2 - 16	3/16" DCEP 130 - 210 20 - 32 2 - 16
30+ +5°,-0°	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a FIGURE 1 - JC → Approxima ↓ 1/16" ± 1	Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" OD DINT DESIGN 1/32"- 1/16"	5/32" DCEP 100 – 165 20 – 32 2 – 16 Dand larger only.	1/8" DCEP 65 - 120 20 - 32 2 - 16 EQUENCE	E8010-P1 5/32" DCEP 90 - 165 20 - 32 2 - 16	3/16" DCEP 130 - 210 20 - 32 2 - 16

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ENERGY.						
API 1104 WELDI	NG PROCED	URE SPECIFI	CATION		age: 1	of 1
WPS Number: 70			Rev: 1	Da	te: 10/01/	2018
PQR-Number: 7-1, 7-2						
Welding Process: Manual S	2 - A - 2					
Pipe or Fitting Material: AP						
Pipe or Fitting Diameter: A					inch or greate	
Joint Design: Figure 1 and a						
	is not intende					will vary
the second se	Il thickness but					d diamator
Technique: Beads may be s Position: All fixed	tringer or weav				ll or Horizonta	
	minutes betwe					
	end of the day		· · · · · · · · · · · · · · · · · · ·			
the second se	ne required un					
	reater the join					15 115 1161
Post-weld Heat Treatment:	None		Interpass Ter		N/A	
Line-up Clamps: None requ	ired but if use	d should comp		· · · · · · · · · · · · · · · · · · ·	BU Welding S	tandard
Cleaning: The surface shall	be free from a	ny detrimenta	l conditions a	nd the weld s	hall be cleaned	d between
passes with powe	er or hand tool	S				and see .
Comments: The weld shou	ld be allowed	to air cool prio	r to inspection	n		
	v	VELDING PAR	AMETERS			
Pass:	1	Only		Optional) (in	cluding backw	elding*)
AWS Classification:		016			018	0.00.00 /
Electrode Diameter:	3/32"	1/8"	3/32"	1/8"	5/32"	3/16"
Current/Polarity:	DCEP	DCEP	DCEP	DCEP	DCEP	DCEP
Current Range:	55 - 90	75 - 120	70 - 110	90 - 160	130-210	180 - 300
Voltage Range:	20 - 28	20 - 28	20 - 28	20 - 28	20 - 28	20 - 28
Travel Speed Range, ipm:	2-16	2 - 16	2 - 16	2 - 16	2 - 16	2 - 16
	*Backwelding a	allowed on 20" OD	and larger only.			
	FIGURE 1 – JC	DINT DESIGN	AND BEAD S	EQUENCE		
30° +5°, 40°		teby1/16" 1/32"- 1/16" 	<u>↑</u> ↓ {	4	\mathcal{V}^-	→ → → → → → → → → → → → → →
Approximately 1/8"	1/16" ± 1	/32"			~~	noninately 1/0
Standard "V" Beve	Butt Joint				a	
Approved (SME):					Date:	

Duke Energy NGBU Welding Procedures

API 1104 WELDI	NG PROCED	URE SPECIF	ICATION		age: 1	of 1
WPS Number: 80			Rev: 1	Da	te: 10/01/	2018
PQR-Number: 8-1, 8-2						
Welding Process: Manual S	MAW	and and				
Pipe or Fitting Material: Gro	eater than API	5L X42 to less	than API 5L X	65 or equivale	ent material	
Pipe or Fitting Diameter: A	1	Pipe or Fittin	g Wall Thickn	ess: 0.188	inch or greate	r
Joint Design: Figure 1 and a	dditional butt	groove design	ns permitted b	y Welding Pro	cedure Qualif	ier.
			bead sequence of 3 passes sho			will vary
Technique: Beads may be st	ringer or wear	ve beads with	the maximum	weave being	3 times the ro	d diameter
Position: All fixed			Welding Direc			
Time Between Passes: 15	minutes betwe	en the root ar	nd second pass	s. Remaining	passes should	start before
			start before th			
			erature is belo			
			ted to 200°F b			
Post-weld Heat Treatment:			Interpass Ter			
Line-up Clamps: None requ	ired but if use	d should com	· · · · · · · · · · · · · · · · · · ·			tandard
Cleaning: The surface shall						
passes with powe					1000 00 910010	
Comments: The weld shou			or to inspection	n		
	V	VELDING PA	RAMETERS			
Pass:	Root	Only	All (Root	t Optional) (in	cluding backw	velding*)
AWS Classification:	E7	016	1.		018	
Electrode Diameter:	3/32"	1/8"	3/32"	1/8″	5/32"	3/16"
Current/Polarity:	DCEP	DCEP	DCEP	DCEP	DCEP	DCEP
Current Range:	55 - 90	75 - 120	70-110	90 - 160	130 - 210	180 - 300
Voltage Range:	20-28	20-28	20 - 28	20 - 28	20 - 28	20 - 28
Travel Speed Range, ipm:	2-16	2-16	2-16	2-16	2-16	2-16
naver speed kange, ipin.		allowed on 20" OE		2 10	2 10	2 10
			AND BEAD S	EQUENCE		
30° +5°,-0°		1/16"				
	1/3	2"- 1/16" -	*	4	5	↓
			<u>1</u> 7	3	\sim	/*
			$\left\{ \right\}$	2	\swarrow —	<u>></u> T
1	<u> </u>	_	↓1		\mathcal{V}	1
	1				App	proximately 1/8"
Approximately 1/8" —>	└── 1/16‴±1/32	-				
Standard "V" Bevel	Butt Joint					
Standard V Devel						
					Date:	
Approved (SME):					Date:	

