



Eastend Iron Industries Ltd.  
6215 - 54 Avenue  
Taber, AB T1G 1X4

Phone: (403) 223-2620  
Fax: (403) 223-8626  
[www.eastendiron.com](http://www.eastendiron.com)

Quality Control  
For the Repairs of  
Firetubes

Constructed for  
C.N.R.L.  
@ 5-14-18-10W4

Repaired By:  
Eastend Iron Ind. Ltd.  
Taber Alberta

AQP.-#2972  
Expires-July 27,2013  
WPS#2178.2 EII-2  
Job #101410F

# Certificate of Authorization Permit

## Quality Management System

Expiry Date: **July 27, 2013**

Reg. No.: **AQP-2972**

This is to certify that:

**EASTEND IRON INDUSTRIES LTD.**

**6006 - 54 AVENUE  
TABER, ALBERTA**

having complied with the provisions of the SAFETY CODES ACT, is hereby authorized to:

**Construct, Repair/Alter ASME B31.1 Power Piping, Boiler External Piping and ASME B31.3 Process Piping**

**Repair/Alter ASME Section I Power Boilers, ASME Section IV Heating Boilers and ASME Section VIII-1 Pressure Vessels**

at the SHOP and FIELD sites controlled from the above address.



Dated at Edmonton, this 30th day of July, 2010

A handwritten signature in blue ink, appearing to read "L. Chan".

Chief Inspector and Administrator

Certificate No.: 7541

# Certificate of Authorization Permit

## Quality Management System

Expiry Date: **July 27, 2013**

Reg. No.: **AQP-2972**

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**EASTEND IRON INDUSTRIES LTD.**

**6215 - 54 AVENUE  
TABER, ALBERTA**

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at the SHOP and FIELD sites controlled from the above address.



Dated at Edmonton, this 30th day of July, 2010

A handwritten signature in blue ink, appearing to read "L. Khan".

Chief Inspector and Administrator

Certificate No.: 7540









**EASTEND IRON IND. LTD.**  
**6215 54 AVENUE**  
**TABER ALBERTA T1G 1X4**  
**TELEPHONE (403) 223-2620**  
**FAX (403) 223-8626**

2011A

Welder Performance Qualification Card

WELDER NAME: *Cuong Dinh Nguyen*

WELDER SIGNATURE: *Cuong Dinh Nguyen*

WELDER ID: *W-16221*

WELDER PHOTO: *[Signature]*



Alberta  
LABOUR

ABSA

Welder Performance Qualification Card

WELDER NAME: *Cuong Dinh Nguyen*

WELDER SIGNATURE: *Cuong Dinh Nguyen*

WELDER ID: *W-16221*

WELDER PHOTO: *[Signature]*

DATE: *October 31, 1997*

**Bromley Mechanical Services**  
(Approved Organization) AD 517 No. 7119

**WELDER PERFORMANCE QUALIFICATION CARD**

*Cuong Nguyen W-16221*

9-April-09 *Cuong Nguyen*

Jack Bennett

Card No. *2413*

Card No. *2413*

**PERFORMANCE QUALIFICATION**

Process: *GTAW SMAW* Shielding Gas: *PA-PB*

Electrode: *ER706 E309L6* Wire Diameter: *1" O.D.*

Min. Thickness: *0.250* Max. Thickness: *0.436* Position: *6G-All*

Welding: *without with* Setting: *Argon*

Position: *uphill uphill*

9-April-2011 *Jack Bennett* *W-16221*

**Bromley Mechanical Services**  
(Approved Organization) AD 517 No. 7119

**WELDER PERFORMANCE QUALIFICATION CARD**

*Cuong Nguyen W-16221*

9-April-09 *Cuong Nguyen*

Jack Bennett

Card No. *2416*

Card No. *2416*

**PERFORMANCE QUALIFICATION**

Process: *SMAW SMAW* Shielding Gas: *PI-P11*

Electrode: *F3 F4* Wire Diameter: *1" O.D.*

Min. Thickness: *0.250* Max. Thickness: *0.622* Position: *6G-All*

Welding: *without with* Setting: *---*

Position: *uphill uphill*

9-April-2011 *Jack Bennett* *W-16221*

**Bromley Mechanical Services**  
(Approved Organization) AD 517 No. 7119

**WELDER PERFORMANCE QUALIFICATION CARD**

*Cuong Nguyen W-16221*

9-April-09 *Cuong Nguyen*

Jack Bennett

Card No. *2418*

Card No. *2418*

**PERFORMANCE QUALIFICATION**

Process: *SMAW SMAW* Shielding Gas: *PI-P11*

Electrode: *F3 F4* Wire Diameter: *1" O.D.*

Min. Thickness: *0.250* Max. Thickness: *0.436* Position: *6G-All*

Welding: *without with* Setting: *---*

Position: *DVhill uphill*

9-April-2011 *Jack Bennett* *W-16221*

FORMS





the pressure equipment safety authority

# BOILERS AND PRESSURE VESSELS REPAIR AND ALTERATION REPORT

(A) #: 2710237

OWNER EQUIP NO.: L-8-325

REPAIR  and/or ALTERATION  Partial  Final

1. **Name and Address of Organization** doing Repair/Alteration Eastend Iron Industries LTD.  
6215 54Ave. Taber Alberta T1G-1X4 AQP No. & Expiry Date 2972 July 27/2013  
 Location of Installation 5-14-18-10W4

2. **Name of Owner** C.N.R.L.  
 Address \_\_\_\_\_

3. **Boiler/Pressure Vessel Description** Horizontal (firtube) CRN H-0995.2  
 Manufacturer's Name C.E. Natco LTD. Serial No. L-8-325

4. **Design Conditions:**  
 a) Vessel/Shellside/Boiler: Max Allowable Working Press. 75 psi Min/Max Design Temp /200F  
 b) Jacket/Tubeside: Max Allowable Working Press. \_\_\_\_\_ Min/Max Design Temp /

5. **Description of defects** (location and types of deterioration that resulted in the repair/alteration). Pitts were found on one leg of the firtube, and touch up grinding required on fillet nweld (flange end)

6. **ASME Code Edition and Addenda** used for work: ASME Sect. VIII Year 2007 Addenda 2009

7. **Repair/Alter. Description of Work.** Step by step description of repair/alteration method, attach additional sheets as needed.

