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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



Welding

WEL-PR-1040

Revision Number: 1

Effective Date: 05/01/2019

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Welding

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 cracking in the weld.</u>

Governing Code and Refer	2.	Governing	Code	and	Reference	s
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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.



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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.



Icon Key:

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.	



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	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	CT1 CT2		
3	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,	CT4		
	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.	CT5		
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 inservice welding procedure?	Yes	No	

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Gas Engineering



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12. Signature

Reviewed and Approved by:

Randy L Bost (Apr 30, 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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Demagnetization of Pipe

WEL-PR-1030

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Welding

Purpose

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



CAUTION: Welding onto magnetized pipe can result in arc blow. Arc blow can affect 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



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

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



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Welding

- 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.



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	a. Depending on the extent of the magnetism and how it was created, it may not be possible to get the entire circumference of the weld joint to the desired Gauss level at the same time. In this case, welding shall only be done in the areas of the weld joint where the Gauss level is acceptable and then the welding machine current level adjusted for other areas until the weld is complete. Make sure the welding procedure is still followed, including time between passes.
	 At some point around the circumference, the polarity of the magnetic field may switch, requiring the terminals of the welding machine to be switched to obtain the desired effect.
8	Weld the root pass around the circumference where the magnetism is below 30 Gauss while continuing to demagnetize the pipe. In other words, one welding machine is used to weld and one is used to demagnetize the pipe.
9	Once the root pass and hot pass are complete, the magnetic field will likely be reduced to an extent where the remaining passes can be welded without further demagnetization. However, in cases where magnetism is severe, the process shall be repeated during subsequent passes as necessary to complete the weld.

11. Contact

Gas Engineering

12. Appendices

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

13. Signature

Reviewed and approved by:

Kandy L Bost Randy L Bost (Apr 30, 2019)



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14. Revision Log

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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



Welding

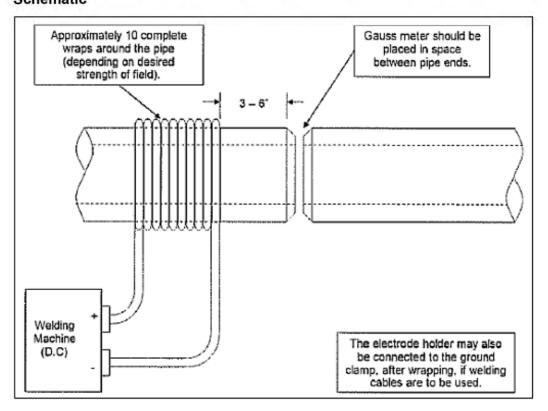
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Appendix: A Pipe Demagnetizing with a Welding Power Supply Procedure Schematic





Welding

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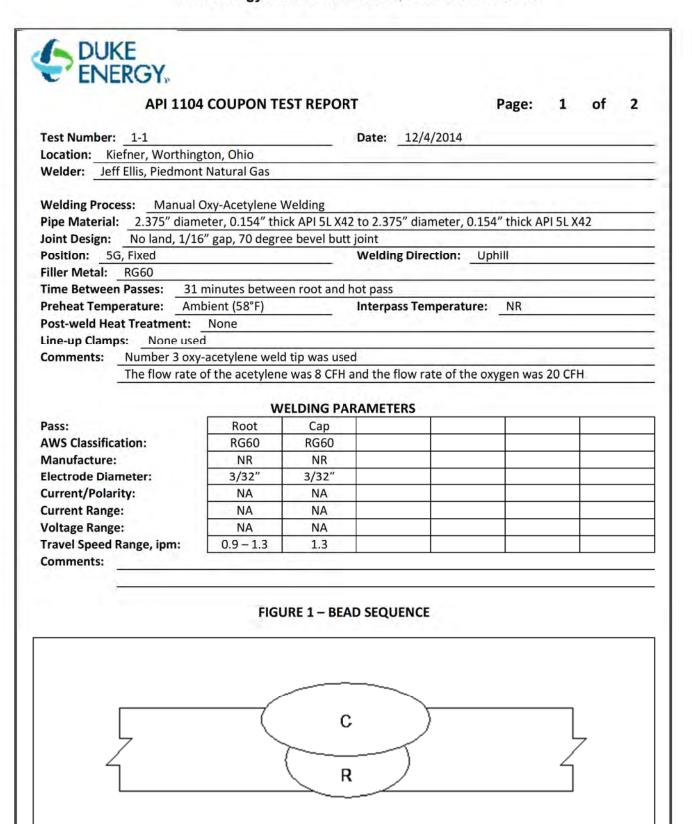
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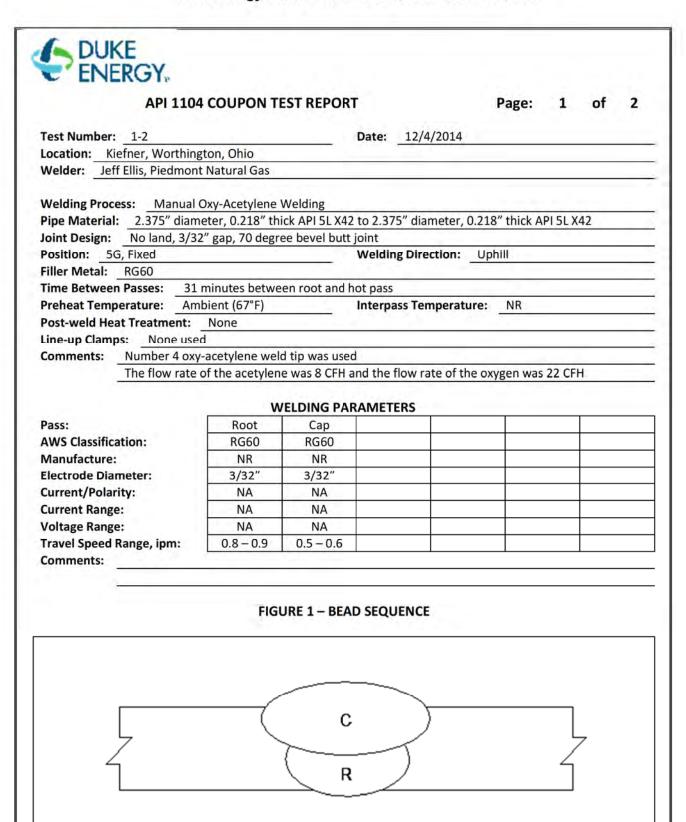
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Who

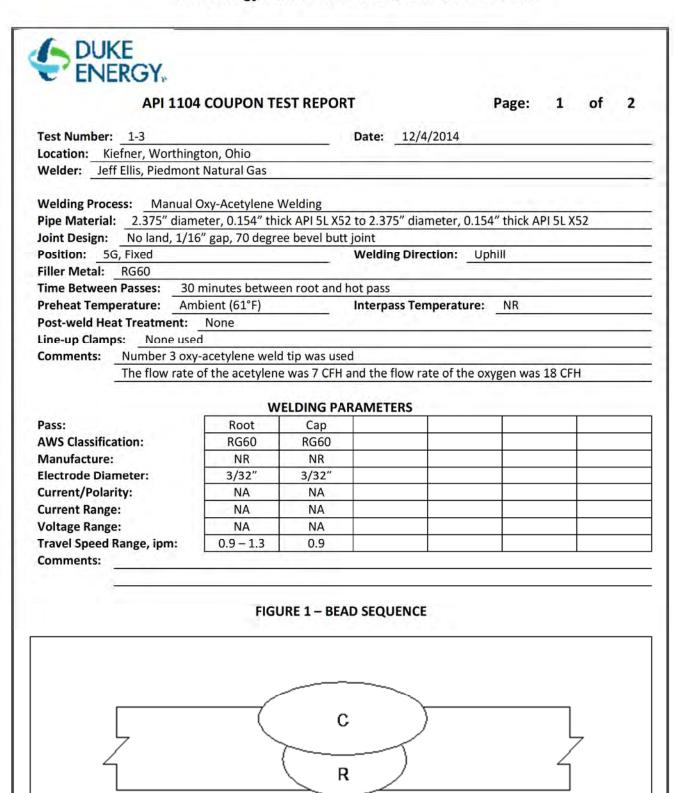
- Gas Engineering
- Major Projects
- · Gas Field Operations
- · Technical Field Operations



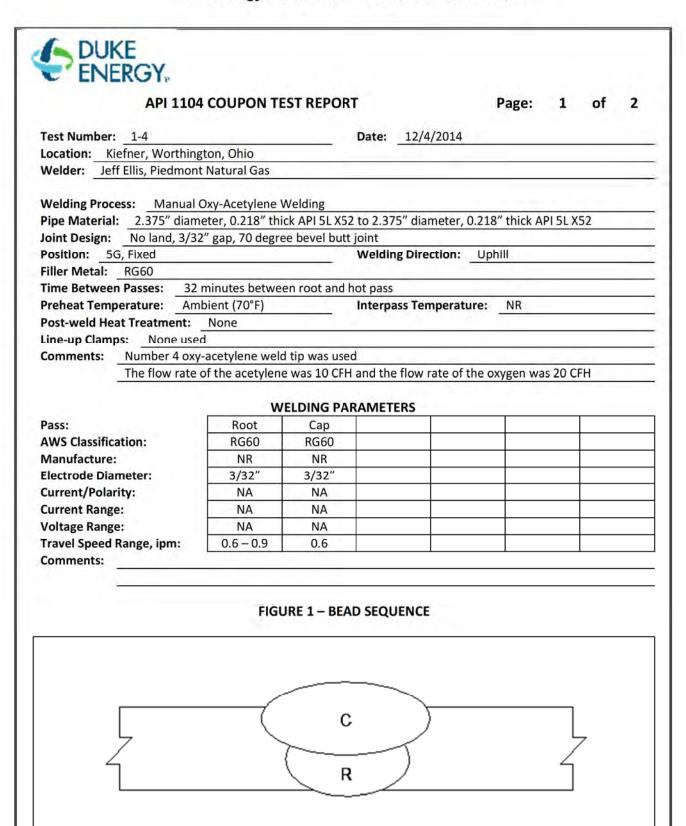
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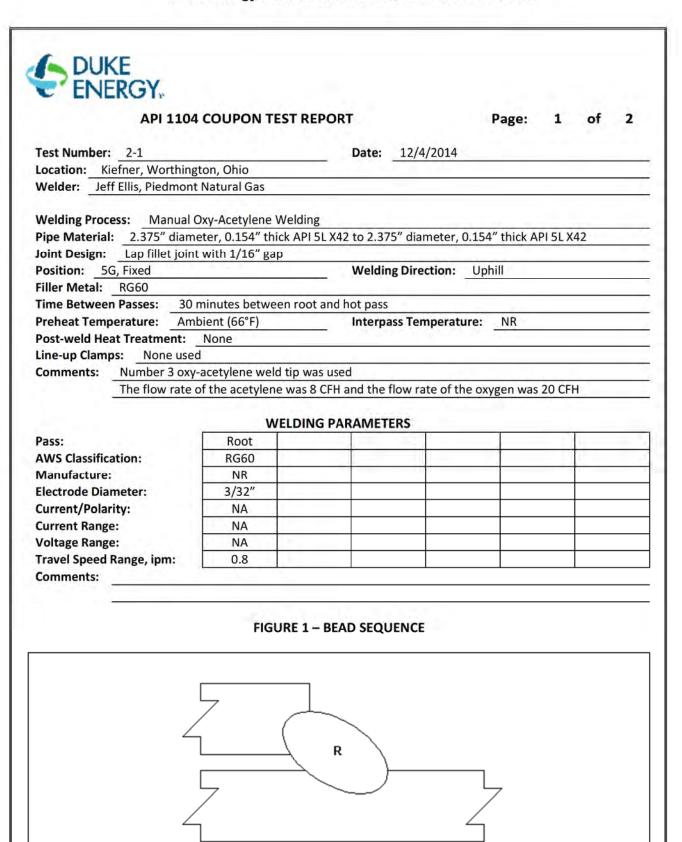
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Maximum Load:		355 psi					
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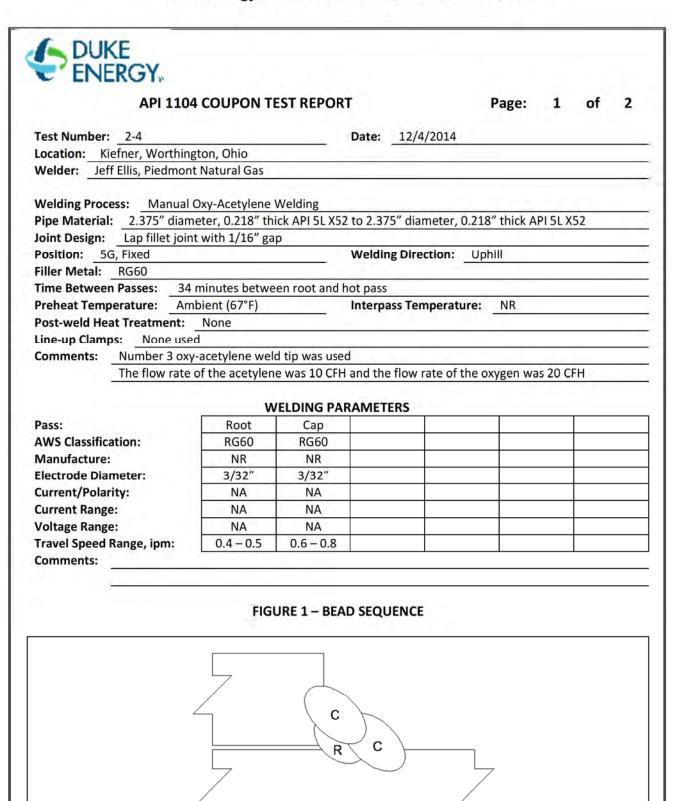
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Avelding Process: Manual Oxy-Acetylene Welding Welding Process: Manual Oxy-Acetylene Welding Pipe Material: 2.375" diameter, 0.218" thick API 5L X42 to 2.375" diameter, 0.218" thick API 5L X42 Point Design: Lap fillet joint with 1/16" gap Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Fime Between Passes: 32 minutes between root and hot pass Preheat Temperature: Ambient (59°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 WELDING PARAMETERS Pass: Root NR Welding Direction: Uphill Filler Metal: RG60 WELDING PARAMETERS Pass: Root NR Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Filler Metal: RG60 Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Welding Direction: Uphill Weld	API 1104	COUPON TEST	REPORT		Page:	1	of 2
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Welding Process: Manual Oxy-Acetylene Welding Pipe Material: 2.375" diameter, 0.218" thick API 5L X42 to 2.375" diameter, 0.218" thick API 5L X42 do 2.375							
Pipe Material: 2.375" diameter, 0.218" thick API 5L X42 to 2.375" diameter, 0.218" thick API 5L X42 loint Design: Lap fillet joint with 1/16" gap Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Firme Between Passes: 32 minutes between root and hot pass Preheat Temperature: Ambient (59°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 WELDING PARAMETERS Pass: Root NR Electrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: NA Voltage Range, ipm: 0.4 – 0.5 Comments: Comments: NA	Welder: Jeff Ellis, Piedmon	t Natural Gas					
Pipe Material: 2.375" diameter, 0.218" thick API 5L X42 to 2.375" diameter, 0.218" thick API 5L X42 loint Design: Lap fillet joint with 1/16" gap Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Firme Between Passes: 32 minutes between root and hot pass Preheat Temperature: Ambient (59°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 WELDING PARAMETERS Pass: Root NR Electrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: NA Voltage Range, ipm: 0.4 – 0.5 Comments: Comments: NA	Arab Estate Same.						
Doint Design: Lap fillet joint with 1/16" gap				7F" 1:	240" (1:1.4	DI EL VA	
Position: 5G, Fixed Welding Direction: Uphill Filler Metal: RG60 Time Between Passes: 32 minutes between root and hot pass Preheat Temperature: Ambient (59°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			71 SL X42 to 2.3	75" diameter, i	J.218" thick A	API 5L X4.	2
Filler Metal: RG60 Time Between Passes: 32 minutes between root and hot pass Preheat Temperature: Ambient (59°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 RG60 Manufacture: NR Belectrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: NA Voltage Range, ipm: 0.4 – 0.5 Comments:		t with 1/16" gap	Woldi	na Direction:	Habill		
Time Between Passes: 32 minutes between root and hot pass Preheat Temperature: Ambient (59°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			weidi	ng Direction:	Ophili		
Preheat Temperature: Ambient (59°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 RG60 RG60 Manufacture: NR Electrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: NA Voltage Range, ipm: 0.4 – 0.5 Comments:		minutes hetween ro	ot and hot nass				
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 RG60 AWS Classification: RG60 Manufacture: NR Electrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: NA Voltage Range, ipm: 0.4 – 0.5 Comments:		CONTROLLER CONTRACTOR STREET			ire. NR		
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 RG60 RG60 RG60 RG60 RG60 RG60 RG60 RG60				ass remperate	10.		
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 RG60 RG60 RG60 RG60 RG60 RG60 RG60 RG60		27.003.22.72					
The flow rate of the acetylene was 8 CFH and the flow rate of the oxygen was 20 CFH WELDING PARAMETERS Pass: Root RG60 RG60 Nanufacture: NR Electrode Diameter: Current/Polarity: NA Current Range: NA Voltage Range: NA Travel Speed Range, ipm: O.4 – 0.5 Comments:			was used				
WELDING PARAMETERS Pass: Root AWS Classification: RG60 Manufacture: NR Electrode Diameter: Current/Polarity: NA Current Range: Voltage Range: Travel Speed Range, ipm: Comments:				flow rate of th	e oxygen was	s 20 CFH	
Pass: Root AWS Classification: RG60 Manufacture: NR Electrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: NA Travel Speed Range, ipm: 0.4 – 0.5 Comments:			2, 37,77 3173 3172		78-11		
AWS Classification: Manufacture: NR Electrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: Travel Speed Range, ipm: Comments:		WELDI	NG PARAMET	ERS			
Manufacture: NR Electrode Diameter: 3/32" Current/Polarity: NA Current Range: NA Voltage Range: NA Travel Speed Range, ipm: 0.4 – 0.5 Comments:	Pass:	Root				11	
Selectrode Diameter: 3/32"	AWS Classification:	RG60	- /			- 11	
Current/Polarity: NA	Manufacture:	NR					
Current Range: NA NA Voltage Range: NA	Electrode Diameter:	3/32"					
Voltage Range: NA Travel Speed Range, ipm: 0.4 – 0.5 Comments:	Current/Polarity:	NA					
Travel Speed Range, ipm: 0.4 – 0.5 Comments:	Current Range:	NA					
Comments:		1,171					
	Travel Speed Range, ipm:	0.4 – 0.5					
FIGURE 1 – BEAD SEQUENCE	Comments:						
FIGURE 1 – BEAD SEQUENCE							
FIGURE 1 – BEAD SEQUENCE		1/2/22/2		721.722			
		FIGURE	I - BEAD SEQ	JENCE			
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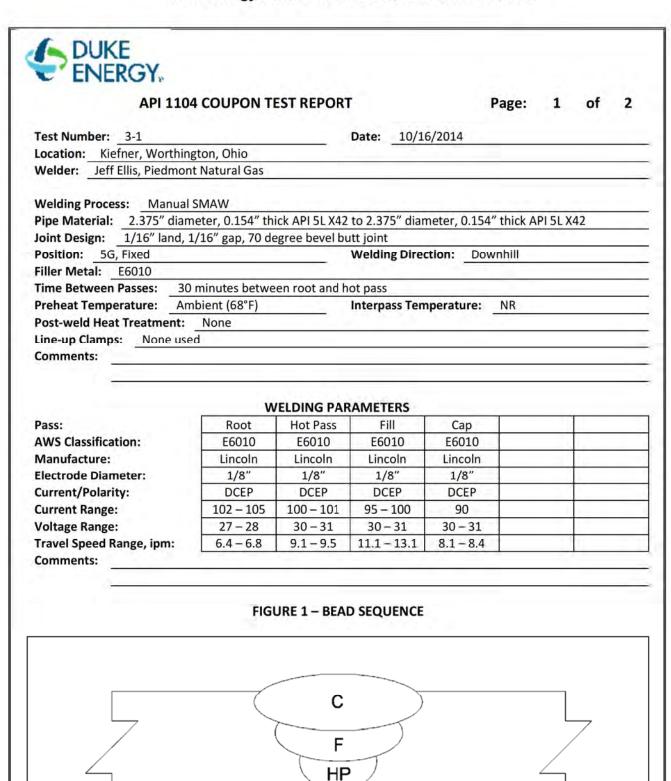
Test Number: 2-2	<u> </u>		Page:	2 of 2
		TENSILE STRENGTH T	EST	
Coupon Number: Coupon Width: Coupon Thickness:				
Coupon Area: Maximum Load:				
Tensile Strength: Fracture Location:				
		BEND TEST		
Coupon Number:				
Results:			1	
Coupon Number:	W6 NB1	NICK-BREAK TEST W6 NB2	W6 NB3	W6 NB4
Results:	Pass	Pass	Pass	Pass
		CHARPY TOUGHNESS	TEST	
Coupon Number: Depth:				
Width:				
Notch Location:				
Test Temperature: Impact Energy:				
% Shear:				
Lateral Expansion:		1		
Comments:				
		OTHER TESTS		
Test Type:				
Results:				
		cord are correct and tha ith the requirements of	이 아이들이 얼마나 아이들이 아니는 아이들이 아이들이 아이들이 아니는 아이들이 모든 것이다.	

