UCS
UNITED CONTRACTING SERVICES, INC.

3989 N. OSAGE DR
Tulsa, OK 74127
918-551-7659

JOB NUMBER

S-4248-07

MATERIAL PURCHASING & RECEIVING		
PURCHASE	RECEIVED	
		COIL OR MILL PLATE ALL GRADES
		ANGLES, FLAT BARS, BEAMS, ETC.
		CUTTED OR BURNED "SS" OR HIGH GRADE
		CUTTED OR BURNED CARBON MATERIAL
		PLATE, ANGLE OR PIPE BENDED FROM VENDOR
		MISCELANEUS PARTS (PIPE, FITTINGS,ETC)
		BOLTS, NUTS , ETC.
		GASKETS
		INSULATION FIBER, ETC.
		PINS, ANCHORS FOR INSULATION, ETC
		PAINT, SAND ETC

CONSTRUCTION - FABRICATION		
		CUTTING & FORM MATERIAL
		WELD PARTS
		OWN INSPECTION
		HYDRO TEST ASSEMBLY
		SAND BLASTING & PAINT
		ADD PINS & INSULATION
		SHIPPING PREP.

INSPECTION FROM CUSTOMER		
		DIMENTIONAL INSPECTION
		X-RAY & HYDRO TEST INSPECTION
		PAINT, SHIPPING PREP &FINAL INSPECTION

OFFICE & QC PAPERWORK		
		ATTACH DWGS, MTRS, ITP ETC IN TO BOOK
		WELD MAPPING
		HYDRO TEST REPORT
		PAINT REPORT
		CERTIFICATE OF COMPLIANCE
		SCAN BOOK & SEND IT TO THE CUSTOMER

SK1 SPOOLS FAB

DUE: 03/10/17

UCS JOB NO. S-4248-07

MANUFACTURER DATA BOOK COVER SHEET

CUSTOMER	**: UOP (RUSSELL LLC)**
CUSTOMER JOB NUMBER	**: J-447/J-448**
SUPPLIER	: UNITED CONTRACTING SERVICES, INC.
SUB-SUPPLIER	: NONE
DOCUMENT DESCRIPTION	: MANUFACTURING DATA BOOK
EQUIPMENT DESCRIPTION	**: Pipe Spools & Skid Structures**
DATE	: 01-20-2016

UCS JOB NO. S-4248

Section 1

List of Contents

JOB: S-4248-07

UCS

UNITED CONTRACTING SERVICES, INC.

UCS JOB NO. S-4248-07

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UCS JOB NO. S-4248

Section 3

Completed Signed / JOB TRAVLER

JOB: S-4248-07

NOTE – The information in this document is confidential and the property of UOP LLC and must not be disclosed to others or reproduced in any manner or used for any purpose whatsoever without its written permission.

A Honeywell Company

UOPR SF-009

PROJECT SPECIFICATION

Job # J- 447
4500757620

REV	DATE	BY	CHK	APV	REV	DATE	BY	CHK	APV
0	3/8/2016	JB							

FABRICATORS PIPING & STRUCTURE INSPECTION PLAN
HONEYWELL UOP RUSSELL PROCESS PLANTS FOR CRYO, REFRIGERATION, AMINE,

REVISION	DESCRIPTION
0	Fabricators Skid ITP

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UOP

A Honeywell Company

UOPR SF-009

PROJECT SPECIFICATION

Job # J-447 4500757620

REV	DATE	BY	CHK	APV	REV	DATE	BY	CHK	APV
0	3/8/2016	JB							

FABRICATORS PIPING & STRUCTURE INSPECTION PLAN
HONEYWELL UOP RUSSELL PROCESS PLANTS FOR CRYO, REFRIGERATION, AMINE,

As a minimum, Fabricator shall review and inspect the Control Activities indicated below.

Fabricator shall provide inspectors (UOPR and Client) with Two (2) working days advance notice for inspection points (A1 and A2).

Fabricator shall provide UPOR QC with Two (2) working days written notification for hold points (H). E-mail is the preferred method of written notification.

Inspection Code:

A1 – 100% Actual Inspection
A2 – Random Inspection

R1 – 100% Review of Documentation
R2 – Random Review of Documentation

H – Hold Point – do not proceed until inspection by party requesting the hold is complete.
W—Witness Point – do not proceed until inspection by party requesting the witness point is Complete or (waived.)

AP – Approval Required
NA – Not Applicable

Control Activity	Governing Code or Specification	Required Inspections Initials and Date			
		Fabricator/ vendor	UOPR	Client	A.I/3rd party
Fabrication Inspection and Testing plan					
Review fabrication isometric drawings and PO Clarification SOP.	UOPR SOP-001 P&IDs ENG-14cf ENG-14ca ENG-14cas	R1	R1		
Review WPS's and PQR's	ENG-14cam ENG-13ap UOPR Quality Control Manual ASME D1.1 Weld Maps ASME Sec. IX		R1		

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A Honeywell Company

UOPR SF-009

PROJECT SPECIFICATION

Job # J-447

4500757620

REV	DATE	BY	CHK	APV	REV	DATE	BY	CHK	APV
0	3/8/2016	JB							

FABRICATORS PIPING & STRUCTURE INSPECTION PLAN
HONEYWELL UOP RUSSELL PROCESS PLANTS FOR CRYO, REFRIGERATION, AMINE,

Control Activity	Governing Code or Specification	Required Inspections Initials and Date			
		Fabricator/ vendor	UOPR	Client	A.I/3rd party
VT/Dimensional check of skid top (Done on Ground).	AWS D1.1 ENG-14de	A1 N/A	H		
Visually examine weld quality and dimensional check of ALL structural components.	AWS D1.1	A1 N/A	A1,H, A2		
Verify trial fit of upper and lower stacked skid structures, ladders, platforms, stairs, handrails and any additional bolt on attachments.		H, A1 N/A	H, A1		
Visually examine piping weld quality.	ENG-13aae ASME B-31.3	A1 5/25	A1,AP		
Conduct dimensional piping and fitting orientation check.	Structural Steel Plan, Elevation and Isometric drawings	H, A1 5/25	H, A1		
Review radiographs and NDE test reports	ASME B-31.3	R1 5/25	R1		
Witness pressure testing of piping. Verify pressure test results. **Chart Required.**	Line List ENG-13aae ASME B-31.3 HUR-1000	N/A	A1, R1		
Review skid documentation / data book.	ENG-13aae	R1 5/25	R1, AP		

5-25-17

NDE reports on 4

5-25-17

INDUSTRIAL PIPING SPECIALISTS

INDUSTRIAL PIPING SPECIALISTS, INC. • (918) 437-9100 • INDUSTRIAL PIPING SPECIALISTS I, LTD.
www.ipipes.com
REMIT TO: P.O. BOX 581270 • TULSA, OK 74158-1270

4248

Packing List

RELEASE #	T0383329-1
DATE	02/21/17
PAGE	1 OF 2

BILL TO
0000482
UOP RUSSELL LLC
c/o HONEYWELL INTERNATIONAL
PO BOX 981762
EL PASO, TX 79998-1762

SHIP TO
M
UNITED CONTRACTING
3989 N. OSAGE DRIVE
TULSA, OK 74127

Shipto Attn:

REQ DATE	SHIP DATE	CUSTOMER P/O NUMBER	PAYMENT TERMS
02/23/17		4500762726	
WRITTEN BY		CONTACT	SHIP VIA
BILL CAUGHRON		PURCHASING	IPS DELIVERY
FREIGHT TERMS		JOB NUMBER	SALES REP
NO CHARGE			35 /TUL

PRODUCT / DESCRIPTION	QUANTITY OPEN	U/M	QUANTITY SHIPPED	QUANTITY BACKORDERED	PRICE / EXTENSION

1 SKID DR-05 FZ 0.0 SKID-1
1 PCS PS-02 TL 0.0
1 PCS N-P TL 0.0

SKID-1; PCS-2 Weight: 0

Signature_____
All shortages must be reported in 5 working days*******

F610904/L 2 EA 2 0
1. 6" 10S LR 90 ELL A403 304/L CPN-5030765
MFG: - Ht#: 1415909 2 PC SKID-1

F615RFWN104/L 4 EA 4 0
20. 6" 150 RFWN 10S SA182 304/L
MFG: - Ht#: 99400 4 PC SKID-1

BR310S04/L 6 FT 6 0
3. 3" 10S EFW A312T304/L PE DR L CPN-5034058
1 PC L- 6' 0" SQ/SQ CTL
MFG: BR Ht#: 951344 PC

BR610S04/LX 17 FT 17 0
4. 6" 10S EFW A312T304/L DR XR AY CPN-5034064
1 PC L- 17' 0" SQ/SQ CTL
MFG: BR Ht#: V0H2 PC

CUSTOMER SIGNATURE

CUSTOMER COPY

TO THE BEST OF OUR KNOWLEDGE MERCHANDISE COVERED IN THIS INVOICE HAS BEEN PRODUCED AND DISTRIBUTED IN COMPLIANCE WITH THE REQUIREMENTS OF THE FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED. (FEDERAL WAGE AND HOUR LAW.)

THE ITEMS LISTED ABOVE WERE HEAT TREATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SPECIFICATION TO WHICH THEY WERE MANUFACTURED.
WE CERTIFY THAT THE PRODUCTS COVERED BY THIS REPORT COMPLY WITH THE APPLICABLE REQUIREMENTS OF ASTM AND/OR ASME SPECIFICATIONS, AS NOTED FOR EACH ITEM.

CONTINUED

SIGNED Warren R. Tatum

INDUSTRIAL PIPING SPECIALISTS

INDUSTRIAL PIPING SPECIALISTS, INC. • (918) 437-9100 • INDUSTRIAL PIPING SPECIALISTS I, LTD.
www.ipipes.com
REMIT TO: P.O. BOX 581270 • TULSA, OK 74158-1270

Packing List

RELEASE #	T0383329-1
DATE	02/21/17
PAGE	2 OF 2

BILL TO
0000482
UOP RUSSELL LLC
c/o HONEYWELL INTERNATIONAL
PO BOX 981762
EL PASO, TX 79998-1762

SHIP TO
M
UNITED CONTRACTING
3989 N. OSAGE DRIVE
TULSA, OK 74127

Shipto Attn:

REQ DATE	SHIP DATE	CUSTOMER P/O NUMBER	PAYMENT TERMS
02/23/17		4500762726	
WRITTEN BY		CONTACT	SHIP VIA
BILL CAUGHRON		PURCHASING	IPS DELIVERY
FREIGHT TERMS		JOB NUMBER	SALES REP
NO CHARGE			35 /TUL

PRODUCT / DESCRIPTION	QUANTITY OPEN	U/M	QUANTITY SHIPPED	QUANTITY BACKORDERED	PRICE / EXTENSION
D1X36-33SO4/L	2	EA	2	0	
5. 1" X 36-3 3M SOL SA182 304/ L CPN-5037557					
MFG: - Ht#: 1K6T	2 PC SKID-1				

Total Weight: 324.6800

CUSTOMER COPY

CUSTOMER SIGNATURE

TO THE BEST OF OUR KNOWLEDGE MERCHANDISE COVERED IN THIS INVOICE HAS BEEN PRODUCED AND DISTRIBUTED IN COMPLIANCE WITH THE REQUIREMENTS OF THE FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED. (FEDERAL WAGE AND HOUR LAW.)

THE ITEMS LISTED ABOVE WERE HEAT TREATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SPECIFICATION TO WHICH THEY WERE MANUFACTURED.
WE CERTIFY THAT THE PRODUCTS COVERED BY THIS REPORT COMPLY WITH THE APPLICABLE REQUIREMENTS OF ASTM AND/OR ASME SPECIFICATIONS, AS NOTED FOR EACH ITEM.

SIGNED Warren B. Tatum

[| 4500762726 | | 5030765 | 1415909] | [IN: 1] | T0383329-1 | F610904/L |

PO#: TP530369 Pack#:432226 Order#: 1042221 Lot# : SUI.1415909 Desc: 6 10S WLD LR 90 A/SA403 304/L SUI

SUPERINOX™
TUBES & PIPES & FITTINGS

ISO 9001:2008 CERT NO: 01 100 106091/02
DIRECTIVE 97/23/EC CERT NO: 01 202 CHN/Q-130513
AD 2000-MERKBLATT W0: 01 202 CHN/Q-130513

INSPECTION CERTIFICATE

SUPERINOX MAX FITTINGS INDUSTRY SDN. BHD. (405083-T)
No. 1584, MK 12, Jalan Nafiri,
Valdor Industrial Estate,
14200 Sungai Jawi, Penang, Malaysia.
Tel. : +604-5825511 Fax. : +604-5828811
E-mail : enquiry@superinox.com.my
Website : www.superinoxtubes.com

EN 10204 3.1

CONTRACT NO.
SHIPPER : SUPERINOX MAX FITTINGS INDUSTRY SDN. BHD.

CUSTOMER : GLOBAL GROUP COMPANIES
PURCHASE ORDER NO. : 211769,214512,214513,214514 & 214515
DELIVERY ORDER NO. : 00806
PRODUCT SPECIFICATION : STAINLESS STEEL BUTTWELD FITTINGS
ASTM A403/ASME SA403-B16.9

CERTIFICATE : 1059

DATE OF ISSUE : 02/08/2016
PAGE : 27 OF 35

PRODUCT & SIZE	QTY PCS	HEAT NO.	TENSILE TEST Y.S. N/mm²	T.S. N/mm²	EL. %	HARDNESS TEST HRB	EDDY CURRENT TEST	FLATTENING TEST	HEAT TREATMENT	DIMENSIONAL INSPECTION	PMI TEST	CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Ni	Cr	Mo
PO:214514																			
WP304/304L-W 6" L/R 90° Elbow SCH 10S	8	1415909	321	632	56	HRB≤90	OK	OK	1050° 15min	OK	OK	0.022	0.26	1.41	0.028	0.004	8.04	18.04	-
WP304/304L-W 3" x 1 1/2" Con Red SCH 10S	10	1430262-07	320	611	52	HRB≤90	OK	OK	1050° 15min	OK	OK	0.027	0.32	1.85	0.020	0.005	8.01	18.09	-
WP316/316L-W 6" x 5" Con Red SCH 40S	10	1320272-03	330	616	53	HRB≤90	OK	OK	1050° 15min	OK	OK	0.021	0.32	1.59	0.018	0.005	10.11	16.98	2.10
WP304/304L-W 4" x 3" Con Red SCH 40S	10	1413066-01	321	600	51	HRB≤90	OK	OK	1050° 15min	OK	OK	0.019	0.22	1.25	0.021	0.003	8.01	18.09	-
WP304/304L-W 5" x 3" Con Red SCH 40S	10	A1300170	303	565	50	HRB≤90	OK	OK	1050° 15min	OK	OK	0.028	0.42	1.65	0.030	0.002	8.07	18.02	-
WP316/316L-W 6" x 4" Con Red SCH 10S	10	1001720	328	569	54	HRB≤90	OK	OK	1050° 15min	OK	OK	0.022	0.58	1.12	0.030	0.003	10.11	16.08	2.02
WP304/304L-W 3" x 2 1/2" Con Red SCH 40S	5	A1301928	296	579	47	HRB≤90	OK	OK	1050° 15min	OK	OK	0.028	0.39	1.63	0.037	0.001	8.06	18.17	-

DEFINITION: T.S. = TENSILE STRENGTH, Y.S. = YIELD STRENGTH, E.L. = ELONGATION%

HEAT TREATMENT : MIN. 1040°C ±10°C QUENCHED IN WATER

QA DEPARTMENT

SUPERINOX MAX FITTINGS INDUSTRY SDN. BHD. ★ QA Depart

Pickled and Passivated
Material Resistant to Intercrystaline Corrosion Test According to ASTM A262, Practice E.
Material is Mercury and Radiation Free
Material in accordance with NACE MR0-175/ISO 15156
ISO 9001: 2008 Certified (01 100 106091/02)
PED Directive 97/23/EC Certified (01 202 CHN/Q-130513)
AD 2000-Merkblatt W0 Certified (01 202 CHN/Q-130513)

Materails was Manufactured, sampled, test and inspected in accordance with indicated Specification and had been found meeting the requirements
We hereby certify that the material described has been manufactured and tested with satisfactory results in accordance
with requirement of the above material specification.

[| 4500762726 | | 5034058 | 951344] | [LN: 3] | T0383329-1 | BR310S04/L |

BRISMET
BRISTOL METALS, LLC

MILL TEST REPORT

RM ID NUMBER
122885

SALES ORDER / RLS
008221 / 5

CERT ID / REV
00083497 / 01

SOLD TO

INDUSTRIAL PIPING SPECIALISTS
606 N. 145TH EAST AVE
TULSA, OK 74116
USA

CUSTOMER P.O.	CUSTOMER PART	HEAT NO.
TP357281		**951344**

DESCRIPTION:**303001003120200**
3" WELDED PIPE SCHED 10S TP304/TP304L (UNS# S30400/S30403) A312 DOUBLE RANDOM LENGTHS

CERTIFICATION REQUIREMENTS

ENGINEERING
ASTM A312-11 ASME SA312-10, 11a ADD.

HYDRO PRESSURE
1,000 PSI

HEAT TREAT
Annealed at1900 Deg F. and water quenched to below 800 Deg. F. in less than 3 minutes.

Chemical

C	Cr	Mn	Ni	N	P	Si	S
.022	18.4	1.65	8.1	.06	.035	.47	.010

Mechanical

TEST	UNITS	RESULTS
Tensile PSI	**PSI**	**93000**
Yield PSI	**PSI**	**47200**
Elong %		**55**

Hardness

RB87

TEST	RESULT
TG Bend	**Pass**

This report shall not be altered or reproduced, except in full, without the prior written approval of Bristol Metals LLC.
This test report represents the actual attributes of the items furnished and all items were manufactured, sampled, inspected, and tested in full compliance with applicable specifications and your purchase order.
Certification is in accordance with EN10204:2004 type 3.1.
Chemical content is % by weight. Mechanical test results are in English units (inches and pounds).
No weld repairs have been performed on the base material.
Hardness in accordance with NACE MR0175 and MR0103 and material is free of cold work to enhance mechanical properties.
Pipe is Pickled and Passivated in accordance with ASTM A380.
Bristol Metals has a Quality Management System in place that is in compliance with ISO 9001:2008.
Bristol Metals does not add mercury during any manufacturing process.
NAFTA country of orgin: USA. Pipe/Tube Manufactured in the USA.
Raw Material Melt Source USA
FAR BAA - Complies, DFARS BAA - Complies, FAR TAA - Complies

Rick Duncan

Rick Duncan - Quality Assurance Mgr

[| 4500762726 | | 5034064 | V0H2] | [LN: 4] | T0383329-1 | BR610S04/LX |

BRISMET
BRISTOL METALS, LLC

MILL TEST REPORT

RM ID NUMBER
134089
SALES ORDER / RLS
012605 / 2
CERT ID / REV
00121238 / 01

SOLD TO

INDUSTRIAL PIPING SPECIALISTS
606 N. 145TH EAST AVE
TULSA, OK 74116
USA

CUSTOMER P.O.	CUSTOMER PART	HEAT NO.
TP468519		**V0H2**

DESCRIPTION:**306001003121200**
6" WELDED PIPE SCHED 10S TP304/TP304L (UNS# S30400/S30403) A312 XRAY DOUBLE RANDOM LENGTHS

CERTIFICATION REQUIREMENTS

ENGINEERING
ASTM A312-14b ASME SA312-13

HYDRO PRESSURE
600 PSI

HEAT TREAT
Annealed at1900 Deg F. and water quenched to below 800 Deg. F. in less than 3 minutes.

Chemical

C	Cr	Mn	Ni	N	P	Si	S
.0227	18.0475	1.749	8.045	.0771	.0335	.2095	.0102

Mechanical

TEST	UNITS	RESULTS
Tensile PSI	**PSI**	**85330**
Yield PSI	**PSI**	**39880**
Elong %		**52.22**

Hardness

RB83

TEST	RESULT
TG Bend	**Pass**

NDE

TEST	RESULT
100% Radiography	**Pass**

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This test report represents the actual attributes of the items furnished and all items were manufactured, sampled, inspected, and tested in full compliance with applicable specifications and your purchase order.
Certification is in accordance with EN10204:2004 type 3.1.
Chemical content is % by weight. Mechanical test results are in English units (inches and pounds).
No weld repairs have been performed on the base material.
Hardness in accordance with NACE MR0175/ISO 15156-3:2009 and MR0103-2012 and material is free of cold work to enhance mechanical properties.
Pipe is Pickled and Passivated in accordance with ASTM A380.
Bristol Metals has a Quality Management System in place that is in compliance with ISO 9001:2008.
In compliance with Pressure Equipment Directive (PED) 97/23/EC as Category 1 material unless otherwise stated.
Bristol Metals does not add mercury dur
Raw Material Melt Source USA
FAR BAA - Complies, DFARS BAA - Complies, FAR TAA - Complies

Rick Duncan – Director of Technical Sales / Compliance

[| 4500762726 | | 5037557 | 1K6T] | [LN: 5] | T0383329-1 | D1X36-33S04/L |

TEXAS PMW, INC.
315 NORTH WAYSIDE DRIVE HOUSTON, TX 77020
(713) 670-7900 – FAX (713) 670-7920

PENNSYLVANIA MACHINE WORKS, INC.
201 BETHEL AVENUE ASTON, PA 19014
(610) 497-3300 – FAX (610) 497-3325

US DROP FORGE CO.
P.O BOX 131 – ROUTE 551
1366 AUBURN ROAD WOOLWICH TOWNSHIP, NJ 08085
(856) 467-0500 – FAX (856) 467-4538

CERTIFIED MATERIAL TEST REPORT

IND'L PIPING SPECIALISTS-TULSA
P.O. BOX 581270
TULSA, OK 74158-1270

P.O. TP531014
ORDER # 03 303849
1/11/17

36-3X1 **3M** **+SOL 304/L** QTY: 35

HEAT CODE: **1K6T** MATERIAL: **F304/304L**
ASTM SPEC: A182 SPEC. YEAR: 15 SPEC. REV:
HEAT TREATMENT: SOLUTION ANNEALED
UNS NUMBER: S30403

CHEMICAL ANALYSIS

C	MN	P	S	SI	NI	CR	MO	CU	N	CO
.015	**1.370**	**.035**	**.025**	**.370**	**8.070**	**18.610**	**.360**	**.530**	**.076**	**.120**

SN
.012

PHYSICAL ANALYSIS

YS (PSI)	TS (PSI)	%EL 4D % 4D	%RA %	HARDNESS (HB)	GRAIN	CHARP1 FT/LB	CHARP2 FT/LB	CHARP3 FT/LB
39000	**89000**	**77.000**	**57.600**	**163**	**10.00**	**94.000**	**88.000**	**89.000**

CHARP AV FT/LB	PMI	TEST@TMP (F)	EDDY	CORRO
90.330	**OK**	**-320**	**OK**	**OK**

CHARPY AVG CHARPY TEST REF;P0;82216
CORROSION TEST CORR. TEST PER ASTM A262 R.E OK
SOLUTION ANNEALED @ 1922F For .01 HOUR, WATER QUENCH

Country of Origin: Italy. Country of Origin is Country of Melt.
Manufactured to: ASME B31.1 & MSS SP-97

ASTM A182-14A
ASME SECTION II SA182 F304/304L 2015 EDITION NO ADDENDA
MATERIAL I/A/W ASME SEC II SA SPECIFICATION-CERTIFICATE I/A/W EN10204 TYPE 3.1
MATERIAL MEETS NACE-MR0175/ISO15156-2009
MATERIAL IS CAPABLE OF PASSING A CORROSION TEST TO ASTM-A262 PRACTICE "E"
MATERIAL PMI VERIFIED (POSITIVE MATERIAL IDENTIFICATION)BY X-RAY FLOURESCENCE (XRF) ANALYZER
MATERIAL MEETS NACE MR0103-2012
DURING THE MANUFACTURE AND PROCESSING OF THIS PRODUCT, IT DID NOT COME IN DIRECT CONTACT WITH MERCURY OR ANY OF ITS COMPOUNDS NOR WITH ANY MERCURY CONTAINING DEVICE THAT EMPLOYED A SINGLE BOUNDARY OF CONTAINMENT.
NO WELD REPAIRED MATERIAL - MADE IN THE U.S.A

WE HEREBY CERTIFY THAT THE REPORTED FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF THE CORPORATION.

James B Friant
(ES-ELECTRONIC SIGNATURE)
JAMES B. FRIANT
QUALITY MANAGER

MANUFACTURERS OF Penn FORGED PIPE FITTINGS
QUALITY • SERVICE • PARTNERSHIP
www.pennusa.com

PROFILES LTD.(FORGING DIVISION)

INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

Customer : GLOBAL STAINLESS SUPPLY HOU 8900-A RAILWOOD DRIVE SUITE B HOUSTON, TX 77078	ISO 9001:2008-TUV NORD REG.No-04100011170-IQ3 EXPIRY DATE : 21.01.2016	INVOICE NUMBER / MTR NO.	1002368/ 1
		DATE	29.02.2016
	AD 2000 MERKBLATT WO-0728031423 WP 1022/14 Q AS PER W2/W9/W10 EXPIRY DATE FEBRUARY 2017	MATERIAL SPECIFICATION	ASTM A182/A182M- 15 / ASME SA182/SA182M - 15
	PED 97/23/EC QMS REG.NO.0728021423 WZ 1022/14 Q EXPIRY DATE: FEBRUARY 2017	PURCHASE ORDER NO.	212371
		DESCRIPTION	STAINLESS STEEL FORGED FLANGES

CHEMICAL ANALYSIS

Sr.No	Item Description	Dimension Specification	Heat No	Qty	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	%Ti	%N		
1	F304/304L 6" WNRF 150# S10S	B16.5	99400	165.000	0.0220	0.860	0.350	0.0210	0.0360	18.320	8.050	0.280	0.0030	0.07200		
2	F304/304L 12" WNRF 300# S80S	B16.5	101126	6.000	0.0200	0.960	0.370	0.0270	0.0370	18.200	8.070	0.350	0.0070	0.07000		

MECHANICAL PROPERTIES

Sr.No	Heat No.	Tensile Strength (MPA)	Proof Stress Rp=0.2 % (MPA)	Proof Stress Rp=1.0% (MPA)	% Elongation LO=4D	% Reduction of Area	Hardness BHN	IMPACT TEST-CHARPY V-NOTCH AT +20 DEG. C (JOULES) 1	2	3	AVG
1	99400	575.780	286.990	340.550	60.40	71.34	160.0	168.0	170.0	172.0	170.0
2	101126	594.260	285.930	337.740	58.40	71.68	161.0	166.0	180.0	162.0	169.0

NACE CERT	: MATERIAL CONFORMS TO NACE MR 0175 / ISO 15156 - 2009 & NACE MR 0103 - 2012
MELTING PROCESS	: INDUCTION / AOD (IRS) / CONCAST
HEAT TREATMENT	: SOLUTION ANNEALED AT 1080°C AND WATER QUENCHED
DIMENSIONS	: CONFORM WITH THE SPECIFICATION (100% INSPECTED)
SURFACE QUALITY	: SATISFACTORY
PMI	: NO OBJECTION(100% TESTED WITH MOBILE SPECTRO)
INTER GRANULAR CORROSION TEST	: PASSED IGC TEST IN ACCORDANCE WITH ASTM A262 PRACTICE E
MICRO OBSERVATION	: NO CARBIDE PRECIPITATION OBSERVED ON GRAIN BOUNDARIES
RADIOACTIVITY TEST	: ALL THE ABOVE MATERIAL IS TESTED FOR RADIOACTIVITY AND FOUND WITH IN THE LIMIT OF BACKGROUND RADIATION
REMARKS	: NO WELD REPAIR WAS PERFORMED & ALL THE ITEMS ARE FREE OF WELD REPAIR : FREE FROM MERCURY CONTAMINATION

WE CERTIFY THAT THE MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE ORDER/CONTRACT AND IS OF INDIAN ORIGIN

MANUFACTURER'S SYMBOL

WORKS INSPECTOR

FACTORY : Survey No. 140/1, Saravali & G-75, MIDC Tarapur Industrial Area Boisar, Dist. Thane, Maharastra-401 506. INDIA. Tel.:(+91) 9049991036 to 1041 Fax: (+912525) 275587. E-MAIL:sylqc@virajj.com

[| 4500762726 | | | 99400] | [IN: 20] | T0383329-1 | F615RFWN104/L |

PO#: NP156790X Pack#: 421376 Order#: 1034886 Lot#: VIR.99400 Desc: 6 150 RF WN FLG 10S A/SA182 304/L VIR

INDUSTRIAL PIPING SPECIALISTS

INDUSTRIAL PIPING SPECIALISTS, INC. • (918) 437-9100 • INDUSTRIAL PIPING SPECIALISTS I, LTD.
www.ipipes.com
REMIT TO: P.O. BOX 581270 • TULSA, OK 74158-1270

4248

Packing List

RELEASE #	T0383195-1
DATE	02/21/17
PAGE	1 OF 1

BILL TO
0000482
UOP RUSSELL LLC
c/o HONEYWELL INTERNATIONAL
PO BOX 981762
EL PASO, TX 79998-1762

SHIP TO
M
UNITED CONTRACTING SERVICES
3989 N. OSAGE DRIVE
TULSA, OK 74127

Shipto Attn:

REQ DATE	SHIP DATE	CUSTOMER P/O NUMBER	PAYMENT TERMS
02/22/17		4500762453	
WRITTEN BY: BILL CAUGHRON		CONTACT: PURCHASING	SHIP VIA: IPS DELIVERY
FREIGHT TERMS: NO CHARGE		JOB NUMBER	SALES REP: 35 /TUL

PRODUCT / DESCRIPTION	QUANTITY OPEN	U/M	QUANTITY SHIPPED	QUANTITY BACKORDERED	PRICE / EXTENSION

1 SKID DR-01 JAH 0.0 SKID-1
1 PCS PS-01 CC 0.0

SKID-1

-1; PCS-1 Weight: 0

Signature_____
All shortages must be reported in 5 working days*******

F615RFWN104/L 2 EA 2 0
1. 6" 150 RFWN 10S SA182 304/L
MFG: - Ht#: 99400 2 PC SKID-1
MFG: - Ht#: 41303 0 PC SKID-1

BR610S04/LX 19 FT 19 0
2. 6" 10S EFW A312T304/L DR XR AY CPN-5034064
1 PC L- 19' 0" SQ/SQ CTL
MFG: - Ht#: 8TC7 PC

D1X36-33SO4/L 1 EA 1 0
3. 1" X 36-3 3M SOL SA182 304/ L CPN-5037557
MFG: - Ht#: 1K6T 1 PC SKID-1

Total Weight: 230.7200

C IER SIGNATURE

CUSTOMER COPY

TO THE BEST OF OUR KNOWLEDGE MERCHANDISE COVERED IN THIS INVOICE HAS BEEN PRODUCED AND DISTRIBUTED IN COMPLIANCE WITH THE REQUIREMENTS OF THE FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED. (FEDERAL WAGE AND HOUR LAW.)

THE ITEMS LISTED ABOVE WERE HEAT TREATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SPECIFICATION TO WHICH THEY WERE MANUFACTURED.
WE CERTIFY THAT THE PRODUCTS COVERED BY THIS REPORT COMPLY WITH THE APPLICABLE REQUIREMENTS OF ASTM AND/OR ASME SPECIFICATIONS, AS NOTED FOR EACH ITEM.

SIGNED Warren B. Tatum

[| 4500762453 | | | 99400] | [IN: 1] | T0383195-1 | F615RFWN104/L |

PO#: NP156790X Pack#:421376 Order#: 1034886 Lot#: VIR.99400 Desc: 6 150 RF WN FLG 10S A/SA182 304/L VIR

PROFILES LTD.(FORGING DIVISION)

INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

Customer :	ISO 9001:2008-TUV NORD REG.No-04100011170-IR3	INVOICE NUMBER / MTR NO.	1002368/ 1
GLOBAL STAINLESS SUPPLY HOU	EXPIRY DATE : 21.01.2016	DATE	29.02.2016
8500-A RAILWOOD DRIVE SUITE B	AD 2000 MERKBLATT WO-0728/1423 WP 1032/14 Q	MATERIAL SPECIFICATION	ASTM A182/A182M- 15 / ASME SA182/SA182M - 15
HOUSTON, TX 77078	AS PER W2/W9/W10 EXPIRY DATE FEBRUARY 2017		
	PED 97/23/EC QMS REG.NO.0728/1423 WZ 1032/14 Q	PURCHASE ORDER NO.	212371
	EXPIRY DATE: FEBRUARY 2017	DESCRIPTION	STAINLESS STEEL FORGED FLANGES

CHEMICAL ANALYSIS

Sr.No.	Item Description	Dimension Specification	Heat No	Qty	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	%Ti	%N		
1	F304/304L 6" WNRF 150# S10S	B16.5	99400	165.000	0.0220	0.860	0.350	0.0210	0.0360	18.320	8.050	0.280	0.0030	0.07200		
2	F304/304L 12" WNRF 300# S80S	B16.5	101126	6.000	0.0200	0.960	0.370	0.0270	0.0370	18.200	8.070	0.350	0.0070	0.07000		

MECHANICAL PROPERTIES

Sr.No	Heat No.	Tensile Strength (MPA)	Proof Stress Rp=0.2 % (MPA)	Proof Stress Rp=1.0% (MPA)	% Elongation LO=4D	% Reduction of Area	Hardness BHN	IMPACT TEST-CHARPY V-NOTCH AT +20 DEG. C (JOULES) 1	2	3	AVG
1	99400	575.780	286.990	340.550	60.40	71.34	160.0	163.0	170.0	172.0	170.0
2	101126	594.260	285.930	337.740	58.40	71.68	161.0	166.0	180.0	162.0	169.0

NACE CERT	: MATERIAL CONFORMS TO NACE MR 0175 / ISO 15156 - 2009 & NACE MR 0103 - 2012
MELTING PROCESS	: INDUCTION / AOD (IRS) / CONCAST
HEAT TREATMENT	: SOLUTION ANNEALED AT 1080°C AND WATER QUENCHED
DIMENSIONS	: CONFORM WITH THE SPECIFICATION (100% INSPECTED)
SURFACE QUALITY	: SATISFACTORY
PMI	: NO OBJECTION(100% TESTED WITH MOBILE SPECTRO)
INTER GRANULAR CORROSION TEST	: PASSED IGC TEST IN ACCORDANCE WITH ASTM A262 PRACTICE E
MICRO OBSERVATION	: NO CARBIDE PRECIPITATION OBSERVED ON GRAIN BOUNDARIES
RADIOACTIVITY TEST	: ALL THE ABOVE MATERIAL IS TESTED FOR RADIOACTIVITY AND FOUND WITH IN THE LIMIT OF BACKGROUND RADIATION
REMARKS	: NO WELD REPAIR WAS PERFORMED & ALL THE ITEMS ARE FREE OF WELD REPAIR
	: FREE FROM MERCURY CONTAMINATION

WE CERTIFY THAT THE MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE ORDER/CONTRACT AND IS OF INDIAN ORIGIN

MANUFACTURER'S SYMBOL

WORKS INSPECTOR

FACTORY : Survey No. 140/1, Saravali & G-75, MIDC Tarapur Industrial Area Boisar, Dist. Thane, Maharastra-401 506. INDIA. Tel.:(+91) 9049991036 to 041 Fax: (+912525) 275587. E-MAIL:vfqc@viraj.com

PROFILES LTD.(FORGING DIVISION)

INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

Customer :	ISO 9001:2008-TUV NORD REG.No-04 100 01391170	INVOICE NUMBER / MTR NO.	1007459/ 1
GLOBAL STAINLESS SUPPLY-PARAMO	EXPIRY DATE : 14.09.2018	DATE	20.06.2016
17005 S. FIGUEROA ST	AD 2000 MERKBLATT WO-072031423 WP 1022/14 Q	MATERIAL SPECIFICATION	ASTM A182/A182M- 15 / ASME SA182/SA182M - 15
GARDENA, CA 90248-3019	AS PER W2/W9/W10 EXPIRY DATE FEBRUARY 2017		
	PED 97/23/EC QMS REG.NO.072021423 WZ 1022/14 Q	PURCHASE ORDER NO.	214126/GARDENA
	EXPIRY DATE: FEBRUARY 2017	DESCRIPTION	STAINLESS STEEL FORGED FLANGES

CHEMICAL ANALYSIS

Sr.No.	Item Description	Dimension Spec	Heat No	Qty	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	%N
1	F304/304L 3" LJ 150#	B16.5	1450	31.000	0.0180	1.520	0.450	0.0070	0.0340	18.170	8.030	0.240	0.05400
2	F304/304L 6" BLRF 150#	B16.5	1455	33.000	0.0160	1.580	0.320	0.0100	0.0420	18.120	8.030	0.180	0.06200
3	F304/304L 6" WNRF 150# S10S	B16.5	41303	18.000	0.0180	1.300	0.400	0.0250	0.0350	18.100	8.020	0.340	0.07100
4	F304/304L 8" BLRF 150#	B16.5	41642	15.000	0.0200	1.240	0.370	0.0250	0.0360	18.260	8.040	0.290	0.08100
5	F304/304L 2-1/2" THRF 300#	B16.5	41726	9.000	0.0140	0.980	0.400	0.0220	0.0340	18.150	8.040	0.340	0.07300
6	F304/304L 1-1/2" WNRF 150# S40S	B16.5	102176	29.000	0.0210	0.950	0.380	0.0230	0.0370	18.200	8.080	0.290	0.08050

MECHANICAL PROPERTIES

Sr.No	Heat No.	Tensile Strength (MPA)	Proof Stress Rp=0.2 % (MPA)	Proof Stress Rp=1.0% (MPA)	% Elongation LO=4D	% Reduction of Area	Hardness BHN	IMPACT TEST-CHARPY V-NOTCH AT +20 DEG. C (JOULES) 1	2	3	AVG
1	1450	592.590	307.960	360.250	58.60	70.89	163.0	183.0	185.0	162.0	177.0
2	1455	560.180	294.320	333.870	55.20	72.14	154.0	178.0	188.0	172.0	179.0
3	41303	547.500	269.700	316.910	56.40	69.39	153.0	200.0	202.0	210.0	204.0
4	41642	549.230	267.940	313.010	59.20	69.98	152.0	227.0	214.0	210.0	217.0
5	41726	591.410	308.770	370.670	56.40	69.15	163.0	160.0	172.0	168.0	167.0
6	102176	535.170	248.440	296.410	58.40	67.63	150.0	215.0	227.0	214.0	219.0

NACE CERT	: MATERIAL CONFORMS TO NACE MR 0175 / ISO 15156 - 2015 & NACE MR 0103 - 2012
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MANUFACTURER'S SYMBOL

VIJAY KUMAR PILLAI (GM, QAD)

FACTORY : Survey No. 140/1, Saravali & G-75, MIDC Tarapur Industrial Area Boisar, Dist. Thane, Maharastra-401 506, INDIA. Tel.:(+91) 9049991036 to 1041 Fax: (+912525) 275587, E-MAIL:vflqc@virnj.com

[| 4500762453 | | | 41303] | [IN: 1] | T0383195-1 | F615RFWN104/L |

PO#: TP531136 Pack#:434418 Order#: 1043613 Lot#: VIR.41303 Desc: 6 150 RF WN FLG 10S A/SA182 304/L VIR

[| 4500762453 | | 5034064 | 8TC7] | [LN: 2] | T0383195-1 | BR610S04/LX |

Brismet
BRISTOL METALS, LLC

MILL TEST REPORT

RM ID NUMBER
114851
SALES ORDER / RLS
005032 / 1
CERT ID / REV
00049804 / 01

SOLD TO

INDUSTRIAL PIPING SPECIALISTS
606 N. 145TH EAST AVE
TULSA, OK 74116
USA

CUSTOMER P.O. **TP262782** CUSTOMER PART HEAT NO. **8TC7**

DESCRIPTION:**306001003121200**
6" WELDED PIPE SCHED 10S TP304/TP304L (UNS# S30400/S30403) A312 XRAY DOUBLE RANDOM LENGTHS

CERTIFICATION REQUIREMENTS

ENGINEERING
ASTM A312-09 ASME SA312-10, No ADD.

HYDRO PRESSURE
600 PSI

HEAT TREAT
Annealed at1900 Deg F. and water quenched to below 800 Deg. F. in less than 3 minutes.

Chemical

C	Cr	Cu	Mn	Mo	Ni	N	P	Si	S
.0169	18.1035	.4820	1.7430	.3330	8.0485	.0694	.0365	.3310	.0105

Mechanical

TEST	UNITS	RESULTS
Tensile PSI	PSI	89220
Yield PSI	PSI	47430
Elong %		50.87

Hardness
RB86

TEST	RESULT
TG Bend	Pass

NDE

TEST	RESULT
100% Radiography	Pass

This report shall not be altered or reproduced, except in full, without the prior written approval of Bristol Metals LLC.
This test report represents the actual attributes of the items furnished and all items were manufactured, sampled, inspected, and tested in full compliance with applicable specifications and your purchase order.
Certification is in accordance with EN10204:2004 type 3.1.
Chemical content is % by weight. Mechanical test results are in English units (inches and pounds).
No weld repairs have been performed on the base material.
Hardness in accordance with NACE MR0175 and MR0103 and material is free of cold work to enhance mechanical properties.
Pipe is Pickled and Passivated in accordance with ASTM A380.
Bristol Metals has a Quality Management System in place that is in compliance with ISO 9001:2008.
Bristol Metals does not add mercury during any manufacturing process.
NAFTA country of orgin: USA. Pipe/Tube Manufactured in the USA.
Raw Material Melt Source USA
FAR BAA - Complies, DFARS BAA - Complies, FAR TAA - Complies

Rick Duncan
Rick Duncan - Quality Assurance Mgr

Date Printed 03/23/2011

[| 4500762453 | | 5037557 | 1K6T] | [LN: 3] | T0383195-1 | D1X36-33S04/L |

TEXAS PMW, INC.
316 NORTH WAYSIDE DRIVE HOUSTON, TX 77020
(713) 679-7900 – FAX (713) 679-7920

PENNSYLVANIA MACHINE WORKS, INC.
201 BETHEL AVENUE ASTON, PA 19014
(610) 497-3300 – FAX (610) 497-3325

US DROP FORGE CO.
P.O BOX 131 – ROUTE 551
1356 AUBURN ROAD WOOLWICH TOWNSHIP, NJ 08085
(856) 467-0500 – FAX (856) 467-4598

CERTIFIED MATERIAL TEST REPORT

IND'L PIPING SPECIALISTS-TULSA
P.O. BOX 581270
TULSA, OK 74158-1270

P.O. TP531014
ORDER # 03 303849
1/11/17

36-3X1 **3M** **+SOL 304/L** QTY: 35

HEAT CODE: **1K6T** MATERIAL: **F304/304L**
ASTM SPEC: A182 SPEC. YEAR: 15 SPEC. REV:
HEAT TREATMENT: SOLUTION ANNEALED
UNS NUMBER: S30403

CHEMICAL ANALYSIS

C	MN	P	S	SI	NI	CR	MO	CU	N	CO
.015	1.370	.035	.025	.370	8.070	18.610	.360	.530	.076	.120

SN
.012

PHYSICAL ANALYSIS

YS (PSI)	TS (PSI)	%EL 4D % 4D	%RA %	HARDNESS (HB)	GRAIN	CHARP1 FT/LB	CHARP2 FT/LB	CHARP3 FT/LB
39000	89000	77.000	57.600	163	10.00	94.000	88.000	89.000

CHARP AV FT/LB	PMI	TEST@TMP (F)	EDDY	CORRO
.330	OK	-320	OK	OK

CHARPY AVG CHARPY TEST REF;P0;82216
CORROSION TEST CORR. TEST PER ASTM A262 R.E OK
SOLUTION ANNEALED @ 1922F For .01 HOUR, WATER QUENCH

Country of Origin: Italy. Country of Origin is Country of Melt.
Manufactured to: ASME B31.1 & MSS SP-97

ASTM A182-14A
ASME SECTION II SA182 F304/304L 2015 EDITION NO ADDENDA
MATERIAL I/A/W ASME SEC II SA SPECIFICATION-CERTIFICATE I/A/W EN10204 TYPE 3.1
MATERIAL MEETS NACE-MR0175/ISO15156-2009
MATERIAL IS CAPABLE OF PASSING A CORROSION TEST TO ASTM-A262 PRACTICE "E"
MATERIAL PMI VERIFIED (POSITIVE MATERIAL IDENTIFICATION) BY X-RAY FLOURESCENCE (XRF) ANALYZER
MATERIAL MEETS NACE MR0103-2012
DURING THE MANUFACTURE AND PROCESSING OF THIS PRODUCT, IT DID NOT COME IN DIRECT CONTACT WITH MERCURY OR ANY OF ITS COMPOUNDS NOR WITH ANY MERCURY CONTAINING DEVICE THAT EMPLOYED A SINGLE BOUNDARY OF CONTAINMENT.
NO WELD REPAIRED MATERIAL - MADE IN THE U.S.A

WE HEREBY CERTIFY THAT THE REPORTED FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF THE CORPORATION.

James B Friant
(ES-ELECTRONIC SIGNATURE)
JAMES B. FRIANT
QUALITY MANAGER

MANUFACTURERS OF Penn FORGED PIPE FITTINGS
QUALITY • SERVICE • PARTNERSHIP
www.pennusa.com

LEE SUPPLY CO., LLC

Your Premier PVF Source
821 East Independence, Tulsa, OK 74106

4248

Phone: (918)587-8181
Phone: (800)375-3753
Fax: (918)582-3471

01 PACKING LIST # 710226 - CUST

06:31AM 03/09
Page: 1

Sold To: THOM02
THOM02 THOMAS RUSSELL CO
PMTUSInvoice981762@Honeyw
ell.com
TX

(539)664-4881

Ship To:
UNITED CONTRACTING
3989 N OSAGE DR
TULSA, OK 74127

Ship Date	Shipping Terms	Ship Via
03/07/17		LEE TRUCK

Ord Date	Terms	Customer PO	Salesman	Order #
02/28/17	1% 10 NET 30	4500764968	DENNY LEE	710226

S447XX
SK1 SPLS

	Open	Ship	B/O	Description
				**********
				PAINT STICK HEAT & PO# ON PIPE
				AS WELL AS SPL# & MK# IF SHOWN
				NO PIPE OVERAGE ALLOWED
				BBE TOLERANCE PLUS 0" MINUS 1/8"
				**********
				MTRS REQUIRED ON PIPE
				**********
				NO CHINA MATERIAL
				**********

MTRs INCLD
WITH SHIPMENT

	Open	Ship	B/O	Description
				Items Sold:
1.	3	3		4.0LR90XHF
	ea			4" XH LR 90 ELBOW SA234 WPB
				***** CUST PART# 5026996**
	Case PAN7018			Heat RH516 Pallet Qty: 3
2.	5	5		8.0RFWN#60XHF
	ea			8" 600# RFWN XH A105
				***** CUST PART# 5025117**
	Case MFR252/2			Heat EX-4086A Pallet Qty: 5

(CONTINUED)

LEE SUPPLY CO., LLC

Your Premier PVF Source
821 East Independence, Tulsa, OK 74106

Phone: (918)587-8181
Phone: (800)375-3753
Fax: (918)582-3471

01 PACKING LIST # 710226 - CUST

06:31AM 03/09
Page: 2

Sold To: THOM02
THOM02 THOMAS RUSSELL CO
PMTUSInvoice981762@Honeyw
ell.com
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UNITED CONTRACTING
3989 N OSAGE DR
TULSA, OK 74127

Ship Date	Shipping Terms	Ship Via
03/07/17		LEE TRUCK

Ord Date	Terms	Customer PO	Salesman	Order #
02/28/17	1% 10 NET 30	4500764968	DENNY LEE	710226

S447XX

	Open	Ship	B/O	Description
3.	2 ea	2		.50X3.0160SML 1/2 X 3" S160 SMLS NIPPLE ***** CUST PART# 5035337**
	Case ANV4905			Heat DD8011 Pallet Qty: 2
4.	6 ea	6		+TOENIPPLES 1 X 3" S160 SMLS TOE NIPPLE A106
5.	3 ea	3		1.0X6.0160SML FOR INVENTORY PURPOSES ONLY
	Case CAM16593			Heat 763A Pallet Qty: 3
6.	1 ea	1		.50X36-.75SOL3 1/2 X 36- 3/4" 3000# SOL A105
	Case WFI2308			Heat 59172 Pallet Qty: 1
7.	3 ea	3		1.0X.50T3RTEED 1 X 1/2" 3000# THRD RED TEE A105 ***** CUST PART# 5034758**
	Case CAM15573			Heat 722FFFF Pallet Qty: 3
8.	1 ea	1		.75X36-1.5TOL3M 3/4 X 36- 1 1/2" 3000# TOL A105
	Case WFI4438			Heat 50048 Pallet Qty: 1

(CONTINUED)

LEE SUPPLY CO., LLC

Your Premier PVF Source
821 East Independence, Tulsa, OK 74106

Phone: (918)587-8181
Phone: (800)375-3753
Fax: (918)582-3471

01 PACKING LIST # 710226 - CUST

06:31AM 03/09
Page: 3

Sold To: THOM02
THOM02 THOMAS RUSSELL CO
PMTUSInvoice981762@Honeywell.com
TX

(539)664-4881

Ship To:
UNITED CONTRACTING
3989 N OSAGE DR
TULSA, OK 74127

Ship Date	Shipping Terms	Ship Via
03/07/17		LEE TRUCK

Ord Date	Terms	Customer PO	Salesman	Order #
02/28/17	1% 10 NET 30	4500764968	DENNY LEE	710226

S447XX

****
* M T R REQUIRED *
* *
****

Est. Weight _608_, # of Boxes _____, W/H: A805X1

Pulled:_____ Checked:_____ Packed:_____ Received by/Date

Report damage Claims or shortages within 10 days. X_____

PAN7018 / RH516 / 4.0LR90XHF / 4" XH LR 90 ELBOW SA234 WPB

INSPECTION CERTIFICATE

PANTECH STEEL INDUSTRIES SDN. BHD. (509731-A)
LOT 13258 & 13259, Jalan Haji Abd. Manan,
Off Jalan Meru, 42200 Klang, Selangor, Malaysia.
Tel: 603-3393 1633 Fax: 603-3393 1733 E-mail: info@pantechsteel.com

LLOYD'S REGISTER-LRQA
ISO 9001
Cert. No.: KLR 0408826
PED 97/23/EC Annex 1 Clause 4.3
Cert. No.: 0058/PED/MUM/0810070/1

WROUGHT CARBON STEEL BUTTWELDING FITTINGS

INSPECTION DOCUMENT: EN10204:2004 Type 3.1

Certificate No : PSI 96239
Date : 29-Dec-14

Purchaser :

Order No.	Invoice No.	Starting Material	Specification for Fittings- Seamless	Specification for Inspection
		Seamless Pipe	ASTM A234 -13 WPB / ASME SA234 -13 WPB NACE MR0175/ NACE MR 0103/ ISO15156*	ASME B16.9 - 12 / ASTM A960 - 10

Heat No.	Product & Size	Quantity (pcs)	Visual Examination	Dimensional Inspection	Heat Treatment	Magnetic Particle Testing
RH 711	4" 90 DEG LR XS ELBOW	57	GOOD	GOOD	H	N.A
RH 516	4" 90 DEG LR XS ELBOW	143	GOOD	GOOD	H	N.A
DY 95	1 1/2" 90 DEG LR S160 ELBOW	50	GOOD	GOOD	H	N.A
RL 401	1 1/4" 45 DEG LR STD ELBOW	300	GOOD	GOOD	H	N.A
RG 301	1 1/2" 45 DEG LR STD ELBOW	200	GOOD	GOOD	H	N.A

Specification	Chemical Composition (%)												Tensile Test *1			Hardness	
	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Pb	CE	YS	TS	E	(HB)	
Min	x100	x100	x100	x1000	x1000	x100	x100	x100	x100	x1000		x100	(KSI / MPa)		(%)	1	2
Max	-	10	29	-	-	-	-	-	-	-	-	-	240	415	22	-	
Heat No.	30	-	106	50	58	40	40	15	40	80	-	50	-	-	-	197	
RH 711	18	25	46	15	5	2	3	0	5	5	< 0.10	28	357	509	32.8	130	131
RH 516	20	27	47	26	19	4	3	2	5	3	< 0.10	30	382	490	38.6	129	130
DY 95	19	20	40	21	13	3	9	0	2	0	< 0.10	28	354	490	28.0	133	129
RL 401	18	19	45	18	13	0	1	0	1	3	< 0.10	28	339	447	29.4	126	127
RG 301	13	18	75	12	8	2	6	2	3	3	< 0.10	28	305	452	34.4	127	128

WE CERTIFY THAT ALL PRODUCTS WERE MANUFACTURED,SAMPLED,TESTED, AND INSPECTED SOLELY BY THE MANUFACTURER LISTED AT THE ADDRESS ABOVE IN ACCORDANCE WITH INDICATED SPECIFICATION AND FOUND TO MEET REQUIREMENTS. MATERIAL IS FREE FROM MERCURY AND RADIOACTIVE CONTAMINATION.
TENSILE REQUIREMENT: CONFORMS TO ASTM A370 STANDARD, LONGITUDINAL DIRECTION, GAUGE LENGTH 2" (50mm)
* HARDNESS ACCORDING TO NACE MR0175/ NACE MR 0103/ ISO15156

NOTE:
C: Cold formed at temperature below 620°C
S: Stress relieved in temperature between 595°C - 690°C and cooled in still air.
H : Hot formed in temperature between 845°C - 945°C and cooled in still air.
N: Normalised at 910°C
Q: Heated to 910°C and quench in water.
T: Temper between 590°C - 690°C.

*1: YS = Yield strength TS=Tensile strength E = Elongation

Made in Malaysia

PANTECH STEEL INDUSTRIES SDN. BHD. 509731-A QA / QC MANAGER HOI YS

Quality Assurance Manager

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MFR252/2 / EX-4086A / 8.0RFWN#60XHF / 8" 600# RFWN XH A105

MF RINGS AND BEARING RACES LIMITED

PLOT NO. 06, SECTOR-4, INDL. AREA, BALLABHGARH, FARIDABAD.121 004
REGD. OFF : 21, COMMUNITY CENTRE, MAYAPURI INDL. AREA,
NEW DELHI – 110064.
Ph.:- 40777222, 40777333, 28114458 Fax:- 28115759
E-mail :- metalforgings@metalforgings.co.in & sales@metalforgings.co.in

TEST CERTIFICATE

AS PER EN-10204:2004 TYPE 3.1

Work T.C. No. & Date	25460 DATED 02.02.2016	Invoice No.	
Customer		Dimension Std:-	ASME B16.5 (2013)
Address			
PO. No. & Date			
Material Specification:-	ASTM A105-2013 / ASME SA105 OF ASME SEC.II PART-A (2013) & Product Specification GSS 7.4.2-02		

We hereby certify that the material detailed meets the requirement of Purchase Order / Relevant specification.

Item No.	Description	Qty.	Heat Code (MF)	Raw Material Heat	H.T. / Temp.	Soaking Time	Cooling Media
8	8" -600# RF WN SCH-XH FLG PART NO.:-WN080CAR060000080RN0-MFR	175	EX-4065C	4507203	N-900°C	4 Hrs.	In Still Air
8	8" -600# RF WN SCH-XH FLG PART NO.:-WN080CAR060000080RN0-MFR	175	EX-4086A	4507203	N-900°C	4 Hrs.	In Still Air

CHEMICAL COMPOSITION IN%

Raw Material Heat	C 0.35 Max.	Mn 0.60-1.05	P 0.035 Max.	S 0.040 Max.	Si 0.10-0.35	Ni 0.40 Max.	Cr 0.30 Max.	Mo 0.12 Max.	V 0.08 Max.	Cu 0.40 Max.	Al 0.02 Min.
					Mill Test Report						
4507203	0.20	1.28	0.012	0.003	0.22	0.009	0.024	0.004	0.002	0.007	0.032
Heat Code (MF)					Product Analysis						
EX-4065C	0.194	1.25	0.015	0.006	0.212	0.012	0.022	0.007	0.006	0.010	0.029
EX-4086A	0.192	1.26	0.014	0.008	0.208	0.013	0.021	0.008	0.008	0.009	0.030

PHYSICAL PROPERITIES

Heat Code (MF)	Y.S.(P.S.I.) (0.2% offset Method) Min 36,000	UTS.(P.S.I.) Min 70,000	Elong% (4D) Min 22%	R.A.% Min 30%	Hardness (HBW) 187 Max.	Charpy 2mm V-Notch Test Temp. (value in Joules) Specimen Size 10x10x55mm			
EX-4065C	46690	72500	34.20	69.08	153, 153	-	-	-	-
EX-4086A	47270	74385	31.80	67.21	156, 156	-	-	-	-

REMARKS.:-

1. Raw material used in production is free from mercury contamination and radiation.
2. Meet all the requirement of latest revision of NACE MR0103, NACE MR0175 and ISO 15156.
3. No weld repair has been carried out. Material is free of rust.
4. Hardness checked on the job two forgings per Heat Code (MF) & found 153 to 159 HBW.
5. Above flanges manufactured in India from raw material manufactured in India.
6. Included each data element from ASTM A105 Section 12 & ASTM A961 Section 19, latest revision.