**Note 1:** Repair/Alteration Procedure to be accepted by ABSA SCO prior to start of work.

The pitts were ground out till sound metal was exposed, The areas were then baked out at 600F for one hour. The pitts were filled and capped using E-7018 electrodes. After welds were completed, the areas were wrapped with an insulating blanket to esure a slow cooling. The fillet weld on the flange end had minor grinding needed.

8. **Material** - List any material used in repair/alteration and any base material welded on:

Item	Mat'l Spec.	Thick/Sch	Diam	Item	Mat'l Spec.	Thick/Sch	Diam
Shell/Drum				Heads/ Ends			
Tubeshe				Tubes			
Nozzles				Flanges/Fitting		Class	

9. **Welding Procedure** – Alberta Registration Number WP- 2178.2 WPS Numbers used: EII2

10. **Heat Treatment:** Bake Out (Temp./Time) 600F / 1hr Preheat Temp 176F Post Weld HT (Temp./Time) NA/1 hr

11. **Non Destructive Examination** (Specify type and extent).

Dry mag done after welding, and wet mag 12 hours after work is done.



(A) #: 2710237 OWNER EQUIP. NO. L-8-325

2. Pressure Test Vessel/Boiler/Shellside Tubeside/Jacket  
 a) Hydrostatic NA NA  
 b) Other Test NA NA

13. **Welded Replacement Parts:** Attached are Manufacturer's Partial Data Reports or Repair/Alteration Reports properly identified and signed by Authorized Inspectors for the following items of this report. (Welded parts supplied by others).

14. **Responsibility Owner/Client.** Identify below items that the owner/client has assumed responsibility for. **Note (2)**

a) Design Submission NA b) Repair/Alteration Procedure: C c) Material Control NA  
 d) Welding Control NA e) NDE NA f) Heat Treatment NA g) Pressure Test NA

**Note 2:** Owner/client must have a valid Alberta Quality Program (AQP), for the scope of work, to assume responsibility for function c, d, e, f, or g.

15. **REMARKS:** No rejectable indications noted at time of the inspection.

16. **CERTIFICATE OF COMPLIANCE**

We certify that the statements made in this Report are correct and that all design, material, construction and workmanship on this repair/alteration conform to the requirements of the Alberta Safety Codes Act and Regulations.

a) For all items except for items identified in 14: b) For items identified in 14 only:

(Repair/Alteration Organization Name)  
AQP # 2972 July 27/ 2013  
 (AQP Number & Expiry Date)  
Perry Weinberger Oct 15/2010  
 (Signature & Date)  
Perry Weinberger  
 (Print Name)

(Owner/Client Organization Name)  
 \_\_\_\_\_  
 (AQP Number & Expiry Date)  
 \_\_\_\_\_  
 (Signature & Date)  
 \_\_\_\_\_  
 (Print Name)

17. DATE WORK WAS COMPLETED: October 15/2010

18. **CERTIFICATE OF INSPECTION**

I have inspected the repairs and/or alterations described in this report. To the best of my knowledge, this work has been done in accordance with the Safety Codes Act and Regulations and the requirements established in AB-513.

a) **Owner-User Inspection Certification (Field Only)**  
 (Required when Owner-User inspects the work under their ABSA Authorized Owner-User Quality Program).

b) **ABSA Safety Codes Officer Certification**  
 (when work is inspected by ABSA).

Owner-User AQP# & Expiry Date

In-Service Inspector Signature & Date

In-Service Inspector Name (Please Print)

In-Service Inspector Alberta Cert #

H Matheson Oct 15/10  
 ABSA SCO Signature & Date  
H Matheson  
 Print Name

Report Received by ABSA SCO \_\_\_\_\_ Date \_\_\_\_\_

<b>Vessel Title</b>	<b>Manufacturer/Serial Number</b>	<b>Identification Number</b>
Horizontal (firtube)	L-8-325	A#2710237
<b>CODE INSPECTOR REVIEW:</b>		<b>REVIEW DATE:</b>

Indicate Sequence Numbers And Hold Points Which Are Applicable By \*

Seq.	Operations	Hold Points	Comments	Rep. Org.	Code Insp.	Owner Insp.
1	Repair/Alteration Procedure Accepted by ABSA Safety Codes Officer/and OUP Inspector when applicable			Perry W 10/14/10	<i>[Signature]</i> OCT 15/10	<i>[Signature]</i> OCT 15/10
2	Welding Procedures Registered for Welding to be done			Perry W 10/14/10	<i>[Signature]</i> OCT 15/10	<i>[Signature]</i> OCT 15/10
3	Welders have valid Alberta P.Q. Card for work to be done			Perry W 10/14/10	<i>[Signature]</i> OCT 15/10	<i>[Signature]</i> OCT 15/10
4	Cracks MT/PT check after removal			Perry W 10/13/10		<i>[Signature]</i> OCT 15/10
5a	Materials to be used - checked against PO/Drawing			NA		
5b	- material identified with correct SA/SB specifications			NA		
5c	- material test reports checked against specifications			NA		
6a	Fit up - shell courses-flush patches-heads			NA		
6b	- tubesheet/shell - firtube			NA		
6c	- nozzles and fittings			NA		
7	Radiographic Examination			NA		
8	Ultrasonic Examination/MT/PT			Perry W 10/15/10		<i>[Signature]</i> OCT 15/10
9	Internal Visual after welding			Perry W 10/14/10		<i>[Signature]</i> OCT 15/10
10	External Visual after welding			Perry W 10/14/10		<i>[Signature]</i> OCT 15/10
11	Heat Treatment			Perry W 10/14/10		<i>[Signature]</i> OCT 15/10
12	Hardness Tests			NA		
13	Hydrostatic Pressure Test		Gauge No.'s	NA		
14	Alternative Test (Specify)			NA		
15	Nonconformance Report # _____ Cleared			NA		
16	Pressure Vessel Repair or Alteration Report (AB 40) completed			Perry W 10/15/10	<i>[Signature]</i> OCT 15/10	<i>[Signature]</i> OCT 15/10
17	Repair/Alteration Nameplate attached			NA		

**OUTLINE SKETCH**

(Record Welder's Symbols and Heat No.'s, Radiograph ID No.'s) Attach separate sketch if required.