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WPS Number: 90		URE SPECIF	ICATION Rev: 1	P Da	age: 1 te: 10/01/	of 1 2018
PQR-Number: 9-1, 9-2, F	12-X42-219					
Welding Process: Manual S						
Pipe or Fitting Material: API						
Pipe or Fitting Diameter: Al			g Wall Thickne		nch or less	
oint Design: Figure 1, addit		-		Welding Proc	cedure Qualifi	er and fillet
welds permitte					<u>, , , , , , , , , , , , , , , , , , , </u>	0.000.000
			bead sequence asses should b			
			NGBU Weldin		nu the linet w	elu size
Technique: Beads may be st					3 times the ro	od diameter
Position: All fixed	inger of freu	Te bedds man	Welding Direc		hill or Horizo	
	ninutes betwe	en the root a	nd second pass			
			start before th	· · · · · · · · · · · · · · · · · · ·		
			erature is below			
200°	F by any suita	able means.				
Post-weld Heat Treatment:	None		Interpass Ten	nperature:	N/A	
ine-up Clamps: None requi	red but if use	d should com	oly with the Du	ike Energy NG	BU Welding S	standard
Cleaning: The surface shall I	be free from a	any detrimenta	al conditions a	nd the weld s	hall be cleane	d between
passes with powe						
Comments: The weld shoul				า		
Electrodes with	P1 designation	on are recomm	nended			
	1	WELDING PA	RAMETERS			
Pass:		All			All	
AWS Classification:		E6010			E7010	
electrode Diameter:	3/32"	1/8″	5/32"	1/8″	5/32"	3/16"
Current/Polarity:	DCEP	DCEP	DCEP	DCEP	DCEP	DCEP
Current Range:	50 - 70	65 - 130	100 - 165	65 - 130	90 - 165	130 - 210
/oltage Range:	20-32	20 - 32	20 - 32	20 - 32	20 - 32	20 - 32
Travel Speed Range, ipm:	2 - 16	2 – 20	2 - 16	2 – 16	2 – 16	2 – 16
	IGURE 1 – JO	DINT DESIGN	AND BEAD S	EQUENCE		
Crotch					Saddle	
	\square			\wedge		
	45° ± 5°		45	°±5°	1/8 in. ± 1/32 in.	
$1/8 \text{ in.} \pm 1/32 \text{ in.}$	24		1		1/8 in. ± 1/32 in.	
	2 3			2 1	1	
				(3)		
Ţ				1.2		

API 1104 WELDI	NG PROCED	URE SPECIF	ICATION	P	age: 1	of 1
WPS Number: 100			Rev: 1	Da		2018
PQR-Number: 10-1, 10-	-3, F6-X60-280					
Welding Process: Manual S	SMAW					
Pipe or Fitting Material: Gr	reater than API	5L X42 to less	than API 5L X	65 or equivale	ent material	
Pipe or Fitting Diameter: A	All	Pipe or Fittin	g Wall Thickn	ess: 0.188	inch to 0.75 ir	nch
	itional branch a ted by Welding			Welding Proc	cedure Qualifi	er and fillet
wall this	L is not intende ckness but a mi comply with th	inimum of 3 p	asses should b	e deposited a		
	stringer or we				g 3 times the	rod diameter
Position: All fixed			Welding Dire			
CARLS AND INC. INC. INC. INC. INC.	minutes betwe					
	e end of the day					
and the second	ne required un					
200	D°F by any suita	ble means				
Post-weld Heat Treatment:	None		Interpass Ter	mperature:	N/A	
Line-up Clamps: None requ	uired but if use	d should com	oly with the Du	uke Energy NG	BU Welding S	Standard
Cleaning: The surface shall passes with pow			al conditions a	nd the weld s	hall be cleane	d between
Commenter The wold show	Id he allowed					
comments: The weld shot	ud be allowed	to air cool pric	or to inspectio	n.		
	th P1 designatio			n.		
	th P1 designation	on are recomm	mended	n.		
Electrodes wit	th P1 designation	on are recomm VELDING PA	mended	n.	Remainder	
Electrodes wit	th P1 designation	on are recomm VELDING PA Root	mended		Remainder 7010 or E801	0
Electrodes wit Pass: AWS Classification:	th P1 designation	on are recomm VELDING PA Root E6010	nended	I	7010 or E801	
Electrodes wit Pass: AWS Classification: Electrode Diameter:	th P1 designation V	VELDING PA Root E6010 1/8"	mended	1/8″	7010 or E801 5/32"	3/16"
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity:	th P1 designation V 3/32" DCEP	VELDING PA Root E6010 1/8" DCEP	nended RAMETERS 5/32" DCEP	1/8" DCEP	7010 or E801 5/32" DCEP	3/16" DCEP
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	th P1 designation V	VELDING PA Root E6010 1/8"	nended RAMETERS 5/32"	1/8″	7010 or E801 5/32"	3/16" DCEP
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	th P1 designation V 3/32" DCEP 50 – 70	on are recomm VELDING PA Root E6010 1/8" DCEP 65 – 130	5/32" DCEP 100 – 165	1/8" DCEP 65 – 140	7010 or E801 5/32" DCEP 90 - 165	3/16" DCEP 130-210
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	th P1 designation V 3/32" DCEP 50 - 70 20 - 32	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	5/32" DCEP 100 - 165 20 - 32 2 - 16	1/8" DCEP 65 - 140 18 - 32 2 - 20	7010 or E801 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	5/32" DCEP 100 - 165 20 - 32 2 - 16	1/8" DCEP 65 - 140 18 - 32 2 - 20	7010 or E801 5/32" DCEP 90 - 165 20 - 32	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	5/32" DCEP 100 - 165 20 - 32 2 - 16	1/8" DCEP 65 - 140 18 - 32 2 - 20	7010 or E801 5/32" DCEP 90 – 165 20 – 32 2 – 16	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32 2 – 16	1/8" DCEP 65 - 140 18 - 32 2 - 20	7010 or E801 5/32" DCEP 90 – 165 20 – 32 2 – 16 Saddle	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	th P1 designation V 3/32" DCEP 50 - 70 20 - 32 2 - 16 FIGURE 1 - JC	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32 2 – 16	1/8" DCEP 65 – 140 18 – 32 2 – 20 SEQUENCE	7010 or E801 5/32" DCEP 90 – 165 20 – 32 2 – 16	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16 FIGURE 1 - JC	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32 2 – 16	1/8" DCEP 65 - 140 18 - 32 2 - 20 SEQUENCE	7010 or E801 5/32" DCEP 90 – 165 20 – 32 2 – 16 Saddle	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	V 3/32" DCEP 50 - 70 20 - 32 2 - 16 FIGURE 1 - JC	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32 2 – 16	1/8" DCEP 65 – 140 18 – 32 2 – 20 SEQUENCE	7010 or E801 5/32" DCEP 90 – 165 20 – 32 2 – 16 Saddle	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm: Crotch	V 3/32" DCEP 50 - 70 20 - 32 2 - 16 FIGURE 1 - JC	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32 2 – 16		7010 or E801 5/32" DCEP 90 – 165 20 – 32 2 – 16 Saddle	3/16" DCEP 130 - 210 20 - 32
Electrodes wit Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm: Crotch	th P1 designation V 3/32" DCEP 50 - 70 20 - 32 2 - 16 FIGURE 1 - JC	Are recommended Root E6010 1/8" DCEP 65 – 130 19 – 33 2 – 20	mended RAMETERS 5/32" DCEP 100 – 165 20 – 32 2 – 16	EQUENCE	$5/32''$ DCEP 90 - 165 20 - 32 2 - 16 Saddle $1/8 \text{ in. } \pm 1/32 \text{ in.}$	3/16" DCEP 130 - 210 20 - 32