Signature / Seal of Surveyor

MF Ring & Bearing Races Ltd. QUALITY CONTROL

2-2-16

In Charge QCL

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Montreal, Quebec

Certificate of Test

Part Number: 0332810605 Description: 1/2 X 3 BLK SCH 160 SMLS
Heat Code: DD8011
Reference No.:
Specification: ASTM A106-08/ASME SA106-11 Grade B
Fitting Trademark: BECK MANUFACTURING

Chemical Analysis %

Heat No.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Cb/Nb
14793	0.19	0.67	0.012	0.015	0.26	0.13	00.06	00.09	0.01	0.00	0.00

Mechanical Properties

Yield Strength		Tensile Stength		Elongation %	Reduction Area	Hardness BHN
psi	048,870	psi	070,910	000044		
MPa	000	MPa	000			

Heat Treatment:

MEETS NACE MR0175 . HARDNESS LESS THAN OR EQUAL 22HRC

HYDROSTATIC: 2500 Bend: GOOD FLATTEN: OK

We certify that this is a true and correct copy of the mill certificate, issued by the manufacturer of the steel employed or the laboratory which has determined it, as retained in the records of the company. We make no representation beyond those of the manufacturer or its agent.

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Capitol Manufacturing
1125 Capitol Avenue
Crowley, LA 70526

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CapProducts

Commanding a Higher Standard℠

Certified Mill Test Report

Printed: 1/18/2017
Certified: 11/10/2016

Customer
LEE SUPPLY CO
PO BOX 1475
TULSA, OK 74101

P.O. 17-0261-DS
Tag

Heat No 1329
Heat Code 763A
Phoenix Order # 1255325

Material ASTM A106-2014 / ASME SA106-2015 Edition

Part Number	Description
15131012	1 X 6" SCH 160 SMLS NIPL TBE

Chemical Properties

C	Mn	P	S	Si	Cu	Ni	Cr
0.1600	0.7300	0.0220	0.0070	0.2400	0.0180	0.0100	0.0160

C Eq. Long
0.2871

Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0010	0.0010		0.0260	0.0010					

Additional Chemical Properties

Cr + Cu + Ni
0.0440

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in. or 4D	R of A	HBW	HBW2
72,099	47,237	45.4%	45.4%	143	0

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average	Test Temp.
N/A	N/A	N/A	N/A	N/A

* Hydro test passed. at 2500 psi.

* Bend test passed.

We hereby certify that these parts were manufactured, sampled, tested, and inspected in accordance with the product specifications stated and were found to meet the requirements.
We further certify that this material was inspected using independentinspectors conforming to the requirements of EN 10204 3.1. These products meet the requirements of the latest editions of NACE MR0175, NACE MR0103, and ISO 15156. No weld repair has been performed on these products. This material was not exposed to mercury or any other metal alloy that is liquid at ambient temperatures during processing or while in our possession

Meets ASME SA 106 Grade B Requirements.

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NUCLEAR PRODUCTS
Manufacturer of Piping and Pressure Vessel Components
4404 Haygood St - Houston, TX 77022
Phone: 713-695-3633 Fax: 713-695-3528
A Bonney Forge Company

Sold To: LEE SUPPLY COMPANY
821 EAST INDEPENDENCE
STREET
TULSA OK 74101

MTR #: 272,451
PO #: 14-1399-DS
Sales Order #: C001404246 Date: 03/28/2014

This product has not come in direct contact with mercury or any of its compounds, nor with any mercury-containing device employing a single boundary of containment. No welding performed.

Certified Material Test Report

We certify that the contents of this report are correct and accurate, and that all test results and operations performed by WFI or its subcontractors are in compliance with the material specification and requirements of the referenced code or standard, and that the material conforms to the dimensional requirements of the order. This document is in accordance with EN10204 3.1.

Heat Code: 59172

Material: A/SA105 11

Item	Quantity	Description
6	2	36 - 3/4 X 1/2 3M SWP A/SA105
7	25	36 - 3/4 X 1/2 3M SWP A/SA105 RACK 0332

Chemical Composition

	C	CR	CU	MN	MO	NB	NI	P
	0.210	0.03	0.05	1.04	0.005	0.016	0.02	0.004
	S	SI	V					
	0.018	0.20	0.003					

Carbon Equivalency: Ladle 0.40

Product	C	CR	CU	MN	MO	NI	P	S
	0.000	0.00	0.00	0.00	0.000	0.00	0.000	0.000
	SI	V						
	0.00	0.000						

	Tensile PSI	Yield PSI	Elong %	RA %	Hardness	
Product	72,500	47,700	32.00	68.00	141 BHN	141 BHN

AS FORGED

Marie Dehmer
Quality Assurance Representative

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CAT115573 / 722FFFF / 1.0X.50T3RTEED / 1 X 1/2 3000# THRD RED TEE

Capitol Manufacturing
1125 Capitol Avenue
Crowley, LA 70526

Phoenix Capitol Cameo
CapProducts

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Certified Mill Test Report

Printed: 9/6/2016
Certified: 03/10/2016

Customer
LEE SUPPLY CO
PO BOX 1475
TULSA, OK 74101

P.O. 16-4116-DS
Tag

Heat No 156044
Heat Code 722FFFF
Phoenix Order # 1226727

Material ASTM A105-2014 / ASME SA105-2015 Edition

Part Number	Description
12201414	1 X 1 X 1/2 3M THD RED TEE

Chemical Properties

C	Mn	P	S	Si	Cu	Ni	Cr
0.2100	0.9000	0.0060	0.0210	0.2100	0.1800	0.0680	0.1060

C Eq. Long
0.4077

Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0180	0.0320								

Additional Chemical Properties

Cr + Cu + Ni
0.3540

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in. or 4D	R of A	HBW	HBW2
84,500	57,500	27.0%	62.0%	179	174

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average	Test Temp.
N/A	N/A	N/A	N/A	N/A

We hereby certify that these parts were manufactured, sampled, tested, and inspected in accordance with the product specifications stated and were found to meet the requirements.
We further certify that this material was inspected using independent inspectors conforming to the requirements of EN 10204 3.1. These products meet the requirements of the latest editions of NACE MR0175, NACE MR0103, and ISO 15156. No weld repair has been performed on these products. This material was not exposed to mercury or any other metal alloy that is liquid at ambient temperatures during processing or while in our possession.

Meets ASME SA-181-70 2013 Edition. Manufactured in the USA.

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WFI4438 / 50048 INTERNATIONAL 1.5TOL3M / 3/4 X 36- 1 1/2" 3000# '

NUCLEAR PRODUCTS
Manufacturer of Piping and Pressure Vessel Components
4404 Haygood St - Houston, TX 77022
Phone: 713-695-3633 Fax: 713-695-3528
A Bonney Forge Company

Sold To: LEE SUPPLY COMPANY
821 EAST INDEPENDENCE
STREET
TULSA OK 74106

MTR #: 323,254

PO #: 17-0539-DS

Sales Order #: C001701064 Date: 02/03/2017

This product has not come in direct contact with mercury or any of its compounds, nor with any mercury-containing device employing a single boundary of containment. No welding performed.

Certified Material Test Report

Heat Code: 50048

We certify that the contents of this report are correct and accurate, and that all test results and operations performed by WFI or its subcontractors are in compliance with the material specification and requirements of the referenced code or standard, and that the material conforms to the dimensional requirements of the order. This document is in accordance with EN10204 3.1.

Material: A/SA105N 14

Item	Quantity	Description
7	1,000	36 - 1 1/2 X 3/4 3M THP A/SA105N TAG: RACK MW0215C

Chemical Composition

Ladle	C	Co	CR	CU	MN	MO	NB	NI
	0.2000	0.004	0.05	0.06	1.060	0.005	0.015	0.020
	P	S	SI	V				
	0.008	0.022	0.240	0.003				

Carbon Equivalency: Ladle 0.39

	Tensile PSI	Yield PSI	Elong %	RA %	Hardness	
Product	72,510	47,632	37.35	63.86	132 BHN	135 BHN

MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#C122936/BONNEY FORGE (USA) - LOT#50048

PARTS ARE NORMALIZED AT 1650°F FOR A MINIMUM OF 1 HOUR OR FOR 1/2 HOUR PER 1" OF THICKNESS, WHICHEVER IS GREATER, & THEN AIR COOLED. THIS PROCESS IS IN CONFORMANCE TO ASTM A105/A350 NORMALIZING REQUIREMENTS.

Marie Delumer
Quality Assurance Representative

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4248

SK1

LEE SUPPLY CO., LLC

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Phone: (800)375-3753
Fax: (918)582-3471

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07:18AM 03/27

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THOM02 THOMAS RUSSELL CO
PMTUSInvoice981762@Honeywell.com
TX

(539)664-4881

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UNITED CONTRACTING
3989 N OSAGE DR
TULSA, OK 74127

Ship Date	Shipping Terms		Ship Via	
03/23/17				LEE TRUCK
Ord Date	**Terms**	**Customer PO**	**Salesman**	**Order #**
03/22/17	1% 10 NET 30	4500765005	DENNY LEE	711606

S447XX
SK1 SPLS

MTRs INCLD WITH SHIPMENT

Subject to review

R. S.

3-28-17

Roberto Rodarte

	Open	Ship	B/O	Description
				**********
				PAINT STICK HEAT & PO# ON PIPE
				AS WELL AS SPL# & MK# IF SHOWN
				NO PIPE OVERAGE ALLOWED
				BBE TOLERANCE PLUS 0" MINUS 1/8"
				**********
				MTRS REQUIRED ON PIPE
				**********
				NO CHINA MATERIAL
				**********

	Open	Ship	B/O	Description
				Items Sold:
1.	2	2		2.0X36-8.0XWOL
	ea			2 X 36-8" XH WOL A105
	Case WFI4269		Heat 50028	Pallet Qty: 2
2.	2	2		1.0A106S160F
	ft			1 S160 A106B SMLS PIPE (.250W)
				***** TOE**
	Case PER347		Heat LZ34605	Pallet Qty: 2

(CONTINUED)

LEE SUPPLY CO., LLC

Your Premier PVF Source
821 East Independence, Tulsa, OK 74106

Phone: (918)587-8181
Phone: (800)375-3753
Fax: (918)582-3471

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3989 N OSAGE DR
TULSA, OK 74127

Ship Date	Shipping Terms	Ship Via
03/23/17		LEE TRUCK

Ord Date	Terms	Customer PO	Salesman	Order #
03/22/17	1% 10 NET 30	4500765005	DENNY LEE	711606

S447XX

	Open	Ship	B/O	Description
3.	3 ea	3		1.5X1.0C160TT 1-1/2 X 1" S160 TXT CONC SWAG NIPPLE A234 WPB
	Case CAM16804			Heat 74JF — Pallet — Qty: 2
	Case CAM16805			Heat 74JF — Pallet — Qty: 1
4.	2 ea	2		2.0X1.5C160BT 2 X 1-1/2" S160 BXT CONC SWAGE NIPPLE A234 WPB
	Case CAM16081			Heat 74FM — Pallet — Qty: 2
5.	3 ea	3		+LATHE 4 X 2" STD X XH RED TEE A234
6.	3 ea	3		4.0X2.0TEEXHF FOR INVENTORY PURPOSES ONLY
	Case CMG2887			Heat 04V — Pallet — Qty: 3

****
* M T R REQUIRED *
*
****

(CONTINUED)

LEE SUPPLY CO., LLC

Your Premier PVF Source
821 East Independence, Tulsa, OK 74106

Phone: (918)587-8181
Phone: (800)375-3753
Fax: (918)582-3471

01 PACKING LIST # 711606 - CUST

07:18AM 03/27

Sold To: THOM02
THOM02 THOMAS RUSSELL CO
PMTUSInvoice981762@Honeywell.com
TX

(539)664-4881

Ship To: **Page:** 3
UNITED CONTRACTING
3989 N OSAGE DR
TULSA, OK 74127

Ship Date	Shipping Terms	Ship Via
03/23/17		LEE TRUCK

Ord Date	Terms	Customer PO	Salesman	Order #
03/22/17	1% 10 NET 30	4500765005	DENNY LEE	711606

S447XX

Est. Weight _66_, # of Boxes _____, W/H: A452X1

Pulled:_____ Checked:_____ Packed:_____ Received by/Date

Report damage Claims or shortages within 10 days. X_____

WFI4269 50028 INTERNATIONAL 36-8.0XWOL / 2 X 36-8" XH WOL A1(

NUCLEAR PRODUCTS
Manufacturer of Piping and Pressure Vessel Components
4404 Haygood St - Houston, TX 77022
Phone: 713-695-3633 Fax: 713-695-3528
A Bonney Forge Company

Sold To: LEE SUPPLY COMPANY
821 EAST INDEPENDENCE
STREET
TULSA OK 74106

MTR #: 319,983
PO #: 16-4938-DS
Sales Order #: C001610069 Date: 11/02/2016

This product has not come in direct contact with mercury or any of its compounds, nor with any mercury-containing device employing a single boundary of containment. No welding performed.

Certified Material Test Report

Heat Code: 50028

We certify that the contents of this report are correct and accurate, and that all test results and operations performed by WFI or its subcontractors are in compliance with the material specification and requirements of the referenced code or standard, and that the material conforms to the dimensional requirements of the order. This document is in accordance with EN10204 3.1.

Material: A/SA105 13

Item	Quantity	Description
16	50	36 - 8 X 2 XS BWP A/SA105 TAG: RACK MW0216B

Chemical Composition

	C	Co	Cr	Cu	Mn	Mo	Nb	Ni
Ladle	0.2100	0.005	0.04	0.14	1.020	0.009	0.015	0.050
	P	S	Si	V				
	0.009	0.023	0.230	0.004				

Carbon Equivalency: Ladle 0.40

	Tensile PSI	Yield PSI	Elong %	RA %	Hardness	
Product	76,196	49,173	31.50	58.16	139 BHN	141 BHN

MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#C122429/BONNEY FORGE (USA) - LOT#50028

AS FORGED

Marie Dehmer
Quality Assurance Representative

PER347 / LZ34605 / 1.0A106S160F / 1 S160 A106B SMLS PIPE

EN 10204-3.1 QUALITY CERTIFICATE № 1006/9

Sheet 1 Sheets2

Seller (Exporter)

Joint-Stock Company "Pervouralsk New Pipe Plant"

Made in Russia

Buyer (Address, country)

Contract№ 27-03/13-01/KLF on 27.03.2013

Order-Nariad № 5,S-1

Freight car №

Export Licence

Order № 2209176/13

Description of goods	Standard	Type of pack	Quantity
Seamless Carbon Steel Pipe for High-Temperature Service	ASTM A106(11)NDE/ASME SA106/ASTM A53(12)/ASME SA53/ASME B36.10M	in bundles	12

Item №	Nos. of Heats	Nos. of Lots	Grades of steel	Dimensions			Metrage	Number of pcs.	Mass (tons)	
				Diameter, inches	Wall, inches	Length, feet			Gross	Net
1	3f2859	э44	Gr.B/Gr.C	1.050	0.154	20-21	746	117		1.57
2	"	э49	"	1.050	0.154	"	599	94		1.27
3	"	э926	"	1.050	0.154	"	786	124		1.69
4	z32455	э959	"	1.050	0.154	"	1036	163		2.22
5	z25125	э970	"	1.050	0.219	"	655	103		1.92
6	3f6348	э157	"	1.315	0.179	"	543	87		1.70
7	"	э172	"	1.315	0.179	"	537	86		1.68
						Total:				

It is hereby certified that the quality of goods mentioned in this Quality Certificate is in conformity with standards and specifications. Visual and dimensional control: no remarks.

Quality characteristics of goods

Compositions (%)

Item №	C	Mn	Si	S	P	Cr	Ni	Cu	V	Mo
1-3	0.30	0.77	0.26	0.008	0.013	0.16	0.12	0.22	0.005	0.013
4	0.26	0.79	0.25	0.004	0.005	0.04	0.04	0.06	0.033	0.044
5	0.25	0.77	0.25	0.014	0.015	0.08	0.06	0.10	0.033	0.043
6,7	0.28	0.76	0.23	0.016	0.008	0.10	0.12	0.17	0.01	0.01

Mechanical Properties

Item №	Type speculum	Tensile strength, psi	Yield strength, psi	Elongation (%)
1	Long.-12.7	91000	72000	24
2	"	95000	62000	26
3	"	94000	54000	22
4	"	88000	66000	25
5	"	80000	47000	29
6	"	85000	63000	28
7	"	85000	63000	28

NOTE: Pipes have been tested by non-destructive method with satisfactory result. Pipes are produced ungalvanized, threadless. The present requirements are correspond to NACE MR 0175(2009).

Hardness: Satisfactory.

Marking: Is made as per requirements of the order

Signature: ТЕХНИЧЕСКОГО КОНТРОЛЯ №51

Date: 21/1/2014

PER347 / LZ34605 / 1.0A106S160F / 1 S160 A106B SMLS PIPE

EN 10204-3.1 QUALITY CERTIFICATE № 1006/9

Seller (Exporter)

Joint-Stock Company "Pervouralsk New Pipe Plant"

Made in Russia

Buyer (Address, country)

Contract№ 27-03/13-01/KLF on 27.03.2013

Order-Nariad № 5,S-1

Freight car №

Export Licence

Order № 2209176/13

Description of goods	Standard	Type of pack	Quantity
Seamless Carbon Steel Pipe for High-Temperature Service	ASTM A106(11)NDE/ASME SA106/ASTM A53(12)/ASME SA53/ASME B36.10M	in bundles	

Item №	Nos. of Heats	Nos. of Lots	Grades of steel	Dimensions			Metrage	Number of pcs.	Mass (tons)	
				Diameter, inches	Wall, inches	Length, feet			Gross	Net
8	lz34605	э145	Gr.B/Gr.C	1.315	0.250	20-21	323	51		1.39
9	"	э127	"	1.315	0.250	"	323	51		1.39
10	lz34607	э489	"	1.315	0.250	"	574	90		2.49
11	"	э117	"	1.315	0.250	"	332	52		1.46
12	"	э142	"	1.315	0.250	"	338	53		1.49
						Total:	6792	1071	20,905	20,27

It is hereby certified that the quality of goods mentioned in this Quality Certificate is in conformity with standards and specifications. Visual and dimensional control: no remarks.

Quality characteristics of goods

Compositions (%)

Item №	C	Mn	Si	S	P	Cr	Ni	Cu	V	Mo
8,9	0.27	0.79	0.28	0.006	0.009	0.08	0.06	0.09	0.032	0.044
10-12	0.27	0.82	0.25	0.005	0.011	0.07	0.05	0.07	0.032	0.043

Mechanical Properties

Item №	Type speculum	Tensile strength, psi	Yield strength, psi	Elongation (%)
8	Long.-12.7	80000	48000	30
9	"	80000	48000	30
10	"	82000	47000	29
11	"	79000	49000	31
12	"	79000	49000	31

NOTE: Pipes have been tested by non-destructive method with satisfactory result. Pipes are produced ungalvanized, threadless. The prosent requirements are correspond to NACE MR 0175(2009).

Heat treatment is satisfactory.

Marking: Made as per requirements of the order

Signatures:

Date: 21/1/2014

CAN 16804 / 74JF / 1.5X1.0C160TT / 1-1/2 X 1" S 160 TXT CONC SWAG

Capitol Manufacturing
1125 Capitol Avenue
Crowley, LA 70526

Phoenix Capitol Camco
CapProducts

Commanding a Higher Standard℠

Certified Mill Test Report

Printed: 2/6/2017
Certified: 04/19/2016

Customer
LEE SUPPLY CO
PO BOX 1475
TULSA, OK 74101

P.O. 17-0596-DS
Tag

Heat No 74JF
Heat Code 74JF
Phoenix Order # 1260209

Material ASTM A234-2011a WPB / ASME SA234-2010 Edition

Part Number	Description
48200027	1 1/2X1 160 WPB CONC SWG TBE

Chemical Properties

C	Mn	P	S	Si	Cu	Ni	Cr
0.2100	0.9300	0.0070	0.0280	0.2200	0.1900	0.0680	0.1100

C Eq. Long
0.4150

Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0190	0.0350			0.0000					

Additional Chemical Properties

Cr + Cu + Ni
0.3680

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in. or 4D	R of A	HBW	HBW2
84,000	57,200	23.0%	39.0%	169	162

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average	Test Temp.
N/A	N/A	N/A	N/A	N/A

We hereby certify that these parts were manufactured, sampled, tested, and inspected in accordance with the product specifications stated and were found to meet the requirements.
We further certify that this material was inspected using independent inspectors conforming to the requirements of EN 10204 3.1. These products meet the requirements of the latest editions of NACE MR0175, NACE MR0103, and ISO 15156. No weld repair has been performed on these products. This material was not exposed to mercury or any other metal alloy that is liquid at ambient temperatures during processing or while in our possession.

Manufactured in the USA.

CAN 16805 / 74JF / 1.5X1.0C160TT / 1-1/2 X 1" S 160 TXT CONC SWAG

Capitol Manufacturing
1125 Capitol Avenue
Crowley, LA 70526

Phoenix Capitol Camco
CapProducts

Commanding a Higher Standard℠

Certified Mill Test Report

Printed: 2/6/2017
Certified: 04/19/2016

Customer
LEE SUPPLY CO
PO BOX 1475
TULSA, OK 74101

P.O. 17-0596-DS
Tag

Heat No 74JF
Heat Code 74JF
Phoenix Order # 1260209

Material ASTM A234-2011a WPB / ASME SA234-2010 Edition

Part Number	Description
48200027	1 1/2X1 160 WPB CONC SWG TBE

Chemical Properties

C	Mn	P	S	Si	Cu	Ni	Cr
0.2100	0.9300	0.0070	0.0280	0.2200	0.1900	0.0680	0.1100

C Eq. Long
0.4150

Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0190	0.0350			0.0000					

Additional Chemical Properties

Cr + Cu + Ni
0.3680

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in. or 4D	R of A	HBW	HBW2
84,000	57,200	23.0%	39.0%	169	162

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average	Test Temp.
N/A	N/A	N/A	N/A	N/A

We hereby certify that these parts were manufactured, sampled, tested, and inspected in accordance with the product specifications stated and were found to meet the requirements.
We further certify that this material was inspected using independent inspectors conforming to the requirements of EN 10204 3.1. These products meet the requirements of the latest editions of NACE MR0175, NACE MR0103, and ISO 15156. No weld repair has been performed on these products. This material was not exposed to mercury or any other metal alloy that is liquid at ambient temperatures during processing or while in our possession.

Manufactured in the USA.

CAM1608 / 74FM / 2.0X1.5C160BT / 2X1 1/2" S160 BXT CONC

Capitol Manufacturing
1125 Capitol Avenue
Crowley, LA 70526

Phoenix Capitol Camco
CapProducts

Commanding a Higher Standard℠

Certified Mill Test Report

Printed: 11/9/2016
Certified: 08/03/2016

Customer
LEE SUPPLY CO
PO BOX 1475
TULSA, OK 74101

P.O. 16-5265-DS
Tag

Heat No 74FM
Heat Code 74FM
Phoenix Order # 1241171

Material ASTM A234-2011a WPB / ASME SA234-2010 Edition

Part Number	Description
48201436	2X1 1/2 160 WPB CONC SWG BXT

Chemical Properties

C	Mn	P	S	Si	Cu	Ni	Cr
0.1750	0.7700	0.0140	0.0050	0.2800	0.2000	0.0800	0.0800

C Eq. Long
0.3433

Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0250	0.0013		0.0340	0.0023					

Additional Chemical Properties

Cr + Cu + Ni
0.3600

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in. or 4D	R of A	HBW	HBW2
66,910	45,230	35.6%	0.0%	144	141

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average	Test Temp.
N/A	N/A	N/A	N/A	N/A

We hereby certify that these parts were manufactured, sampled, tested, and inspected in accordance with the product specifications stated and were found to meet the requirements.
We further certify that this material was inspected using independent inspectors conforming to the requirements of EN 10204 3.1. These products meet the requirements of the latest editions of NACE MR0175, NACE MR0103, and ISO 15156. No weld repair has been performed on these products. This material was not exposed to mercury or any other metal alloy that is liquid at ambient temperatures during processing or while in our possession.

Manufactured in the USA.

CMG2887 / 04V / 4.0X2.0TEEXHF / 4 X 2" XH RED TEE SA234 WPB

INSPECTION CERTIFICATE
(MILL TEST CERTIFICATE)
EN 10204 3.1

CHARM MING VIETNAM CO., LTD
SAIGON - LINH TRUNG EXPORT PROCESSING ZONE
THU DUC DISTRICT, HO CHI MINH CITY, VIET NAM.
TEL : 84-8-3897 4885
FAX : 84-8-3897 4894

PURCHASER :
ORDER NO. :
SPEC. FOR RAW MATERIAL : ASTM A106 Gr. B, ASTM A234 Gr. WPB
SPEC. FOR INSPECTION : ASTM A234 - 13e1 WPB
ASME SA234 - 2013 WPB
ASME B16.9-2012 / ASME B16.25-2012
BS EN 10204 3.1-2004

JOB NO. :
CERTIFICATE NO. : Q150627009D-11
DATE. : JUN. 27, 2015

	PO. Item No.	Product & Size(Inch)			Heat Code	Quantity	Heat No.	Raw Material Mfg	Certificate No.
44	77	RED. TEE	3 x 2-1/2	XH	903	17	307903	BAOSHAN	T20343119
45	79	RED. TEE	4 x 2	XH	04V	70	1435204V	HENGYANG	C201440194-1
46	80	RED. TEE	4 x 2-1/2	XH	464	33	300464	BAOSHAN	BGSAG0901230003500
47	59	TEE	3	STD	909V	686	1426909V	HENGYANG	C201504946-1
48	60	RED. TEE	3 x 2	STD	20V	102	1425620V	HENGYANG	C201434646-1

Spe.	Chemical Composition %													Tension Test			Hardness Test	Magnetic Particle Exam.
	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Pb	CE	Yield Strength	Tensile Strength	Elongation		
	X100	X100	X100	X1000	X1000	X100	X100	X100	X100	X1000	X1000	X1000	X100	P.S.I	P.S.I	%	HBW	
MIN		10	29											35000	60000	30		
MAX	25		106	50	58	40	40	40	15	80	20		42		95000		197	
44	13	17	79	9	3	8	4	4	1	*0	1	*<3	28	44225	67860	38	122 - 126	Acceptable
45	15	25	90	11	6	9	3	4	1	3	2	2	32	42485	68730	35	104 - 112	Acceptable
46	13	16	82	9	3	6	3	3	1	*0	<1	*<3	28	44225	71775	37	122 - 130	Acceptable
47	14	27	84	18	6	7	3	7	2	4	1	3	31	42340	67860	36	118 - 124	Acceptable
48	15	22	87	15	7	7	3	7	2	5	1	2	32	45385	66990	37	108 - 115	Acceptable

Visual Examination	Dimensional Inspection	Heat Treatment	(*) Product Analysis by CHARM MING
Acceptable	Acceptable	S.R 700°C x 0.5H	

CE = C + Mn/6 + (Cr + Mo + V) / 5 + (Ni + Cu) /15

MATERIAL (HARDNESS) CONFORMS TO THE REQUIREMENTS OF NACE MR0103-2012/ NACE MR0175-2009 and ISO 15156-2009

We hereby certify that the products described here in have been manufactured and tested in accordance with specifications and also the purchaser's requirements concerned.

NOTE:

1. THE QUALITY MANAGEMENT SYSTEM OF ISO 9001-2008 AND PED 97/23/EC, ANNEX I SEC. 4.3 HAVE BEEN APPROVED BY LRQA
2. ANOTHER PED 97/23/EC, ANNEX I SEC. 4.3 TUV-NORD 0045
3. THE MANGANESE ABOVE THE SPECIFIED MAXIMUM WILL BE PERMITTED UP TO A MAXIMUM OF 1.65%. (FOOTNOTE **D** IN TABLE 1 OF ASTM A234 -13e1 WPB).

Quality Assurance Section/Manager

UCS JOB NO. S-4248

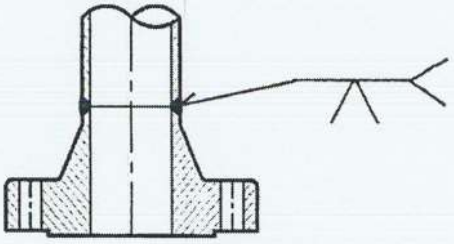
Section 5

Welding Procedures / Procedure Qualification Records

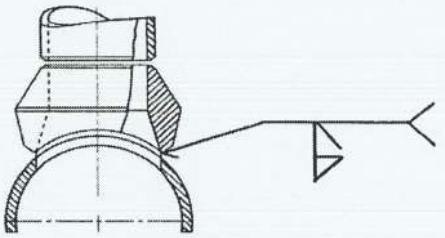
JOB: S-4248-07

UNITED CONTRACTING SERVICES, INC.

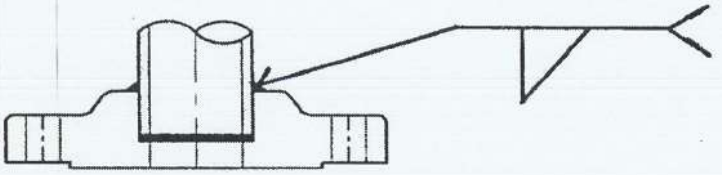
UCS JOB NO.	S-4248-07
CUSTOMER JOB NO.	J-447
PO NO.	4500757620
DATE:	1/25/2017
REVISION:	1



BUTT WELD, TYP.



O-LET WELD, TYP.



FILLET WELD, TYP.

JOINT TYPE: VAIROUS, PIPE				
WPS	PROCESS	MAX DEPOSIT-T	GROOVE-T, min/max	NOTES
5004A	GTAW	0.25"	0.187"-1.0"	P1-Gr.1or2 to P1-Gr.1or2, UNLIMITED PIPE DIA.
	SMAW	0.75"		
5011A	GMAW	0.25"	0.187"-1.50"	P1-Gr.1or2 to P1-Gr.1or2, UNLIMITED PIPE DIA.
	FCAW	1.25"		
5012A	GTAW	1.812"	0.187"-1.812"	P1-Gr.1or2 to P1-Gr.1or2, UNLIMITED PIPE DIA.
GT-1-1.2-50CVN	GTAW	0.625"	0.375"-0.75"	P1-Gr.1or2 to P1-Gr.1or2, BNH, UNLIMITED PIPE DIA.
GM-FC-1-1.2-50CVN	GMAW	0.1375	0.375"-0.75"	P1-Gr.1or2 to P1-Gr.1or2, BNH, UNLIMITED PIPE DIA.
	FCAW	0.50"		
5001A	GTAW	0.864"	0.187"-0.864"	P8-Gr.1 to P8Gr.1, 308L , 309L, 316L
5002A	GMAW	0.137"	0.187"-0.864"	P8-Gr.1 to P8-Gr.1, 308L OR 316L, MIN. PIPE DIA. =0.75"
	FCAW	0.614"		
5007A	GTAW	0.294"	0.062"-0.294"	P8-Gr.1 to P8G-Gr.1, 308L or 316L, UNLIMITED PIPE DIA.

ADDITIONAL NOTES:
Rev. 1 added 5007A for P8 Gr. 1 weld groove thickness down to 0.062"

UCS QUALITY REVIEW: _____ DATE: _____

CUSTOMER REVIEW: _____ DATE: _____

3RD PARTY/ END USER: _____ DATE: _____

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)

(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Juston W Davis CWI 12111841 QC1 EXP. 11/1/2015

05MAR2015

Company Name **UNITED CONTRACTING SERVICES** By: Tim Morris Approved By: 10-22-12

Welding Procedure Specification No. **5004-A** Date 8-14-09 Supporting PQR No.(s) 5004-A

Revision No. 3 Date 10-22-12

Welding Process(es) GAS TUNGSTEN ARC WELDING (GTAW) & SHIELDED METAL ARC WELDING (SMAW) Type(s) GTAW/ SMAW -manual (Automatic,Manual,Machine,Semi-auto)

Joints (QW-402)

Joint Design Single Vee or Bevel , Double Vee or Bevel

Backing (Yes) Optional (No) GTAW-open root

Backing Material (type) Weld metal for double sided weld

(Refer to both backing and retainers.)

☒ Metal ☐ Nonfusing Metal

☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process, procedures, etc.)

Details

Joint Designs page 3 of WPS

See shop drawings for optional joint designs used with this WPS. This WPS may be used in conjunction with other WPS' as indicated on shop drawings.

*** BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

OR

Specification type and grade Example: SA-106B

To Specification type and grade Example: SA-106B

OR

Chem. Analysis and Mech. Prop.

To Chem. Analysis and Mech. Prop.

Thickness Range:

Base Metal: Groove 3/16" – 1" Fillet Unlimited

Pipe Dia. Range: Groove All Diameters Fillet All Diameters

Other

*** FILLER METALS (QW-404)**	**GTAW Root**	**SMAW Fill**
Spec. No. (SFA)	5.18	5.1
AWS No. (Class)	ER70S-2 or ER70S-6	E7018 or E7018-1
F-No.	6	4
A-No.	1 (verify that ER70S-6 meets A1 chemistry)	1
Size of Filler Metals	1/16", 3/32", 1/8"	3/32", 1/8", 5/32"
Weld Metal Thickness Range:	No autogenous welding allowed	
Groove	.250" (1/4") maximum deposit	.750" (3/4") max. deposit
Fillet	Unlimited	Unlimited
Electrode-Flux (Class)	NONE USED	NA
Flux Trade Name	NONE USED	NA
Consumable Insert	None	NA
Other	Bare (Solid wire)	Max. pass thk. < ½"
	Addition of flux: None	

*Each base metal-filler metal combination should be recorded individually.

WPS No. **5004-A** Rev. 2X 3

POSITIONS (QW-405)

Positions(s) of Groove: All positions
Welding Progression: Up Yes Down
Position(s) of Fillet: All positions

PREHEAT (QW-406)

Preheat Temp. Min.: 3/16" to 1" = 55°F
Interpass Temp. Max.: 550°F
Preheat Maintenance: None
(Continuous or special heating where applicable should be recorded)

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range: As Welded Condition
Time Range: N/A

GAS (QW-408)

GTAW	Gas(es)	Percent Composition Mixture	Flow rate
Shielding	Argon	99.995%	20-50 CFH
Trailing	None		
Backing	None		

ELECTRICAL CHARCACTERISTICS (QW-409)

Current AC or DC: Below Polarity: Below
Amps (Range): Below Volts (Range): Below

(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)

Tungsten Electrode Size and Type: EWTh-2 3/32" or 1/8"
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW: N/A
(Spray arc, short circuiting arc, etc.)

Electrode Wire feed speed range: N/A

TECHNIQUE (QW-410)

String or Weave Bead: GTAW- weave SMAW- String or weave (3X rod dia. Max)
Orifice or Gas Cup Size: GTAW: #4 - #12
Initial and Interpass Cleaning (Brushing, Grinding, etc.: All deleterious materials shall be removed 1" both sides of weld joint by grinding or wire brushing. Interpass cleaning with wire brush, chipping hammer or pneumatic scaling gun required.

Method of Back Gouging: N/A for GTAW single side open root stringer deposit. Back gouge and/or grind second side for double side weld using the GTAW process if required.
Contact to Tube Work Distance: N/A
Multiple or Single Pass (per side): Multiple
Multiple or Single Electrodes: Single
Travel Speed (Range): See Below
Peening: None
Other: Oscillation: None Pulsing current: None

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp Range	Volt Range	Travel Speed Range	Other Max. J/in.
Root &	GTAW	ER70S-2	1/16", 3/32"	DC/SP	40-200	12-25	Manual	
Hot pass		or ER70S-6	1/8"	DC/SP	130-300	18-25	Manual	
Fill & cap	SMAW	E7018	3/32"	DC/RP	70-100	19-24	Manual	
		or E7018-1	1/8"	DC/RP	110-135	19-24	Manual	
			5/32"	DC/RP	130-200	19-25	Manual	
			3/16"	DC/RP	180-250	22-28	Manual	

WELD PROCEDURE SPECIFICATION (WPS) JOINT DESIGNS

WPS No.: 5004-A Date: 8-14-09 Rev. No.: 3 Date: 05MAR2015

JOINTS (QW-402

Single-V groove:	**GTAW /SMAW**	**Single bevel groove:**	**GTAW/SMAW**
Backing:	No backing	Backing:	No backing
Root opening:	3/32" – 3/16"	Root opening:	3/32" – 3/16"
Groove angle:	50 deg. Min. included	Groove angle:	45 deg. Min. included
Root face:	1/8" Max	Root face:	1/8" Max
Single-V groove:		**Single bevel groove:**	
Backing:	Backgouged & welded	Backing:	Backgouged & welded
Root opening:	¼" Max.	Root opening:	¼" Max.
Groove angle:	50 deg. Min. included	Groove angle:	45 deg. Min. included
Root face:	3/16" Max.	Root face:	3/16" Max.
Double bevel groove:		**Single J groove:**	3/8" J **GTAW**
Backing:	Backgouged & welded	Backing:	No backing
Root opening:	¼" Max.	Root opening:	3/32" – 3/16"
Groove angle:	50 deg. Min. included	Groove angle:	15 deg. Min. included
Root face:	3/16" Max.	Root face:	1/8" Max
Double V groove:		**Single U groove:**	¾" U **GTAW**
Backing:	Backgouged & welded	Backing:	No backing
Root opening:	¼" Max.	Root opening:	3/32" – 3/16"
Groove angle:	45 deg. Min. included	Groove angle:	15 deg. Min. included
Root face:	3/16" Max.	Root face:	1/8" Max

Single or double fillet weld: GTAW/SMAW

Backing:	Base metal
Root opening:	3/16" Max.
Weld size:	See drawings

1) Alternate weld joint designs may be shown on the drawings or engineering specifications and will take precedence.

2) Initial and interpass cleaning is shown on page 2 of the WPS.

3) Preheat shall be maintained during all thermal cutting, taking and backgouging operations as shown on the WPS.

4) Welds shall be cleaned as required on page 2 of the WPS.

Prepared By:	Tim Morris	Approved By:		Date:	10-22-12

05MAR2015

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015

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

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

Record Actual Conditions Used to Weld Test Coupon.

Company Name **UNITED CONTRACTING SERVICES**

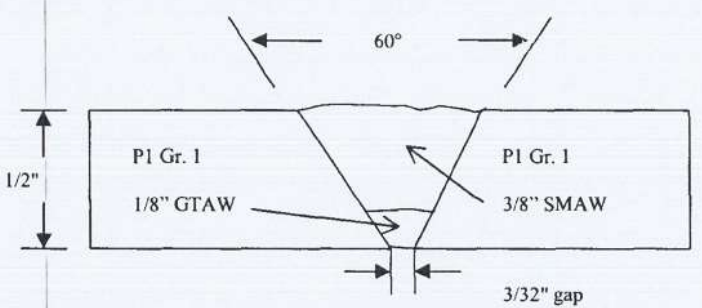
Procedure Qualification Record No. 5004-A Date 8-14-09

WPS No. 5004-A

Welding Processes(es) GAS TUNGSTEN ARC WELDING (GTAW) & SHIELDED METAL ARC WELDING (SMAW)

Types (Manual, Automatic,Semi-auto.) GTAW/ SMAW : Manual

JOINTS (QW-402)



Groove Design of Test Coupon

*(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used)

BASE METALS (QW-403)

Material Spec. SA-106-B

Type or Grade Gr. B

P No. P 1 Gr. 1 to P 1 Gr. 1

Thickness of Test Coupon 1/2 "

Diameter of Test Coupon 8.825"

Other Qualifies T thk. 3/16" – 1" with no PWHT
Qualifies GTAW t thk. 1/4" max.
Qualifies SMAW t thk. 3/4" max.
Max. bead thk. < 1/2"

POSTWELD HEAT TREATMENT (QW-407)

Temperature As Welded

Time N/A

Other

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow rate
Shielding	Argon	99.995%	40 CFH
Trailing	None		
Backing	None		

Other

FILLER METALS (QW-404)	**SMAW**	**GTAW**
SFA Specification	5.1	5.18
AWS Classification	E7018	ER70S-2
Filler metal F-No.	4	6
Weld Metal Analysis A-No.	1	1
Size of Filler Metal	1/8"	1/8"
Other	GTAW :Solid wire	
	Consumable inserts: None	
	Addition of flux for GTAW: None	
Weld Metal Thickness	3/8" *	1/8"
Max. pass thk. <1/2"		With filler* addition

ELECTRICAL CHARACTERISTICS (QW-409)

Current GTAW: DC SMAW: DC

Polarity GTAW: SP SMAW: RP

Amps GTAW: 130 SMAW: 98

Volts GTAW: 19 SMAW: 19

Tungsten Electrode Size 1/8" dia. EWTh-2

Pulsing Amps None

J/in. Qualified (CVN's) N/A

Other

POSITION (QW-405)

Position of Groove 6G

Weld Progression (Uphill, Downhill) Uphill

Other

PREHEAT (QW-406)

Preheat Temp. (min.) 70°F

Interpass Temp. (max.) 550°F

Other

TECHNIQUE (QW-410)

Travel Speed Manual

String or Weave Bead GTAW: Weave SMAW: String

Oscillation None

Multipass or Single Pass (per side) Multipass

Single or Multiple Electrodes Single

Other

*Corrected SMAW deposit from 1/2" to 3/8" and added with filler addition to GTAW process. Recertified 10-22-10

QW-483 (Back)

PQR No. 5004-A

Tensile Test (QW-150)

Specimen No.	Width (in)	Thickness (in)	Area (sq. in)	Ultimate Total Load lb	Ultimate Unit Stress Psi	Type of Failure & Location
1	0.756	0.479	0.3621	24,260	66,998	Base- ductile
2	0.748	0.482	0.3605	24,333	67,498	Base- ductile

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
#1 Side bend per QW-462.2	Satisfactory
#2 Side bend per QW-462.2	Satisfactory
#3 Side bend per QW-462.2	Satisfactory
#4 Side bend per QW-462.2	Satisfactory

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.°F	Impact Values	Lateral Expansion		Drop Weight	
					% Shear	Mils	Break	No Break
			10mmX10mm specimen					
			HAZ (P1 Gr. 1 & Gr. 2)					

Fillet-Weld Tests (QW-180)

Result- Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes _____ No _____

Macro- Results _____

Other Tests

Type of Test _____

Deposit Analysis _____

Other _____

Welders Name Jorge Pando Clock No. _____ Stamp No. A

Test conducted by: Tulsa Gamma Ray Inc. Laboratory Test No. 102127934

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the Requirements of Section IX of the ASME Code. Updated to new form 8-13-12

Manufacturer UNITED CONTRACTING SERVICES

Date 8-14-09 By _____

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name UCONTRACTING SERVICES INC. By: Juston Davis Approved by: Jose R Estrada
Welding Procedure Specification No. 5011A Date 4/18/12 Supporting PQR No.(s) 5011A
Revision No. 3 Date 11-23-2016
Welding Process(es) GMAW/FCAW Type(s) Semi-Auto/Semi-Auto
(Automatic,Manual,Machine,Semi-auto)

Joints (QW-402) Details

Joint Design Any*
Root Spacing SEE SHEET 3
Backing (Yes) FCAW (No) GMAW
Backing Material (type) PER CUSTOMER REQUIRMENT
(Refer to both backing and retainers.)

See page 3 of WPS for joint design details.
*1 See shop drawings for optional joint designs used with this WPS.

☒ Metal ☐ Nonfusing Metal
☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process, procedures, etc.)

This WPS may be used in conjunction with other WPS' as indicated on shop drawings. (Ex. Used for repair or root pass.)

*** BASE METALS (QW-403)**
P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2
OR
Specification type and grade EXAMPLE: SA-516-60
To Specification type and grade EXAMPLE: SA516-70
OR
Chem. Analysis and Mech. Prop. SEE P NO. ABOVE
To Chem. Analysis and Mech. Prop. SEE P NO. ABOVE
Thickness Range:
Base Metal: Groove 3/16"~1.5" Fillet UNLIMITED
Maximum Pass Thickness ≤ ½ in. (Yes) X (No)
Other Not allowed for ASME Services greater than 1.5". Thicknesses between 1.0~1.25" shall have a minimum pre-heat of 175ºF and thicknesses from 1.25~1.5" shall have a minimum pre-heat of 200ºF.

*** FILLER METALS (QW-404)**	**FCAW**	**GMAW**
Spec. No. (SFA)	5.20/5.36	5.17/5.18
AWS No. (Class)	E71T-M1/E71T1-M21A2	ER70S-3 or ER70S-6
F-No.	6	6
A-No.	1 (VERIFY E71T-M MEETS A1 CHEM.)	1 (VERIFY ER70S-6 MEETS A1 CHEM.)
Size of Filler Metals	0.045", 1/16"	0.035", 0.045"
Filler Metal Product Form	TUBULAR	BARE WIRE
Supplemental Filler Metal	NONE ALLOWED	NONE ALLOWED
Weld Metal Thickness Range: Groove	3/16"~1.375"	0.062"~0.250"
Fillet	UNLIMITED	UNLIMITED
Electrode-Flux (Class)	NO ADDITIONAL FLUX ADDED	NO ADDITIONAL FLUX ADDED
Flux Trade Name	NONE	NONE
Consumable Insert	NONE	NONE
Other	NO ALLOYING ELEMENTS	NO ALLOYING ELEMENTS

*Each base metal-filler metal combination should be recorded individually.

WPS No. 5011A Rev. 3

POSITIONS (QW-405)
Positions(s) of Groove: ALL
Welding Progression: Up FCAW Down GMAW
Position(s) of Fillet: ALL
Other

POSTWELD HEAT TREATMENT (QW-407)
Temperature Range: N/A
Time Range: N/A
Other

PREHEAT (QW-406)
Preheat Temp. Min.: 50°F
Interpass Temp. Max.: 500°F MAX.
Preheat Maintenance: NONE AFTER WELDING
(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	Percent Composition Mixture	Flow rate
Shielding	AR/CO2	75/25	30~50CHF
Trailing	NONE		
Backing	NONE		
Other			

ELECTRICAL CHARCACTERISTICS (QW-409)

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp Range	Volt Range	IPM Travel Speed Range	Wire Feed Speed Range	Energy or Power Range	(e.g. Remarks Comment Technique
ROOT	GMAW	ER70S-3 or ER70S-6	.035"	DC/RP	115~145	18~23	MAN.	VAR.	*	
FILL/ CAP	FCAW	E71T-M	.045"	DC/RP	140~240	22~29	MAN.	VAR.	*	
	FCAW	E71T-M	1/16"	DC/RP	220~380	22~32	MAN.	VAR.	*	

Amps and volts, or power or energy range, should be recorded for each electrode size

Pulsing Current: NONE Heat Input Range: *NOT REQUIRED FOR IMPACT EXEMPT APPLICATIONS
Tungsten Electrode size: NONE
Mode of Transfer for GMAW (FCAW): GMAW-GLOB., FCAW-GLOB. or SPRAY
Other

TECHNIQUE (QW-410)
String or Weave Bead: GMAW- STRING or WEAVE, FCAW-STRING (3/4" MAX.)
Orifice or Gas Cup Size: 5/16" or ¾" I.D.
Initial and Interpass Cleaning (Brushing, Grinding, etc.): **All deleterious materials shall be removed 1" both sides of weld joint by grinding or wire brushing. GMAW – WIRE BRUSH EACH PASS REQUIRED. FCAW - Interpass cleaning with wire brush, chipping hammer, or pneu. Scaling gun required.**
Method of Back Gouging: N/A for single side w/ no access to second side; grinding optional if second side accessible. FCAW may be used for dbl. sided welding with sec. side back gouged to bright metal & welded w/FCAW
Oscillation: None
Contact to Tube Work Distance: ½" ~ 1-1/4"
Multiple or Single Pass (per side): MULT.
Multiple or Single Electrodes: SINGLE
Electrode Spacing: NONE
Peening: NONE ALLOWED
Other: NO OCCILATION

PROCEDURE SPECIFICATION (WPS) JOINT DESIGNS

WPS No.: 5011A Date: 4-18-12 Rev. No.: 3 Date: 11-23-16

JOINTS (QW-402

Single-V groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32"~3/16"
Groove angle:	50° Min. included
Root face:	1/8" Max.

Single bevel groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32"~3/16"
Groove angle:	45° Min. included
Root face:	1/8" Max.

Single-V groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	¼" Max.
Groove angle:	50° Min. included
Root face:	3/16" Max.

Single bevel groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	¼" Max.
Groove angle:	45° Min. included
Root face:	3/16" Max.

Double bevel groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	¼" Max.
Groove angle:	50° Min. included
Root face:	3/16" Max.

Single J groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32"~3/16"
Groove angle:	15° Min. included
Root face:	1/8" Max.

Double V groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	¼" Max.
Groove angle:	45° Min. included
Root face:	3/16" Max.

Single U groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32"~3/16"
Groove angle:	15° Min. included
Root face:	1/8" Max.

Single or double fillet weld:	**GMAW/FCAW**
Backing:	Base metal
Root opening:	3/16" Max.
Weld size:	See drawing details

1) Alternate weld joint designs may be shown on the drawings or engineering specifications and will take precedence.

2) Initial and interpass cleaning is shown on page 2 of the WPS.

3) Preheat shall be maintained during all thermal cutting, taking and backgouging operations as shown on the WPS.

4) Welds shall be cleaned as required on page 2 of the WPS.

Prepared By:	Juston Davis	Approved By:	Jose R. Estrada	Date:	11/23/16

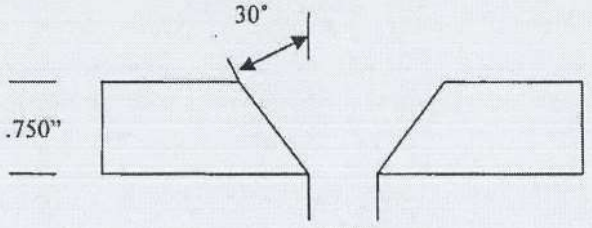
TULSA GAMMA RAY, INC.
1127 S Lewis Ave. Tulsa, OK 74104
PH 918-585-3228 FX 918-598-5584

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

(See QW-200.0 Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company UNITED CONTRACTING SERVICES
PQR No. 5011 Date 4-18-12
WPS No. 5011-A Welding Process(es) GMAW/FCAW
Types (Manual, Automatic, Semi-Auto) SEMI-AUTO

JOINTS (QW-402)



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

BASE METALS (QW-403)
Material Spec. SA516
Type or Grade 70
P-No. 1 Gr. 1 to P-No. 1 Gr. 1
Thickness of Test Coupon 0.750"
Diameter of Test Coupon N.A.
Maximum Pass Thickness 0.250"
Other OPEN ROOT, NO BACKING

POSTWELD HEAT TREATMENT (W-407)
Temperature N/A
Time N/A
Other

GAS (QW-408)

	Gas(es)	Percent Composition Mixture	Flow Rate
Shielding	ARGON/CO2	75/25	35 CFH
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

FILLER METALS (QW-404)

SFA Specification	5.18	5.20
AWS Classification	ER70S-6	E71T-1M
Filler Metal F-No.	6	6
Weld Metal Analysis A-No.	1	1
Size of Filler Metal	0.035"	0.045"
Filler Metal Product Form	SOLID	TUBULAR
Supplemental Filler Metal	NONE	NONE
Electrode Flux Classification	N/A	N/A
Flux Type	N/A	N/A
Flux Trade Name	N/A	N/A
Weld Metal Thickness	0.125"	0.437"

Other

ELECTRICAL CHARACTERISTICS (QW-409)
Current DCEP /DCEP
Polarity REVERSE /REVERSE
Amps. 130 / 150 Volts 21/23
Tungsten Electrode Size N/A
Mode of Transfer for GMAW (FCAW) SEE BELOW
Other GMAW: GLOBULAR FCAW: GLOBULAR

POSITION (QW-405)
Position of Groove 1G
Weld Progression N.A.
Other N/A

TECHNIQUE (QW-410)
Travel Speed 12 IPM
String or Weave Bead STRINGER
Oscillation NONE
Multipass or Single Pass (per side) MULTIPASS
Single or Multiple Electrodes SINGLE
Other

PREHEAT (QW-406)
Preheat Temp. AMBIENT (70°F)
Interpass Temp. 475°F MAX
Other

UCS HE
QC Approved
By
Date 4/18/12

TULSA GAMMA RAY, INC.
1127 S Lewis Ave. Tulsa, OK 74104
PH 918-585-3228 FX 918-598-5584

PQR No. 5011-A

Tensile Test (QW-150)

Specimen No.	Width	Thickness	Area	Ultimate Total Load lb.	Ultimate Unit Stress psi	Type of Failure & Location
1 (	0.755"	0.714"	0.5391	44,191	81,972	DUCTILE BASE METAL
2	0.755"	0.722"	0.5451	44,190	74,249	DUCTILE BASE METAL

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
SIDE FIG. 462.3(a) 102131246	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"
SIDE FIG. 462.3(a) 102131246	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"
SIDE FIG. 462.3(a) 102131246	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"
SIDE FIG. 462.3(a) 102131246	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"

Toughness Tests (QW-170) N/A

Specimen No.	Notch Location	Specimen Size	Test Temp.	Impact Values			Drop Weight Break (Y/N)
				Ft. lbs	Lateral Expansion	% Shear	
1	WM 1/16"ROOT	10mm x 10mm	-20°F	23	19	55	N
2	WM 1/16"ROOT	10mm x 10mm	-20°F	19	17	50	N
3	WM 1/16"ROOT	10mm x 10mm	-20°F	13	13	45	N
4	WM 1/16" CAP	10mm x 10mm	-20°F	32	28	45	N
5	WM 1/16" CAP	10mm x 10mm	-20°F	23	22	50	N
6	WM 1/16" CAP	10mm x 10mm	-20°F	34	27	50	N
7	HAZ	10mm x 10mm	-20°F	18	18	40	N
8	HAZ	10mm x 10mm	-20°F	15	21	45	N
9	HAZ	10mm x 10mm	-20°F	16	19	45	N

Comments: _____

Fillet-Weld Test (QW-180) N/A

Result-Satisfactory Yes _____ No _____ Penetration into Parent Metal: Yes _____ No _____

Macro-Results _____

Other Tests

Type of Test _____

Deposit Analysis _____

Other _____

Welder's Name JORGE PANDO Clock No. _____ Stamp No. _____

Tests Conducted By Tulsa Gamma Ray, Inc. JP Laboratory Test No. 102131246

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

Manufacturer UNITED CONTRACTING SERVICES

Date 4/18/12 By H. E. Edwards

UNITED CONTRACTING SERVICES

Tulsa, Ok.

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATIONS (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

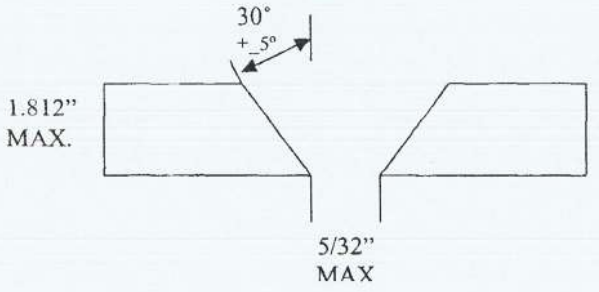
Company Name UNITED CONTRACTING SERVICES Approved by / Date 8-21-13
WPS No: 5012-A Date 6-1-12 Supporting PQR No. (s) 5012
Revision No. 2 Date of Rev. 8-21-13 **Added "with filler Addition" comment**

Welding Process(es) GTAW Type MANUAL
(Automatic, Manual, Machine, or Semi-Auto)

JOINTS (QW-402)
Joint Design Any
Backing With or without
Backing Material (Type) Per customer requirement
Refer to both backing and retainers

☐ Metal ☐ Nonfusing Metal
☐ Nonmetallic ☐ Other
No nonmetallic or non-fusing metal retainers used.

Details



Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.
(At the option of the Mfgr. / sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g., for notch toughness procedures, for multiple process procedures, etc.)

V,J or U bevel grooves, fillets or other joints detailed on engineering drawings, production routing or repair procedures.

BASE METALS (QW-403)
P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2
OR
Specification type and grade or UNS Number
to Specification type and grade or UNS Number
OR
Chem. Analysis and Mech. Prop
To Chem. Analysis and Mech. Prop
Thickness Range:
Base Metal: Groove 0.1875" TO 1.812" MAX Fillet UNLIMITED
Diameter Groove UNLIMITED Fillet UNLIMITED
Maximum Pass Thickness ≤ ½ in.(13mm)
Other No pass greater than ½"

*FILLER METALS (QW-404)

Spec. No. (SFA)	5.18
AWS No. (Class)	ER70S-6/ER70S-2
F-No.	6
A-No.	1(Verify Chemistry)
Size of Filler Metals	3/32", 1/8"
Filler Metal Product Form	SOLID
Supplemental Filler Metal	NONE
Weld Metal	
Thickness Range:	
Groove	1.812"
Fillet	ANY
Electrode-Flux (Class)	N.A.
Flux Trade Name	N.A.
Consumable Insert	N.A.
Other	With Filler Addition

*Each base metal-filler metal combination should be recorded individually.

UNITED CONTRACTING SERVICES

Tulsa, Ok.

