ARC ENTERPRISES, INC.
STEEL FABRICATION

AISC CERTIFIED FABRICATOR

PHONE: 207.265.2646 • FAX: 207.265.4054

WWW.ARCENTERPRISESINC.COM

LETTER OF TRANSMITTAL

DATE: 1/15/15	**A.R.C. JOB#:** 14-148
SHIP TO: Douglas E. Bonneau	**PROJECT NAME:** Waterbury, VT
DOCUMENTS ENCLOSED: WPS Package for Structural Steel, Bridge's 46A, 46N & 46S	

COPIES	PAGES	DESCRIPTION
1	8	WPS Package for Approval

REMARKS:

Vermont Agency of Transportation

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Waterbury Str 58 46A 46N 46S WPS Approved.pdf

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January 15, 2015

RESUBMIT No **Approved**

BY D Bonneau **DATE** 02/11/15

SIGNED: _____

Jake Kilbreth, A.R.C. Enterprises, Inc.

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BY D Bonneau DATE 02/11/15

WELDING PROCEDURE SPECIFICATION (WPS) YES (X)
PREQUALIFIED ____ QUALIFIED BY TESTING __X__
or PROCEDURE QUALIFICATION RECORD (PQR) YES ( )

Company Name ARC Ent. Inc.
Welding Process(es) SAW
Supporting PQR No.(s) ARC PQR # 45

Identification # ARC WPS 45a
Revision 3 Date 9/12/2014 By SVH
Autherized by STEVE HOWARD Date 6/8/2012
Type - Manual Semi - Automatic ( )
Machine ( ) Automatic (X)

DART Welder

JOINT DESIGN USED
Type FILLET
Single (X) Double Weld ( )
Backing ( ) NO
Backing Material
Root Opening 0 Root Face Dimension
Groove Angle NA Radius (J-U)
Back Gouging Method

BASE METALS
Material Spec A709
Type or Grade 50 50W HPS50W
Thickness Groove Fillet U
Diameter (Pipe)

FILLER METALS
AWS Specification A5.23 Lincoln LA-75
AWS Classification ENi1K-Ni1-H8

SHIELDING
Flux 960 Gas
Composition
Electrode - Flux (Class) Flow Rate
F8A2-ENi1K-Ni1 Gas Cup Size

Preheat up to 3/4" = 50 degrees 3/4" - 1 1/2" = 70 degrees
1 1/2" - 2 1/2" = 150 degrees Over 2 1/2" = 225 degrees F.

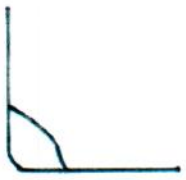
POSITION
Position of Groove Fillet 1F 2F
Vertical Progression ( )

ELECTRICAL CHARACTERISTICS
Transfer Mode (FCAW) Short Circuiting ( )
Globular ( ) Spray (X)
Current : AC ( ) DCEP DCEN (X)
Pulsed ( )
OTHER :

TECHNIQUE
Stringer or Weave Bead STRINGER
Multi-pass or Single Pass (per side) SINGLE
Number of Electrodes
Electrode Spacing Longitudinal
Lateral
Angle
Contact Tube to Work Distance 1 1/4" Stickout +/- 1/4"
Peening
Interpass Cleaning :

POSTWELD HEAT TREATMENT
Temp
Time

WELDING PROCEDURE

Pass or Weld Layer(s)	S	Filler Metals		Current		Volts	Travel Speed	Joint Details
		Class	Diameter	Type & Polartiy	Amps or Wire Feed Speed			
	SAW	ENi1K	3/32"	DCEN	360-440	28-32	12-16.2 ipm	
1	1/4"							
1	5/16"							
1	3/8"							

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WELDING PROCEDURE SPECIFICATION (WPS) YES (X)

PREQUALIFIED ___ QUALIFIED BY TESTING ___(X)___

or PROCEDURE QUALIFICATION RECORD (PQR) YES (x)

Company Name A.R.C. Ent. Inc.