**MATERIAL USED IN REPAIR/ALTERATION**

Item	Mat.'l Spec	Plate & Heads Heat & Plate#	Thk/	Sch.	Rating
Shell/Patches					
Heads' End					
Tubesheet					
Firetube					
Nozzles					
Fittings					

IRIS NDT  
REPORTS



Procedures: MT-2V IRIS 5.0  
Code: ASME V AND VIII  
DIV.1 APP.6

Job / P.O. #: \_\_\_\_\_  
Client: CNRL  
Location: CA-Medicine Hat Alberta  
Item inspected: FIRE TUBE

IRISNDT #: 150063

Date: 14-Oct-10

Surface Condition: Painted  Sandblasted  Machined  As Cast  As Forged  Weldment  Other

Material: C.S. Thickness: N/A Heat Treatment: NO

Magnetizing Equipment: Yoke  Coil  Prod  Bench: Headshot  Central Conductor  Coil   
IRISNDT #: 40062 Mfg: CONTOUR Calibration Date: 27-Sep-10

Blacklight:  IRISNDT #: \_\_\_\_\_ Mfg: \_\_\_\_\_ Calibration Date: --10  
 Verification per ASME V Art 7 T.777.2

Whitelight: Battery Powered Min. 3V  } Held within 30 cm (12in) of the inspection surface  
110V Power Min. 60W Bulb  } provides minimum 1000 Lx (100fc)

Method of Magnetization: AC  DC  Continuous  Residual

Magnetic Particles: Dry  Wet  Red  Grey  Black  Fluorescent   
Batch #: 1026 Mfg: MAGNAFLUX Type: 7C

Background:  Batch #: 1089 Mfg: ARDROX Type: 8901W

WET BLACK MAGNETIC PARTICLE INSPECTION HAS BEEN CARRIED-OUT ON THE FOLLOWING CHECKING FOR CRACKS;

**ITEMS INSPECTED:**

05-14-018-10 W4  
A# 2710237  
FIRE TUBE  
- ALL ACCESSIBLE EXTERNAL WELDS

**INSPECTION RESULTS:**

CRACK LIKE INDICATIONS FOUND, GROUND OUT (REMOVED) AND RE-INSPECTED AT THREE LOCATIONS;  
A - LENGTH 6" TRANSVERSE TO MITER WELD ON TUBE  
B - LENGTH 1/2" TRANSVERSE TO FLANGE WELD ON TUBE  
C - LENGTH 1/2" FLANGE WELD

NO CRACK LIKE INDICATIONS FOUND AT THIS TIME OF INSPECTION -ACCEPTABLE-

**Inspection Limitation(s):**

Unit# 177	Kilometers _____	Consumables: MIN	Interpretation by: MICHAEL REDGWELL	SNT-TC-1A: <u>II</u>
In: _____	Out: _____	Hrs: _____	(Print) 	C.G.S.B. <u>8</u> (Level)
vt: _____	Out: _____	Hrs: _____	(Signature) _____	C.G.S.B. # <u>11272</u>
Personnel: _____			Client Representative: _____	
M.R. _____			I am in full agreement with report contents	
			(Print) _____	
			(Sign) _____	

Procedures: MT-2V IRIS 5.0

Job / P.O. #:

IRISNDT #: 150083

Date: 15-Oct-10

Code: ASME V AND VIII  
DIV. 1 APP. 8

Client: CNRL

Location: CA-Medicine Hat Alberta

Item Inspected: FIRE TUBE

Surface Condition: Painted  Sandblasted  Machined  As Cast  As Forged  Weldment  Other 

Material: C.S.

Thickness: N/A

Heat Treatment: NO

Magnetizing Equipment: Yoke  Coil  Prod Bench Headshot  Central Conductor  Coil 

IRISNDT #: 40062

Mfg: CONTOUR

Calibration Date: 27-Sep-10

Blacklight:   

IRISNDT #:

Mfg:

Calibration Date: --10

Verification per ASME V Art 7 T.777.2

Whitelight:

Battery Powered Min. 3V  
110V Power Min. 60W Bulb }  
 }Held within 30 cm (12in) of the inspection surface  
provides minimum 1000 Lx (100fc)Method of Magnetization: AC  DC  Continuous  Residual 

Magnetic Particles:

Dry  Wet Red  Grey  Black  Fluorescent 

Batch #: 1026

Mfg: MAGNAFLUX

Type: 7C

Background: 

Batch #: 1089

Mfg: ARDROX

Type 8901W

WET BLACK MAGNETIC PARTICLE INSPECTION HAS BEEN CARRIED-OUT ON THE FOLLOWING:

ITEMS INSPECTED:

05-14-018-10 WEST 4

# 2679781

FIRE TUBE

12 HOURS AFTER WELDING

- WELD BUILD-UP ON TOP SIDE OF TUBE AT ISOLATED PITTING

INSPECTION RESULTS:

NO REJECTABLE INDICATIONS FOUND AT HIS TIME OF INSPECTION - ACCEPTABLE - TO CODE

## Inspection Limitation(s):

Unit: 177	Kit/Tools: _____	Conservables MIN	Interpretation by MICHAEL REDGWELL	SNT-TC-1A # _____
In: _____	Out: _____		(Print) 	C.G.S.B. # _____
W: _____	Out: _____		(Signature) _____	C.G.S.B. # 11272
Personnel			Client Representative: (Print) _____	
M.R.			I am in full agreement with report contents. (Sign) _____	

1011 - 95 Street Edmonton, Alberta, T6E 2T9 Phone: (780) 437-2022 Fax: (780) 438-1438

Calgary (403) 279-6121  
Edmonton (780) 475-5455  
Fort McMurray (780) 575-5016  
Medicine Hat (780) 535-7918Cold Lake (780) 534-1114  
Fort McMurray (780) 743-1030  
High Level (780) 950-4004  
Red Deer (403) 347-1742  
Medicine Hat (403) 427-6284Corpus Christi, TX (361) 888-4700  
Dover Park, TX (281) 478-4494  
Merida Junction, TX (713) 722-7177  
Tulsa City, TX (409) 345-2282  
Tulsa, OK (918) 445-8774

IRISNDT 2-2013

Procedures: MT-1V IRIS 5.0  
Code: ASME V AND VIII  
DIV.1 APP.B

Job / P.O. #: \_\_\_\_\_ IRISNDT #: 150063  
Client: CNRL  
Location: CA-Medicine Hat Alberta  
Item Inspected: FIRE TUBE

Date: 14-Oct-10

Surface Condition: Painted  Sandblasted  Machined  As Cast  As Forged  Weldment  Other

Material: C.S. Thickness: N/A Heat Treatment: NO

Magnetizing Equipment: Yoke  Coil  Prod  Bench Headshot  Central Conductor  Coil   
IRISNDT #: 40062 Mfg: CONTOUR Calibration Date: 27-Sep-10

Blacklight:  IRISNDT #: \_\_\_\_\_ Mfg: \_\_\_\_\_ Calibration Date: --10  
 Verification per ASME V Art 7 T.777.2

Whiteflight: Battery Powered Min. 3V  } Held within 30 cm (12in) of the inspection surface  
110V Power Min. 50W Bulb  } provides minimum 1000 Lx (100fc)

Method of Magnetization: AC  DC  Continuous  Residual

Magnetic Particles: Dry  Wet  Red  Grey  Black  Fluorescent   
Batch #: 1026 Mfg: MAGNAFLUX Type: 8A

Background:  Batch #: \_\_\_\_\_ Mfg: \_\_\_\_\_ Type: \_\_\_\_\_

DRY RED MAGNETIC PARTICLE INSPECTION HAS BEEN CARRIED-OUT ON THE FOLLOWING:

ITEMS INSPECTED:

05-14-018-10 W4  
# 2710237  
FIRE TUBE  
- WELD BUILD-UP ON TOP SIDE OF TUBE AT ISOLATED PITTING

INSPECTION RESULTS:

NO REJECTABLE INDICATIONS FOUND AT THIS TIME OF INSPECTION -ACCEPTABLE- TO CODE

Inspection Limitation(s):

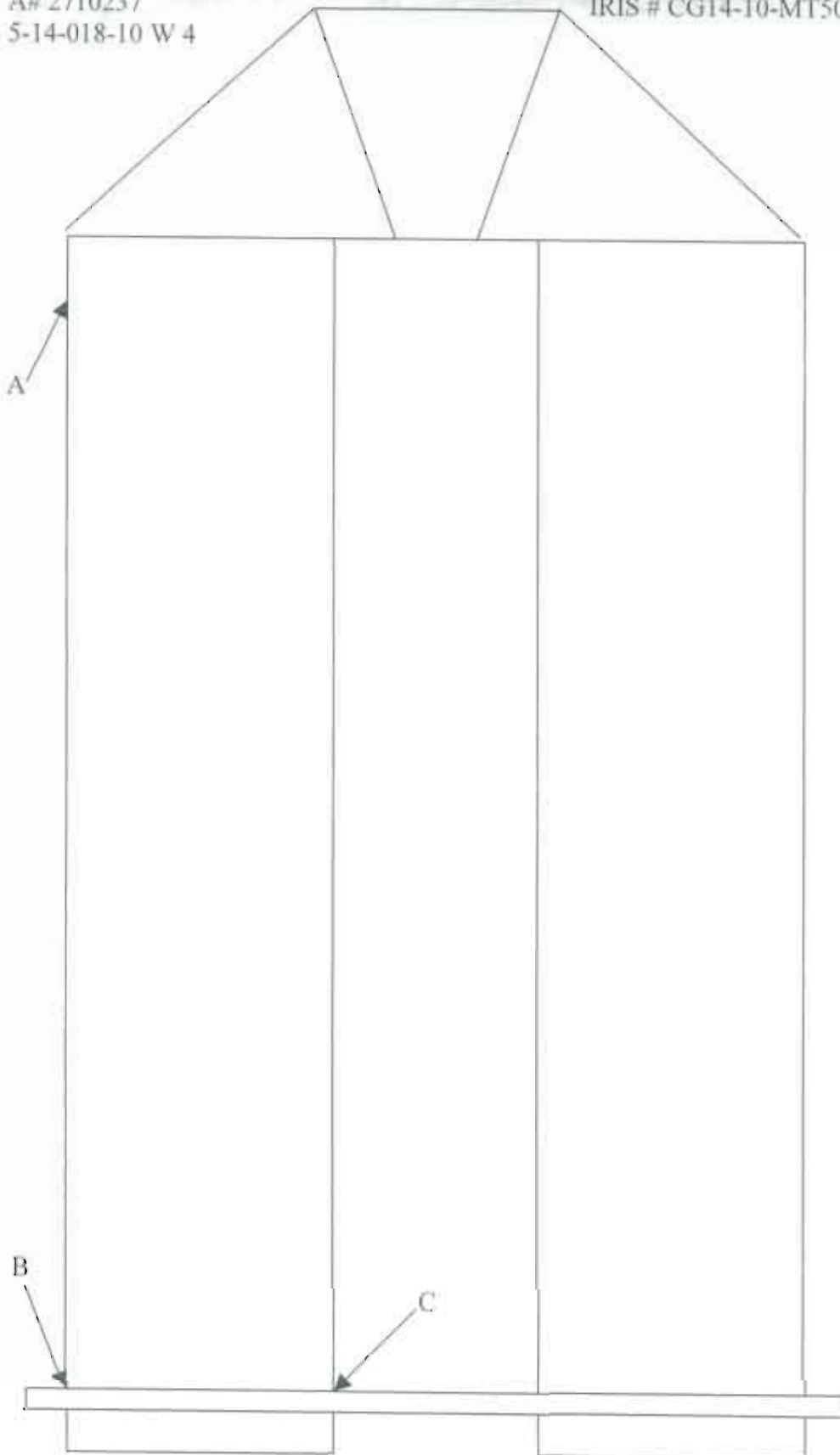
Unit: 17 In: _____ Out: _____ In: _____ Out: _____ Personnel: M.R.	Consumables: MIN	Interpretation by: MICHAEL REDGWELL (Print)  (Signature) Client Representative: (Print) _____ I am in full agreement with report contents (Sign) _____	SNT-TC-1A <u>  8  </u> C.G.S.B. <u>  8  </u> C.G.S.B. # <u>  11272  </u>
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# IRIS NDT