API 1104	COUPON TEST R	REPORT Page: 1 of
Test Number: 2-3		Date: _12/4/2014
Location: Kiefner, Worthing		
Welder:Jeff Ellis, Piedmont	: Natural Gas	
Welding Process: Manual (Oxy-Acetylene Weldi	ing
		PI SL X52 to 2.375" diameter, 0.154" thick API SL X52
	t with 1/16" gap	
Position: 5G, Fixed		Welding Direction: Uphill
Filler Metal: RG60		
	minutes between ro	
	bient (64°F)	Interpass Temperature: NR
Post-weld Heat Treatment:	None	
Line-up Clamps: None used		. Sac. 10. 47
	-acetylene weld tip v	was used s 10 CFH and the flow rate of the oxygen was 22 CFH
The now rate of	of the acetylene was	s to crit and the now rate of the oxygen was 22 crit
	WELDI	ING PARAMETERS
Pass:	Root	TANAMETERS
AWS Classification:	RG60	
Manufacture:	NR	
Electrode Diameter:	3/32"	
Current/Polarity:	NA	
Current Range:	NA	
Voltage Range:	NA	
Travel Speed Range, ipm:	0.8 - 0.9	
Comments:	A	
	FIGURE 1	1 – BEAD SEQUENCE
		232-2-2-3-10-12-1
		٦
	\vdash	
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_	1	
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Test Number: 2-3			Pag	e: 2 of 2
		TENSILE STRENGTI	H TEST	
Coupon Number: Coupon Width: Coupon Thickness: Coupon Area: Maximum Load: Tensile Strength: Fracture Location:				
		BEND TEST	'	
Coupon Number: Type: Results:		DENU IESI		
Coupon Number:	W7 NB1	NICK-BREAK TE W7 NB2	W7 NB3	W7 NB4
Results:	Pass	Pass	Pass	Pass
		CHARPY TOUGHNE	SS TEST	
Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:				
Comments:				
		OTHER TESTS		
We certify that the sta	ntements in this re		that the test welds were of the 21st Edition of API	
Date: 12/4/2014				

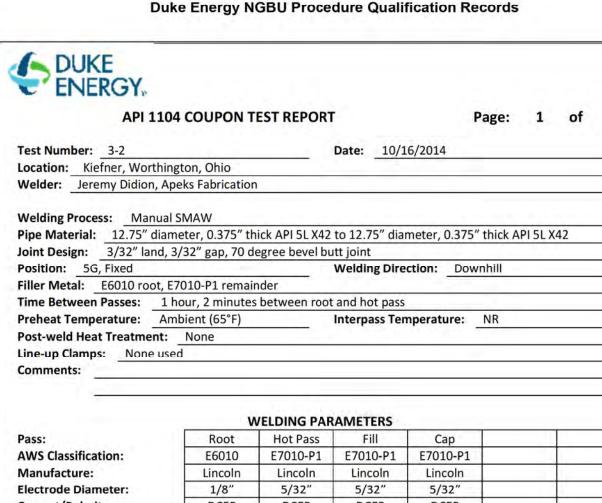


Test Number: 2-4	<u>-</u>			Page:	2 of 2
		TENSILE STREN	GTH TEST		
Coupon Number: Coupon Width: Coupon Thickness: Coupon Area: Maximum Load: Tensile Strength:					
Fracture Location:		1			
Coupon Number: Type: Results:		BEND TE	EST		
Coupon Number:	W8 NB1	NICK-BREA		NB3	W8 NB4
Results:	Pass	Pass (1)		ass	Pass (1)
		CHARPY TOUGH	INESS TEST		
Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:					
Comments: (1) Indi	cations were prese	ent but were with	in the acceptable li	mits of API 11	04
Test Type:		OTHER T			
Decultor					
We certify that the states			and that the test wents of the 21st Edi	the state of the s	And the second s
Date: 12/4/2014					_



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Test Number:	3-1					Page	2	of 2
		T	ENSILE S	TRENGTH	TEST			
Coupon Number: Coupon Width: Coupon Thickness: Coupon Area: Maximum Load: Tensile Strength: Fracture Location:								
			RFI	ND TEST				
Coupon Number: [Type: Results:	W9 RB1 Root Pass	W9 RB2 Root Pass	JE	1231		4	1-	
			NICK-E	BREAK TES	ST .			
Coupon Number: Results:		W9 NB1 Pass		W9 NB2 Pass (1)				
		СН	ARPY TO	UGHNES	S TEST			
Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:								
Comments: (1) I	ndications	were present	but were	within the	acceptable	limits of API 1	104	
				ER TESTS				
Results:	East of	villation.	0.77.5					0.000
We certify that the						welds were po dition of API 1		welded, ar
Date: 10/16/2014	1							



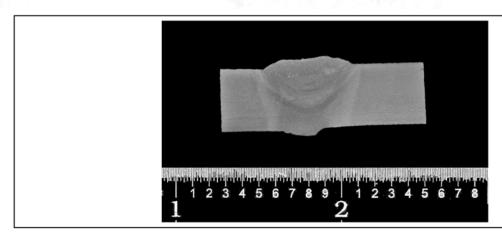
Current/Polarity: **Current Range:** Voltage Range:

Travel Speed Range, ipm: Comments:

Root	Hot Pass	Fill	Cap	
E6010	E7010-P1	E7010-P1	E7010-P1	
Lincoln	Lincoln	Lincoln	Lincoln	
1/8"	5/32"	5/32"	5/32"	
DCEP	DCEP	DCEP	DCEP	
75 – 77	100 - 110	105 – 112	100 – 105	
24 – 27	25 – 28	25 – 29	25 – 29	
3.5 – 5.7	4.1 - 5.5	3.1 - 4.4	2.9 - 4.8	1

2

FIGURE 1 – BEAD SEQUENCE



Test Number:	3-2					Page	. 2	of	2
			TENSILE STE	RENGTH TE	ST				
Coupon Number:	l w	10 T1	W10 T2						
Coupon Width:	_	'0 inch	1.039 inch						
Coupon Thickness:	0.382 inch		0.374 inch						
Coupon Area:	0.371 inch ²		0.389 inch ²						
Maximum Load:	30,872 lb		31,569 lb						
Tensile Strength:	83,213 psi		81,155 psi						
Fracture Location:	Base Metal		Base Metal			- 1			
			BENI	TEST					
Coupon Number:	W10 FB1	W10 FB2	W10 RB1	W10 RB2					
Гуре:	Face	Face	Root	Root					
Results:	Pass	Pass	Pass (1)	Pass	1.0		11	1	
				1000					
	\A/10	NB1	100.00	EAK TEST					
Coupon Number: Results:		s (1)	W10 NB2 Pass (1)						
Depth: Width: Notch Location: Fest Temperature: Impact Energy:									
Mpact Energy: % Shear:	-		_						
Lateral Expansion:									
Comments: (1)			ot but were w	R TESTS		mits of API 1	104		
Test Type:									

2

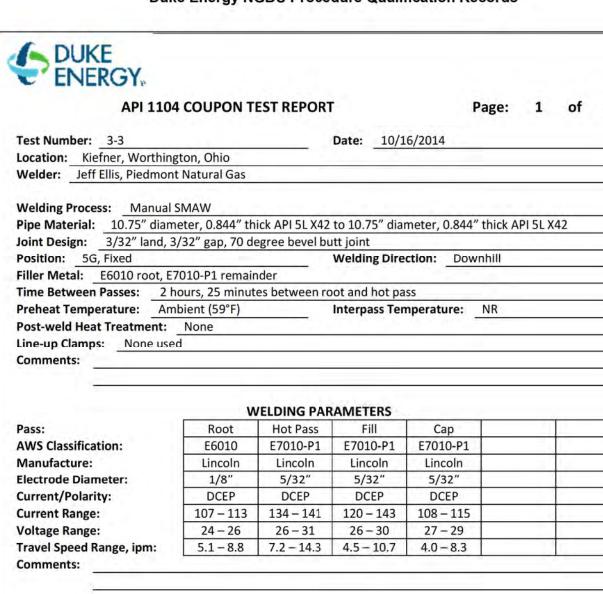
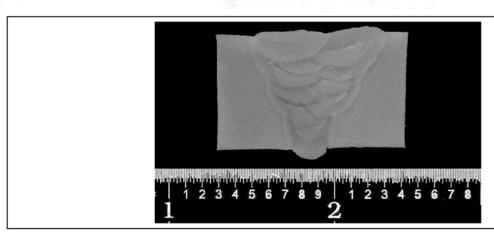


FIGURE 1 - BEAD SEQUENCE



Coupon Width: 1.167 inch 1.133 inch 0.870 inch 0.826 inch 0.870 inch 0.826 inch 0.936 inch	
Coupon Width: 1.167 inch 1.133 inch 0.826 inch 0.870 inch 0.826 inch 0.936 inch	
Coupon Thickness: 0.870 inch 0.826 inch	
Coupon Area: 1.015 inch² 0.936 inch²	
Maximum Load: 71,300 lb 72,600 lb	
Tensile Strength: 70,200 psi 77,600 psi Base Metal Base Meta	
Base Metal Bas	
BEND TEST	
W11 SB1 W11 SB2 W11 SB4	
Type: Face Face Root Root Results: Pass Pass (1)	
Results: Pass Pass (1) Pass (1) Pass (1) NICK-BREAK TEST Coupon Number: Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
NICK-BREAK TEST Coupon Number: W11 NB1 W11 NB2 Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
Coupon Number: W11 NB1 W11 NB2 Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: Shear: Lateral Expansion:	
Coupon Number: W11 NB1 W11 NB2 Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: Shear: Lateral Expansion:	
Results: Pass (1) Pass (1) CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
CHARPY TOUGHNESS TEST Coupon Number: Depth: Width: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
Test Temperature: Impact Energy: % Shear: Lateral Expansion:	
Impact Energy: % Shear: Lateral Expansion:	
Lateral Expansion:	
Comments: (1) Indications were present but were within the acceptable limits of API 1104	
(1) Indications were present but were within the acceptable limits of API 1104	
OTHER TESTS	
Test Type:	
Results:	
	S. A. A.
We certify that the statements in this record are correct and that the test welds were prepared	, welded, an
tested in accordance with the requirements of the 21st Edition of API 1104.	
Date: 10/16/2014	
Test Conducted By: Jim Winigman, Kiefner	



API 1104 COUPON TEST REPORT

Page: 1 of 2

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

Line-up Clamps: None used

Comments:

WELDING PARAMETERS

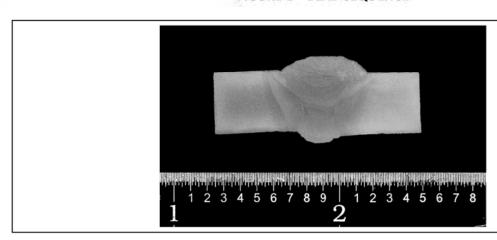
rass.
AWS Classification:
Manufacture:
Electrode Diameter:
Current/Polarity:
Current Range:
Voltage Range:

Trave	Speed	Range,	ipm:
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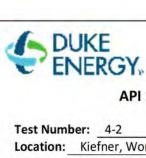
Comments:

Root	Hot Pass	Fill	Cap		
E6010	E7010-P1	E7010-P1	E7010-P1	- 1	
Lincoln 1/8"	Lincoln 5/32"	Lincoln 5/32"	Lincoln 5/32"		
DCEP	DCEP	DCEP	DCEP	- 1	
75 – 76	96 – 100	95 – 98	93 – 95		
24 – 26	24 – 27	25 – 28	27 – 29		
3.5 - 5.2	3.4 - 5.4	4.4 - 5.3	3.4 - 5.5		

FIGURE 1 - BEAD SEQUENCE



Test Number:	4-1					Page:	2	of	2
		-	TENSILE STE	RENGTH TES	ST				
Coupon Number:	l w	12 T1	1	2 T2					
Coupon Width:		7 inch		3 inch					
Coupon Thickness:		7 inch		3 inch					
Coupon Area:		2 inch ²		inch²					
Maximum Load:		340 lb		84 lb					
Tensile Strength:		L54 psi		55 psi					
Fracture Location:		Metal		Metal		111			
			RENI	D TEST					
Coupon Number:	W12 FB1	W12 FB2	W12 RB2	W12 RB2					
Type:	Face	Face	Root	Root				1	
Results:	Pass	Pass	Pass	Pass					
				1,000					
				EAK TEST					
Coupon Number:		NB1	W12 NB2						
Results:	Pa	ass	Pass	(1)					
		c	HARPY TOL	JGHNESS TE	ST				
Coupon Number:			I I I I I I I I I I I I I I I I I I I	JOINTESS II		110.1			
Depth:									
Width:									
width.									
Notch Location									
			- 1						
Test Temperature:									
Test Temperature: Impact Energy:									
Test Temperature: Impact Energy: % Shear:									
Test Temperature: Impact Energy: % Shear:									
Test Temperature: Impact Energy: % Shear: Lateral Expansion:	ndications	were presen	nt but were v	vithin the acc	ceptable limit	s of API 1	104		
Test Temperature: Impact Energy: % Shear: Lateral Expansion:	ndications	were presen		40.11	ceptable limit	s of API 1	104		
			OTHE	R TESTS		s of API 1	104		
Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:(1) Test Type:			OTHE	40.11		s of API 1	104		
Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:(1) Test Type: Results:			ОТНЕ	R TESTS				~ in	
Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:(1) Test Type: Results:	statement	s in this rec	OTHE	R TESTS		ls were pr	epared, v	welded,	, and
Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:(1) Test Type: Results:	statement sted in acco	s in this rec	OTHE	R TESTS	the test welc	ls were pr	epared, v	welded,	, and



API 1104 COUPON TEST REPORT

3.5.5

Cap

E7010-P1

Lincoln

5/32"

DCEP

Page: 1

1 of 2

Test Number: 4-2	Date:	10/16/2014
------------------	-------	------------

Location: Kiefner, Worthington, Ohio
Welder: Jeremy Didion, Apeks Fabrication

Welding Process: Manual SMAW

Pipe Material: 10.75" diameter, 0.875" thick API 5L X60 to 10.75" diameter, 0.875" 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: 18 hours 30 minutes between root and hot pass

Root

Preheat Temperature: Ambient (60°F) Interpass Temperature: NR

Post-weld Heat Treatment: None

Line-up Clamps: None used

Comments:

WELDING PARAMETERS

Fill

E7010-P1

Lincoln

5/32"

DCEP

Hot Pass

E7010-P1

Lincoln

5/32"

DCEP

P	a	S	ς	٠	
	ч	,	•	•	

AWS Classification: Manufacture: Electrode Diameter: Current/Polarity:

Current Range: Voltage Range:

Travel Speed Range, ipm:

	E6010
	Lincoln
	1/8"
	DCEP
П	78 – 79
	24 – 26

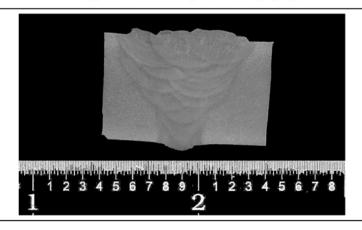
 78 - 79
 107 - 118
 107 - 119
 105 - 116

 24 - 26
 26 - 30
 20 - 31
 27 - 31

 3.9 - 4.8
 5.2 - 7.2
 2.4 - 6.7
 2.7 - 5.1

Comments:

FIGURE 1 - BEAD SEQUENCE



Test Number:	4-2					Page	: 2	of	2
		1	ENSILE ST	RENGTH TES	ST				
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:		5 inch ²		inch ²					
Maximum Load:		060 lb	87,1						
Tensile Strength:		000 psi		00 psi					
Fracture Location:	Base	Metal	Base	Metal		<u>'</u>			
			BENI	TEST					
Coupon Number:	W13 SB1	W13 SB2	W13 SB3	W13 SB4					
Type:	Side	Side	Side	Side			41 -	11(1)	
Results:	Pass (1)	Pass (1)	Pass	Pass (1)					
			NICK DD	EAK TEST					
Coupon Number:	\\/13	NB1					r -		
Results:		s (1)	W13 NB2 Pass (1)						
,	1,00	- (-)		1-7					
		CI	HARPY TOU	JGHNESS TE	ST				
Coupon Number:	1								
Depth:									
Width:									
Notch Location:									
Test Temperature:									
Impact Energy: % Shear:		_							
% Snear: Lateral Expansion:									
Lateral Expansion.									
Comments: (1) I	ndications	were presen	t but were v	vithin the acc	ceptable li	mits of API 1	104		
Test Type:				R TESTS					
Test Type: Results:									
We certify that the						the state of the s		welded	, and
te	sted in acco	ordance witl	h the require	ements of th	e 21st Edi	tion of API	1104.		
Date: 10/16/201	4								
Date: 10/16/201									
Test Conducted By:	lim Win	igman Kiefr	or						



API 1104 COUPON TEST REPORT

۲	ag	e:	1	. 0	T 2

rest Numi	per: 4-3	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, E8010-P1 remainder

Time Between Passes: 4 hours, 22 minutes between root and hot pass

2.9 - 5.2

Preheat Temperature: Ambient (68°F) Interpass Temperature: NR

Post-weld Heat Treatment: None

Line-up Clamps: None used

Comments:

Hot Pass Fill

Cap E8010-P1 Lincoln

5/32"

DCEP 92 – 107

24 - 28

3.1 - 5.4

. 455.	
AWS	Classification:

Dacc.