Duke Energy NGBU Welding Procedures

API 1104 WELDIN	NG PROCED	URE SPECIF	ICATION	Р	age: 1	of 1
WPS Number: 110	2012/01/21		Rev: 1	Da	te: 10/01/	/2018
PQR-Number: 11-1, F8-X	(65-322					
Welding Process: Manual S	MAW					
Pipe or Fitting Material: AP	15L X65 or equ	uivalent mater	rial			
Pipe or Fitting Diameter: Al			g Wall Thickne		inch to 0.75 ir	10 A 192 A
oint Design: Figure 1, addit				Welding Proc	edure Qualifi	er and fillet
welds permitt						
			pead sequence			
		the second se	asses should b	a transfer of the property second and	nd the fillet w	eld size
			NGBU Weldin	-		1 1
Technique: Beads may be st	ringer or wear					
Position: All fixed			Welding Direc			
			nd second pass	- · ·		
The second se			start before th		day, see WEL-	-51-1010.
		ature of 250°F	should be use			
Post-weld Heat Treatment:	None		Interpass Ter		N/A	
Line-up Clamps: None requ						
Cleaning: The surface shall		the second se	al conditions a	nd the weld sl	hall be cleane	d between
passes with powe						
Comments: The weld should	id be allowed	to air cool pric	or to inspection	n		
	V	VELDING PAI	RAMETERS			
Pass:		Root	U III E I E III		Remainder	T
AWS Classification:		E6010			E8010-P1	_
Electrode Diameter:	3/32"	1/8"	5/32"	1/8″	5/32"	3/16"
Current/Polarity:	DCEP	DCEP	DCEP	DCEP	DCEP	DCEP
Current Range:	50 - 70	65 - 130	100-165	65 - 135	90 - 165	130-210
/oltage Range:	20-32	20 - 33	20-32	20 - 32	20-32	20-32
Fravel Speed Range, ipm:	2 - 16	2 - 20	2 - 16	2 - 20	2 - 16	2 - 16
r			AND BEAD S	FOLIENCE		
Crotch		NIT DESIGN	AND DEAD 3	LQULINCE	Saddle	
	A			X		
	XI			$\langle \chi \rangle$		
$1/8$ in. $\pm 1/32$ in.	4 45°±5	0	45°: /	± 5° (4)	$1/8 \text{ in.} \pm 1/32 \text{ in}$	ı.
+ /	2 3		.)		+	
		1		$\begin{pmatrix} 2 \\ 3 \\ \end{pmatrix}$	f	
		1				
					all a faith and a faith	
-	$1/16 \text{ in } \pm 1/32 \text{ in}$			/ +	• $1/16$ in $= 1/32$ in	