A# 2710237  
5-14-018-10 W 4

IRIS # CG14-10-MT503





## CNRL OUP REPAIR PROCEDURE 2: WELD BUILD-UP OF WASTED AREAS

A#:	2710237	Facility:	Medicine Hat West; Ralston
CRN#:	H0995.2	LSD:	5-14-018-10W4
S/N:	L-8-325		
MAWP:	75 Psig	Vessel Description:	8' X 25' Horizontal Treater
Material:	SA-516-70		
Vessel Head Thickness:	Hot: .667" Cold: .598"	Scope of Work:	Weld build-up of pitted areas on fire tube as per Iris report and mark-ups
Vessel Shell Thickness:	.375"		
Owner's Inspector:	Stephanie Simm Iris NDT		
Repair Organization:	Eastend Iron Taber		
Date(s) of Repair:	October 15, 2010		

### SCOPE

*Anthony* The weld build-up of wasted areas in the shell, head, or firetube in an ASME Section VIII Division I pressure vessel constructed of P-I Group 1 or 2 materials. Weld build up shall not exceed the lesser of one-half the vessel wall thickness or a maximum of 12.7mm (1/2 inch).

Materials shall be of the same specification, grade, and dimensions as defined in the manufacturer's original registered design.

### PROCEDURE

#### Weld Preparation

1. The area to be welded shall be cleaned to white metal for a distance of 10 mm beyond the expected weld area. Stress raisers such as sharp edges of pits shall be removed or contoured by grinding.



2. The weld area shall be UT and Wet Fluorescent MT examined for laminations and surface discontinuities. If laminations or surface discontinuities are identified they shall be brought to the attention of the Chief Inspector.

**Hydrogen Bake out and Sulfur Removal** (Remove this section if vessel has not been in sour service):

3. Vessels that have been exposed to sour or sulfur bearing process streams shall required the weld attachment area to undergo a "Bake Out" procedure. This procedure shall consist of heating the weld attachment area and 10 cm on each side to 315 C (600 F) for and holding that temperature for a minimum of 60 minutes. Bake out should be done prior to cutting out, if cutout is done thermally. Stipulate controls methods.
4. Bake Out is performed by either induction coil (use thermocouples as control instrumentation) or propane torch (use temperature-sensitive crayons – upper and lower temperature to be controlled). Oxyacetylene torches are not acceptable.
5. If induction coils are used, a 250 C (482 F) four-hour heat treatment may be substituted for the normal 315 C (600 F) one-hour heat treatment.

**Welding**

6. Minimum pre-heat shall be 80 C (176 F) for a 100 mm band on both sides of the weld attachment area.
7. The CNRL Owner's Inspector shall witness the seal on the box being broken and ensure that once the box has been opened the electrodes are stored in an oven.
8. Welding shall be in accordance with the contractor's registered WPS utilizing new 2.4 (3/32 inch) E 7018-1 electrodes.
9. Use only stringer beads where the width of the weld weave is a maximum of 7 mm.
10. No down hand welding shall be used.
11. Perform dry powder MT on the first layer of welding.
12. Maximum inter-pass temperature shall not exceed 230 C (450 F)
13. Once the welds are completed the weld area shall be wrapped with an insulating blanket and allowed to slow cool to 100 C (212 F). The cooling rate shall not exceed 260 C (500 F) / hour.
14. Once the finished weld has cooled below 100 C (21 F) grind off the cap of the weld smooth and contour to the original shape.
15. IF vessel is PWHT, perform PWHT as per U1A by either oven or stress-relief truck. - NOT REQ'D

**Post Welding NDE**

16. MT 12 hours after completion of the work
17. No hydro-test is required.

### Documentation

18. The CNRL Owner's Inspector must make sure that Contractor has completed required QC documentation and jurisdictional documents.
19. The CNRL Owner's Inspector must sign off the jurisdictional documents and make sure one copy is submitted to the jurisdictional authority and one is included in the QC package.
20. Mail a hard copy of QC Documentation to:  
Anthony Merle c/o CNRL  
Suite 2500, 855 - 2<sup>nd</sup> Street SW  
Calgary AB, T2P 4J8