Manufacture:
Electrode Diameter:
Current/Polarity:
Current Range:

Voltage Range:

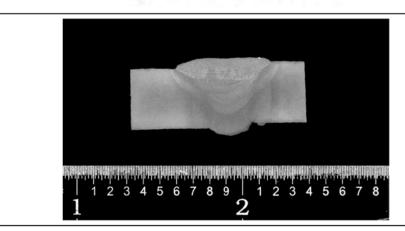
NOOL	HOLFass	3 111
E6010	E8010-P1	E8010-P1
Lincoln	Lincoln	Lincoln
1/8"	5/32"	5/32"
DCEP	DCEP	DCEP
68 – 76	98 – 100	99 – 109
22 – 26	24 – 27	24 - 26

3.8 - 5.5

Travel Speed Range, ipm: Comments:

FIGURE 1 – BEAD SEQUENCE

4.7 - 7.3



Coupon Number:						Page	: 2	of	2
[TENSILE STE	RENGTH TE	ST				
[W	14 T1	1	4 T2					
Coupon Width:	1.215 inch		1.102	2 inch					
Coupon Thickness:	0.37	4 inch	0.370) inch					
Coupon Area:	0.45	4 inch ²	0.408	inch²					
Maximum Load:	40,5	575 lb	37,1	68 lb		_			
Tensile Strength:	89,3	73 psi	91,09	97 psi					
Fracture Location:	Base	Metal	Base	Metal					
			BENI	TEST					
Coupon Number: W	/14 FB1	W14 FB2	W14 RB2	W14 RB2					
Type:	Face	Face	Root	Root				Ti-	
	ass (1)	Pass (1)	Pass (1)	Pass (1)					
			NICK BD	EAK TEST					
Coupon Number:	W/14	NB1	W14						
Results:	Pass		Pass (1)						
Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear:									
Lateral Expansion:				0.0.0.0			. 5.5		_
Comments: (1) Indi	ications v	were presen	* Y 10,000 G	vithin the ac	ceptable	imits of API 1	.104		
Test Type:			OTHE						
Results:									
We certify that the states						welds were p lition of API 1		welded	, and
Date: 10/16/2014									



API 1104 COUPON TEST REPORT

•	ag	e	:	T	OT	4

Test Number: 4-4		Date: 10/16/2014	V.C
Location: Kiefner, Wo	thington, Ohio	-	
Welder: Jeff Ellis, Pied	mont Natural Gas		
Pipe Material: 10.75"	nual SMAW diameter, 0.875" thick API ! nd, 3/32" gap, 70 degree be		0.875" thick API 5L X60
Position: 5G, Fixed		Welding Direction:	Downhill
Filler Metal: E6010 ro	ot, E8010-P1 remainder	The state of the s	
Time Between Passes:	6 hours, 27 minutes betw	een root and hot pass	
Prohest Temperature	Ambient (64°E)	Internace Temperati	ure: NR

Post-weld Heat Treatment: None

Line-up Clamps: None used Comments:

WELDING PARAMETERS

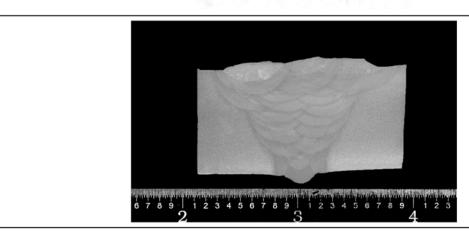
Pass:
AWS Classification:
Manufacture:
Electrode Diameter:
Current/Polarity:
Current Range:
Voltage Range:
Travel Speed Pange in

Hot Pass	Fill	Cap	
E8010-P1	E8010-P1	E8010-P1	
Lincoln	Lincoln	Lincoln	
5/32"	5/32"	5/32"	
DCEP	DCEP	DCEP	
132 - 136	121 - 152	105 – 116	
25 – 27	25 – 29	27 - 31	
8.2 - 12.6	2.4 - 6.7	4.6 - 14.5	11
	E8010-P1 Lincoln 5/32" DCEP 132 – 136 25 – 27	E8010-P1 E8010-P1 Lincoln Lincoln 5/32" 5/32" DCEP DCEP 132 - 136 121 - 152 25 - 27 25 - 29	E8010-P1 E8010-P1 E8010-P1 Lincoln Lincoln Lincoln 5/32" 5/32" 5/32" DCEP DCEP DCEP 132 - 136 121 - 152 105 - 116 25 - 27 25 - 29 27 - 31

Travel Speed Range, ipm:

Comments:

FIGURE 1 – BEAD SEQUENCE



Test Number:	4-4					Page:	2	of	2
		7	TENSILE STR	ENGTH TEST					
Coupon Number:	W15 T1		W15	T2					
Coupon Width:		21 inch	1.087						
Coupon Thickness:		7 inch	0.879						
Coupon Area:	-	6 inch2	0.955						
Maximum Load: Tensile Strength:		800 lb	83,80						
Fracture Location:		100 psi Metal	87,70 Base I			-			
racture Location.	Dase	. IVICtal	Dase	yietai					
				TEST					
Coupon Number:	W15 SB1	W15 SB2	W15 SB3	W15 SB4					
Type:	Side	Side	Side	Side					
Results:	Pass (1)	Pass (1)	Pass (1)	Pass					
			NICK-BR	EAK TEST					
Coupon Number:	W15	NB1	W15			- 1			
Results:	Pa	ass	Pass	(1)					
Coupon Number:		C	HARPY TOU	GHNESS TES	I				
Depth:									
Width:									
Notch Location:		10	Y						
Test Temperature:									
Impact Energy:									
% Shear:									
Lateral Expansion:									
Comments: (1)	ndications	were presen	t but were w	ithin the acce	ptable limits o	of API 11	.04		
All the second									
				TESTS					
Test Type:									
Results:									
We certify that the	statement	s in this rec	ord are corre	ct and that th	e test welds	were pro	epared,	welded	, and
				ments of the					
Date: 10/16/2014	4								
Test Conducted By:	Con VAIC	· V: - F	n Str						



API 1104 COUPON TEST REPORT

P	ag	e:	1	0	T 2

Test Number: 5-1	Date: 10/16/2014
Location: Kiefner, Worthington, Ohio	
Welder: Jeff Ellis, Piedmont Natural Gas	
Welding Process: Manual SMAW	
Pine Material: 12 75" diameter 0 375" thick A	PLSL X65 to 12 75" diameter 0 375" thick APLSL X65

Position: 5G, Fixed Welding Direction: Downhill

Filler Metal: E6010 root, E8010-P1 remainder

Joint Design: 3/32" land, 3/32" gap, 70 degree bevel butt joint

Time Between Passes: 5 hours, 15 minutes between root and hot pass

Preheat Temperature: Ambient (64°F) Interpass Temperature: NR

Post-weld Heat Treatment: None
Line-up Clamps: None used

Comments:

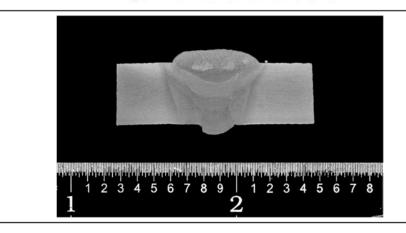
WELDING PARAMETERS

Pass:
AWS Classification:
Manufacture:
Electrode Diameter:
Current/Polarity:
Current Range:
Voltage Range:

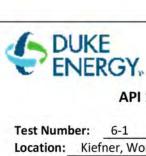
Root	Hot Pass	Fills	Cap		
E6010	E8010-P1	E8010-P1	E8010-P1		
Lincoln	Lincoln	Lincoln	Lincoln		
1/8"	5/32"	5/32"	5/32"		
DCEP	DCEP	DCEP	DCEP		
106 - 113	141 – 145	131 – 137	114 – 119	1	
24 – 26	25 – 27	26 – 28	25 – 28		
7.0 - 11.2	8.0 - 11.4	5.7 - 8.5	4.3 - 6.0	1.11	

Travel Speed Range, ipm: Comments:

FIGURE 1 - BEAD SEQUENCE



Test Number:	5-1					Page:	2	of	2
			TENSILE STE	RENGTH TE	ST				
Coupon Number:	W:	16 T1	W1	6 T2					
Coupon Width:	1.02	9 inch	1.073	3 inch					
Coupon Thickness:	0.37	0 inch	0.377	7 inch					
Coupon Area:	0.38	1 inch ²	0.405	inch ²					
Maximum Load:	32,	841 lb	33,0	19 lb					
Tensile Strength:	86,1	196 psi	81,53	30 psi					
Fracture Location:		Metal		Metal					
			RENI	TEST					
Coupon Number:	W16 FB1	W16 FB2	W16 RB1	W16 RB2				1	
Гуре:	Face	Face	Root	Root				7	
Results:	Pass	Pass	Pass (1)	Pass					
Coupon Number:	14/16	NB1	U.S	EAK TEST					
Results:		s (1)	W16 NB2 Pass (1)						_
Coupon Number: Depth: Width: Notch Location: Test Temperature:									
mpact Energy:									
% Shear:									
Lateral Expansion:									
Comments: (1)	ndications	were presen	t but were v	vithin the ac	ceptable li	mits of API 1	104		
			ОТНЕ	R TESTS					
Test Type:				107774					
3 Print 1 Print 1 Print 1									
		e in this roc	ord are corre					velded,	and
Results: We certify that the			h the require	ements of th	ne 21st Eai	tion of API 1	104.		
Results: We certify that the	sted in acco		h the require	ements of th	ne 21st Eai	tion of API 1	104.		



API 1104 COUPON TEST REPORT

1501

Cap

E8010-P1

Lincoln

5/32"

DCEP

Page:

1 of 2

Test Number: 6-1 Date: 10/16/2014

Location: Kiefner, Worthington, Ohio **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: NR

Post-weld Heat Treatment: None

Line-up Clamps: None used

Comments:

WELDING PARAMETERS

Pass:

AWS Classification: Manufacture: Electrode Diameter: Current/Polarity:

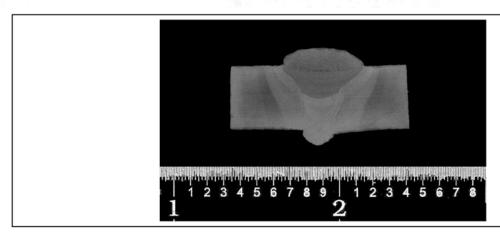
Current Range: Voltage Range:

Comments:

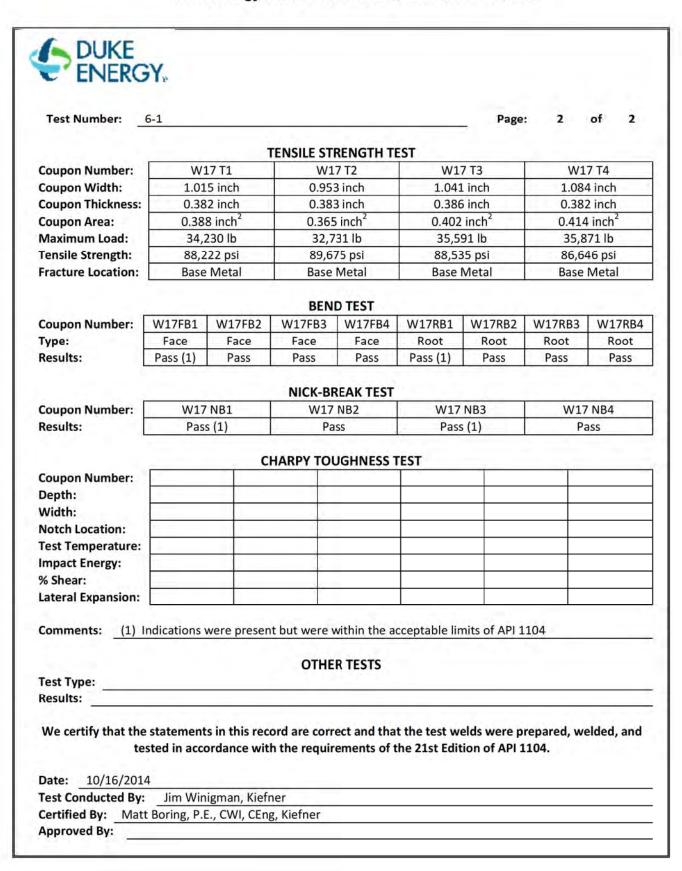
Travel Speed Range, ipm:

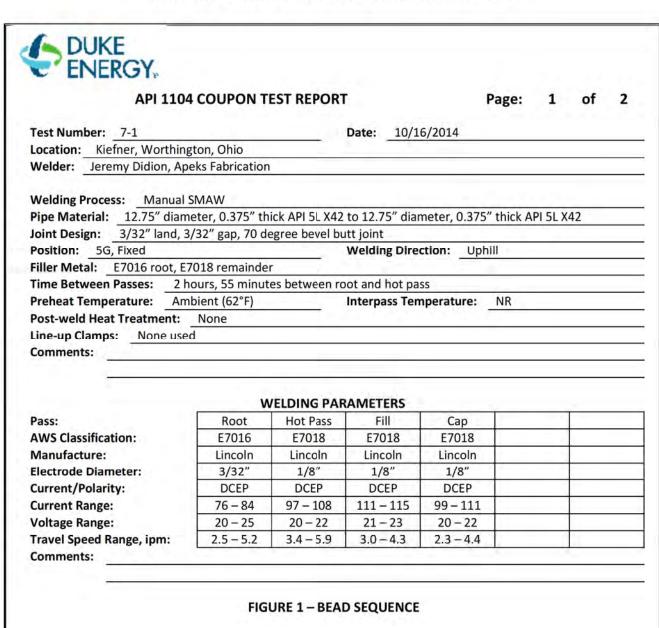
Root	Hot Pass	Fills
E6010	E8010-P1	E8010-P1
Lincoln	Lincoln	Lincoln
1/8"	5/32"	5/32"
DCEP	DCEP	DCEP
102 – 114	139 – 141	126 - 142
22 – 25	26-27	25 - 28

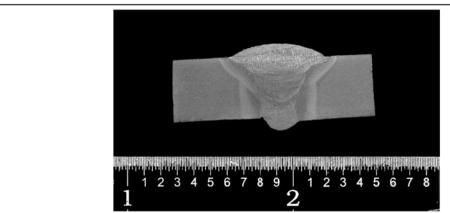
FIGURE 1 – BEAD SEQUENCE



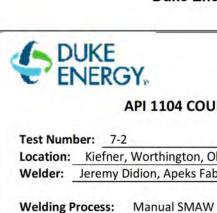
6.1 - 11.3







Test Number:	7-1					Page:	2	of	2
			TENSILE STR	RENGTH TES	Ť				
Coupon Number:	W:	18 T1	W18	8 T2					
Coupon Width:	1.02	28 inch	1.016	inch					
Coupon Thickness:	0.37	4 inch	0.381	inch					
Coupon Area:	0.38	4 inch ²	0.387	inch ²					
Maximum Load:	29,	486 lb	29,73	33 lb					
Tensile Strength:	76,7	787 psi	76,82	29 psi					
Fracture Location:	Base	Metal	Base I	Metal					
			BEND	TEST					
Coupon Number:	W18 FB1	W18 FB2	W18 RB1	W18 RB2					
Гуре:	Face	Face	Root	Root					
Results:	Pass	Pass	Pass	Pass					
			NICK-RD	EAK TEST					
Coupon Number:	W/18	NB1	W18						
Results:		s (1)	Pass						
Coupon Number: Depth: Width: Notch Location: Test Temperature: mpact Energy:									
% Shear:									
Lateral Expansion:		- 1							
Comments: (1)	ndications	were presen	t but were w	vithin the acc	eptable lin	nits of API 11	04		
			OTHER	RTESTS					
Test Type:				- A.Y.					
0 10									
Results:		s in this rec	ord are corre					velded,	and
We certify that the			h the require	ements of the	e 21st Edit	ion of API 11	04.		
We certify that the	sted in acco		h the require	ements of the	e 21st Edit	ion of API 11	04.		



API 110	4 COLIPO	N TEST I	REPORT

Date: 10/16/2014

Page: 1 of

2

	W. f W W Ol.:
Location:	Kiefner, Worthington, Ohio

Welder: Jeremy Didion, Apeks 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 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

D	2	c	c	
	a	3	3	

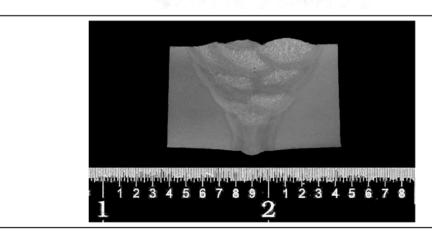
AWS Classification: Manufacture: **Electrode Diameter:** Current/Polarity: **Current Range:** Voltage Range:

Travel Speed Range, ipm:

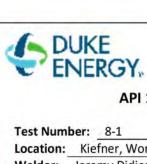
Comments:

Root	Hot Pass	Fill	Cap	
E7016	E7018	E7018	E7018	
Lincoln	Lincoln	Lincoln	Lincoln	
3/32"	1/8"	1/8"	1/8"	
DCEP	DCEP	DCEP	DCEP	
79 – 82	104 - 110	110 - 119	109 - 119	
21 – 24	22 – 23	21-24	21 – 23	
2.6 - 4.3	2.9 - 4.8	2.1 - 4.8	2.3 - 4.9	= 11

FIGURE 1 – BEAD SEQUENCE



Test Number:	7-2					Page	. 2	of	2
			ENSILE STR	RENGTH TE	ST				
Coupon Number:	W	19 T1	W19						
Coupon Width:		1 inch	0.980						
Coupon Thickness:		3 inch	0.866						
Coupon Area:		5 inch ²	0.849						
Maximum Load:		240 lb	67,47						
Tensile Strength:		00 psi	79,50						
racture Location:		Metal	Base I	7.011					
			BENE	TEST					
Coupon Number:	W19 SB1	W19 SB2	W19 SB3	W19 SB4					
Гуре:	Face	Face	Root	Root					
Results:	Pass	Pass (1)	Pass	Pass			11		
			2.2.2.2						
Coupon Number:	W/10	NB1		EAK TEST					
Results:		ISS	W19 Pass						
Depth: Width: Notch Location: Fest Temperature:									
mpact Energy:									
% Shear: .ateral Expansion:									
Comments: (1) Ir	ndications	were presen	t but were w	vithin the ac	ceptable l	mits of API 1	104		
Test Type:				RTESTS					
We certify that the tes						velds were point of API 1		welded	, and
Date: 10/16/2014									



API 1104 COUPON TEST REPORT

Page: 1 of

2

Test Number: 8-1	Date: 10/16/2014
Location: Kiefner, Worthington, Ohio	-0.000000000000000000000000000000000000
Welder: Jeremy Didion, Apeks Fabrication	
	5L X60 to 12.75" diameter, 0.375" thick API 5L X60
Joint Design: 3/32" land, 3/32" gap, 70 degree b	Welding Direction: Uphill
Filler Metal: E7016 root, E7018 remainder	Weiding Direction.
Time Between Passes: 1 hour, 22 minutes betw	reen root and hot pass
Preheat Temperature: Ambient (64°F)	Interpass Temperature: NR
Post-weld Heat Treatment: None	
Line-up Clamps: None used	
Comments:	

WELDING PARAMETERS

Pass:	-					
	ν	а	c	c	۰	
		a	Э	3	٠	

AWS Classification: Manufacture: **Electrode Diameter:** Current/Polarity: **Current Range:** Voltage Range:

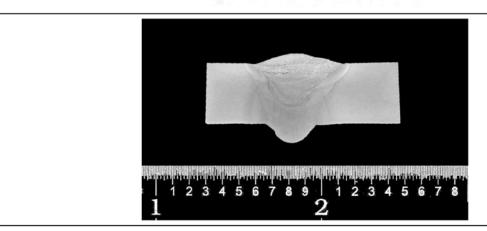
Comments:

Travel Speed Range, ipm:

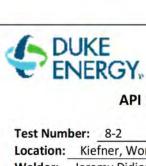
Root	Hot Pass	Fill	Cap
E7016	E7018	E7018	E7018
Lincoln	Lincoln	Lincoln	Lincoln
3/32"	1/8"	1/8"	1/8"
DCEP	DCEP	DCEP	DCEP
78 – 89	96 – 102	106 – 109	100 - 118
20 – 28	20 – 22	20 - 23	20 - 24