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DUKE ENERGY.						
API 1104 WELDI	NG PROCED	URE SPECIF	ICATION	P	age: 1	of 1
WPS Number: 120			Rev: 1	Dat		/2018
PQR-Number: 12-1			647 60 (A			
Welding Process: Manual S	SMAW					
	PI 5L X70 or equ	uivalent mater	rial		12.00	
Pipe or Fitting Diameter: A	.11	Pipe or Fittin	g Wall Thickne	ess: 0.188	inch to 0.75 ir	nch
	itional branch g ted by Welding	-		Welding Proc	edure Qualifi	er and fillet
wall thic	is not intende kness but a mi	inimum of 3 p	asses should b	e deposited a		
	comply with the			-		1.8
Technique: Beads may be st	tringer or weav	ve beads with			10 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	od diameter
Position: All fixed			Welding Direc			
	minutes betwe		Construction of the Property o	•		
A STATE OF A STAT	end of the day				day, see WEL-	-51-1010.
있는 것, 물로 가슴을 만든 것은 것을 것을 가지 않는 것 수 있는 것이다.	nimum temper	ature of 250°F				
Post-weld Heat Treatment:	None		Interpass Ten		N/A	
	uired but if use					
Cleaning: The surface shall			al conditions a	nd the weld s	hall be cleane	d between
passes with powe						
Comments: The weld shou	ld be allowed	to air cool prio	or to inspection	1		
	v	VELDING PA	RAMETERS			
Pass:		Root			Remainder	
AWS Classification:	1	E6010			E8010-P1	
Electrode Diameter:	3/32"	1/8"	5/32"	1/8″	5/32"	3/16"
Current/Polarity:	DCEP	DCEP	DCEP	DCEP	DCEP	DCEP
Current Range:	50 - 70	65 - 125	100 - 165	65 - 130	90 - 165	130-210
Voltage Range:	20-32	20-33	20-32	20 - 32	20-32	20-32
Fravel Speed Range, ipm:	2-16	2-16	2-16	2-16	2-16	2-16
	FIGURE 1 – JO			100.00		
· · ·		DINT DESIGN	AND BEAD S	EQUENCE		
		JINT DESIGN	AND BEAD S	EQUENCE	Saddle	
Crotch		JINT DESIGN	AND BEAD S		Saddle	
					Saddle	
Crotch	445°±5		AND BEAD S		Saddle 1/8 in. ± 1/32 ir	1.
	24			k 5° 4		1.
Crotch	4					ì.
Crotch	24			k 5° 4		1.
Crotch 1/8 in. ± 1/32 in. 1/8 in. ± 1/32 in.	24					ı.
Crotch 1/8 in. ± 1/32 in. 1/8 in. ± 1/32 in. 1/8 in. ± 1/32 in.	2 3				1/8 in. ± 1/32 ir ↓ ↑ + 1/16 in. = 1/32 m	ı.
Crotch $1/8 \text{ in.} \pm 1/32 \text{ in.}$ \downarrow 1 \uparrow 1	2 3				1/8 in. ± 1/32 ir	ı.

Duke Energy NGBU Welding Procedures

API 1104 WELDI	NG PROCED	URE SPECIF	ICATION	P	age: 1	of 1
WPS Number: 130			Rev: 1	Da	1. The second	2018
PQR-Number: 13-1						
Welding Process: Manual S	MAW					
	1 5L X42 or less	s or equivalent	t material			
Pipe or Fitting Diameter: A			g Wall Thickn	ess: 0.188	inch to 0.75 i	nch
loint Design: Figure 1, addi	tional branch g	groove designs	s permitted by		Control Control Control State and State	
	ted by Welding					
	is not intende		and the second se			
	kness but a mi	and the second		the second se	nd the fillet w	eld size
the second se	comply with the				2 times the re	d diamatar
Technique: Beads may be st	tringer or weav		Welding Dire			u diameter
Position: All fixed Time Between Passes: 15	minutes betwe					ctart hafan
	end of the day				Contraction of the last of the	
	ne required unl					
	°F by any suita		ature is belo	w 40 r the joi	in shall be field	
Post-weld Heat Treatment:	None	Die means	Interpass Ter	nnerature:	N/A	
그는 가슴 유민이는 희망에서 이 가려지 않아 주셨다.	ired but if used	d should comr			S and Early a	tandard
leaning. The surface shall	he tree from a	ny detriments	al conditions a	nd the wold s	hall he cleane	d hetween
			al conditions a	nd the weld s	hall be cleane	d between
passes with powe	er or hand tool	s	112 A 200 A	31.4253.52	hall be cleane	d between
passes with powe	er or hand tool	s	112 A 200 A	31.4253.52	hall be cleane	d between
passes with powe	er or hand tool	s	112 A 200 A	31.4253.52	hall be cleane	d between
passes with powe	er or hand tool Id be allowed t	s to air cool pric	or to inspectio	31.4253.52	hall be cleane	d between
passes with powe Comments:The weld shou	er or hand tool Id be allowed t	s to air cool pric	or to inspectio	n		d between
passes with powe Comments: The weld shou	er or hand tool Id be allowed t M Root	s to air cool pric VELDING PAR Only	or to inspectio	n All (Root	hall be cleane Optional) 018	d between
passes with powe Comments: The weld shou Pass: AWS Classification:	er or hand tool Id be allowed t M Root E70	s to air cool pric VELDING PAR Only 016	AMETERS	n All (Root E70	Optional) 018	
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter:	er or hand tool Id be allowed t M Root	s to air cool pric VELDING PAF Only 016 1/8"	AMETERS	n All (Root E7) 1/8″	Optional) 018 5/32"	3/16"
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity:	er or hand tool Id be allowed to Root E70 3/32" DCEP	s to air cool pric VELDING PAF Only 016 1/8" DCEP	AMETERS 3/32" DCEP	n All (Root E70 1/8″ DCEP	Optional) 018 5/32" DCEP	3/16" DCEP
passes with powe Comments:The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	er or hand tool Id be allowed to Root E70 3/32" DCEP 55 – 90	s to air cool pric VELDING PAR Only 016 1/8" DCEP 75 – 120	AMETERS 3/32" DCEP 70 – 110	n All (Root E70 1/8" DCEP 90 – 160	Optional) 018 5/32″ DCEP 130 – 210	3/16" DCEP 180 – 300
passes with powe Comments:The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	er or hand tool Id be allowed to Root E70 3/32" DCEP	s to air cool pric VELDING PAF Only 016 1/8" DCEP	AMETERS 3/32" DCEP	n All (Root E70 1/8″ DCEP	Optional) 018 5/32" DCEP	3/16" DCEP
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	er or hand tool Id be allowed to Root 3/32" DCEP 55 – 90 20 – 28 2 – 16	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16	n All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16	Optional) 018 5/32" DCEP 130 – 210 20 – 28	3/16" DCEP 180 - 300 20 - 28
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	r or hand tool Id be allowed to Root E70 3/32" DCEP 55 – 90 20 – 28	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16	n All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16	Optional) 018 5/32" DCEP 130 – 210 20 – 28	3/16" DCEP 180 - 300 20 - 28
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	er or hand tool Id be allowed to Root 3/32" DCEP 55 – 90 20 – 28 2 – 16	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16	n All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16	Optional) 018 5/32" DCEP 130 – 210 20 – 28 2 – 16	3/16" DCEP 180 - 300 20 - 28
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	er or hand tool Id be allowed to Root E70 3/32" DCEP 55 – 90 20 – 28 2 – 16 FIGURE 1 – JO	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16 AND BEAD S	All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16 EQUENCE	Optional) 018 5/32" DCEP 130 – 210 20 – 28 2 – 16	3/16" DCEP 180 - 300 20 - 28
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:	er or hand tool Id be allowed to Root 3/32" DCEP 55 – 90 20 – 28 2 – 16	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16 AND BEAD S	n All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16	Optional) 018 5/32" DCEP 130 – 210 20 – 28 2 – 16	3/16" DCEP 180 - 300 20 - 28
	er or hand tool Id be allowed to Root E70 3/32" DCEP 55 – 90 20 – 28 2 – 16 FIGURE 1 – JO	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16 AND BEAD S	All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16 SEQUENCE	Optional) 018 5/32" DCEP 130 – 210 20 – 28 2 – 16 Saddle	3/16" DCEP 180 - 300 20 - 28
	er or hand tool Id be allowed to Root E70 3/32" DCEP 55 - 90 20 - 28 2 - 16 FIGURE 1 - JO	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16 AND BEAD S	All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16 EQUENCE	Optional) 018 5/32" DCEP 130 – 210 20 – 28 2 – 16 Saddle	3/16" DCEP 180 - 300 20 - 28
	er or hand tool Id be allowed to Root E70 3/32" DCEP 55 - 90 20 - 28 2 - 16 FIGURE 1 - JO	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16 AND BEAD S	All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16 SEQUENCE	Optional) 018 5/32" DCEP 130 – 210 20 – 28 2 – 16 Saddle	3/16" DCEP 180 - 300 20 - 28
passes with power Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm: Crotch	er or hand tool Id be allowed to Root E70 3/32" DCEP 55 - 90 20 - 28 2 - 16 FIGURE 1 - JO	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16 AND BEAD S	All (Root E70 1/8" DCEP 90 – 160 20 – 28 2 – 16 SEQUENCE	Optional) 018 5/32" DCEP 130 – 210 20 – 28 2 – 16 Saddle	3/16" DCEP 180 - 300 20 - 28
passes with powe Comments: The weld shou Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm: Crotch	er or hand tool Id be allowed to Root E70 3/32" DCEP 55 – 90 20 – 28 2 – 16 FIGURE 1 – JO	s to air cool price VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	AMETERS 3/32" DCEP 70 – 110 20 – 28 2 – 16 AND BEAD S	All (Root E70 1/8'' DCEP 90 - 160 20 - 28 2 - 16 EQUENCE	Optional) 018 5/32'' DCEP 130 - 210 20 - 28 2 - 16 Saddle $1/8 \text{ in.} \pm 1/32 \text{ in.}$	3/16" DCEP 180 - 300 20 - 28