Procedure 2 Checklist: Weld Build-Up of Wasted Areas. A# 2710237

Section	Comments	Sign Off	Date
Scope			
Procedure			
Weld Preparation			
Step 1		Benny Weinberger	Oct 14/2010
Step 2		Benny Weinberger	Oct 14/2010
Hydrogen Bake Out and Sulphur Removal			
Step 3		Benny Weinberger	Oct 14/2010
Step 4		Benny Weinberger	Oct 14/2010
Step 5		NA	
Welding			
Step 6		Benny Weinberger	Oct 14/2010
Step 7			
Step 8		Benny Weinberger	Oct 14/2010
Step 9		Benny Weinberger	Oct 14/2010
Step 10		Benny Weinberger	Oct 14/2010
Step 11		Benny Weinberger	Oct 14/2010
Step 12		Benny Weinberger	Oct 14/2010
Step 13		Benny Weinberger	Oct 14/2010
Step 14		Benny Weinberger	Oct 14/2010
Step 15	N/A	NA	
Post Welding NDE			
Step 16		Benny Weinberger	Oct 15/2010
Step 17		NA	
Documentation			
Step 18			
Step 19		Benny Weinberger	Oct 15/2010
Step 20			







# EASTEND IRON INDUSTRIES (1995) LTD.

7215 - 54 Avenue SER. NO. LSJ157608

Taber, Alberta T1G 1X4

Telephone (403) 223-2620

Fax (403) 223-8626

WELDING PROCEDURE SPECIFICATION NO: E11-2

WELDING PROCEDURE QUALIFICATION RECORD NO(S): PO5, PO8, P, P

### QUALIFIED FOR

Base Metal (Typical): P1 Groups 1 & 2 to P1 Groups 1 & 2 (SA 333 Gr. 6, SA 420 WPL6, SA 350 Gr. LF2, SA 516 Gr. 70 etc.)

Process(es): SMAW Weld Types: GROOVE & FILLET

Position: ALL POSITIONS Diameter: ALL DIAMETERS

Filler Metal: E6010 E7018-1

### BASE METAL CONDITIONS & THICKNESS RANGE QUALIFIED:

#### NOTCH TOUGHNESS APPLICATIONS TO -46°C AS WELDED

ASME B31.1 3.2 to 19.1 mm (0.125 to 0.750 in.) inclusive

ASME B31.3 3.2 to 19.1 mm (0.125 to 0.750 in.) inclusive

ASME SECT. VIII, DIV. 1 3.2 to 38.1 mm (0.125 to 1.50 in.) inclusive

ALBERTA BOILERS SAFETY ASSOCIATION  
 PROVINCE OF ALBERTA  
 SAFETY CODES ACT  
 WELDING PROCEDURE

Reg. No. WP 31782

Spec. No. E11-2

Weld Process SMAW

MANUFACT. GR. P. No. 1 Gr. 12 TO P. No. 1 Gr. 12

Elec. Gr. P. No. 344 A No. 1

Th. Qual. For 3.2 to 38.1 mm PWHT NO

C.V.N. -46°C

Valid Mo. 7 Day 30 Signed [Signature]  
 R. ROSSBERG, P. ENG.  
 WELDING SPECIALIST

PROVINCIAL REGISTRATION



## QW-482 WELDING PROCEDURE SPECIFICATION (WPS)

Eastend Iron Industries (1995) Ltd., 6215 - 54 Avenue, Taber, Alberta T1G 1X4  
Welding Procedure Specification No. EII-2 Date July 21, 1999  
Revision(s) ---  
Supporting PQR No. (s) PQ5, PQ6, PQ7  
Welding Process(es) SMAW Type(s) Manual

### JOINTS (QW-402)

Joint Design All ASME groove & fillet, reference construction drawing for joint details, where joint details are not specified, refer to figures 1 to 15 attached  
Backing With or without Root Opening 0 - 6.4 mm (0 - 1/4 in.)  
Retainers Not required

### BASE METALS (QW-403)

P-Number P1 Groups 1 & 2 To P-Number P1 Groups 1 & 2  
Thickness Range: Groove See cover page for thickness qualified by governing code  
Fillet All base metal thicknesses  
Pipe Diameter Ranges: Groove All diameters  
Fillet All diameters  
Deposited Weld Metal (Per Pass) 12.7 mm (0.500 in.) maximum

### FILLER METALS (QW-404)

Specification No. (SFA) SFA 5.1 SFA 5.1  
AWS No. (Class) E6010 E7018-1  
F-No. F3 F4  
A-No. A1 A1  
Size 3/32 to 5/32 in. inclusive 3/32 to 1/4 in. inclusive  
Deposited Weld Metal Thickness Range:  
Groove 6.35 mm (0.250 in.) max 38.1 mm (1.50 in.) max  
Fillet All fillet sizes All fillet sizes

### POSITION (QW-405)

Position of Groove All positions Position of Fillet All positions  
Weld Progression F3: Vertical up or vertical down F4: Vertical up

### PREHEAT (QW-406)

Preheat Temperature (Minimum) See attached preheat sheet  
Interpass Temperature (Maximum) 232°C (450°F)  
Preheat Maintenance Per attached preheat sheet prior to welding. Preheat maintenance is not required if welding is interrupted or after the completion of welding.



WPS NO. EII-2

**POST WELD HEAT TREATMENT (QW-407)**

Temperature Range None Time Range N/A

**ELECTRICAL CHARACTERISTICS (QW-409)**

Current Direct Polarity Reverse, electrode positive  
 Amps See Table #1 Volts See Table #1  
 Maximum Heat Input See Table #1

Base Metal Thickness Range	E6010 Electrode	E7018-1 Electrode
(0.125 - 0.499 in. T)	25 793 J/in.	39 103 J/in.
(0.500 - 0.624 in. T)	32 775 J/in.	72 833 J/in.
(0.625 - 1.50 in. T)	35 526 J/in.	84 682 J/in.