Welding Process(es) SAW

Supporting PQR No.(s) ARC - PQR - 42

Identification # ARC WPS #42

Revision 3 Date 9/12/2014 By SVH

Autherized by STEVE HOWARD Date 12/10/2012

Type - Manual Semi - Automatic ( )

Machine ( ) Automatic (X)

JOINT DESIGN USED

Type FILLET

Single (X) Double Weld ( )

Backing ( ) NO (X)

Backing Material

Root Opening Root Face Dimension

Groove Angle Radius (J-U)

Back Gouging Method

BASE METALS

Material Spec A709

Type or Grade 36 50 50W HPS50W

Thickness Groove Fillet UNLIMITED

Diameter (Pipe)

FILLER METALS

Lincoln I-61

AWS Specification A 5.23 A 5.17

AWS Classification EM12K

SHIELDING

Flux LINCOLN 960 Gas

Composition

Electrode - Flux (Class) Flow Rate

F7A2-EM12K Gas Cup Size

Preheat < 3/4" = 50 degrees 3/4" - 1 1/2" = 70 degrees

1 1/2" - 2 1/2" = 150 degrees Over 2 1/2" = 225 degrees F

POSITION

Position of Groove Fillet 1F 2F

Vertical Progression ( )

ELECTRICAL CHARACTERISTICS

Transfer Mode (FCAW) Short Circuiting ( )

Globular ( ) Spray (X)

Current : AC ( ) DCEP DCEN (X)

Pulsed ( )

OTHER :

TECHNIQUE

Stringer or Weave Bead STRINGER

Multi-pass or Single Pass (per side) SINGLE

Number of Electrodes -1

Electrode Spacing Longitudinal

Lateral

Angle

Contact Tube to Work Distance 1"1/4 STICKOUT +/_ 1/4"

Peening

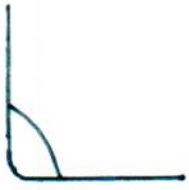
Interpass Cleaning : hand and power tools

POSTWELD HEAT TREATMENT

Temp

Time

WELDING PROCEDURE

Pass or Weld Layer(s)	S	Filler Metals		Current		Volts	Travel Speed	Joint Details
		Class	Diameter	Type & Polartiy	Amps or Wire Feed Speed			
	5/16"	EM12K	5/32	DCEN	540-620	29.8 - 32	21 - 23.8	

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WELDING PROCEDURE SPECIFICATION (WPS) YES (X)
PREQUALIFIED ____ QUALIFIED BY TESTING ___(X)___
or PROCEDURE QUALIFICATION RECORD (PQR) YES (x)

Company Name ARC ENT. INC.
Welding Process(es) GMAW
Supporting PQR No.(s) ARC PQR 5M3-2

Identification # ARC WPS 5M3-2
Revision 1 Date 9/18/2013 By SVH
Autherized by STEVE HOWARD Date 5/14/2012
Type - Manual Semi - Automatic (X)
Machine ( ) Automatic ( )

JOINT DESIGN USED
Type FILLET
Single (X) Double Weld ( )
Backing ( ) NO
Backing Material
Root Opening 0 Root Face Dimension
Groove Angle Radius (J-U)
Back Gouging Method

BASE METALS
Material Spec A709
Type or Grade 36 50 50W
Thickness Groove Fillet UNLIMITED
Diameter (Pipe)

FILLER METALS LINCOLN L-56
AWS Specification A5.18
AWS Classification ER70S-6

SHIELDING
Flux
Gas 98/2
Composition 98Argon 2 oxygen
Electrode - Flux (Class)
Flow Rate 36-52 cfh
Gas Cup Size 5/8"

Preheat up to 3/4" - 50 degress F 3/4"-1 1/2" - 70 degress F
1 1/2" - 2 1/2" - 150 degress
over 2 1/2" - 225 degress F

POSITION
Position of Groove Fillet 1F 2F
Vertical Progression ( )