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				-	
WPS Number: 140			Rev: 1	Date:	10/01/2018
PQR-Number: N16-020	081				
Welding Process: SMAW					
Pipe or Fitting Material: <	API 5L (X42) thru	API 5L (X65)		
Pipe or Fitting Diameter:	≤2.375″				
Pipe or Fitting Wall Thicknes					
Joint Design and Bead Seque	ence: Single "	V" Butt Weld	/ See Figure 1		
Position: Horizontal (Fixed)		Welding Directio	n: Horizontal	
Filler Metal: Group 1			the stand bir collo		
	Minutes			S. 6. 199	
			a 200°F minimur	n preheat is reco	mmended for
	oisture remova	ıl.			
Post-weld Heat Treatment:	N/A	<u></u>	Interpass Tempe	rature: 80°F	
Line-up Clamps: External					
Cleaning: Grinding / Powe	r Wire Brush				
Commonte					
Comments:					
	W	ELDING PAR	RAMETERS		
Pass:	1	2	3		1
AWS Classification:	A5.1	A5.1	A5.1		-
Electrode Diameter:	1/8"	3/32"	3/32"		
Current/Polarity:	DCRP	DCRP	DCRP		
Current Range:	72 - 75	75 - 80	80 - 84		
Voltage Range:	20-22	22 - 24	24 - 26		
Travel Speed Range, ipm:	6 - 12 IPM	4 - 8 IPM	4 - 8 IPM		
	FIGURE 1 - 10		AND BEAD SEQ	LIENCE	
	HOOKE I JO	INT DESIGN	AND DEAD JEQ	OLIVEL	
		1	20 /		
		1			
			t /		
	F	23	i/ /		
	<u> </u>	233 T	*/ }		
	<u>}</u>				
		1/16" ± 1/32"			