			WPS No.	5012-A	Rev. 2

POSITIONS (QW-405)		POSTWELD HEAT TREATMENT (QW-407)	
Position(s) of Groove	ALL	Temp Range	N.A.
Welding Progression:	☐ DOWN ☒ Up	Time Range	N.A.
Position(s) of Fillet	ALL	Other	
Other			

PREHEAT (QW-406)			GAS (QW-408)	Percent Composition	
Preheat Temp. Min.	50°		Gas(es)	Mixture	Flow Rate
Interpass Temp. Max.	550°	Shielding	Argon	100	20-35 CFH
Preheat Maintenance		Trailing	N.A.	N.A.	N.A.
Other		Backing	N.A.	N.A.	N.A.
(Continuous or special heating where applicable should be recorded)		Other			

ELECTRICAL CHARACTERISTICS (QW-409)

Weld Pass(es)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar	Current Amp. Range	Volt Range	Travel Speed (Range)	Other ; Remarks And Comments
ALL	GTAW	ER70S-6 OR ER70S-2	3/32" OR 1/8"	DCEN	75-150	10-13	3-7 ipm	
ALL	GTAW	ER70S-6 OR ER70S-2	3/32" OR 1/8"	DCEN	75-150	10-13	3-8 ipm	

Amps and volts range should be recorded for each electrode size, position, and thickness, etc.

Pulsing Current N/A Heat Input (max.) N/A

Tungsten Electrode Size and Type: 3/32" or 1/8" EWTh-2

(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW (FCAW): **N/A**

(Spray Arc, Short Circuiting Arc, etc.)

Electrode Wire Feed Speed Range: **N/A**

Other:

TECHNIQUE (QW-410)

String or Weave Bead: STRING or WEAVE

Orifice, Nozzle or Gas Cup Size: #4 TO #12

Initial and Interpass Cleaning (brushing, Grinding, etc.) BRUSHING AND GRINDING AS NEEDED

Method of Back Gouging CARBON ARC GOUGHING

Oscillation: NONE

Contact Tube to Work Distance: N/A

Multiple or Single (per side): MULTIPASS

Multiple or Single Electrodes: SINGLE

Electrode Spacing: N/A

Peening: NONE ALLOWED

Other:

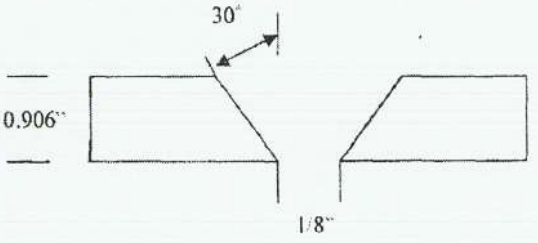
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PH 918-585-3228 FX 918-598-5584

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

(See QW-200.0 Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company UNITED CONTRACTING SERVICES
PQR No. 5012 Date 6-1-12 Corrected Deposited Filler Metal Thickness & Typos Date: 8-21-13
WPS No. 5012-A Welding Process(es) GTAW
Types (Manual, Automatic, Semi-Auto) MANUAL

JOINTS (QW-402)



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

BASE METALS (QW-403)
Material Spec. SA106
Type or Grade B
P-No. 1 Gr. 1 to P-No. 1 Gr. 1
Thickness of Test Coupon 0.906"
Diameter of Test Coupon N.A.
Maximum Pass Thickness 0.250"
Other OPEN ROOT, NO BACKING

FILLER METALS (QW-404)
SFA Specification 5.18
AWS Classification ER70S-6
Filler Metal F-No. 6
Weld Metal Analysis A-No. 1
Size of Filler Metal 3/32"
Filler Metal Product Form SOLID
Supplemental Filler Metal NONE
Electrode Flux Classification N/A
Flux Type N/A
Flux Trade Name N/A
Weld Metal Thickness 0.906"
Other With filler addition

POSITION (QW-405)
Position of Groove 1G
Weld Progression N.A.
Other N/A

PREHEAT (QW-406)
Preheat Temp AMBIENT (90°F)
Interpass Temp. 475°F MAX
Other

POSTWELD HEAT TREATMENT (W-407)
Temperature N/A
Time N/A
Other

GAS (QW-408)

	Gas(es)	Percent Composition Mixture	Flow Rate
Shielding	ARGON	100%	35 CFH
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

ELECTRICAL CHARACTERISTICS (QW-409)
Current DCEN
Polarity STRAIGHT
Amps. 130 Volts 19
Tungsten Electrode Size 1/8" EWTh-2
Mode of Transfer for GMAW (FCAW) N/A
Other N/A

TECHNIQUE (QW-410)
Travel Speed 10 IPM
String or Weave Bead STRINGER
Oscillation NONE
Multipass or Single Pass (per side) MULTIPASS
Single or Multiple Electrodes SINGLE
Other

TULSA GAMMA RAY, INC.
1127 S Lewis Ave. Tulsa, OK 74104
PH 918-585-3228 FX 918-598-5584

QW-483 (BACK)

PQR No. 5012

Tensile Test (QW-150)

Specimen No	Width	Thickness	Area	Ultimate Total Load lb.	Ultimate Unit Stress psi	Type of Failure & Location
1	0.748	0.893	0.6679	53,726	80,440	DUCTILE BASE METAL
2	0.753	0.905	0.6814	51,064	74,940	DUCTILE BASE METAL

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
SIDE FIG. 462.2	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"
SIDE FIG. 462.2	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"
SIDE FIG. 462.2	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"
SIDE FIG. 462.2	PASS NO RELEVANT INDICATIONS GREATER THAN 1/8"

Hardness Test- Brinell Hardness

Location	Readings 1	2	3
HAZ	162	176	226
WELD	200	210	198
HAZ	196	176	185

Comments:

Fillet-Weld Test (QW-180) N/A

Result-Satisfactory Yes ____ No ____ Penetration into Parent Metal: Yes ____ No ____

Macro-Results

Other Tests N/A

Type of Test

Deposit Analysis

Other

Welder's Name JORGE PANDO Clock No. ____ Stamp No. A

Tests Conducted By Tulsa Gamma Ray, Inc. Laboratory Test No. 102131720

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

Manufacturer UNITED CONTRACTING SERVICES

Date 8-21-13 By

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)

(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015

Company Name **UNITED CONTRACTING SERVICES** By: Tim Morris Approved By:

Welding Procedure Specification No. **GT-1-1.2 -50CVN** Date 11-18-14 Supporting PQR No.(s) 14-14534

Revision No. 0 Date N/A

Welding Process(es) **GAS TUNGSTEN ARC WELDING (GTAW)** Type(s) Manual

(Automatic,Manual,Machine,Semi-auto)

Joints (QW-402) Details

Joint Design Single Vee or Bevel , Double Vee or Bevel, Fillet

Root Spacing 3/32" to 3/16"

Backing (Yes) Optional (No) GTAW- open rrot

Backing Material (type) Weld metal or base metal

(Refer to both backing and retainers.)

See page 3 of WPS for joint design details.

*1 See shop drawings for optional joint designs used with this WPS.

☒ Metal ☐ Nonfusing Metal

☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process, procedures, etc.)

This WPS may be used in conjunction with other WPS' as indicated on shop drawings. (Ex. Used for repair or root pass.)

*** BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

OR

Specification type and grade Ex: SA-106-B

To Specification type and grade Ex: SA-105

OR

Chem. Analysis and Mech. Prop.

To Chem. Analysis and Mech. Prop.

Thickness Range:

Base Metal: Groove 3/8" to 3/4" Fillet Unlimited

Maximum Pass Thickness ≤ ½ in. (Yes) X (No)

Other

*** FILLER METALS (QW-404)**	**GTAW**	
Spec. No. (SFA)	5.18	
AWS No. (Class)	**ER70S-6**	
F-No.	6	
A-No.	1 *	*ER70S-6 weld cert. must meet
Size of Filler Metals	1/16", 3/32", 1/8"	1.60% max. Mn and 1.0% max. Si
Filler Metal Product Form	Solid (bare) wire	to meet A1 chemistry.
Supplemental Filler Metal	None	
Weld Metal Thickness Range: Groove	5/8" maximum deposit.**	
Fillet	Unlimited	
Electrode-Flux (Class)	None used for aid in penetration	
Flux Trade Name	N/A	
Consumable Insert	None	
Other	** Due to the mismatch on the coupon, the mechanical testing and CVN's were taken from 5/16" thk. machined material.	

*Each base metal-filler metal combination should be recorded individually.

WPS No. GT-1-1.2 -50 CVN Rev. 0

POSITIONS (QW-405)

Positions(s) of Groove 1G & 2G
Welding Progression: Up N/A Down N/A
Position(s) of Fillet 1F & 2F
Other

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range None (As welded condition)
Time Range N/A
Other N/A

PREHEAT (QW-406)

Preheat Temp. Min. 60° F
Interpass Temp. Max. 450° F
Preheat Maintenance None after completion of weldment.
(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	Percent Composition Mixture	Flow rate
Shielding	Argon	99.995%	25-40 CFH
Trailing	None		
Backing	None		

Other

ELECTRICAL CHARCACTERISTICS (QW-409)

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp Range	Volt Range	IPM Travel Speed Range	Wire Feed Speed Range	Energy or Power Range	(e.g. Remarks Comment Technique
	GTAW	ER70S-6	1/16"	DC/SP	70-120	14-21	2.8-6	N/A	*	
	GTAW	ER70S-6	3/32"	DC/SP	80-150	14-21	2.8-7	N/A		
	GTAW	ER70S-6	1/8"	DC/SP	120-150	15-21	2.8-8	N/A		

Amps and volts, or power or energy range, should be recorded for each electrode size

Pulsing Current None Heat Input Range. 67,500 J/in. maximum qualified
Tungsten Electrode size 3/32" or 1/8" EWTh-2
Mode of Transfer for GMAW (FCAW) N/A
Other * Power range is not recorded.

TECHNIQUE (QW-410)

String or Weave Bead String or weave bead
Orifice or Gas Cup Size #6 - #10
Initial and Interpass Cleaning (Brushing, Grinding, etc. **All deleterious materials shall be removed 1" both sides of weld joint by grinding or wire brushing or descaling. Light flash rust after grinding or descaling is acceptable. Interpass cleaning with wire brush, grinding or chatter gun.**
Method of Back Gouging Double side weld- Air carbon arc and/or grind second side to sound metal. NA for fillet welds or open root.
Oscillation None
Contact to Tube Work Distance N/A
Multiple or Single Pass (per side) Multiple
Multiple or Single Electrodes Single
Electrode Spacing Manual
Peening None
Other

PROCEDURE SPECIFICATION (WPS) JOINT DESIGNS

WPS No.: GT-1-1.2 -50CVN Date: 11-18-14 Rev. No.: 0 Date: N/A

JOINTS (QW-402

Single-V groove:	**GTAW**
Backing:	No backing
Root opening:	3/32" – 1/4"
Groove angle:	50 deg. Min. included
Root face:	1/8" Max

Single bevel groove:	**GTAW**
Backing:	No backing
Root opening:	3/32" – 1/4"
Groove angle:	45 deg. Min. included
Root face:	1/8" Max

Single-V groove:	**GTAW**
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	50 deg. Min. included
Root face:	3/16" Max.

Single bevel groove:	**GTAW**
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	45 deg. Min. included
Root face:	3/16" Max.

Double bevel groove: GTAW	
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	50 deg. Min. included
Root face:	3/16" Max.

Single J groove:	**GTAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	15 deg. Min. included
Root face:	1/8" Max

Double V groove: GTAW	
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	45 deg. Min. included
Root face:	3/16" Max.

Single U groove:	**¾" U GTAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	15 deg. Min. included
Root face:	1/8" Max

Single or double fillet weld: GTAW	
Backing:	Base metal
Root opening:	3/16" Max.
Weld size:	See drawings

1) Alternate weld joint designs may be shown on the drawings or engineering specifications WS 1.00-10 and will take precedence.

2) Initial and interpass cleaning is shown on page 2 of the WPS.

3) Preheat shall be maintained during all thermal cutting, taking and backgouging operations as shown on the WPS.

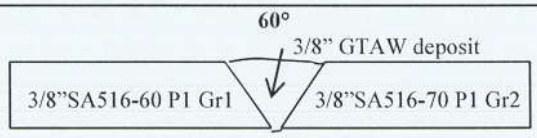
4) Welds shall be cleaned as required on page 2 of the WPS.

Prepared By:	Tim Morris	Approved By:	Juston W Davis CWI 12111641 QC1 EXP. 11/1/2015	Date:	

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name **UNITED CONTRACTING SERVICES**
Procedure Qualification Record No. 14-14534 Date 11-18-14
WPS No. **GT-1-1.2 -50 CVN**
Welding Processes(es) **GAS TUNGSTEN ARC WELDING (GTAW)**
Types (Manual, Automatic,Semi-auto.) Manual

JOINTS (QW-402)



Groove Design of Test Coupon
*(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used)

BASE METALS (QW-403)
Material Spec. SA-516-60 to SA-516-70
Type or Grade Dual certified plate
P No. 1 Gr. No. 1 to P No 1 Gr. No 2
Thickness of Test Coupon 3/8"
Diameter of Test Coupon N/A (plate test)
Max. pass thk. < 1/2"
Other SA-516-60/70 Nucor Ht# 4500920

POSTWELD HEAT TREATMENT (QW-407)
Temperature None (As welded)
Time N/A
Other N/A

GAS (QW-408)

	Percent Composition Gas(es)	(Mixture)	Flow rate
Shielding	Argon	99.995%	40 CFH
Trailing	None		
Backing	None		

FILLER METALS (QW-404)	**GTAW**
SFA Specification	5.18
AWS Classification	ER70S-6
Filler metal F-No.	6
Weld Metal Analysis A-No.	1
Size of Filler Metal	3/32"
Filler metal product form	Bare (solid) wire
Supplemental Filler Metal	N/A
Electrode Flux Classification	N/A
Flux Type	N/A
Flux trade name	None
Weld Metal Thickness	3/8"
Consumable inserts	None

Other GTAW: Oxford Alloys 3/32" HT# SA02684
Meets A1 chemistry

ELECTRICAL CHARACTERISTICS (QW-409)
Current DC
Polarity Straight
Amps 150
Volts 21
Tungsten Electrode Size 1/8" EWTh-2
Pulsing Amps None
J/in. Qualified (CVN's) 67,500 J/in
Mode of metal transfer
GMAW/FCAW N/A
Other

POSITION (QW-405)
Position of Groove 1G .
Weld Progression (Uphill, Downhill) N/A
Other

PREHEAT (QW-406)
Preheat Temp. (min.) 60°F (ambient temp.)
Interpass Temp. (max.) 400°F
Other

TECHNIQUE (QW-410)
Travel Speed 2.8 IPM
String or Weave Bead Weave
Oscillation None
Multipass or Single Pass (per side) Multipass
Single or Multiple Electrodes Single
Other

QW-483 (Back)

PQR No. 14-1453

Tensile Test (QW-150)

Specimen No.	Width (in)	Thickness (in)	Area (sq. in)	Ultimate Total Load lb	Ultimate Unit Stress Psi	Type of Failure & Location
1	0.751	0.328	0.246	19,840	80,650	Base-ductile
2	0.746	0.304	0.277	18,230	80,308	Base-ductile

Guided-Bend Tests (QW-160)

Type and Figure No. QW-462.2a	Result
#1 Side bend	Satisfactory
#2 Side bend	Satisfactory
#3 Side bend	Satisfactory
#4 Side bend	Satisfactory

Toughness Tests (QW-170) (N/A)

Specimen No.	Notch Location	Notch Type	Test Temp.°F	Impact Values			Drop Weight	
				Values ft/lb	% Shear	Mils (in.)	Break	No Break
1,2,3	Weld	"V"	-50 *	45,45,10	N/A	N/A	N/A	N/A
1,2,3	HAZ (SA516-60)	"V"	-50 *	57,46,64	N/A	N/A	N/A	N/A
1,2,3	HAZ (SA516-70)	"V"	-50 *	64,54,34	N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
Specimen Size 10mm X 7mm *(Actual test temperature due to sub-sized specimen was -58°F)								

Fillet-Weld Tests (QW-180)

Result- Satisfactory: Yes N/A No N/A Penetration into Parent Metal: Yes N/A No N/A

Macro- Results N/A

Other Tests

Type of Test BHN: SA-516-70 (141,139,141) , HAZ (156,156,159) Weld (162,153,159) SA-516-60 (132,130,137) HAZ (153,156, 159)

Other N/A

Welders Name Jorge Pando Sr. Clock No. N/A Stamp No. A

Test conducted by: Sun Materials Testing / Element Laboratory Test No. 14-14534-1/-2

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

Organization **UNITED CONTRACTING SERVICES**

Date 11-18-14 By: Tim Morris Certified by

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)

(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015

Company Name **UNITED CONTRACTING SERVICES** By: Tim Morris Approved By:

Welding Procedure Specification No. GM-FC-1-1.2 -50 CVN Date 11-9-14 Supporting PQR No.(s) 14-14510

Revision No. 0 Date N/A

Welding Process(es) **GAS METAL ARC WELDING (GMAW) &** **FLUX CORED ARC WELDING (FCAW)** Type(s) Semi-automatic (Automatic,Manual,Machine,Semi-auto)

Joints (QW-402) Details

Joint Design Single V or Bevel , Double V or Bevel, Fillet

Root Spacing 3/32" to 3/16"

Backing (Yes) Optional (No) GMAW- open root

Backing Material (type) Weld metal or base metal

(Refer to both backing and retainers.)

See page 3 of WPS for joint design details.

*1 See shop drawings for optional joint designs used with this WPS.

☒ Metal ☐ Nonfusing Metal

☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process, procedures, etc.)

This WPS may be used in conjunction with other WPS' as indicated on shop drawings. (Ex. Used for repair or root pass.)

*** BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

OR

Specification type and grade Ex: SA-106-B Normalized

To Specification type and grade Ex: SA-516-60/70 Normalized

OR

Chem. Analysis and Mech. Prop. Base material must be in the normalized condition.

To Chem. Analysis and Mech. Prop.

Thickness Range:

Base Metal: Groove 3/8" to 3/4" * Fillet Unlimited

Maximum Pass Thickness ≤ ½ in. (Yes) X (No)

Other *Maximum fill on a 3/4" thk. base metal is 0.6375" due to GMAW short circuiting arc process.

*** FILLER METALS (QW-404)**	**FCAW**	**GMAW**
Spec. No. (SFA)	5.20	5.18
AWS No. (Class)	E71T-12MJ	ER70S-6
F-No.	6	6
A-No.	E71T-12MJ (Kobe DWA-55ESR) *	ER70S-6 *
Size of Filler Metals	.045"	.035"
Filler Metal Product Form	Flux cored wire wire	Solid (bare) wire
Supplemental Filler Metal	None	None
Weld Metal Thickness Range: Groove	1/2" maximum	0.1375" maximim
Fillet	Unlimited	Unlimited
Electrode-Flux (Class)	N/A	N/A
Flux Trade Name	N/A	N/A
Consumable Insert	N/A	N/A
Other	Alloy elements: None	Alloy elements: None
	*Cert. must meet < 1.60 Mn & < .90 Si for A1	*Cert. must meet < 1.60 Mn & < .90 Si for A1

*Each base metal-filler metal combination should be recorded individually.

WPS No. GM-FC-1-1.2 -50 CVN Rev. 0

POSITIONS (QW-405)

Positions(s) of Groove: All positions
Welding Progression: Up x Down
Position(s) of Fillet: All positions
Other

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range: As Welded Condition
Time Range: N/A
Other

PREHEAT (QW-406)

Preheat Temp. Min.: 60° F
Interpass Temp. Max.: 450° F
Preheat Maintenance: None after completion of weldment.
(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	Percent Composition Mixture	Flow rate
Shielding	Argon/CO2	75/25%	25-40 CFH
Trailing	None		
Backing	None		

Other

ELECTRICAL CHARCACTERISTICS (QW-409)

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp Range	Volt Range	IPM Travel Speed Range	Wire Feed Speed Range	Energy or Power Range	(e.g. Remarks Comment Technique
Root	GMAW	ER70S-6	.035"	DC/RP	70-100	14-16	4 - 6	N/A	*	
Fill & Cap	FCAW	E71T-12MJ	.045"	DC/RP	175-190	23-25	11-14	N/A		

Amps and volts, or power or energy range, should be recorded for each electrode size

Pulsing Current: None Heat Input Range. GMAW: 24,000 J/in. max. FCAW: 25,909 J/in max.
Tungsten Electrode size: N/A
Mode of Transfer for GMAW (FCAW): GMAW; Short circuiting arc FCAW: Globular
Other: * Power range is not recorded.

TECHNIQUE (QW-410)

String or Weave Bead: GMAW- string or weave bead FCAW- String bead
Orifice or Gas Cup Size: 5/16" or ¾" I.D.
Initial and Interpass Cleaning (Brushing, Grinding, etc.: **All deleterious materials shall be removed 1" both sides of weld joint by grinding or wire brushing or descaling. Light flash rust after grinding or descaling is acceptable. Interpass cleaning with wire brush, grinding or chatter gun.**
Method of Back Gouging: NA for single side GMAW welding w/out access to back side of joint. Grinding optional if back side is accessible. FCAW may be used for double sided weld with second side backgouged, ground to bright metal and welded with FCAW.
Oscillation: None
Contact to Tube Work Distance: ½" to 1 ¼"
Multiple or Single Pass (per side): Multiple
Multiple or Single Electrodes: Single
Electrode Spacing: Manual
Peening: None
Other

PROCEDURE SPECIFICATION (WPS) JOINT DESIGNS

WPS No.: GM-FC-1-1.2 -50CVN Date: 11-9-14 Rev. No.: 0 Date: N/A

JOINTS (QW-402

Single-V groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 1/4"
Groove angle:	50 deg. Min. included
Root face:	1/8" Max

Single bevel groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 1/4"
Groove angle:	45 deg. Min. included
Root face:	1/8" Max

Single-V groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	50 deg. Min. included
Root face:	3/16" Max.

Single bevel groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	45 deg. Min. included
Root face:	3/16" Max.

Double bevel groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	50 deg. Min. included
Root face:	3/16" Max.

Single J groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	15 deg. Min. included
Root face:	1/8" Max

Double V groove:	**GMAW/FCAW**
Backing:	Backgouged & welded
Root opening:	1/4" Max.
Groove angle:	45 deg. Min. included
Root face:	3/16" Max.

Single U groove:	¾" U **GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	15 deg. Min. included
Root face:	1/8" Max

Single or double fillet weld:	**GMAW/FCAW**
Backing:	Base metal
Root opening:	3/16" Max.
Weld size:	See drawings

1) Alternate weld joint designs may be shown on the drawings or engineering specifications WS 1.00-10 and will take precedence.

2) Initial and interpass cleaning is shown on page 2 of the WPS.

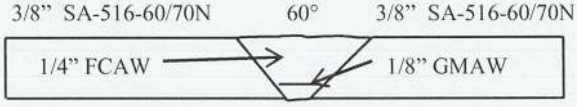
3) Preheat shall be maintained during all thermal cutting, taking and backgouging operations as shown on the WPS.

4) Welds shall be cleaned as required on page 2 of the WPS.

Prepared By:	Tim Morris	Approved By:	Juston W Davis CWI 12111641 QC1 EXP. 11/1/2015	Date:	11-9-14

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name **UNITED CONTRACTING SERVICES**
Procedure Qualification Record No. 14-14510 Date 11-9-14
WPS No. **GM-FC-1-1.2 -50 CVN**
Welding Processes(es) **GAS METAL ARC WELDING (GMAW) & FLUX CORED ARC WELDING (FCAW)**
Types (Manual, Automatic,Semi-auto.) Semi-automatic



Groove Design of Test Coupon
*(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used)

BASE METALS (QW-403)
Material Spec. SA-516 to SA516
Type or Grade Dual certified to Gr.60 & Gr. 70 normalized.
P No. 1 Gr. No. 1/2 to P No 1 Gr. No 1/2
Thickness of Test Coupon 3/8"
Diameter of Test Coupon N/A plate test
Max. pass thk. < 1/2"
Other NUCOR SA-516-60/70 HT# 4500920

Qualifies T thk. 3/8" – 3/4 " with CVN's
Qualifies t thk. GMAW: Sec, IX CVN's 0.1375" max.
Qualifies t thk. FCAW: Sec, IX CVN's 1/2" max.

POSTWELD HEAT TREATMENT (QW-407)
Temperature As welded condition
Time N/A
Other

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow rate
Shielding	Ar/CO2	75/55%	30 CFH *
Trailing	None		
Backing	None		
		*FCAW	40 CFH

FILLER METALS (QW-404)	**FCAW**	**GMAW**
SFA Specification	5.20	5.18
AWS Classification	E71T-12MJ	ER70S-6
Filler metal F-No.	6	6
Weld Metal Analysis A-No.	E71T-12MJ	ER70S-6
Size of Filler Metal	.045"	.035"
Filler metal product form	Flux cored	Bare (solid) wire
Supplemental Filler Metal	None	None
Electrode Flux Classification	N/A	N/A
Flux Type	N/A	N/A
Flux trade name	N/A	N/A
Weld Metal Thickness	1/4"	1/8"
Consumable inserts	N/A	N/A

Other GMAW: Exocor" HT# X7910 Ally elements: None
FCAW Kobelco DW-A55ESR HT# AW4569

ELECTRICAL CHARACTERISTICS (QW-409)
Current GMAW – DC FCAW – DC
Polarity GMAW –Reverse FCAW- Reverse
Amps GMAW- 100 FCAW- 190
Volts GMAW- 16 FCAW-25
Tungsten Electrode Size N/A
Pulsing Amps None
J/in. Qualified (CVN's) GMAW: 24,000 J/in
FCAW: 25,909 J/in
Mode of metal transfer
GMAW/FCAW GMAW: Short circuiting arc
Other FCAW: Globular

POSITION (QW-405)
Position of Groove 3G
Weld Progression (Uphill, Downhill) Up-hill
Other

PREHEAT (QW-406)
Preheat Temp. (min.) 70°F (ambient temp.)
Interpass Temp. (max.) 450°F
Other

TECHNIQUE (QW-410)
Travel Speed GMAW- 4 IPM FCAW- 11 IPM
String or Weave Bead GMAW –Weave FCAW- String
Oscillation None
Multipass or Single Pass (per side) Multipass
Single or Multiple Electrodes Single
Other

QW-483 (Back)

PQR No. 14-14510

Tensile Test (QW-150)

Specimen No.	Width (in)	Thickness (in)	Area (sq. in)	Ultimate Total Load lb	Ultimate Unit Stress Psi	Type of Failure & Location
1	0.752	0.330	0.248	19,020	76,694	Weld -ductile
2	0.753	0.347	0.261	20,490	78,508	Weld -ductile

Guided-Bend Tests (QW-160)

Type and Figure No. QW-462.2a	Result
#1 Side bend	Satisfactory
#2 Side bend	Satisfactory
#3 Side bend	Satisfactory
#4 Side bend	Satisfactory

Toughness Tests (QW-170) (N/A)

Specimen No.	Notch Location	Notch Type	Test Temp.°F	Impact Values			Drop Weight	
				Values ft/lb	% Shear	Mils (in.)	Break	No Break
1,2,3	Weld 1/16" root surface	"V"	-50	62,61,41	N/A	N/A	N/A	N/A
1,2,3	HAZ	"V"	-50	39,74,61	N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
Specimen Size 10mmX10mm								

Fillet-Weld Tests (QW-180)

Result- Satisfactory: Yes N/A No N/A Penetration into Parent Metal: Yes N/A No N/A

Macro- Results N/A

Other Tests

Type of Test BHN: Base- 150,179,141 Weld- 150,159,141 HAZ- 169,162,147

Deposit Analysis N/A

Other N/A

Welders Name Marco Morenos Clock No. N/A Stamp No. M2

Test conducted by: Sun Materials Testing / Element Laboratory Test No. 14-14510-1/-2

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

Organization **UNITED CONTRACTING SERVICES**

Date 11-9-14 By: Tim Morris Certified by

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015

MATERIALS TESTING

Division of Sun Heat Treating Inc.

Client: **United Contracting Service**
2716 East Apache St
Tulsa, Oklahoma 74110

Report No: 14-14510-1
Date: November 5, 2014
Auth By: Tim Morris

Subject: Weld Procedure Qualification per ASME Section IX.

Identification:		
	Procedure No:	GM-FC-1.1-1.2-50CVN (GMAW/FCAW)
	Base Material:	SA516-60/70 to SA516-60/70
	Heat No:	812A36440
	Electrode:	Filler 1: ER-70S-6CF Plus/Heat X7910
		Filler 2: DW-A55ESR/Heat AW456A E71T-12MJ
	Welder:	Mr. Marco Morenos/Stamp M2
	Position:	3G Uphill

TENSILE TEST (QW-150)

	Tensile 1	Tensile 2
Width (in)	0.752	0.753
Thickness (in)	0.330	0.347
Area (sqin)	0.248	0.261
Ultimate load (lbs)	19,020	20,490
Ultimate stress (psi)	**76,694**	**78,508**
Failure Type	Ductile	Ductile
Failure Location	Weld	Weld

TRANSVERSE GUIDED BEND TEST (QW-160)

Specimen Type	Accept/Reject QW-163	Specimen Type	Accept/Reject QW-163
No 1 Side Bend	**Acceptable**	No 2 Side Bend	**Acceptable**
No 3 Side Bend	**Acceptable**	No 4 Side Bend	**Acceptable**

BRINELL HARDNESS SURVEY OF WELD CROSS SECTION

Location	Reading 1	Reading 2	Reading 3	Average Rb/BHN
Weld Zone	80/150	83/159	77/141	80Rb/150BHN
Heat Affected Zone	86/169	84/162	79/147	83Rb/159BHN
Base Material	80/150	79/179	77/141	79Rb/147BHN

SUN HEAT TREATING INC.
Materials Testing Division
Paul R. Secrest
Paul R. Secrest/President

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015

MATERIALS TESTING

Division of Sun Heat Treating Inc.

Client: **United Contracting Service**
2716 East Apache St
Tulsa, Oklahoma 74110

Report No: 14-14510-2
Date: November 5, 2014
Auth By: Tim Morris

Subject: Charpy Impact Testing per ASME Section VIII, Div 2, UG-84 (2013).

Identification:		
	Procedure No:	GM-FC-1.1-1.2-50CVN (GMAW/FCAW)
	Base Material:	SA516-60/70 to SA516-60/70
	Heat No:	812A36440
	Electrode:	Filler 1: ER-70S-6CF Plus/Heat X7910
		Filler 2: DW-A55ESR/Heat AW456A E71T-12MJ
	Welder:	Mr. Marco Morenos/Stamp M2
	Position:	3G Uphill

Results:

CHARPY IMPACT TEST AT -50°F.

Weld Zone:	**62**	**61**	**41**	ft-lbs
Heat Affected Zone:	**39**	**74**	**61**	ft-lbs

End of Data

TEST PARAMETERS

Type of Machine: Tinius Olsen 74
Serial No: 123871/Next Calibration 09-15
Impact Velocity: 17 ft/sec
Specimen Type: "V" notch
Available Impact: 264 ft-lbs
Method of Test: ASTM A370/E23
Specimen Location: Per UG 84
Specimen Size: 10mm x 8.7mm

Temperature Measurement: Kiethly RTD/MOC 868
Serial No: 1481976/Next Calibration 12-14

SUN HEAT TREATING INC.
Materials Testing Division
Paul R. Secrest
Paul R. Secrest/President

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015

UCS QC Approved RK 3-4-13

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)

(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name UNITED CONTRACTING SERVICES INC. By: Tim Morris Approved by: Robert Kent

Welding Procedure Specification No. 5001-A Date 3-30-09 Supporting PQR No.(s) 5001-A

Revision No. 3 Date 3-9-13

Welding Process(es) GAS TUNGSTEN ARC WELDING (GTAW) Type(s) GTAW -manual

(Automatic,Manual,Machine,Semi-auto)

Joints (QW-402) Details

Joint Design Single V or Bevel , Double V or Bevel *1

Backing (Yes) Optional (No) GTAW-open root

Backing Material (type) Weld or base metal for double side weld

Retainers: None (Refer to both backing and retainers.)

☒ Metal ☐ Nonfusing Metal

☐ Nonmetallic ☐ Other

Joint Designs page 3 of WPS

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process, procedures, etc.)

*1 See shop drawings for optional joint designs used with this WPS. This WPS may be used in conjunction with other WPS' as indicated on shop drawings.

*** BASE METALS (QW-403)**

P-No. 8 Group No. 1 to P-No. 8 Group No. 1

OR

Specification type and grade Example: SA-240 Type 308L / 308 or 316L / 316

To Specification type and grade

OR

Chem. Analysis and Mech. Prop.

To Chem. Analysis and Mech. Prop.

Thickness Range:

Base Metal: Groove 3/16" – 0.864" Fillet Unlimited

Pipe Dia. Range: Groove All Diameters Fillet All Diameters

Other

*** FILLER METALS (QW-404)**	**GTAW**	
Spec. No. (SFA)	5.9	
AWS No. (Class)	ER308L, ER309L, ER316L *	
F-No.	6	
A-No.	8	
Size of Filler Metals	1/16", 3/32", 1/8"	
Weld Metal Thickness Range: Groove	0.864" maximum deposit	
Fillet	Unlimited	*ER308L with 304 or 304L base metals
Electrode-Flux (Class)	N/A	*ER316L with 316 or 316L base metal
Flux Trade Name	N/A	*ER309L with 310 to 304 or 304L base metals
Consumable Insert	None	
Other	Solid (bare) wire	
	Addition of flux: None	

*Each base metal-filler metal combination should be recorded individually.

WPS No. **5001-A** Rev. 3

POSITIONS (QW-405)
Positions(s) of Groove: All positions
Welding Progression: Up Yes Down
Position(s) of Fillet: All positions

POSTWELD HEAT TREATMENT (QW-407)
Temperature Range: As Welded
Time Range: N/A

PREHEAT (QW-406)
Preheat Temp. Min.: 50° F
Interpass Temp. Max.: 350°F
Preheat Maintenance: None
(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

GTAW	Gas(es)	Percent Composition Mixture	Flow rate
Shielding	Argon	99.995%	20-40 CFH
Trailing	None		
Backing	Argon	99.995%	**

** Prior to welding, purge with 6 – 8 volume changes of Argon @ 20 – 40 CFH. During welding, continue to purge @ 10-20 CFH to minimize back pressure until weld is completed or a minimum of 1/4" weld is deposited. O2 < .5% in purge area.

ELECTRICAL CHARCACTERISTICS (QW-409)
Current AC or DC: Below Polarity: Below
Amps (Range): Below Volts (Range): Below

(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)

Tungsten Electrode Size and Type: EWTh-2 3/32" or 1/8"
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW: N/A
(Spray arc, short circuiting arc, etc.)

Electrode Wire feed speed range: N/A

TECHNIQUE (QW-410)
String or Weave Bead: GTAW- string or weave
Orifice or Gas Cup Size: GTAW: #4 - #12
Initial and Interpass Cleaning (Brushing, Grinding, etc.: All deleterious materials shall be removed 2" both sides of weld joint by grinding or stainless steel wire brushing. Interpass cleaning with wire brush, chipping hammer or pneumatic scaling gun required.
Method of Back Gouging: N/A for GTAW single side open root stringer deposit. Back gouge and/or grind second side for double side weld using the GTAW process.
Contact to Tube Work Distance: N/A
Multiple or Single Pass (per side): Multiple
Multiple or Single Electrodes: Single
Travel Speed (Range): See Below
Peening: None
Other: Pulsing amps: None

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp Range	Volt Range	Travel Speed Range	Other Max. J/in.
Root Hot pass Fill	GTAW	See page 1 for AWS filler designation. Filler must match correct base metal.	1/16", 3/32" 1/8"	DC/SP DC/SP	80-200 120-250	12-25 18-25	Manual Manual	

WELD PROCEDURE SPECIFICATION (WPS) JOINT DESIGNS

WPS No.: 5001-A Date: 3-30-09 Rev. No.: 3 Date: 3-9-13

JOINTS (QW-402

Single-V groove:	**GTAW**	**Single bevel groove:**	**GTAW**
Backing:	No backing	Backing:	No backing
Root opening:	3/32" – 3/16"	Root opening:	3/32" – 3/16"
Groove angle:	50 deg. Min. included	Groove angle:	45 deg. Min. included
Root face:	1/8" Max	Root face:	1/8" Max
Single-V groove:	**GTAW**	**Single bevel groove:**	**GTAW**
Backing:	Backgouged & welded	Backing:	Backgouged & welded
Root opening:	¼" Max.	Root opening:	¼" Max.
Groove angle:	50 deg. Min. included	Groove angle:	45 deg. Min. included
Root face:	3/16" Max.	Root face:	3/16" Max.
Double bevel groove:	**GTAW**	**Single J groove:**	**3/8" J GTAW**
Backing:	Backgouged & welded	Backing:	No backing
Root opening:	¼" Max.	Root opening:	3/32" – 3/16"
Groove angle:	50 deg. Min. included	Groove angle:	15 deg. Min. included
Root face:	3/16" Max.	Root face:	1/8" Max
Double V groove:	**GTAW**	**Single U groove:**	**¾" U GTAW**
Backing:	Backgouged & welded	Backing:	No backing
Root opening:	¼" Max.	Root opening:	3/32" – 3/16"
Groove angle:	45 deg. Min. included	Groove angle:	15 deg. Min. included
Root face:	3/16" Max.	Root face:	1/8" Max

Single or double fillet weld: GTAW

Backing:	Base metal
Root opening:	3/16" Max.
Weld size:	See drawings

1) Alternate weld joint designs may be shown on the drawings or engineering specifications and will take precedence.

2) Initial and interpass cleaning is shown on page 2 of the WPS.

3) Preheat shall be maintained during all thermal cutting, taking and backgouging operations as shown on the WPS.

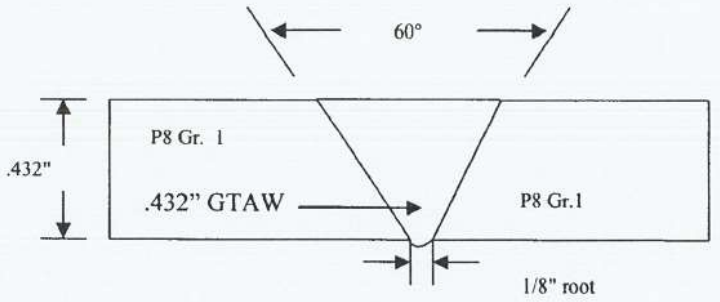
4) Welds shall be cleaned as required on page 2 of the WPS.

Prepared By:	Tim Morris	Approved By:	Robert Keil	Date:	3-9-13

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name **UNITED CONTRACTING SERVICES INC.**
Procedure Qualification Record No. 5001-A Date 3-30-09
WPS No. 5001-A
Welding Processes(es) GAS TUNGSTEN ARC WELDING (GTAW)
Types (Manual, Automatic,Semi-auto.) Manual -- Both processes

JOINTS (QW-402)



Groove Design of Test Coupon
*(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used)

BASE METALS (QW-403)
Material Spec. SA-312 to SA-312
Type or Grade 304 to 304
P No. P 8 Gr. 1 to P 8 Gr. 1
Thickness of Test Coupon .432"
Diameter of Test Coupon 6.625"
Other Qualifies T thk. 3/16" – 0.864"
Qualifies GTAW t thk. 0.864" max.
Max. bead thk. < 1/2"

POSTWELD HEAT TREATMENT (QW-407)
Temperature As Welded
Time N/A
Other

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow rate
Shielding	Argon	99.995%	40 CFH
Trailing	None		
Backing	Argon	99.995%	35 CFH
Other			

FILLER METALS (QW-404)

	GTAW
SFA Specification	5.9
AWS Classification	ER308L
Filler metal F-No.	6
Weld Metal Analysis A-No.	8
Size of Filler Metal	1/8"
Other	
Solid bare wire	
No flux addition	
Weld Metal Thickness	0.432"
Consumable inserts- None	

ELECTRICAL CHARACTERISTICS (QW-409)
Current GTAW & SMAW: DC
Polarity GTAW- Straight
Amps GTAW- 110
Volts GTAW- 19
Tungsten Electrode Size EWTh-2 1/8" dia.
Pulsing Amps None
J/in. Qualified (CVN's)
Other

POSITION (QW-405)
Position of Groove 6G
Weld Progression (Uphill, Downhill) Vertical up
Other

PREHEAT (QW-406)
Preheat Temp. (min.) 55°F ambient temp.
Interpass Temp. (max.) 350°F
Other

TECHNIQUE (QW-410)
Travel Speed 10 IPM
String or Weave Bead GTAW – Slight Weave
Oscillation None
Multipass or Single Pass (per side) Multipass
Single or Multiple Electrodes Single
Other

QW-483 (Back)

PQR No. 5001-A

Tensile Test (QW-150)

Specimen No.	Width (in)	Thickness (in)	Area (sq. in)	Ultimate Total Load lb	Ultimate Unit Stress Psi	Type of Failure & Location
1	0.752	0.409	0.3076	24,315	79,047	P8 base -ductile
2	0.756	0.412	0.3115	24,075	77,287	P8 base-ductile

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
#1 Side bend per QW-462.2	Satisfactory
#2 Side bend per QW-462.2	Satisfactory
#3 Side bend per QW-462.2	Satisfactory
#4 Side bend per QW-462.2	Satisfactory

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.°F	Impact Values	Lateral Expansion		Drop Weight	
					% Shear	Mils	Break	No Break
			10mmX10mm specimen					

Fillet-Weld Tests (QW-180)

Result- Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes _____ No _____

Macro- Results _____

Other Tests

Type of Test _____

Deposit Analysis _____

Other _____

Welders Name Marco Moreno Clock No. _____ Stamp No. M2

Test conducted by: Tulsa Gamma Ray, Inc Laboratory Test No. 102127500

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the Requirements of Section IX of the ASME Code. Updated on new form 9-6-12

Manufacturer UNITED CONTRACTING SERVICES INC.

Date 3-30-09 By Tim Morris Approved by: Robert Kane

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name **UNITED CONTRACTING SERVICES INC.** By: Tim Morris Approved by:
Welding Procedure Specification No. **5002-A** Date 3-20-09 Supporting PQR No.(s) 5002-A
Revision No. 1 Date 9-15-12
Welding Process(es) GAS METAL ARC WELDING (GMAW) & Type(s) Semi-automatic
FLUX CORED ARC WELDING (FCAW) (Automatic,Manual,Machine,Semi-auto)

Joints (QW-402) Details

Joint Design Single V or Single Bevel , Fillet *1
Backing (Yes) FCAW (No) GMAW
Backing Material (type) Weld metal or base metal
(Refer to both backing and retainers.)

Joint Designs page 3 of WPS

GMAW- Open root stringer
☒ Metal (FCAW) ☐ Nonfusing Metal
☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process, procedures, etc.)

*1 See shop drawings for optional joint designs used with this WPS. This WPS may be used in conjunction with other WPS' as indicated on shop drawings.

*** BASE METALS (QW-403)**

P-No. 8 Group No. 1 to P-No. 8 Group No. 1
OR
Specification type and grade Example: SA-240 Type 308L / 308 or 316L / 316
To Specification type and grade
OR
Chem. Analysis and Mech. Prop. See P-No. above.
To Chem. Analysis and Mech. Prop. See P-No. above.
Thickness Range:
Base Metal: Groove 3/16" – 0.864" Fillet Unlimited
Pipe Dia. Range: Groove 3/4 " Min. Fillet Unlimited
Other

*** FILLER METALS (QW-404)**	FCAW	GMAW
Spec. No. (SFA)	5.22	5.9
AWS No. (Class)	E308LT1-4 or E316LT1-4 *	ER308L or ER316L *
F-No.	6	6
A-No.	8	8
Size of Filler Metals	.045" , 1/16"	.035", .045"
Weld Metal Thickness Range: Groove	*ER308L with 304 or 304L base metals *ER316L with 316 or 316L base metal 0.614" max. deposit	*ER308L with 304 or 304L base metals *ER316L with 316 or 316L base metal 0.137" max. deposit
Fillet	Unlimited	Unlimited
Electrode-Flux (Class)	NA	N/A
Flux Trade Name	NA	N/A
Consumable Insert	NA	N/A
Other	Max. passthk. <3/8"	Max pass thk.: 1/8"
	Product form: Flux cored wire Supplemental filler metal: None Alloy elements: None	Product form: Bare wire Supplemental filler metal: None Alloy elements: None

*Each base metal-filler metal combination should be recorded individually.

UCS QC Approved By: RJC Date 9-17-12

QW-482 (Back)
WPS No. 5002-A Rev. 1

POSITIONS (QW-405)
Positions(s) of Groove: All positions
Welding Progression: Up Yes Down N/A
Position(s) of Fillet: All positions

PREHEAT (QW-406)
Preheat Temp. Min.: 50°F
Interpass Temp. Max.: 350°F max.
Preheat Maintenance: None after welding
(Continuous or special heating where applicable should be recorded)

POSTWELD HEAT TREATMENT (QW-407)
Temperature Range: As Welded condition
Time Range:

10 HOURS MAX. HOLD TIME

GAS (QW-408) Percent Composition

Shielding Gas(es)	Mixture	Flow rate
FCAW	Argon/CO2	75%/25%	30-50 CFH
GMAW	Argon	99.995%	25-45 CFH
Backing	Argon	99.995%	**
Trailing None			

ELECTRICAL CHARCACTERISTICS (QW-409)
Current AC or DC: DC Polarity: Reverse
Amps (Range): Below Volts (Range): Below

(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)

** Prior to welding, purge with 6 – 8 volume changes of Argon @ 20 – 40 CFH. During welding, continue to purge @ 10-20 CFH to minimize back pressure until weld is completed or a minimum of 1/4" weld is deposited. O2 < .5% in purge area.

Tungsten Electrode Size and Type: NA
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW: FCAW: globular transfer GMAW: Short arc
(Spray arc, short circuiting arc, etc.)

Electrode Wire feed speed range: Not recorded

TECHNIQUE (QW-410)
String or Weave Bead: GMAW- string or weave bead FCAW- String bead (3/4" max.)
Orifice or Gas Cup Size: 5/16" or ¾" I.D.
Initial and Interpass Cleaning (Brushing, Grinding, etc.: All deleterious materials shall be removed 1" both sides of weld joint by grinding or wire brushing. Interpass cleaning with wire brush, chipping hammer or pneumatic scaling gun required for FCAW. GMAW root pass shall be wire brushed prior to welding with FCAW. Use stainless steel brushes for cleaning.
Method of Back Gouging: NA for single side welding w/out access to back side of joint. Grinding optional if back side is accessable. FCAW may be used for double sided weld with second side backgouged, ground to bright metal and welded with FCAW.
Contact to Tube Work Distance: ½" to 1 ¼"
Multiple or Single Pass (per side): Multiple
Multiple or Single Electrodes: Single
Travel Speed (Range): Manual
Peening: None
Other: Oscillation: None

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp Range	Volt Range	Travel Speed Range	Other (e.g. Remarks Comments Technique)
Root .137" max.	GMAW	ER308L or ER316L	.035"	DC/RP	80-160	18-23	Manual	
Balance (fill & cap)	FCAW	E308LT1-4 or	.045"	DC/RP	140-200	22-29	Manual	
(Fillet) .614" max.	FCAW	E316LT1-4	1/16"	DC/RP	210-250	22-32	Manual	

UCS QC Approved By Date 9-12-12

WELD PROCEDURE SPECIFICATION (WPS) JOINT DESIGNS

WPS No.: 5002-A Date: 3-20-09 Rev. No.: 1 **Date:** 9-15-12

JOINTS (QW-402

Single-V groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	50 deg. Min. included
Root face:	1/8" Max

Single bevel groove:	**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	45 deg. Min. included
Root face:	1/8" Max

Single-V groove:	**GMAW/FCAW**
Backing:	Backgouged& welded
Root opening:	¼" Max.
Groove angle:	50 deg. Min. included
Root face:	3/16" Max.

Single bevel groove:	**GMAW/FCAW**
Backing:	Backgouged& welded
Root opening:	¼" Max.
Groove angle:	45 deg. Min. included
Root face:	3/16" Max.

Double bevel groove:	**GMAW/FCAW**
Backing:	Backgouged& welded
Root opening:	¼" Max.
Groove angle:	50 deg. Min. included
Root face:	3/16" Max.

Single J groove:	3/8" J**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	15 deg. Min. included
Root face:	1/8" Max

Double V groove:	**GMAW/FCAW**
Backing:	Backgouged& welded
Root opening:	¼" Max.
Groove angle:	45 deg. Min. included
Root face:	3/16" Max.

Single U groove:	¾" U**GMAW/FCAW**
Backing:	No backing
Root opening:	3/32" – 3/16"
Groove angle:	15 deg. Min. included
Root face:	1/8" Max

Single or double fillet weld:	**GMAW/FCAW**
Backing:	Base metal
Root opening:	3/16" Max.
Weld size:	See drawings

1) Alternate weld joint designs may be shown on the drawings or engineering specifications and will take precedence.

2) Initial and interpass cleaning is shown on page 2 of the WPS.

3) Preheat shall be maintained during all thermal cutting, taking and backgouging operations as shown on the WPS.

4) Welds shall be cleaned as required on page 2 of the WPS.

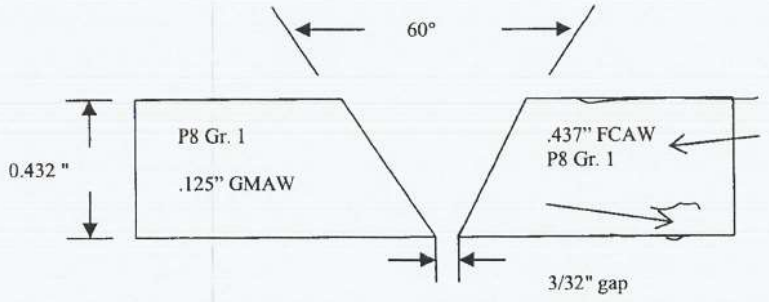
Prepared By:	Tim Morris	Approved By:		Date:	9-17-12

UCS QC Approved By Date 9-17-12

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name **UNITED CONTRACTING SERVICES INC.**
Procedure Qualification Record No. 5002-A Date 3-20-09
WPS No. **5002-A**
Welding Processes(es) GAS METAL ARC WELDING (GMAW) & FLUX CORED ARC WELDING (FCAW)
Types (Manual, Automatic,Semi-auto.) Semi-automatic both processes

JOINTS (QW-402)



Groove Design of Test Coupon
*(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used)

BASE METALS (QW-403)
Material Spec. SA-312 to SA-312
Type or Grade 304 to 304
P No. P8 Gr.1 to P8 Gr.1
Thickness of Test Coupon 0.432"
Diameter of Test Coupon 6.625'
Other
Qualifies T thk. 3/16" – 0.864"
Qualifies t thk. GMAW: Sec, IX 0.137" max.
Qualifies t thk.FCAW: Sec, IX 0.614" max.
Max. pass thk: GMAW-1/8" FCAW- 3/8"

POSTWELD HEAT TREATMENT (QW-407)
Temperature As Welded
Time
Other

GAS (QW-408)
GMAW & FCAW process

	Gas(es)	Percent Composition (Mixture)	Flow rate
FCAW			
Shielding	Ar/CO2	75%/25%	40 CFH
Trailing	None		
Backing	Argon	99.995%	35 CFH
GMAW	Argon	99.995%	30 CFH

FILLER METALS (QW-404)

	GMAW	FCAW
SFA Specification	5.9	5.22
AWS Classification	ER308L	E308LT1-4
Filler metal F-No.	6	6
Weld Metal Analysis A-No.	8	8
Size of Filler Metal	.035"	.045"
Other	Supplemental filler: None	
	FCAW – flux cored wire GMAW-Bare	
Weld Metal Thickness	1/8"	0.307"
Alloy elements: None		

ELECTRICAL CHARACTERISTICS (QW-409)
Current GMAW – DC FCAW – DC
Polarity GMAW –Reverse FCAW- Reverse
Amps GMAW- 80FCAW- 140
Volts GMAW- 20FCAW-23
Tungsten Electrode Size N/A
Pulsing Amps None
J/in. Qualified (CVN's)
Other Mode of transfer: FCAW- Globular transfer
GMAW- Short Arc

POSITION (QW-405)
Position of Groove 6 G
Weld Progression (Uphill, Downhill) Uphill
Other

PREHEAT (QW-406)
Preheat Temp. (min.) 70°F Ambient temp.
Interpass Temp. (max.) 550°F
Other

TECHNIQUE (QW-410)
Travel Speed GMAW- 12 IPM FCAW- 12 IPM
String or Weave Bead GMAW –String FCAW- String
Oscillation None
Multipass or Single Pass (per side) Multiple
Single or Multiple Electrodes Single
Other

UCS QC Approved By Date 9-17-12

QW-483 (Back)

PQR No. 5002-A

Tensile Test (QW-150)

Specimen No.	Width (in)	Thickness (in)	Area (sq. in)	Ultimate Total Load lb	Ultimate Unit Stress Psi	Type of Failure & Location
Tensile A	0.759	0.411	0.3119	24,335	78,021	Base-ductile
Tensile B	0.752	0.416	0.3128	23,826	76,170	Base-ductile

Guided-Bend Tests (QW-160)

Type and Figure No. QW-462.2a	Result
#1 Top & Bottom Transverse Side Bends	Satisfactory
#2 Top & Bottom Transverse Side Bend	Satisfactory
#3 Top & Bottom Transverse Side Bend	Satisfactory
#4 Top & Bottom Transverse Side Bend	Satisfactory

Toughness Tests (QW-170) Specimen size: 10mm X 10mm

Specimen No.	Notch Location	Notch Type	Test Temp.°F	Impact Values	Lateral Expansion		Drop Weight	
					% Shear	Mils	Break	No Break
		"V"						
		"V"						
			10mmX10mm specimen					

Other Tests

Type of Test _____

Welders Name EloyGrajeda Clock No. _____ Stamp No. EG

Test conducted by: Tulsa Gamma Ray, Inc Laboratory Test No. 102127501

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the Requirements of Section IX of the ASME Code. Updated on new form 9-15-12

Manufacturer **UNITED CONTRACTING SERVICES INC.**

Date 3-20-09 By Tim Morris Approved by: _____

UCS QC Approved By _____ Date 9-12-12

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name **UNITED CONTRACTING SERVICES INC.** By: Tim Morris Approved by:
Welding Procedure Specification No. **5007-A** Date 3-30-09 Supporting PQR No.s 5007-A
Revision No. 3 Date 9-7-12
Welding Process(es) GAS TUNGSTEN ARC WELDING (GTAW) Type(s) GTAW -manual
(Automatic,Manual,Machine,Semi-auto)

Joints (QW-402) Details

Joint Design Single V or Bevel , Double V or Bevel *1
Backing (Yes) Optional (No) GTAW-open root
Backing Material (type) Weld or base metal for double side weld
Retainers: None (Refer to both backing and retainers.)

☒ Metal ☐ Nonfusing Metal
☐ Nonmetallic ☐ Other

Joint Designs page 3 of WPS

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process, procedures, etc.)

*1 See shop drawings for optional joint designs used with this WPS. This WPS may be used in conjunction with other WPS' as indicated on shop drawings.

*** BASE METALS (QW-403)**

P-No. 8 Group No. 1 to P-No. 8 Group No. 1
OR
Specification type and grade Example: SA-240 Type 308L / 308 or 316L /316
To Specification type and grade
OR
Chem. Analysis and Mech. Prop.
To Chem. Analysis and Mech. Prop.
Thickness Range:
Base Metal: Groove 1/16" – 0.294" Fillet Unlimited
Pipe Dia. Range: Groove All Diameters Fillet All Diameters
Other

*** FILLER METALS (QW-404)**	**GTAW**	
Spec. No. (SFA)	5.9	
AWS No. (Class)	ER308L *	ER316L*
F-No.	6	
A-No.	8	
Size of Filler Metals	1/16", 3/32", 1/8"	
Weld Metal Thickness Range: Groove	0.294" maximum deposit	
Fillet	Unlimited	
Electrode-Flux (Class)	N/A	*ER308L with 304 or 304L base metals
Flux Trade Name	N/A	*ER316L with 316 or 316L base metal
Consumable Insert	None	
Other	Solid wire	
	Addition of flux: None	

*Each base metal-filler metal combination should be recorded individually.

UCS QC Approved By KT Date 9-17-12

WPS No. **5007-A** Rev. 3

POSITIONS (QW-405)

Positions(s) of Groove: All positions
Welding Progression: Up Yes Down
Position(s) of Fillet: All positions

PREHEAT (QW-406)

Preheat Temp. Min.: 50° F
Interpass Temp. Max.: 350°F
Preheat Maintenance: None
(Continuous or special heating where applicable should be recorded)

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range: As Welded
Time Range: N/A

GAS (QW-408)

GTAW	Gas(es)	Percent Composition Mixture	Flow rate
Shielding	Argon	99.995%	20-40 CFH
Trailing	None		
Backing	Argon	99.995%	**

** Prior to welding, purge with 6 – 8 volume changes of Argon @ 20 – 40 CFH. During welding, continue to purge @ 10-20 CFH to minimize back pressure until weld is completed or a minimum of 1/4" weld is deposited. O2 < .5% in purge area.

ELECTRICAL CHARCACTERISTICS (QW-409)

Current AC or DC: Below Polarity: Below
Amps (Range): Below Volts (Range): Below

(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)

Tungsten Electrode Size and Type: EWTh-2 3/32" or 1/8"
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW: N/A
(Spray arc, short circuiting arc, etc.)