2.5 - 6.0 | 3.7 - 5.3 | 3.2 - 4.5 | 2.6 - 6.5

FIGURE 1 – BEAD SEQUENCE



Test Number:	8-1					Page	: 2	of	2
			TENSILE STI	RENGTH TES	T				
Coupon Number:	W:	20 T1	1	0 T2					
Coupon Width:	1.06	7 inch	1.046	5 inch					
Coupon Thickness:	0.36	9 inch	0.370	0 inch					
Coupon Area:	0.39	4 inch ²	0.387	'inch ²					
Maximum Load:	34,	143 lb	33,6	09 lb					
Tensile Strength:	86,6	556 psi	86,84	45 psi					
Fracture Location:	Base	Metal	Base	Metal		- 1	11		_
			BENI	D TEST					
Coupon Number:	W20 FB1	W20 FB2	W20 RB1	W20 RB2			T		
Type:	Face	Face	Root	Root					
Results:	Pass	Pass (1)	Pass	Pass (1)				1	_
Coupon Number:	\A/20	NB1	W20	NR2					_
Results:		s (1)	Pass						_
Depth: Width:									_ _
									_
Test Temperature:									_
Test Temperature: Impact Energy:									_
Test Temperature: Impact Energy: % Shear:									_
Test Temperature: Impact Energy: % Shear: Lateral Expansion:	ndications	were presen		within the acc	eptable lin	nits of API 1	104		
Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: (1)			OTHE	R TESTS					
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:(1) Test Type: Results:			OTHE	R TESTS					
Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:(1) Test Type: Results:	statement	s in this reco	OTHE	R TESTS	he test we	elds were p	repared, v	A 300 1	
Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:(1) Test Type: Results:	statement sted in acco	s in this reco	OTHE	R TESTS	he test we	elds were p	repared, v	A 300 1	



API 1104 COUPON TEST REPORT

Date: 12/4/2014

Page: 1 of

2

Location: Kiefner, Worthington, Ohio

Welder: Jeremy Didion, Apeks Fabrication

Welding Process: Manual SMAW

Pipe Material: 10.75" diameter, 0.875" thick API 5L X60 to 10.75" diameter, 0.875" thick API 5L X60

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: 8 hours, 3 minutes between root and hot pass

Preheat Temperature: Ambient (43°F) Interpass Temperature: NR

Post-weld Heat Treatment: None

Line-up Clamps: None used

Comments:

WELDING PARAMETERS

P	a	S	S	:	

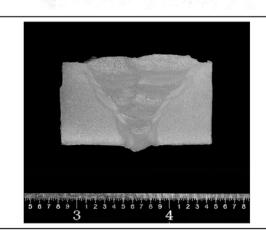
AWS Classification: Manufacture: Electrode Diameter: Current/Polarity: **Current Range:**

Voltage Range:

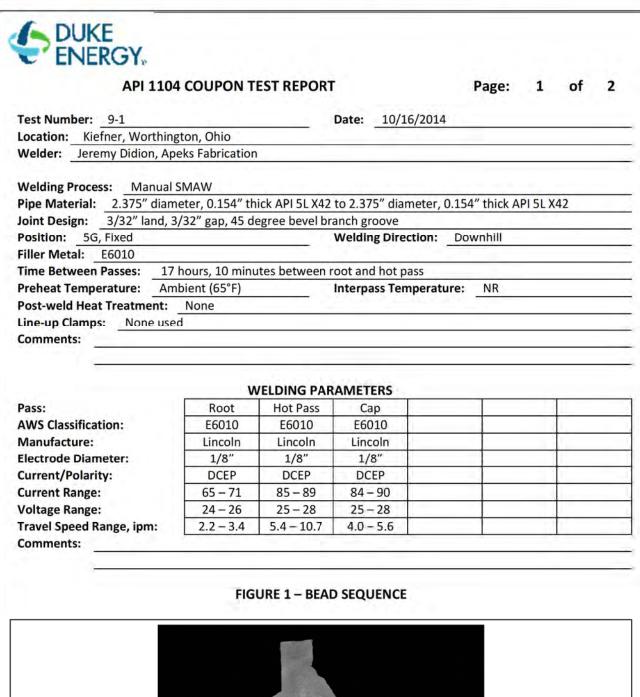
Travel Speed Range, ipm: Comments:

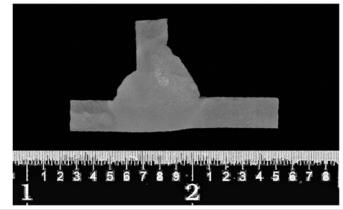
Root	Hot Pass	Fill	Cap	
E7016	E7018	E7018	E7018	
Lincoln	Lincoln	Lincoln	Lincoln	
3/32"	1/8"	1/8"	1/8"	
DCEP	DCEP	DCEP	DCEP	
68 – 75	101 - 108	120 - 137	120 - 130	1
20 - 23	20 – 22	20 - 23	20-22	
2.7 - 4.3	2.6 - 4.4	2.0 - 5.0	2.0 - 4.1	

FIGURE 1 – BEAD SEQUENCE

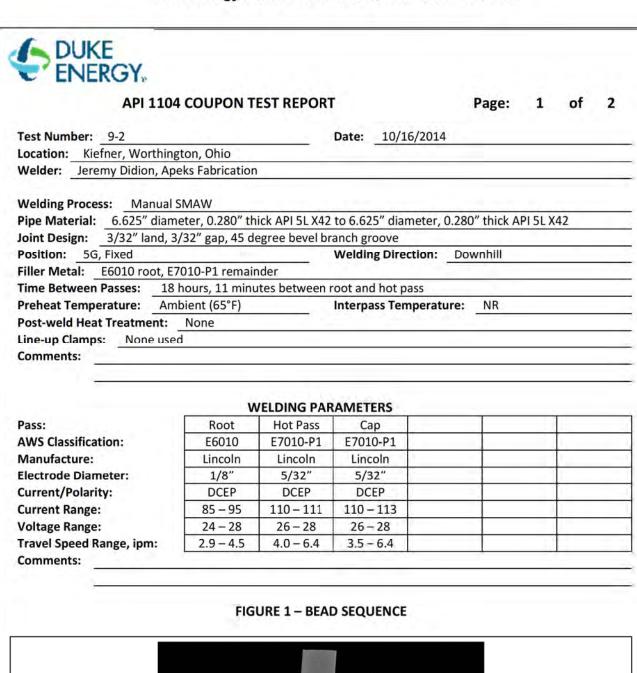


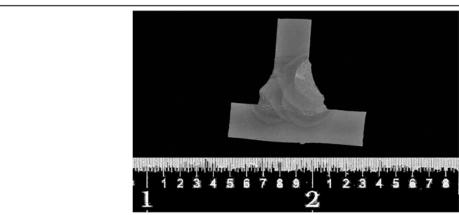
Test Number:	8-2					Page	: 2	of	2
			TENSILE STR	RENGTH TE	ST				
Coupon Number:	W	21 T1	W21	1 T2					
Coupon Width:	1.12	20 inch	1.041	inch					
Coupon Thickness:	0.88	36 inch	0.887	inch					
Coupon Area:	0.99	2 inch ²	0.923	inch²					
Maximum Load:		487 lb	77,83						
Tensile Strength:		192 psi	84,30						
Fracture Location:		Metal	Base I				11		
			BENE	TEST					
Coupon Number:	W21 SB1	W21 SB2	W21 SB3	W21 SB4					
Type:	Side	Side	Side	Side					
Results:	Pass (1)	Pass	Pass (1)	Pass			11		
4			7.5						
	14124	1104		EAK TEST					
Coupon Number: Results:		L NB1 ass	W21						
Coupon Number:		C	HARPY TOU	IGHNESS T	EST				
Depth:									
Width:									
Notch Location:									
Test Temperature:									
Impact Energy:			-						
% Shear: Lateral Expansion:									
f 1	. Description	.0000.000.00	V 4060	(40.4°E	San de		101		
Comments: (1)	ndications	were presen	it but were w	ithin the ac	ссертавіе і	imits of API	.104		
Test Type:				RTESTS					
Results:									
We certify that the			ord are corre					welded	, and
Date: 12/4/2014									





Test Number: 9-1			Page:	2 of 2	
		TENSILE STRENGTH TI	EST		
Coupon Number:					
Coupon Width:					
Coupon Thickness:					
Coupon Area:					
Maximum Load:					
Tensile Strength:					
Fracture Location:					
		BEND TEST			
Coupon Number:					
Гуре:					
Results:					
		NICK-BREAK TEST			
Coupon Number:	W22 NB1			W22 NB4	
Results:	Pass	Pass	Pass	Pass (1)	
Coupon Number:		CHARPY TOUGHNESS T			
Width:					
Notch Location:					
Test Temperature:					
mpact Energy:	_				
% Shear: Lateral Expansion:					
Lateral Expansion.					
Comments: (1) Indi	cations were pres	ent but were within the a	cceptable limits of API 11	04	
		OTHER TESTS			
Test Type:		OTTLER TESTS			
Results:					
The state of the s		ecord are correct and tha vith the requirements of t			
teste					
Date: 10/16/2014					





Test Number: 9-2			Page:	2 of 2	
		TENSILE STRENGTH T	EST		
Coupon Number:					
Coupon Width:			h-1		
Coupon Thickness:					
Coupon Area:					
Maximum Load:					
Tensile Strength:					
Fracture Location:		1			
		BEND TEST			
Coupon Number:					
Type:					
Results:					
		NICK-BREAK TEST			
Coupon Number:	W23 NB1	W23 NB2	W23 NB3	W23 NB4	
Results:	Pass	Pass	Pass	Pass	
Coupon Number:		CHARPY TOUGHNESS	TEST		
Width:					
Notch Location:					
Test Temperature:					
Impact Energy:		===1()			
% Shear:					
Lateral Expansion:		Ti			
Comments:					
		OTHER TESTS			
Test Type:					
Test Type: Results:			t the test welds were pre	epared, welded, and	
We certify that the sta			the 21st Edition of API 11	04.	
We certify that the sta		th the requirements of t			



API 1104 COUPON TEST	REPORT Page: 1 of 2
Test Number: _ 10-1	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 Al Joint Design: 3/32" land, 3/32" gap, 45 degree	PI 5L X60 to 12.75" diameter, 0.375" thick API 5L X60 be bevel branch groove
Position: 5G, Fixed	Welding Direction: Downhill
Filler Metal: E6010 root, E7010-P1 remainder	The state of the s
Time Between Passes: 44 hours, 39 minutes b	petween root and hot pass
Preheat Temperature: Ambient (52°F)	Interpass Temperature: NR
Post-weld Heat Treatment: None	
Line-up Clamps: None used	
Comments:	

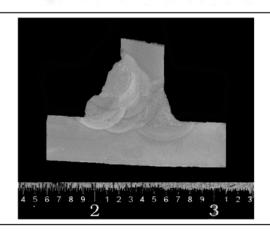
WELDING PARAMETERS

Pass:
AWS Classification:
Manufacture:
Electrode Diameter:
Current/Polarity:
Current Range:
Voltage Range:
Travel Speed Range, in

Root	Hot Pass	Fill	Cap	
E6010	E7010-P1	E7010-P1	E7010-P1	
Lincoln	Lincoln	Lincoln	Lincoln	
1/8"	5/32"	5/32"	5/32"	
DCEP	DCEP	DCEP	DCEP	
83 - 106	113 - 120	110 - 118	100 - 115	
25 – 33	25 – 28	25 – 29	26-30	
3.2 - 5.5	3.4 - 5.5	3.7 - 6.8	3.2 - 7.0	

Comments:

FIGURE 1 – BEAD SEQUENCE



Test Number: 10-	1		Page:	2 of 2	
		TENSILE STRENGTH T	EST		
Coupon Number:					
Coupon Width:			h-1	1 -	
Coupon Thickness:					
Coupon Area: Maximum Load:					
Tensile Strength:					
Fracture Location:					
-		DENID TEST			
Coupon Number:		BEND TEST			
Гуре:					
Results:					
_		Tres desire			
	MOANDA	NICK-BREAK TEST	I WAANDA I	W24 NB4	
Coupon Number:	W24 NB1 Pass (1)	W24 NB2 Pass	W24 NB3 Pass (1)	Pass	
results.	1 433 (1)	1 033	1 833 (1)	1 033	
		CHARPY TOUGHNESS	TEST	T y	
Coupon Number:			710.2		
Depth:					
Width:					
Test Temperature:		+			
mpact Energy:					
% Shear:					
Lateral Expansion:		T			
Comments: (1) Indi	cations were prese	ent but were within the a	cceptable limits of API 11	104	
<u> </u>	р				
ran Tomas		OTHER TESTS			
Nesuits.					
We certify that the sta	atements in this re	cord are correct and tha	t the test welds were pr	epared, welded, and	
teste	d in accordance wi	th the requirements of t	the 21st Edition of API 1	104.	
Date: 10/16/2014					



API 1104 COUPON TEST REP	ORT Page: 1	of 2
Test Number: 10-3	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 Joint Design: 3/32" land, 1/16" gap, 45 degree bevo)
Position: 5G, Fixed	Welding Direction: Downhill	
Filler Metal: E6010 root, E8010-P1 remainder	· · · · · · · · · · · · · · · · · · ·	
Time Between Passes: 20 hours, 18 minutes between	een root and hot pass	
Preheat Temperature: Ambient (74°F)	Interpass Temperature: NR	
Post-weld Heat Treatment: None		
Line-up Clamps: None used		
Comments:		

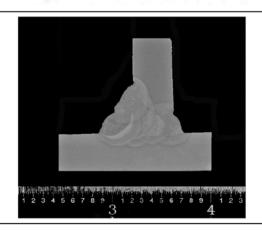
WELDING PARAMETERS

Pass:
AWS Classification:
Manufacture:
Electrode Diameter:
Current/Polarity:
Current Range:
Voltage Range:
Travel Speed Range, ip

Root	Hot Pass	Fill	Cap	
E6010	E8010-P1	E8010-P1	E8010-P1	
Lincoln	Lincoln	Lincoln	Lincoln	
1/8"	5/32"	5/32"	5/32"	
DCEP	DCEP	DCEP	DCEP	
75 – 98	115 – 123	117 - 133	116 – 122	
23 – 30	24 – 27	23 – 27	25 – 28	
3.2 - 5.5	3.4 - 5.6	3.8 - 9.3	3.3 - 6.2	

Comments:

FIGURE 1 - BEAD SEQUENCE



Coupon Number: Coupon Width: Coupon Thickness: Coupon Area: Maximum Load: Tensile Strength:		TENSILE STRENGTH T	EST		
Coupon Width: Coupon Thickness: Coupon Area: Maximum Load:					
Coupon Thickness: Coupon Area: Maximum Load:					
Coupon Area: Maximum Load:			1-1		
Maximum Load:					
rensile Strength:		4			
For skins I a saki su.					
Fracture Location:					
		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:		HARPY TOUGHNESS			
Width:					
Notch Location:					
Test Temperature:					
% Shear:					
Lateral Expansion:					
Comments: (1) Indicat	cions were preser	nt but were within the a	cceptable limits of API 11	04	
		OTHER TESTS			
Test Type: Results:					
Results:					
We certify that the state tested in			t the test welds were pre the 21st Edition of API 11		
Date: 10/16/2014					

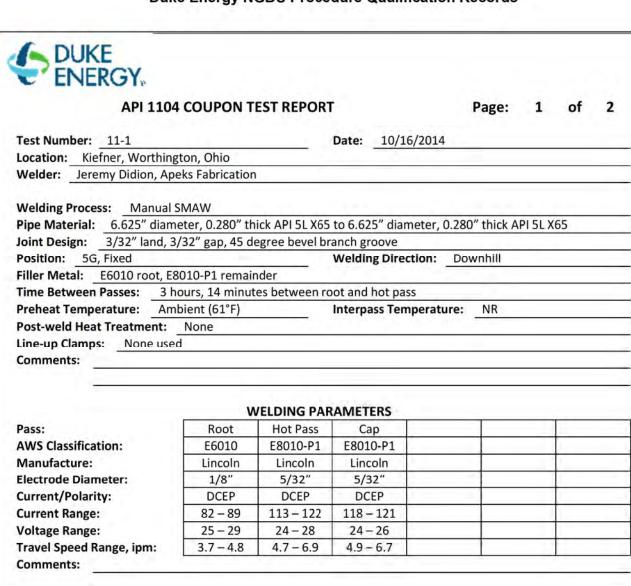
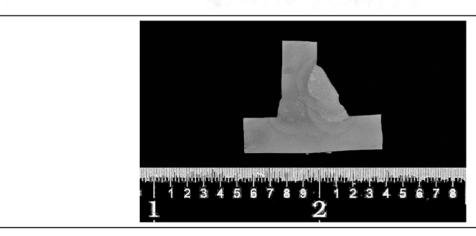
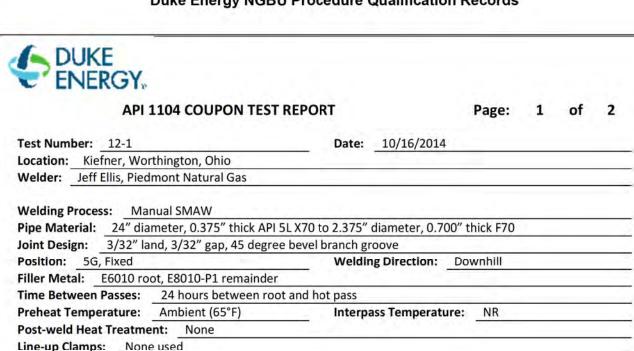


FIGURE 1 – BEAD SEQUENCE



Test Number: 11-	1		Page:	2 of 2
		TENSILE STRENGTH TE	EST	
Coupon Number:				
Coupon Width:			in a land	
Coupon Thickness:				
Coupon Area:				
Maximum Load: Tensile Strength:		4		
Fracture Location:				
rracture Location.				
		BEND TEST		
Coupon Number:				
Туре:				
Results:				
		NICK-BREAK TEST		
Coupon Number:	W28 NB1 W28 NB2		W28 NB3 W28 NB4	
Results:	Pass	Pass (1)	Pass	Pass
		CHARPY TOUGHNESS 1	TEST	
Coupon Number:		START TOOGTHEESS T		
Depth:				
Width:		11		
Notch Location:				
Test Temperature:				
mpact Energy:				
% Shear:	k			
Lateral Expansion:		11		
Comments: (1) Indi	cations were prese	ent but were within the a	cceptable limits of API 11	04
<u>(2)</u>	cations were prese	The back were within the a		-
		OTHER TESTS		
Test Type:				
Results:				
	atements in this re	cord are correct and tha	t the test welds were pre	epared, welded, and
			he 21st Edition of ADI 11	04
We certify that the sta	d in accordance wi	th the requirements of t	the 21st Edition of API 11	04.
We certify that the sta	d in accordance wi	th the requirements of t	the 21st Edition of API 11	



WELDING PARAMETERS

Pass:
AWS Classification:
Manufacture:
Electrode Diameter:
Current/Polarity:
Current Range:
Voltage Range:
Travel Speed Range in

Comments:

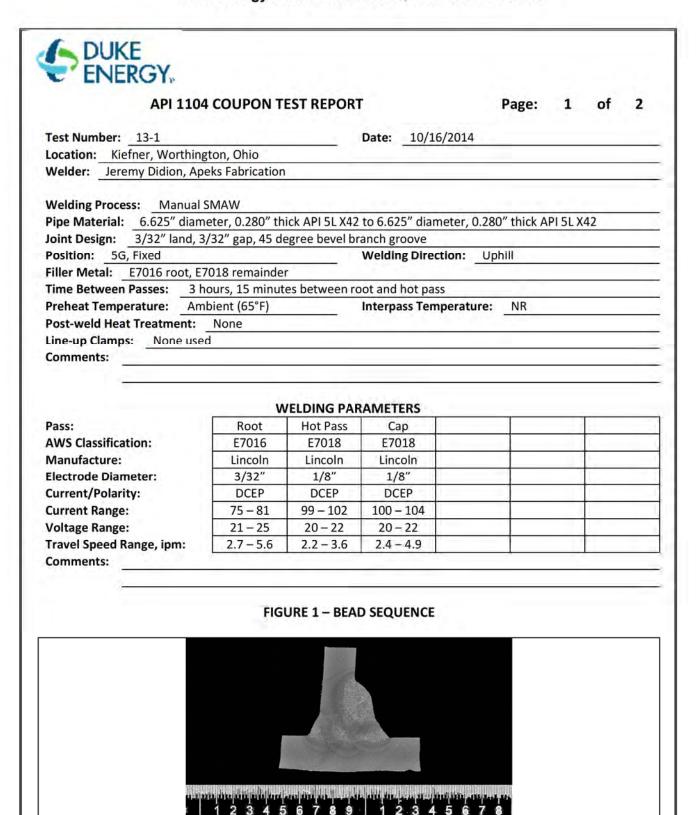
Root	Hot Pass	Fill	Cap	1111	
E6010	E8010-P1	E8010-P1	E8010-P1		
Lincoln	Lincoln	Lincoln	Lincoln		
1/8"	5/32"	5/32"	5/32"		
DCEP	DCEP	DCEP	DCEP		
88 – 106	106 - 109	117 - 145	114 - 124		
23 – 27	28 – 29	25 – 28	24-27		
5.1 - 14.9	8.2 - 9.6	6.6 - 10.6	5.3 - 6.9		

Travel Speed Range, ipm: Comments:

FIGURE 1 – BEAD SEQUENCE



Test Number: 12-	1		F	Page: 2 of 2		
		TENSILE STRENGT	H TEST			
Coupon Number: Coupon Width: Coupon Thickness: Coupon Area: Maximum Load: Tensile Strength: Fracture Location:						
		BEND TEST				
Coupon Number: Type: Results:		DEND TEST				
Coupon Number:	NICK-BREAK TE		W29 NB3			
Results:	W29 NB1 Pass	W29 NB2 Pass	Pass	W29 NB4 Pass		
		CHARPY TOUGHNE	SS TEST			
Coupon Number: Depth: Width: Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:						
Comments:						
		OTHER TEST				
Results:	atomonts in this	cord are correct	that the test wolds	ere prepared, welded, and		
			of the 21st Edition of A			
Date: 10/16/2014						



Test Number: 13-	1		Page:	2 of 2	
		TENSILE STRENGTH T	EST		
Coupon Number:			1		
Coupon Width:			land had been been been been been been been bee		
Coupon Thickness:					
Coupon Area:		-			
Maximum Load:					
Tensile Strength: Fracture Location:					
Fracture Location:					
		BEND TEST			
Coupon Number:					
Туре:					
Results:					
		NICK-BREAK TEST			
Coupon Number:	W30 NB1	W30 NB2	W30 NB3	W30 NB4 Pass	
Results:	Pass	Pass	Pass		
Coupon Number: Depth: Width:					
Notch Location:					
Notch Location: Test Temperature:			+ + + + + + + + + + + + + + + + + + + +		
Notch Location: Test Temperature: Impact Energy:					
Notch Location: Test Temperature: Impact Energy: % Shear:					
Notch Location: Fest Temperature: Impact Energy: % Shear:					
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:					
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion:		OTHER TESTS			
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:					
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments:		OTHER TESTS			
Notch Location: Test Temperature: Impact Energy: % Shear: Lateral Expansion: Comments: Test Type: Results: We certify that the sta	atements in this		t the test welds were pre	pared, welded, and	



Duke Energy NGBU Procedure Qualification Records

Welding Procedure

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Effective Date: 05/01/2019

1. Signature

Reviewed and approved by:

Randy L Bost
Randy L Bost (Apr 30, 2019)



Duke Energy NGBU Procedure Qualification Records

Welding Procedure

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Effective Date: 05/01/2019
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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

ID#:		Vendor Company:				
Individual:	DO	B:	Resource Ce	nter:		
	Verification	of Train	ing			
This section MUST be completed if:	 This is an Initial Evaluation, or, The individual's qualification has The individual has lost their qual There has been a significant cha 	ification du	e to poor performance	or incident, or		
TrainingMethod:	CBT (Computer Based TrainILT (Instructor Lead Training)					
I acknowledge that th	is training was verified and in accordance	with the lear	ning objectives identified	for this Covered Task.		
Evaluator/Instructor***PL	EASE PRINT NAME		ID Number	Date		
	Pre-Evaluat	ion Test	ing			
	□ Written valuation has been successfully comp dividual listed above has FAILED the	oleted by s				
Test Administrator ***PLE	ASE PRINT NAME		ID Number	Date		
	Performance	Evalua	tion			
Evaluation Reason:	InitialSubsequentField Evaluation		Incident Simulated Evaluation	□ PoorPerformance		
Qualified: ☐ Yes	Individual listed above has performed the evaluation steps in accordance to NGBU Policies and Procedures.					
Qualified: □ No	The individual listed above has FAILED to perform the evaluation steps in accordance to NGBU Policies and Procedures. Please attach completed Qualification Suspension Form and email to address below.					
Evaluator Signature ***PL	EASE PRINT & SIGN		ID Number	Date		
Individuals' Sianature ***!	DI EASE DRINT & SIGN		ID Number	Date		

Please sign and e-mail completed form and certifications to: OQPEF@duke-energy.com
Only LEGIBLE, 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 21st Edition SNT-TC-1A NDT Level II Subsequent Qualification Interval: 36 Months
Successful completion of Radiographic Testing Training and Certification.	0	_	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	0	0	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 		0	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 	0	0	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

WEL-PR-1010 Revision Number: 1

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Duke Energy NGBU Welding Procedure Specifications

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Who

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



API 1104 WELDI	NG PROCEDURE SPECIFI	ICATION P	age: 1 of 1
WPS Number: 10		Rev: 1 Da	te: 10/01/2018
PQR-Number: 1-1, 1-2,	1-3, 1-4		
Welding Process: Manual (Oxy-Acetylene Welding		
Pipe or Fitting Material: AF		t material	
		or Fitting Wall Thickness:	0.218 inch or less
oint Design: Figure 1 and			
Number of Beads: Figure 1	is not intended to show all bill thickness		
Technique Beads may be s	tringer or weave beads with	the maximum weave being	3 times the rod diameter
Position: All fixed		Welding Direction: Uphi	ll or Horizontal
Time Between Passes: 15	minutes between the root ar	nd 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-ST-1010.
	ne required		
Post-weld Heat Treatment:	None	Interpass Temperature:	N/A
ine-up Clamps: None requ	uired but if used should comp	: 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	
	be free from any detrimenta		
passes with pow			
	ald be allowed to air cool prio	or to inspection	
	Number 4 oxy-acetylene weld		should be based on wall
thickness	valliber 4 day acceptence were	ing tips are permitted and	stidula be basea on waii
tilickiless	CARTERIA		
	WELDING PAR	RAMETERS	
Pass:		All	
AWS Classification:		RG60 or RG65	
Rod Diameter:	3/32"	1/8"	5/32"
Velding Gas:	Oxygen/Acetylene	Oxygen/Acetylene	Oxygen/Acetylene
cetylene Flow Rate, CFH:	2 – 25	2 – 25	2 – 25
ias Pressure, psi:	3-10/3-7	3-10/3-7	3-10/3-7
lame Type:	Neutral	Neutral	Neutral
Travel Speed Range, ipm:	0.5 – 2.0	0.5 – 2.0	0.5 – 2.0
raver speed Kange, ipini	0.5 2.0	0.5 2.0	0.5 2.0
	FIGURE 1 – JOINT DESIGN	AND BEAD SEQUENCE	
+5'0'	Approximately 1/10"		
	1/32"- 1/16"	1 4	5
*	*	3	/ /
† }	' }	2	<i>₹</i>
↓ [<u> </u>	
Approximately 1/h*	1/10-11/12-		Approximately 1/8"
Standard "V" Bevel	Butt Joint		
approved (SMF).			Date:
Approved (SME):			Date:



	ELDING PROCEDURE SPECI		Page: 1 of 1
WPS Number: 20 POR-Number: 2-1.	22224	Rev: 1 Da	ate: 10/01/2018
PQR-Number: 2-1,	2-2, 2-3, 2-4		
Welding Process: Man	nual Oxy-Acetylene Welding		
	API 5L X52 or less or equivaler	nt material	
Pipe or Fitting Diameter:		4	
Pipe or Fitting Wall Thick	kness: 0.218 inch or less for ru expanded pipe end	un pipe with slightly larger d	liameter permitted for the
loint Design: Socket w			
wal	ure 1 is not intended to show all Il thickness and the fillet weld sizendard.		
Technique: Beads may	be stringer or weave beads with	the maximum weave being	g 3 times the rod diameter
Position: All fixed			ill or Horizontal
Time Between Passes:	15 minutes between the root a		그들은 사람이 되면 하는데 이번 시간에 되었다면 하는데 되었다면 다른데 다른데 되었다.
	the end of the day. If you can'	t start before the end of the	day, see WEL-ST-1010.
Preheat Temperature:	None required		
Post-weld Heat Treatme	TOTAL CONTRACTOR OF THE PROPERTY OF THE PROPER	Interpass Temperature:	
	required but if used should com		
	shall be free from any detriment	tal conditions and the shall l	be cleaned between passes
	or hand tools	55.5 to 55.5 to 5	
-	should be allowed to air cool pri 0 to Number 4 oxy-acetylene we		tin coloction chould be
		iding tips are permitted and	tip selection should be
hased on	wall thickness		
_ based on	wall thickness	toxcopeo.co	
based on	wall thickness WELDING PA		
Pass:		All	
Pass:	WELDING PA	All RG60 or RG65	
Pass: AWS Classification: Rod Diameter:	WELDING PA	All RG60 or RG65 1/8"	5/32"
Pass: AWS Classification: Rod Diameter: Welding Gas:	3/32" Oxygen/Acetylene	All RG60 or RG65 1/8" Oxygen/Acetylene	Oxygen/Acetylene
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI	3/32" Oxygen/Acetylene H: 2 – 25	All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25	Oxygen/Acetylene 2 – 25
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI 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
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI 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
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI 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	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI Gas Pressure, psi: Flame Type:	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
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI 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
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI 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 0.5 - 2.0	Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI Gas Pressure, psi: Flame Type:	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
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI Gas Pressure, psi: Flame Type: Travel Speed Range, ipm	3/32" Oxygen/Acetylene 1: 2-25 3-10/3-7 Neutral 0.5-2.0 FIGURE 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
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI 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 AND BEAD SEQUENCE	Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI Gas Pressure, psi: Flame Type: Travel Speed Range, ipm	3/32" Oxygen/Acetylene H: 2-25 3-10/3-7 Neutral 0.5-2.0 FIGURE 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
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI Gas Pressure, psi: Flame Type: Travel Speed Range, ipm	3/32" Oxygen/Acetylene H: 2-25 3-10/3-7 Neutral 0.5-2.0 FIGURE 1 – JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0 NAND BEAD SEQUENCE	Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI Gas Pressure, psi: Flame Type: Travel Speed Range, ipm	3/32" Oxygen/Acetylene H: 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 FIGURE 1 - JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0 NAND BEAD SEQUENCE	Oxygen/Acetylene 2-25 3-10/3-7 Neutral 0.5-2.0
Pass: AWS Classification: Rod Diameter: Welding Gas: Acetylene Flow Rate, CFI Gas Pressure, psi: Flame Type: Travel Speed Range, ipm	3/32" Oxygen/Acetylene H: 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0 FIGURE 1 - JOINT DESIGN	All RG60 or RG65 1/8" Oxygen/Acetylene 2 – 25 3 – 10 / 3 – 7 Neutral 0.5 – 2.0 NAND BEAD SEQUENCE	Oxygen/Acetylene 2 - 25 3 - 10 / 3 - 7 Neutral 0.5 - 2.0



API 1104 W WPS Number: 30	ELDING PROCED		ICATION Rev: 1	P Da	age: 1 te: 10/01/	of 1 /2018
PQR-Number: 3-1, 3-2, 3-3, 1-X42-179, 2-X42-154, 12-X42-219, 20-GRB-250						
Welding Process: Ma	WAM2 Icun					
Pipe or Fitting Material		s or equivalent	t material			
Pipe or Fitting Diamete			g Wall Thickn	ess: All		
Joint Design: Figure 1			and the second s	The state of the s	cedure Quali	fier.
	gure 1 is not intende					
	th wall thickness bu		the second of th			11.00
Technique: Beads ma	y be stringer or wea	ve beads with	the maximum	weave being	3 times the ro	od diameter
Position: All fixed			Welding Direc	tion: Down	hill or Horizo	ntal
ime Between Passes:	15 minutes between	en the root ar	nd second pass	. Remaining	passes should	start before
	the end of the day	y. If you can't	start before th	ne end of the	day, see WEL-	-ST-1010.
reheat 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
400 May 32 000	any suitable mean	S				
ost-weld Heat Treatm			Interpass Ter	_		
ine-up Clamps: Non						
	shall be free from a		al conditions a	nd the weld s	hall be cleane	d between
	power or hand tool					
	should be allowed			1		
Electrod	es with P1 designation	on are recomn	nended			
	V	VELDING PA	RAMETERS			
Pass:	All (inc	luding backwe	elding*)	All (inc	luding backwo	elding*)
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	19 – 32	20 – 32	20 – 32	20 – 32	20-32
ravel Speed Range, ipi		2 – 20	2 – 16	2 – 16	2 – 16	2 – 16
	*Backwelding a	allowed on 20" Of	D and larger only.			
	FIGURE 1 – JO	INT DESIGN	AND BEAD S	EQUENCE		
30'	Approximately	s face				
+5",-0"	Арргохінатегу	4/10				
	1/32	"- 1/16"	↑ [.	4	5	
T			+ <	3	\nearrow	<
T > \			; >	2	\mathcal{Z}	>↑
			_ ↓ _1	1	<u> </u>	
Approximately 1/8" —					Apı	proximately 1/8"
	/" Bevel Butt Joint					
Standard	. Dorei butt Joint					
pproved (SME):					Date:	



API 1104	WELDING PRO	CEDURE SPECII	FICATION	Page:	1	of	1
WPS Number:	40		Rev: 1	Date:	10/01/	2018	
PQR-Number:	4-1, 4-2, 4-3, 4-4,	12-X60-375, 12-X5	2-375, 16-X60-312				
Welding Process:	Manual SMAW						
Pipe or Fitting Mate	erial: Greater tha	an API 5L X42 to les	s than API 5L X65	or equivalent ma	aterial		
Pipe or Fitting Diam	neter: All	Pipe or Fitti	ng Wall Thickness	: 0.188 inch c	r greate	r	
Joint Design: Figu	re 1 and additiona	I butt groove desig	gns permitted by V	Velding Procedu	re Qualif	ier.	
Number of Beads:		tended to show all ss but a minimum	production to the second secon		of beads	will va	ry
Technique: Beads	may be stringer o	r weave beads with	the maximum we	eave being 3 time	es the ro	d diam	eter
Position: All fixed			Welding Direction	n: Downhill o	r Horizo	ntal	
Time Between Pass		between the root a he day. If you can'					
Preheat Temperatu		ed unless the temp wall thickness is 1 means					
Post-weld Heat Tre	atment: None		Interpass Tempe	erature: N/A			
Line-up Clamps:	None required but	if used should com	ply with the Duke	Energy NGBU W	elding S	tandar	d
Cleaning: The sur		rom any detriment					
Comments: The	weld should be allo	owed to air cool pri	or to inspection				
Elec	trodes with P1 desi	gnation are recom	mended				

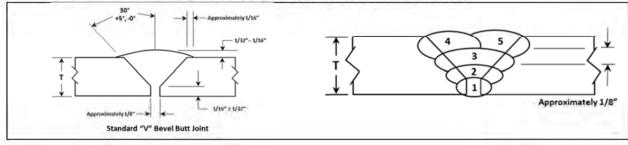
WELDING PARAMETERS

AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Travel Speed Range, ipm:

	Root or All		Remainder (including backwelding*) E7010 or E8010			
	E6010					
3/32"	1/8"	5/32"	1/8"	5/32"	3/16"	
DCEP	DCEP	DCEP	DCEP	DCEP	DCEP	
50 - 70	65 – 130	100 – 165	65 – 140	90 – 165	130 - 210	
20 – 32	20 – 32	20 – 32	18 – 32	20 – 32	20 - 32	
2-16	2 – 20	2-16	2-20	2 - 16	2-16	

^{*}Backwelding allowed on 20" OD and larger only.

FIGURE 1 - JOINT DESIGN AND BEAD SEQUENCE



Approved (SME):	Date:
Approved (Dir. of Eng.):	Date:
2 N. S. 1 N. S. M. S.	