WPS Number: 150	02081		Rev: 1	Da	ate:	10/	01/201	18
PQR-Number: N16-	02061							
Welding Process: SMA	W							
Pipe or Fitting Material:		u API 5L (X65)					
Pipe or Fitting Diameter:								
Pipe or Fitting Wall Thick								
loint Design and Bead Se	quence: Fillet W	eld / See Fig	ure 1					
Position: Horizontal (Fi	(ixed)		Welding Direct	tion: Dow	nhill			
Filler Metal: Group 1	incuj		Weiding Direct					
and the second sec	12 Minutes				1.1.1			
Preheat Temperature:	None required.	Below 50°F,	a 200°F minim	um prehea	at is reco	omme	nded f	for
	moisture remova	al.			10.0	-	100	2
Post-weld Heat Treatmen	nt: N/A		Interpass Tem	perature:	80°F			
Line-up Clamps:Extern	nal	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
Line-up Clamps: Extern Cleaning: Grinding / Po	nal							
Line-up Clamps:Exterr Cleaning:Grinding / Po Comments:	nal ower Wire Brush W	ELDING PAF	E E		1			
Line-up Clamps:Exterr Cleaning:Grinding / Po Comments: Pass:	nal ower Wire Brush W	2	3					
Line-up Clamps:Exterr Cleaning:Grinding / Po Comments: Pass: AWS Classification:	hal bwer Wire Brush W 1 A5.1	2 A5.1	3 A5.1					
Line-up Clamps:Exterr Cleaning:Grinding / Po Comments: Pass: AWS Classification: Electrode Diameter:	nal ower Wire Brush M 1 A5.1 1/8"	2 A5.1 3/32"	3 A5.1 3/32"					
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity:	hal bwer Wire Brush W 1 A5.1	2 A5.1	3 A5.1					
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	Mal wer Wire Brush 1 A5.1 1/8" DCRP	2 A5.1 3/32" DCRP	3 A5.1 3/32" DCRP					
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	Mal Sower Wire Brush 1 A5.1 1/8" DCRP 72 - 75 20 - 22	2 A5.1 3/32" DCRP 75 - 80	3 A5.1 3/32" DCRP 80 - 84					
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	I 1 A5.1 1/8" DCRP 72 - 75 20 - 22 6 - 12 IPM	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM					
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	Mal Sower Wire Brush 1 A5.1 1/8" DCRP 72 - 75 20 - 22	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM	QUENCE				
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	I 1 A5.1 1/8" DCRP 72 - 75 20 - 22 6 - 12 IPM	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM	QUENCE				
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	I 1 A5.1 1/8" DCRP 72 - 75 20 - 22 6 - 12 IPM	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM	QUENCE				
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	I 1 A5.1 1/8" DCRP 72 - 75 20 - 22 6 - 12 IPM	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM	QUENCE				
Line-up Clamps: Cleaning: Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	I 1 A5.1 1/8" DCRP 72 - 75 20 - 22 6 - 12 IPM	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM	QUENCE				
Line-up Clamps: <u>Exterr</u> Cleaning: <u>Grinding / Po</u> Comments: Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range:	I 1 A5.1 1/8" DCRP 72 - 75 20 - 22 6 - 12 IPM	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM	QUENCE				
Line-up Clamps: <u>Extern</u> Cleaning: <u>Grinding / Po</u> Comments: <u></u> Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm	I 1 A5.1 1/8" DCRP 72 - 75 20 - 22 6 - 12 IPM	2 A5.1 3/32" DCRP 75 - 80 22 - 24 4 - 8 IPM	3 A5.1 3/32" DCRP 80 - 84 24 - 26 4 - 8 IPM					

VPS Number: 160		Po	v. : 1	Date:	10/01/201	8
and the second	-B-1 and support					
tandard: API 1104 A						
	ipperion D) 20	and and and a				
Velding Process: M	lanual SMAW					
Pipe and Branch Mate	rial SMYS: Les	than or equ	ual to API 5L X	70 or equivale	nt	
Pipe and Branch Mate	rial CE (1): Tab	le 1				
Pipe Wall Thickness (2): 0.188 - 0.75	in. Pip	e Diameter:	All diameter	s	
Branch Wall Thickness	: 0.188 – 0.75 i	n. Bra	anch Diamete	er: All diame	ters	
oint Design: Figure 1						
	ure 1, the figure					
	ss shall not conta				and the second	lired. The
roc	ot pass can be de					
v. Li ci	Branch groove					
Veld Size and Shape:	branch pipe O.					
Velding Technique:	the run pipe at		ely 45 or as s	peched by the	e nitting mar	luracturer.
Position: Fixed	Stringer of weav		alding Directi	on: Uphill or	horizontal	
	10 minutes m			pletion of the		nd the
ime Between Passes:				aximum betwe		
	None require		7 A	nimum prehea		
Preheat Temperature:	moisture rem					
Preheat Method: An	y adequate meth	od may be u	sed to achiev	e and maintair	n the minim	um
pre	eheat temperatu	e.				
ine-up Clamps: Non	e required	Pos	st-weld Heat	Treatment:	None permi	tted
Cleaning: Weld bead	s shall be cleaned	l between pa	asses using po	ower tools or h	and tools as	s required.
	Aay include crude					the second s
	nd nitrogen. Co		hall be given	to the effect w	elding may	have on
	ther pipeline pro				No. Colombication	
Pipeline Operating Con	ndifions.			3, flow rate an	d pressure	are factors
	in th	ermal severi	ty.			
	FIGURE 1 – J	DINT DESIGN	AND BEAD	SEQUENCE		
1.5.10				and the second second		
C				S:	addle	
Crotch	4				latite	