Electrode Wire feed speed range: N/A

TECHNIQUE (QW-410)

String or Weave Bead: GTAW- string or weave
Orifice or Gas Cup Size: GTAW: #4 - #12
Initial and Interpass Cleaning (Brushing, Grinding, etc.: All deleterious materials shall be removed 2" both sides of weld joint by grinding or stainless steel wire brushing. Interpass cleaning with wire brush, chipping hammer or pneumatic scaling gun required.
Method of Back Gouging: N/A for GTAW single side open root stringer deposit. Back gouge and/or grind second side for double side weld using the GTAW process. Use stainless steel brushes for cleaning.
Contact to Tube Work Distance: N/A
Multiple or Single Pass (per side): Multiple
Multiple or Single Electrodes: Single
Travel Speed (Range): See Below
Peening: None
Other: Pulsing amps: None

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp Range	Volt Range	Travel Speed Range	Other Max. J/in.
Root	GTAW	ER308L	1/16", 3/32"	DC/SP	80-200	12-25	Manual	
Hot pass			1/8"	DC/SP	120-250	18-25	Manual	
Fill								

UCS QC Approved
Date 9-17-12

WELD PROCEDURE SPECIFICATION (WPS) JOINT DESIGNS

WPS No.: 5007-A Date: 3-30-09 Rev. No.: 3 Date: 9-7-12

JOINTS (QW-402

Single-V groove: GTAW		**Single bevel groove: GTAW**	
Backing:	No backing	Backing:	No backing
Root opening:	3/32" – 3/16"	Root opening:	3/32" – 3/16"
Groove angle:	50 deg. Min. included	Groove angle:	45 deg. Min. included
Root face:	1/8" Max	Root face:	1/8" Max
Single-V groove: GTAW		**Single bevel groove: GTAW**	
Backing:	Backgouged & welded	Backing:	Backgouged & welded
Root opening:	¼" Max.	Root opening:	¼" Max.
Groove angle:	50 deg. Min. included	Groove angle:	45 deg. Min. included
Root face:	3/16" Max.	Root face:	3/16" Max.
Double bevel groove: GTAW		**Single J groove:**	**3/8" J GTAW**
Backing:	Backgouged & welded	Backing:	No backing
Root opening:	¼" Max.	Root opening:	3/32" – 3/16"
Groove angle:	50 deg. Min. included	Groove angle:	15 deg. Min. included
Root face:	3/16" Max.	Root face:	1/8" Max
Double V groove: GTAW		**Single U groove:**	**¾" U GTAW**
Backing:	Backgouged & welded	Backing:	No backing
Root opening:	¼" Max.	Root opening:	3/32" – 3/16"
Groove angle:	45 deg. Min. included	Groove angle:	15 deg. Min. included
Root face:	3/16" Max.	Root face:	1/8" Max
Single or double fillet weld: GTAW			
Backing:	Base metal		
Root opening:	3/16" Max.		
Weld size:	See drawings		

1) Alternate weld joint designs may be shown on the drawings or engineering specifications and will take precedence.

2) Initial and interpass cleaning is shown on page 2 of the WPS.

3) Preheat shall be maintained during all thermal cutting, taking and backgouging operations as shown on the WPS.

4) Welds shall be cleaned as required on page 2 of the WPS.

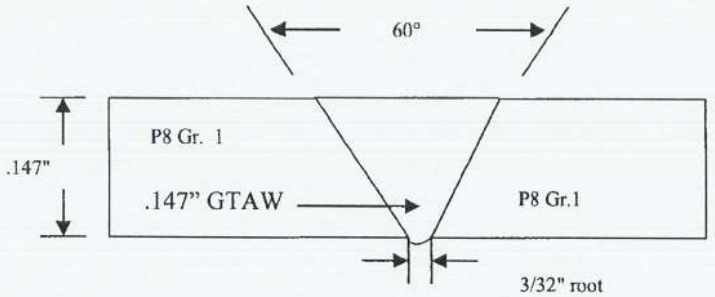
Prepared By:	Tim Morris	Approved By:		Date:	9-17-12

UCS QC Approved By Date 9-17-12

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name **UNITED CONTRACTING SERVICES INC.**
Procedure Qualification Record No. 5007-A Date 10-1-10
WPS No. 5007-A
Welding Processes(es) GAS TUNGSTEN ARC WELDING (GTAW)
Types (Manual, Automatic,Semi-auto.) Manual – Both processes

JOINTS (QW-402)



Groove Design of Test Coupon
*(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used)

BASE METALS (QW-403)
Material Spec. SA-312 to SA-312
Type or Grade 304 to 304
P No. P 8 Gr. 1 to P 8 Gr. 1
Thickness of Test Coupon .147"
Diameter of Test Coupon 0.840"
Other Qualifies T thk. 1/16" – 0.294"
Qualifies GTAW t thk. 0.294" max.
Max. bead thk. < 1/2"

POSTWELD HEAT TREATMENT (QW-407)
Temperature As Welded
Time N/A
Other

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow rate
Shielding	Argon	99.995%	30 CFH
Trailing	None		
Backing	Argon	99.995%	25 CFH

Other

FILLER METALS (QW-404)

	GTAW
SFA Specification	5.9
AWS Classification	ER308L
Filler metal F-No.	6
Weld Metal Analysis A-No.	8
Size of Filler Metal	1/8"
Other	
Solid bare wire	
No flux addition	
Weld Metal Thickness	0.147"
Consumable inserts- None	

ELECTRICAL CHARACTERISTICS (QW-409)
Current GTAW & SMAW: DC
Polarity GTAW- Straight
Amps GTAW- 112
Volts GTAW- 19
Tungsten Electrode Size EWTh-2 1/8" dia.
Pulsing Amps None
J/in. Qualified (CVN's)
Other

POSITION (QW-405)
Position of Groove 6G
Weld Progression (Uphill, Downhill) Vertical up
Other

PREHEAT (QW-406)
Preheat Temp. (min.) 60°F ambient temp.
Interpass Temp. (max.) 350°F
Other

TECHNIQUE (QW-410)
Travel Speed 10 IPM
String or Weave Bead GTAW – Slight Weave
Oscillation None
Multipass or Single Pass (per side) Multipass
Single or Multiple Electrodes Single
Other

UCS QC Approved By
Date 9-17-12

QW-483 (Back)

PQR No. 5007-A

Tensile Test (QW-150)

Specimen No.	Width (in)	Thickness (in)	Area (sq. in)	Ultimate Total Load lb	Ultimate Unit Stress Psi	Type of Failure & Location
1	0.834	0.144	0.1214	9,685	79,778	P8 base -ductile
2	0.846	0.145	0.1227	9,523	77,612	P8 base-ductile

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
#1 Side bend per QW-462.2	Satisfactory
#2 Side bend per QW-462.2	Satisfactory
#3 Side bend per QW-462.2	Satisfactory
#4 Side bend per QW-462.2	Satisfactory

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.°F	Impact Values	Lateral Expansion		Drop Weight	
					% Shear	Mils	Break	No Break
			10mmX10mm specimen					

Fillet-Weld Tests (QW-180)

Result- Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes _____ No _____

Macro- Results _____

Other Tests

Type of Test _____

Deposit Analysis _____

Other _____

Welders Name Jorge Pando Clock No. _____ Stamp No. M2

Test conducted by: Tulsa Gamma Ray, Inc Laboratory Test No. 102129134

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the Requirements of Section IX of the ASME Code. Updated on new form 9-7-12

Manufacturer UNITED CONTRACTING SERVICES INC.

Date 10-1-10 By Tim Morris Approved by

UCS QC Approved By Date 9-17-12

UCS JOB NO. S-4248

Section 6

Welder Qualification Records

JOB: S-4248-07

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name SABINO LOPEZ Identification No. SL

TEST DESCRIPTION

Identification of WPS followed 5012A ☐ Test Coupon ☒ Production Weld
Specification of base metal(s) SA106B to SA106B Thickness 0.322

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW	GTAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	2"	1" AND GREATER
Base metal P or S-Number to P- or S Number	P1 TO P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18	
Filler metal or electrode classification(s) (info only)	70S6	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GTAW 3 layers minimum ☒ yes ☐ no	0.344"	0.688" MAX
Process 2: ____ 3 layers minimum ☐ yes ☐ no	----	----
Position qualified (2G, 6G, 3F, etc.)	6G	ALL
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	N/A	N/A
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN	DCEN

RESULTS

Visual Examination of Completed Weld (QW-302.4) QW-191

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by JACK LLOYD Company API, Inc.
Mechanical tests conducted by JACK LLOYD Laboratory Tests 148768
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 09/10/2015

Certified by JUSTON DAVIS

United Contracting Services INC.
2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name LEONARDO FLORES Identification No. LF

TEST DESCRIPTION

Identification of WPS followed 5005-A ☒ Test Coupon ☐ Production Weld
Specification of base metal(s) SA-106 Gr. B Thickness 0.280"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1-P11F & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T-1M	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.062"	0.125" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.218"	0.436"MAX
Position qualified (2G, 6G, 3F, etc.)	1GR	1GR
Vertical progression (uphill or downhill)	FLAT	FLAT
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB/GLOB	GLOB/GLOB
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by Chris Brookhart Company IRIS NDT
Mechanical tests conducted by ____ Laboratory Tests 0454
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 30JAN2017

Certified by Juston Davis

United Contracting Services INC.
2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name LEONARDO FLORES Identification No. LF

TEST DESCRIPTION

Identification of WPS followed 5012-A ☒ Test Coupon ☐ Production Weld
Specification of base metal(s) SA-106 Gr. B Thickness 0.154"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW	GTAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	2" OD	1" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18	
Filler metal or electrode classification(s) (info only)	ER70S-6	
Filler metal F-Numbers	6	6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GTAW 3 layers minimum ☒ yes ☐ no	0.154"	0.308" MAX
Process 2: ____ 3 layers minimum ☐ yes ☐ no	-------	-------
Position qualified (2G, 6G, 3F, etc.)	6G	ALL POSITIONS
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	N/A	N/A
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN	DCEN

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by Chris Brookhart Company American Piping Inspectors Inc
Mechanical tests conducted by N/A Laboratory Tests 0454
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 30JAN2017

Certified by Juston Davis

United Contracting Services INC.
2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Santos Gutierrez — Identification No.: SG

TEST DESCRIPTION

Identification of WPS followed: 5011-A — ☒ Test Coupon ☐ Production Weld

Specification of base metal(s): SA-106 Gr. B — Thickness: 0.432"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	0.432 Total	0.864 MAX
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.0625"	0.187" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.3695"	0.739 MAX
Position qualified (2G, 6G, 3F, etc.)	1G-R	1G, 1F, 1G-R
Vertical progression (uphill or downhill)	FLAT	FLAT
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOBULAR	GLOBULAR
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)

☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]

☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE

Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A

Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A

Other Tests: N/A

Film or Specimens evaluated by: Chris Brookhart — Company: IRIS NDT

Mechanical tests conducted by: ____ — Laboratory Tests: IRISNDT# 0522

Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 03FEB2017

Certified by: Juston Davis

UCS QC Approved By Date 2/3/17

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110 PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Matt Little — Identification No.: ML

TEST DESCRIPTION

Identification of WPS followed: 5007-A — ☒ Test Coupon ☐ Production Weld

Specification of base metal(s): SA-312 Typ. 304/304L — Thickness: 0.154"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW	GTAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	2" OD	1" AND GREATER
Base metal P or S-Number to P- or S Number	P8	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.9	
Filler metal or electrode classification(s) (info only)	ER308L	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.154"	0.308" MAX
Process 2: ____ 3 layers minimum ☐ yes ☐ no	N/A	N/A
Position qualified (2G, 6G, 3F, etc.)	6G	ALL POSITIONS
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	WITH	WITH or WITHOUT
Transfer mode (spray/globular or pulse to short circuit-GMAW)	N/A	N/A
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN	DCEN

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)

☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]

☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE

Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A

Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A

Other Tests: N/A

Film or Specimens evaluated by: Daniel Culver — Company: IRIS NDT

Mechanical tests conducted by: N/A — Laboratory Tests: IRISNDT# 623

Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 10FEB2017

Certified by: Juston Davis

UCS QC Approved By Date 2/10/17

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110 PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Matt Little — Identification No.: ML

TEST DESCRIPTION

Identification of WPS followed: 5011-A — ☒ Test Coupon ☐ Production Weld

Specification of base metal(s): SA-106 Gr. B — Thickness: 0.432"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	0.432 Total	0.864 MAX
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.0625"	0.187" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.3695"	0.739" MAX
Position qualified (2G, 6G, 3F, etc.)	1G-R	1G, 1F, 1G-R
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)

☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]

☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE

Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A

Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A

Other Tests: N/A

Film or Specimens evaluated by: Daniel Culver — Company: IRIS NDT

Mechanical tests conducted by: N/A — Laboratory Tests: IRISNDT# 623

Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 10FEB2017

Certified by: Juston Davis

UCS QC Approved By Date 2/10/17

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name Jorge Pando JR Identification No. JP

TEST DESCRIPTION

Identification of WPS followed 5011-A ☐ Test Coupon ☒ Production Weld
Specification of base metal(s) SA106B Thickness 0.322''

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	8.625"	2 5/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P11 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.20	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71T-1M	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.125''	0.250" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.200''	.644'' MAX
Position qualified (2G, 6G, 3F, etc.)	6G	ALL
Vertical progression (uphill or downhill)	3G	3G/1G
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOBULAR	GLOBULAR
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by Tyler Warrington Company American piping inspectors, Inc
Mechanical tests conducted by Laboratory Tests 53834
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 7/06/12

Certified by Robert Kirk

UCS QC Approved By Date 7/8/14

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name VICENTE BUSTOS Identification No. VB

TEST DESCRIPTION

Identification of WPS followed 5011-A ☒ Test Coupon ☐ Production Weld
Specification of base metal(s) SA36 Thickness 0.375"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☒ Plate ☐ Pipe (enter diameter if pipe or tube)	PLATE ({2} 2G&3G)	24" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.125"	0.25" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.25"	½" MAX.
Position qualified (2G, 6G, 3F, etc.)	2G/3G	1G, 2G, 3G
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by BRAD FRAZIER Company API, INC.
Mechanical tests conducted by N/A Laboratory Tests 150345
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 2/23/2016

Certified by JUSTON DAVIS

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name JOSE A. GALVAN Identification No. JG

TEST DESCRIPTION

Identification of WPS followed 5011-A ☒ Test Coupon ☐ Production Weld
Specification of base metal(s) SA-106 Gr. B Thickness 0.5"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	8"	2-7/8" and Greater
Base metal P or S-Number to P- or S Number	P1	P1-P11F & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T-1M	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.062"	0.125" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.438"	Max to be Welded
Position qualified (2G, 6G, 3F, etc.)	3G	1,2,3G
Vertical progression (uphill or downhill)	GM-DOWN/FC-UP	GM-DOWN/FC-UP
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB./SPRAY	GLOB./SPRAY
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by JACK LLOYD Company AMERICAN PIPING INSP.
Mechanical tests conducted by ____ Laboratory Tests 149189
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 09/25/2015

Certified by JUSTON W. DAVIS

UCS QC Approved By Date 9/25/15

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110 PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name AARON SNATIAGO Identification No. AS

TEST DESCRIPTION

Identification of WPS followed 5011-A ☐ Test Coupon ☒ Production Weld

Specification of base metal(s) SA36 Thickness 0.375"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	5" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.062"	0.125" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.313"	0.626" MAX
Position qualified (2G, 6G, 3F, etc.)	2G	1G, 2G
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)

☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]

☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE

Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A

Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A

Other Tests N/A

Film or Specimens evaluated by Jack Henson Company API, INC.

Mechanical tests conducted by N/A Laboratory Tests 140594

Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 08/12/2015

Certified by JUSTON DAVIS

United Contracting Services INC.
2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name JIMMY NIBARGER Identification No. JN

TEST DESCRIPTION

Identification of WPS followed 5011-A ☒ Test Coupon ☐ Production Weld
Specification of base metal(s) SA106B Thickness 0.432"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.062"	0.187" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.396"	0.739
Position qualified (2G, 6G, 3F, etc.)	6G	ALL POSITIONS
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by JACK HENSON Company SGS
Mechanical tests conducted by N/A Laboratory Tests 1703170814
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 3-17-2017

Certified by JUSTON DAVIS

United Contracting Services INC.
2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: BOBBY DOWNS — Identification No.: BD

TEST DESCRIPTION

Identification of WPS followed: 5011-A — ☒ Test Coupon ☐ Production Weld
Specification of base metal(s): SA-106 Gr. B — Thickness: 0.432"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	0.432 Total	0.864 MAX
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.0625"	0.187" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.3695"	0.739" MAX
Position qualified (2G, 6G, 3F, etc.)	1G-R	1G, 1F, 1G-R
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE
Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A
Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A
Other Tests: N/A
Film or Specimens evaluated by: CHRIS BROOKHART — Company: IRIS – 0454
Mechanical tests conducted by: N/A — Laboratory Tests: 3-22-2017 – 0454
Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 3-22-2017

Certified by: Juston Davis

TULSA GAMMA RAY INC. 1127 South Lewis Ave. Tulsa OK 74104
PH 918.585.3228 FX 918.584.5598

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Saul Medina — Identification No.: SM

TEST DESCRIPTION

Identification of WPS followed: 5011A-HT (PQR) — ☒ Test Coupon ☐ Production Weld
Specification of base metal(s): SA-516-60/70 — Thickness: 0.75"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☒ Plate ☐ Pipe (enter diameter if pipe or tube)	N/A	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P11 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.20 / 5.18	
Filler metal or electrode classification(s) (info only)	ER70S-6 / E71T-1M	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/TUBULAR	SOLID/TUBULAR
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.125"	0.1625" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.625"	MAX to be Welded
Position qualified (2G, 6G, 3F, etc.)	6G	ALL
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☒ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☒ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result
SIDE	ACCEPTABLE	SIDE	ACCEPTABLE		
SIDE	ACCEPTABLE	SIDE	ACCEPTABLE		

Alternative radiographic examination results (QW-191): N/A
Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A
Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A
Other Tests: N/A
Film or Specimens evaluated by: JOHN PHILLIPS — Company: API, Inc.
Mechanical tests conducted by: JOHN PHILLIPS — Laboratory Tests: M150928-1B
Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 09/30/2015

Certified by: Juston Davis

United Contracting Services INC.
2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name SAUL MEDENA Identification No. SM

TEST DESCRIPTION

Identification of WPS followed 5010-A ☐ Test Coupon ☒ Production Weld
Specification of base metal(s) SA-106 GR.B Thickness 0.75"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/SAW	GMAW/SAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	14"	
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/EH11K	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.25"	0.5" MAX
Process 2: SAW 3 layers minimum ☒ yes ☐ no	0.50"	MAX TO BE WELDED
Position qualified (2G, 6G, 3F, etc.)	1G/1G	1G,1G
Vertical progression (uphill or downhill)	-------	-------
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by KENNITH NIXON Company AMERICAN PIPING INSP.
Mechanical tests conducted by ____ Laboratory Tests 131006
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 03-14-2015

Certified by JUSTON W. DAVIS

Juston W Davis
CWI 12111641
QC1 EXP. 11/1/2015
3/14/15

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name ERNESTO MERCADO Identification No. EM

TEST DESCRIPTION

Identification of WPS followed 5012A ☐ Test Coupon ☒ Production Weld
Specification of base metal(s) SA106B Thickness 0.322"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW	GTAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	8"	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18	
Filler metal or electrode classification(s) (info only)	ER70S6	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GTAW 3 layers minimum ☒ yes ☐ no	0.322"	0.644" MAX
Process 2: ____ 3 layers minimum ☐ yes ☐ no	----	----
Position qualified (2G, 6G, 3F, etc.)	6G	ALL POSITIONS
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	N/A	N/A
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN	DCEN

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☒ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(e)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by JACK LLOYD Company API, INC.
Mechanical tests conducted by ____ Laboratory Tests 148769
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 09/10/2015

Certified by JUSTON DAVIS

UCS
QC Approved
By
Date 9/10/15

United Contracting Services INC.
2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name ERNESTO MERCADO Identification No. EM

TEST DESCRIPTION

Identification of WPS followed 5011-A ☒ Test Coupon ☐ Production Weld
Specification of base metal(s) SA106B Thickness 0.280"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6"	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	-------	-------
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.125"	0.25" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.375"	0.75"MAX
Position qualified (2G, 6G, 3F, etc.)	6G	ALL POSITIONS
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(e)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) ACCEPTABLE
Fillet weld – fracture test (QW-180) N/A Length and percent of defects N/A
Macro examination (QW-184) N/A Fillet size (in.) ____ x ____ Concavity/convexity (in.) N/A
Other Tests N/A
Film or Specimens evaluated by JACK HENSON Company API, INC.
Mechanical tests conducted by N/A Laboratory Tests 140594
Welding supervised by UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor UNITED CONTRACTING SERVICES

Date 08/12/2015

Certified by JUSTON DAVIS

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110 PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Israel Martinez Identification No.: FO

TEST DESCRIPTION

Identification of WPS followed: 5011-A ☒ Test Coupon ☐ Production Weld

Specification of base metal(s): SA-106 Gr. B Thickness: 0.322"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	8" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	0.322 Total	0.644 MAX
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.0625"	0.187" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.2605"	0.521" MAX
Position qualified (2G, 6G, 3F, etc.)	1G-R	1G, 1F, 1G-R
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)

☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]

☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE

Fillet weld – fracture test (QW-180): N/A Length and percent of defects: N/A

Macro examination (QW-184): N/A Fillet size (in.): ____ x ____ Concavity/convexity (in.): N/A

Other Tests: N/A

Film or Specimens evaluated by: Daniel Culver Company: IRIS NDT

Mechanical tests conducted by: N/A Laboratory Tests: IRISNDT# 623

Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 10FEB2017

Certified by: Juston Davis

UCS QC Approved By Date 2/10/17

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Israel Martinez — Identification No.: FO

TEST DESCRIPTION

Identification of WPS followed: 5011-A — ☒ Test Coupon ☐ Production Weld
Specification of base metal(s): SA-106 Gr. B — Thickness: 0.322"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	8" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	0.322 Total	0.644 MAX
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.0625"	0.187" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.2605"	0.521" MAX
Position qualified (2G, 6G, 3F, etc.)	1G-R	1G, 1F, 1G-R
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE
Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A
Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A
Other Tests: N/A
Film or Specimens evaluated by: Daniel Culver — Company: IRIS NDT
Mechanical tests conducted by: N/A — Laboratory Tests: IRISNDT# 623
Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 10FEB2017

Certified by: Juston Davis

UCS QC Approved By Date 2/10/17

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Matt Little — Identification No.: ML

TEST DESCRIPTION

Identification of WPS followed: 5011-A — ☒ Test Coupon ☐ Production Weld
Specification of base metal(s): SA-106 Gr. B — Thickness: 0.432"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GMAW/FCAW	GMAW/FCAW
Type (i.e.: manual, semi-auto) used	SEMI-AUTO	SEMI-AUTO
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6" OD	2 7/8" AND GREATER
Base metal P or S-Number to P- or S Number	P1	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.17	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71-T	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID/CORED	SOLID/CORED
Deposit thickness for each process	0.432 Total	0.864 MAX
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.0625"	0.187" MAX
Process 2: FCAW 3 layers minimum ☒ yes ☐ no	0.3695"	0.739" MAX
Position qualified (2G, 6G, 3F, etc.)	1G-R	1G, 1F, 1G-R
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	GLOB.	GLOB.
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE
Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A
Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A
Other Tests: N/A
Film or Specimens evaluated by: Daniel Culver — Company: IRIS NDT
Mechanical tests conducted by: N/A — Laboratory Tests: IRISNDT# 623
Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 10FEB2017

Certified by: Juston Davis

UCS QC Approved By Date 2/10/17

United Contracting Services INC. 2716 E Apache ST Tulsa OK, 74110
PH 918.551-7659 FX 918.561-6027

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Matt Little — Identification No.: ML

TEST DESCRIPTION

Identification of WPS followed: 5007-A — ☒ Test Coupon ☐ Production Weld
Specification of base metal(s): SA-312 Typ. 304/304L — Thickness: 0.154"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW	GTAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NO BACKING	WITH or WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	2" OD	1" AND GREATER
Base metal P or S-Number to P- or S Number	P8	P1 thru P15F,P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.9	
Filler metal or electrode classification(s) (info only)	ER308L	
Filler metal F-Numbers	F6	F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	-------	-----
Process 1: GMAW 3 layers minimum ☐ yes ☒ no	0.154"	0.308" MAX
Process 2: ____ 3 layers minimum ☐ yes ☐ no	N/A	N/A
Position qualified (2G, 6G, 3F, etc.)	6G	ALL POSITIONS
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	WITH	WITH or WITHOUT
Transfer mode (spray/globular or pulse to short circuit-GMAW)	N/A	N/A
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN	DCEN

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☐ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191): ACCEPTABLE
Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A
Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A
Other Tests: N/A
Film or Specimens evaluated by: Daniel Culver — Company: IRIS NDT
Mechanical tests conducted by: N/A — Laboratory Tests: IRISNDT# 623
Welding supervised by: UNITED CONTRACTING SERVICES

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

Manufacturer or Contractor: UNITED CONTRACTING SERVICES

Date: 10FEB2017

Certified by: Juston Davis

UCS QC Approved By Date 2/10/17

UCS JOB NO. S-4248

Section 7

NDE RECORDS & TRACEABILITY RECORDS

(WID, HT, & NDE Maps)

JOB: S-4248-07

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	Film Brand	FUJI,AGFA	Client:	United Contracting Services	Date:	2/17/2017
Curies	95	Film Type:	80,D3	Job#	S-4248	IRISNDT#	725
EFSS:	0.146"	#Film/Cassette:	1	Location:	Tulsa, OK	PKG#	
Code:	B31.3 NFS			Item Inspected:	spool piping		
Material:	Carbon Steel, Stainless Steel						

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Tech.	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR12R	3-T	6"	.432"	JP	15F	6.62"	.432"	2-4		A
XR19R	T-2	4"	.120"	LC EM	15F	4.38"	.120"	2-4	[ ]	R
	3-T									A
XR22	T-2	6"	.432"	ML	15F	6.62"	.432"	2-4		A
	2-3									A
	3-T									A
XR23	T-2	8"	.500"	JP	BF	8.62"	.500"	2-4		A
	2-3									A
	3-T									A
XR25	T-2	6"	.280"	JP	15F	6.62"	.280"	2-4		A
	2-3									A
	3-T									A
XR26	T-2	6"	.432"	JP	15F	6.62"	.432"	2-4		A
	2-3									A
	3-T									A
XR27	T-2	6"	.432"	JP	15F	6.62"	.432"	2-4		A
	2-3									A
	3-T									A
XR28	T-2	8"	.500"	LF	BF	8.62"	.500"	2-4		A
	2-3									A
	3-T									A
XR30	T-2	4"	.237"	LC	15F	4.38"	.237"	2-4	RESHOOT, CRACKED SCREEN	R
	2-3									A
	3-T									A
XR31	T-2	6"	.280"	LC	15F	6.62"	.280"	2-4		A
	2-3									A
	3-T									A
XR32	T-2	4"	.216"	~~SM~~ SLAG	15F	3.5"	.216"	2-4		A
	2-3									A
	3-T								ROOT POROSITY	R

RT Technique:

Exposure	Viewing	Technique
S.W.E.	S.W.V.	1,2,2A,6,7
D.W.E.	S.W.V.	3, 3A
D.W.E.	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance
O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EL - Elongated Indication
EUIC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit# 395 Miles
In: Out Hrs
In: Out Hrs

Personnel: Daniel Culver
Ben Hunnicut

Film Quantity:	
3 1/2 x 8 1/2 /10	24
3 1/2 x 17	6
4 1/2 x 8 1/2 /10	
4 1/2 x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:
Daniel Culver (PRINT)
(Signature)
SNT-TC-1A II
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ASNT
Cert # 341

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West Berlin, NJ (856) 809 - 0270
New

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	Film Brand	FUJI,AGFA	Client:	United Contracting Services	Date:	2/22/2017
Curies	92	Film Type:	80,D3	Job#	S-4248	IRISNDT#	789
EFSS:	0.146"	#Film/Cassette:	1	Location:	Tulsa, OK	PKG#	
Code:	B31.3 NFS			Item Inspected:	spool piping		
Material:	Carbon Steel, Stainless Steel						

Film ID	Interval	Size	Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Tech.	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR[illegible]R	T-2	4"	.120"	LC	10F	4.5"	[illegible]	2-4	RT3		A
	2-3										A
	3-T										A
XR35R	T-2	3"	.216"	SM	12F	3.5"	.216"	2-4	RT3		A
	2-3										A
	3-T										A
XR36R	T-2	3"	.216"	SM	12F	3.5"	.216"	2-4	RT3		A
	2-3										A
	3-T										A
XR44R	A	2"	.109"	EM	12	18"	2.375"	2-4	RT4		A
	B										A
XR45R	A	2"	.109"	EM	12	18"	2.375"	2-4	RT4	POR-OK	A
	B										A
XR53R	T-2	3"	.216"	SG	12F	3.5"	.216"	2-4	RT3		A
	2-3										A
	3-T										A
XR57	T-2	4"	.237"	SG	12F	4.5"	.237"	2-4	RT3	IF, SLAG	R
	2-3	SKI-005 W5									A
	3-T										A
XR[illegible]	T-2	3"	.216"	SG	12F	3.5"	.216"	2-4	RT3	IF, SLAG	R
	2-3									IF, SLAG	A
	3-T										A
XR[illegible]4	T-2	3"	.216"	SG	12F	3.5"	.216"	2-4	RT3		A
	2-3										A
	3-T									POR	A
XR[illegible]9	A	2"	.109"	EM	12	18"	2.375"	2-4	RT4		A
	B										A
XR[illegible]0	A	2"	.109"	EM	12	18"	2.375"	2-4	RT4		A
	B										A

RT Technique:

Exposure	Viewing	Technique
S.W.E.	S.W.V.	1,2,2A,6,7
D.W.E.	S.W.V.	3, 3A
D.W.E.	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance
O.F.D. = Distance from source side of object to film

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P - Porosity
EL - Elongated Indication

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IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag

IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit# 395 Miles

In: ____ Out ____ Hrs ____

In: ____ Out ____ Hrs ____

Personnel: Daniel Culver
Casey McDaniel

Film Quantity:

3 1/2 x 8 1/2 /10	29
3 1/2 x 17	
4 1/2 x 8 1/2 /10	
4 1/2 x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:

Daniel Culver (PRINT)

(Signature)

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ASNT
Cert # 341

Client Representative

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Orleans, LA
Claremore, OK
West Berlin, NJ

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	Film Brand	FUJI,AGFA	Client:	United Contracting Services	Date:	2/22/2017
Curies	92	Film Type:	80,D3	Job#	S-4248	IRISNDT#	789
EFSS:	0.146"	#Film/Cassette:	1	Location:	Tulsa, OK	PKG#	
Code:	B31.3 NFS			Item Inspected:	spool piping		
Material:	Carbon Steel, Stainless Steel						

Film ID	Interval	Size	Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Tech.	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR71		8"	.322"	EM		18"	2.375"	2-4	RT4	POR-OK	A
	2-3									POR-OK	A
XR72	1	8"	.109"	EM	1	18"	2.375"	2-4	RT4		A
XR74	T-2	8"	.216"	SM	15F	2.5"	.216"	2-4	RT3		A
	2-3										A
	3-T										A
XR55	T-2	8"	.280"	SM	15F	6.625"	.280"	2-4	RT3		A
	2-3										A
	3-T										A
XR65	T-2	8"	.432"	SM	15F	6.625"	.432"	2-4	RT3	CONCAVITY	R
	2-3										R
	3-T									IP, CONCAVITY	R
XR66	T-2	8"	.432"	SM	15F	6.625"	.432"	2-4	RT3		A
	2-3										A
	3-T										A
XR67	T-2	8"	.432"	SM	15F	6.625"	.432"	2-4	RT3		A
	2-3										A
	3-T										A
XR68	T-2	8"	.432"	SM	15F	6.625"	.432"	2-4	RT3		A
	2-3										A
	3-T										A
XR7R	T-2	8"	.500"	LF	BF	8.625"	.500"	2-4	RT3		A
	2-3	SK1-001-W1								POR-OK	A
	3-T										A
XR21	T-2	8"	.500"	FO	BF	8.625"	.500"	2-4	RT3		A
	2-3										A
	3-T										A

RT Technique:

Exposure	Viewing	Technique
S.W.E.	S.W.V.	1,2,2A,6,7
D.W.E.	S.W.V.	3, 3A
D.W.E.	D.W.V	4, 5, 8

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O.F.D. = Distance from source side of object to film

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IP - Incomplete Penetration
S - Slag

IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit# 395 Miles

In: Out Hrs

In: Out Hrs

Personnel: Daniel Culver
Casey McDaniel

Film Quantity:	
3 1/2 x 8 1/2 /10	22
3 1/2 x 17	6
4 1/2 x 8 1/2 /10	
4 1/2 x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:
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Claremore, OK 1420 (856) 809 –
West Berlin, NJ 0270

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	Film Brand	FUJI,AGFA	Client:	United Contracting Services	Date:	2/22/2017
Curies	92	Film Type:	80,D3	Job#	S-4248	IRISNDT#	789
EFSS:	0.146"	#Film/Cassette:	1	Location:	Tulsa, OK	PKG#	
Code:	B31.3 NFS			Item Inspected:	spool piping		
Material:	Carbon Steel, Stainless Steel						

Film ID	Interval	Size, Thickness		Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Tech.	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR29	T-2	8"	.500"	LF	BF	8.625"	.500"	2-4	RT3		A
	2-3	SK1-001					W4			SK1-002 w3 Porosity Porosity	A
	3-T										A
XR46	T-2	8"	.322"	JG	BF	8.625"	.322"	2-4	RT3		A
	2-3									RESHOOT	R
	3-T									RESHOOT	R
XR54	T-2	10"	.375	JP	BF	10.375"	.375"	2-4	RT3		A
	2-3										A
	3-T										A
XR56	T-2	10"	.375	JP	BF	10.375"	.375"	2-4	RT3		A
	2-3										A
	3-T										A
XR58	T-2	8"	.500"	JP	BF	8.625"	.500"	2-4	RT3		A
	2-3	SK1-009					W5				A
	3-T										A
XR59	T-2	8"	.500"	SM	BF	8.625"	.500"	2-4	RT3		A
	2-3	SK1-012					W10				A
	3-T										A
XR60	T-2	8"	.500"	JG	BF	8.625"	.500"	2-4	RT3		A
	2-3	SK1-009					W2				A
	3-T										A
XR62	T-2	8"	.322"	SG	BF	8.625"	.322"	2-4	RT3		A
	2-3									POROSITY	R
	3-T										A

RT Technique:

Exposure	Viewing	Technique
S.W.E.	S.W.V.	1,2,2A,6,7
D.W.E.	S.W.V.	3, 3A
D.W.E.	D.W.V	4, 5, 8

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O.F.D. = Distance from source side of object to film

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P - Porosity
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IUC - Internal Undercut
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IP - Incomplete Penetration
S - Slag

IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit# 395 Miles

In: Out Hrs

In: Out Hrs

Personnel: Daniel Culver
Casey McDaniel

Film Quantity:	
3 1/2 x 8 1/2 /10	
3 1/2 x 17	30
4 1/2 x 8 1/2 /10	
4 1/2 x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:

Daniel Culver (PRINT)

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West Berlin, NJ 0270

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	Film Brand	FUJI,AGFA	Client:	United Contracting Services	Date:	2/22/2017
Curies	92	Film Type:	80,D3	Job#	S-4248	IRISNDT#	789
EFSS:	0.146"	#Film/Cassette:	1	Location:	Tulsa, OK	PKG#	
Code:	B31.3 NFS			Item Inspected:	spool piping		
Material:	Carbon Steel, Stainless Steel						

Film ID	Interval	Size, Thickness		Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Tech.	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
✓ XR73	T-2	8"	.322"	JP	BF	8.625"	.322"	2-4	RT3		A
	2-3	SK1-009					W8				A
	3-T										A
✓ XR75	T-2	8"	.322"	SG	BF	8.625"	.322"	2-4	RT3		A
	2-3	SK1-007					W4				A
	3-T										A

RT Technique:

Exposure	Viewing	Technique
S.W.E.	S.W.V.	1,2,2A,6,7
D.W.E.	S.W.V.	3, 3A
D.W.E.	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance
O.F.D. = Distance from source side of object to film

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IP - Incomplete Penetration
S - Slag

IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit# 395 Miles

In: ____ Out ____ Hrs ____

In: ____ Out ____ Hrs ____

Personnel: Daniel Culver
Casey McDaniel

Film Quantity:

3 1/2 x 8 1/2 /10	
3 1/2 x 17	6
4 1/2 x 8 1/2 /10	
4 1/2 x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:

Daniel Culver (PRINT)

(Signature)

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Cert # 341

Client Representative

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IRISNDT

RADIOGRAPHIC INSPECTION REPORT

274480

Page 3 of 5

Gamma Type: Ir192 | Film Brand: Fuji AX
Curies: 88 | Film Type: 80 D3
EFSS: .14 | #Film/cassette: 1/1
Code: B31.3
Material:

Client: UCS | Date: 3-2-17
Job #: 4248 | IRISNDT #: 0941
Location: Tulsa | P.O. #:
Item Inspected:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XC91	T 2 / 2 3 / 3 T	8".500	SG	8F	8".500		2.4	T3	SK1-009	A
									Light Leak	A
XC92	T 2 / 2 3 / 3 1	8".216	SM	1F	8".216					A
XC93	T 2 / 2 3 / 3 1	2".218	SM		2".218				BT	R
XC94	1 2 / 2 3 / 3 1	8".500	JP	8F	8".500				SK1-012	A
									RX WELD OK NSM ASME 1B4.10.2	R A
XC95	1 2 / 2 3 / 3 1		SM						SK1-003	A
XC96	1 2 / 2 3 / 3 1		JP						SK1-003	
XC98	T 2 / 2 3 / 3 1	2".218	SM	1F	2".218				SK1-031	
XC99	T 2 / 2 3 / 3 1	8".500	JG	8F	8".500					
XC100	T 2 / 2 3 / 3 1	4".337	JG	1F	4".337				LF SK1-004	R
									LF	R
									LF	R

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1, 2, 2A, 6, 7
D.W.E	S.W.V	3, 3A
D.W.E	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance

O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EI - Elongated Indication
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 760 | Miles:
In: | Out: | Hrs:
In: | Out: | Hrs:
Personnel: Chris Cox
Dan Cox

Film Quantity:

3 ½ x 8 ½ /10	
3 ½ x 17	
4 ½ x 8 ½ /10	
4 ½ x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:
Chris Cox (Print)
(Signature)
Client Representative: (Print)
I am in full agreement with report contents
(Sign)

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ASNT II (Level)
CERT # 10414

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IRISNDT

RADIOGRAPHIC INSPECTION REPORT

274649

Page 1 of 5

Gamma Type: Ir192 | Film Brand: Fuji AgfA
Curies: 80 | Film Type: D7 D3
EFSS: .14 | #Film/cassette: 1/1
Code: 331.3
Material:

Client: UCS | Date: 3-2-17
Job #: 4248 | IRISNDT #: 0941
Location: Tulsa | P.O. #:
Item Inspected:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
~~XR 3L~~	~~3 T~~	~~3" .216~~	~~SG~~	~~12F~~	~~3½"~~	~~.216~~				A
~~XR 4L~~	~~2 3~~	~~8" .322~~	~~JG~~	~~8F~~	~~8⅛~~	~~.322~~				
	3 T									
XR 57R	T 2	4" .237	SG	12F	4½"	.237			P SKI-005, W5	R
~~XR 1R~~	~~2 3~~	~~10" .365~~	~~SG~~	~~8F~~	~~10¾~~	~~.365~~				A
~~XR 3R~~	~~T 2~~	~~4" .337~~	~~JG~~	~~15F~~	~~4½"~~	~~.337~~				
	2 3									
XR 6R	3 T		SG						P	R
XR 5R	T 2	6" .280	Sm	8F	6⅛	.280				A
	3 T									
✓ XR 77	1 2	8" .500	JG		8⅛	.500			Light Leak	A
	2 3								SKI-005	
	3 1									
✓ XR 78	1 2	4" .337	Sm	15F	4½"	.337				
	2 3								SKI-013	
	3 1									
XR 79	1 2	8" .500	JG	8F	8⅛	.500				
	2 3								SKI-003	
	3 1									
~~XR 80~~	~~T 2~~	~~2" .216~~	~~ML~~	~~12F~~	~~2⅜~~	~~.216~~				
	2 3									
	3 T									
✓ XR 81	T 2	4" .337	SG	15F	4½"	.337			P SKI-015	
	2 3								P OK per code	
	3 T									

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1, 2, 2A, 6, 7
D.W.E	S.W.V	3, 3A
D.W.E	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance

O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EI - Elongated Indication
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 760 Miles:
In: Out: Hrs:
In: Out: Hrs:
Personnel: Chris Combs
Dean Law

Film Quantity:

3 ½ x 8 ½ /10	
3 ½ x 17	
4 ½ x 8 ½ /10	
4 ½ x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:
Chris Combs (Print)
(Signature)
SNT-TC-1A II
ASNT II (Level)
CERT # 10414
Client Representative:
(Print)
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IRISNDT

RADIOGRAPHIC INSPECTION REPORT

266530

Gamma Type: Ir-192 Film Brand: Fuji Agfa
Curies: 83 Film Type: D7 D3
EFSS: 14 #Film/cassette: 4
Code: B31 3
Material:

Client: UCS Date: 3-2-17
Job #: 4248 IRISNDT #: 0941
Location: Tulsa P.O. #:
Item Inspected:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR82	T 2	8".500	FO	BF	8½	.500	2.4	ET3	SK1-002	A
	2 3									A
	3 T									A
XR83	T 2	4".337	FO	IQI	4½"	.337			SK1-017	A
	2 3									A
	3 T								P	R
XR84	T 2	10"	SG	BF	10¾	3½				R
	2 3									
	3 T								Light Leak	
XR85	T 2		SG							A
	2 3									A
	3 T								P ok on Code	A
XR86	T 2		SG							A
	2 3									A
	3 T								P	R
XR87	T 2		SG							R
	2 3									
	3 T									
XR88	T 2	4"	237	SG	IQI	4½"	.237			
	2 3									
	3 T									
XR89	T 2	6"	280	SG	BF	6½	.500			
	2 3									
	3 T									
XR90	T 2	8".500	SG		8½	500			SK1-001	
	2 3									
	3 T								P	R

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1, 2, 2A, 6, 7
D.W.E	S.W.V	3, 3A
D.W.E	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance

O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EI - Elongated Indication
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 260 Miles:
In: Out: Hrs:
In: Out: Hrs:
Personnel: Chris Cook
Dean Cox

Film Quantity:

3 ½ x 8 ½ /10	
3 ½ x 17	
4 ½ x 8 ½ /10	
4 ½ x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by: Chris Cook SNT-TC-1A II
(Print) ASNT (Level)
(Signature) CERT # 104
Client Representative:
(Print)
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(Sign)

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ORIGINAL

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

275027

Page 4 of 5

Gamma Type: Ir-192 Film Brand: Fuji Agfa
Curies: 88 Film Type: D7 D3
EFSS: .14 #Film/cassette: VI
Code: B31.3
Material:

Client: UCS Date: 3-2-15
Job #: 4248 IRISNDT #: 6941
Location: Tulsa P.O. #:
Item Inspected:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR101	T 2	4" .337	LF	1SF	4½"	.337	2.4	T3	SKI-017	A
	2 3									
	3 T									
XR102	T 2		SG						SKI-014	
	2 3									
	3 T								P	R
XR103	T 2	3" .300	SG		3½"	.300			Too Light SKI-014	—
	2 3									—
	3 T									—
~~XR104~~	T 2	2" .432	~~JT~~	2SF	6½"	.432			Too	R
	2 3									A
	3 T									A
XR105	T 2	4" .337	JG	1SF	4½"	.337			LF SKI-008	R
	2 3								LF	R
	3 T								LF	R
XR106	T 2		JD						SKI-017	A
	2 3								Pix per code	
	3 T								Pix per code	
XR107	T 2	8" .500	JG	BF	87/8	.500			SKI-003	
	2 3									
	3 T									
XR108	T 2		JG						SKI-004	
	2 3									
	3 T									
XR109	T 2	4" .337	JG	1SF	4½"	.337			SKI-015	
	2 3									
	3 T									

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1, 2, 2A, 6, 7
D.W.E	S.W.V	3, 3A
D.W.E	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance

O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EI - Elongated Indication
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 760 Miles:
In: Out: Hrs:
In: Out: Hrs:
Personnel: Chris Combs
Don Low

Film Quantity:

3 ½ x 8 ½ /10	
3 ½ x 17	
4 ½ x 8 ½ /10	
4 ½ x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:
Chris Combs (Print)
SNT-TC-1A II
ASNT II (Level)
CERT # 1044
(Signature)
Client Representative:
(Print)
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IRISNDT

RADIOGRAPHIC INSPECTION REPORT

275028

Page 5 of 5

Gamma Type: Ir192 | Film Brand: Agfa | Client: UCS | Date: 3-2-17
Curies: 88 | Film Type: D3 | Job #: 4248 | IRISNDT #: 0941
EFSS: .014 | #Film/cassette: 1/1 | Location: Tulsa | P.O. #:
Code: B31.3 | Item Inspected:
Material:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR110	T 2	4½", .337	ML	ISF	4½"	.337	2.4	RT3	SKI-017	A
	2 3									
	3 T									
XR111	T 2		ML						SKI-016	
	2 3									
	3 T									
XR112	T 2		ML						P SKI-016	R
	2 3								P	R
	3 T									A
XR113	T 2		FO						SKI-017	
	2 3									
	3 T								P ok per Code	
XR114	T 2		FO						SKI-017	
	2 3									
	3 T									
XR115	T 2		FO						SKI-016	
	2 3									
	3 T									

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1, 2, 2A, 6, 7
D.W.E	S.W.V	3, 3A
D.W.E	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance

O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EI - Elongated Indication
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 760 Miles:
In: Out: Hrs:
In: Out: Hrs:
Personnel: Chris Combs
Don Lou

Film Quantity:

3 ½ x 8 ½ /10	
3 ½ x 17	
4 ½ x 8 ½ /10	
4 ½ x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:
Chris Combs (Print)
(Signature)
SNT-TC-1A II
ASNT II (Level)
CERT # 1044
Client Representative:
(Print)
I am in full agreement with report contents
(Sign)

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IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	Film Brand	AGFA	Client:	United Contracting Services	Date:	3/15/2017
Curies	94	Film Type:	D3	Job#	S-4248	IRISNDT#	1143
EFSS:	0.146"	#Film/Cassette:	1	Location:	Tulsa, OK	PKG#	
Code:	B31.3 NFS			Item Inspected:	spool piping		
Material:	Carbon Steel						

Film ID	Interval	Size, Thickness		Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Tech.	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR139	T-2	2"	.154"	ML	10F	2.375"	.154"	2-4	RT3	SK1-026	A
	2-3									POR,IF	R
	3-T										A
XR83	T-2	2"	.154"	SM	10F	2.375"	.154"	2-4	RT3		A
	2-3										A
	3-T									IF	R
XR83	T-2	4"	.337"	FD	15F	4.5"	.337"	2-4	RT3	RESHOOT	R
	2-3									RESHOOT	R
	3-T									RESHOOT	R
XR126	T-2	4"	.337"	~~AS~~ JP 5/16	15F	4.5"	.337"	2-4	RT3	SK1-007	A
	2-3										A
	3-T										A
XR128	T-2	4"	.337"	JG	15F	4.5"	.337"	2-4	RT3	SK1-019 IF	R
	2-3										A
	3-T										A
XR129	T-2	4"	.337"	JG	15F	4.5"	.337"	2-4	RT3	SK1-019	A
	2-3										A
	3-T										A
XR130	T-2	4"	.337"	SG	15F	4.5"	.337"	2-4	RT3	SK1-007	A
	2-3										A
	3-T										A
XR134	T-2	4"	.337"	JG	15F	4.5"	.337"	2-4	RT3	SK1-019	A
	2-3										A
	3-T										A
XR135	T-2	4"	.337"	JG	15F	4.5"	.337"	2-4	RT3	SK1-019	A
	2-3										A
	3-T										A
XR136	T-2	4"	.337"	JG	15F	4.5"	.337"	2-4	RT3	SK1-019 RESHOOT	R
	2-3									RESHOOT	R
	3-T									RESHOOT	R

RT Technique:

Exposure	Viewing	Technique
S.W.E.	S.W.V.	1,2,2A,6,7
D.W.E.	S.W.V.	3, 3A
D.W.E.	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance
O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EL - Elongated Indication
EUIC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit# 395 Miles

In: Out Hrs

In: Out Hrs

Personnel: Daniel Culver

Casey McDaniel

Film Quantity:	
3 1/2 x 8 1/2 /10	30
3 1/2 x 17	
4 1/2 x 8 1/2 /10	
4 1/2 x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:

Daniel Culver (PRINT)

(Signature)

SNT-TC-1A II

CGSB

ASNT Cert # 341

Client Representative

I am in full agreement with report contents (Print) (Sign)

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West Berlin, NJ 0270

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	Film Brand	FUJI, AGFA	Client:	United Contracting Services	Date:	3/15/2017
Curies	94	Film Type:	80,D3	Job#	S-4248	IRISNDT#	1143
EFSS:	0.146"	#Film/Cassette:	1	Location:	Tulsa, OK	PKG#	
Code:	B31.3 NFS			Item Inspected:	spool piping		
Material:	Carbon Steel						

Film ID	Interval	Size, Thickness		Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Tech.	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR139	T-2	8"	.280"	SG	15.F	6.625"	.280"	2-4	RT3		A
	2-3										A
	3-T										A
XR141	T-2	8"	.280"	JP	15.F	6.625"	.280"	2-4	RT3		A
	2-3										A
	3-T										A
XR153	T-2	8"	.280"	SG	15.F	6.625"	.280"	2-4	RT3		A
	2-3										A
	3-T										A
XR154	T-2	8"	.280"	SG	15.F	6.625"	.280"	2-4	RT3	CONCAVITY-OK	A
	2-3									CONCAVITY-OK	A
	3-T									CONCAVITY-OK	A
XR164	T-2	8"	.280"	SG	15.F	6.625"	.280"	2-4	RT3		A
	2-3										A
	3-T										A
XR90	T-2	8"	.500"	SG	B.F	8.625"	.500"	2-4	RT3	SKI-001	A
	2-3										A
	3-T									POR	R
XR127	T-2	8"	.500"	~~EM~~JP	B.F	8.625"	.500"	2-4	RT3	SKI-007	A
	2-3										A
	3-T										A

RT Technique:

Exposure	Viewing	Technique
S.W.E.	S.W.V.	1,2,2A,6,7
D.W.E.	S.W.V.	3, 3A
D.W.E.	D.W.V	4, 5, 8

S.O.D. = Source-to-object distance
O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EL - Elongated Indication
EUIC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit# 395 Miles
In: Out Hrs
In: Out Hrs

Personnel: Daniel Culver
Casey McDaniel

Film Quantity:	
3 1/2 x 8 1/2 /10	15
3 1/2 x 17	6
4 1/2 x 8 1/2 /10	
4 1/2 x 17	
7 x 17	
14 x 17	
8 x 10	

Interpretation by:
Daniel Culver (PRINT)
(Signature)
SNT-TC-1A II
CGSB
ASNT
Cert # 341

Client Representative
I am in full agreement with report contents (Print) (Sign)

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West Berlin, NJ 0270

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type: IR 192 **Film Brand:** FUJI
Curies: 95 **Film Type:** 80
EFSS: .14 **#Film/cassette:**
Code: B31-3
Material:

Client: UCS **Date:** 17-Mar-17
IRISNDT #: 1190 **Job #:** S-4248
Location: TULSA **PO #:**
Item Inspected:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR-76	T-2	4" .337	SM	15F	4.5"	.337	2-4	RT 3	SKI-010	A
	2-3									
	3-T									
XR-77	T-2	8" .500	JG	BF	8.675"	.500			SKI-005	
XR-83	T-2	4" .337	FO	15F	4.5"	.337			SKI-017	
	2-3									
	3-T									
XR-91	T-2	8" .500	SG	BF	8.675"	.500			SKI-009	
	2-3									
	3-T									
XR-100	T-2	4" .337	JG	15F	4.5"	.337			SKI-004	
	2-3									
	3-T									
XR-102	T-2		SG						SKI-014	
	2-3									
	3-T									
XR-105	T-2		JG						SKI-008	
	2-3									
	3-T									
XR-112	T-2		ML						SKI-016	
	2-3									
	3-T									
XR-118	T-2	8" .500	FO	BF	8.675"	.500			SKI-007	
	2-3									
	3-T									
XR-119	T-2		FO						SKI-001	
	2-3									
	3-T									

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1,2,2A,6,7
D.W.E	S.W.V	3,3A
D.W.E	D.W.V	4,5,8

S.O.D. = Source-to-object distance
O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EI - Elongated Indication
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 760 Miles:
In: Out: Hrs:
In: Out: Hrs:

Personnel:
CHRIS COMBS
DEAN LOW

Film Quantity:

Interpretation by:
CHRIS COMBS (Print)
(Signature)
SNT-TC-1A:
ASNT: II (Level)
CERT #: 1044
Client Representative: (Print)
I am in full agreement with report contents (Sign)

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Deer Park, TX (281) 476-4444
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Denver, CO (303) 289-5253
www.irisndt.com
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Texas City, TX (409) 945-2662
New Orleans, LA (504) 328-0070
Claremore, OK (918) 343-1420
West Berlin, NJ (856) 809-0270

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type: IR 192 | Film Brand: FUJI
Curies: 95 | Film Type: 80
EFSS: .14 | #Film/cassette:
Code: B31.3
Material:

Client: UCS | Date: 17-Mar-17
IRISNDT #: 1190 | Job #: S-4248
Location: TULSA | PO #:
Item Inspected:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR-122	T-2	4" .337	SG	15F	4.5"	.337	2-4	RT 3		A
	2-3								SKI-015	
	3-T									
XR-123	T-2		SG						SKI-015	
	2-3									
	3-T									
XR-128	T-2		JG							
XR-131	T-2	8" .500	SG	BF	8.675"	.500			SKI-003 B1	R
	2-3									
	3-T									
XR-136	T-2	4" .337	JG	15F	4.5"	.337			SKI-019	A
	2-3									
	3-T									
XR-137	T-2		JG						SKI-015	
	2-3									
	3-T									
XR-138	T-2	8" .500	ML	BF	8.675"	.500			BT SKI-003	R
	2-3									
	3-T									
XR-139	2-3	2" .154	ML	12F	2.375"	.154			SKI-026	A
XR-140	T-2	8" .500	JP	BF	8.675"	.500			LF+P SKI-005	R
	2-3									
	3-T									
XR-160	T-2	2" .218	ML	12F	2.375"	.218			SKI-031 P	A
	2-3									
	3-T									
XR-161	T-2	8" .500	SG	BF	8.675"	.500			SKI-005	R
	2-3									
	3-T									

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1,2,2A,6,7
D.W.E	S.W.V	3,3A
D.W.E	D.W.V	4,5,8

S.O.D. = Source-to-object distance

O.F.D. = Distance from source side of object to film

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BT - Burn Through
CK - Crack
EP - Excessive Penetration
P - Porosity
EI - Elongated Indication
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 760 Miles:
In: Out: Hrs:
In: Out: Hrs:

Personnel:
CHRIS COMBS
DEAN LOW

Film Quantity:

Interpretation by:
CHRIS COMBS (Print)
(Signature)
SNT-TC-1A:
ASNT: II (Level)
CERT #: 1044
Client Representative: (Print)
I am in full agreement with report contents (Sign)

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Claremore, OK (918) 343-1420
West Berlin, NJ (856) 809-0270

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

Gamma Type:	IR 192	**Film Brand:**	FUJI	**Client:**	UCS
Curies:	95	**Film Type:**	80	**IRISNDT #:**	1190
EFSS:	.14	**#Film/cassette:**		**Location:**	TULSA
Code:				**Item Inspected:**	
Material:					

Date: 17-Mar-17
Job #: S-4248
PO #:

Film ID	Interval	Size, Thickness	Welder ID	IQI	S.O.D. Inches	O.F.D. Inches	Density	Technique	Type and Location of Discontinuities (rejectable discontinuities in square brackets [ ])	(A)ccept (R)eject
XR-169	T-2	4" .337	JG	15F	4.5"	.337	2-4	RT 3	SKI-020	A
	2-3									
	3-T									
XR-174	T-2	2" .218	ML	12F	2.375"	.218			SKI-031	
	2-3									
	3-T									

RT Techniques:

Exposure	Viewing	Technique
S.W.E	S.W.V	1,2,2A,6,7
D.W.E	S.W.V	3,3A
D.W.E	D.W.V	4,5,8

S.O.D. = Source-to-object distance

O.F.D. = Distance from source side of object to film

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
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EUC - External Undercut
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HB - Hollow Bead
IP - Incomplete Penetration
S - Slag
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
TI - Tungsten Inclusion

Unit#: 760 Miles:

In: Out: Hrs:

In: Out: Hrs:

Personnel:
CHRIS COMBS
DEAN LOW

Film Quantity:

Interpretation by:
CHRIS COMBS (Print)
(Signature)
SNT-TC-1A:
ASNT: II (Level)
CERT #: 1044

Client Representative:
(Print)
I am in full agreement with report contents
(Sign)

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Denver, CO (303) 289-5253
Griffith, IN (219) 923-6501
Texas City, TX (409) 945-2662
New Orleans, LA (504) 328-0070
Claremore, OK (918) 343-1420
West Berlin, NJ (856) 809-0270
www.irisndt.com

Radiographic Inspection Report

Customer:	UCS	**Location:**	Tulsa OK	**Date:**	4/14/2017
Job:	4248	**P.O. #:**		**W.O. #:**		**FJT#:**	1704140808
AFE:		**Material:**	CS	**Code:**	ASME B31.3 N	**Code:**	ASME B31.3 N

TESTING VARIABLES

IR192 [X] CO60 [ ] SE75 [ ] X-Ray [ ] Single Film [X] Composite Film [ ] Digital Image [ ]

Exposure Technique DWE/SWV [X] DWE/DWV [ ] SWE/SWV [ ] Type: FUJI 80 / AGFA D5 Class: I / I

Film Usage 70mm: 19 3½ x 8½: 25 3½ x 10: 3½ x 17: 28 4½ x 8½: 4½ x 10:
8 x 10: 14 x 17: 7 x 17: 4½ x 17:

	Film I.D.	Film Interval	I.Q.I.	O.D. (Inches)	Material Thickness	Welder Stamp	Density	Accept Reject	Comments and Remarks
1	XR- 57 R	100%	1BF	4.500	0.237	SG	2.0-3.8	A	SK1-005 w5
2	XR- 103	100%	1BF	3.500	0.216	SG	2.0-3.8	A	SK1-014 w7
3	XR-160 T1	100%	1AF	2.375	0.218	ML	2.0-3.8	A	SK1-031 w18
4	XR- 188 T1	100%	1BF	3.500	0.216	ML	2.0-3.8	A	SK1-031 w12
5	XR-189 T2	100%	1AF	2.375	0.218	ML	2.0-3.8	A	SK1-031 w1
6	XR- 190 T1	100%	1AF	2.375	0.218	ML	2.0-3.8	A	SK1-031 w13
7	XR- 191 T2	100%	1AF	2.375	0.218	ML	2.0-3.8	A	SK1-031 w6
8	XR- 194	100%	1BF	4.500	0.237	JP	2.0-3.8	A	SK1-018 w10
9	XR- 195	100%	1BF	4.500	0.237	JP	2.0-3.8	A	SK1-018 w11
10	XR- 196	100%	1BF	4.500	0.237	EM	2.0-3.8	A	SK1-018 w13
11	XR- 197	100%	1BF	4.500	0.237	SM	2.0-3.8	A	SK1-018 w12
12	XR- 198	100%	1AF	2.375	0.218	AS	2.0-3.8	A	SK1-011 w5
13	XR- 199	100%	1BF	4.500	0.237	BD	2.0-3.8	A	SK1-018 w16
14	XR- 200	100%	1AF	2.375	0.218	JN	2.0-3.8	A	SK1-011 w4
15	XR- 90	3-T	1BF	8.625	0.322	SG	2.0-3.8	A	SK1-001 w12
16	XR- 91	100%	1BF	8.625	0.322	SG	2.0-3.8	A	SK1-009 w14
17	XR- 131	100%	1BF	8.625	0.322	SG	2.0-3.8	R	2-3SLAG SK1-003 w6
18	XR- 138 T1R	100%	1BF	8.625	0.322	ML	2.0-3.8	A	SK1-003 w3
19	XR- 140 R	T-2	1BF	8.625	0.322	JP	2.0-3.8	A	SK1-005 w2
20	XR- 186 T1	100%	1BF	8.625	0.322	SG	2.0-3.8	A	SK1-009 w14
21	XR- 187 T2	100%	1BF	8.625	0.322	SG	2.0-3.8	A	SK1-009 w15
22	XR- 192 T1	100%	1BF	8.625	0.322	JP	2.0-3.8	A	SK1-009 w13
23	XR- 193 T2	100%	1BF	8.625	0.322	JP	2.0-3.8	A	SK1-009 w2
24	XR- 201	100%	1BF	8.625	0.322	VB	2.0-3.8	A	SK1-012 w9
25									
26									
27									
28									
29									
30									

Terms and Abbreviations:

AB - Arc Burns	EUC - External Undercut	HB - Hollow Bead	LC - Low Cover	P - Porosity
BT - Burn Through	IUC - Internal Undercut	IP - Incomplete Penetration	MA -	S - Slag
CK - Crack	EP - Excessive Penetration	IC - Internal Concavity	LF - Lack of	RS - Round Seam
LS - Long Seam	IQI - Image Quality Indicator (Penetrameter)			

Vehicle #: 43
Miles Driven: Hours: 8
Personnel: Graffenstein, Lance
Kelley, Ryan

Interpretation by
SNT-TC-1A: Lance Graffenstein (print)
CERT. #:
Accepted: 4/16/2017 11:15:51 PM (signature)

I am in full agreement with report contents:
Client Representative: (print) (signature)

2122 S. East Ave., Cushing, OK 74023 Ph. (918) 225-0586 2628 North Hemlock Circle Broken Arrow, OK 74012 ~ Ph. (918) 505-3100 Fax (918) 893-6031

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Radiographic Inspection Report

Customer:	UCS	**Location:**	Tulsa OK	**Date:**	4/18/2017
Job:	S-4248	**P.O. #:**		**W.O. #:**		**FJT#:**	1704181250
AFE:		**Material:**	CS/SS	**Code:**	ASME B31.3 N	**Code:**	ASME B31.3 N

TESTING VARIABLES

IR192 [X] CO60 [ ] SE75 [ ] X-Ray [ ] Single Film [X] Composite Film [ ] Digital Image [ ]

Exposure Technique DWE/SWV [X] DWE/DWV [ ] SWE/SWV [ ] Type: FUJI 80 / AGFA D5 Class: I / I

Film Usage 70mm: ____ 3½ x 8½: ____ 3½ x 10: ____ 3½ x 17: 1 4½ x 8½: ____ 4½ x 10: ____ 8 x 10: ____ 14 x 17: ____ 7 x 17: ____ 4½ x 17: ____

	Film I.D.	Film Interval	I.Q.I.	O.D. (Inches)	Material Thickness	Welder Stamp	Density	Accept Reject	Comments and Remarks
1	XR- 131	2-3	1BF	8.625	0.322	SG	2.0-3.8	A	SKI-003
2									
3									
4									
5									
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26									
27									
28									
29									
30									

Terms and Abbreviations:

AB - Arc Burns	EUC - External Undercut	HB - Hollow Bead	LC - Low Cover	P - Porosity
BT - Burn Through	IUC - Internal Undercut	IP - Incomplete Penetration	MA -	S - Slag
CK - Crack	EP - Excessive Penetration	IC - Internal Concavity	LF - Lack of	RS - Round Seam
LS - Long Seam	IQI - Image Quality Indicator (Penetrameter)			

Vehicle #: 43

Miles Driven: ____ Hours: ____

Personnel: Graffenstein, Lance

Kelley, Ryan

Blanck, Shawn

Interpretation by

SNT-TC-1A: ____ Graffenstein, Lance (print)

CERT. #: 0 (signature)

I am in full agreement with report contents: Juston Davis (print)

Client Representative: (signature)

2122 S. East Ave., Cushing, OK 74023 Ph. (918) 225-0586 2628 North Hemlock Circle Broken Arrow, OK 74012 ~ Ph. (918) 505-3100 Fax (918) 893-6031

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Radiographic Inspection Report

Customer:	UCS	**Location:**		**Date:**	5/25/2017
Job:	S-4248 SK-1	**P.O. #:**		**W.O. #:**		**FJT#:**	1705251333
AFE:		**Material:**	CS	**Code:**	ASME VIII UW51	**Code:**	

TESTING VARIABLES

IR192 ☐ CO60 ☐ SE75 ☐ X-Ray ☐ Single Film ☐ Composite Film ☐ Digital Image ☐

Exposure Technique DWE/SWV ☒ DWE/DWV ☐ SWE/SWV ☐ Type: ___ / ___ / ___ Class: ___ / ___ / ___

Film Usage 70mm: ___ 3½ x 8½: ___ 3½ x 10: ___ 3½ x 17: ___ 4½ x 8½: ___ 4½ x 10: ___
8 x 10: ___ 14 x 17: ___ 7 x 17: ___ 4½ x 17: ___ 2¼ x 5½: ___

	Film I.D.	Film Interval	I.Q.I.	O.D. (Inches)	Material Thickness	Welder Stamp	Density	Accept Reject	Comments and Remarks
1	026 XR-375	T-2	1AF	2.375	0.218	EM	2.0-3.8	A	
2		2-3	1AF	2.375	0.218	EM	2.0-3.8	A	
3		3-T	1AF	2.375	0.218	EM	2.0-3.8	A	
4	003 XR-376	T-2	1BF	8.625	0.322	SG	2.0-3.8	A	
5		2-3	1BF	8.625	0.322	SG	2.0-3.8	A	
6		3-T	1BF	8.625	0.322	SG	2.0-3.8	A	
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
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22									
23									
24									
25									
26									
27									
28									
29									
30									

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BT - Burn Through	IUC - Internal Undercut	IP - Incomplete Penetration	MA -	S - Slag
CK - Crack	EP - Excessive Penetration	IC - Internal Concavity	LF - Lack of	RS - Round Seam
LS - Long Seam	IQI - Image Quality Indicator (Penetrameter)			

Vehicle #: ___
Miles Driven: ___ Hours: ___
Personnel: ___

Interpretation by

SNT-TC-1A: ___ Lance Graffenstein (print)

CERT. #: ___ (signature)

Accepted: 5/25/2017 1:37:18 PM

I am in full agreement with report contents: ___ (print)

Client Representative: ___ (signature)

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A Honeywell Company

UOPR SF-009

PROJECT SPECIFICATION

Job # J-447-SKI-701 PAGE 2 OF 3
PO# 4500767613

REV	DATE	BY	CHK	APV	REV	DATE	BY	CHK	APV
0	3/8/2016	JB							

FABRICATORS PIPING & STRUCTURE INSPECTION PLAN
HONEYWELL UOP RUSSELL PROCESS PLANTS FOR CRYO, REFRIGERATION, AMINE,

As a minimum, Fabricator shall review and inspect the Control Activities indicated below.

Fabricator shall provide inspectors (UOPR and Client) with Two (2) working days advance notice for inspection points (A1 and A2).

Fabricator shall provide UPOR QC with Two (2) working days written notification for hold points (H). E-mail is the preferred method of written notification.

Inspection Code:

A1 – 100% Actual Inspection
A2 – Random Inspection

R1 – 100% Review of Documentation
R2 – Random Review of Documentation

H – Hold Point – do not proceed until inspection by party requesting the hold is complete.
W—Witness Point – do not proceed until inspection by party requesting the witness point is Complete or (waived.)

AP – Approval Required
NA – Not Applicable

Control Activity	Governing Code or Specification	Required Inspections Initials and Date			
		Fabricator/ vendor	UOPR	Client	A.I/3rd party
Fabrication Inspection and Testing plan					
Review fabrication isometric drawings and PO Clarification SOP.	UOPR SOP-001 P&IDs ENG-14cf ENG-14ca ENG-14cas	R1 1/23/17	R1		2/28/17
Review WPS's and PQR's	ENG-14cam ENG-13ap UOPR Quality Control Manual ASME D1.1 Weld Maps ASME Sec. IX	1/23/17	R1		2/28/17

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UOPR SF-009

PROJECT SPECIFICATION

Job # J-447-5K1-701 PAGE 3 OF 3
PO # 4500757613

REV	DATE	BY	CHK	APV	REV	DATE	BY	CHK	APV
0	3/8/2016	JB							

FABRICATORS PIPING & STRUCTURE INSPECTION PLAN
HONEYWELL UOP RUSSELL PROCESS PLANTS FOR CRYO, REFRIGERATION, AMINE,

Control Activity	Governing Code or Specification	Required Inspections Initials and Date			
		Fabricator/ vendor	UOPR	Client	A.I/3rd party
VT/Dimensional check of skid top (Done on Ground).	AWS D1.1 ENG-14de	A1 2/20/17	H		2/28/17
Visually examine weld quality and dimensional check of ALL structural components.	AWS D1.1	A1 2/20/17	A1,H, A2		2/28/17
Verify trial fit of upper and lower stacked skid structures, ladders, platforms, stairs, handrails and any additional bolt on attachments.		H, A1 2/27/17	H, A1		4/27/17
Visually examine piping weld quality.	ENG-13aae ASME B-31.3	A1 N/A	A1,AP		
Conduct dimensional piping and fitting orientation check.	Structural Steel Plan, Elevation and Isometric drawings	H, A1 N/A	H, A1		
Review radiographs and NDE test reports	ASME B-31.3	R1 2/3/17	R1		2/28/17
Witness pressure testing of piping. Verify pressure test results. **Chart Required.**	Line List ENG-13aae ASME B-31.3 HUR-1000	N/A	A1, R1		
Review skid documentation / data book.	ENG-13aae	R1 2/27/17	R1, AP		2/28/17

J-447

SK1 Assy
Spools

ISTI
Weld Procedures

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welding Procedure Specification (WPS)

WPS No.: 1001 Date: 1/24/2007 Rev.: 5 Date: 1/5/2017 Page: 1 of 2

By: Rod Hall Date Signed: 1/5/2017

Supporting PQR's: P1-P1-1001 Rev.2 (1/5/17)

Welding Process(es) / Type(s): GTAW / Manual

Joints (QW-402)

Joint Design: Groove and fillet welds

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	No backing	3/16" max	50 deg min	1/8" max	-
Single bevel	No backing	3/16" max	45 deg min	1/8" max	-
Single-V groove	Gouged & back welded	1/4" max	50 deg min	3/16" max	-
Double bevel	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Double-V groove	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Square groove	T-joint	1/32" max	-	-	-
Square groove	No backing	3/32" max	-	-	-

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.

Retainers: None

SEE ENGINEERING DRAWINGS FOR MISALIGNMENT TOLERANCES. INTERNAL MISALIGNMENT TO BE 1/4" OF WALL THICKNESS, NOT TO EXCEED 1/8" MAX.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

P-No.: 1 Group No.: 1, 2 Thickness Range (in.): 0.1875 to 1.5000

to P-No.: 1 Group No.: 1, 2

Filler Metals (QW-404)

Spec. No. (SFA): 5.18

AWS No. (Class): ER70S-6

Filler Metal Use: Filler Metal Used

F No.: 6 A No.: 1 (Conforms to QW-422)

Weld Metal Thickness Range: 1.5000 in. maximum

Flux Type: N/A

Flux Trade Name: N/A

Consumable Insert: None

Other:

Flux: None

Product Form: Bare (Solid)

Strip Thickness or Width (in.) : N/A

ISTI Plant Services

Welding Procedure Specification (WPS)

WPS No.: 1001 Date: 1/24/2007 Rev.: 5 Date: 1/5/2017 Page: 2 of 2

Positions (QW-405)

Position of Joint: All Positions

Weld Progression: Vertical up

Postweld Heat Treatment (QW-407)

Type: No PWHT will be performed

Temperature Range: None °F

Time Range: None

Preheat (QW-406)

Preheat Temp. Min.: 75 °F

Interpass Temp. Max.: 450 °F

Preheat Maintenance: None

When Base Metal Preheat is < 50°F, preheat to 150°F minimum

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: 100% Argon / 23-30 CFH

Trailing: None

Backing: None

Electrical Characteristics (QW-409)

Current Type / Polarity: DCEN (straight)

Pulsed Current: None

Tungsten Electrode Type and Size: EWTh-2 / 3/32

Mode of Metal Transfer for GMAW(FCAW): N/A

Max. Heat Input (J/in): None

Energy/Power: CC

Technique (QW-410)

Thermal Processes: -

String or Weave Bead: Stringer and weave bead

Orifice or Gas Cup Size: #5 to #10

Initial and Interpass Cleaning: With wire brush clean 1 inch (25 mm) on both sides of weld joint

Method of Back Gouging: When required, grind until all defects are removed.

Oscillation: N/A

Contact Tube to Work Distance: N/A

Single or Multiple Passes (per side): Multipass

Single or Multiple Electrodes: N/A

Peening: None

No Autogenous Welding is permitted.

GTAW Bead Width limited to 4.5x the rod diameter.

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		Class	Diameter (in.)	Type / Polarity	Amperage Range		
Any	GTAW	ER70S-6	1/16	DCEN (straight)	70-150	17-22	Var.
Any	GTAW	ER70S-6	3/32	DCEN (straight)	80-180	18-23	Var.
Any	GTAW	ER70S-6	1/8	DCEN (straight)	130-275	20-25	Var.
Any	GTAW	ER70S-6	3/16	DCEN (straight)	200-375	21-27	Var.

Notes

*Rev. 1: Corrected Preheat to match PQR and added Hardness Results to PQR.

**Rev. 2: Added Preheat temperature for 1-1/4" to 1-1/2" thickness and verify chemical analysis for ER70S-6.

***Rev. 3: Method of confirming ER70S-6 chemical analysis & misalignment limitations (A-No. Verification confirmed by OEM documentation.)

****Rev. 4: Added "No Autogenous Welding is permitted" comment, and "GTAW bead width is limited to 4.5x the rod diameter" comment.

*****Rev. 5: Added NACE MR0175 Vickers Hardness to PQR.

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Procedure Qualification Record (PQR)

PQR No.: **PI-PI-1001 Rev.2 (1/5/17)** WPS No.: **1001 Rev. 5** Date: **1/24/2007** Page: **1 of 2**

Welding Process(es) / Type(s): **GTAW / Manual**

Joints (QW-402)

Weld Type: Groove weld
Single-V groove
Backing: Open butt, no back weld
Root Opening: 5/32 in. Root Face: 0 in.
Groove Angle: 60 °

Base Metals (QW-403)

Material Spec., Type or Grade:
SA-516, Grade 70 to SA-516, Grade 70
P-No.: 1 Group No.: 2 to P-No.: 1 Group No.: 2
Thickness of Test Coupon (in.): 0.750

Filler Metals (QW-404)

SFA Specification: 5.18
AWS Classification: ER70S-6
Filler Metal Use: Filler Metal Used
Filler Metal F-No: 6
Weld Metal Analysis A-No: 1 (Conforms to QW-422)
Size of Filler Metal (in.): 3/32
Weld Deposit 't' (in.): 0.750
Filler Metal Product Form: Bare (Solid)
Consumable Insert: None
Flux: None

Positions (QW-405)

Position of Joint: 1G - Flat
Weld Progression: N/A

Preheat (QW-406)

Preheat Temp.: 75 °F
Interpass Temp.: 450 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate
Shielding: 100% Argon / 25 CFH
Trailing: None
Backing: None

Electrical Characteristics (QW-409)

Current / Polarity: DCEN (straight)
Amps: 142
Volts: 15
Tungsten Type / Size: EWTh-2 / 3/32
Heat Input: N/R
Pulsed Current: None

Technique (QW-410)

Travel Speed (in/min): 3
Thermal Processes: (1)No
String/Weave Bead: Stringer and weave bead
Oscillation: N/A
Mult./Single Pass (per side): Multipass
Mult./Single Electrode: N/A
Nozzle/Gas Cup Size: 6

(1) *Rev. 1 (2/22/2010): Added Brinell Hardness to PQR.
**Rev. 2 (1/5/2017): Added NACE MR0175 Vickers Hardness to PQR - Lab #M170003 Welder: Mando Tang.
**SEE LAB REPORT FOR ACTUAL HARDNESS READING LOCATIONS.

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1001 Rev.2 (1/5/17)

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in^2)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.755	0.753	0.5685	41250	72559	Ductile - BM
2	0.757	0.752	0.5693	42050	73863	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Passed	QW-462.2 Side bend	Passed
QW-462.2 Side bend	Passed	QW-462.2 Side bend	Passed
None		None	

Hardness Test - Brinell/Vickers hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-516, Grade 70 BM (Brinell)	165	163	159	159	158	167			
SA-516, Grade 70 HAZ (Brinell)	174	175	176	168	169	171			
Weld metal (Brinell)	189	191	186						
SA-516, Grade 70 BM (Vickers)	163.8	161.2	162.4	173.2					
SA-516, Grade 70 HAZ (Vickers)	180.9	189.3	256.3	225.2	227.9	209.9	233.6	232.4	188.7
SA-516, Grade 70 HAZ (Vickers).	197.8								
Weld metal (Vickers)	193.6	181.1	247.9	234.5	181.1				

Visual Examination: Acceptable

Jimmy Dick 102124579
Andres Garcia 102126206
Mando Tang M170003

Welder's Name: J. Dick-4579 A. Garcia-6206 M. Tang-0003 ID: _____ Stamp: _____

Welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: Tulsa Gamma Ray, Inc. Test ID.: See Above

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

Approved By: _____ 1/5/2017
Date

TULSA GAMMA RAY, INC.
INSPECTION DIVISION
1127 S. Lewis Avenue Tulsa, OK 74104-3900
Phone 918-585-3228 Fax 918-584-5598

TEST REPORT

PQR# P1-P1-1001
WPS# 1001
Lab No. 102124579
Material SA516-70
Thickness 0.750"

Date 1-24-07

TENSILE TEST (QW-150)

SPECIMEN NO.	WIDTH	THICKNESS	AREA	ULTIMATE TOATL LOAD (LB)	ULTIMATE UNIT STRESS (PSI)	TYPE OF FAILURE & LOCATION
1	0.755	0.753	0.5685	41250	72559	Ductile-Base
2	0.757	0.752	0.5693	42050	73863	Ductile-Base

GUIDED BEND TESTS (QW-160)

TYPE AND FIGURE NO.	RESULTS
1 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
2 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
3 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
4 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"

Welder Jimmy Dick

ISTI PLANT SERVICES
Client

Submitted by John Phillips

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

MECHANICAL TEST REPORT

☐ Welder Qualification ☒ Weld Procedure Evaluation

Organization	ISTI PLANT SERVICES	**LAB #**	102126206
Base Metal Type	SA516-70	**PWHT**	N.A.
Coupon Thickness	0.500"	**PQR#**	P1-P1-1001
WPS No.	1001	**Filler**	ER70S-6
Weld Process	GTAW	**Position**	1G
Welder's Name	ANDRES GARCIA		

BENDS

Specimen Number	Bend Type	Results/Comments
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A

TENSILE TESTS

Specimen Number	Specimen Size	Specimen Area sq. in.	Load at Failure PSI	Ultimate Tensile PSI	Break Location
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A

HARDNESS IN BHN

Material 1			Heat Affected Zone			Weld Metal		
1	2	3	1	2	3	1	2	3
165	163	159	174	175	176	189	191	186
Material 2			**Heat Affected Zone**					
1	2	3	1	2	3			
159	158	167	168	169	171			

CHARPY V-NOTCH IMPACT TESTING

Specimen Number	Specimen Type	Specimen Size	Temp. F	Value Ft./Lbs.	Lateral Expansion	Percent Shear
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Other Tests Performed: NONE

Heat Treatment per ASME Sec. VIII Div. I UCS-56, Impacts per UG-84.
All test performed in accordance to methods specified in ASME SA-370 & ASME Sec. IX.

Signature JOHN PHILLIPS John Phillips Date 2-22-10

American Piping Inspection, Metallurgical Lab
18501 E. Admiral Pl. Catoosa, Oklahoma 74015
Office: (918) 266-4130

Form: MR-8
Established: 10/2/16
Revision: 0
Date: 10/2/16

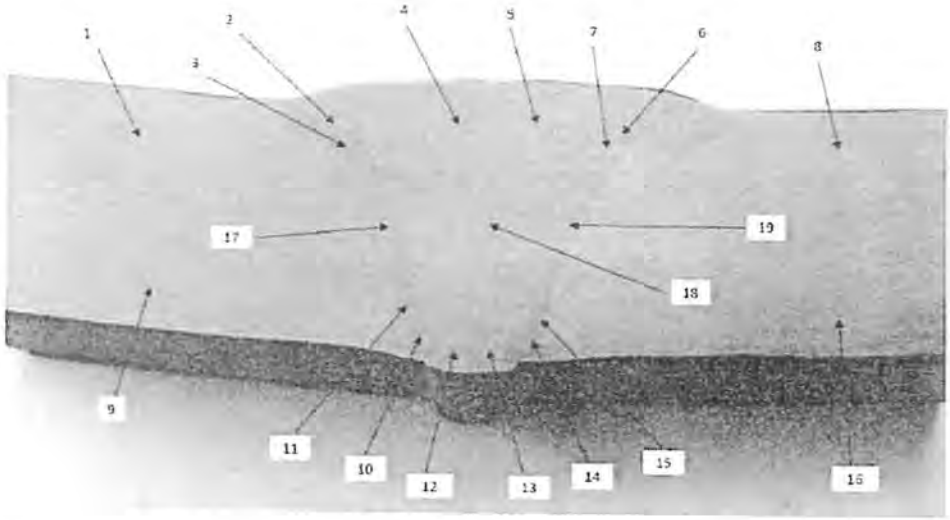
Mechanical/Lab Test Report

Organization:	ISTI Plant Services	Lab Number:	M170003 Rev. 0
Base Material:	1 SA-106 GRB to 2 SA-106 GRB	Heat Number:	N/A
Coupon Dimension:	6.625" O.D. x 0.562" Pos. 1GR	Welder Name/ID:	Mando Tang ID. N/A
WPS/PQR #:	1001	Process(es):	GTAW
Filler Metal:	ER70S-6	PWHT:	N/A

Vickers Hardness (HV10)

Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value
1	BM	163.8	11	HAZ	209.9	N/A		
2	HAZ	180.9	12	WM	247.9	N/A		
3	HAZ	189.3	13	WM	234.5	N/A		
4	WM	193.6	14	HAZ	233.6	N/A		
5	WM	181.1	15	HAZ	232.4	N/A		
6	HAZ	256.3	16	BM	173.2	N/A		
7	HAZ	225.2	17	HAZ	188.7	N/A		
8	BM	161.2	18	WM	181.1	N/A		
9	BM	162.4	19	HAZ	197.8	N/A		
10	HAZ	227.9	N/A			N/A		
	Average BM:	165.15		Average HAZ:	214.2		Average WM:	207.64

For Reference Only



Comments

Other Tests: N/A

All testing performed in accordance with the methods specified in NACE MR0175

Approved by: Eric Darge Date: 1/5/2017 Signature: Eric Darge

Title: Certified Associate Welding Inspector

*Test results relate only to the items tested. This document shall not be reproduced, except in full, without the written approval of American Piping Inspection, Inc. Metallurgical Laboratory.

IST1 Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welding Procedure Specification (WPS)

WPS No.: 1003. Date: 11/15/2006 Rev.: 4 Date: 1/5/2017 Page: 1 of 2
By: Date Signed: 1/5/2017
Supporting PQR's: **P1-P1-1003 Rev.4 (1/5/2017)**
Welding Process(es) / Type(s): **(1) GTAW / Manual (2) FCAW / Semiautomatic**

Joints (QW-402)
Joint Design: Groove and fillet welds

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	No backing	3/16" max	50 deg min	1/8" max	-
Single bevel	No backing	3/16" max	45 deg min	1/8" max	-
Single-V groove	Gouged & back welded	1/4" max	50 deg min	3/16" max	-
Double bevel	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Double-V groove	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Square groove	T-joint	1/32" max	-	-	-
Square groove	No backing	3/32" max	-	-	-

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.
Retainers: None
Groove weld joint details to be approved by Company Representative.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)
P-No.: 1 Group No.: 1 or 2 Thickness Range (in.): 0.1875 to 8.0000
to P-No.: 1 Group No.: 1 or 2

*Rev. 1 (10/15/2009): Added SI Materials designation to supporting PQR line per customer requuest.
**Rev. 2 (9/18/2015): Clarified weld progression, added maximum Hardness Note, and updated to latest Prowrite format.
***Rev. 3 (4/11/2016): claified GTAW Chemistry verification, Tube to Work Contact Distance, grinding if needed between passes ,added preheat ranges, group 2 designation & groove weld joint detail approval by Company Representative statement.
****Rev. 4 (1/5/17): Added NACE MR0175 Vickers Hardness to PQR.

Filler Metals (QW-404)
Spec. No. (SFA): (1) 5.18 (2) 5.20
AWS No. (Class): (1) ER70S-6 (2) E71T-12M
Filler Metal Use:(1) Filler Metal Used
F No.: (1 & 2) 6 A No.: (1 & 2) (verify chemistry)
Weld Metal Thickness Range: (1) 0.2500 in. maximum (2) 8.0000 in. maximum No Pass Greater Than ½" Allowed
Flux Type: N/A
Flux Trade Name: N/A
Consumable Insert: (1) No consumable insert used
Other:
Flux: (1) No flux used
Product Form: (1) Bare (Solid) (2) Flux cored
Supplemental Filler Metal: (2) None
Strip Thickness or Width (in.) : N/A

ISTI Plant Services

Welding Procedure Specification (WPS)

WPS No.: 1003. Date: 11/15/2006 Rev.: 4 Date: 1/5/2017 Page: 2 of 2

Positions (QW-405)

Position of Joint: (1 & 2) All Positions

Weld Progression: (1 & 2) Vertical up

Preheat (QW-406)

Preheat Temp. Min.: 70 °F

Interpass Temp. Max.: 400 °F

Preheat Maintenance: None

70°F< 1.00", 175°F > 1.00"

Postweld Heat Treatment (QW-407)

Type: No PWHT will be performed

Temperature Range: None °F

Time Range: None

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: (1) 100% Argon / 23-30 CFH

(2) 75% Argon, 25% CO2 / 23-30 CFH

Trailing: (1 & 2) None

Backing: (1 & 2) None

Electrical Characteristics (QW-409)

Current Type / Polarity: (1) DCEN (straight) (2) DCEP (reverse)

Pulsed Current: (1) No pulsed current used

Tungsten Electrode Type and Size: (1) EWTh-2 / 3/32 (2) N/A

Mode of Metal Transfer for GMAW(FCAW): (1) N/A (2) Globular arc

Max. Heat Input (J/in): (1 & 2) None

Technique (QW-410)

Thermal Processes: (1 & 2) -

String or Weave Bead: (1 & 2) Stringer and weave bead

Orifice or Gas Cup Size: (1) #5 to #10 (2) 3/8" to 5/8"

Initial and Interpass Cleaning: Grind or wire brush clean 1 inch 925mm) on both sides of weld joint

Method of Back Gouging: When required, grind until all defects are removed.

Oscillation: N/A

Contact Tube to Work Distance: (2) 5/8" - 7/8"

Single or Multiple Passes (per side): (1) Multipass (2) -

Single or Multiple Electrodes: N/A

Peening: (1 & 2) None

(1) ER70S-6 chemistry to be verified bt Typical MTR from filler metal manufacturer.

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		Class	Diameter (in.)	Type / Polarity	Amperage Range		
Any	GTAW	ER70S-6	1/16	DCEN (straight)	70-150	n/r	Var.
Any	GTAW	ER70S-6	3/32	DCEN (straight)	80-180	n/r	Var.
Any	GTAW	ER70S-6	1/8	DCEN (straight)	130-275	n/r	Var.
Any	GTAW	ER70S-6	3/16	DCEN (straight)	200-375	n/r	Var.
Any	FCAW	E71T-12M	0.035	DCEP (reverse)	120-200	19-24	Var.
Any	FCAW	E71T-12M	0.045	DCEP (reverse)	150-225	22-26	Var.
Any	FCAW	E71T-12M	1/16	DCEP (reverse)	175-275	25-28	Var.
Any	FCAW	E71T-12M	5/64	DCEP (reverse)	200-400	26-32	Var.
Any	FCAW	E71T-12M	3/32	DCEP (reverse)	300-500	26-34	Var.

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1003 Rev.4 (1/5/2017) WPS No.: 1003. Date: 11/15/2006 Page: 1 of 2

Welding Process(es) / Type(s): (1) GTAW / Manual (2) FCAW / Semiautomatic

Joints (QW-402)

Weld Type: Groove weld
Single-V groove
Backing: Open butt, no back weld
Root Opening: 1/8 in. Root Face: - in.
Groove Angle: 60 °

Base Metals (QW-403)

Material Spec., Type or Grade:
SA-516, Grade 70 to SA-516, Grade 70
P-No.: 1 Group No.: 2 to P-No.: 1 Group No.: 2
Thickness of Test Coupon (in.): 1.500

Filler Metals (QW-404)

SFA Specification: (1) 5.18 (2) 5.20
AWS Classification: (1) ER70S-6 (2) E71T-12M
Filler Metal Use: (1) Filler Metal Used
Filler Metal F-No: (1 & 2) 6
Weld Metal Analysis A-No: (1 & 2) (verify chemistry)
Size of Filler Metal (in.): (1) 3/32 (2) 0.045
Weld Deposit 't' (in.): (1) 0.125 (2) 1.375
Pass Greater Than ½": (2) No
Filler Metal Product Form: (1) Bare (Solid) (2) Flux cored
Supplemental Filler Metal: (2) None
Consumable Insert: (1) None

Positions (QW-405)

Position of Joint: (1 & 2) 1G - Flat
Weld Progression: (1 & 2) N/A

Preheat (QW-406)

Preheat Temp.: 32 °F
Interpass Temp.: 500 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate
Shielding: (1) 100% Argon / 25 CFH
(2) 75% Argon, 25% CO2 / 25 CFH
Trailing: (1 & 2) None
Backing: (1 & 2) None

Electrical Characteristics (QW-409)

Current / Polarity: (1) DCEN (straight) (2) DCEP (reverse)
Amps: (1) 140 (2) 160
Volts: (1) 15 (2) 26
Tungsten Type / Size: (1) EWTh-2 / 3/32 (2) N/A
Transfer Mode: (2) Globular arc
Wire Feed Speed (in/min): (2) 300
Heat Input: (1 & 2) N/R

Technique (QW-410)

Travel Speed (in/min): (1) 3 (2) 4
Thermal Processes: (1 & 2) No
String/Weave Bead: (1 & 2) Stringer and weave bead
Oscillation: (1 & 2) N/A
Mult./Single Pass (per side): (1 & 2) Multipass
Mult./Single Electrode: (1 & 2) N/A
Nozzle/Gas Cup Size: (2) .625
Contact Tube to Work Dist.: (2) 3/4

(1) *Rev. 1 (4/3/08): Added Brinell Hardness
**Rev. 2 (10/15/09): Added SI Material
***Rev. 3 (9/18/15): Updated to latest Prowrite Format.

(2) ****Rev. 4 (1/7/2017): Added NACE MRO175 Vickers Hardness to PQR - Lab #M170005 Welder: Arturo Vallejo.
****SEE LAB REPORT FOR ACTUAL HARDNESS READING LOCATIONS

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1003 Rev.4 (1/5/2017)

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in^2)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.758	1.521	1.15	84350	73300	Ductile - BM
2	0.753	1.527	1.15	83850	72900	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Passed	QW-462.2 Side bend	Passed
QW-462.2 Side bend	Passed	QW-462.2 Side bend	No defects noted
None		None	

Hardness Test - Brinell/Vickers hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-516, Grade 70 BM (Brinell)	264	266	258	267	263	269			
SA-516, Grade 70 HAZ (Brinell)	275	273	270	276	275	281			
Weld metal (Brinell)	281	281	289						
SA-106, Grade B BM (Vickers)	159.7	167.5	175.6	169					
SA-106, Grade B HAZ (Vickers)	197.4	199.1	233.6	223.6	178.1	176.1	194.6	186.6	172.9
SA-106, Grade B HAZ (Vickers).	174								
Weld metal (Vickers)	194.3	188.7	184.6	189.9	172.7				

Visual Examination: Acceptable

Welders/Lab Numbers
Jimmy Dick Lab# 102124377
Erik Medrando Lab# 102126341
Arturo Vallejo Lab# W170005

Welder's Name: J. Dick -4377 E. Medrando-6341 A. Vallejo-7005 ID: _____ Stamp: _____

Welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: Tulsa Gamma Ray Test ID.: See Above

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

Approved By: Rod Wolfe 1/5/2017
Date

TULSA GAMMA RAY, INC.
INSPECTION DIVISION
1127 S. Lewis Avenue Tulsa, OK 74104-3900
Phone 918-585-3228 Fax 918-584-5598

TEST REPORT

PQR# P1-P1-1003
WPS# 1003
Lab No. 102124377
Material SA516-70
Thickness 1.500"

Date 11-15-06

TENSILE TEST (QW-150)

SPECIMEN NO.	WIDTH	THICKNESS	AREA	ULTIMATE TOATL LOAD (LB)	ULTIMATE UNIT STRESS (PSI)	TYPE OF FAILURE & LOCATION
1	0.758"	1.521"	1.15	84,350	73,300	Ductile-Base
2	0.753"	1.527"	1.15	83,850	72,900	Ductile-Base

GUIDED BEND TESTS (QW-160)

	TYPE AND FIGURE NO.		RESULTS
#1	SIDE BEND	QW-462.2	NO DEFECT GREATER THAN 1/8". "PASSED"
#2	SIDE BEND	QW-462.2	NO DEFECT GREATER THAN 1/8". "PASSED"
#3	SIDE BEND	QW-462.2	NO DEFECT GREATER THAN 1/8". "PASSED"
#4	SIDE BEND	QW-462.2	NO DEFECT GREATER THAN 1/8". "PASSED"

Welder Jimmy Dick

ISTI PLANT SERVICES
Client

JP
Submitted by John Phillips

All test performed in accordance to methods specified in ASTM A370 & ASME Sec. IX

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

MECHANICAL TEST REPORT

☐ Welder Qualification ☒ Weld Procedure Evaluation

Organization	ISTI PLANT SERVICES	**LAB #**	102126341
Base Metal Type	SA106B	**PWHT**	N.A.
Coupon Thickness	6" Sch 120 (6.625" x 0.562")	**PQR#**	P1-P1-1003
WPS No.	1003	**Filler**	ER70S-6/E71T-12M
Weld Process	GTAW/FCAW	**Position**	6G
Welder's Name	Erik Medrando		

BENDS

Specimen Number	Bend Type	Results/Comments
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A

TENSILE TESTS

Specimen Number	Specimen Size	Specimen Area sq. in.	Load at Failure PSI	Ultimate Tensile PSI	Break Location
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A

HARDNESS IN BHN

Material 1			Heat Affected Zone			Weld Metal		
1	2	3	1	2	3	1	2	3
264	266	258	275	273	270	281	281	289
Material 2			**Heat Affected Zone**					
1	2	3	1	2	3			
267	263	269	276	275	281			

CHARPY V-NOTCH IMPACT TESTING

Specimen Number	Specimen Type	Specimen Size	Temp. F	Value Ft./Lbs.	Lateral Expansion	Percent Shear
NONE	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Other Tests Performed: NONE

Heat Treatment per ASME Sec. VIII Div 1 UCS-56. Impacts per UG-84.
All test performed in accordance to methods specified in ASME SA-370 & ASME Sec. IX.

Signature JOHN PHILLIPS JP

Date 4-3-08

American Piping Inspection, Metallurgical Lab
18501 E. Admiral Pl. Catoosa, Oklahoma 74015
Office: (918) 266-4130

Form: MR-8
Established: 10/2/16
Revision: 0
Date: 10/2/16

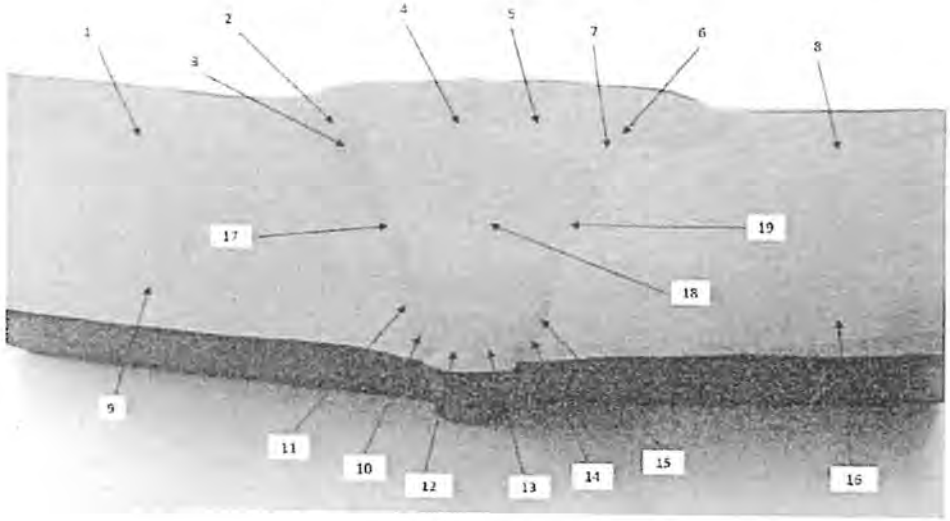
Mechanical/Lab Test Report

Organization:	ISTI Plant Services	Lab Number:	M170005 Rev. 0
Base Material:	1 SA-106 GRB to 2 SA-106 GRB	Heat Number:	N/A
Coupon Dimension:	6.625" O.D. x 0.562" Pos. 1GR	Welder Name/ID:	Arturo Vallejo ID. N/A
WPS/PQR #:	1003	Process(es):	GTAW/FCAW
Filler Metal:	ER70S-6/E71T-12M	PWHT:	N/A

Vickers Hardness (HV10)

Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value
1	BM	159.7	11	HAZ	176.1	N/A		
2	HAZ	197.4	12	WM	184.6	N/A		
3	HAZ	199.1	13	WM	189.9	N/A		
4	WM	194.3	14	HAZ	194.6	N/A		
5	WM	188.7	15	HAZ	186.6	N/A		
6	HAZ	233.6	16	BM	169	N/A		
7	HAZ	223.6	17	HAZ	172.9	N/A		
8	BM	167.5	18	WM	172.7	N/A		
9	BM	175.6	19	HAZ	174	N/A		
10	HAZ	178.1	N/A			N/A		
	Average BM:	167.95		Average HAZ:	193.6		Average WM:	186.04

For Reference Only



Comments

Other Tests: N/A

All testing performed in accordance with the methods specified in NACE MR0175

Approved by: Eric Darge Date: 1/5/2017 Signature:

Title: Certified Associate Welding Inspector

*Test results relate only to the items tested. This document shall not be reproduced, except in full, without the written approval of American Piping Inspection, Inc. Metallurgical Laboratory.

ISTI Plant Services
17207 East 21st Street
Tulsa, Ok 74134

Welding Procedure Specification (WPS)

WPS No.: 1004. Date: 10/16/2006 Rev.: 4 Date: 1/5/2017 Page: 1 of 2

By: Date Signed: 1/5/2017

Supporting PQR's: P1-P1-1004 Rev. 4 (1/5/2017)

Welding Process(es) / Type(s): (1) GMAW / Semiautomatic (2) FCAW / Semiautomatic

Joints (QW-402)

Joint Design: Groove and fillet welds

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	No backing	3/16" max	50 deg min	1/8" max	-
Single bevel	No backing	3/16" max	45 deg min	1/8" max	-
Single-V groove	Gouged & back welded	1/4" max	50 deg min	3/16" max	-
Double bevel	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Double-V groove	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Square groove	T-joint	1/32" max	-	-	-
Square groove	No backing	3/32" max	-	-	-

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.

Retainers: None

All groove weld joint details musdt be approved by Company Representative.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

P-No.: 1 Group No.: 1 or 2 Thickness Range (in.): 0.1875 to 8.0000

to P-No.: 1 Group No.: 1 or 2

*Rev. 1 (7/5/2007): Deleted SA516-70 Material Spec
**Rev. 2 (9/10/2015): Updated to latest Prowrite Format
***Rev. 3 (4/11/2016): Updated contact to work distances, corrected GMAW mode of transfer to reflect actual Volts &Amps used, added Group 2 designation of P Number & added groove weld joint detail approval by Company Representative statement.
****Rev. 4 (1/5/2017): Added NACE MR0175 Vickers Hardness to PQR.

Filler Metals (QW-404)

Spec. No. (SFA): (1) 5.18 (2) 5.20

AWS No. (Class): (1) ER70S-6 (2) E71T-12M

F No.: (1 & 2) 6 A No.: (1 & 2) (verify chemistry)

Weld Metal Thickness Range: (1) 0.2500 in. maximum No Pass Greater Than ½" Allowed
(2) 8.0000 in. maximum No Pass Greater Than ½" Allowed

Flux Type: N/A

Flux Trade Name: N/A

Consumable Insert: N/A

Other:

Product Form: (1) Bare (Solid) (2) Flux cored

Supplemental Filler Metal: (1 & 2) None

Strip Thickness or Width (in.) : N/A

ISTI Plant Services

Welding Procedure Specification (WPS)

WPS No.: 1004. Date: 10/16/2006 Rev.: 4 Date: 1/5/2017 Page: 2 of 2

Positions (QW-405)

Position of Joint: (1 & 2) All Positions

Weld Progression: (1 & 2) Vertical up

Preheat (QW-406)

Preheat Temp. Min.: 70 °F

Interpass Temp. Max.: 400 °F

Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

Type: No PWHT will be performed

Temperature Range: None °F

Time Range: None

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: (1 & 2) 75% Argon, 25% CO2 / 32-42 CFH

Trailing: (1 & 2) None

Backing: (1 & 2) None

Electrical Characteristics (QW-409)

Current Type / Polarity: (1 & 2) DCEP (reverse)

Tungsten Electrode Type and Size: (1 & 2) N/A

Mode of Metal Transfer for GMAW(FCAW): (1 & 2) Globular arc

Max. Heat Input (J/in): (1 & 2) None

Technique (QW-410)

Thermal Processes: (1 & 2) -

String or Weave Bead: (1 & 2) Stringer and weave bead

Orifice or Gas Cup Size: (1 & 2) 3/8" to 5/8"

Initial and Interpass Cleaning: Grind or wire brush clean 1 inch (25 mm) on both sides of weld joint

Method of Back Gouging: When required, grind until all defects are removed.

Oscillation: N/A

Contact Tube to Work Distance: (1) 1/2 to 3/4"" (2) 5/8" to 7/8"

Single or Multiple Passes (per side): (1) Multipass (2) -

Single or Multiple Electrodes: N/A

Peening: (1 & 2) None

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		Class	Diameter (in.)	Type / Polarity	Amperage Range		
Any	GMAW	ER70S-6	0.035	DCEP (reverse)	100-175	23-26	Var.
Any	GMAW	ER70S-6	0.045	DCEP (reverse)	150-250	23-27	Var.
Any	GMAW	ER70S-6	1/16	DCEP (reverse)	200-300	24-28	Var
Any	FCAW	E71T-12M	0.035	DCEP (reverse)	120-200	19-24	Var.
Any	FCAW	E71T-12M	0.045	DCEP (reverse)	150-225	22-26	Var.
Any	FCAW	E71T-12M	1/16	DCEP (reverse)	175-275	25-28	Var.
Any	FCAW	E71T-12M	5/64	DCEP (reverse)	200-400	26-32	Var.
Any	FCAW	E71T-12M	3/32	DCEP (reverse)	300-500	26-34	Var.

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1004 Rev. 4 (1/5/2017) WPS No.: 1004. Date: 1/5/2017 Page: 1 of 2

Welding Process(es) / Type(s): (1) GMAW / Semiautomatic (2) FCAW / Semiautomatic

Joints (QW-402)

Weld Type: Groove weld
Single-V groove
Backing: Open butt, no back weld
Root Opening: 1/8 in. Root Face: - in.
Groove Angle: 60 °

Base Metals (QW-403)

Material Spec., Type or Grade:
SA-516, Grade 70 to SA-516, Grade 70
P-No.: 1 Group No.: 2 to P-No.: 1 Group No.: 2
Thickness of Test Coupon (in.): 1.500

Filler Metals (QW-404)

SFA Specification: (1) 5.18 (2) 5.20
AWS Classification: (1) ER70S-6 (2) E71T-12M
Filler Metal F-No: (1 & 2) 6
Weld Metal Analysis A-No: (1 & 2) (verify chemistry)
Size of Filler Metal (in.): (1 & 2) 0.035
Weld Deposit 't' (in.): (1) 0.125 (2) 1.375
Pass Greater Than ½": (1 & 2) No
Filler Metal Product Form: (1) Bare (Solid) (2) Flux cored
Supplemental Filler Metal: (1 & 2) None

Positions (QW-405)

Position of Joint: (1 & 2) 1G - Flat
Weld Progression: (1 & 2) N/A

Preheat (QW-406)

Preheat Temp.: 70 °F
Interpass Temp.: 400 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate
Shielding: (1 & 2) 75% Argon, 25% CO2 / 35 CFH
Trailing: (1 & 2) None
Backing: (1 & 2) None

Electrical Characteristics (QW-409)

Current / Polarity: (1 & 2) DCEP (reverse)
Amps: (1) 110 (2) 160
Volts: (1) 20 (2) 26
Tungsten Type / Size: (1 & 2) N/A
Transfer Mode: (1 & 2) Globular arc
Heat Input: (1 & 2) N/R

Technique (QW-410)

Travel Speed (in/min): (1) 4 (2) 5
Thermal Processes: (1 & 2) No
String/Weave Bead: (1 & 2) Stringer and weave bead
Oscillation: (1 & 2) N/A
Mult./Single Pass (per side): (1 & 2) Multipass
Mult./Single Electrode: (1 & 2) N/A
Nozzle/Gas Cup Size: (1 & 2) 3/8
Contact Tube to Work Dist.: (1 & 2) 1/2

(1)
*Rev. 1: Corrected FCAW Weld Metal Thickness.
**Rev. 2 (4/8/2008): Added Brinell Hardness.

(2) ***Rev. 3 (9/10/2015): Updated to latest Prowrite Format.
****Rev. 4 (1/5/2017): Added NACE MR0175 Vickers Hardness to PQR - Lab #W170004 Welder: Arturo Vallejo
****SEE LAB REPORT FOR ACTUAL HARDNESS READING LOCATIONS.

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1004 Rev. 4 (1/5/2017)

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in^2)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.756	1.526	1.15	85425	74300	Ductile - BM
2	0.751	1.520	1.14	83450	73200	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Passed	QW-462.2 Side bend	Passed
QW-462.2 Side bend	Passed	QW-462.2 Side bend	Passed
None		None	

Hardness Test - Brinell/Vickers Hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-516, Grade 70 BM (Brinell)	174	168	163	169	168	171			
SA-516, Grade 70 HAZ (Brinell)	174	168	171	175	182	183			
Weld metal (Brinell)	182	183	181						
SA-106, Grade B BM (Vickers)	177.2	181.7	184	179.7					
SA-106, Grade B HAZ (Vickers)	253.9	244.8	211.7	205.4	184.6	186.6	174	184.3	181.4
SA-106, Grade B HAZ (Vickers),	189.6								
Weld metal (Vickers)	187.2	192.7	181.9	167	175.6				

Jimmy Dick-102124379
Mike Littrell-102126352
Arturo Vallejo-W170004

Welder's Name: J. Dick-4379 M. Littrell-6352 A. Vallejo-004 ID: _____ Stamp: _____

Welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: Tulsa Gamma Ray Test ID.: See Above

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

Approved By: _____ 1/5/2017
Date

TULSA GAMMA RAY, INC.
INSPECTION DIVISION
1127 S. Lewis Avenue Tulsa, OK 74104-3900
Phone 918-585-3228 Fax 918-584-5598

TEST REPORT

PQR# P1-P1-1004
WPS# 1004
Lab No. 102124379
Material SA516-70
Thickness 1.500"

Date 10-16-06

Weld Process GMAW/FCAW (ER70S-6/E71T-12M)

TENSILE TEST (QW-150)

SPECIMEN NO.	WIDTH	THICKNESS	AREA	ULTIMATE TOATL LOAD (LB)	ULTIMATE UNIT STRESS (PSI)	TYPE OF FAILURE & LOCATION
1	0.756	1.526	1.15	85425	74300	Ductile-BM
2	0.751	1.520	1.14	83450	73200	Ductile-BM

GUIDED BEND TESTS (QW-160)

TYPE AND FIGURE NO.	RESULTS
1 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
2 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
3 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
4 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"

Welder Jimmy Dick

ISTI PLANT SERVICES
Client

Submitted by John Phillips

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

MECHANICAL TEST REPORT

☒Welder Qualification ☒Weld Procedure Evaluation

Organization	ISTI plant Services	LAB #	102126352
Base Metal Type	SA106B	PWHT	NONE
Coupon Thickness	6" S/120 (6.625" x .562"wall)		
WPS No.	1004	Weld Process	GMAW/FCAW
Welder's Name	Mike Littrell	ID#	N/A

BENDS

Specimen Number	Bend Type	Results/Comments	
1	Side Bend	No Relevant Indications	PASSED
1	Side Bend	No Relevant Indications	PASSED
3	N/A	N/A	
4	N/A	N/A	

TENSILE TESTS

Specimen Number	Specimen Size	Specimen Area sq. in.	Load at Failure PSI	Ultimate Tensile PSI	Break Location
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A

HARDNESS IN BHN

Material 1			Heat Affected Zone			Weld Metal		
1	2	3	1	2	3	1	2	3
174	168	163	174	168	171	182	183	181
Material 2			**Heat Affected Zone**					
1	2	3	1	2	3			
169	1268	171	175	182	183			

CHARPY V-NOTCH IMPACT TESTING

Specimen Number	Specimen Type	Specimen Size	Temp. F	Value Ft./Lbs.	Lateral Expansion	Percent Shear
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Other Tests Performed: NONE

All test performed in accordance to methods specified in ASME SA-370 & ASTM Sec. IX.

Signature John Phillips JP Date 4-8-08

American Piping Inspection, Metallurgical Lab

18501 E. Admiral Pl. Catoosa, Oklahoma 74015
Office: (918) 266-4130

Form: MR-8
Established: 10/2/16
Revision: 0
Date: 10/2/16

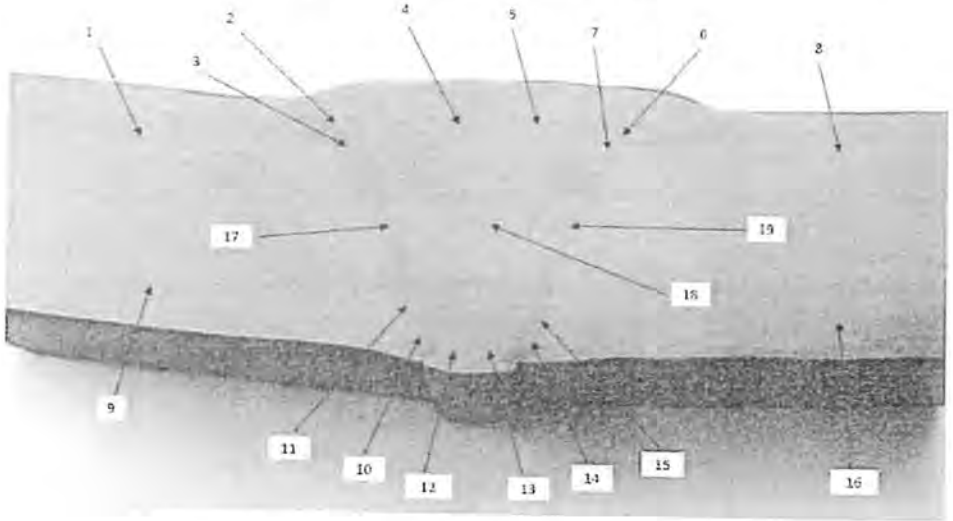
Mechanical/Lab Test Report

Organization:	ISTI Plant Services	Lab Number:	W170004 Rev. 0
Base Material:	1 SA-106 GRB to 2 SA-106 GRB	Heat Number:	N/A
Coupon Dimension:	6.625" O.D. x 0.562" Pos. IGR	Welder Name/ID:	Arturo Vallejo ID. N/A
WPS/PQR #:	1004	Process(es):	GMAW/FCAW
Filler Metal:	ER70S-6/E71T-12M	PWHT:	N/A

Vickers Hardness (HV10)

Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value
1	BM	177.2	11	HAZ	186.6	N/A		
2	HAZ	253.9	12	WM	171.9	N/A		
3	HAZ	244.8	13	WM	167	N/A		
4	WM	187.2	14	HAZ	174	N/A		
5	WM	192.7	15	HAZ	184.3	N/A		
6	HAZ	211.7	16	BM	179.7	N/A		
7	HAZ	205.4	17	HAZ	181.4	N/A		
8	BM	181.7	18	WM	175.6	N/A		
9	BM	184	19	HAZ	189.6	N/A		
10	HAZ	184.6	N/A			N/A		
	Average BM:	180.65		Average HAZ:	201.63		Average WM:	178.88

For Reference Only



Comments

Other Tests: N/A

All testing performed in accordance with the methods specified in NACE MR0175

Approved by: Josh Mattox Date: 1/5/2017 Signature:

Title: Certified Welding Inspector

*Test results relate only to the items tested. This document shall not be reproduced, except in full, without the written approval of American Piping Inspection, Inc. Metallurgical Laboratory.