WPS Number: 50		URE SPECIF	Rev: 1	Da	age: 1 te: 10/01/	of 1 /2018
PQR-Number: 5-1, 16-X	55-375		,			
Welding Process: Manual S	MAW					
		uivalent mater	ial		X - 2 -	
Pipe or Fitting Diameter: A	11-	Pipe or Fittin	g Wall Thickne	ess: 0.188	inch to 0.75 ir	nch
oint Design: Figure 1 and a						
			pead sequence			will vary
			of 3 passes sho			al diamatan
Fechnique: Beads may be st	ringer or wea					
Position: All fixed Time Between Passes: 15	minutes between		Welding Direct and second pass			
			start before th		A Later Artist American Artists at	
			should be use		ady, see WLL	J. 1010.
Post-weld Heat Treatment:	None	OI 250 I	Interpass Ten		N/A	
ine-up Clamps: None requ		d should com		_		Standard
Cleaning: The surface shall						
passes with power		그 이 이 그 집을 때 때가 살다. 다는	2 107-100			
			or to inspection	n		
		WELDING PAI	DAMETEDS			
Pass:		Root	MAIVILILING	Remainder	(including ba	ckwelding*)
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 – 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
		allowed on 20" O				
	IGURE 1 – JO	DINT DESIGN	AND BEAD S	EQUENCE		
*5°,.0°		ately 1/16" 1/32"– 1/16"				1
1	11 1]	Ţ	4 3	~ /)—	<u></u>
<u> </u>	1/16"±		<u>↓</u> 1	1	<u> </u>	proximately 1/8"
Approximately 1/8" → ← Standard "V" Bevel	Butt Joint					
.,,	Butt Joint			2.0	Date:	



Approved (SME):

Approved (Dir. of Eng.):

WPS Number: 60			Rev: 1	Da	te: 10/01/	2018
PQR-Number: 6-1						
	1200					
Velding Process: Manual S						
	I 5L X70 or equ					
ipe or Fitting Diameter: A			ng Wall Thickne		inch to 0.75 in	
oint Design: Figure 1 and a						
with wal	ll thickness but	t a minimum o	bead sequence of 3 passes sho	uld be deposi	ted	
echnique: Beads may be st	tringer or wear	ve beads with				
osition: All fixed			Welding Direct			
			nd second pass		the state of the s	
the state of the s			start before th		day, see WEL-	ST-1010.
		ature of 250°F	should be use			
ost-weld Heat Treatment:	None		Interpass Ten	_	N/A	-14
ine-up Clamps: None requ						
Cleaning: The surface shall	be free from a	iny detrimenta	al conditions a	nd the weld sl	hall be cleane	d between
passes with power	er or hand tool	s		7.0.77	7. 7. 7. 7. 7. 7.	
	er or hand tool	s		1	7.70	
passes with power	er or hand tool	s		1		
passes with power	er or hand tool ld be allowed	s	or to inspection			
passes with power The weld should be passes:	er or hand tool ld be allowed	to air cool prio	or to inspection		(including ba	ckwelding*)
passes with power The weld should be passes. Pass: WS Classification:	er or hand tool Ild be allowed V	velDING PA Root E6010	or to inspection	Remainder	E8010-P1	
passes with power of the weld should be passes. The weld should be passes. Pass: WS Classification: Electrode Diameter:	er or hand tool ald be allowed to	to air cool prior VELDING PA Root E6010 1/8"	or to inspection	Remainder	E8010-P1 5/32"	ckwelding*)
passes with power The weld should be provided by the well shou	v 3/32" DCEP	VELDING PA Root E6010 1/8" DCEP	PAMETERS 5/32" DCEP	Remainder 1/8" DCEP	E8010-P1 5/32" DCEP	3/16" DCEP
passes with power Comments: The weld should Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	or or hand tool ald be allowed to V 3/32" DCEP 50 – 70	VELDING PA Root E6010 1/8" DCEP 65 – 125	S/32" DCEP 100 – 165	Remainder 1/8" DCEP 65 – 120	E8010-P1 5/32" DCEP 90 – 165	3/16" DCEP 130 – 210
passes with power of the weld should be asses: ass: aWS Classification: lectrode Diameter: current/Polarity: current Range: foltage Range:	3/32" DCEP 50 - 70 20 - 32	Root E6010 1/8" DCEP 65 – 125 20 – 32	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
passes with power of the weld should be asses: ass: aWS Classification: lectrode Diameter: current/Polarity: current Range: foltage 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 2 – 16	Remainder 1/8" DCEP 65 – 120	E8010-P1 5/32" DCEP 90 – 165	3/16" DCEP 130 – 210
passes with power The weld should be asses: WS Classification: Electrode Diameter: Eurrent/Polarity: Eurrent Range: Foliage Range: Fravel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a	NELDING PA Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" Of	5/32" DCEP 100 – 165 20 – 32 2 – 16 D and 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
passes with power The weld should be asses: WS Classification: Electrode Diameter: Eurrent/Polarity: Eurrent Range: Foliage Range: Fravel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a	NELDING PA Root E6010 1/8" DCEP 65 – 125 20 – 32 2 – 16 allowed on 20" Of	5/32" DCEP 100 – 165 20 – 32 2 – 16	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
passes with power Comments: The weld should Pass: 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" OI	5/32" DCEP 100 – 165 20 – 32 2 – 16 D and 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
passes with power Comments: The weld should Pass: 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" OI	5/32" DCEP 100 – 165 20 – 32 2 – 16 D and 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
passes with power comments: The weld should Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Fravel 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" OI	5/32" DCEP 100 – 165 20 – 32 2 – 16 D and 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
passes with power comments: The weld should Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Fravel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a	NELDING PA 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 D and larger only.	Remainder 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
passes with power comments: The weld should Pass: AWS Classification: Electrode Diameter: Current/Polarity: Current Range: Voltage Range: Fravel Speed Range, ipm:	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a	NELDING PA 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 D and larger only.	Remainder 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
passes with power omments: The weld should be assested. The weld should be assested by the weld should be assested. The weld should be assested by the well as the well	3/32" DCEP 50 - 70 20 - 32 2 - 16 *Backwelding a	NELDING PA 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 D and larger only.	Remainder 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
passes with power Comments: The weld should Pass: 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	NELDING PA 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 D and larger only.	Remainder 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

Date:

Date:



API 1104 WELDI	NG PROCED	URE SPECIFI	CATION	p	age: 1	of 1
WPS Number: 70	. J . NOCLD		Rev: 1		te: 10/01/	PG.
PQR-Number: 7-1, 7-2			7777 TA-7		20/02/	
Welding Process: Manual S	MAW					
Pipe or Fitting Material: AP		s or equivalent	material			
Pipe or Fitting Diameter: A			g Wall Thickne	ess: 0.188	inch or greate	r
oint Design: Figure 1 and a		The second secon				
		d to show all b				
with wa	ll thickness bu	t a minimum o	f 3 passes sho	uld be deposi	ted	
Technique: Beads may be s	tringer or wear					
Position: All fixed					ll or Horizonta	
		en the root ar				
		y. If you can't				
	the life who was a first than the same of	less the tempe				is 1.5 inch
or g Post-weld Heat Treatment:	None	nt shall be heat				
ine-up Clamps: None requ		d should comr	Interpass Ter			tandard
Cleaning: The surface shall						
passes with power			i conditions a	na the weld 3	nan be cleaner	u between
Comments: The weld shou			r to inspection	n		
		1 S S S S S S S S S S S S S S S S S S S				
2000		VELDING PAI	11 10 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 11 //		- (() +\
Pass: AWS Classification:		t Only 016	All (Root		cluding backw 018	relaing*)
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
/oltage 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	allowed on 20" Of	and larger only.			
	IGURE 1 – JO	DINT DESIGN	AND BEAD S	EQUENCE		
+5°, -0°	Approxima	1/32"- 1/16"	* [4	5	↓
	<u></u>	}	<u> </u>	3 2 1		proximately 1/8"
	1/16" ± 1	1/32"				
Approximately 1/8">						
Approximately 1/8" →	Butt Joint					
Approximately 1/8" → ← Standard "V" Beve	Butt Joint					
	Butt Joint			- 26	Date:	



WPS Number: 80	DING PROCED		Rev: 1		age: 1 te: 10/01/	of 1 2018
PQR-Number: 8-1, 8-	2				10/01/	
	la de la companya de					
Welding Process: Manu						
Pipe or Fitting Material:						
Pipe or Fitting Diameter:		400000000000000000000000000000000000000	g Wall Thickn	-	inch or greate	
loint Design: Figure 1 ar						
	e 1 is not intende wall thickness bu					will vary
Technique: Beads may b	e stringer or wea	ve beads with	the maximum	weave being	3 times the ro	d diameter
Position: All fixed	. T T T T T T		Welding Dire	ction: Uphi	ll or Horizonta	
	15 minutes betwe				A COLUMN TO THE REAL PROPERTY.	
_	he end of the da					
	None required un					is 1.5 inch
	or greater the join	it shall be heat				
Post-weld Heat Treatment		111111	The first of the first of the first	nperature: _		
Line-up Clamps: None re						
	all be free from a		al conditions a	nd the weld s	hall be cleane	d between
	ower or hand too		25 40 0000000000000000000000000000000000	77		
Comments: The weld sh	ould be allowed	to air cool pric	or to inspectio	n		
235		WELDING PAI			fy fra a to a second	1.11. 41
Pass:		Only	All (Roo		cluding backw	reiding*)
AWS Classification:		016	2/22//		018	2/40"
Electrode Diameter:	3/32"	1/8"	3/32"	1/8"	5/32"	3/16"
Current/Polarity:	DCEP	DCEP	DCEP	DCEP 00 160	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
		allowed on 20" OD				
	FIGURE 1 – JO	DINT DESIGN	AND BEAD S	EQUENCE		
+5°,-0°	→ ← Approximatel	y1/16"				
*						1
		2"- 1/16" -		4	5	,↓
\uparrow	\nearrow		† <	3	\mathcal{Z}	<_
7 \	/ \ \ \ \		i /	$\langle \rangle^2$	$\langle \mathcal{O} \rangle$? î
<u>↓</u> [-	<u>*</u>		Ann	roximately 1/8"
Approximately 1/8" —>		-			APP	roximately 1/6
Standard "V" B	evel Butt Joint					
	11111111111					
Approved (SME):					Date:	



API 1104 WELD WPS Number: 90	ING PROCED	URE SPECIF			age: 1 te: 10/01/	of 1
	F12-X42-219		Rev: 1		ie: _10/01/	2016
Welding Process: Manual	NZVV I					
Pipe or Fitting Material: A		s or equivalen	t material			
and the second s	All		g Wall Thickne	ess: 0.75 ir	ich or less	
	ditional branch					er and fillet
welds permi	tted by Welding	g Procedure Q	ualifier.			
	1 is not intende			A STATE OF THE STA		
	ickness but a m				nd the fillet w	eld size
	comply with th				2.12	10.00
Fechnique: Beads may be	stringer or wea					
Position: All fixed Fime Between Passes: 15	materials at least to		Welding Direc			
	minutes between e end of the day					
	ne required un					
	0°F by any suita		oratare is being		in sinan se ne	ateu to
Post-weld Heat Treatment:	None		Interpass Ten	nperature:	N/A	
ine-up Clamps: None req	uired but if use	d should comp	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 pow					100000	
	uld be allowed			1		
Electrodes wi	th P1 designation	on are recomm	nended			
	1	NELDING PA	RAMETERS			
Pass:		All	7 7 1		All	
AWS Classification:		E6010			E7010	
lectrode 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 – 16	2 – 16	2 – 16
	FIGURE 1 – JO	NINT DESIGN	AND BEAD S	EQUENCE		
Crotch	FIGURE 1 – JC	JINI DESIGN	AND BEAD 3	EQUENCE	Saddle	
Crotch					Saudie	
	K					
	45° ± 5°		45	°±5° /4	1/8 in. ± 1/32 in.	
1/8 in. ± 1/32 in.	/ 4 \ \				•	
1/8 in. ± 1/32 in.	2 4 3			/ 2 11_		
• //	2 3		.9	3 2 1	•	
• //	2 3		.3	3	A.Sanara	
<u>†</u> /_1	$-1/16 \text{ in } \pm 1/32 \text{ in.}$.,	3	- 1/16 in = 1/32 in.	
<u>†</u> / 1	1 3 1			3	- 1/16 in. ± 1/32 in.	



API 1104 WELDI	NG PROCED	URE SPECIF	ICATION	P	age: 1	of 1
WPS Number: 100			Rev: 1	Da	te: 10/01/	2018
PQR-Number: 10-1, 10-	-3, F6-X60-280					
Welding Process: Manual	SMAW				1	
Pipe or Fitting Material: Gi	reater than API					
	All		g Wall Thickne			
6 TO THE TOTAL OF T	itional branch ; ted by Welding		TO SECURE AND ADDRESS OF THE PARTY OF THE PA	Welding Prod	edure Qualifi	er and fillet
	is not intende			s the numbe	r of heads wil	vary with
	ckness but a m		Transport Action Services	A		
	comply with th					210.5122
	stringer or we				3 times the	rod diameter
Position: All fixed			Welding Direc	ction: Down	hill or Horizo	ntal
Time Between Passes: 15	minutes betwe	en the root a	nd second pass	s. Remaining	passes should	start before
the	e end of the da	y. If you can't	start before th	ne end of the	day, see WEL	ST-1010.
Preheat Temperature: No	ne required un	less the tempe	erature is belo	w 40°F the joi	nt shall be he	ated to
200	O°F by any suita	ble means				
Post-weld Heat Treatment:	None		Interpass Ter		N/A	
	uired but if use					
Cleaning: The surface shall		THE RESERVE OF THE PARTY OF THE	al conditions a	nd the weld s	nall be cleane	d between
passes with pow						
	uld be allowed			n.		
_ Electrodes wit	th P1 designati	on are recomn	nended			
	1	VELDING PA	RAMETERS			
Pass:		Root			Remainder	
AWS Classification:		E6010		E	7010 or E801	.0
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 – 140	90 – 165	130 - 210
Voltage Range:	20 – 32	19-33	20 – 32	18 – 32	20 – 32	20 – 32
Travel Speed Range, ipm:	2-16	2-20	2-16	2-20	2-16	2-16
	FIGURE 1 – IC	OINT DESIGN	AND BEAD S	EQUENCE		
Crotch	// X				Saddle	
			1 1 1 1 1 1		Saddle	
	45°±5°		1 1 1 1 1 1	45°±5°	Saddle 1/8 in. ± 1/32 in.	
Crotch 1/8 in. ± 1/32 in.	45°±5°		1 1 1 1 1 1	45" ± 5" 4		
Crotch	45°±5°		1 1 1 1 1 1			
Crotch 1/8 in. ± 1/32 in.	45°±5°		1 1 1 1 1 1	445" ± 5" 4		



Welding Process: Manual SM Pipe or Fitting Material: API 5 Pipe or Fitting Diameter: All Joint Design: Figure 1, addition welds permitted Number of Beads: Figure 1 is wall thickny should con Position: All fixed Fime Between Passes: 15 minter The Preheat Temperature: Minime Post-weld Heat Treatment: Note of the present o	onal branch and by Welding not intendentes but a minutes between dof the dam temper lone ed but if use	groove designs g Procedure Q d to show all k inimum of 3 p e Duke Energy ve beads with een the root al y. If you can't ature of 250°F	ng Wall Thickness permitted by ualifier. Dead sequence asses should by NGBU Welding the maximum Welding Director of second pass start before the should be used interpass Temply with the Duries of the ply with the Duries of the plant of the pl	s, the number deposited and standard weave being stion: See Remaining part of the condition of the conditio	inch to 0.75 incedure Qualification of beads will not the fillet was times the republic of the fill or Horizon asses should day, see WEL-N/A	nch ier and fillet I vary with veld size od diameter ontal start before -ST-1010.
Welding Process: Manual SM Pipe or Fitting Material: API 5 Pipe or Fitting Diameter: All Joint Design: Figure 1, addition welds permitted Number of Beads: Figure 1 is wall thickny should con Technique: Beads may be strict Position: All fixed Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	onal branch and by Welding not intendentes but a minutes between dof the dam temper lone ed but if use	Pipe or Fitting groove designs grocedure Q d to show all binimum of 3 per Duke Energy ve beads with een the root at y. If you can't ature of 250°F d should comp	ng Wall Thickness permitted by ualifier. Dead sequence asses should by NGBU Welding the maximum Welding Director of second pass start before the should be used interpass Temply with the Duries of the ply with the Duries of the plant of the pl	s, the number deposited and standard weave being stion: See Remaining part of the condition of the conditio	r of beads wil nd the fillet w 3 times the ro nhill or Horizo asses should day, see WEL- N/A	I vary with veld size od diameter ontal start before -ST-1010.
Pipe or Fitting Material: API 5 Pipe or Fitting Diameter: All Joint Design: Figure 1, addition welds permitted Number of Beads: Figure 1 is wall thickn should con Technique: Beads may be strin Position: All fixed Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	onal branch and by Welding not intende ness but a minply with the ness between dof the darm temper lone ed but if use	Pipe or Fitting groove designs grocedure Q d to show all binimum of 3 per Duke Energy ve beads with een the root at y. If you can't ature of 250°F d should comp	ng Wall Thickness permitted by ualifier. Dead sequence asses should by NGBU Welding the maximum Welding Director of second pass start before the should be used interpass Temply with the Duries of the ply with the Duries of the plant of the pl	s, the number deposited and standard weave being stion: See Remaining part of the condition of the conditio	r of beads wil nd the fillet w 3 times the ro nhill or Horizo asses should day, see WEL- N/A	I vary with veld size od diameter ontal start before -ST-1010.
Pipe or Fitting Material: API 5 Pipe or Fitting Diameter: All Joint Design: Figure 1, addition welds permitted Number of Beads: Figure 1 is wall thickn should con Technique: Beads may be strin Position: All fixed Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	not intendences but a minutes between dof the dame de but if use	Pipe or Fitting groove designs grocedure Q d to show all binimum of 3 per Duke Energy ve beads with een the root at y. If you can't ature of 250°F d should comp	ng Wall Thickness permitted by ualifier. Dead sequence asses should by NGBU Welding the maximum Welding Director of second pass start before the should be used interpass Temply with the Duries of the ply with the Duries of the plant of the pl	s, the number deposited and standard weave being stion: See Remaining part of the condition of the conditio	r of beads wil nd the fillet w 3 times the ro nhill or Horizo asses should day, see WEL- N/A	I vary with veld size od diameter ontal start before -ST-1010.
Pipe or Fitting Diameter: All Joint Design: Figure 1, addition welds permitted Number of Beads: Figure 1 is wall thickn should con Technique: Beads may be strip Position: All fixed Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	not intendences but a minutes between dof the dame de but if use	Pipe or Fitting groove designs grocedure Q d to show all binimum of 3 per Duke Energy ve beads with een the root at y. If you can't ature of 250°F d should comp	ng Wall Thickness permitted by ualifier. Dead sequence asses should by NGBU Welding the maximum Welding Director of second pass start before the should be used interpass Temply with the Duries of the ply with the Duries of the plant of the pl	s, the number deposited and standard weave being stion: See Remaining part of the condition of the conditio	r of beads wil nd the fillet w 3 times the ro nhill or Horizo asses should day, see WEL- N/A	I vary with veld size od diameter ontal start before -ST-1010.
welds permitted Number of Beads: Figure 1 is wall thickn should con Technique: Beads may be strice Position: All fixed Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	d by Welding not intende less but a minply with the less between the day and of the day and temper lone led but if use	g Procedure Que do to show all be inimum of 3 pe e Duke Energy ve beads with een the root as y. If you can't ature of 250°F d should comp	ualifier. bead sequence asses should be NGBU Weldin the maximum Welding Direct and second pass start before the should be use Interpass Ten ply with the Du	s, the number e deposited ar g Standard weave being s stion: Down s Remaining pa he end of the o d hperature: hke Energy NG	r of beads will not the fillet was the ronhill or Horizon asses should day, see WEL-N/A	I vary with weld size od diameter ontal start before -ST-1010.
Number of Beads: Figure 1 is wall thickn should con Technique: Beads may be string Position: All fixed Time Between Passes: 15 minuthe er Preheat Temperature: Minimum Post-weld Heat Treatment: National Line-up Clamps: None requires	not intende ness but a mi mply with th nger or wear nutes betweend of the dar num temper lone ed but if use	d to show all kinimum of 3 po e Duke Energy we beads with een the root and y. If you can't ature of 250°F	pead sequence asses should by NGBU Welding the maximum Welding Direct and second pass start before the should be used Interpass Ten	e deposited and g Standard weave being stion:	nd the fillet was times the real times times the real times times the real times times times the real times times times times times times the real times tim	od diameter ontal start before -ST-1010.
should con Technique: Beads may be strip Position: All fixed Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	nutes betweend of the dannum temperalone ed but if use	e Duke Energy ve beads with een the root ar y. If you can't ature of 250°F	NGBU Welding the maximum Welding Direct of second pass start before the should be used Interpass Temply with the During the maximum of the property of the maximum of the m	g Standard weave being : tion:	3 times the ronhill or Horizon asses should day, see WEL- N/A	od diameter ontal start before -ST-1010.
Technique: Beads may be string Position: All fixed Time Between Passes: 15 ming the er Preheat Temperature: Minime Post-weld Heat Treatment: Name of the properties of the pro	nutes betweend of the day	een the root ar y. If you can't ature of 250°F	the maximum Welding Direct Ind second pass Start before the should be use Interpass Ten Toly with the Du	weave being to tion: Down Remaining page end of the cod mperature: Like Energy NG	nhill or Horizo asses should day, see WEL- N/A	ontal start before -ST-1010.
Position: All fixed Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	nutes betweend of the dar num temper lone ed but if use	een the root a y. If you can't ature of 250°F d should comp	Welding Direct and second pass start before the should be use Interpass Ten ply with the Du	tion: Down Remaining page end of the ord Department of the ord Dep	nhill or Horizo asses should day, see WEL- N/A	ontal start before -ST-1010.
Time Between Passes: 15 mi the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	nd of the dan num temper Jone ed but if use	een the root al y. If you can't ature of 250°F d should comp	nd second pass start before the should be use Interpass Ten ply with the Du	Remaining page end of the odd d nperature: lke Energy NG	asses should day, see WEL- N/A	start before -ST-1010.
the er Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	nd of the dan num temper Jone ed but if use	y. If you can't ature of 250°F d should comp	start before the should be use Interpass Ten ply with the Du	ne end of the o d nperature: lke Energy NG	day, see WEL- N/A	-ST-1010.
Preheat Temperature: Minim Post-weld Heat Treatment: N Line-up Clamps: None require	nd of the dan num temper Jone ed but if use	y. If you can't ature of 250°F d should comp	start before the should be use Interpass Ten ply with the Du	ne end of the o d nperature: lke Energy NG	day, see WEL- N/A	-ST-1010.
Post-weld Heat Treatment: N Line-up Clamps: None require	lone ed but if use	d should comp	Interpass Ten	nperature: ike Energy NG		Standard
Line-up Clamps: None require	ed but if use		ply with the Du	ike Energy NG		Standard
					BU Welding	Standard
Cleaning: The surface shall be	e free from a	nv detrimenta	al conditions a			Januaru
			ai conditions a	nd the weld sh	nall be cleane	d between
passes with power	or hand tool					
Comments: The weld should			or to inspection	1		
	V	VELDING PAI	RAMETERS			
Pass:		Root			Remainder	
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
Voltage Range:	20 - 32	20 – 33	20 – 32	20 – 32	20 - 32	20 - 32
Travel Speed Range, ipm:	2 – 16	2 - 20	2 – 16	2 – 20	2 – 16	2-16
_						
FIG	SURE 1 - JO	DINT DESIGN	AND BEAD S	EQUENCE		
Crotch					Saddle	
Croton	1			3	Juda C	
	/ /					
	45° ± 5	5°	45°	5°	1/8 in. ± 1/32 ir	n
1/8 in. ± 1/32 in.	2 4		1	4	176 III. ± 1732 II	
	2 3			2 1	1	
1				(3)	1	
				/		
→ 1/1	$16 \text{ in.} \pm 1/32 \text{ in.}$			/	← 1/16 in = 1/32 in	
A					a at a	
Approved (SME): Approved (Dir. of Eng.):					Date: Date:	