ELECTRICAL CHARACTERISTICS
Transfer Mode (FCAW) Short Circuiting ( )
Globular ( ) Spray (X)
Current : AC ( ) DCEP (X) DCEN ( )
Pulsed ( )
OTHER :

TECHNIQUE
Stringer or Weave Bead STRINGER
Multi-pass or Single Pass (per side) SINGLE/MULTI
Number of Electrodes ONE
Electrode Spacing Longitudinal
Lateral
Angle
Contact Tube to Work Distance 5/8" - 3/4"
Peening
Interpass Cleaning : HAND AND POWER TOOLS

POSTWELD HEAT TREATMENT
Temp
Time

WELDING PROCEDURE

Pass or Weld Layer(s)	S	Filler Metals		Current		Volts	Travel Speed	Joint Details
		Class	Diameter	Type & Polartiy	Amps or Wire Feed Speed			
1	3/16"		.035"	DCEP	209-255	24.9-28.5	8.1-9.9 ipm	
1	1/4"		.035"	DCEP	209-255	24.9-28.5	8.1-9.9 ipm	
1	5/16"		"	"	"	"	8.1-9.9 ipm	
2	3/8"		"	"	"	"	8.1-9.9 ipm	
3	7/16"		"	"	"	"	8.1-9 ipm	
3	1/2"		"	"	"	"	8.1-9 ipm	

No welds over 5/16" with this wire for 50W!

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Welding Procedure Specification (wps) Yes (X)
PREQUALIFIED ___ QUALIFIED BY TESTING ___X___
or PROCEDURE QUALIFICATION RECORD (PQR) YES ( )

Company Name A.R.C. Enterprises, Inc.
Welding Process(es) SAW
Supporting PQR No.(s) ARC PQR # 45

Identification # ARC WPS #45
Revision 7 Date 5/1/2013 By SVH
Authorized by STEVE HOWARD Date 5/1/2013
Type - Manual Semi - Automatic ( )
Machine ( ) Automatic x

JOINT DESIGN USED
Type B-L2c-S
Single Double Weld (X)
Backing ( ) NO (X)
Backing Material
Root Opening 0" Root Face Dimension 1/4" min
Groove Angle 60 degrees Radius (J-U)
Back Gouging (YES) Method open

BASE METALS
Material Spec A709
Type or Grade 50W HPS50W
Thickness Groove U Fillet
Diameter (Pipe)

FILLER METALS Lincoln LA-75
AWS Specification A5.23
AWS Classification ENi1K-Ni1-H8

SHIELDING
Flux 960 Lincoln Gas
Composition
Electrode - Flux (Class) Flow Rate
F8A2-ENi1K-Ni1-H8 Gas Cup Size

Preheat 3/4" = 50 degrees 3/4" - 1 1/2" = 70 degrees.
1 1/2" - 2 1/2" = 150 degrees Over 2 1/2" = 225 degrees F.

POSITION
Position of Groove 1G Fillet
Vertical Progression ( )

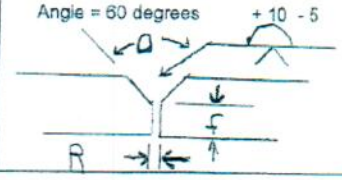
ELECTRICAL CHARACTERISTICS
Transfer Mode (FCAW) Short Circuiting ( )
Globular ( ) Spray (X)
Current : AC ( ), DCEP (X) DCEN ( )
Pulsed ( )
OTHER :

TECHNIQUE
Stringer or Weave Bead STRINGER
Multi-pass or Single Pass (per side) MULTI
Number of Electrodes ONE
Electrode Spacing Longitudinal
Lateral
Angle
Contact Tube to Work Distance 1"1/4 stickout +/-1/4"
Peening none
Interpass Cleaning : Hand or Power tools

POSTWELD HEAT TREATMENT
Temp

WELDING PROCEDURE Min. heat input=37.3 Kj/in. Max heat input= 70.4 Kj/in.