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welding Procedure Specification (WPS)

WPS No.: 1005 Date: 11/20/2006 Rev.: 7 Date: 1/23/2018 Page: 1 of 2

By: Rob Hola Date Signed: 1/23/2018

Supporting PQR's: P8-P8-1005-SS ; P8-P8-1005-SS-Supplemental

Welding Process(es) / Type(s): GTAW / Manual

Joints (QW-402)

Joint Design: Groove and fillet welds

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	No backing	3/16" max	50 deg min	1/8" max	-
Single bevel	No backing	3/16" max	45 deg min	1/8" max	-
Single-V groove	Gouged & back welded	1/4" max	50 deg min	3/16" max	-
Double bevel	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Double-V groove	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Square groove	T-joint	1/32" max	-	-	-
Square groove	No backing	3/32" max	-	-	-

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.

Retainers: None

SEE ENGINEERING DRAWINGS FOR MISALIGNMENT TOLERANCES. INTERNAL MISALIGNMENT TO BE 1/4 OF WALL THICKNESS, NOT TO EXCEED 1/8" MAX.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

P-No.: 8 Group No.: 1 Thickness Range (in.): 0.1875 to 8.0000

to P-No.: 8 Group No.: 1

Rev. 1 11/8/08 Added Filler Metal to Base Metal direction.
Rev. 2 9/24/14 Added Backing Gas maintenance notation.
Rev. 3 7/12/16 Clarified no autogenous welding allowed and GTAW bead width limited to 4.5x filler metal diameter.
Rev. 4 7/28/16 Corrected typo from Rev. 3. Weld wire from ER70S-6 to ER308L
Rev. 5 10/20/17 Removed preheat rquirement and lowered interpass temperature to -350°F.
Rev. 6 12/7/17 Added PQR P8-P8-1005-SS-Supplemental to include NACR MR0175 hardness.
Rev. 7 1/23/18 Corrected SFA # to 5.9 & added filler metal to base metal claification

Filler Metals (QW-404)

Spec. No. (SFA): 5.9

AWS No. (Class): ER308L or ER316L

Filler Metal Use: Filler Metal Used

F No.: 6 A No.: 8

Weld Metal Thickness Range: 8.0000 in. maximum

Flux Type: N/A

Flux Trade Name: N/A

Consumable Insert: None

Other:

Flux: None

Product Form: Bare (Solid)

Strip Thickness or Width (in.) : N/A

ISTI Plant Services

Welding Procedure Specification (WPS)

WPS No.: 1005 Date: 11/20/2006 Rev.: 7 Date: 1/23/2018

Positions (QW-405)

Position of Joint: All Positions

Weld Progression: Vertical up

Postweld Heat Treatment (QW-407)

Type: No PWHT will be performed

Temperature Range: None °F

Time Range: None

Preheat (QW-406)

Preheat Temp. Min.: 50 °F

Interpass Temp. Max.: 350 °F

Preheat Maintenance: None

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: 100% Argon / 27-36 CFH

Trailing: None

Backing: 100% Argon / 23-30 CFH

Electrical Characteristics (QW-409)

Current Type / Polarity: DCEN (straight)

Pulsed Current: None

Tungsten Electrode Type and Size: EWTh-2 / 1/8

Mode of Metal Transfer for GMAW(FCAW): N/A

Max. Heat Input (J/in): None

Technique (QW-410)

Thermal Processes: -

String or Weave Bead: Stringer or weave bead

Orifice or Gas Cup Size: #5 to #10

Initial and Interpass Cleaning: With Stainless steel brush clean 2 inches (50 mm) on both sides of weld joint

Method of Back Gouging: When required, grind until all defects are removed.

Oscillation: N/A

Contact Tube to Work Distance: N/A

Single or Multiple Passes (per side): Multipass

Single or Multiple Electrodes: N/A

Peening: None

Backing gas must be maintained through 2nd pass or until 0.250" weld deposit achieved.
No Autogenous welding allowed
GTAW Bead Width limited to 4.5x the filler metal diameter.

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		Class	Diameter (in.)	Type / Polarity	Amperage Range		
Any	GTAW	ER308L	3/16	DCEN (straight)	200-375	n/r	Var.
Any	GTAW	ER316L	1/8"	DCEN (straight)	130-275	n/r	Var.
Any	GTAW	ER308L	3/32	DCEN (straight)	80-180	n/r	Var.
Any	GTAW	ER316L	3/16	DCEN (straight)	200-375	n/r	Var.
Any	GTAW	ER308L	1/8	DCEN (straight)	130-275	n/r	Var.
Any	GTAW	ER316L	3/32	DCEN (straight)	80-180	n/r	Var.

Notes

Filler Metal to Base Metal
Filler Metal ER308L allowable for 304 & 304L Base Metal.
Filler Metal ER316L allowable for 316 & 316L Base Metal

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Procedure Qualification Record (PQR)

PQR No.: P8-P8-1005-SS WPS No.: 1005 Date: 11/20/2006 Page: 1 of 2

Welding Process(es) / Type(s): GTAW / Manual

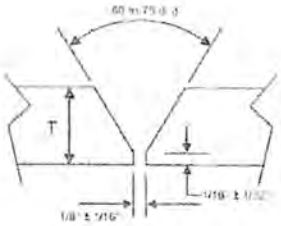
Joints (QW-402)

Weld Type: Groove weld
Single-V groove

Backing: Open butt, no back weld

Root Opening: 5/32 in. Root Face: 0 in.

Groove Angle: 37.5 °



SINGLE VEE GROOVE

Base Metals (QW-403)

Material Spec., Type or Grade:

SA-240, Type 304L to SA-240, Type 304L

P-No.: 8 Group No.: 1 to P-No.: 8 Group No.: 1

Thickness of Test Coupon (in.): 1.500

Filler Metals (QW-404)

SFA Specification: 5.9
AWS Classification: ER308L
Filler Metal Use: Filler Metal Used
Filler Metal F-No: 6
Weld Metal Analysis A-No: 8
Size of Filler Metal (in.): 1/8
Weld Deposit 't' (in.): 1.500
Filler Metal Product Form: Bare (Solid)
Consumable Insert: None
Flux: None

Positions (QW-405)

Position of Joint: 1G - Flat
Weld Progression: N/A

Preheat (QW-406)

Preheat Temp.: 50 °F
Interpass Temp.: 300 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: 100% Argon / 30 CFH
Trailing: None
Backing: 100% Argon / 25 CFH

Electrical Characteristics (QW-409)

Current / Polarity: DCEN (straight)
Amps: 180
Volts: NR
Tungsten Type / Size: EWTh-2 / 1/8
Heat Input: N/R
Pulsed Current: None

Technique (QW-410)

Travel Speed (in/min): NR
Thermal Processes: (1)No
String/Weave Bead: Stringer bead
Oscillation: N/A
Mult./Single Pass (per side): Multipass
Mult./Single Electrode: N/A
Nozzle/Gas Cup Size: 6

Additional Welding Parameters

Layer(s) and/or Pass(es)	Process	Filler Metal AWS Classification	Filler Metal Size (in.)	Current Type / Polarity	Current Amperage Range	Voltage Range	Travel Speed Range (in/min)
ALL	GTAW	ER308L	1/8	DCEN (straight)	180	NR	NR

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: P8-P8-1005-SS

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in^2)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.755	1.520	1.15	93120	81000	Ductile - BM
2	0.753	1.523	1.15	94050	81800	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Acceptable	QW-462.2 Side bend	Acceptable
QW-462.2 Side bend	Acceptable	QW-462.2 Side bend	Acceptable
None		None	

Macro-Examination Test: None

Visual Examination: Acceptable

Liquid Penetration Test: None

Updated to latest ASME fromat by American Piping Inspection-Metlab 7/12/16

Welder's Name: Jimmy Dick ID: _____ Stamp: _____

Welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: Tulsa Gamma Ray Test ID.: 102124373

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

Approved By: _____ 11/20/2006
Date

TULSA GAMMA RAY, INC.
INSPECTION DIVISION
1127 S. Lewis Avenue Tulsa, OK 74104-3900
Phone 918-585-3228 Fax 918-584-5598

TEST REPORT

PQR# P8-P8-1005-SS
WPS# 1005
Lab No. 102124373
Material SA240-304L
Thickness 1.500"

Date 11-20-06

Weld Process GTAW ER308L

TENSILE TEST (QW-150)

SPECIMEN NO.	WIDTH	THICKNESS	AREA	ULTIMATE TOATL LOAD (LB)	ULTIMATE UNIT STRESS (PSI)	TYPE OF FAILURE & LOCATION
1	0.755	1.520	1.15	93120	81000	Ductile-BM
2	0.753	1.523	1.15	94050	81800	Ductile-BM

GUIDED BEND TESTS (QW-160)

TYPE AND FIGURE NO.	RESULTS
1 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
2 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
3 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"
4 SIDE BEND	NO DEFECT GREATER THAN 1/8". "PASSED"

Welder Jimmy Dick

ISTI PLANT SERVICES
Client

Submitted by John Phillips

American Piping Inspection, Metallurgical Lab
18501 E. Admiral Pl. Catoosa, Oklahoma 74015
Office: (918) 266-4130

Form: MR-16
Established: 10/2/16
Revision: 0
Date: 10/2/16

Mechanical/Lab Test Report

Organization:	ISTI Plant Services	Lab Number:	M170193 Rev. 0
Base Material:	1 SA-312 TP304L to 2 SA-312 TP304L	Heat Number:	N/A
Coupon Dimension:	10.750" O.D. x 0.325" Pos. IGR	Welder Name/ID:	Eulid Valezquez ID. N/A
WPS/PQR #:	1005	Process(es):	GTAW
Filler Metal:	ER308L	PWHT:	N/A

Charpy V-Notch Impact Test

Specimen Number	Specimen Size (mm)	V-Notch Location	Temperature (°F)	Impact Value (ft/lbs)	Lateral Expansion (mils)	Percent Shear (%)	Average (ft/lbs)
1	10 x 7.5	WM	-325	41	0.037	30	38.67
2	10 x 7.5	WM	-325	37	0.043	40	
3	10 x 7.5	WM	-325	38	0.043	20	
4	10 x 7.5	HAZ	-325	67	0.047	40	68
5	10 x 7.5	HAZ	-325	70	0.055	40	
6	10 x 7.5	HAZ	-325	67	0.048	45	
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							

Comments

*Pipe honed to 0.325" wall thickness by customer.
*Minimum thickness shall be 0.325" when used for Low-Temp. Sevice.

Other Tests: N/A

All testing performed in accordance with the methods specified in ASME SEC IX

Approved by: Eric Darge Date: 2/7/2017 Signature:

Title: Certified Associate Welding Inspector

*Test results relate only to the items tested. This document shall not be reproduced, except in full, without the written approval of American Piping Inspection, Inc. Metallurgical Laboratory.

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Procedure Qualification Record (PQR)

PQR No.: P8-P8-1005-SS-Supplemental WPS No.: 1005 Date: 12/2/2017 Page: 1 of 2
Welding Process(es) / Type(s): GTAW / Manual

Joints (QW-402)
Weld Type: Groove weld
Single-V groove
Backing: Open butt, no back weld
Root Opening: 0.125 in. Root Face: 0 in.
Groove Angle: 75 °

Base Metals (QW-403)
Material Spec., Type or Grade:
SA-312, TP304L to SA-312, TP304L
P-No.: 8 Group No.: 1 to P-No.: 8 Group No.: 1
Thickness of Test Coupon (in.): 0.432
Diameter of Test Coupon (in.): 6.625

Filler Metals (QW-404)
SFA Specification: 5.9
AWS Classification: ER308L
Filler Metal Use: Filler Metal Used
Filler Metal F-No: 6
Weld Metal Analysis A-No: 8
Size of Filler Metal (in.): 1/8
Weld Deposit 't' (in.): 0.432
Filler Metal Product Form: Bare (Solid)
Consumable Insert: None
Flux: None

Positions (QW-405)
Position of Joint: 1GR - Rotated
Weld Progression: N/A

Preheat (QW-406)
Preheat Temp.: 50 °F
Interpass Temp.: 300 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)
Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)
Gas Composition / Flow Rate
Shielding: 100% Argon / 30 CFH
Trailing: None
Backing: 100% CO2 / 25 CFH

Electrical Characteristics (QW-409)
Current / Polarity: DCEN (straight)
Amps: 180
Volts: n/r
Tungsten Type / Size: EWTh-2 / 1/8
Heat Input: N/R
Pulsed Current: None

Technique (QW-410)
Travel Speed (in/min): n/r
Thermal Processes: (1)No
String/Weave Bead: Stringer bead
Oscillation: N/A
Mult./Single Pass (per side): Multipass
Mult./Single Electrode: N/A
Nozzle/Gas Cup Size: 6

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: P8-P8-1005-SS-Supplemental

Hardness Test - Vickers hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-312, TP304L BM#1	1-240	9-242							
SA-312, TP304L HAZ#1	2-246	3-244	10-246	11-243	17-241				
Weld metal	4-241	5-243	12-248	13-247	18-245				
SA-312, TP304L HAZ#2	6-247	7-243	14-246	15-243	19-237				
SA-312, TP304L BM#2	8-238	16-235							

Macro-Examination Test: None

Visual Examination: Acceptable

Liquid Penetration Test: None

Refer to attached mechanical report diagram for individual hardness placement.

Welder's Name: Cardenas, Francisco ID: _____ Stamp: V8

Welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: American Piping Inspection Test ID.: M172124

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

Approved By: _____ 12/2/2017
Date

American Piping Inspection, Metallurgical Lab

18501 E. Admiral Pl. Catoosa, Oklahoma 74015
Office: (918) 266-4130

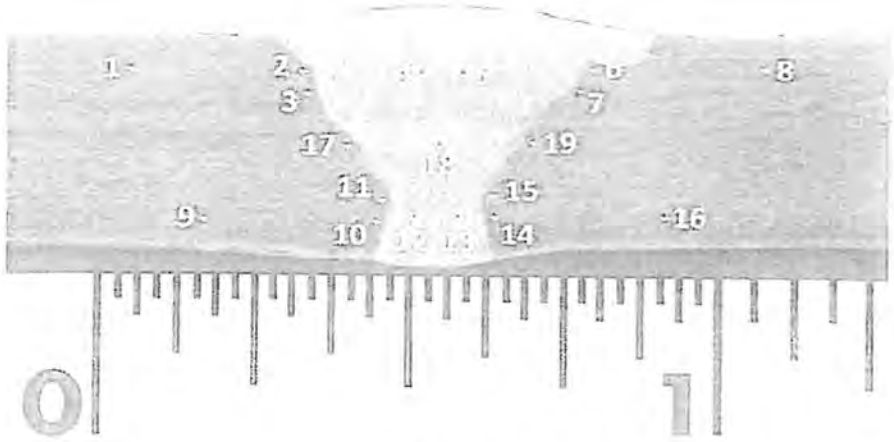
Form: MR-8
Established: 10/2/16
Revision: 0
Date: 10/2/16

Mechanical/Lab Test Report

Organization:	ISTI Plant Services	Lab Number:	M172124 Rev:
Base Material:	1 SA312-304L to 2 SA312-304L	Heat Number:	
Coupon Dimension:	6" Sch 80 (.432" WT) Pos. 1GR	Welder Name/ID:	Francisco Cardenas ID. V8
WPS/PQR #:	1005 / P8-P8-1005-SS	Process(es):	GTAW
Filler Metal:	ER308L	PWHT:	N/A

Vickers Hardness (HV10) Electrolytic 10% Oxalic Etch

Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value	Indention Number	Location	Hardness Value
1	BM	240	11	HAZ	243	N/A		
2	HAZ	246	12	WM	248	N/A		
3	HAZ	244	13	WM	247	N/A		
4	WM	241	14	HAZ	246	N/A		
5	WM	243	15	HAZ	243	N/A		
6	HAZ	247	16	BM	235	N/A		
7	HAZ	243	17	HAZ	241	N/A		
8	BM	238	18	WM	245	N/A		
9	BM	242	19	HAZ	237	N/A		
10	HAZ	246	N/A			N/A		
	Average BM:	238.75		Average HAZ:	243.6		Average WM:	244.3



Comments

Other Tests:

All testing performed in accordance with the methods specified in: NACE MR0175

Approved by: Jason Pierce Date: 12/2/2017 Signature:

Title: Laboratory Manager

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ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welding Procedure Specification (WPS)

WPS No.: 1012 Date: 5/12/2007 Rev.: 1. Date: 6/30/2016 Page: 1 of 2

By: Date Signed: 6/30/2016

Supporting PQR's: P1-P1-1012

Welding Process(es) / Type(s): (1) GTAW / Manual (2) FCAW / Semiautomatic

Joints (QW-402)

Joint Design: Groove and fillet welds

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	No backing	3/16" max	50 deg min	1/8" max	-
Single bevel	No backing	3/16" max	45 deg min	1/8" max	-
Single-V groove	Gouged & back welded	1/4" max	50 deg min	3/16" max	-
Double bevel	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Double-V groove	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Square groove	T-joint	1/32" max	-	-	-
Square groove	No backing	3/32" max	-	-	-

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.

Retainers: None

SEE ENGINEERING DRAWINGS FOR MISALIGNMENT TOLERANCES. INTERNAL MISALIGNMENT TO BE 1/4" OF WALL THICKNESS, NOT TO EXCEED 1/8" MAX.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

P-No.: 1 Group No.: 1 Thickness Range (in.): 0.432 to 0.8640

to P-No.: 1 Group No.: 1

Filler Metals (QW-404)

Spec. No. (SFA): (1) 5.18 (2) 5.20

AWS No. (Class): (1) ER70S-6 (2) E71T-12M

Filler Metal Use: (1) Filler Metal Used

F No.: (1 & 2) 6 A No.: (1) (verify chemistry) (2) 1

Weld Metal Thickness Range: (1) 0.3750 in. maximum (2) 0.4890 in. maximum No Pass Greater Than ½" Allowed

Flux Type: N/A

Flux Trade Name: N/A

Consumable Insert: (1) None

Other:

Flux: (1) None

Product Form: (1) Bare (Solid) (2) Flux cored

Trade Name: (2) Kobelco Frontiarc-711

Supplemental Filler Metal: (2) None

Strip Thickness or Width (in.): N/A

ISTI Plant Services

Welding Procedure Specification (WPS)

WPS No.: 1012 Date: 5/12/2007 Rev.: 1. Date: 6/30/2016

Positions (QW-405)

Position of Joint: (1 & 2) All Positions

Weld Progression: (1 & 2) Vertical up

Preheat (QW-406)

Preheat Temp. Min.: 70 °F

Interpass Temp. Max.: 550 °F

Preheat Maintenance: None

When Base Metal is < 50°F, preheat to 150°F minimum
200°F for Base Metal 1-1/4" to 1-1/2"

Postweld Heat Treatment (QW-407)

Type: No PWHT will be performed

Temperature Range: None °F

Time Range: None

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: (1) 100% Argon / 23-30 CFH
(2) 75% Argon, 25% CO2 / 32-42 CFH

Trailing: (1 & 2) None

Backing: (1 & 2) None

Electrical Characteristics (QW-409)

Current Type / Polarity: (1 & 2) DCEP (reverse)

Pulsed Current: (1) None

Tungsten Electrode Type and Size: (1) EWTh-2 / 3/32 (2) N/A

Mode of Metal Transfer for GMAW(FCAW): (1) N/A (2) Globular arc

Max. Heat Input (J/in): (1) 48280 (2) 30360

Technique (QW-410)

Thermal Processes: (1 & 2) -

String or Weave Bead: (1 & 2) Stringer and weave bead

Orifice or Gas Cup Size: (1) #5 to #10 (2) 3/8" to 5/8"

Initial and Interpass Cleaning: With wire brush clean 1 inch (25 mm) on both sides of weld joint

Method of Back Gouging: When required, grind until all defects are removed.

Oscillation: N/A

Contact Tube to Work Distance: (2) N/A

Single or Multiple Passes (per side): (1) Multipass (2) Multipass

Single or Multiple Electrodes: N/A

Peening: (1 & 2) None

(1) GTAW Chemistry verified by manufacturer's typical Material Test Report (MTR).
GTAW Bead Width limited to 4.5x rod diameter.
No Autogenous Welding allowed

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		Class	Diameter (in.)	Type / Polarity	Amperage Range		
Any	GTAW	ER70S-6	1/8	DCEP (reverse)	100-142	14-17	3-6
Any	FCAW	E71T-12M	0.045	DCEP (reverse)	90-110	20-23	5-7

Notes

*Rev. 1 6/30/16: Corrected A-No. Designation, Clarified FCAW Type, and adjusted GTAW/FCAW parameters, added "No single weld pass greater than 1/2"" note, added "No Autogenous Welding allowed" note, added GTAW bead width note, added B31.3 misalignment tolerance note and Preheat note, added GTAW Chemistry verified note, added "Kobelco Frontiarc-71I" to filler metals

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1012 WPS No.: 1012 Date: 5/22/2007 Page: 1 of 2

Welding Process(es) / Type(s): (1) GTAW / Manual (2) FCAW / Semiautomatic

Joints (QW-402)
Weld Type: Groove weld
Single-V groove
Backing: Open butt, no back weld
Root Opening: 5/32 in. Root Face: 0 in.
Groove Angle: 60 °

Base Metals (QW-403)
Material Spec., Type or Grade:
SA-333, Grade 6 to SA-333, Grade 6
P-No.: 1 Group No.: 1 to P-No.: 1 Group No.: 1
Thickness of Test Coupon (in.): 0.432
Diameter of Test Coupon (in.): 6.625

Filler Metals (QW-404)
SFA Specification: (1) 5.18 (2) 5.20
AWS Classification: (1) ER70S-6 (2) E71T-12M
Filler Metal Use: (1) Filler Metal Used
Filler Metal F-No: (1 & 2) 6
Weld Metal Analysis A-No: (1) (verify chemistry) (2) 1
Size of Filler Metal (in.): (1) 1/8 (2) 0.045
Weld Deposit 't' (in.): (1) 0.1875 (2) 0.2445
Pass Greater Than ½": (2) No
Filler Metal Product Form: (1) Bare (Solid) (2) Flux cored
Supplemental Filler Metal: (2) None
Consumable Insert: (1) None
Flux: (1) None

Positions (QW-405)
Position of Joint: (1 & 2) 6G - 45 degree pipe
Weld Progression: (1 & 2) Vertical up

Preheat (QW-406)
Preheat Temp.: 70 °F
Interpass Temp.: 550 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)
Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)
Gas Composition / Flow Rate
Shielding: (1) 100% Argon / 25 CFH
(2) 75% Argon, 25% CO2 / 35 CFH
Trailing: (1 & 2) None
Backing: (1 & 2) None

Electrical Characteristics (QW-409)
Current / Polarity: (1 & 2) DCEP (reverse)
Amps: (1) 142 (2) 110
Volts: (1) 17 (2) 23
Tungsten Type / Size: (1) EWTh-2 / 3/32 (2) N/A
Transfer Mode: (2) Globular arc
Wire Feed Speed: (2) N/A
Heat Input: (1) 48280 J/in (2) 30360 J/in
Pulsed Current: (1) None

Technique (QW-410)
Travel Speed (in/min): (1) 3 (2) 5
Thermal Processes: (1 & 2) No
String/Weave Bead: (1 & 2) Stringer and weave bead
Oscillation: (1 & 2) N/A
Mult./Single Pass (per side): (1 & 2) Multipass
Mult./Single Electrode: (1 & 2) N/A
Nozzle/Gas Cup Size: (1) 6 (2) N/A
Contact Tube to Work Dist.: (2) N/A

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1012

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in^2)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.506	0.419	0.2120	13570	64006	Ductile - BM
2	0.517	0.426	0.2202	14380	65292	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
None		None	

Toughness Test (QW-170)

Specimen Number	Notch Location	Notch Type	Test Temp. (°F)	Impact Value (ft-lb)	Lateral Expansion		Drop Weight Break
					Shear %	Mils	
1	Base metal	"V"	-40	21	10	18	Yes
2	Base metal	"V"	-40	16	10	15	Yes
3	Base metal	"V"	-40	18	10	17	Yes
4	Weld metal	"V"	-40	34	20	36	Yes
5	Weld metal	"V"	-40	20	10	21	Yes
6	Weld metal	"V"	-40	17	10	20	Yes
7	HAZ	"V"	-40	129	40	76	Yes
8	HAZ	"V"	-40	124	40	87	Yes
9	HAZ	"V"	-40	138	40	79	Yes
1.	Weld metal	"V"	-50	18	30	8	No
2.	Weld metal	"V"	-50	24	20	10	No
3.	Weld metal	"V"	-50	25	30	20	No
4.	HAZ	"V"	-50	45	35	30	No
5.	HAZ	"V"	-50	10	10	8	No
6.	HAZ	"V"	-50	80	30	54	No

(2/7/2017): Added -50F CVN Impacts to PQR – Lab #M170192 Welder: Eduardo Rubalcaba

Welder's Name: Raul Meza ID: _____ Stamp: _____

Welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: Tulsa Gamma Ray, Inc. Test ID.: 102125172

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

Approved By: Rod Wold 5/22/2017

Date

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

MECHANICAL TEST REPORT

☐ Welder Qualification ☒ Weld Procedure Evaluation

Organization	ISTI plant Services	**LAB #**	102125172
Base Metal Type	SA333 gr. 6	**PWHT**	NONE
Coupon Thickness	6" S/80 (6.625" x .432"wall)		
WPS No.	1012	**Weld Process**	GTAW/FCAW
Welder's Name	Raul Meza	**ID#**	

BENDS

Specimen Number	Bend Type	Results/Comments	
1	Root Bend	No Relevant Indications	PASSED
1	Face Bend	No Relevant Indications	PASSED
3	Root Bend	No Relevant Indications	PASSED
4	Face Bend	No Relevant Indications	PASSED

TENSILE TESTS

Specimen Number	Specimen Size	Specimen Area sq. in.	Load at Failure PSI	Ultimate Tensile PSI	Failure Type & Break Location
1	0.506" x 0.419"	0.2120	13570	64006	Ductile – Base Metal
2	0.517" x 0.426"	0.2202	14380	65292	Ductile – Base Metal
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A

HARDNESS IN BHN

Material 1			Heat Affected Zone			Weld Metal		
1	2	3	1	2	3	1	2	3
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

CHARPY V-NOTCH IMPACT TESTING

Specimen Number	Notch Type	Notch Location	Specimen Size	Temp. °F	Value Ft./Lbs.	Lateral Expansion Shear %	Lateral Expansion Mils	Drop Weight Break
1	"V"	BM	10mm x 10mm	-40	21	10	18	Yes
2	"V"	BM	10mm x 10mm	-40	16	10	15	Yes
3	"V"	BM	10mm x 10mm	-40	18	10	17	Yes
4	"V"	WM	10mm x 10mm	-40	34	20	36	Yes
5	"V"	WM	10mm x 10mm	-40	20	10	21	Yes
6	"V"	WM	10mm x 10mm	-40	17	10	20	Yes
7	"V"	HAZ	10mm x 10mm	-40	129	40	76	Yes
8	"V"	HAZ	10mm x 10mm	-40	124	40	87	Yes
9	"V"	HAZ	10mm x 10mm	-40	138	40	79	Yes

Other Tests Performed: NONE

All tests performed in accordance to methods specified in ASME SA-370 & ASTM Sec. IX.

Signature John Phillips

Date 5-22-07

American Piping Inspection, Metallurgical Lab
18501 E. Admiral Pl. Catoosa, Oklahoma 74015
Office: (918) 266-4130

Form: MR-16
Established: 10/2/16
Revision: 0
Date: 10/2/16

Mechanical/Lab Test Report

Organization:	ISTI Plant Services	Lab Number:	M170192 Rev. 0
Base Material:	1 SA-333 GR6 to 2 SA-333 GR6	Heat Number:	951029
Coupon Dimension:	6.625" O.D. x 0.432" Pos. IGR	Welder Name/ID:	Eduardo Rubalcaba ID. N/A
WPS/PQR #:	1012	Process(es):	GTAW/FCAW
Filler Metal:	ER70S-6/E71T-12MJ	PWHT:	N/A

Charpy V-Notch Impact Test

Specimen Number	Specimen Size (mm)	V-Notch Location	Temperature (°F)	Impact Value (ft/lbs)	Lateral Expansion (mils)	Percent Shear (%)	Average (ft/lbs)
1	10 x 10	WM	-50	18	0.008	30	22.33
2	10 x 10	WM	-50	24	0.010	20	
3	10 x 10	WM	-50	25	0.020	30	
4	10 x 10	HAZ	-50	45	0.030	35	45
5	10 x 10	HAZ	-50	10	0.008	10	
6	10 x 10	HAZ	-50	80	0.054	30	
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							
N/A							

Comments

Only one side of the HAZ tested since both base metals were the same Heat Number.

Other Tests: N/A

All testing performed in accordance with the methods specified in ASME SEC IX

Approved by: Eric Darge Date: 2/7/2017 Signature: 2/7/2017

Title: Certified Associate Welding Inspector

*Test results relate only to the items tested. This document shall not be reproduced, except in full, without the written approval of American Piping Inspection, Inc. Metallurgical Laboratory.

ISTI Plant Services

Tulsa, Ok.

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATIONS (WPS)

(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: ISTI Plant Services — Approved by / Date: 11-17-2014

WPS No: 1025 — Date: 11-17-2014 — Supporting PQR No. (s): P1-P1-1025a, P1-P1-1025b

Revision No. 0 — Date of Rev. ----

Welding Process(es): GTAW — Type: Manual (Automatic, Manual, Machine, or Semi-Auto)

JOINTS (QW-402)

Joint Design: All Allowable ASME Joint Configurations

Root Spacing:

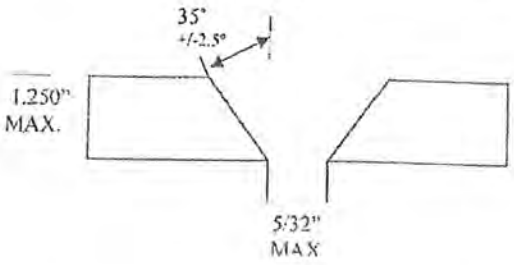
Backing: WITH OR WITHOUT

Backing Material (Type): PER CUSTOMER REQUIREMENT (Refer to both backing and retainers)

☐ Metal ☐ Nonfusing Metal

☐ Nonmetallic ☐ Other

Details



Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.
(At the option of the Mfgr. / sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g., for notch toughness procedures, for multiple process procedures, etc.)

V,J or U bevel grooves, fillets or other joints detailed on engineering drawings, production routing or repair procedures.

*BASE METALS (QW-403)

P-No. 1 — Group No. 1 or 2 — to P-No. 1 — Group No. 1 or 2

OR

Specification type and grade

to Specification type and grade

OR

Chem. Analysis and Mech. Prop

To Chem. Analysis and Mech. Prop

Thickness Range:

Base Metal: Groove 0.125" to 1.250" — Fillet UNLIMITED

Pipe Dia.: Range Groove UNLIMITED — Fillet UNLIMITED

Maximum Pass Thickness ≤ 1/2 in. (13mm) ☒ Yes ☐ No

Other: This procedure is qualified for low temperature service to -50°F

*FILLER METALS (QW-404)	1	2
Spec. No. (SFA)	5.18	
AWS No. (Class)	ER70S-6 Verify Chemistry	
F-No.	6	
A-No.	1 Verification confirmed by OEM Documentation	
Size of Filler Metals	3/32", 1/8"	
Filler Metal Product Form	Solid	
Supplemental Filler Metal	None	
Weld Metal		
Deposited Thickness:		
Groove	0.125" to 1.250"	
Fillet	Unlimited	
Electrode-Flux (Class)	N.A.	
Flux Type	No flux added to face of weld	
Flux Trade Name	N.A.	
Consumable Insert	None	
Other		

*Each base metal-filler metal combination should be recorded individually

ISTI Plant Services
Tulsa, Ok.

WPS No. 1025 Rev. 0

POSITIONS (QW-405)

Position of Groove	ALL
Welding Progression:	☒ Up ☐ Down
Position(s) of Fillet	ALL
Other	

POSTWELD HEAT TREATMENT (QW-407)

Temp Range	No PWHT Performed
Time Range	
Other	B31.3 Requires thickness greater than 3/4" to be PWHT

PREHEAT (QW-406)

Preheat Temp. Min.	75°F Min. / 200°F for thickness of 1 ¼" to 1 ½"
Interpass Temp. Max.	450°F
Preheat Maintenance	None
Other	N.A.

(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	% Mixture	Flow Rate
Shielding	Argon	100	20-35 CFH
Trailing	N.A.	N.A.	N.A.
Backing	N.A.	N.A.	N.A.
Other	N.A.	N.A.	N.A.

Percent Composition

ELECTRICAL CHARACTERISTICS (QW-409)

Weld Layers	Process	Classification	Diameter	Current Type & Polarity	Amps (Range)	Wire Feed Speed (Range)	Energy or Power (Range)	Volts (Range)	Travel Speed (Range)	Other, Remarks, Addition
Any	GTAW	ER70S-6	3/32"	DCEN	130-160	N.A.	N.A.	15-19	5-8 ipm	
Any	GTAW	ER70S-6	1/8"	DCEN	140-170	N.A.	N.A.	16-20	6-9 ipm	

Amps and volts, or power or energy range should be recorded for each electrode size, position and thickness, etc.

Pulsing Current: No Pulsing Current Used

Heat Input (max.): 24000 J/in Max with 3/32" 23314 J/in Max with 1/8"

Amperage/voltage may be decreased or travel speed increased to maintain maximum heat input (Heat Input is a Nonessential Variable unless used for low temperature service.))

Tungsten Electrode Type and Size: EWTH-2 3/32", 1/8"
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW (FCAW): N.A.
(Spray arc, short circuiting arc, etc.)

Other:

TECHNIQUE (QW-410)

String or Weave Bead	Stringer or Weave
Orifice, Nozzle or Gas Cup Size	#5 to #10
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	Grinding or wire brush as required
Method of Back Gouging	When required, grind until all defects are removed.
Oscillation	N.A.
Contact Tube to Work Distance	N.A.
Multiple or Single (per side)	Multiple
Multiple or Single Electrodes	Single
Electrode Spacing	N.A.
Peening	None Allowed
Misalignment	Misalignment shall not be greater than 1/4T

ISTI Plant Services
Tulsa,
Oklahoma

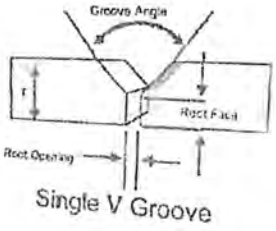
Procedure Qualification Record (PQR)

PQR No.: PI-PI-1025a WPS No.: 1025 Date: 11/17/2014 Page: 1 of 2

Welding Process(es) / Type(s): GTAW / Manual

Joints (QW-402)

Weld Type: Groove weld
Single-V groove
Backing: Open butt, no back weld
Root Opening: 0.125 in. Root Face: 0.0 in.
Groove Angle: 75 °



Single V Groove

Base Metals (QW-403)

Material Spec., Type or Grade:
SA-516-60/65/70 to SA-516-60/65/70
P-No.: 1 Group No.: 1 to P-No.: 1 Group No.: 2
Thickness of Test Coupon (in.): 0.250
Test Coupon certified to SA-516-60/65/70

Filler Metals (QW-404)

SFA Specification: 5.18
AWS Classification: ER70S-6
Filler Metal F-No: 6
Weld Metal Analysis A-No: (verify chemistry)
Size of Filler Metal (in.): 3/32
Weld Deposit 't' (in.): 0.250
Filler Metal Product Form: Bare (Solid)
Consumable Insert: None
Flux: None Added

Positions (QW-405)

Position of Joint: 3G - Vertical
Weld Progression: Vertical up

Preheat (QW-406)

Preheat Temp.: 75 °F
Interpass Temp.: 450 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate
Shielding: 100% Argon / 25 CFH
Trailing: None
Backing: None

Electrical Characteristics (QW-409)

Current / Polarity: DCEN (straight)
Amps: 150
Volts: 17
Tungsten Type / Size: EWTh-2 / 3/32"
Heat Input: 24000 J/in
Pulsed Current: No Pulsed Current

Technique (QW-410)

Travel Speed (in/min): 6
Thermal Processes: No
String/Weave Bead: Stringer bead
Oscillation: N/A
Mult./Single Pass (per side): Multipass
Mult./Single Electrode: N/A
Nozzle/Gas Cup Size: 5

(1) Single Electrode

Additional Welding Parameters

Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		AWS Classification	Size (in.)	Type / Polarity	Amperage Range		
All	GTAW	ER70S-6	3/32	DCEN (straight)	150	16	6

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: P1-P1-1025a

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in^2)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.750	0.202	0.152	12263	80700	Ductile - BM
2	0.750	0.208	0.156	12705	81400	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Acceptable	QW-462.3(a) Root bend	Acceptable
QW-462.3(a) Face bend	Acceptable	QW-462.3(a) Root bend	Acceptable
None		None	

Toughness Test (QW-170)

Specimen Number	Notch Location	Notch Type	Test Temp. (°F)	Impact Value (ft-lb)	Lateral Expansion		Drop Weight Break
					Shear %	Mils	
1	Weld metal	"V"	-67	14	25	23	No
2	Weld metal	"V"	-67	15	30	23	No
3	Weld metal	"V"	-67	17	30	25	No
4	HAZ	"V"	-67	20	30	34	No
5	HAZ	"V"	-67	20	30	36	No
6	HAZ	"V"	-67	19	30	39	No

Hardness Test - Vickers hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-516-60/65/70 BM-1 Root	17-170	18-171	19-171	20-173					
SA-516-60/65/70 BM-1 Top	1-170	2-183	3-188	4-1197					
SA-516-60/65/70 BM-2 Root	29-166	30-165	31-161	32-163					
SA-516-60/65/70 BM-2 Top	12-170	14-158	15-162	16-161					
SA-516-60/65/70 HAZ-1 Root	21-172	22-165							
SA-516-60/65/70 HAZ-1 Top	5-197	6-192							
SA-516-60/65/70 HAZ-2 Root	27-175	28-170							
SA-516-60/65/70 HAZ-2 Top	11-188	12-173							
Weld metal	7-189	8-191	9-193	10-191	23-152	24-151	25-158	26-160	

Macro-Examination Test: None

Visual Examination: Acceptable

Liquid Penetration Test: None

Vickers hardness in accordnace with NACE SP0472-2010 Figure 2 and 3

Charpy V Notch Specimen Size: 10mm x 5.0mm

Welder's Name: Eulid Valezquez ID: _____ Stamp: _____

PQR was done and welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: Tulsa Gamma Ray, Inc. Test ID.: 102135828

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

Prepared By: John Phillips 11/7/14 Procedure Specialist

Date

Accepted By: _____ 11/7/14 QC Manager

Date

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

LAB / MECHANICAL TEST REPORT

☐ Welder Qualification ☒ Weld Procedure Evaluation

Organization	ISTI Plant Services	LAB #	102135828
Base Metal Type	SA516-60/65/70	PWHT	None
Coupon Thickness	0.250"	PQR#	P1-P1-1025a
WPS No.	1025	Filler	ER70S-6
Weld Process	GTAW	ID#	
Welder's Name	Eulid Valezquez	Position	3G-Up

BENDS

Specimen Number	Type of Bend	Results/Comments
1	FACE BEND #1	PASSED No Relevant Indications Greater Than 1/8"
2	FACE BEND #2	PASSED No Relevant Indications Greater Than 1/8"
3	ROOT BEND #1	PASSED No Relevant Indications Greater Than 1/8"
4	ROOT BEND #2	PASSED No Relevant Indications Greater Than 1/8"

TENSILE TESTS

Specimen Number	Specimen Size	Specimen Area sq. in.	Load at Failure (lbs.)	Ultimate Tensile (psi)	Type of Failure & Location
1	0.750" X 0.202"	0.152	12263	80700	Ductile-BM
2	0.750" X 0.208"	0.156	12705	81400	Ductile-BM

HARDNESS IN BHN

Base Material #1			Heat Affected Zone #1			Weld Metal		
1	2	3	1	2	3	1	2	3
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Heat Affected Zone #2			**Base Material #2**					
1	2	3	1	2	3			
N/A	N/A	N/A	N/A	N/A	N/A			

CHARPY V-NOTCH IMPACT TESTING

Specimen Number	Specimen Type/Location	Specimen Size	Temp.	Value Ft./Lbs.	Lateral Expansion	Percent Shear	Drop Weight/ Break
1	V/Weld Metal	10mm x 5.0mm	-67°F	14	25	23	No
2	V/Weld Metal	10mm x 5.0mm	-67°F	17	30	23	No
3	V/Weld Metal	10mm x 5.0mm	-67°F	15	30	25	No
4	V/HAZ	10mm x 5.0mm	-67°F	20	30	34	No
5	V/HAZ	10mm x 5.0mm	-67°F	20	30	36	No
6	V/HAZ	10mm x 5.0mm	-67°F	19	30	39	No

Other Tests Performed: NONE

All tests performed in accordance to methods specified in ASME B31.3 & SEC IX.

Signature: John Phillips — Date: 11-17-2014

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

LAB / MECHANICAL TEST REPORT

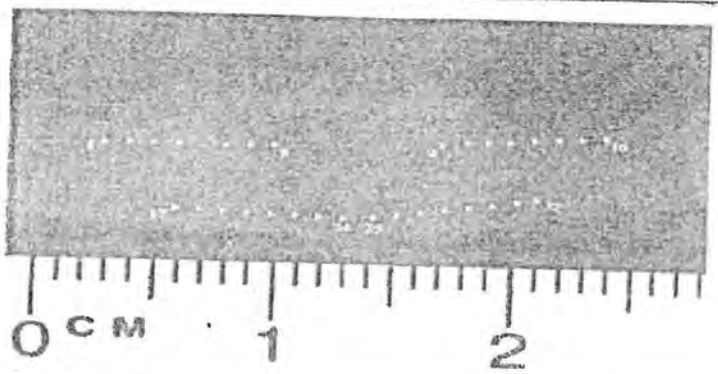
☐ Welder Qualification ☒ Weld Procedure Evaluation

Organization	ISTI Plant Services	LAB #	102135828
Base Metal Type	SA516-60/65/70	PWHT	None
Coupon Thickness	0.250"	PQR#	P1-P1-1025a
WPS No.	1025	Filler	ER70S-6
Weld Process	GTAW	ID#	
Welder's Name	Eulid Valezquez	Position	3G-Up

Microhardness Survey ASTM E384-11
NACE SP0472-2010, Figure 2 and 3

Reading Number	HIV Value	Reading Number	HIV Value
1	170	17	170
2	183	18	171
3	188	19	171
4	197	20	173
5	197	21	172
6	192	22	165
7	189	23	152
8	191	24	151
9	193	25	158
10	191	26	160
11	188	27	175
12	173	28	170
13	170	29	166
14	158	30	165
15	162	31	161
16	161	32	163

Vickers Hardness Survey 2% Nital



Other Tests Performed:	NONE

All tests performed in accordance to methods specified in ASME B31.3 & SEC IX.

Signature	John Phillips	Date	11-17-2014

ISTI Plant Services
Tulsa
Oklahoma

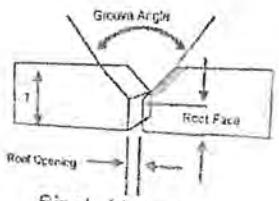
Procedure Qualification Record (PQR)

PQR No.: P1-P1-1025b WPS No.: 1025 Date: 11/17/2014 Page: 1 of 2

Welding Process(es) / Type(s): GTAW / Manual

Joints (QW-402)

Weld Type: Groove weld
Single-V groove
Backing: Open butt, no back weld
Root Opening: 0.125 in. Root Face: 0 in.
Groove Angle: 75 °



Single V Groove

Base Metals (QW-403)

Material Spec., Type or Grade:
SA-516-60/65/70 to SA-516-60/65/70
P-No.: 1 Group No.: 1 to P-No.: 1 Group No.: 2
Thickness of Test Coupon (in.): 0.625
Test Coupon certified to SA516-60/65/70

Filler Metals (QW-404)

SFA Specification: 5.18
AWS Classification: ER70S-6
Filler Metal F-No: 6
Weld Metal Analysis A-No: (verify chemistry)
Size of Filler Metal (in.): 1/8
Weld Deposit 't' (in.): 0.625
Filler Metal Product Form: Bare (Solid)
Consumable Insert: No Consumable Insert or Retainers used
Flux: No flux added

Positions (QW-405)

Position of Joint: 3G - Vertical
Weld Progression: Vertical up

Preheat (QW-406)

Preheat Temp.: 75 °F
Interpass Temp.: 450 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate
Shielding: 100% Argon / 25 CFH
Trailing: None
Backing: None

Electrical Characteristics (QW-409)

Current / Polarity: DCEN (straight)
Amps: 160
Volts: 17
Tungsten Type / Size: EWTh-2 / 1/8
Heat Input: 23314 J/in
Pulsed Current: No Pulsed Current used

Technique (QW-410)

Travel Speed (in/min): 7
Thermal Processes: No
String/Weave Bead: Stringer bead
Oscillation: N/A
Mult./Single Pass (per side): Multipass
Mult./Single Electrode: N/A
Nozzle/Gas Cup Size: #5

(1) Single Electrode

Additional Welding Parameters

Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		AWS Classification	Size (in.)	Type / Polarity	Amperage Range		
Any	GTAW	ER70S-6	1/8	DCEN (straight)	160	17	7

ISTI Plant Services

Procedure Qualification Record (PQR)

PQR No.: PI-PI-1025b

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in^2)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.750	0.504	0.378	29906	79100	Ductile - BM
2	0.750	0.554	0.416	32876	79000	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Acceptable	QW-462.2 Side bend	Acceptable
QW-462.2 Side bend	Acceptable	QW-462.2 Side bend	Acceptable
None		None	

Toughness Test (QW-170)

Specimen Number	Notch Location	Notch Type	Test Temp. (°F)	Impact Value (ft-lb)	Lateral Expansion		Drop Weight Break
					Shear %	Mils	
1	Weld metal	"V"	-50	123	55	71	No
2	Weld metal	"V"	-50	125	60	71	No
3	Weld metal	"V"	-50	95	30	59	No
4	HAZ	"V"	-50	37	30	22	No
5	HAZ	"V"	-50	35	30	20	No
6	HAZ	"V"	-50	30	25	21	No

Hardness Test - Vickers hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-516-60/65/70 BM-1 Root	17-168	18-170	19-174	20-177					
SA-516-60/65/70 BM-1 Top	1-150	2-161	3-176	4-205					
SA-516-60/65/70 BM-2 Root	29-175	30-177	31-174	32-172					
SA-516-60/65/70 BM-2 Top	13-208	14-190	15-162	16-159					
SA-516-60/65/70 HAZ-1 Root	21-185	22-188							
SA-516-60/65/70 HAZ-1 Top	5-229	6-233							
SA-516-60/65/70 HAZ-2 Root	27-189	28-187							
SA-516-60/65/70 HAZ-2 Top	11-242	12-236							
Weld Metal	7-233	8-223	9-245	10-240	23-182	24-194	25-191	26-185	

Macro-Examination Test: None

Visual Examination: Acceptable

Liquid Penetration Test: None

Vickers hardness in accordance with NACE SP0472-2010 Figure 2 and 3.

Charpy V Notch Specimen Size: 10mm x 10mm.

Welder's Name: Eulid Valezquez ID: _____ Stamp: _____

PQR was done and welding of coupon was witnessed by: ISTI Plant Services

Tests Conducted By: Tulsa Gamma Ray, Inc. Test ID.: 102135826

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

Prepared By: John Phillips 11/17/14 Date Procedure Specialist

Accepted By: Rodfold 11/17/14 Date QC Manager

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

LAB / MECHANICAL TEST REPORT

☐ Welder Qualification ☒ Weld Procedure Evaluation

Organization	ISTI Plant Services	LAB #	102135826
Base Metal Type	SA516-60/65/70	PWHT	None
Coupon Thickness	0.625"	PQR#	P1-P1-1025b
WPS No.	1025	Filler	ER70S-6
Weld Process	GTAW	ID#	
Welder's Name	Eulid Valezquez	Position	3G-Up

BENDS

Specimen Number	Type of Bend	Results/Comments
1	SIDE BEND #1	PASSED No Relevant Indications Greater Than 1/8"
2	SIDE BEND #2	PASSED No Relevant Indications Greater Than 1/8"
3	SIDE BEND #3	PASSED No Relevant Indications Greater Than 1/8"
4	SIDE BEND #4	PASSED No Relevant Indications Greater Than 1/8"

TENSILE TESTS

Specimen Number	Specimen Size	Specimen Area sq. in.	Load at Failure (lbs.)	Ultimate Tensile (psi)	Type of Failure & Location
1	0.750" X 0.504"	0.378	29906	79100	Ductile-BM
2	0.750" X 0.554"	0.416	32876	79000	Ductile-BM

HARDNESS IN BHN

Base Material #1			Heat Affected Zone #1			Weld Metal		
1	2	3	1	2	3	1	2	3
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Heat Affected Zone #2			**Base Material #2**					
1	2	3	1	2	3			
N/A	N/A	N/A	N/A	N/A	N/A			

CHARPY V-NOTCH IMPACT TESTING

Specimen Number	Specimen Type/Location	Specimen Size	Temp.	Value Ft./Lbs.	Lateral Expansion	Percent Shear	Drop Weight/ Break
1	V/Weld Metal	10mm x 10mm	-50°F	123	71	55	No
2	V/Weld Metal	10mm x 10mm	-50°F	125	71	60	No
3	V/Weld Metal	10mm x 10mm	-50°F	95	59	30	No
4	V/HAZ	10mm x 10mm	-50°F	37	22	30	No
5	V/HAZ	10mm x 10mm	-50°F	35	20	30	No
6	V/HAZ	10mm x 10mm	-50°F	30	21	25	No

Other Tests Performed: NONE

All tests performed in accordance to methods specified in ASME B31.3 & SEC IX.

Signature: John Phillips — Date: 11-17-2014

TULSA GAMMA RAY, INC.

1127 S Lewis Ave Tulsa, OK 74104
918.585.3228

LAB / MECHANICAL TEST REPORT

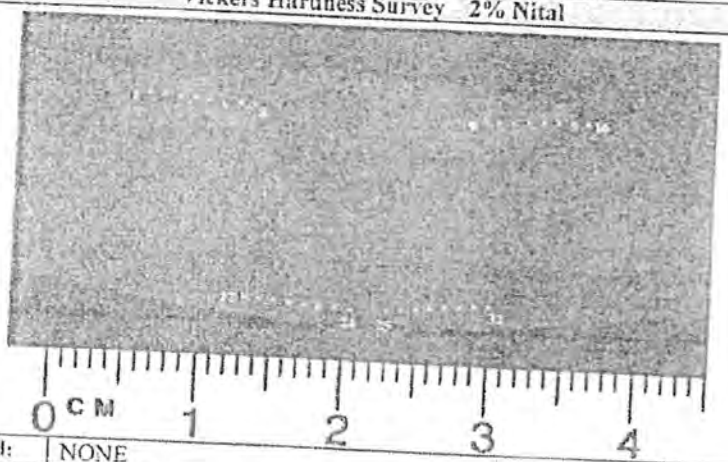
☐ Welder Qualification ☒ Weld Procedure Evaluation

Organization	ISTI Plant Services	LAB #	102135826
Base Metal Type	SA516-60/65/70	PWHT	None
Coupon Thickness	0.625"	PQR#	P1-P1-1025b
WPS No.	1025	Filler	ER70S-6
Weld Process	GTAW	ID#	
Welder's Name	Eulid Valezquez	Position	3G-Up

Microhardness Survey ASTM E384-11
NACE SP0472-2010, Figure 2 and 3

Reading Number	HIV Value	Reading Number	HIV Value
1	150	17	168
2	161	18	170
3	176	19	174
4	205	20	177
5	229	21	185
6	233	22	188
7	233	23	182
8	223	24	194
9	245	25	191
10	240	26	185
11	242	27	189
12	236	28	187
13	208	29	175
14	190	30	177
15	162	31	174
16	159	32	172

Vickers Hardness Survey 2% Nital



Other Tests Performed: NONE

All tests performed in accordance to methods specified in ASME B31.3 & SEC IX.

Signature: John Phillips — Date: 11-17-2014

J-447

SK1 Assy
Spools

ISTI
Welder Qualifications

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: Rendals, Justin Stamp: HZ
Test WPS No.: 1001 Rev.: 3 WPQ No.: _____ Date: 2/24/2017
Welding process(es) / type(s) used: GTAW / Manual
Type of joint welded: Pipe Groove weld Joint type(s) qualified: Groove and Fillet Welds
Base metal(s) welded: SA-106, Grade B to SA-106, Grade B

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-15F,P-34 & P-4X
Base metal thickness (in.)	0.218	WPS Limits
Pipe diameter (in.)	2.375	1.00" minimum
	GTAW / Manual	**GTAW / Manual**
Backing **	No backing used	With or without backing
AWS classification	ER70S-6	
Filler metal specification (SFA)	5.18	5.xx
Filler metal F-No.	6	F-No. 6
Filler metal product form	Bare (Solid)	Bare / metal cored
Consumable insert	No insert used	Without insert only
Deposit thickness (in.) [>= 3 layers]	0.218 [N/A]	0.4360" maximum
Welding position	6G - 45 degree pipe	All Positions
Weld progression	Vertical up	Vertical up (n4)
Backing gas	No backing gas used	With or Without backing gas
GTAW welding current / polarity	DCEN (straight)	DCEN (straight)

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n4) The root pass, when removed to sound weld metal in preparation for welding the second side, and the cover or wash pass may be up or down.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194
Volumetric test results: None
Welding test conducted by: ISTI Plant Services
Mechanical/Radiographic tests conducted by: American Piping Inspection Lab test no.: W170118

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

Approved By: Rod Holden Organization: ISTI Plant Services
2/24/2017
Date

ISTI Plant Services
17207 East 21st Street
Tulsa OK 74134

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: **Rendals, Justin** Stamp: HZ
Test WPS No.: 1004 Rev.: 3 WPQ No.: _____ Date: 2/24/2017
Welding process(es) / type(s) used: GMAW / Semiautomatic and FCAW / Semiautomatic
Type of joint welded: Pipe Groove weld Joint type(s) qualified: Groove and Fillet Welds
Base metal(s) welded: SA-106, Grade B to SA-106, Grade B

Welder Variables (QW-350)	Actual Values Used		Range Qualified	
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1		P-1 thru P-15F,P-34 & P-4X	
Base metal thickness (in.)	0.562		WPS Limits	
Pipe diameter (in.)	6.625		2.875" minimum	
	GMAW / Semiauto	FCAW / Semiauto	GMAW / Semiauto	FCAW / Semiauto
Backing **	No backing used	Backing used	With or without backing	With backing only
AWS classification	ER70S-6	E71T-12M		
Filler metal specification (SFA)	5.18	5.20	5.xx	5.xx
Filler metal F-No.	6	6	F-No. 6	F-No. 6
Filler metal product form	N/A	N/A	N/A	N/A
Consumable insert	N/A	N/A	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.125 [N/A]	0.437 [N/A]	0.2500" maximum	0.8740" maximum
Welding position	1GR - Rotated	1GR - Rotated	Flat only	Flat only
Weld progression	N/A	N/A	N/A	N/A
Backing gas	No backing gas used	No backing gas used	W/WO backing gas	W/WO backing gas
GMAW / FCAW transfer mode	Globular arc	Globular arc	Spray, Pulsed, or Globular	Spray, Pulsed, or Globular

Machine Welding Variables (QW-360)	Actual Values Used		Range Qualified	
Direct / remote visual control	N/A	N/A	N/A	N/A
Automatic voltage control	N/A	N/A	N/A	N/A
Automatic joint tracking	N/A	N/A	N/A	N/A
Welding position	N/A	N/A	N/A	N/A
Consumable insert	N/A	N/A	N/A	N/A
Backing **	N/A	N/A	N/A	N/A
Single / multiple pass per side	N/A	N/A	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes:

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Passed	QW-462.2 Side bend	Passed
None		None	
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194
Volumetric test results: None
Welding test conducted by: ISTI Plant Services
Mechanical/Radiographic tests conducted by: American Piping Inspection Lab test no.: W170119

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

Approved By: Brad Mohler 2/24/2017 Date
Organization: ISTI Plant Services

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: **Hughart, Jesse** Stamp: _ H8
Test WPS No.: **1001** Rev.: 0 WPQ No.: _____ Date: 4/7/2017
Welding process(es) / type(s) used: GTAW / Manual
Type of joint welded: Pipe Groove weld Joint type(s) qualified: Groove and Fillet Welds
Base metal(s) welded: SA-106, Grade B to SA-106, Grade B

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-15F,P-34 & P-4X
Base metal thickness (in.)	0.218	WPS Limits
Pipe diameter (in.)	2.375	1.00" minimum
	GTAW / Manual	**GTAW / Manual**
Backing **	No backing used	With or without backing
AWS classification	ER70S-6	
Filler metal specification (SFA)	5.18	5.xx
Filler metal F-No.	6	F-No. 6
Filler metal product form	Bare (Solid)	Bare / metal cored
Consumable insert	No insert used	Without insert only
Deposit thickness (in.) [>= 3 layers]	0.218 [N/A]	0.4360" maximum
Welding position	6G - 45 degree pipe	All Positions
Weld progression	Vertical up	Vertical up (n4)
Backing gas	No backing gas used	With or Without backing gas
GTAW welding current / polarity	DCEN (straight)	DCEN (straight)

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n4) The root pass, when removed to sound weld metal in preparation for welding the second side, and the cover or wash pass may be up or down.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194
Volumetric test results: None
Welding test conducted by: ISTI Plant Services
Mechanical/Radiographic tests conducted by: American Piping Inspection Lab test no.: W170232

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

Organization: ISTI Plant Services

Approved By: _____ 4/10/17 Date

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: Lopez, Jaime Stamp: JL

Test WPS No.: 1001 Rev.: 0 WPQ No.: _____ Date: 8/2/2017

Welding process(es) / type(s) used: GTAW / Manual

Type of joint welded: Pipe Groove weld Joint type(s) qualified: Groove and Fillet Welds

Base metal(s) welded: SA-106, Grade B to SA-106, Grade B

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-15F,P-34 & P-4X
Base metal thickness (in.)	0.218	WPS Limits
Pipe diameter (in.)	2.375	1.00" minimum
	GTAW / Manual	GTAW / Manual
Backing **	No backing used	With or without backing
AWS classification	ER70S-6	
Filler metal specification (SFA)	5.18	5.xx
Filler metal F-No.	6	F-No. 6
Filler metal product form	Bare (Solid)	Bare / metal cored
Consumable insert	No insert used	Without insert only
Deposit thickness (in.) [>= 3 layers]	0.218 [N/A]	0.4360" maximum
Welding position	6G - 45 degree pipe	All Positions
Weld progression	Vertical up	Vertical up (n4)
Backing gas	No backing gas used	With or Without backing gas
GTAW welding current / polarity	DCEN (straight)	DCEN (straight)

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n4) The root pass, when removed to sound weld metal in preparation for welding the second side, and the cover or wash pass may be up or down.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194

Volumetric test results: None

Welding test conducted by: ISTI Plant Services

Mechanical/Radiographic tests conducted by: American Piping Inspection Lab test no.: M171154

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

Organization: ISTI Plant Services

Approved By: _____ 8/2/17 Date

ISTI Plant Services
17207 East 21st Street
Tulsa, OK 74134

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: Lopez, Jaime Stamp: JL
Test WPS No.: 1004 Rev.: 3 WPQ No.: _____ Date: 8/2/2017
Welding process(es) / type(s) used: GMAW / Semiautomatic and FCAW / Semiautomatic
Type of joint welded: Pipe Groove weld Joint type(s) qualified: Groove and Fillet Welds
Base metal(s) welded: SA-106, Grade B to SA-106, Grade B

Welder Variables (QW-350)	Actual Values Used		Range Qualified	
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1		P-1 thru P-15F,P-34 & P-4X	
Base metal thickness (in.)	0.718		WPS Limits	
Pipe diameter (in.)	6.625		2.875" minimum	
	GMAW / Semiauto	FCAW / Semiauto	GMAW / Semiauto	FCAW / Semiauto
Backing **	No backing used	Backing used	With or without backing	With backing only
AWS classification	ER70S-6	E71T-12M		
Filler metal specification (SFA)	5.18	5.20	5.xx	5.xx
Filler metal F-No.	6	6	F-No. 6	F-No. 6
Filler metal product form	N/A	N/A	N/A	N/A
Consumable insert	N/A	N/A	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.125 [N/A]	0.593 [No]	0.1375" maximum	1.1860" maximum
Welding position	1GR - Rotated	1GR - Rotated	Flat only	Flat only
Weld progression	N/A	N/A	N/A	N/A
Backing gas	No backing gas used	No backing gas used	W/WO backing gas	W/WO backing gas
GMAW / FCAW transfer mode	Short-circuiting arc	Globular arc	Short-circuiting arc	Spray, Pulsed, or Globular

Machine Welding Variables (QW-360)	Actual Values Used		Range Qualified	
Direct / remote visual control	N/A	N/A	N/A	N/A
Automatic voltage control	N/A	N/A	N/A	N/A
Automatic joint tracking	N/A	N/A	N/A	N/A
Welding position	N/A	N/A	N/A	N/A
Consumable insert	N/A	N/A	N/A	N/A
Backing **	N/A	N/A	N/A	N/A
Single / multiple pass per side	N/A	N/A	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes:

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Passed	QW-462.2 Side bend	Passed
None		None	
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194
Volumetric test results: None
Welding test conducted by: ISTI Plant Services
Mechanical/Radiographic tests conducted by: American Piping Inspection Lab test no.: M171153

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

Approved By: _____ Organization: ISTI Plant Services
8/2/17
Date

TULSA GAMMA RAY INC.