lifier. ad sequences ses should be GBU Welding e maximum delding Direct second pass art before the mould be used enterpass Tem with the Du	Welding Proces, the number deposited and Standard weave being stion:	inch to 0.75 incedure Qualification of beads will a times the republic passes should day, see WEL-N/A	nch ier and fillet I vary with yeld size od diameter d start before -ST-1010.
wall Thicknees are the found be used by the last of th	Welding Proces, the number deposited and Standard weave being stion:	r of beads will not the fillet was the ronhill passes should day, see WEL-N/A	l vary with weld size od diameter distart before-ST-1010.
wall Thicknees are the found be used by the last of th	Welding Proces, the number deposited and Standard weave being stion:	r of beads will not the fillet was the ronhill passes should day, see WEL-N/A	l vary with weld size od diameter distart before-ST-1010.
wall Thicknees are the found be used by the last of th	Welding Proces, the number deposited and Standard weave being stion:	r of beads will not the fillet was the ronhill passes should day, see WEL-N/A	l vary with weld size od diameter distart before-ST-1010.
lifier. ad sequences ses should be GBU Welding e maximum relding Direct second pass art before the nould be used terpass Tem with the Du conditions ar	Welding Proces, the number deposited and Standard weave being stion:	r of beads will not the fillet was the ronhill passes should day, see WEL-N/A	l vary with weld size od diameter distart before-ST-1010.
lifier. ad sequences ses should be GBU Welding e maximum relding Direct second pass art before the nould be used terpass Tem with the Du conditions ar	s, the number e deposited an g Standard weave being 3 tion:	r of beads will not the fillet was the ronhill passes should day, see WEL-N/A	I vary with veld size od diameter distart before-ST-1010.
ad sequences ses should be GBU Welding e maximum felding Direc second pass art before th hould be used terpass Tem with the Du conditions ar	e deposited and g Standard weave being stion: Down st. Remaining place end of the cod be Energy NG and the weld shows a standard street of the condition of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition o	and the fillet was times the repair of the state of the s	od diameter d start before -ST-1010.
ses should be GBU Welding e maximum velding Direct second pass art before the mould be used terpass Term with the Duconditions are	e deposited and g Standard weave being stion: Down st. Remaining place end of the cod be Energy NG and the weld shows a standard street of the condition of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition of the weld shows a standard street of the condition o	and the fillet was times the repair of the state of the s	od diameter d start before -ST-1010.
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e maximum of elding Direct second pass art before the nould be used terpass Term with the Duconditions are	weave being in tion:	nhill passes should day, see WEL- N/A BU Welding S	d start before -ST-1010. Standard
second pass art before the nould be used aterpass Tem with the Du conditions ar	tion: Down Remaining page end of the ode Downberger of the ode Do	nhill passes should day, see WEL- N/A BU Welding S	d start before -ST-1010. Standard
art before the nould be used terpass Tem with the Du conditions are	ne end of the od d nperature: _ ke Energy NG nd the weld sh	N/A BBU Welding S	-ST-1010. Standard
nould be used terpass Tem with the Du conditions an	d nperature: _ ke Energy NG nd the weld sh	N/A BU Welding S	Standard
nterpass Tem with the Du conditions an	nperature: ke Energy NG nd the weld sh	BU Welding S	
with the Du conditions ar	ke Energy NG nd the weld sh	BU Welding S	
conditions an	nd the weld sh		
		nall be cleane	d between
to inspection	1		
METERS			
		Remainder	
		E8010-P1	
5/32"	1/8"	5/32"	3/16"
DCEP	DCEP	DCEP	DCEP
100 - 165	65 – 130	90 – 165	130 - 210
20 – 32	20 – 32	20 – 32	20-32
2-16	2-16	2-16	2-16
ND BEAD SI	FOUENCE		
		Saddle	
	`		
_3			
45° ±	5°	1/8 in. ± 1/32 ir	n.
.}		+	
	2 1	•	
	(3)		
		-1/16 in = 1/22 m	
	7	- 1/10 III. = 1/32 III.	
			Date:



API 1104 WELDI	NG PROCED				age: 1	of 1
VPS Number: 130 QR-Number: 13-1			Rev: _1	Da	te: 10/01/	2018
QR-Number: 13-1						
Welding Process: Manual S	SMAW					
ipe or Fitting Material: AP	I 5L X42 or les	s or equivalent	material			
ipe or Fitting Diameter: A	11	Pipe or Fittin	g Wall Thickn	ess: 0.188	inch to 0.75 ir	nch
이 없는 아이를 다 하는데 하는데 그 아이를 하는데 하다 하다.	tional branch			Welding Pro	cedure Qualifie	er and fillet
	ted by Welding is not intende			s the numbe	r of beads will	vary with
	kness but a m					
	omply with th			the second secon		*******
echnique: Beads may be s					3 times the ro	d diameter
Position: All fixed			Welding Dire	ction: Uphi	II	
ime Between Passes: 15	minutes betwe	en the root ar	nd second pas	s. Remaining	passes should	start before
the	end of the day	y. If you can't	start before t	he end of the	day, see WEL-	ST-1010.
Preheat Temperature: Nor	ne required un	less the tempe	rature is belo	w 40°F the joi	nt shall be hea	ted to
200	°F by any suita	ble means				
				and the second s	AI / A	
Post-weld Heat Treatment:	None		Interpass Ter		N/A	
Post-weld Heat Treatment: .ine-up Clamps: None requ	ired but if use		oly with the Du	ike Energy NG	BU Welding S	
Post-weld Heat Treatment: Line-up Clamps: None requirements. None requirements. None requirements.	ired but if use be free from a	ny detrimenta	oly with the Du	ike Energy NG	BU Welding S	
Post-weld Heat Treatment: ine-up Clamps: None requ Cleaning: The surface shall passes with power	ired but if use be free from a er or hand tool	ny detrimenta s	oly with the Du al conditions a	uke Energy NG nd the weld s	BU Welding S	
Post-weld Heat Treatment: ine-up Clamps: None requirement Cleaning: The surface shall passes with power	ired but if use be free from a er or hand tool	ny detrimenta s	oly with the Du al conditions a	uke Energy NG nd the weld s	BU Welding S	
Post-weld Heat Treatment: ine-up Clamps: None requice Shall passes with power	ired but if use be free from a er or hand tool	ny detrimenta s	oly with the Du al conditions a	uke Energy NG nd the weld s	BU Welding S	
Post-weld Heat Treatment: ine-up Clamps: None requ Cleaning: The surface shall passes with power	ired but if use be free from a er or hand tool ld be allowed	ny detrimenta s to air cool pric	oly with the Du al conditions a or to inspectio	uke Energy NG nd the weld s	BU Welding S	
Post-weld Heat Treatment: Line-up Clamps: None requications Cleaning: The surface shall passes with power passes with power passes. The weld should be a should b	be free from a be free from a er or hand too ld be allowed	ny detrimenta s to air cool prio	oly with the Du al conditions a or to inspectio	uke Energy No nd the weld s	GBU Welding S hall be cleaned	
Post-weld Heat Treatment: Line-up Clamps: None requirements: None requ	be free from a er or hand tool ld be allowed	ny detrimenta s to air cool prio VELDING PAR Only	oly with the Du al conditions a or to inspectio	nd the weld s	GBU Welding S hall be cleaned Optional)	
Post-weld Heat Treatment: ine-up Clamps: None requirements: None requi	be free from a er or hand tool ld be allowed V Root E7	ny detrimenta s to air cool prio VELDING PAR Only	oly with the Dual conditions a per to inspection	nd the weld s	Optional)	d between
cost-weld Heat Treatment: ine-up Clamps: None requirements: None requi	v Root E7 3/32"	velding PAR Only 1/8"	oly with the Dual conditions a conditions a conditions a conditions a conditions a conditions are to inspections. RAMETERS 3/32"	All (Root	Optional) 5/32"	d between
Post-weld Heat Treatment: Line-up Clamps: None requirements Cleaning: The surface shall passes with power passes with power passes. The weld should be commentated by the commentate passes. Pass: AWS Classification: Electrode Diameter: Current/Polarity:	v Root 3/32" DCEP	velding PAF Only 1/8" DCEP	oly with the Dual conditions a per to inspection RAMETERS 3/32" DCEP	All (Root 1/8" DCEP	Optional) 018 5/32" DCEP	3/16" DCEP
Post-weld Heat Treatment: Line-up Clamps: None requirements Cleaning: The surface shall passes with power passes with power passes. The weld should be passes: AWS Classification: Electrode Diameter: Current/Polarity: Current Range:	very street but if use be free from a ser or hand tool lid be allowed Very Root E7 3/32" DCEP 55 – 90	velding PAF Only 1/8" DCEP 75 – 120	al conditions a report to inspection report to inspection report to inspect t	All (Root E7 1/8" DCEP 90 – 160	Optional) 018 5/32" DCEP 130 – 210	3/16" DCEP 180 – 300
cost-weld Heat Treatment: ine-up Clamps: None requirements: None requi	verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use free from a ser or hand tool lid be allowed Verified but if use free from a ser or hand tool lid be allowed Verified but if use free from a ser or hand tool lid be allowed Verified but if use free free from a ser or hand tool lid be allowed Verified but if use free free free free free free free fr	VELDING PAR Only 1/8" DCEP 75 – 120 20 – 28	al conditions a report to inspection and a report to inspect to inspe	All (Root E7 1/8" DCEP 90 – 160 20 – 28	Optional) 018 5/32" DCEP 130 – 210 20 – 28	3/16" DCEP 180 – 300 20 – 28
rost-weld Heat Treatment: ine-up Clamps: None requirements: None requirements: None requirements: None requirements: None requirements: None requirements: The surface shall passes with power of the weld should be sho	very street but if use be free from a ser or hand tool lid be allowed Very Root E7 3/32" DCEP 55 – 90	velding PAF Only 1/8" DCEP 75 – 120	al conditions a report to inspection report to inspection report to inspect t	All (Root E7 1/8" DCEP 90 – 160	Optional) 018 5/32" DCEP 130 – 210	3/16" DCEP 180 – 300
Post-weld Heat Treatment: Line-up Clamps: None requirements: None requ	very sired but if use be free from a ser or hand tool ld be allowed Very Root E7 3/32" DCEP 55 - 90 20 - 28 2 - 16	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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
Post-weld Heat Treatment: Line-up Clamps: None requirements Cleaning: The surface shall passes with power passes with power passes. Pass: Line-up Clamps: The weld should passes with power passes with power passes with power passes. Pass: Line-up Clampets: Line-up Clamps:	verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use be free from a ser or hand tool lid be allowed Verified but if use free from a ser or hand tool lid be allowed Verified but if use free from a ser or hand tool lid be allowed Verified but if use free from a ser or hand tool lid be allowed Verified but if use free free from a ser or hand tool lid be allowed Verified but if use free free free free free free free fr	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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
Post-weld Heat Treatment: Line-up Clamps: None requirements: None requ	very sired but if use be free from a ser or hand tool ld be allowed Very Root E7 3/32" DCEP 55 - 90 20 - 28 2 - 16	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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
Post-weld Heat Treatment: Line-up Clamps: None requirements Cleaning: The surface shall passes with power passes with power passes. Pass: Line-up Clamps: The weld should passes with power passes with power passes with power passes. Pass: Line-up Clampets: Line-up Clamps:	very sired but if use be free from a ser or hand tool ld be allowed Very Root E7 3/32" DCEP 55 - 90 20 - 28 2 - 16	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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
Post-weld Heat Treatment: Line-up Clamps: None requirements: The surface shall passes with power passes with power none not requirements: The weld should be not requirements: None requ	very sired but if use be free from a ser or hand tool ld be allowed Very Root E7 3/32" DCEP 55 - 90 20 - 28 2 - 16	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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
Post-weld Heat Treatment: Line-up Clamps: None requirements Cleaning: The surface shall passes with power passes with power passes. Pass: Line-up Clamps: The weld should passes with power passes with power passes with power passes. Pass: Line-up Clampets: Line-up Clamps:	rired but if use be free from a ser or hand tool ld be allowed V Root E7 3/32" DCEP 55 – 90 20 – 28 2 – 16 FIGURE 1 – JC	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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
Post-weld Heat Treatment: Line-up Clamps: None requirements: The surface shall passes with power passes with power none not requirements: The weld should be not requirements: None requ	rired but if use be free from a ser or hand tool ld be allowed V Root E7 3/32" DCEP 55 – 90 20 – 28 2 – 16 FIGURE 1 – JC	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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
Post-weld Heat Treatment: Line-up Clamps: None requirements: The surface shall passes with power passes with power none not requirements: The weld should be not requirements: None requ	rired but if use be free from a ser or hand tool ld be allowed V Root E7 3/32" DCEP 55 – 90 20 – 28 2 – 16 FIGURE 1 – JC	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7 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
Post-weld Heat Treatment: ine-up Clamps:None requirements:None req	rired but if use be free from a ser or hand tool ld be allowed V Root E7 3/32" DCEP 55 – 90 20 – 28 2 – 16 FIGURE 1 – JC	VELDING PAR Only 016 1/8" DCEP 75 – 120 20 – 28 2 – 16	al conditions a report to inspection of the insp	All (Root E7) 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



API 1104 WI	LDING PROCEDI	JRE SPECIF	ICATION	Page:	1 of 1
WPS Number: 140			Rev: 1	Date:	10/01/2018
PQR-Number: N16	-02081				
Welding Process: SMA	W				
Pipe or Fitting Material:	<api (x42)="" 5l="" td="" thru<=""><td>API 5L (X65</td><td>)</td><td></td><td></td></api>	API 5L (X65)		
Pipe or Fitting Diameter	≤2.375″		-		
Pipe or Fitting Wall Thicl	cness: ≤0.188"				
Joint Design and Bead Se		V" Butt Weld	/ See Figure 1		
Position: Horizontal (F	ixed)		Welding Direct	on: Horizontal	
Filler Metal: Group 1					
Time Between Passes:	12 Minutes				
Preheat Temperature:	None required. I	Below 50°F	a 200°F minim	um preheat is red	commended for
	moisture remova	The state of the s			
Post-weld Heat Treatme			Internass Tem	perature: 80°F	
Line-up Clamps: Exter			interpuss rein	Clatare. 00 T	
Cleaning: Grinding / P					
olicaning.	ower wife brasin				
Comments:					
Assessment to the					
	W	ELDING PA	RAMETERS		
Pass:	1	2	3		
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 – JO	INT DESIGN	AND BEAD SE	QUENCE	
	210210			4071657	
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		- 1	9/		
		23	7		
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		1/16" ± 1/32	130		
		5	1/16" ± 1/32"		
		ω	-		
		32	32*		
		×,	32*		