/1 2

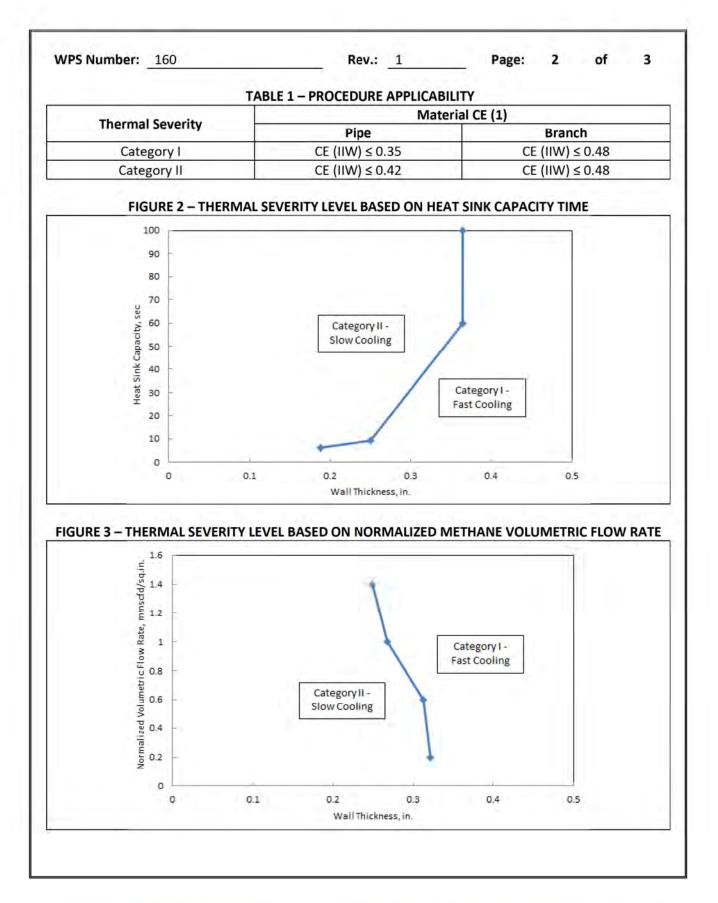
4

- 1/16 in. ± 1/32 in.

3

→ 1/16 in. ± 1/32 in.

+



		10.000				
	WELDING	PARAMETERS				
Pass:			Root			
AWS Classification:	E7018		or	E7016 H4		
Electrode Diameter (in.) (3):	3/32	1/8	3/32	1/8		
Current/Polarity:	DCEP	DCEP	DCEP			
Current Range (amps) (4):	48 - 132 (60 - 110)	68 – 192 (85 – 160)	44 – 96 (55 – 80			
Voltage Range (volts) (4):	14 - 34 (18 - 28)	14 - 34 (18 - 28)	14 - 34 (18 - 28			
Travel Speed Range (ipm):		2-15	2-7	2-11		
Heat Input Min. (kJ/in.) (5):		25	25	25		
Run-Out Ratio Max. (6):		0.61	0.37	0.61		
Pass:		R	emainder			
AWS Classification:		E7018 H4R				
Electrode Diameter (in.) (3):	3/32			5/32		
Current/Polarity:			DCEP	DCEP		
Current Range (amps) (4):	48-132 (60-1	48 - 132 (60 - 110) 68 - 192		88-264 (110-220)		
Voltage Range (volts) (4):	14 - 34 (18 - 2	28) 14-	34 (18 - 28)	14 - 34 (18 - 28)		
Travel Speed Range (ipm):	2 - 10		2 - 15	2 - 21 25		
Heat Input Min. (kJ/in.) (5):	25		25			
Run-Out Ratio Max. (6):	0.37		0.61	0.94		
Comment: (1) C.E. (IIW)	= %C + %Mn/6 + (%	Cu + %Ni)/15	+ (%Cr + %Mo +	%V)/5		
(2) thickness	burn-through sho is less than 0.25 in.			ng if the pipe wall		
(3) less than (oues are perm	incled when the p			
(4) The weldi	ng parameter range	es in the paren	theses are recor	mmended		
(5) Heat input	t (kJ/in.) = (Current	*Voltage*60)/	(Travel Speed*1	000)		
(6)	ut ratio is the maxi to achieve the mir			r length of electrode el.		
Prepared By:			Date:			
Approved By:			Date:			

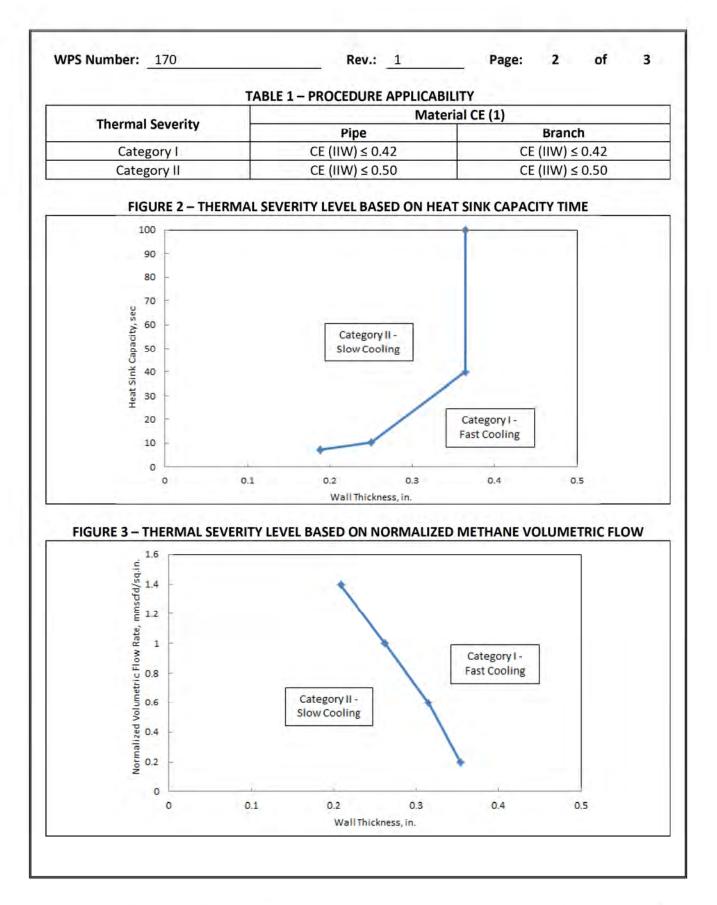
WPS Number: 170	R	v.: 1	Date: 10/01/2	2018
PQR Number: 40LH-	B-1 and supporting verificati			
	ppendix B, 20 th Edition and			
Welding Process: M	anual SMAW	1991 a. T. I.		
Pipe and Branch Mater	ial SMYS: Less than or eq	al to API 5L X70 o	or equivalent	
Pipe and Branch Mater	ial CE (1): Table 1			
Pipe Wall Thickness:		and the second	ll diameters	
Branch Wall Thickness		anch Diameter:	All diameters	
	1, branch groove welds			
A. C. M. M. M. M. M. M. M. M. M. W. W. M. W. M. W. W. M. W. W. W. W. W. M. W.	ire 1, the figure is not intend		이 이 이 이 이 가지 않는 것 같아요. 아이	
	s shall not contact the run p		그 아이지는 것이 아이지 않는 것이 같아요. 아이지 않는 것이 같아요.	equired. The
roo	t pass can be deposited from			
Strates and set	Branch groove welds shall			
Weld Size and Shape:	branch pipe O.D. Fillet we			
	the run pipe at approxima	ely 45° or as spec	ified by the fitting r	nanufacturer.
그는 방법을 주시되었다. 문화 전자의 문문	Stringer or weave beads			
Position: Fixed	the second se		Uphill or horizont	
Time Between Passes:	10 minutes maximum be			
	start of the second pass.			
Preheat Temperature:	None required. Below 50	°F, a 200°F minim	ium preneat is recoi	mmended for
A	moisture removal.		ad maintain the set	
Preneat Wethod:	y adequate method may be	used to achieve a	nd maintain the mil	nimum
	eheat temperature.	at wold Heat Tro	atmonte Nono nor	maittad
			atment: None per	
	s shall be cleaned between			
	ay include crude petroleum			
· · · · · · · · · · · · · · · · · · ·	nd nitrogen. Consideration s ther pipeline products.	nali be given to ti	ie enect weiding ma	ay have on
		o 2 or Eiguro 2 fl	ow rate and pressur	a are factors
Pipeline Operating Con	in thermal severi	•	w rate and pressur	e are factors
	in thermal seven	<u>y</u> .		
	FIGURE 1 – JOINT DESIG	N AND BEAD SEC	UENCE	
		TAND DEAD JEG	OLIVEL	
Crotch			Saddle	