1127 South Lewis Ave. Tulsa OK 74104
PH 918.585.3228 FX 918.584.5598

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Antonio Flores — Identification No.: Q8

TEST DESCRIPTION

Identification of WPS followed: WPS 1001 — ☒ Test Coupon ☐ Production Weld

Specification of base metal(s): SA106B — Thickness: 0.218"

TESTING CONDITIONS & QUALIFICATIONS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW	GTAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	WITHOUT	WITH/WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	2"	1" & GREATER
Base metal P or S-Number to P- or S Number	P1 to P1	P1 thru P15E,P34, P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.20	
Filler metal or electrode classification(s) (info only)	ER70S-6	
Filler metal F-Numbers	F6	ALL F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	------	------
Process 1: GTAW 3 layers minimum ☐ yes ☒ no	0.218"	0.436" MAX
Process 2: N/A 3 layers minimum ☐ yes ☐ no	N/A	N/A
Position qualified (2G, 6G, 3F, etc.)	1GR	1GR, 1F
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	N/A	N/A
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN	DCEN

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☒ Bend Test ☐ Transverse Root and Face [QW-462.2(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☒ Side (QW-462.2)

☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(e)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]

☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result
FACE #1	ACCEPTABLE	ROOT #2	ACCEPTABLE	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Alternative radiographic examination results (QW-191): N/A

Fillet weld – fracture test (QW-180): N/A — Length and percent of defects: N/A

Macro examination (QW-184): N/A — Fillet size (in.): ____ x ____ — Concavity/convexity (in.): N/A

Other Tests: N/A

Film or Specimens evaluated by: John Phillips — Company: Tulsa Gamma Ray, Inc.

Mechanical tests conducted by: TULSA GAMMA RAY, Inc. — Laboratory Tests: 102135525

Welding supervised by: ISTI Plant Services

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

Organization: ISTI Plant Services

Date: 09-29-2014

By: Rod Wold

American Piping Inspection

18501 E Admiral Pl. Catoosa, OK 74015
PH 918.266.4130

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Antonio Flores — Identification No.: Q8

TEST DESCRIPTION

Identification of WPS followed: 1004
Specification of base metal(s): SA106B
☒ Test Coupon ☐ Production Weld
Thickness: 0.562"

TESTING CONDITIONS & QUALIFICATIONS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	(1)GMAW/(2)FCAW	(1)GMAW/(2)FCAW
Type (i.e.: manual, semi-auto) used	(1)SEMI/(2)SEMI	(1)SEMI/(2)SEMI
Backing (metal, weld metal, double-welded, etc.)	(1)WITHOUT/(2) WITH	(1)WITH OR WITHOUT/(2) WITH
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6.625"	2 7/8" to UNLIMITED
Base metal P or S-Number to P- or S Number	P1 to P1	P1- P15F, P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	(1)5.18/(2)5.20	(1)5.18/(2)5.20
Filler metal or electrode classification(s) (info only)	(1)ER70S-2/(2)E71T-12M	(1)ER70S-6/(2)E71T-12M
Filler metal F-Numbers	F6	ALL F6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	(1)SOLID/(2)TUBULAR	(1)SOLID/(2)TUBULAR
Deposit thickness for each process	------	------
Process 1: (1)GMAW 3 layers min. ☐ yes ☒ no	(1) 0.125"	(1) 0.1375" MAX
Process 2: (2)FCAW 3 layers min. ☒ yes ☐ no	(2) 0.437"	(2) 0.874"
Position qualified (2G, 6G, 3F, etc.)	1GR	1G, 1F
Vertical progression (uphill or downhill)	N/A	N/A
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	NONE	NONE
Transfer mode (spray/globular or pulse to short circuit-GMAW)	(1)SHORT CIRCUIT/(2)GLOBULAR	(1)SHORT CIRCUIT/(2)GLOBULAR
GTAW current type/polarity (AC, DCEP, DCEN)	(1)DCEP/(2)DCEP	(1)DCEP/(2)DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☒ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☒ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay[QW-462.5(e)] ☐ Plate bend specimen, corrosion resistant overlay[QW-462.5(d)]
☐ Macro test fusion [QW-462.5 (b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result
SIDE BEND #1	ACCEPTABLE	SIDE BEND #2	ACCEPTABLE	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Alternative radiographic examination results (QW-191): N/A
Fillet weld – fracture test (QW-180): N/A
Macro examination (QW-184): N/A — Fillet size (in.) ____ x ____ — Length and percent of defects: N/A — Concavity/convexity (in.): N/A
Other Tests: N/A
Film or Specimens evaluated by: Maxwell D. Stocker — Company: American Piping Inspection
Mechanical tests conducted by: American Piping Inspection — Laboratory Tests: M150327-1D
Welding supervised by: ISTI Plant Services

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

Date: 3-27-15 — Organization: ISTI Plant Services

By: Rodolfo

TULSA GAMMA RAY INC
1127 South Lewis Ave Tulsa OK 74104
PH 918.585.3228 FX 918.584.5598

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name HUGO MEZA Identification No W

TEST DESCRIPTION

Identification of WPS followed 1001
Specification of base metal(s) SA106B
☒ Test Coupon ☐ Production Weld
Thickness .218"

TESTING CONDITIONS & QUALIFICATIONS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW	GTAW
Type (i.e., manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	NONE	WITH OR WITHOUT
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	2"	1" to UNLIMITED
Base metal P or S-Number to P- or S-Number	P1 to P1	P1- P1
Filler metal or electrode specification(s) (SFA) (info only)	5.18	
Filler metal or electrode classification(s) (info only)	ER70S-6	
Filler metal F-Numbers	6	6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored powdered) (GTAW or PAW)	SOLID	SOLID
Deposit thickness for each process	.218"	.436"
Process 1 GTAW 3 layers minimum ☒ yes ☐ no		
Process 2 ____ 3 layers minimum ☐ yes ☐ no	N.A.	N.A.
Position qualified (2G, 6G, 3F, etc.)	6G	ALL
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N.A.	N.A.
Inert gas backing (GTAW, PAW, GMAW)	NONE	NONE
Transfer mode (spray, globular or pulse to short circuit-GMAW)	N.A.	N.A.
GTAW current type polarity (AC, DCEP, DCEN)	DCEN	DCEN

RESULTS

Visual Examination of Completed Weld (QW-302.4) ACCEPTABLE

☒ Bend Test ☒ Transverse Root and face (QW-462.3(a)) ☐ Longitudinal root and face (QW-462.3(b)) ☐ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay (QW-462.5(d)) ☐ Plate bend specimen, corrosion resistant overlay (QW-462.5(d))
☐ Macro test fusion (QW-462.5(e)) ☐ Macro test for fusion (QW-462.5(e))

Type	Result	Type	Result	Type	Result
Face	Acceptable	Face	Acceptable		
Root	Acceptable	Root	Acceptable		

Alternative radiographic examination results (QW-191) N.A.
Fillet weld - fracture test (QW-180) N.A.
Macro examination (QW-184) N.A. Fillet size (in.) N.A. Length and percent of defects N.A.
Other Tests N.A. Concavity/convexity (in.) N.A.

Film or Specimens evaluated by RICK PRICE
Mechanical tests conducted by RICK PRICE Company Tulsa Gamma Ray, Inc.
Welding supervised by ISTI Plant Services Laboratory Tests 102132039
We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code. Radiography Ticket # N.A.

Date 4-12-11 Organization ISTI Plant Services
By

TULSA GAMMA RAY INC
1127 South Lewis Ave Tulsa OK 74104
PH 918.585.3228 FX 918.584.5598

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: HUGO MEZA Identification No.: W

TEST DESCRIPTION

Identification of WPS followed: 1004
Specification of base metal(s): SA106-B
☒ Test Coupon ☐ Production Weld
Thickness: 0.562"

TESTING VARIBLES & QUALIFICATION LIMITS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	(1)GMAW/(2)FCAW	(1)GMAW/(2)FCAW
Type (i.e., manual, semi-auto) used	(1)SEMI/(2)SEMI	(1)SEMI/(2)SEMI
Backing (metal, weld metal, double-welded, etc.)	(1)Without/(2)With	(1)With or Without/(2) With
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6"	2 7/8" to UNLIMITED
Base metal P or S-Number to P- or S Number	P1-P1	P1thru P15E, P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.20	
Filler metal or electrode classification(s) (info only)	ER70S-6/E71T-12M	
Filler metal F-Numbers	6/6	6/6
Consumable Insert (GTAW or PAW)	NONE	NONE
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	(1)SOLID/(2)TUBULAR	(1)SOLID/(2)TUBULAR
Deposit thickness for each process	------	-------
Process 1: GMAW 3 layers min. ☐ yes ☒ no	0.125"	0.1375" MAX
Process 2: FCAW 3 layers min. ☒ yes ☐ no	0.307"	0.614"
Position qualified (2G, 6G, 3F, etc.)	1G	1G, 1F
Vertical progression (uphill or downhill)	N.A.	N.A.
Type of fuel gas (OFW)	N.A.	N.A.
Inert gas backing (GTAW, PAW, GMAW)	NONE	NONE
Transfer mode (spray/globular or pulse to short circuit-GMAW)	SHORT CIRCUIT	SHORT CIRCUIT
GTAW current type/polarity (AC, DCEP, DCEN)	DCEP	DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☒ Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Longitudinal Root and Face [QW-462.3(b)] ☒ Side [QW-462.2]
☐ Pipe bend specimen, corrosion-resistant overlay [QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay [QW-462.5(d)]
☐ Macro test fusion [QW-462.5(b)] ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result
SIDE BEND #1	PASS				
SIDE BEND #2	PASS				

Alternative radiographic examination results (QW-191): N/A
Fillet weld - fracture test (QW-180): N/A
Macro examination (QW-184): N/A Fillet size (in.): ___ x ___ Length and percent of defects: N/A
Other Tests: N/A Concavity/convexity (in.): N/A
Film or Specimens evaluated by: ROBERT BAKER
Mechanical tests conducted by: ROBERT BAKER Company: TULSA GAMMA RAY, Inc.
Welding supervised by: ISTI PLANT SERVICES Laboratory Tests: 102132585

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

Manufacturer or Contractor: ISTI PLANT SERVICES

Date: 12-7-12

Certified by:

TULSA GAMMA RAY INC.
1127 South Lewis Ave. Tulsa OK 74104
PH 918.585.3228 FX 918.584.5598

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)

(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's Name: Hugo Meza Identification No.: W

TEST DESCRIPTION

Identification of WPS followed: 1002 ☒ Test Coupon ☐ Production Weld
Specification of base metal(s): SA106B Thickness: 0.562"

TESTING CONDITIONS & QUALIFICATIONS

Welding Variables (QW-350)	Actual values	Range Qualified
Welding Process(es)	GTAW / SMAW	GTAW / SMAW
Type (i.e.: manual, semi-auto) used	MANUAL	MANUAL
Backing (metal, weld metal, double-welded, etc.)	WITHOUT / WITH	WITH or WITHOUT / WITH
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	6.625"	2.875" & ABOVE
Base metal P or S-Number to P- or S Number	P1 TO P1	P1-P15F, P34 & P4X
Filler metal or electrode specification(s) (SFA) (info only)	5.18/5.1	
Filler metal or electrode classification(s) (info only)	(1)ER70S-6/(2)E7018	
Filler metal F-Numbers	F6/F3	ALL CLASSIFICATIONS
Consumable Insert (GTAW or PAW)	N/A	N/A
Filler type (solid/metal or flux cored/powdered) (GTAW or PAW)	COATED	COATED
Deposit thickness for each process	--------	--------
Process 1: GTAW 3 layers minimum ☐ yes ☒ no	0.125"	0.250" MAX.
Process 2: SMAW 3 layers minimum ☒ yes ☐ no	0.437"	0.874" MAX
Position qualified (2G, 6G, 3F, etc.)	6G	ALL
Vertical progression (uphill or downhill)	UPHILL	UPHILL
Type of fuel gas (OFW)	N/A	N/A
Inert gas backing (GTAW, PAW, GMAW)	N/A	N/A
Transfer mode (spray/globular or pulse to short circuit-GMAW)	N/A	N/A
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN/DCEP	DCEN/DCEP

RESULTS

Visual Examination of Completed Weld (QW-302.4): ACCEPTABLE

☒ Bend Test ☐ Transverse Root and face [QW-462.3(a)] ☐ Longitudinal root and face [QW-462.3(b)] ☒ Side (QW-462.2)
☐ Pipe bend specimen, corrosion-resistant overlay [QW-462.5(c)] ☐ Plate bend specimen, corrosion resistant overlay [QW-462.5(d)]
☐ Macro test fusion [QW-462.5(b)] ☐ Macro test for fusion [QW-462.5(e)]

TYPE	RESULT	TYPE	RESULT	TYPE	RESULT
SIDE BEND #1	ACCEPTABLE	SIDE BEND#3	ACCEPTABLE	N/A	N/A
SIDE BEND #2	ACCEPTABLE	SIDE BEND#4	ACCEPTABLE	N/A	N/A

Alternative radiographic examination results (QW-191): N/A
Fillet weld – fracture test (QW-180): N/A Length and percent of defects: N/A
Macro examination (QW-184): N/A Fillet size (in.): ___ x ___ Concavity/convexity (in.): N/A
Other Tests: N/A
Film or Specimens evaluated by: Maxwell D. Stocker MDS. Company: Tulsa Gamma Ray, Inc.
Mechanical tests conducted by: TULSA GAMMA RAY, INC. Laboratory Tests: 102136018
Welding supervised by: ISTI Plant Services

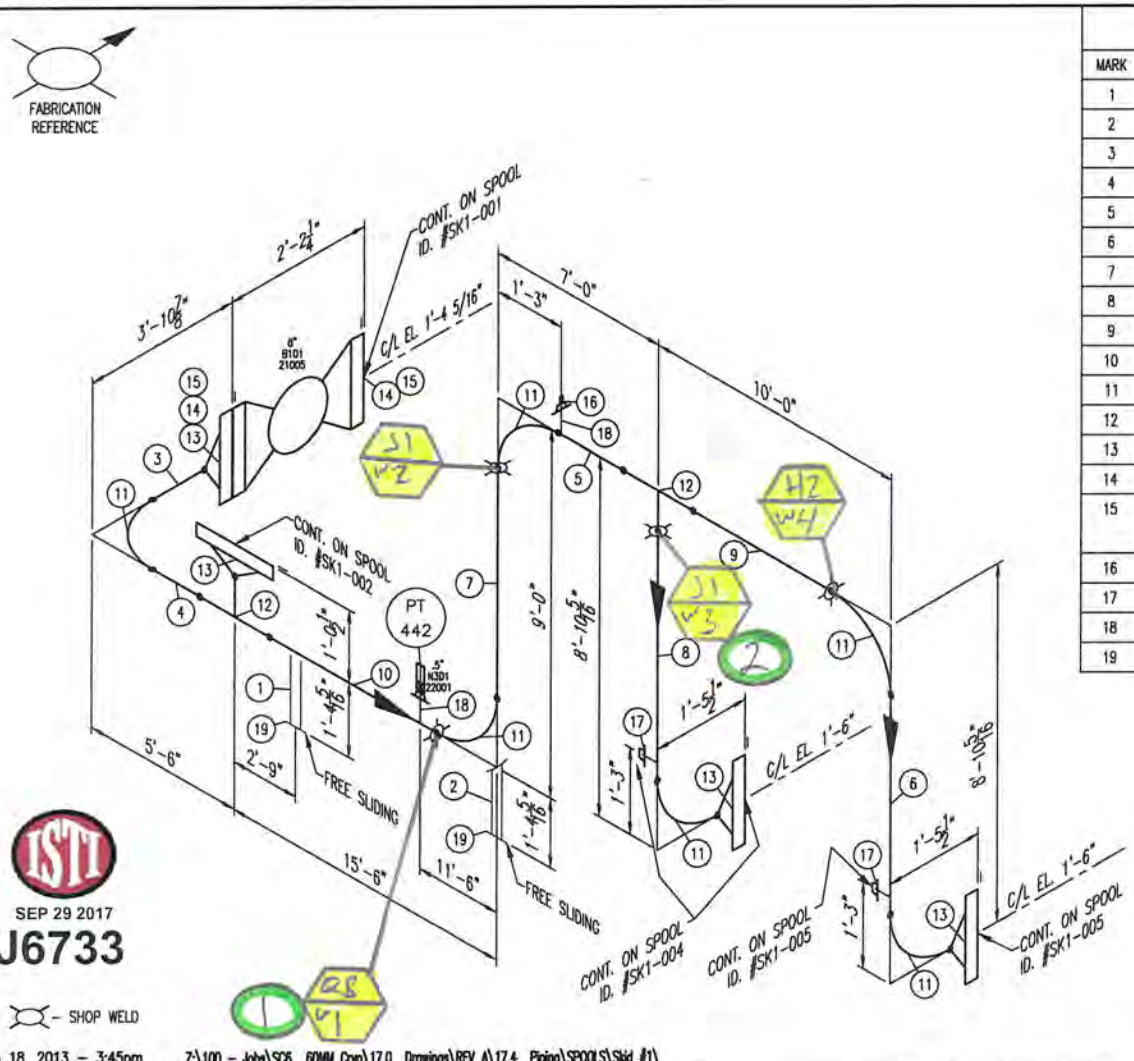
We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME Section IX Boiler & Pressure Vessel Code.

Date: 12-2-2014 Organization: ISTI Plant Services
By: Rod Lodle

J-447

SK1 Assy
Spools

ISTI
Weld Maps



ISTI

SEP 29 2017

J6733

– SHOP WELD

J-447
12/16/16
IFC

*** = JOB #

BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	1	4"	PIPE, STD SMLS, A-106-B	1'-3 13/16"
2	1	4"	PIPE, STD SMLS, A-106-B	2'-3 13/16"
3	1	8"	PIPE, XH SMLS, A-106-B	2'-5 3/8"
4	1	8"	PIPE, XH SMLS, A-106-B	3'-11"
5	1	8"	PIPE, XH SMLS, A-106-B	5'-5"
6	1	8"	PIPE, XH SMLS, A-106-B	6'-10 5/16"
7	1	8"	PIPE, XH SMLS, A-106-B	7'-0"
8	1	8"	PIPE, XH SMLS, A-106-B	7'-3 5/16"
9	1	8"	PIPE, XH SMLS, A-106-B	8'-5"
10	1	8"	PIPE, XH SMLS, A-106-B	13'-11"
11	6	8"	ELL, 90 LR XH, A-234-WPB	
12	2	8"	TEE, STR. XH, A-234-WPB	
13	4	8"	FLG, RFWN 600LB XH, A-105	
14	2	1 1/8"	(12) STUD BOLTS, A-193-B7 w/ TWO HEAVY HEX NUTS, A-194-2H	7 3/4"
15	2	8"	GASKET, 1/8" THK, 600LB RF, SPIRALWOUND, 304SS WINDING, FLEXITE SUPER FILLER, CS GUIDE RING	
16	1	1/2"	PLUG, SOLID STEEL, ROUND HEAD, A-105	
17	2	8"x3/4"	SOL, 3000LB FS, A-105	
18	2	8"x1/2"	TOL, 3000LB FS, A-105	
19	2		BASE PLATE, 1/2" THK. x 6" x 6" (SA-36 MATERIAL)	

Sep 18, 2013 – 3:45pm Z:\100 – Jobs\SC6_ 60MM Cryo\17.0 Drawings\REV_A\17.4 Piping\SPOOLS\Skid #1\

DESIGN PRESS.	1100 Psig	FAB. LOCATION	SHOP				
DESIGN TEMP.	150°F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	910 Psia						
OPER. TEMP.	76°F	CORR. ALLOW.	.0625"				
STRESS RELIEVE	NO	INSULATION	NONE	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	15% NORMAL	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

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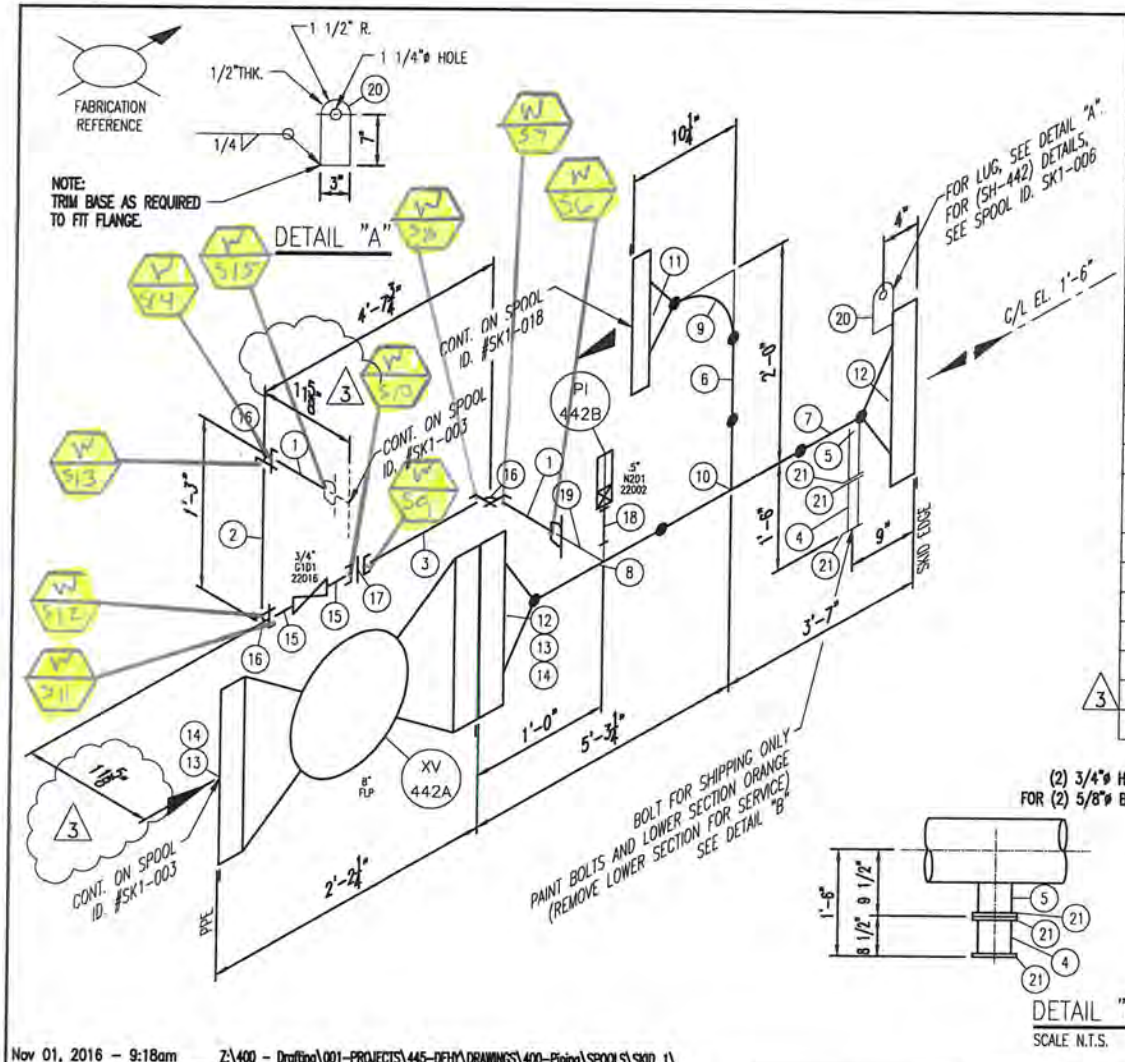
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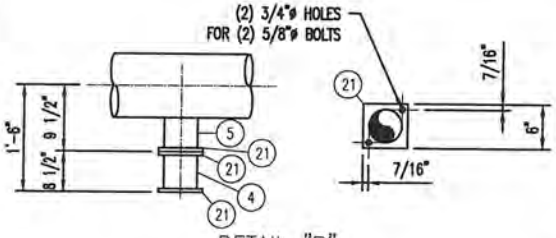
ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR BW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SADDLED ON.

Thomas Russell Co.

7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	102-D1-CS-8" / 103-D1-CS-8"
ASSEMBLY DRAWING	SC6-401
P&ID DRAWING	***-221 & SC6-222
DRAWN BY	b.lowe
DATE DRAWN	04/14/11
JOB No.	-SC6-
SPOOL I.D. No.	SK1-003
REV.	0





DETAIL "B"
SCALE N.T.S.

BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	2	3/4"	PIPE, S/160 SMLS, A-106-B PBE	6"
2	1	3/4"	PIPE, S/160 SMLS, A-106-B PBE	1'-1 1/2"
3	1	3/4"	PIPE, S/160 SMLS, A-106-B PBE	3'-8 11/16"
4	1	4"	PIPE, STD SMLS, A-106-B	7 1/2"
5	1	4"	PIPE, STD SMLS, A-106-B	9"
6	1	4"	PIPE, XH SMLS, A-106-B	11 7/8"
7	1	8"	PIPE, XH SMLS, A-106-B	2'-6 1/2"
8	1	8"	PIPE, XH SMLS, A-106-B	4'-2 3/4"
9	1	4"	ELL, 90 LR XH, A-234-WPB	
10	1	8"x4"	TEE, REDUCING XH, A-234-WPB	
11	1	4"	FLG, RFWN 600LB XH, A-105	
12	2	8"	FLG, RFWN 600LB XH, A-105	
13	2	1 1/8"	(12) STUD BOLTS, A-193-B7 w/ TWO HEAVY HEX NUTS, A-194-2H	7 3/4"
14	2	8"	GASKET, 1/8" THK, 600LB RF, SPIRALWOUND, 304SS WINDING, GRAPHITE FILLER, CS GUIDE RING	
15	2	3/4"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
16	3	3/4"	ELL, 90 SW, 3000LB FS, A-105	
17	1	3/4"	UNION, SW, 3000LB FS, A-105	
18	1	1/2"	CPLG, TOE x 3 1/2" LG., 3000LB FS, A-105	
19	1	8"x3/4"	SOL, 3000LB FS, A-105	
3 20	1		PLATE, 1/2" THK. x 8 1/2" x 3" (SA-36 MATERIAL) PER DETAIL	
21	3		BASE PLATE, 1/2" THK. x 6" x 6" (SA-36 MATERIAL)	

ISTI
SEP 29 2017
J6733

J-447
12/16/16
IFC

NOTE:
PPE = PREFERRED PRESSURE END

*** = JOB #

Nov 01, 2016 - 9:18am Z:\400 - Drafting\001-PROJECTS\445-DEHY\DRAWINGS\400-Piping\SPOOLS\SKID_1\

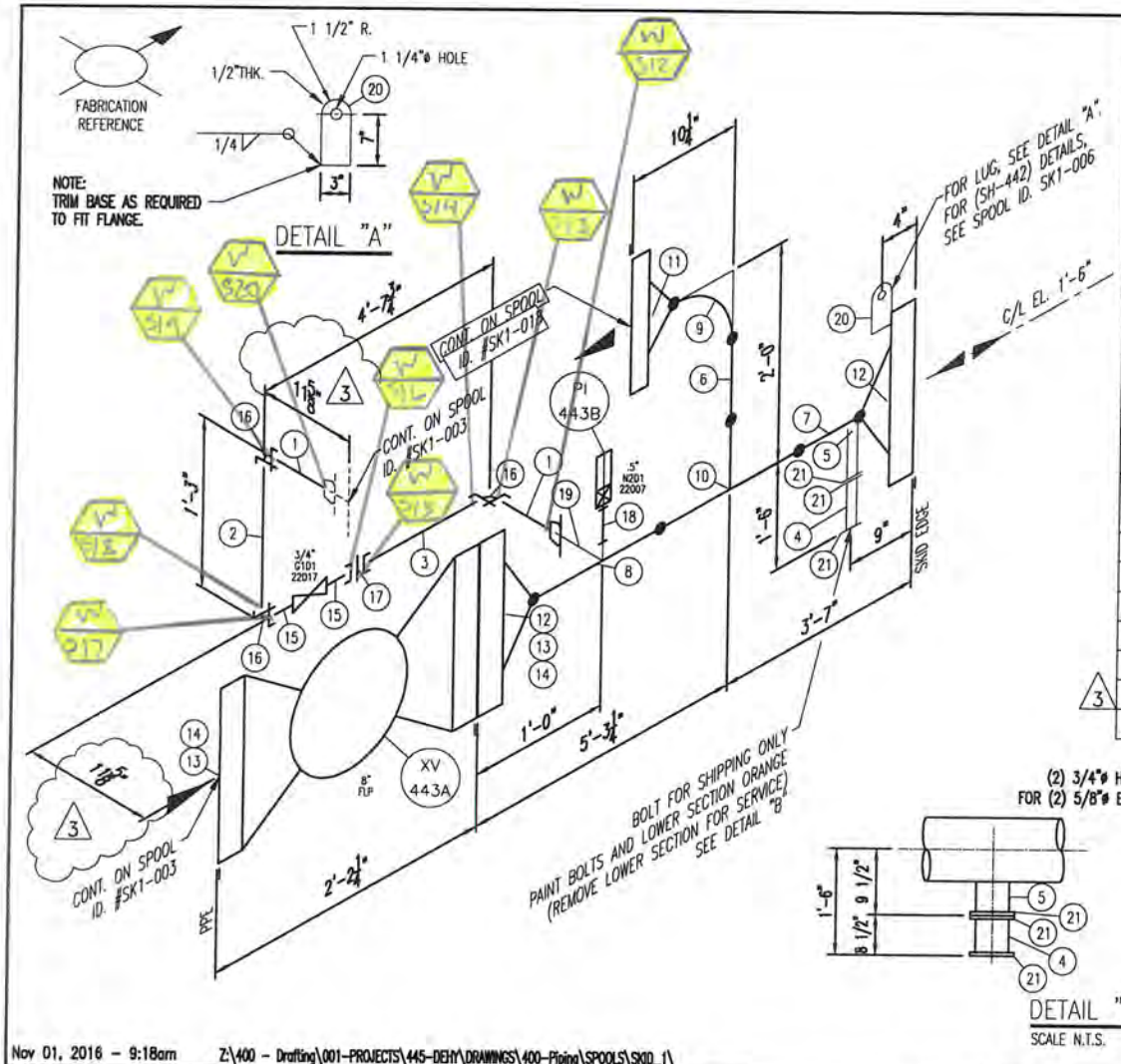
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DESIGN TEMP.	600°F	SPOOL LOCATION	SKID #1	3	REVISED DIM & BOM ITEM #20	10/25/16	MSD	LH
OPER. PRESS.	910 Psia			2	REVISED AS NOTED	6/22/12	LH	LH
OPER. TEMP.	400°F	CORR. ALLOW.	.0625"	1	REVISED AS NOTED	4/25/12	LH	LH
STRESS RELIEVE	NO	INSULATION	3"H	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	15% NORMAL	PAINT	TRCo SYSTEM #2	NO.	REVISION	DATE	BY	APR

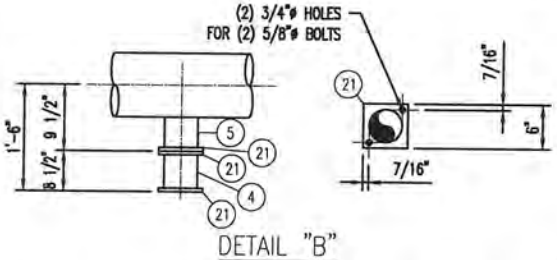
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ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SKIDDED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	104-D1-CS-8" 3"H
ASSEMBLY DRAWING	SCS-401
FIELD DRAWING	***-222
DRAWN BY	b.lowe
DATE DRAWN	04/14/11
JOB No.	~~SCS~~
SPOOL I.D. No.	SK1-004
REV.	3





BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	2	3/4"	PIPE, S/160 SMLS, A-106-B PBE	6"
2	1	3/4"	PIPE, S/160 SMLS, A-106-B PBE	1'-1 1/2"
3	1	3/4"	PIPE, S/160 SMLS, A-106-B PBE	3'-8 11/16"
4	1	4"	PIPE, STD SMLS, A-106-B	7 1/2"
5	1	4"	PIPE, STD SMLS, A-106-B	9"
6	1	4"	PIPE, XH SMLS, A-106-B	11 7/8"
7	1	8"	PIPE, XH SMLS, A-106-B	2'-6 1/2"
8	1	8"	PIPE, XH SMLS, A-106-B	4'-2 3/4"
9	1	4"	ELL, 90 LR XH, A-234-WPB	
10	1	8"x4"	TEE, REDUCING XH, A-234-WPB	
11	1	4"	FLG, RFWN 600LB XH, A-105	
12	2	8"	FLG, RFWN 600LB XH, A-105	
13	2	1 1/8"	(12) STUD BOLTS, A-193-B7 w/ TWO HEAVY HEX NUTS, A-194-2H	7 3/4"
14	2	8"	GASKET, 1/8" THK, 600LB RF, SPIRALWOUND, 304SS WINDING, GRAPHITE FILLER, CS GUIDE RING	
15	2	3/4"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
16	3	3/4"	ELL, 90 SW, 3000LB FS, A-105	
17	1	3/4"	UNION, SW, 3000LB FS, A-105	
18	1	1/2"	CPLG, TOE x 3 1/2" LG., 3000LB FS, A-105	
19	1	8"x3/4"	SOL, 3000LB FS, A-105	
3	20	1		PLATE, 1/2" THK. x 8 1/2" x 3" (SA-36 MATERIAL) PER DETAIL
	21	3		BASE PLATE, 1/2" THK. x 6" x 6" (SA-36 MATERIAL)

ISTI
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12/16/16
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NOTE:
PPE = PREFERRED PRESSURE END

*** = JOB #

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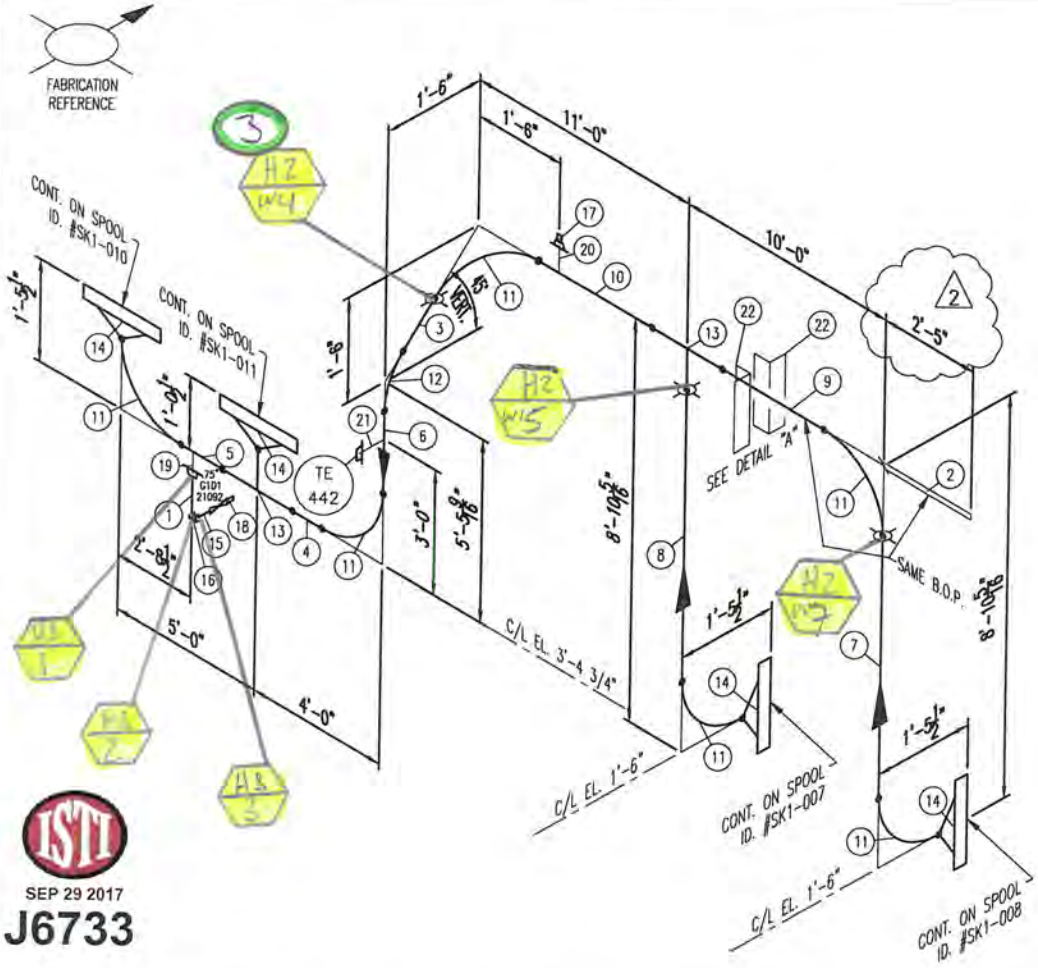
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DESIGN TEMP.	600 °F	SPOOL LOCATION	SKID #1	3	REVISED DIM & BOM ITEM #20	10/25/16	MSD	LH
OPER. PRESS.	910 Psia			2	REVISED AS NOTED	6/22/12	LH	LH
OPER. TEMP.	400 °F	CORR. ALLOW.	.0625"	1	REVISED AS NOTED	4/25/12	LH	LH
STRESS RELIEVE	NO	INSULATION	3"H	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	15% NORMAL	PAINT	TRCo SYSTEM #2	NO.	REVISION	DATE	BY	APR

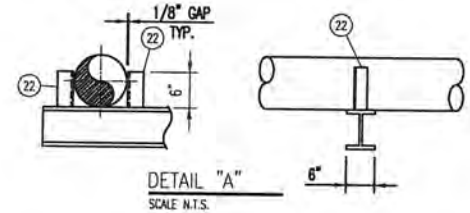
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FABRICATION NOTES:
ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR BW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SADDLED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	104-D1-CS-8" 3"H
ASSEMBLY DRAWING	SC6-401
P&ID DRAWING	***-222
DRAWN BY	b.lowe
DATE DRAWN	04/14/11
JOB No.	~~SC6~~
SPOOL I.D. No.	SK1-005
REV.	3





SEP 29 2017

J6733

– SHOP WELD

BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	1	3/4"	PIPE, S/160 SMLS, A-106-B PBE	3"
2	1	4"	PIPE, STD SMLS, A-106-B	3'-3"
3	1	8"	PIPE, XH SMLS, A-106-B	8 7/16"
4	1	8"	PIPE, XH SMLS, A-106-B	2'-5"
5	1	8"	PIPE, XH SMLS, A-106-B	3'-5"
6	1	8"	PIPE, XH SMLS, A-106-B	4'-0 9/16"
7	1	8"	PIPE, XH SMLS, A-106-B	6'-10 5/16"
8	1	8"	PIPE, XH SMLS, A-106-B	7'-3 5/16"
9	1	8"	PIPE, XH SMLS, A-106-B	8'-5"
10	1	8"	PIPE, XH SMLS, A-106-B	9'-5"
11	6	8"	ELL, 90 LR XH, A-234-WPB	
12	1	8"	ELL, 45 LR XH, A-234-WPB	
13	2	8"	TEE, STR. XH, A-234-WPB	
14	4	8"	FLG, RFWN 600LB XH, A-105	
15	1	3/4"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	6"
16	1	3/4"	ELL, 90 SW, 3000LB FS, A-105	
17	1	1/2"	PLUG, SOLID STEEL, ROUND HEAD, A-105	
18	1	3/4"	PLUG, SOLID STEEL, ROUND HEAD, A-105	
19	1	8"x3/4"	SOL, 3000LB FS, A-105	
20	1	8"x1/2"	TOL, 3000LB FS, A-105	
21	1	8"x3/4"	TOL, 3000LB FS, A-105	
22	2		ANGLE, 2" x 2" x 1/4" x 6" LG. A-36	

J-447
12/16/16
IFC

*** = JOB #

Nov 01, 2016 – 9:18am Z:\400 - Drafting\001-PROJECTS\445-DEHY\DRAWINGS\400-Piping\SPOOLS\SKID_1\

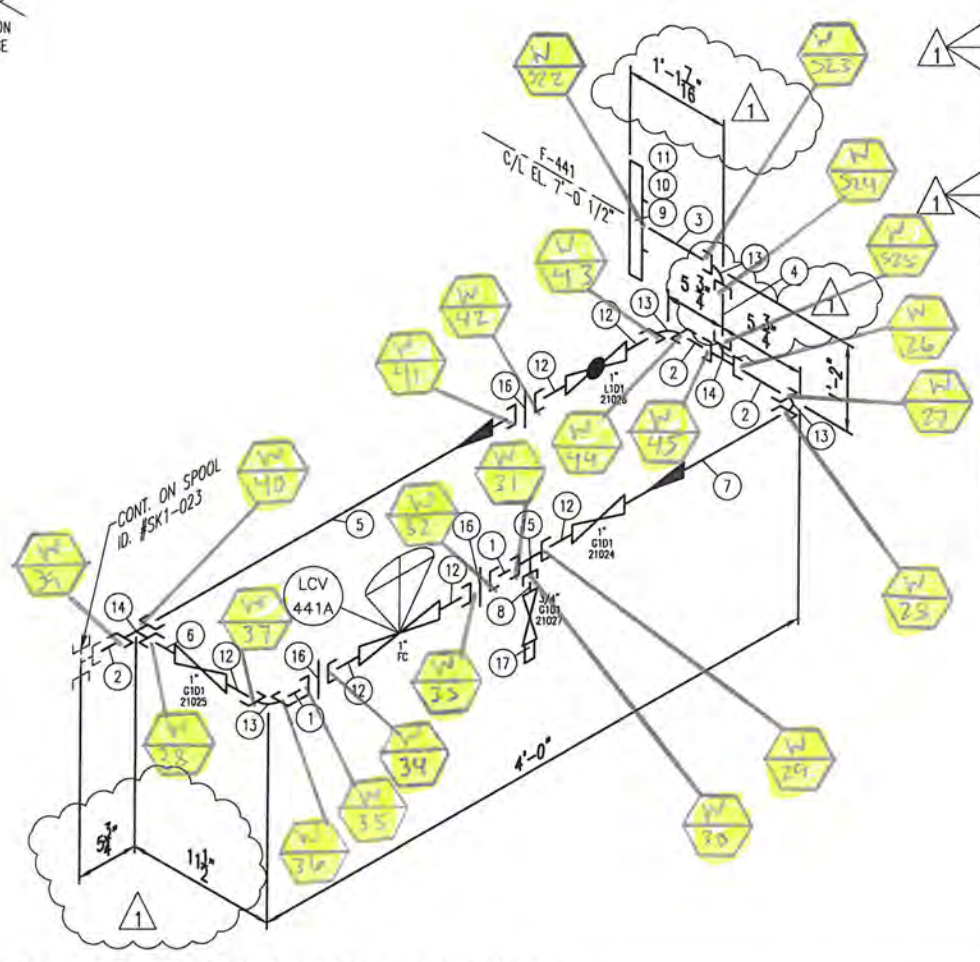
DESIGN PRESS.	1100 Psig	FAB. LOCATION	SHOP				
DESIGN TEMP.	150 °F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	895 Psia			2	REVISED DIM	10/25/16	MSD	LH
OPER. TEMP.	70 °F	CORR. ALLOW.	.0625"	1	ADDED GUIDE & ITEM #22 W/ DETAIL	5/26/16	LG	LH
STRESS RELIEVE	NO	INSULATION	NONE	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	15% NORMAL	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

CONFIDENTIAL STATEMENT
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FABRICATION NOTES:
ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR BW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SADDLED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	106 / 107-D1-CS-8"
ASSEMBLY DRAWING	SC6-401
PAID DRAWING	***-221 & SC6-222
DRAWN BY	b.lowe
DATE DRAWN	04/14/11
JOB No.	~~SC6~~
SPOOL I.D. No.	SK1-009
REV.	2



BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	2	1"	NIPPLE, S/160 SMLS, A-106-B PBE	3"
2	3	1"	NIPPLE, S/160 SMLS, A-106-B PBE	4"
3	1	1"	PIPE, S/160 SMLS, A-106-B PBE	11 3/4"
4	1	1"	PIPE, S/160 SMLS, A-106-B PBE	1'-0 1/4"
5	1	1"	PIPE, S/160 SMLS, A-106-B PBE	2'-11 7/16"
6	1	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	4 1/16"
7	1	1"	PIPE, S/160 SMLS, A-106-B POE-TOE	1'-6 3/4"
8	1	3/4"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
9	1	1"	FLG, RFSW 600LB S/160, A-105	
10	1	5/8"	(4) STUD BOLTS, A-193-B7 w/ TWO HEAVY HEX NUTS, A-194-2H	3 3/4"
11	1	1"	GASKET, 1/8" THK, 600LB RF, SPIRALWOUND, 304SS WINDING, FLEXITE SUPER FILLER, CS GUIDE RING	
12	6	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
13	4	1"	ELL, 90 SW, 3000LB FS, A-105	
14	2	1"	TEE, SW, 3000LB FS, A-105	
15	1	1"x3/4"	TEE RED, SW, 3000LB FS, A-105	
16	3	1"	UNION, SW, 3000LB FS, A-105	
17	1	3/4"	PLUG, SOLID STEEL, ROUND HEAD, A-105	

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SEP 29 2017

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J-447
12/16/16
IFC

*** = JOB #

Nov 01, 2016 - 9:18am Z:\400 - Drafting\001-PROJECTS\445-DEHY\DRAWINGS\400-Piping\SPOOLS\SKID_1\

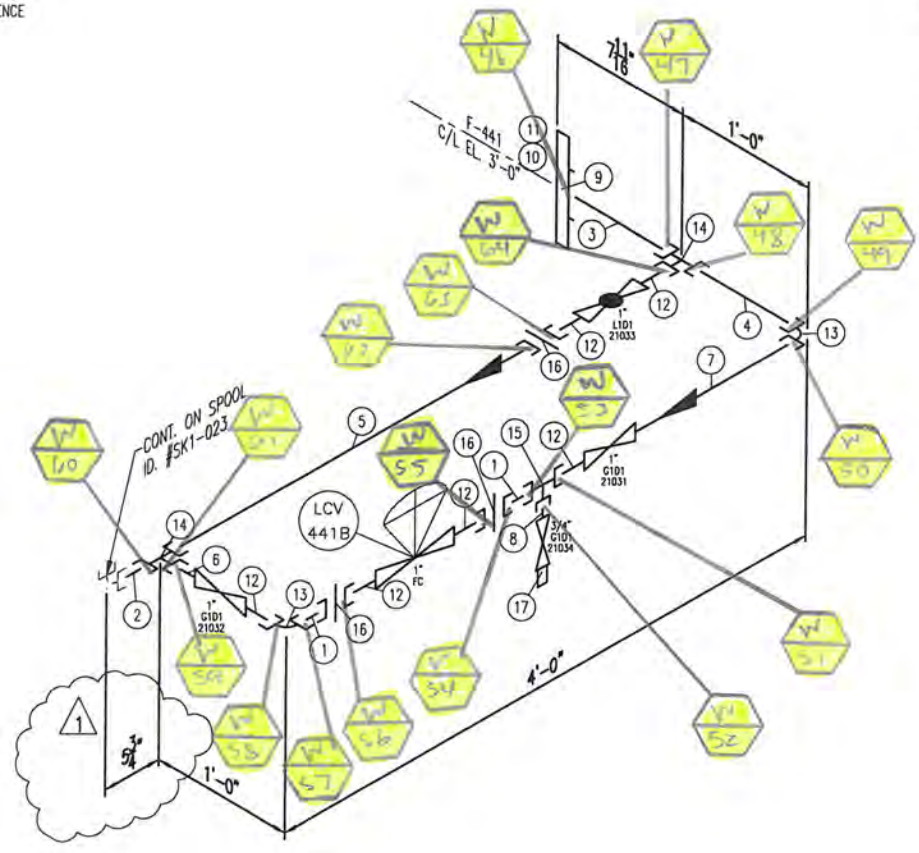
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DESIGN TEMP.	150°F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	910 Psia						
OPER. TEMP.	76°F	CORR. ALLOW.	.125"	1	REVISED DIMS & BOM ITEMS	10/26/16	MSD	LH
STRESS RELIEVE	NO	INSULATION	1"H w/ ET	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	NONE	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

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FABRICATION NOTES:
ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR SW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SADDLED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	841-D2-CS-1" 1"H
ASSEMBLY DRAWING	SC6-401
FIELD DRAWING	***-221
DRAWN BY	b.lowe
DATE DRAWN	04/19/11
JOB No.	~~SC6~~
SPOOL I.D. No.	SK1-021
REV.	1



BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	2	1"	NIPPLE, S/160 SMLS, A-106-B PBE	3"
2	1	1"	NIPPLE, S/160 SMLS, A-106-B PBE	4"
3	1	1"	PIPE, S/160 SMLS, A-106-B PBE	6"
4	1	1"	PIPE, S/160 SMLS, A-106-B PBE	10 1/4"
5	1	1"	PIPE, S/160 SMLS, A-106-B PBE	2'-11 1/8"
6	1	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	4 9/16"
7	1	1"	PIPE, S/160 SMLS, A-106-B POE-TOE	1'-6 15/16"
8	1	3/4"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
9	1	1"	FLG, RFSW 600LB S/160, A-105	
10	1	5/8"	(4) STUD BOLTS, A-193-B7 w/ TWO HEAVY HEX NUTS, A-194-2H	3 3/4"
11	1	1"	GASKET, 1/8" THK, 600LB RF, SPIRALWOUND, 304SS WINDING, FLEXITE SUPER FILLER, CS GUIDE RING	
12	6	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
13	2	1"	ELL, 90 SW, 3000LB FS, A-105	
14	2	1"	TEE, SW, 3000LB FS, A-105	
15	1	1"x3/4"	TEE RED, SW, 3000LB FS, A-105	
16	3	1"	UNION, SW, 3000LB FS, A-105	
17	1	3/4"	PLUG, SOLID STEEL, ROUND HEAD, A-105	

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*** = JOB #

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DESIGN PRESS. 1100 Psig	FAB. LOCATION SHOP					
DESIGN TEMP. 150°F	SPOOL LOCATION SKID #1					
OPER. PRESS. 910 Psia						
OPER. TEMP. 76°F	CORR. ALLOW. .125"	1	REVISED DIM & BOM ITEMS	10/26/16	MSD	LH
STRESS RELIEVE NO	INSULATION 1"H w/ ET	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY NONE	PAINT TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

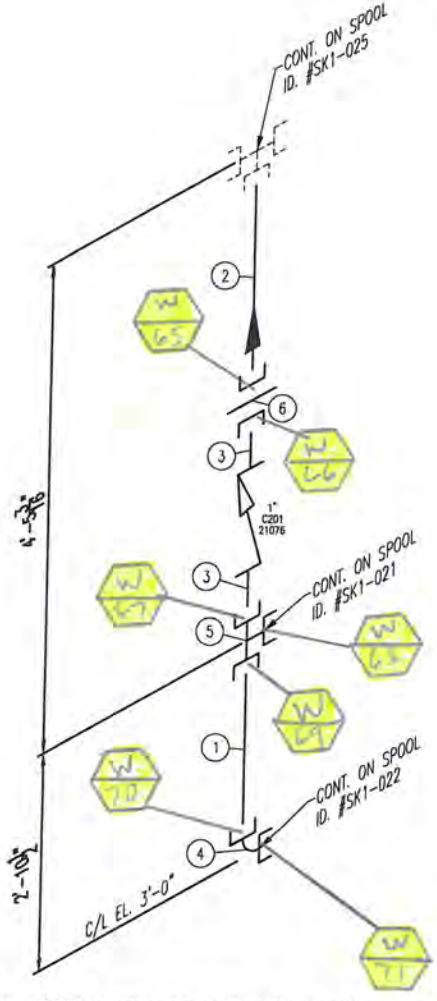
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FABRICATION NOTES:
ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR SW PIPE DO NOT INCLUDE WELD GAPS. SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SADDLED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No. 842-D2-CS-1" 1"H
ASSEMBLY DRAWING SC6-401
FIELD DRAWING ***-221
DRAWN BY b.lowe
DATE DRAWN 04/19/11
JOB No. ~~SC6~~
SPOOL I.D. No. SK1-022
REV. 1

FABRICATION REFERENCE



BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	1	1"	PIPE, S/160 SMLS, A-106-B PBE	2'-8 3/4"
2	1	1"	PIPE, S/160 SMLS, A-106-B PBE	3'-4 11/16"
3	2	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
4	1	1"	ELL, 90 SW, 3000LB FS, A-105	
5	1	1"	TEE, SW, 3000LB FS, A-105	
6	1	1"	UNION, SW, 3000LB FS, A-105	