Pass or Weld Layer(s)	S	Filler Metals		Current		Volts	Travel Speed	Joint Details	
		Class	Diameter	Type & Polartiy	Amps or Wire Feed Speed				Tolerance
	SAW	ENi1K	3/32"	DCEP	360-440	28-32	14-16.2 ipm	Root = 0"	+ 1/16"
								Face = > 1/2" - 1" = 1/4"	+ 1/4"
								> 1" - 1 1/2" = 3/8"	+ 1/4"
								> 1 1/2" - 2" = 1/2"	+ 1/4"
								Angle = 60 degrees	+ 10 - 5



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WELDING PROCEDURE SPECIFICATION (WPS) YES (X)

PREQUALIFIED __x__ QUALIFIED BY TESTING _____

or PROCEDURE QUALIFICATION RECORD (PQR) YES (x)

Company Name ARC Enterprises, Inc.

Welding Process(es) SMAW

Supporting PQR No.(s) _____

Identification # ARC WPS # 40

Revision 3 Date 6/8/2012 By SVH

Autherized by STEVE HOWARD Date 6/8/2012

Type - Manual (X) Semi - Automatic ( )

Machine ( ) Automatic ( )

JOINT DESIGN USED

Type Groove - repair

Single Double Weld ( )

Backing ( ) NO

Backing Material _____

Root Opening _____ Root Face Dimension _____

Groove Angle 60 degrees Radius (J-U) _____

Back Gouging Method _____

BASE METALS

Material Spec A709

Type or Grade 36 50 50W

Thickness Groove unlimited See below _____

Diameter (Pipe) _____

FILLER METALS

AWS Specification A5.5

AWS Classification E8018-C3-H4R

SHIELDING

Flux _____ Gas _____

Composition _____

Electrode - Flux (Class) Flow Rate _____

_____ Gas Cup Size _____

pre-heat up to 3/4"=50 degrees F 3/4"-1 1/2" = 70 degrees F
70 degrees F when steel temp is equal to or less than 0 degrees F.
1 1/2" - 2 1/2" = 150degrees F over 2 1/2" = 225 degrees F

POSITION

Position of Groove horizontal Fillet _____

Vertical Progression ( )

ELECTRICAL CHARACTERISTICS

Transfer Mode (FCAW) Short Circuiting ( )

Globular ( ) Spray

Current : AC ( ) DCEP (X) DCEN ( )

Pulsed ( )

OTHER : _____

TECHNIQUE

Stringer or Weave Bead stringer

Multi-pass or Single Pass (per side) multi-pass

Number of Electrodes _____

Electrode Spacing Longitudinal _____

Lateral _____

Angle _____

Contact Tube to Work Distance _____

Peening _____

Interpass Cleaning : _____

POSTWELD HEAT TREATMENT

Temp _____

Time _____

WELDING PROCEDURE

Pass or Weld Layer(s)	S	Filler Metals		Current		Volts	Travel Speed	Joint Details
		Class	Diameter	Type & Polartiy	Amps or Wire Feed Speed			
1 or more		E8018-C3	1/8"	DCEP	90 - 160	variable	8 ipm	
Weld layers	Flat = 1/8" V O & H = 3/16"		per 4.6.7					Run-off tabs required M.T. repair

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Heat Cambering and Straightening Procedure

Purpose: This procedure describes the method for heat cambering and straightening.

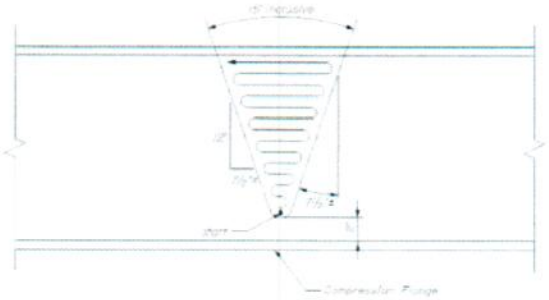
Responsibility: Production Manager

Procedure:

- Method of heating: #12 heating tip. Both sides shall be heated simultaneously.
  Gas / Oxygen: 18 – 31 psi – oxygen. 8 – 15 psi – gas.
  Heat range is 1,100 minimum to 1,125 maximum degrees Fahrenheit. Appropriate temp sticks shall be used to verify the above temperature requirements are met. The surface temperature of the heated areas shall be tested with the appropriate temp stick approximately ten (10) seconds after removal of the heat source. Temperatures exceeding 1,200 degrees Fahrenheit may be cause for rejection.
- Members to be heat cambered shall be supported at each end with the compression flange down.
- Heating patterns shall be equally spaced along the length of the girder. Heating shall begin at the midpoint of the girder and shall alternate either side of the girder midpoint working toward the ends of the girder.
- Web heating progression shall be according to the "half lap" technique. Once started, each heat pattern shall be carried on to completion without interruption. Each heat pattern shall be heated only once. Two (2) torches are to be used – one on each side of the girder web.

Flange heating procedure:

- Upon completing the web portion, heating of the flange areas shall commence without pause, also using the "half lap" technique. The flanges shall be concurrently heated top and bottom on each side of the flange centerline, heating from the web centerline toward the outside edge of the flange. Each flame heat shall alternate starting point from one side of the web centerline to the other side, reducing the possibility of sweep induction.
- After heat cambering, the heat patterns shall be allowed to cool in still air to 600 degrees Fahrenheit. If necessary, compressed air may be used to cool the beam below 600 degrees Fahrenheit.
- If the required camber has not been achieved, additional heat points shall be located evenly throughout the length of the girder at locations which have not been previously heated.
- All heating shall be carried out in the presence of the QA Inspector.



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Heat Straightening Procedure

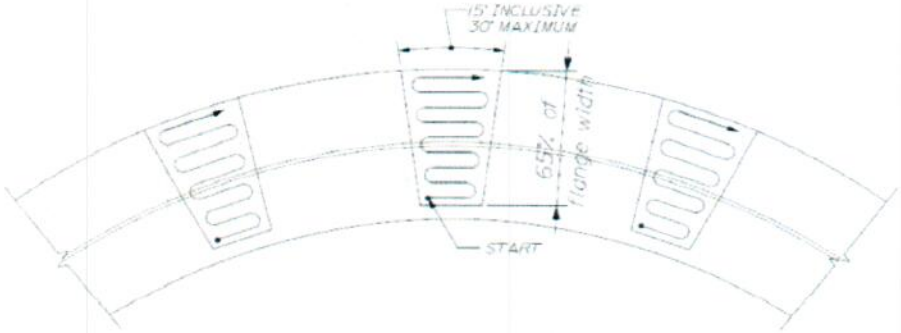
Purpose:

This procedure describes the method for heat straightening beams.

Responsibility: Production Manager

Procedure:

- Method of heating: #12 heating tip. Both sides shall be heated simultaneously.
  Gas / Oxygen: 18 – 31 psi (oxygen). 8 – 15 psi (gas).
  Heat range is 1,100 minimum to 1,125 maximum degrees Fahrenheit. Appropriate temp sticks shall be used to verify the temperature requirements are met. The surface temperature of the heated areas shall be tested with the appropriate temp stick approximately ten (10) seconds after removal of the heat source. Temperatures exceeding 1,200 degrees Fahrenheit may be cause for rejection.
- Members to be heat straightened shall be supported at each end (with sweep up) and shall be blocked to prevent excess movement.
- Heat patterns shall be placed from midpoint working toward both ends of the girder.

Flange heating procedure:

- Two (2) torches shall be used, concurrently heating both sides of the flange, starting at the inside of the sweep and working across the flange using the "half lap" technique.
- After heat straightening, the heat patterns shall be allowed to cool in still air to 600 degrees Fahrenheit. If necessary, compressed air may be used to cool the steel below 600 degrees Fahrenheit.
- If the required straightness has not been achieved, additional heat points shall be located evenly throughout the length of the girder at locations which have not been previously heated.
- All heat straightening shall be carried out in the presence of the QA Inspector.