**TECHNIQUE (QW-410)**

String or Weave F3: String F4: Either Travel Speed See Table #1  
 Initial & Interpass Cleaning Brushing, chipping or grinding as required  
 Method of Back Gouging Air carbon arc, back-grind as required  
 Multiple or Single Pass Per Side Either  
 Multiple or Single Electrodes Single  
 Peening Not required

**TABLE 1 - WELDING PARAMETERS**

Process	Filler Metal	Diameter mm(in.)	Current Type & Polarity	Amperage Range	Voltage Range	Travel Speed mm/min (ipm.)
SMAW	E6010	2.4 (3/32)	DCRP	50 - 100	18 - 30	38 - 300 (1.5 - 12)
SMAW	E6010	3.2 (1/8)	DCRP	60 - 140	19 - 32	48 - 350 (1.9 - 14)
SMAW	E6010	4.0 (5/32)	DCRP	115 - 250	21 - 32	104 - 400 (4.1 - 16)
SMAW	E7018-1	2.4 (3/32)	DCRP	60 - 110	17 - 26	18 - 300 (0.7 - 12)
SMAW	E7018-1	3.2 (1/8)	DCRP	90 - 150	18 - 28	23 - 350 (1.1 - 14)
SMAW	E7018-1	4.0 (5/32)	DCRP	110 - 220	19 - 28	38 - 400 (1.5 - 16)
SMAW	E7018-1	5.0 (3/16)	DCRP	160 - 320	20 - 30	53 - 500 (2.3 - 20)
SMAW	E7018-1	5.5 (7/32)	DCRP	240 - 350	21 - 32	91 - 550 (3.6 - 22)
SMAW	E7018-1	6.4 (1/4)	DCRP	300 - 400	22 - 32	119 - 550 (4.7 - 22)

Note: Welding parameters shall be adjusted to insure that the maximum heat input value specified in QW-409 above is not exceeded.

## TYPICAL GROOVE DESIGNS



Figure 1  
Single Square Butt

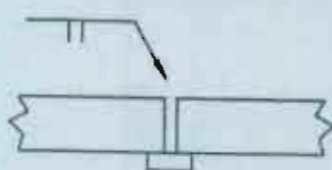


Figure 2  
Single Square Butt with Backing Strip

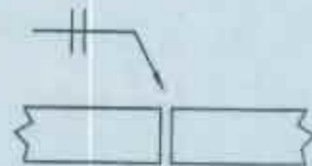


Figure 3  
Double Square Butt



Figure 4  
Single Vee Butt



Figure 5  
Single Vee Butt with Backing Strip



Figure 6  
Double Vee Butt

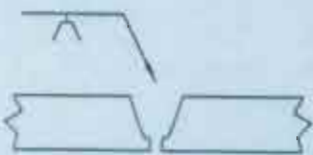


Figure 7  
Single U Butt



Figure 8  
Single U Butt with Backing Strip



Figure 9  
Double U Butt



Figure 10  
Single J Butt



Figure 11  
Single J Butt with Backing Strip



Figure 12  
Double J Butt

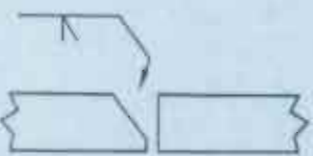


Figure 13  
Single Bevel Butt

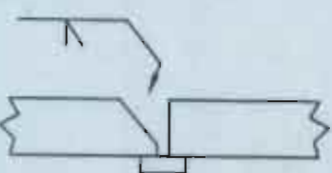


Figure 14  
Single Bevel Butt with Backing Strip



Figure 15  
Double Bevel Butt

Prepared By: Ludwig & Associates Ltd.

**PREHEAT**  
**P-No. 1 Groups 1, 2 & 3**

1. Welds joining pressure parts or attachments shall be preheated to not less than the minimum preheat temperatures stated in paragraph 6.
2. The preheat temperature shall be maintained during welding.
3. If welding is interrupted, the weld joint and adjacent areas shall be reheated to the minimum preheat temperature stated in paragraph 6, prior to the start of welding.
4. The preheated area shall not be less than 50.8 mm (2.0 in.) wide on each side of the weld.
5. Preheat temperatures shall be checked by the welder or inspector, using temperature indicating crayons or other reputable methods.
6. Minimum preheating temperatures shall be as follows:

**PRESSURE VESSELS IN ACCORDANCE WITH ASME SECTION VIII, DIV. 1**

NOMINAL WALL THICKNESS	MINIMUM PREHEAT TEMPERATURE
0 to 31.8 mm (0 to 1.25 in.)	10°C (50°F)
Over 31.8 mm (Over 1.25 in.)	93°C (200°F)
Over 25.4 mm (1.0 in.) & specified maximum carbon content in excess of 0.30%	80°C (175°F)

**CHEMICAL PLANT & PETROLEUM REFINERY PIPING IN ACCORDANCE WITH ASME B31.3**

NOMINAL WALL THICKNESS	MINIMUM SPECIFIED BASE METAL TENSILE STRENGTH	MINIMUM PREHEAT TEMPERATURE
< 25.4 mm (1.0 in.)	< 490 MPa (71 ksi)	10°C (50°F)
> 25.4 mm (1.0 in.)	All	80°C (175°F)
All	> 490 MPa (71 ksi)	80°C (175°F)

**POWER PIPING IN ACCORDANCE WITH ASME B31.1**

NOMINAL WALL THICKNESS	MINIMUM PREHEAT TEMPERATURE
Over 25.4 mm (1.0 in.) & specified maximum carbon content in excess of 0.30%	80°C (175°F)
All others	10°C (50°F)



### QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

Eastend Iron Industries (1995) Ltd. 6215 - 54 Avenue, Taber, Alberta T1G 1X4  
Procedure Qualification Record No. PQ5 Date July 13, 1999  
Welding Procedure Specification No. EII-2  
Welding Process(es) SMAW Type(s) Manual

#### JOINTS (QW-402)

Type Butt joint, single vee groove, see next page

#### BASE METALS (QW-403)

Material Spec. SA 333 to SA 350 Type or Grade Gr. 6 to Gr. LF2  
P-No. P1 Group 1 To P-No. P1 Group 2 Thickness 6.32 mm (0.249 in.)  
Diameter 114.3 mm (4.50 in.) O.D. Other Schedule 80 m/c to 0.249 in. w.t.