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*** = JOB #

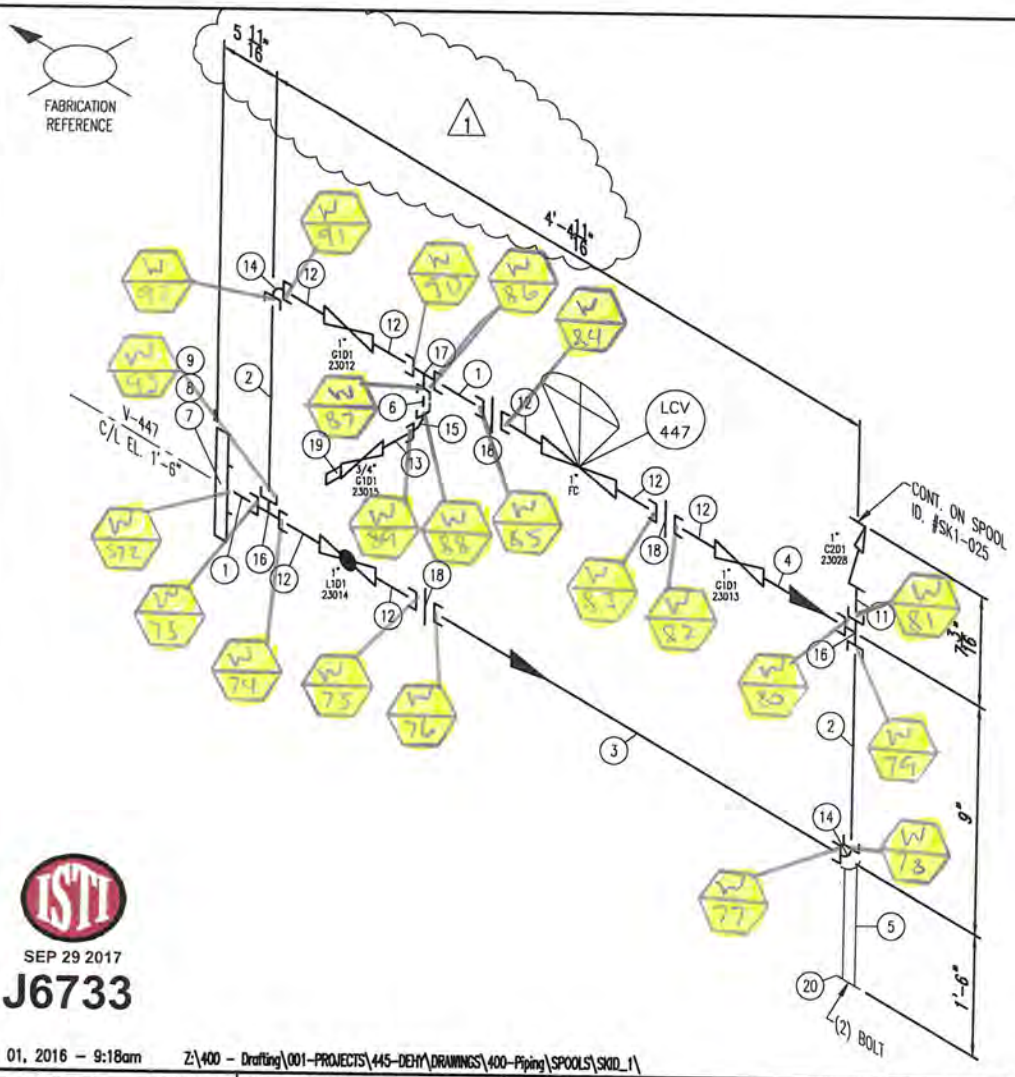
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DESIGN TEMP.	150°F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	910 Psia						
OPER. TEMP.	76°F	CORR. ALLOW.	.125"	1	REVISED BOM ITEM #2	10/26/16	MSD	LH
STRESS RELIEVE	NO	INSULATION	1"H w/ ET	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	NONE	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

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FABRICATION NOTES:
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ALL FITTING MAKE-UP & CUT LENGTHS FOR SW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SNUBBED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	843-D2-CS-1" 1"H
ASSEMBLY DRAWING	SC6-401
P&ID DRAWING	***-221
DRAWN BY	b.lowe
DATE DRAWN	04/19/11
JOB No.	~~SC6~~
SPOOL I.D. No.	SK1-023
REV.	1



BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	2	1"	NIPPLE, S/160 SMLS, A-106-B PBE	4"
2	2	1"	PIPE, S/160 SMLS, A-106-B PBE	7 1/4"
3	1	1"	PIPE, S/160 SMLS, A-106-B PBE	3'-1 13/16"
4	1	1"	PIPE, S/160 SMLS, A-106-B POE-TOE	1'-0 1/8"
5	1	1"	PIPE, XH SMLS, A-106-B	1'-7"
6	1	3/4"	NIPPLE, S/160 SMLS, A-106-B PBE	3"
7	1	1"	FLG, RFSW 600LB S/160, A-105	
8	1	5/8"	(4) STUD BOLTS, A-193-B7 w/ TWO HEAVY HEX NUTS, A-194-2H	3 3/4"
9	1	1"	GASKET, 1/8" THK, 600LB RF, SPIRALWOUND, 304SS WINDING, FLEXITE SUPER FILLER, CS GUIDE RING	
~~10~~	~~1~~	~~1"~~	~~NIPPLE, S/160 SMLS, A-106-B PBE~~	~~4"~~
11	1	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
12	7	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	4"
13	1	3/4"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
14	2	1"	ELL, 90 SW, 3000LB FS, A-105	
15	1	3/4"	ELL, 90 SW, 3000LB FS, A-105	
16	2	1"	TEE, SW, 3000LB FS, A-105	
17	1	1"x3/4"	TEE RED, SW, 3000LB FS, A-105	
18	3	1"	UNION, SW, 3000LB FS, A-105	
19	1	3/4"	PLUG, SOLID STEEL, ROUND HEAD, A-105	
20	1		BASE PLATE, 1/2" THK. x 5" x 5" (SA-36 MATERIAL)	

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J-447
12/16/16
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*** = JOB #

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DESIGN PRESS.	1100 Psig	FAB. LOCATION	SHOP				
DESIGN TEMP.	150 °F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	932 Psia						
OPER. TEMP.	125 °F	CORR. ALLOW.	.125"	1	REVISED DIMS & BOM ITEMS	10/26/16	MSD	LH
STRESS RELIEVE	NO	INSULATION	1"H w/ ET	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	NONE	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

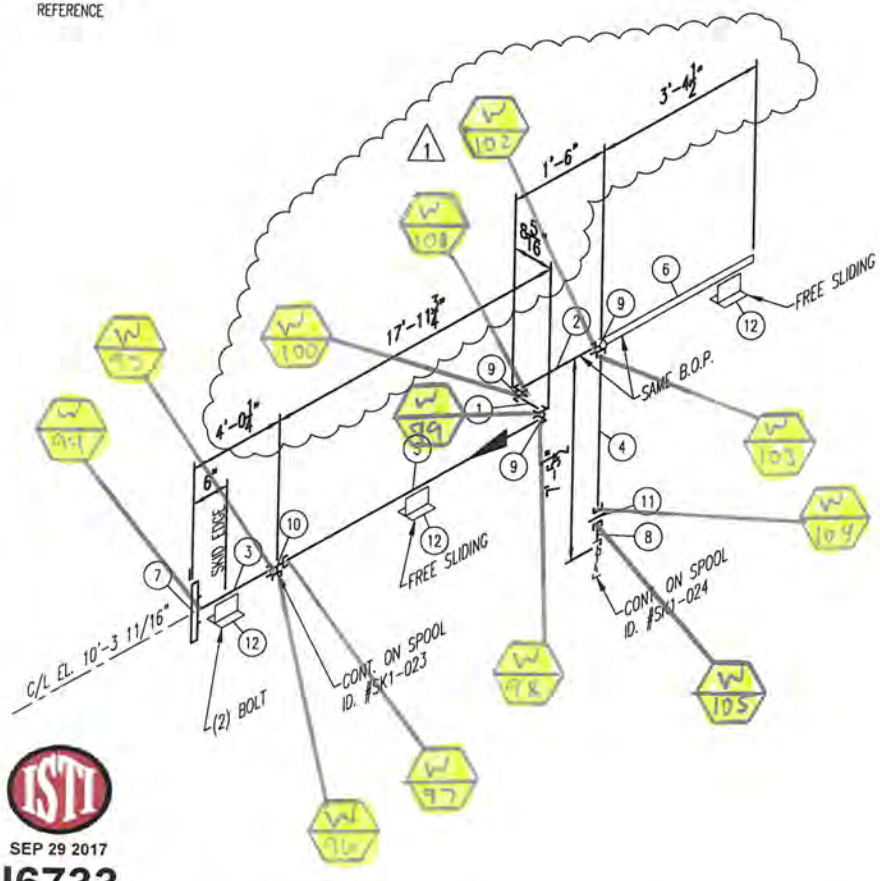
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FABRICATION NOTES:
ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR BW PIPE DO NOT INCLUDE WELD GAPS. SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SADDLED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	847-D2-CS-1" 1"H
ASSEMBLY DRAWING	SC6-401
FIELD DRAWING	***-223
DRAWN BY	b.lowe
DATE DRAWN	04/19/11
JOB No.	~~SC6~~ 447
SPOOL I.D. No.	SK1-024
REV.	1

FABRICATION REFERENCE



SEP 29 2017

J6733

BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	1	1"	PIPE, S/160 SMLS, A-106-B PBE	6 9/16"
2	1	1"	PIPE, S/160 SMLS, A-106-B PBE	1'-4 1/4"
3	1	1"	PIPE, S/160 SMLS, A-106-B PBE	3'-9 5/8"
4	1	1"	PIPE, S/160 SMLS, A-106-B PBE	7'-0 1/8"
5	1	1"	PIPE, S/160 SMLS, A-106-B PBE	17'-10"
6	1	1"	PIPE, XH SMLS, A-106-B PBE	3'-5 3/8"
7	1	1"	FLG, RFSW 600LB S/160, A-105	
8	1	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
9	3	1"	ELL, 90 SW, 3000LB FS, A-105	
10	1	1"	TEE, SW, 3000LB FS, A-105	
11	1	1"	UNION, SW, 3000LB FS, A-105	
12	3		PIPE SHOE, 8" LG x 3" HI FROM W6x15	

J-447
12/16/16
IFC

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*** = JOB #

DESIGN PRESS.	1100 Psig	FAB. LOCATION	SHOP				
DESIGN TEMP.	150 °F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	35 Psia						
OPER. TEMP.	127 °F	CORR. ALLOW.	.125"	1	REVISED DIMS & BOM ITEMS	10/27/16	MSD	LH
STRESS RELIEVE	NO	INSULATION	1"H w/ ET	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	NONE	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

CONFIDENTIAL STATEMENT

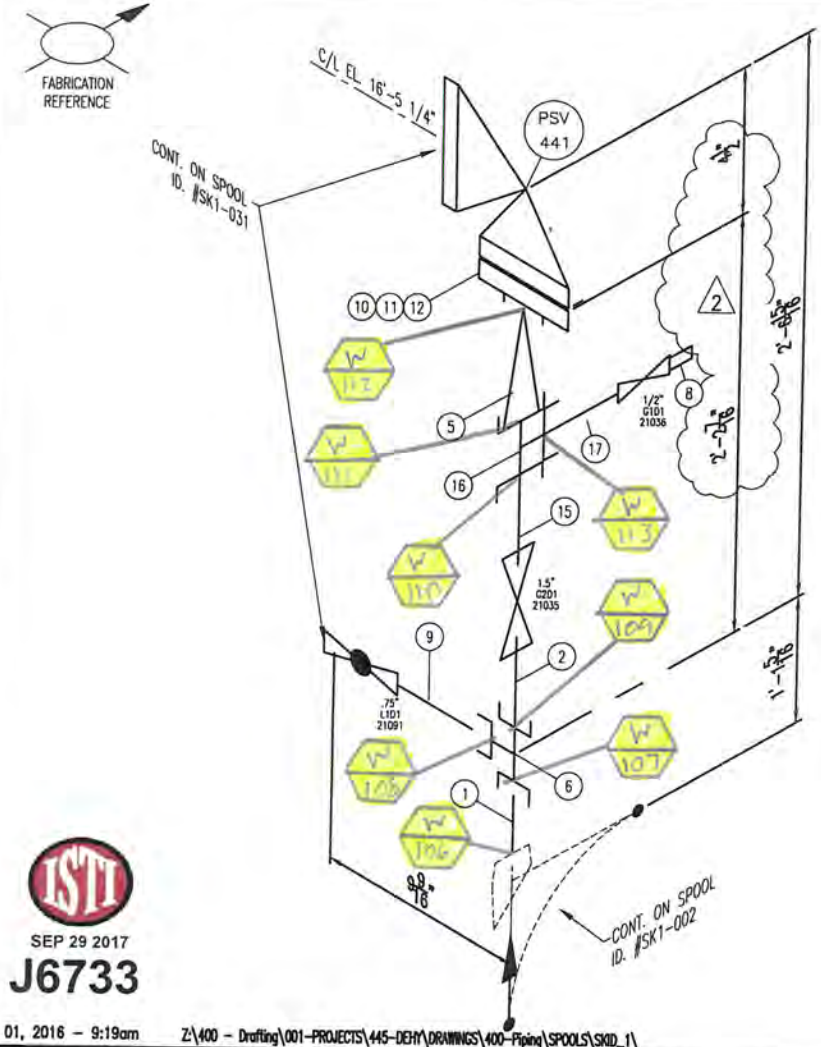
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FABRICATION NOTES:

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ALL FITTING MAKE-UP & CUT LENGTHS FOR BW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SADDLED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	848-D2-CS-1" 1"H
ASSEMBLY DRAWING	SC6-401
FIELD DRAWING	***-221 & 223
DRAWN BY	b.lowe
DATE DRAWN	04/19/11
JOB No.	~~SC6~~
SPOOL I.D. No.	SK1-025
REV.	1



BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	1	1 1/2"	PIPE, S/160 SMLS, A-106-B PBE	10 13/16"
2	2	1 1/2"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	6"
3				
4				
5	1	1 1/2"x1"	SWAGE, CONC, S/160, A-106-B PLE-PSE	
6	1	1 1/2" x 3/4"	RED. TEE, SW, 3000LB FS, A-105	
7				
8	1	1/2"	PLUG, SOLID STEEL, ROUND HEAD, A-105	
9	1	3/4"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	4"
10	1	1"	FLG, RFSW 600LB S/160, A-105	
11	1	5/8"	(4) STUD BOLTS, A-193-B7 w/ TWO HEAVY HEX NUTS, A-194-2H	4"
12	1	1"	GASKET, 1/8" THK, 600LB RF, SPIRALWOUND, 304SS WINDING, FLEXITE SUPER FILLER, CS GUIDE RING	
13	1	1 1/2" x 1/2"	SWAGE, CONC, S/160, A-106-B PLE-TSE	
14	1	1 1/2"	TEE, SW, 3000LB FS, A-105	
15	1	1 1/2"	PIPE, S/160 SMLS, A-106-B POE-TOE	8"
16	1	1 1/2" x 1/2"	RED. TEE, SW, 3000LB FS, A-105	
17	1	1/2"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"

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SEP 29 2017

J6733

J-447
12/16/16
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Nov 01, 2016 – 9:19am Z:\400 – Drafting\001-PROJECTS\445-DEHY\DRAWINGS\400-Piping\SPOOLS\SKID_1\

*** = JOB #

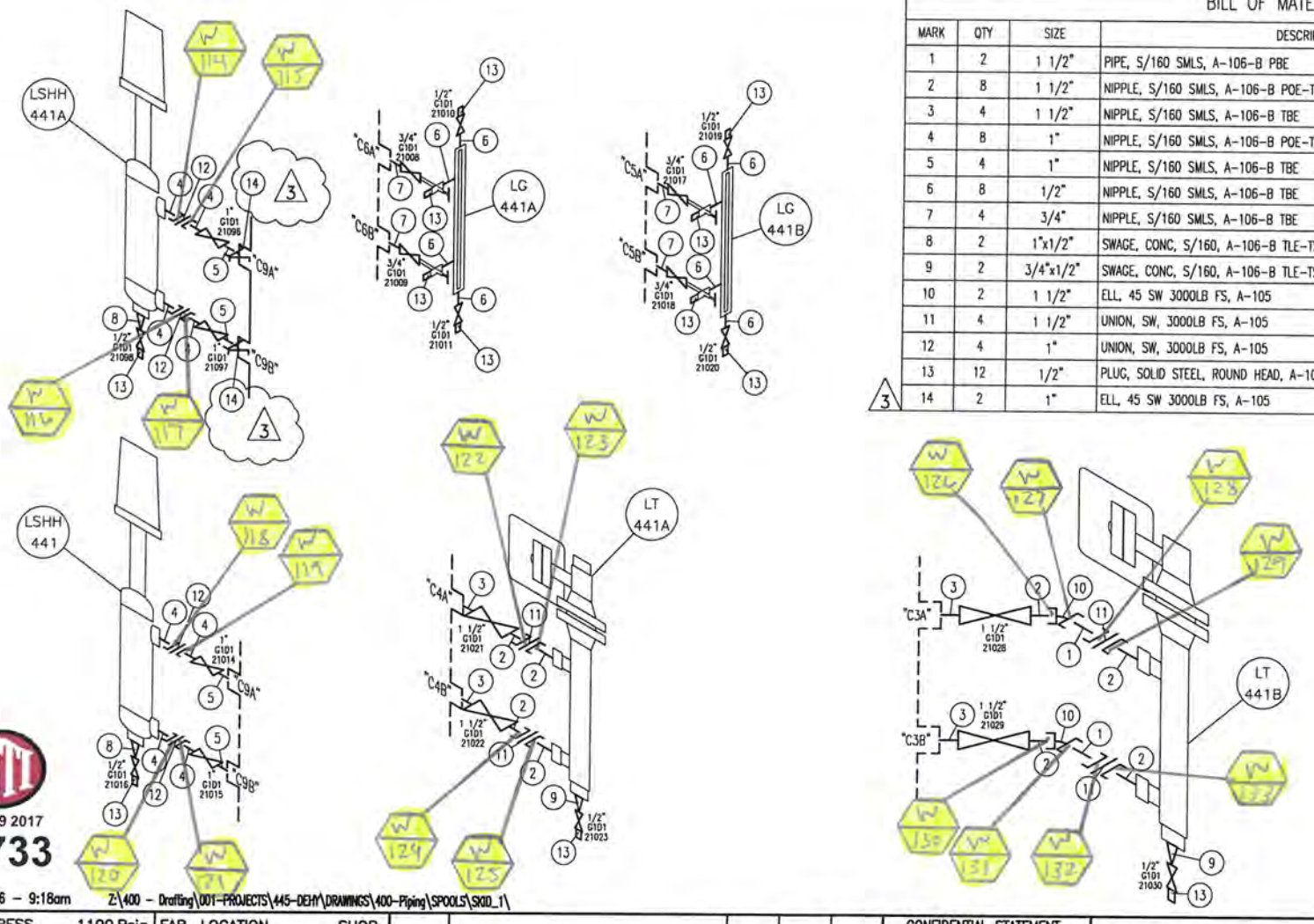
DESIGN PRESS.	1100 Psig	FAB. LOCATION	SHOP				
DESIGN TEMP.	150 °F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	910 Psig			2	REVISED DIMS & BOM ITEMS	10/26/16	MSD	LH
OPER. TEMP.	76 °F	CORR. ALLOW.	.0625"	1	REVISE AS NOTED	10/10/13	MSD	KK
STRESS RELIEVE	NO	INSULATION	NONE	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	NONE	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

CONFIDENTIAL STATEMENT
THIS DRAWING IS THE PROPERTY OF THE THOMAS RUSSELL Co. AND IS NOT TO BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

FABRICATION NOTES:
ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR BW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.
ALL COUPLING TO BE SWAGED ON.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	PSV-441 (D1-CS)
ASSEMBLY DRAWING	SC6-401
PAID DRAWING	***-221
DRAWN BY	b.lowe
DATE DRAWN	04/19/11
JOB No.	~~SC6~~
SPOOL I.D. No.	SK1-027
REV.	2



BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	2	1 1/2"	PIPE, S/160 SMLS, A-106-B PBE	4"
2	8	1 1/2"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	4"
3	4	1 1/2"	NIPPLE, S/160 SMLS, A-106-B TBE	4"
4	8	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
5	4	1"	NIPPLE, S/160 SMLS, A-106-B TBE	3"
6	8	1/2"	NIPPLE, S/160 SMLS, A-106-B TBE	3"
7	4	3/4"	NIPPLE, S/160 SMLS, A-106-B TBE	3"
8	2	1"x1/2"	SWAGE, CONC, S/160, A-106-B TLE-TSE	
9	2	3/4"x1/2"	SWAGE, CONC, S/160, A-106-B TLE-TSE	
10	2	1 1/2"	ELL, 45 SW 3000LB FS, A-105	
11	4	1 1/2"	UNION, SW, 3000LB FS, A-105	
12	4	1"	UNION, SW, 3000LB FS, A-105	
13	12	1/2"	PLUG, SOLID STEEL, ROUND HEAD, A-105	
3 14	2	1"	ELL, 45 SW 3000LB FS, A-105	

ISTI

SEP 29 2017

J6733

Nov 01, 2016 – 9:18am Z:\400 - Drafting\001-PROJECTS\445-DEHY\DRAWINGS\400-Piping\SPOOLS\SKID_1\

J-447
12/16/16
IFC

*** = JOB #

DESIGN PRESS.	1100 Psig	FAB. LOCATION	SHOP				
DESIGN TEMP.	150°F	SPOOL LOCATION	SKID #1	3	REVISED TO ADD BOM ITEM #14	10/26/16	MSD	RC
OPER. PRESS.	964 Psia			2	ADDED MATERIAL FOR LSHH 441A	2/5/15	MRE	CWR
OPER. TEMP.	120°F	CORR. ALLOW.	.125"	1	ADDED LSHH 441A	10/10/13	MSD	KK
STRESS RELIEVE	NO	INSULATION	1"H w/ ET	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	NONE	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

CONFIDENTIAL STATEMENT

THIS DRAWING IS THE PROPERTY OF THE THOMAS RUSSELL Co. AND IS NOT TO BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

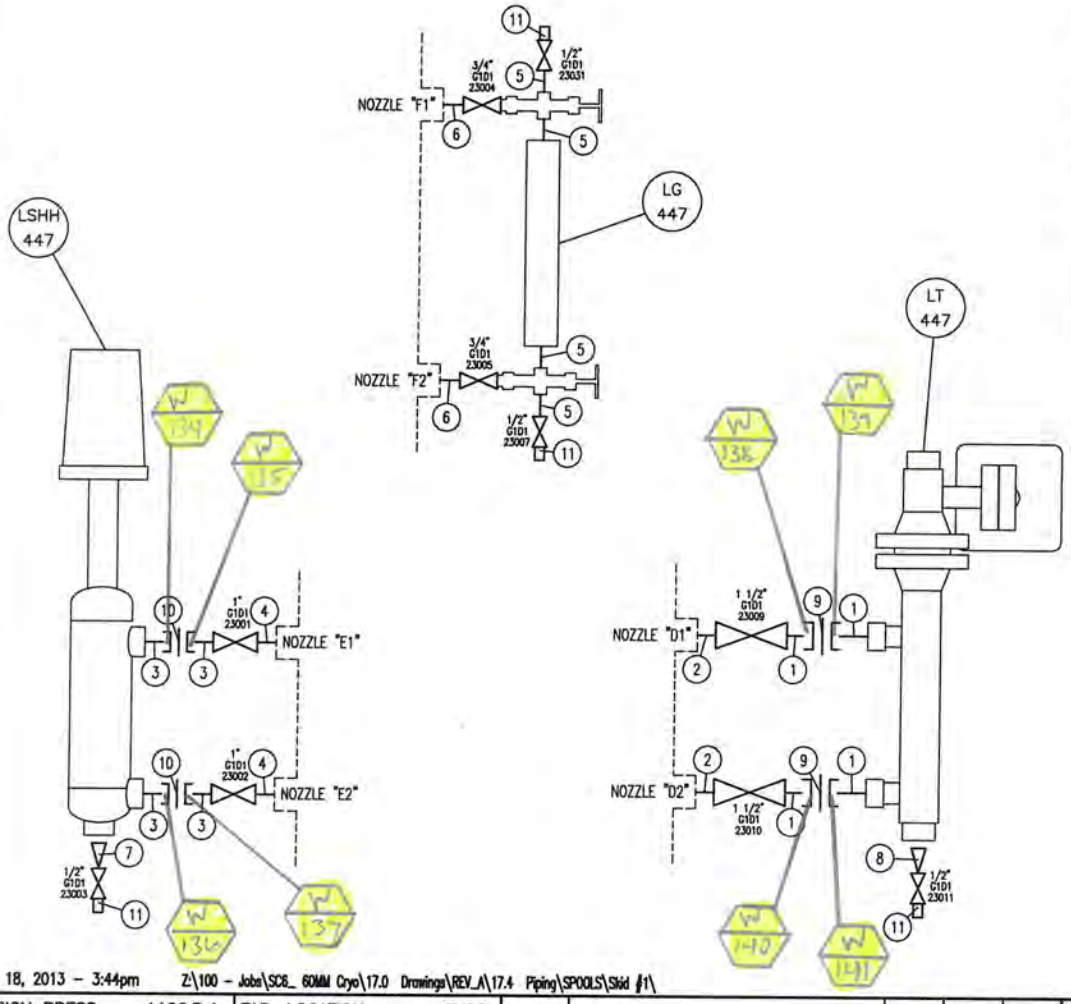
FABRICATION NOTES:

ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR SW PIPE DO NOT INCLUDE WELD GAPS.
SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.

Thomas Russell Co.

7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	F-441 TRIM (D2-CS)
ASSEMBLY DRAWING	SC6-401
FIELD DRAWING	***-221
DRAWN BY	b.lowe
DATE DRAWN	04/18/11
JOB No.	-SC6-
SPOOL I.D. No.	SK1-033
REV.	3



BILL OF MATERIAL

MARK	QTY	SIZE	DESCRIPTION	LENGTH
1	4	1 1/2"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	4"
2	2	1 1/2"	NIPPLE, S/160 SMLS, A-106-B TBE	4"
3	4	1"	NIPPLE, S/160 SMLS, A-106-B POE-TOE	3"
4	2	1"	NIPPLE, S/160 SMLS, A-106-B TBE	3"
5	4	1/2"	NIPPLE, S/160 SMLS, A-106-B TBE	3"
6	2	3/4"	NIPPLE, S/160 SMLS, A-106-B TBE	3"
7	1	1"x1/2"	SWAGE, CONC, S/160, A-106-B TLE-TSE	
8	1	3/4"x1/2"	SWAGE, CONC, S/160, A-106-B TLE-TSE	
9	2	1 1/2"	UNION, SW, 3000LB FS, A-105	
10	2	1"	UNION, SW, 3000LB FS, A-105	
11	4	1/2"	PLUG, SOLID STEEL, ROUND HEAD, A-105	

ISTI

SEP 29 2017

J6733

J-447
12/16/16
IFC

*** = JOB #

Sep 18, 2013 - 3:44pm Z:\100 - Jobs\SC6_ 60MM Cryo\17.0 Drawings\REV_A\17.4 Piping\SPOOLS\Skid #1\

DESIGN PRESS.	1100 Psig	FAB. LOCATION	SHOP				
DESIGN TEMP.	150°F	SPOOL LOCATION	SKID #1				
OPER. PRESS.	981 Psia						
OPER. TEMP.	120°F	CORR. ALLOW.	.125"				
STRESS RELIEVE	NO	INSULATION	1"H w/ ET	0	ISSUE FOR CONSTRUCTION	4/26/11	BWL	LH
RADIOGRAPHY	NONE	PAINT	TRCo SYSTEM #3	NO.	REVISION	DATE	BY	APR

CONFIDENTIAL STATEMENT

THIS DRAWING IS THE PROPERTY OF THE THOMAS RUSSELL Co. AND IS NOT TO BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

FABRICATION NOTES:

ALL VALVES ARE RAISED FACE UNLESS NOTED.
ALL FITTING MAKE-UP & CUT LENGTHS FOR SW PIPE DO NOT INCLUDE WELD GAPS. SHOP TO MAKE ADJUSTMENTS FOR WELD GAPS.
ALL PIPE SEAMLESS UNLESS NOTED OTHERWISE.

Thomas Russell Co.
7050 S. Yale, Suite 210
Tulsa, Oklahoma 74136
PH.: 918-481-5682

LINE No.	V-447 TRIM (D2-CS)
ASSEMBLY DRAWING	SC6-401
FIELD DRAWING	***-223
DRAWN BY	b.lowe
DATE DRAWN	04/18/11
JOB No.	~~SC6~~
SPOOL LD. No.	SK1-036
REV.	0

J-447

SK1 Assy
Spools

ISTI
NDE Test Reports

Advanced Inspection Technologies

Radiographic Inspection Report

CUSTOMER ISTI LOC Catawba DATE 10-8-17 PAGE ___ OF ___

JOB# 6733 PART# J-474 SK#1 P.O. ___

MAT'L CS CODE ASME B-31.3NS PROC.# RT-1 ORIG. FILM ✓ REPAIR FILM ___

TRAVEL MILES ___ TRAVEL HRS. ___ WORK HRS. ___ STANDBY HRS. ___ TOTAL HRS. ___

RADIOGRAPHER Davy Burgett Jr LEVEL II ASSISTANT J. Kennedy LEVEL I

INTERPRETED BY Davy Burgett Jr

TESTING VARIABLES

☑ IR192 ☐ CO60 ☐ X-RAY Ci 80 Kv ___ Ma ___ Focal Spot 1.35

PROCESSING: ☐ MANUAL ☑ AUTOMATIC FILM/CASSETTE 1 ☑ SINGLE FILM ☐ Comp Film

EXPOSURE: ☑ DWE/SWV ☐ DWE/DWV ☐ SWE/SWV

FILM: TYPE F-80 CLASS 2 SENSITIVITY 2-2T

FILM USAGE: 3-1/2 x 8-1/2 ___ 3-1/2 x 10 ___ 3-1/2 x 17 9 4-1/2 x 10 ___
4-1/2 x 17 ___ 7 x 8-1/2 ___ 7 x 17 ___ 8 x 10 ___
14 x 17 ___ 70 MM ___ OTHER ___

	FILM ID	INTERVAL	I.Q.I	SHIM	MAT. THK.	WELD THK.	REINF.	OFD	SOD	DIA.	DEN.	DISCONTINUITIES	ACCEPT	REJECT
1	XR-1 Q8	100%	13F		.5	.625	.125	.625	8"	10"			✓	
2	XR-2 J1	↓	↓		↓	↓	↓	↓	↓	↓			✓	
3	XR-3 H2	↓	↓		↓	↓	↓	↓	↓	↓			✓	
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31												Jonathan Cox L.II		
32														
33														
34														
35														

Sheet #1

Date: 10/8/2017

ISTI Plant Services
Radiography Sheet

Use XR numbers listed

on reader sheets

AIT

Job #	SK#/Desc	Spool #	Weld#	XR #	Welder	Size	Schd.	Comments
6733	SK1	SK1-003	W-1	XR-1	Q8	8"	XH	Good
6733	SK1	SK1-003	W-3	XR-2	J1	8"	XH	Good
6733	SK1	SK1-009	W-4	XR-3	H2	8"	XH	Good

J-447

SK1 Assy
Spools

ISTI
Pressure Test Reports

PLANT SERVICES

PNEUMATIC TEST FORM

TEST PACKAGE # 04

ISTI Client **UOP Russell LLC.**

ISTI Job# **J-6733**

TEST PRESSURE **165** TEST MEDIA **Nitrogen**

PRE-PNEUMATIC

Test Supervisor **Jerry Allen** Date: **10/27/2017**

ISTI Quality Rep. **Rod Holden** Date: **10/27/2017**

PNEUMATIC TEST START Date: **10/27/2017** Time: **10:30 AM**

Test Gauge # **Digital 794845**

PNEUMATIC TEST COMPLETE Date: **10/27/2017** Time: **12:00 PM**

Chart Recorder# **0-1000 psi 265-42857**

Test Supervisor **Jerry Allen** Date: **10/27/2017**

ISTI Quality Rep. **Rod Holden** Date: **10/27/2017**

POST -PNEUMATIC

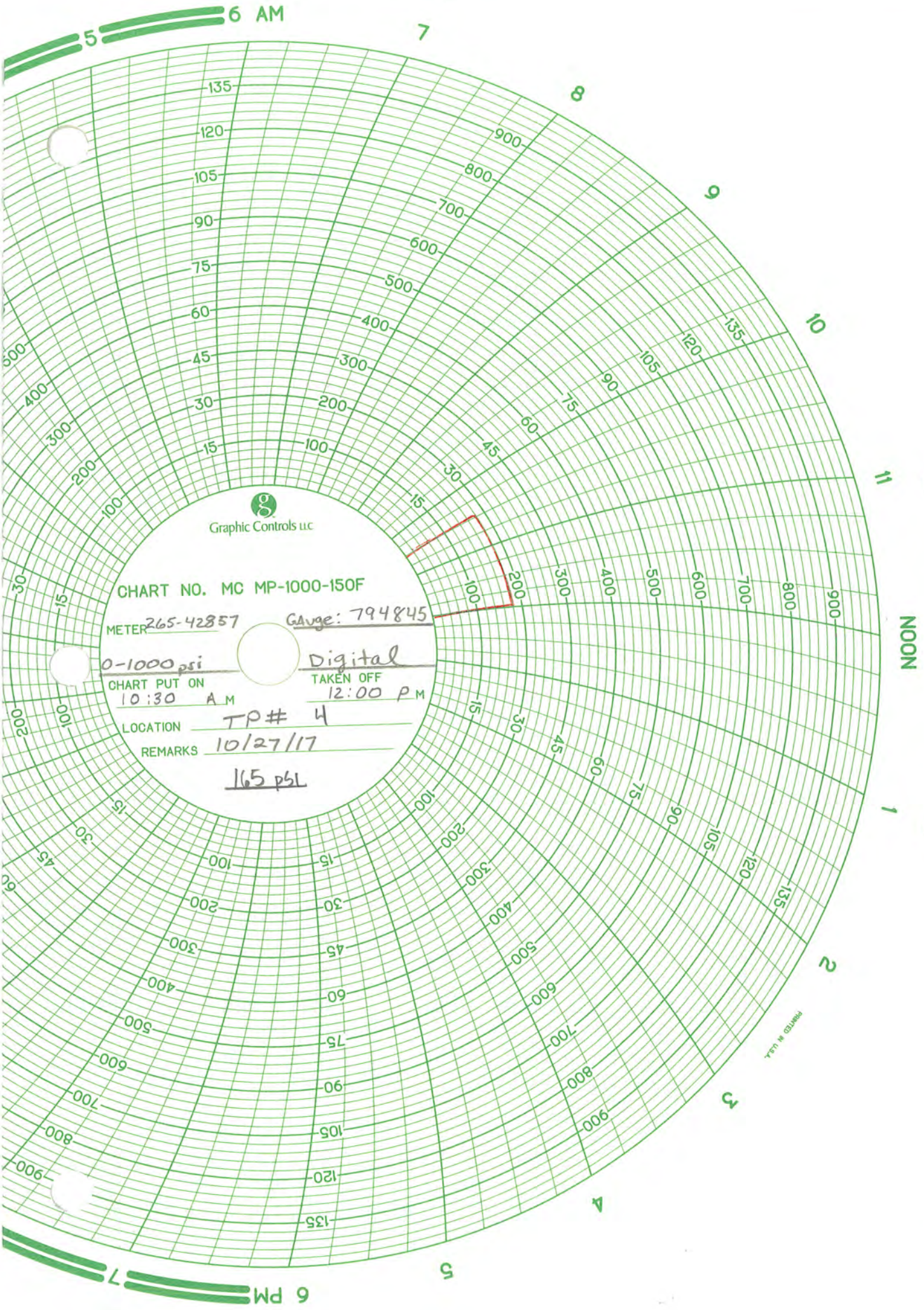
System Piping Dried Date: **10/27/2017**

Test Supervisor **Jerry Allen** Date: **10/27/2017**

ISTI Quality Rep. **Rod Holden** Date: **10/27/2017**

ISTI Plant Services J-6733
Client: UOP Russell

Spool ID	TEST #	Test Date	Test Pressure
SK1-026	TP#4	10/27/2017	165
SK1-031	TP#4	10/27/2017	165


6 AM
NOON
6 PM
Graphic Controls LLC
CHART NO. MC MP-1000-150F
METER 265-42857
Gauge: 794845
0-1000 psi
Digital
CHART PUT ON
10:30 A M
TAKEN OFF
12:00 P M
LOCATION TP# 4
REMARKS 10/27/17
165 psi

PLANT SERVICES

PNEUMATIC TEST FORM

TEST PACKAGE # 05

ISTI Client **UOP Russell LLC.**

ISTI Job# **J-6733**

TEST PRESSURE **1210 psi** TEST MEDIA **Nitrogen**

PRE-PNEUMATIC

Test Supervisor **Jerry Allen** Date: **10/27/2017**

ISTI Quality Rep. **Rod Holden** Date: **10/27/2017**

PNEUMATIC TEST START Date: **10/27/2017** Time: **1:15 PM**

Test Gauge # **Digital** **567628**

PNEUMATIC TEST COMPLETE Date: **10/27/2017** Time: **2:30 PM**

Chart Recorder# **0-2000 psi** **202-21048**

Test Supervisor **Jerry Allen** Date: **10/27/2017**

ISTI Quality Rep. **Rod Holden** Date: **10/27/2017**

POST -PNEUMATIC

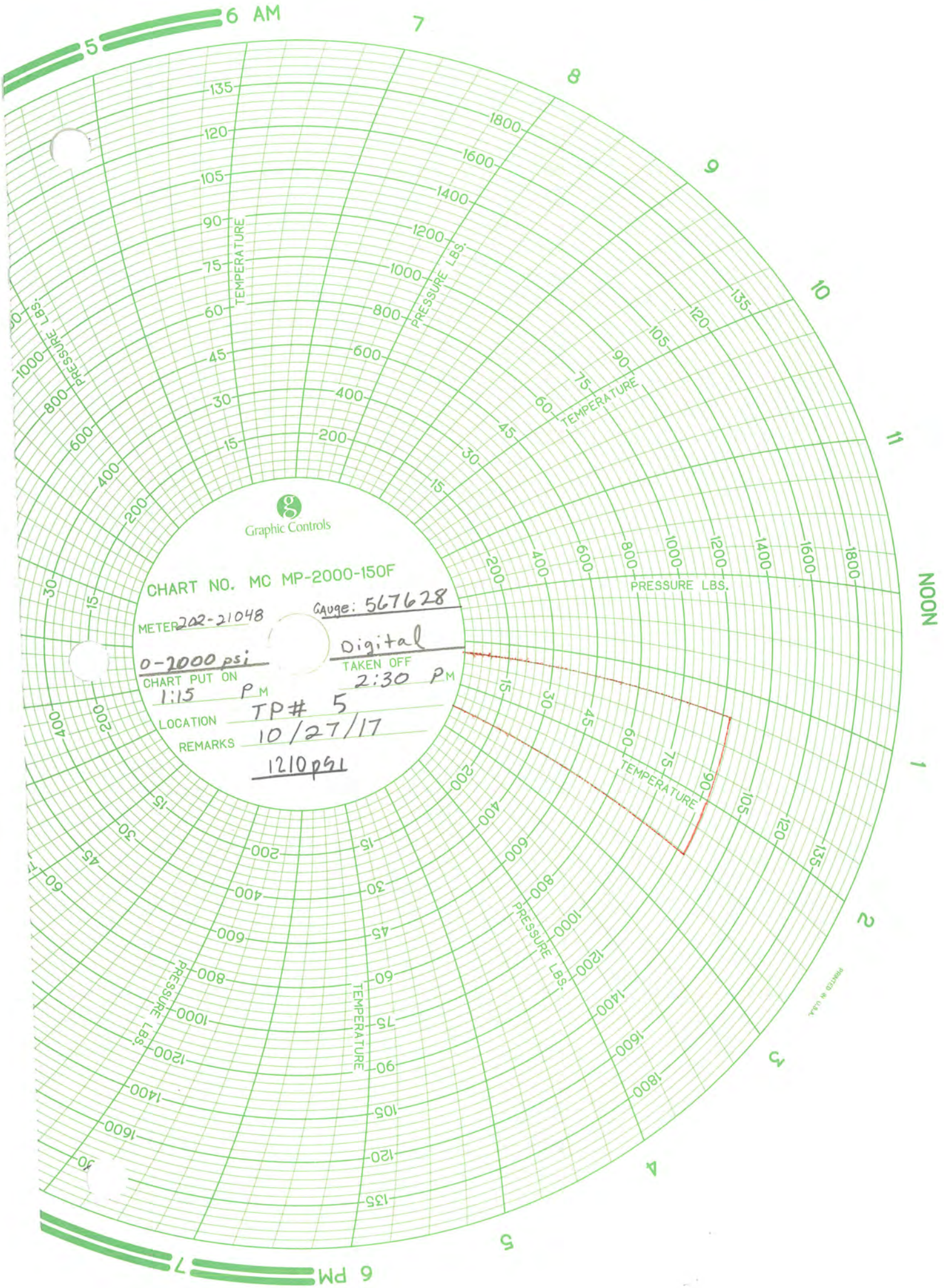
System Piping Dried Date: **10/27/2017**

Test Supervisor **Jerry Allen** Date: **10/27/2017**

ISTI Quality Rep. **Rod Holden** Date: **10/27/2017**

ISTI Plant Services J-6733
Client: UOP Russell

Spool ID	TEST #	Test Date	Test Pressure
SK1-001	TP#5	10/27/2017	1210
SK1-002	TP#5	10/27/2017	1210
SK1-003	TP#5	10/27/2017	1210
SK1-004	TP#5	10/27/2017	1210
SK1-005	TP#5	10/27/2017	1205
SK1-007	TP#5	10/27/2017	1205
SK1-008	TP#5	10/27/2017	1205
SK1-009	TP#5	10/27/2017	1210
SK1-010	TP#5	10/27/2017	1210
SK1-011	TP#5	10/27/2017	1210
SK1-012	TP#5	10/27/2017	1210
SK1-013	TP#5	10/27/2017	1210
SK1-014	TP#5	10/27/2017	1210
SK1-015	TP#5	10/27/2017	1210
SK1-016	TP#5	10/27/2017	1205
SK1-017	TP#5	10/27/2017	1205
SK1-018	TP#5	10/27/2017	1205
SK1-019	TP#5	10/27/2017	1210
SK1-020	TP#5	10/27/2017	1210
SK1-021	TP#5	10/27/2017	1210
SK1-022	TP#5	10/27/2017	1210
SK1-023	TP#5	10/27/2017	1210
SK1-024	TP#5	10/27/2017	1210
SK1-025	TP#5	10/27/2017	1210
SK1-027	TP#5	10/27/2017	1210
SK1-028	TP#5	10/27/2017	1210
SK1-029	TP#5	10/27/2017	1210
SK1-030	TP#5	10/27/2017	1210
SK1-033	TP#5	10/27/2017	1210


6 AM
7
8
9
10
11
NOON
1
2
3
4
5
6 PM
7
Graphic Controls
CHART NO. MC MP-2000-150F
METER 202-21048
Gauge: 567628
Digital
0-2000 psi
CHART PUT ON 1:15 PM
TAKEN OFF 2:30 PM
LOCATION TP# 5
REMARKS 10/27/17
1210psi
PRESSURE LBS.
TEMPERATURE
PRINTED IN U.S.A.

J-447

SK1 Assy
Spools

ISTI
Calibration Certificates

HYDRO-CHART

Calibration → Certification → Repair → Rental

www.hydro-chart.com 7709 E. 42nd Place, Suite 128 Tulsa, OK 74145 918-834-3210

CERTIFICATE OF CALIBRATION

Customer Name:	ISTI
Model:	Barton Pressure/Temperature Recorder
Serial Number:	202-21048
Range:	0 - 2,000 psi / 0 - 150 Deg. F.
Accuracy +/- :	1%
Condition as Left:	Within Tolerance
Date Calibrated:	September 26, 2017
Action Performed:	Calibrated/Certified

Tech: Mark M. Harrison

Authorized Signature: Mark M. Harrison

This certificate applies solely for the equipment listed above.
The primary test and measuring equipment used is calibrated and traceable to the National Institute of Standards and Technology (NIST) United States.

Additel SN: 211H13610038 Asset # 1123679 Due Date: 09/05/2018
Crystal SN: 261773 Asset # 1126050 Due Date: 09/05/2018
Fluke SN: 20000054 Asset # 1141857 Due Date: 10/17/2017

Based on Standard Gravity @72 Deg. F. and 39% Relative Humidity.

CERTIFICATION OF CALIBRATION

THE INSTRUMENTS LISTED BELOW MEET-OR EXCEED PUBLISHED SPECIFICATION AND HAS BEEN CALIBRATED UNDER CONTROLLED CONDITIONS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (FORMERLY N.B.S.). M & M INSTRUMENTS CONFORMS TO ANSI Z540-1.

CERTIFICATION#: 39190

INSTRUMENT MAKE: CRYSTAL DIGITAL TEST GAUGE
MODEL: XP2i
ID#: NONE
S/N: 356841
DATE: 09-21-17
DUE: 09-21-18
HUMIDITY: 63.2% TEMPERATURE: 74.18 DEG F

SOURCE 1: PRESSUREMENTS W2000/3HP — CERT#: 2103511
SOURCE 2: — CERT#:
SOURCE 3: — CERT#:

INSTRUMENT RECEIVED: IN TOL.

MANUFACTURER ACCURACY: +/-0.1% RDG. 20-100%F.S., +/-0.02%F.S. 0-20%F.S.

COMMENTS:

CERTIFIED BY EP

M & M INSTRUMENTS

5022 SYCAMORE AVE.

PASADENA, TX 77503

PHONE (281) 991-5036
FAX (281) 991-5077

TechCal
Established 1984

Tech Cal Recorder™
Certificate of Calibration

This is to certify that this pressure and/or temperature recorder has been manufactured and calibrated in accordance with Technology & Calibrations, Inc.'s quality assurance program, current revision. All measurements are traceable to the National Institute of Standards and Technology (NIST) and certified in accordance with ANSI/NCSL, Z540-1 and ISO 10012-1. All calibrations performed at 72 degrees Fahrenheit, plus or minus 4 degrees and less than 65% relative humidity. The collective uncertainty of the measurement standard does not exceed 25% of the acceptable tolerance for each characteristic of the measuring and test equipment being certified.

Model Number: 2B1T0 Serial Number: 08176

Pen 1 Range: 1,000 PSI Pen 2 Range: 0-150 Deg. F Pen 3 Range: N/A

The Accuracy of this Recorder is +/- 0.5% of Indicated Range

Date of Calibration: Sep 8, 2017

Customer "In Service Date": _____

Calibration Due Date: _____

Technician: M. Rosales QA Approval: _____

This certificate shall not be reproduced except in full, without the written approval of Tech Cal.

WARRANTY

Tech Cal Recorders are warranted against defective materials or workmanship for 12 months following the date of shipment. Technology & Calibration, Inc.'s liability is limited to repair or replacement at the factory. No obligation can be assumed for recorders subjected to misuse or unauthorized repairs.

HYDRO-CHART
Calibration → Certification → Repair → Rental

www.hydro-chart.com 7709 E. 42nd Place, Suite 128 Tulsa, OK 74145 918-834-3210

CERTIFICATE OF CALIBRATION

Customer Name:	ISTI
Model:	Barton Pressure/Temperature Recorder
Serial Number:	202A-40940
Range:	0 - 1,000 psi / 0 - 150 Deg. F.
Accuracy +/- :	1%
Condition as Left:	Within Tolerance
Date Calibrated:	September 5, 2017
Action Performed:	Calibrated/Certified

Tech: Mark M. Harrison

Authorized Signature: Mark M. Harrison

This certificate applies solely for the equipment listed above.
The primary test and measuring equipment used is calibrated and traceable to the National Institute of Standards and Technology (NIST) United States.
Crystal Engineering SN: 070569 Asset# 1121166 Due Date: 11/10/2017
Fluke SN: 20000054 Asset # 1141857 Due Date: 10/17/2017
Based on Standard Gravity @72 Deg. F. and 39% Relative Humidity.

HYDRO CHART
Calibration → Certification → Repair → Rental

www.hydro-chart.com 7709 E. 42nd Place, Suite 128 Tulsa, OK 74145 918-834-3210

CERTIFICATE OF CALIBRATION

Customer Name:	ISTI
Model:	Barton Pressure/Temperature Recorder
Serial Number:	242A-4998
Range:	0 - 2,000 psi / 0 - 150 Deg. F.
Accuracy +/- :	1%
Condition as Left:	Within Tolerance
Date Calibrated:	September 5, 2017
Action Performed:	Calibrated/Certified

Tech: Mark M. Harrison

Authorized Signature: Mark M. Harrison

This certificate applies solely for the equipment listed above.
The primary test and measuring equipment used is calibrated and traceable to the National Institute of Standards and Technology (NIST) United States.
Crystal Engineering SN: 070569 Asset# 1121166 Due Date: 11/10/2017
Fluke SN: 20000054 Asset # 1141857 Due Date: 10/17/2017
Based on Standard Gravity @72 Deg. F. and 39% Relative Humidity.

CERTIFICATION OF CALIBRATION

THE INSTRUMENTS LISTED BELOW MEET-OR EXCEED PUBLISHED SPECIFICATION AND HAS BEEN CALIBRATED UNDER CONTROLLED CONDITIONS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (FORMERLY N.B.S.). M & M INSTRUMENTS CONFORMS TO ANSI Z540-1.

CERTIFICATION#: 38889

INSTRUMENT MAKE: CRYSTAL DIGITAL TEST GAUGE
MODEL: XP2i
ID#: NONE
S/N: 567628
DATE: 07-27-17
DUE: 07-27-18
HUMIDITY: 55.6% TEMPERATURE: 78.00 DEG F

SOURCE 1: PRESSUREMENTS W2000/3HP — CERT#: 2103511
SOURCE 2: — CERT#:
SOURCE 3: — CERT#:

INSTRUMENT RECEIVED: IN TOL.

MANUFACTURER ACCURACY: +/-0.1% RDG. 20-100%F.S., +/-0.02%F.S. 0-20%F.S.

COMMENTS: REPLACED SENSOR AND BATTERIES.

CERTIFIED BY EP

M & M INSTRUMENTS

5022 SYCAMORE AVE.

PASADENA, TX 77503

PHONE (281) 991-5036
FAX (281) 991-5077

Crystal Engineering Corporation
708 Fiero Lane, Suite 9
San Luis Obispo, CA 93401

TEL 805.595.5477 · FAX 805.595.5466
crystalengineering.net

Report Number: 271065

Certificate of Calibration

Calibrations comply with ISO/IEC 17025:2005 and ANSI NCSL Z540-1-1994

ACCREDITED
CALIBRATION CERT #2601.01

Device Information	
Model	5KPSIXP2I
Serial Number	794845
Water Column (@ 1 Atm)	4° C
Calibration Date	11 July 2017
Verification Date	12 July 2017
As Received Condition	New
As Left Condition	In Tolerance

Laboratory Conditions	
Laboratory ambient conditions throughout this calibration	
Temperature	19 to 23° C
Humidity	20 to 60% RH

Definitions

Temperature ..... Measured temperature of Device Under Test (DUT) during data collection.
Reference Reading .... True value according to our reference standards.
Indicated Reading ..... Displayed reading from test unit.
Condition ..... Pass or Fail.
Difference ..... Indicated reading minus reference reading.
Relative Difference ..... (Difference / reference reading) x 100.
Allowable Tolerance .... ± according to manufacturer's specifications.
Pressure Medium ..... Nitrogen.

Traceability Statement

Reference Standards used in this calibration are traceable to the National Institute of Standards and Technology of the United States (NIST) or other NMI.

System Expanded Uncertainty

System expanded uncertainty evaluation includes the calibration reference used and device under test and is calculated in accordance with ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainties reported represent expanded uncertainties using a coverage factor (k) to approximate a percentage (%) confidence level. *In Tolerance* or *Pass* conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. Test methods defined by COI-054.

Coverage Factor (k)	2
Confidence Level (%)	~ 95

Traceable Reference Standards				
Manufacturer	**Calibration Reference Used**	**Serial Number**	**Report No.**	**Reference Cal. Due**
DHI	PPCH-G 618 10KPSI Pressure Controller	618	16028	19 November 2017

Laboratory Representative
Tony Ly

Quality Representative
Bruce Hitt

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Crystal Engineering Corporation, is ISO 9001:2008 Quality Management System Certified by Intertek, Certificate No. QMS 1058.

AMETEK®
TEST & CALIBRATION INSTRUMENTS

Crystal pressure

Crystal Engineering Corporation
708 Fiero Lane, Suite 9
San Luis Obispo, CA 93401

TEL 805.595.5477 · FAX 805.595.5466
crystalengineering.net

Report Number: 270667

Certificate of Calibration

Calibrations comply with
ISO/IEC 17025:2005 and
ANSI NCSL Z540-1-1994

ilac-MRA

ACCREDITED
CALIBRATION CERT #2601.01

Device Information	
Model	5KPSIXP2I
Serial Number	794666
Water Column (@ 1 Atm)	4° C
Calibration Date	06 July 2017
Verification Date	06 July 2017
As Received Condition	New
As Left Condition	In Tolerance

Laboratory Conditions	
Laboratory ambient conditions throughout this calibration	
Temperature	19 to 23° C
Humidity	20 to 60% RH

Definitions

Temperature ... Measured temperature of Device Under Test (DUT) during data collection.
Reference Reading .... True value according to our reference standards.
Indicated Reading ..... Displayed reading from test unit.
Condition ..... Pass or Fail.
Difference ..... Indicated reading minus reference reading.
Relative Difference ..... (Difference / reference reading) x 100.
Allowable Tolerance .... ± according to manufacturer's specifications.
Pressure Medium ..... Nitrogen.

Traceability Statement

Reference Standards used in this calibration are traceable to the National Institute of Standards and Technology of the United States (NIST) or other NMI.

System Expanded Uncertainty

System expanded uncertainty evaluation includes the calibration reference used and device under test and is calculated in accordance with ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainties reported represent expanded uncertainties using a coverage factor (k) to approximate a percentage (%) confidence level. *In Tolerance* or *Pass* conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. Test methods defined by COI-054.

Coverage Factor (k)	2
Confidence Level (%)	~95

Traceable Reference Standards				
Manufacturer	**Calibration Reference Used**	**Serial Number**	**Report No.**	**Reference Cal. Due**
DHI	PPCH-G 618 10KPSI Pressure Controller	618	16028	19 November 2017

Laboratory Representative
Tony Ly

Quality Representative
Bruce Hitt

This certificate shall not be reproduced except in full, without written approval of Crystal Engineering Corporation, a part of Ametek, Incorporated.

HYDRO CHART

Calibration → Certification → Repair → Rental

www.hydro-chart.com 7709 E. 42nd Place, Suite 128 Tulsa, OK 74145 918-834-3210

CERTIFICATE OF CALIBRATION

Customer Name:	ISTI
Model:	Barton Pressure/Temperature Recorder
Serial Number:	265-42857
Range:	0 - 1,000 psi and 0 - 150° F.
Accuracy +/- :	1%
Date Calibrated:	June 19, 2017
Condition as received:	Could not test - Clogged Tube
Condition as left:	Within Tolerance
Action Performed:	Calibrated/Certified

Tech: Mark M. Harrison

Authorized Signature: Mark M. Harrison

This certificate applies solely for the equipment listed above. Calibration is performed on-site at 7709 E. 42nd Place #128, Tulsa OK, 74145.

The primary test and measuring equipment used is calibrated and traceable to the National Institute of Standards and Technology (NIST) United States.

Additel SN: 211H136100338 Asset # 1123679 Due Date: 08/23/2017

Fluke SN: 20000054 Asset # 1141857 Due Date: 10/17/2017

Based on Standard Gravity @72 Deg. F. and 39% Relative Humidity.

HYDRO CHART
CALIBRATION SERVICES

7709 EAST 42nd PLACE, SUITE 128 TULSA, OK 74145 918-834-3210

CALIBRATION CERTIFICATION

We certify the instrument identified below has been tested using precision Standards traceable to NIST and the accuracy found is attested to below:

CUSTOMER PIPELINE SUPPLY & SERVICE

MODEL Crystal Engineering XP2i Digital Test Gauge

SERIAL NUMBER 576360

RANGE 0 - 5,000 psi

ACCURACY +/- 0.1 %

CALIBRATED BY Mark M. Harrison Mark M. Harrison

DATE March 27, 2017

The primary test and measuring equipment used is calibrated and traceable to NIST (National Institute of Standards and Technology) United States

Additel SN 211H136100338 Asset # 1123679 Due Date: 08/23/2017

Fluke SN: 20000054 Asset # 1141857 Due Date: 10/17/2017

Based on Standard Gravity @72 Deg. F and 39% Relative Humidity

HYDRO-CHART
CALIBRATION SERVICES

7709 EAST 42nd PLACE, SUITE 128 TULSA, OK 74145 918-834-3210

CALIBRATION CERTIFICATION

We certify the instrument identified below has been tested using precision Standards traceable to NIST and the accuracy found is attested to below:

CUSTOMER ISTI

MODEL Barton Pressure / Temperature Recorder

SERIAL NUMBER 202A - 156510

RANGE 0 - 3,000 psi and 0 - 150° F.

ACCURACY + / - 1 %

CALIBRATED BY Mark M. Harrison Mark M. Harrison

DATE February 6, 2017

The primary test and measuring equipment used is calibrated and traceable to NIST (National Institute of Standards and Technology) United States

Additel SN 211H136100338 Asset # 1123679 Due Date: 08/23/2017

Fluke SN: 20000054 Asset # 1141857 Due Date: 10/17/2017

Based on Standard Gravity @72 Deg. F and 39% Relative Humidity