PQR-Number: N16-02081 Welding Process: SMAW Pipe or Fitting Material: <api (x42)="" (x65)<="" 5l="" api="" th="" thru=""><th>PQR-Number: N16-02081 Welding Process: SMAW Pipe or Fitting Material: <api 51<="" th=""><th>(X42) thru</th><th>=</th><th>Rev: 1</th><th> Date: _</th><th>10/01/2018</th></api></th></api>	PQR-Number: N16-02081 Welding Process: SMAW Pipe or Fitting Material: <api 51<="" th=""><th>(X42) thru</th><th>=</th><th>Rev: 1</th><th> Date: _</th><th>10/01/2018</th></api>	(X42) thru	=	Rev: 1	Date: _	10/01/2018
Welding Process: SMAW Dipe or Fitting Material: <api (x42)="" (x65)<="" 5l="" api="" td="" thru=""> Sipe or Fitting Diameter: ≤2.375" Dipe or Fitting Wall Thickness: ≤0.188" Dipe or Fitting Material: Sol.188" Dipe or Fitting Material: ≤0.188" Dosting Horizontal (Fixed) Welding Direction: Downhill Downhill Dime Between Passes: 12 Minutes Post-weld Heat Treatment: N/A Interpass Temperature: 80°F Dine-up Clamps: External External Cleaning: Grinding / Power Wire Brush Comments: MELDING PARAMETERS Pass: 1 2 3 3 AWS Classification: A5.1 A5.1 A5.1 A5.1 Electrode Diameter: 1/8" 3/32" 3/32" Basical As.1 Current Polarity: DCRP DCRP DCRP DCRP Current Range: 72-75 75-80 80-84 B0-84 Voltage Range: 20-22 22-24 24-26</api>	Welding Process: SMAW Pipe or Fitting Material: <api 51<="" th=""><th>. (X42) thru</th><th></th><th></th><th></th><th></th></api>	. (X42) thru				
Pipe or Fitting Material:	Pipe or Fitting Material: <api 51<="" th=""><th>(X42) thru</th><th></th><th></th><th></th><th></th></api>	(X42) thru				
Pipe or Fitting Material:	Pipe or Fitting Material: <api 51<="" td=""><td>(X42) thru</td><td></td><td></td><td></td><td></td></api>	(X42) thru				
Pipe or Fitting Diameter: ≤2.375" Pipe or Fitting Wall Thickness: ≤0.188" Point Design and Bead Sequence: Fillet Weld / See Figure 1 Position: Horizontal (Fixed) Welding Direction: Downhill Position: Horizontal (Fixed) Welding Direction: Downhill Fillet Metal: Group 1 Filme Between Passes: 12 Minutes Preheat Temperature: None required. Below 50°F, a 200°F minimum preheat is recommended for moisture removal. Post-weld Heat Treatment: N/A Interpass Temperature: 80°F Line-up Clamps: External Cleaning: Grinding / Power Wire Brush Comments: WELDING PARAMETERS Pass: 1 2 3 AWS Classification: A5.1 A5.1 A5.1 Electrode Diameter: 1/8" 3/32" 3/32" Current/Polarity: DCRP DCRP Current Range: 72 - 75 75 - 80 80 - 84 Voltage Range: 20 - 22 22 - 24 24 - 26	[14] 기계 : [1] : [API 5L (X65)		
Position: Horizontal (Fixed) Welding Direction: Downhill Filler Metal: Group 1 Fime Between Passes: 12 Minutes Preheat Temperature: None required. Below 50°F, a 200°F minimum preheat is recommended for moisture removal. Post-weld Heat Treatment: N/A Interpass Temperature: 80°F Line-up Clamps: External Cleaning: Grinding / Power Wire Brush Comments: WELDING PARAMETERS Pass: 1 2 3 AWS Classification: A5.1 A5.1 A5.1 Electrode Diameter: 1/8" 3/32" 3/32" Current/Polarity: DCRP DCRP Current Range: 72 - 75 75 - 80 80 - 84 Voltage Range: 20 - 22 22 - 24 24 - 26						
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Filler Metal: Group 1 Filme Between Passes: 12 Minutes None required. Below 50°F, a 200°F minimum preheat is recommended for moisture removal. Post-weld Heat Treatment: N/A Interpass Temperature: 80°F Line-up Clamps: External Cleaning: Grinding / Power Wire Brush Comments: WELDING PARAMETERS Pass: 1 2 3 AWS Classification: A5.1 A5.1 A5.1 Electrode Diameter: 1/8" 3/32" 3/32" Current/Polarity: DCRP DCRP Current Range: 72 - 75 75 - 80 80 - 84 Voltage Range: 20 - 22 22 - 24 24 - 26	oint Design and Bead Sequence:	Fillet W	eld / See Fig	ure 1		
Filler Metal: Group 1 Filme Between Passes: 12 Minutes None required. Below 50°F, a 200°F minimum preheat is recommended for moisture removal. Post-weld Heat Treatment: N/A Interpass Temperature: 80°F Line-up Clamps: External Cleaning: Grinding / Power Wire Brush Comments: WELDING PARAMETERS Pass: 1 2 3 AWS Classification: A5.1 A5.1 A5.1 Electrode Diameter: 1/8" 3/32" 3/32" Current/Polarity: DCRP DCRP Current Range: 72 - 75 75 - 80 80 - 84 Voltage Range: 20 - 22 22 - 24 24 - 26						
Time Between Passes: 12 Minutes Preheat Temperature: None required. Below 50°F, a 200°F minimum preheat is recommended for moisture removal. Post-weld Heat Treatment: N/A Interpass Temperature: 80°F Interpass Temperature: 80°				Welding Direction	: Downhill	
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Moisture removal. Main Interpass Temperature: 80°F						
Cost-weld Heat Treatment: N/A Interpass Temperature: 80°F	[HO [HO] [HO HO H			a 200°F minimum	n preheat is rec	ommended for
Cleaning: Grinding / Power Wire Brush Cleaning: Grinding / Power Wire Brush Comments:		UT AND SOF ON	d.		20%5	
Comments:		4)	Interpass Temper	ature: 80°F	
WELDING PARAMETERS		o Druch				
WELDING PARAMETERS Pass: 1 2 3 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	Lieaning: Grinding / Power Wir	e brusn				
WELDING PARAMETERS Pass: 1 2 3 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	Comments:					
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AWS Classification: A5.1 A5.1 A5.1 Electrode Diameter: 1/8" 3/32" 3/32" Current/Polarity: DCRP DCRP Current Range: 72 - 75 75 - 80 80 - 84 /oltage Range: 20 - 22 22 - 24 24 - 26	C. C.	W	ELDING PAR	RAMETERS		
1/8" 3/32" 3/32"		1	2	3		
Current/Polarity: DCRP DCRP DCRP Current Range: 72 - 75 75 - 80 80 - 84 /oltage Range: 20 - 22 22 - 24 24 - 26			7.14.754			
Current Range: 72 - 75 75 - 80 80 - 84 70 70 70 70 70 70 70 70 70 70 70 70 70						
/oltage Range: 20 - 22 22 - 24 24 - 26						
ravel Speed Range, ipm: 6 - 12 IPM 4 - 8 IPM 4 - 8 IPM	/oltage Pange:					
	ravel Speed Range, ipm: 6			AND BEAD SEQU		

Date:

Approved By:



IN-SERVICE WELDING PROCEDURE SPECIFICATION

Page:

1

3

Rev.: 1

Date: 10/01/2018

PQR Number: 25CLH-B-1 and supporting verification welds 35LH, 35LH-BW, 48LH and 42LH-O

Standard: API 1104 Appendix B, 20th Edition and API 1104 Annex B, 21st Edition

Welding Process:

Manual SMAW

Pipe and Branch Material SMYS: Less than or equal to API 5L X70 or equivalent

Pipe and Branch Material CE (1): Table 1

Pipe Wall Thickness (2): 0.188 - 0.75 in.

Pipe Diameter: All diameters

Branch Wall Thickness: 0.188 – 0.75 in.

Branch Diameter: All diameters

Joint Design: Figure 1, branch groove welds

Figure 1, the figure is not intended to show all possible bead sequences, the last

Bead Sequence:

pass shall not contact the run pipe and minimum of three passes is required. The

root pass can be deposited from the branch pipe I.D or O.D.

Branch groove welds shall completely fill the groove beyond flush with the

Weld Size and Shape:

branch pipe O.D. Fillet weld reinforcement in the crotch position shall meet the run pipe at approximately 45° or as specified by the fitting manufacturer.

Welding Technique: Stringer or weave beads Position: Fixed

Welding Direction: Uphill or horizontal

Time Between Passes:

Preheat Temperature:

10 minutes maximum between the completion of the root pass and the

start of the second pass. 30 minutes maximum between all other passes.

None required. Below 50°F, a 200°F minimum preheat is recommended for

moisture removal.

Preheat Method:

Any adequate method may be used to achieve and maintain the minimum

preheat temperature.

Line-up Clamps: None required

Pipeline Products:

Post-weld Heat Treatment: None permitted

Cleaning: Weld beads shall be cleaned between passes using power tools or hand tools as required.

May include crude petroleum, petroleum products, fuel gases, carbon dioxide,

and nitrogen. Consideration shall be given to the effect welding may have on

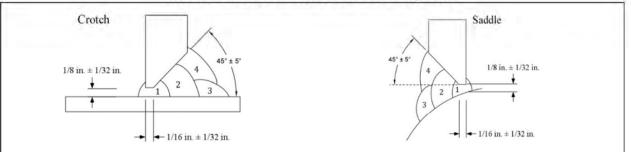
other pipeline products.

Pipeline Operating Conditions:

Table 1 and Figure 2 or Figure 3, flow rate and pressure are factors

in thermal severity.

FIGURE 1 - JOINT DESIGN AND BEAD SEQUENCE



WPS Number: 160 Rev.: 1 Page: 2 of 3

TABLE 1 - PROCEDURE APPLICABILITY

Thornal Coverity	Materia	al CE (1)
Thermal Severity	Pipe	Branch
Category I	CE (IIW) ≤ 0.35	CE (IIW) ≤ 0.48
Category II	CE (IIW) ≤ 0.42	CE (IIW) ≤ 0.48

FIGURE 2 – THERMAL SEVERITY LEVEL BASED ON HEAT SINK CAPACITY TIME

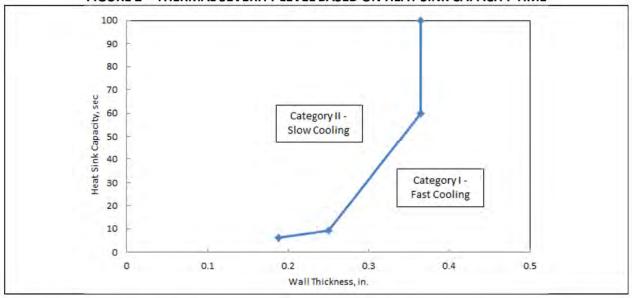
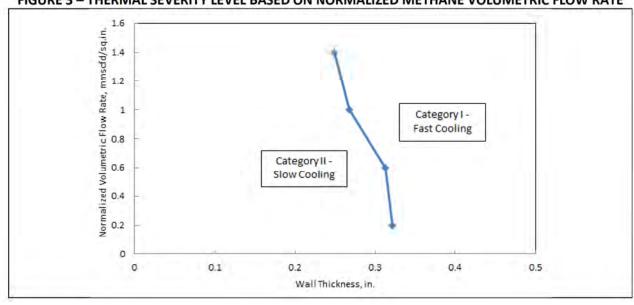


FIGURE 3 – THERMAL SEVERITY LEVEL BASED ON NORMALIZED METHANE VOLUMETRIC FLOW RATE



WPS Numbe	L: 160		Rev.: _1_		Page:	3 of 3			
		WELDING	PARAMET	ERS					
	Pass		Root						
AV	VS Classification	E7018	E7018 H4R			er E7016 H4			
Electrode Diameter (in.) (3):		3/32	3/32 1/8		3/32	1/8			
	Current/Polarity	DCEP	DCE	P	DCEP	DCEP			
Current Range (amps) (4):		48 – 132 (60 – 110)			44 – 96 (55 – 80				
Voltage l	Range (volts) (4)	14 – 34 (18 – 28)	14 – 1 (18 – 1		14 – 34 (18 – 28				
Travel Sp	eed Range (ipm)	2-10	2 – 15		2-7	2-11			
Heat Input	Heat Input Min. (kJ/in.) (5):		25		25	25			
Run-Ou	Run-Out Ratio Max. (6):		0.63	1	0.37	0.61			
Δ1/	Pass VS Classification	Remainder E7018 H4R							
Electrode Diameter (in.) (3):			3/32		1141	5/32			
			DCEP		P	DCEP			
Current/Polarity: Current Range (amps) (4):						88 – 264 (110 – 220			
Voltage Range (volts) (4):				68 – 192 (85 – 160) 14 – 34 (18 – 28)		14 – 34 (18 – 28)			
Travel Speed Range (ipm):			-0/	2-15		2-21			
	Min. (kJ/in.) (5)			25		25			
Run-Out Ratio Max. (6):			0.37		L .	0.94			
Comment:		= %C + %Mn/6 + (%Cu + %Ni)/15 + (%Cr + %Mo + %V)/5							
	(2) The risk of thickness	ne risk of burn-through should be evaluated prior to welding if the pipe wall ickness is less than 0.25 in.							
	less than	Only 3/32 in. diameter electrodes are permitted when the pipe wall thickness is less than 0.25 in.							
	AND A CONTRACT OF THE PARTY OF	The welding parameter ranges in the parentheses are recommended							
		Heat input (kJ/in.) = (Current*Voltage*60)/(Travel Speed*1000)							
	(h)	The run-out ratio is the maximum allowable weld length per length of electrode consumed to achieve the minimum required heat input level.							
Prepared By					Date:				
Approved By):				Date:				



IN-SERVICE WELDING PROCEDURE SPECIFICATION

Page:

1

3

WPS Number: 170

Rev.: 1

Date: 10/01/2018

PQR Number:

40LH-B-1 and supporting verification welds 42LH, 42LH-BW and 50LH-O

Pipe and Branch Material SMYS: Less than or equal to API 5L X70 or equivalent

of

Standard: API 1104 Appendix B, 20th Edition and API 1104 Annex B, 21st Edition

Welding Process:

Manual SMAW

Pipe and Branch Material CE (1): Table 1

Pipe Diameter:

All diameters

Pipe Wall Thickness: 0.250-0.75 in. Branch Wall Thickness: 0.188-0.75 in.

Branch Diameter:

All diameters

Joint Design: Figure 1, branch groove welds

Figure 1, the figure is not intended to show all possible bead sequences, the last

Bead Sequence:

pass shall not contact the run pipe and minimum of three passes is required. The

root pass can be deposited from the branch pipe I.D or O.D.

Branch groove welds shall completely fill the groove beyond flush with the

Weld Size and Shape:

branch pipe O.D. Fillet weld reinforcement in the crotch position shall meet

the run pipe at approximately 45° or as specified by the fitting manufacturer.

Welding Technique: Stringer or weave beads

Position: Fixed

Welding Direction: Uphill or horizontal

Time Between Passes:

10 minutes maximum between the completion of the root pass and the

start of the second pass. 30 minutes maximum between all other passes.

Preheat Temperature:

None required. Below 50°F, a 200°F minimum preheat is recommended for

moisture removal.

Preheat Method:

Any adequate method may be used to achieve and maintain the minimum

preheat temperature.

Line-up Clamps:

None required

Post-weld Heat Treatment: None permitted

Pipeline Products:

Pipeline Operating Conditions:

Cleaning: Weld beads shall be cleaned between passes using power tools or hand tools as required.

May include crude petroleum, petroleum products, fuel gases, carbon dioxide,

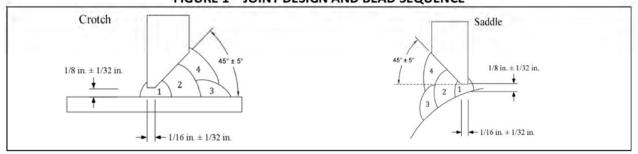
and nitrogen. Consideration shall be given to the effect welding may have on

other pipeline products.

Table 1 and Figure 2 or Figure 3, flow rate and pressure are factors

in thermal severity.

FIGURE 1 – JOINT DESIGN AND BEAD SEQUENCE



WPS Number: 170 Rev.: 1 Page: 2 of 3

TABLE 1 - PROCEDURE APPLICABILITY

Thermal Cavarity	Material CE (1)				
Thermal Severity	Pipe	Branch			
Category I	CE (IIW) ≤ 0.42	CE (IIW) ≤ 0.42			
Category II	CE (IIW) ≤ 0.50	CE (IIW) ≤ 0.50			

FIGURE 2 - THERMAL SEVERITY LEVEL BASED ON HEAT SINK CAPACITY TIME

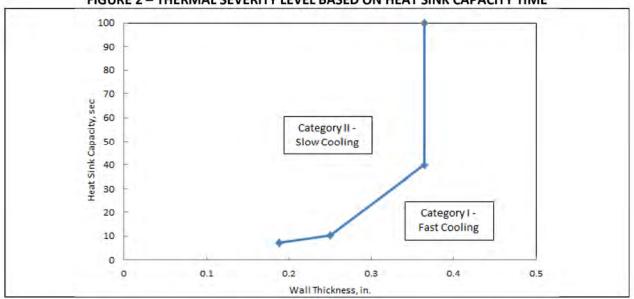
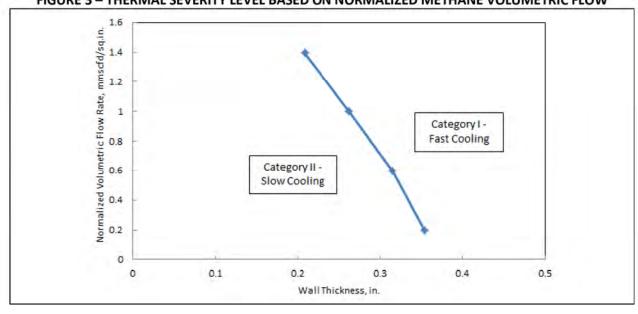


FIGURE 3 – THERMAL SEVERITY LEVEL BASED ON NORMALIZED METHANE VOLUMETRIC FLOW



			WEIDIN	G PAR	AMETERS					
		Pass:	WELDIN	O I AIN		ot				
AWS Classification:			E7018 H4R			r	F7	7016 H4		
		eter (in.):	3/32		1/8	3/:		1/8		
	Current/Polarity:				DCEP	DC		DCEP		
Current Range (amps) (2):		48 – 132			44 -	- 96	60 – 144			
		(60 - 110)	(85 – 160)		(55 – 80)		(75 – 120)			
		14 – 34		14 – 34	14 -		14 – 34			
Voltage R	ange (volts) (2):	(18 - 28)	(1	18 – 28)	(18 – 28) 2 – 4		(18-28)		
Travel Spe	ed Rar	nge (ipm):	2-6		2-9	2 -	- 4	2-7		
Heat Input Min. (kJ/in.) (3):			40		40	4	0	40		
Run-Out Ratio Max. (4):		0.23		0.38	0.23		0.38			
		5.65.51.00.								
		Pass:			Rema	inder				
AWS Classification:		E7018 H4F								
Electrode Diameter (in.):		3/32		1/8			5/32			
Current/Polarity:		DCEP		DC	EP		DCEP			
Current Range (amps) (2):		48 – 132 (60 – 110)		68 – 192 (85 – 160)		88 -	88 – 264 (110 – 220			
Voltage Range (volts) (2):		14 – 34 (18 – 28)		14 – 34 (18 – 28)		14	14 – 34 (18 – 28)			
Travel Speed Range (ipm):			2-6		2-9			2 – 13		
Heat Input Min. (kJ/in.) (3):			40		40			40		
Run-Out Ratio Max. (4):			0.23		0.38			0.59		
Comment:	(1)	C.E. (IIW)	= %C + %Mn/6 + (%Cu +	%Ni)/15 + (%	6Cr + %M	o + %V)/	5		
	(2)	The weldi	e welding parameter ranges in the parentheses are recommended							
	(3)	Heat input (kJ/in.) = (Current*Voltage*60)/(Travel Speed*1000)								
	(4)		The run-out ratio is the maximum allowable weld length per length of electrode onsumed to achieve the minimum required heat input level.							
		Consumed	to acmeve the m	IIIIIIui	n required n	eat input	ievei.			
Prepared By	:					D	ate:			

IN-SERVICE W	ELDING PR	OCEDURE	SPECIFICATION	ON	Page	e:	1	of	4
WPS Number: _180			Rev.:	1	Date	e: 10,	/01/20	18	
			erification we						
Standard: API 1104	Appendix B,	20 th Editio	on and API 11	.04 Annex	B, 21 st Edit	tion			
Welding Process: Ma	anual SMAV	/							
Pipe and Branch Mate	rial SMYS:	Less tha	n or equal to	API 5L X7	0 or equiva	lent, T	able 1		
Pipe and Branch Mate	rial CE (1):	Less tha	n or equal to	0.50 CE (I	IW)				
Pipe Wall Thickness (2): 0.157 -	0.75 in.	Pipe Dia	meter:	All diamet	ers			
Branch Wall Thickness	: 0.157 -	- 0.75 in.	Branch	Diameter	All dian	neters			
loint Design: Figure	1, branch gr	oove welc	ds						
sead Sequence: thre	ee passes is n the brancl	required a h pipe I.D		ering layeı	. The root	pass c	an be	deposi	ited
Weld Size and Shape:	branch p	ipe OD. Fi	ds shall comp llet weld rein roximately 4	forcemen	t in the cro	tch po	sition	shall m	neet
Welding Technique:	Stringer or weave beads								
Position: Fixed			Welding	Direction	1:	Uphill	or ho	rizontal	
Time Between Passes:			um between 30 minutes						start
Preheat Temperature:	None required. Below 50°F, a 200°F minimum preheat is recommended for moisture removal.							l for	
Preneat Wethod:	ny adequat reheat temp		may be used	to achieve	e and main	tain th	e min	imum	
Line-up Clamps: Nor	ne required		Post-we	ld Heat T	reatment:	None	e pern	nitted	
	s shall be cl	eaned bet	ween nasses	using pov	ver tools or	r hand	tools	as requ	
Cleaning: Weld bead			troleum, pet						

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in

Case No(s). 16-0253-GA-BTX

Summary: Correspondence Duke Energy Ohio, Inc.'s adherence with Condition No. 34-PART 1 electronically filed by Carys Cochern on behalf of Duke Energy