#### FILLER METALS (QW-404)

Specification No. (SFA)	<u>SFA 5.1</u>	<u>SFA 5.1</u>
AWS No. (Class)	<u>E6010</u>	<u>E7018-1</u>
Filler Metal F-No.	<u>F3</u>	<u>F4</u>
Filler Metal A-No.	<u>A1</u>	<u>A1</u>
Size of Electrode	<u>See attached sketch</u>	
Deposited Weld Metal Thickness	<u>2.39 mm (0.094 in.)</u>	<u>3.94 mm (0.155 in.)</u>

#### POSITION (QW-405)

Position of Groove 5G  
Weld Progression Vertical up

#### PREHEAT (QW-406)

Preheat Temperature 10°C (50°F) Interpass Temp. (Max.) 232°C (450°F)

#### POSTWELD HEAT TREATMENT (QW-407)

Temperature None Time N/A

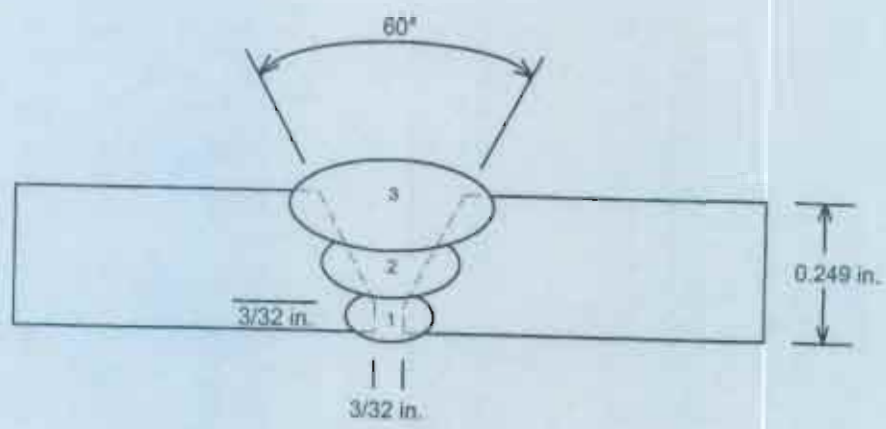
#### ELECTRICAL CHARACTERISTICS (QW-409)

Current	<u>Direct</u>	Polarity	<u>Reverse, electrode positive</u>
Amps	<u>See next page</u>	Volts	<u>See next page</u>
Heat Input	<u>F3: 25 793 J/in. Max.</u>		<u>F4: 39 103 J/in. Max.</u>

#### TECHNIQUE (QW-410)

String or Weave F3: String F4: Weave Travel Speed See next page  
Multiple or Single Pass Per Side Multipass from groove side  
Multiple or Single Electrodes Single

PQR NO. PQ5



Pass	Process	Filler Metal	Diameter mm (in.)	Current & Polarity	Amperage Range	Voltage Range	Travel Speed mm/min (ipm.)
1	SMAW	E6010	2.4 (3/32)	DCRP	70 - 80	22 - 25	104 (4.1)
2	SMAW	E7018-1	2.4 (3/32)	DCRP	90 - 100	20 - 22	99 (3.9)
3	SMAW	E7018-1	2.4 (3/32)	DCRP	85 - 95	20 - 22	74 (2.9)

PQR NO. PQ5

**TENSILE TEST (QW-150)**

Specimen No.	Width mm (in.)	Thickness mm (in.)	Area Sq. mm (Sq. In.)	Ultimate Load N (lbs.)	Ultimate Stress Mpa (Psi)	Character & Fracture Location
T1	18.9 (0.744)	5.00 (0.197)	94.5 (0.146)	47 600 (10,700)	504 (73,100)	Partial cup & cone Parent metal (Gr. 6)
T2	19.0 (0.748)	4.80 (0.189)	91.2 (0.141)	44 900 (10,100)	492 (71,400)	Partial cup & cone Parent metal (Gr. 6)

**GUIDED BEND TEST (QW-160)**

Type & Figure No.	Result	Type & Figure No.	Result
QW-462.3a, TFB - F1	Pass	QW-462.3a, TRB - R1	Pass
QW-462.3a, TFB - F2	Pass	QW-462.3a, TRB - R2	Pass

**CHARPY IMPACT TOUGHNESS**

Type of Test Charpy V Notch Orientation Transverse  
 Test Temperature -48°C (-55°F) Specimen Size 10 x 5 mm

Specimen No.	Notch Location	Impact Values J (ft. lbs)
C2.1	Weld Metal	41.0 (30.2)
C2.2	Weld Metal	46.1 (34.0)
C2.3	Weld Metal	50.2 (37.0)
C3.1	Gr. 6 - HAZ	65.6 (48.4)
C3.2	Gr. 6 - HAZ	102 (75.0)
C3.3	Gr. 6 - HAZ	75.9 (56.0)
C4.1	Gr. LF2 - HAZ	40.4 (29.8)
C4.2	Gr. LF2 - HAZ	44.7 (33.2)
C4.3	Gr. LF2 - HAZ	31.5 (23.2)

**OTHER TESTS**

Vickers hardness survey - see attached report, C99-474.8

Welders Name Larry Czerniak Certificate File No. W-12887  
 Tests Conducted By Ludwig & Associates Ltd.  
 Laboratory Test No. C99-474.8

We certify the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer EASTEND IRON INDUSTRIES (1995) LTD.

Date July 21, 1994 Signed [Signature]