4

→ 1/16 in. ± 1/32 in.

ŧ

← 1/16 in. ± 1/32 in.



		WELDING	G PARAMETERS				
	Pass:	The second		ot			
AW	S Classification:	E7018	H4R o	r	E7016 H4		
Electrode	Diameter (in.):	3/32	1/8	3/32	1/8		
C	urrent/Polarity:	DCEP	DCEP	DCEP	DCEP		
6		48-132	68 - 192	44 - 96	60 - 144		
Current Ra	inge (amps) (2):	(60 - 110)	(85 – 160)	(55 - 80) (75 – 120)		
Malaan D		14 - 34	14 - 34	14-34	14 - 34		
voltage R	ange (volts) (2):	(18 - 28)	(18 – 28)	(18 - 28	3) (18 – 28)		
Travel Spee	ed Range (ipm):	2-6	2-9	2-4	2-7		
Heat Input M	Vin. (kJ/in.) (3):	40	40	40	40		
Run-Out	Ratio Max. (4):	0.23	0.38	0.23	0.38		
	Pass:		Bama	indor			
010/	S Classification:	Remainder E7018 H4R					
	Diameter (in.):	3/32	1/		5/32		
	urrent/Polarity:	DCEP	DC		DCEP		
	inge (amps) (2):	48 - 132 (60 - 1		_,	88 - 264 (110 - 220)		
	ange (volts) (2):	14 - 34 (18 - 2			$\frac{14 - 34(18 - 28)}{2 - 13}$		
	ed Range (ipm):	2-6	2-				
	Min. (kJ/in.) (3):	40	40		40		
	Ratio Max. (4):	0.23	0.3		0.59		
Comment:		2.222	%Cu + %Ni)/15 + (%		17.22.23		
comment.			ges in the parenthe				
			t*Voltage*60)/(Tra				
	(4) The run-or	ut ratio is the max		eld length pe	er length of electrode		
Prepared By	i			Date			
Approved By				Date			

		E SPECIFICATION	Page:	1 of	4
		Rev.: 1	Date:	10/01/2018	
Standard: API 1104	B-1 and supporting	verification welds 50LH-	2 and 50LH-BV	V	
	Appendix B, 20 th Edit	tion and API 1104 Annex	x B, 21 st Editior	1	
Nelding Process: Ma	anual SMAW				
Pipe and Branch Mate	rial SMYS: Less th	an or equal to API 5L X7	70 or equivalen	it, Table 1	
Pipe and Branch Mate	rial CE (1): Less th	an or equal to 0.50 CE (IIW)		
Pipe Wall Thickness (2		Pipe Diameter:			
Branch Wall Thickness			-		
oint Design: Figure					
Figu	re 1 or Figure 2, the	figures are not intende	d to show all p	ossible bead	
seq	uences, only the but	tering layers shall conta	ict the run pipe	and minimum	of
Bead Sequence: three	e passes is required	after the buttering laye	er. The root pa	ss can be depos	ited
fror	n the branch pipe I.C) or 0.D.			4. O.
	Branch groove we	elds shall completely fill	the groove bey	yond flush with	the
Neld Size and Shape:	branch pipe OD.	Fillet weld reinforcemen	nt in the crotch	position shall n	neet
	the run pipe at ap	proximately 45° or as s	pecified by the	fitting manufac	turer
Welding Technique:	Stringer or weave I	beads			
Position: Fixed		Welding Directio	on: Up	hill or horizonta	
Time Between Passes:	10 minutes maxin	num between the comp	letion of the ro	oot pass and the	star
Time between Passes.	of the second pas	s. 30 minutes maximur	n between all o	other passes.	
Preheat Temperature:		elow 50°F, a 200°F mini	mum preheat	is recommended	d for
Construction and the second	moisture remova				
Preneat Wethod:		d may be used to achiev	e and maintain	n the minimum	
The second s	reheat temperature		California de la		
	ne required	Post-weld Heat 1		lone permitted	
Cleaning: Weld bead		etween passes using po			
		petroleum, petroleum p			
Pipeline Products:		ideration shall be given	to the effect w	elding may have	e on
	other pipeline prod				
Pipeline Operating Co					