



the pressure equipment safety authority

PRESSURE PIPING CONSTRUCTION AND TEST DATA REPORT

In accordance with the provisions of the PESR Section 31(1)

Shop Construction ☒; Field Construction ☐;Final Data Report ☒; Partial Data Report ☐ (from one ABSA- authorized Contractor to another ABSA- authorized Contractor).

Complete both sides of this Form

1. Constructed By: NWP Industries Inc Owner's Job No: 08806-002

(Name of ABSA authorized primary contractor or subcontractor)

4017 60th Ave Innisfail AB T4G 1S9

(Address)

Certificate of Authorization Permit No. AQP-1253 Expiry Date: Nov 24, 20142. Constructed For: NA

(Name of primary contractor if different from above)

NA

(Address)

Certificate of Authorization Permit No. AQP-NA Expiry Date: NA

(Required when the primary contractor undertakes some/all of the quality functions, e.g., NDE, PWHT, Tie-in, fabrication, hydro test, final assembly etc.)

3. Owner: Encana Corporation 500 Center ST SW Calgary AB T2G 1A6

(Name and address)

500 Center ST SW Calgary AB T2G 1A6

(Location of installation)

Certificate of Authorization Permit No. AQP- NA Expiry Date: NA

(Required when the owner undertakes some/all of the quality functions, e.g., NDE, PWHT, Tie-in, fabrication, hydro test, final assembly etc.)

4. Piping Design Alberta Registration No.: PP-NA(Required if aggregate piping volume is over 0.5m³)5. Design Responsibility: Owner ☐; Contractor ☒6. WP No.: WP-1604.2; Company: NWP Industries Inc Owner's WP No. (If used): WP-NA

(Alberta Registration No.)

(Alberta Registration No.)

WPS No(s). used: NWP-4 Rev4; Owner's WPS No(s). (If used): NA7. Code: ASME B31.1 Non Boiler External Piping ☐; ASME B31.1 Boiler External Piping ☐;B31.5 ☐; B31.9 ☐; CSA Z662 Steam Pipelines ☐;ASME B31.3 ☒ - Service Category: Normal ☒, D ☐, M ☐, High Pressure ☐; Severe Cyclic Condition ☐High Purity ☐

Drawing No. Rev. No. Line No.	Fluid (Air/Stm. Etc.)	Des. Press. psi	Des. Temp. ^o F (Max. & Min.)	Pressure Test psi	Test Medium	Pipe Mat'l Spec. & Grade	C.A. in	Pipe NPS & Schedule	Flange Material & Rating	PWHT/ Preheat Temp. ^o F	NDE
08562-2A Rev 0											
PF-4"-I- XXHBD-100	Hydrocarbons	5171	200/-49	7757	Water	SA333-6	1/16	4" SCH XXH	SA350LF2 CL2500	1160/50	100%RT 10%HT
PF-4"-I- XXHBD-101	Hydrocarbons	5171	200/-49	7757	Water	SA333-6	1/16	4" SCH XXH	SA350LF2 CL2500	1160/50	100%RT 10%HT
		150	200/-49	165	Air	316SS	0	3/8".035" WT	NA	NA/NA	Visual
PF-4"-I- XXHBD-103	Hydrocarbons	5171	200/-49	7757	Water	SA333-6	1/16	4" SCH XXH	SA350LF2 CL2500	1160/50	100%RT 10%RT
PF-4"-I- XXHBD-104	Hydrocarbons	5171	200/-49	7757	Water	SA333-6	1/16	4" SCH XXH	SA350LF2 CL2500	1160/50	100%RT 10%RT
FG-1"-C- 80A/BD-300	Hydrocarbons	150	200/-49	165	Air	SA333-6	1/16	1" SCH80	NA	NA/NA	10%RT
FG-1"-C- 80AD-302	Hydrocarbons	150	100/-20	165	Air	SA106B	1/16	1" SCH80	NA	NA/NA	10%RT
D-3/4"-C- 80A/BD-250	Hydrocarbons	150	100/-20	165	Air	SA106B	1/16	1" SCH80	NA	NA/NA	10%RT

Constructed by: NWP Industries IncOwner's Job # 08806-002

Page 1 of 3

FG-1"-C-80AD-303	Hydrocarbons	150	100/-20	165	Air	SA106B	1/16	1" SCH80	NA	NA/NA	10%RT
FG-1"-C-160A-BE-301	Hydrocarbons	1440	200/-20	2160	Water	SA106B	1/16	1" SCH160	NA	NA/50	10%RT 10%MT
FG-1"-C-80A/BD-304	Hydrocarbons	150	100/-20	165	Air	SA106B 316SS	1/16 0	1" SCH80 3/8" .035" WT	NA NA	NA/NA NA/NA	10%RT Visual



Partial Data Reports certified by sub-contractors are listed below and attached to this Data Report ☐

No.	Line No.	Spool No.	Dwg. No. (with Rev. No.)	Sub-contractor (Name)	AQP No. (if from Alberta)	Expiry (if from Alberta)

Remarks: For partial data report provide information about the code work that was not completed by the subcontractor (e.g., hydrostatic test, PWHT etc.). For final data report provide information about the code work that was not completed by subcontractors and subsequently completed by the primary contractor (e.g., hydrostatic test of entire assembly, PWHT etc.)

Endorse certificate 'A' or 'B'

A. CERTIFICATE OF COMPLIANCE

Signed by the subcontractor when supplying this certificate as a
Partial Data Report

We certify that the statements in this Data Report are correct and that materials, construction and workmanship of the piping fabrication conform to the registered quality system and the applicable Piping code(s).

Date: _____

Contractor

Print Authorized Representative's Name

Signature

This certificate is not valid unless it forms part of a Final Data Report signed by Primary Contractor

B. CERTIFICATE OF COMPLIANCE

Signed by the primary contractor when supplying this certificate as a
Final Data Report

We certify that the statements in this Data Report are correct and that piping job no. 08806-002 described in this Data Report was constructed in accordance with the Province of Alberta Safety Codes Act and Regulations, and applicable ASME Piping Code(s).

Date: July 30, 2013 NWP Industries Inc

Contractor

Colleen Tysoe

Print Authorized Representative's Name

Signature

CERTIFICATE OF INSPECTION

I, the undersigned, employed by Encana Corporation have verified that all required examination and testing has been completed, and inspected the piping described in this construction data report to the extent necessary to be satisfied that it conforms to all applicable examination requirements of the Code and of the engineering design, and state that, to the best of my knowledge and belief, the contractor has constructed this piping in accordance with the Alberta Safety Codes Act and Regulations. By signing this certificate neither the inspector nor his or her employer makes any warranty, expressed or implied, concerning the piping described in this construction data report. Furthermore, neither the inspector nor his or her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date: July 30, 2013

Date: _____

Kevin Fundytus

Owner's Inspector Name (please print)

ABSA Safety Codes Officer (please print)
(BOILER EXTERNAL PIPING ONLY)

[Signature]
Owner's Inspector Signature:

[Signature]
ABSA Safety Codes Officer's Signature

Current version of this Form may be obtained from www.absa.ca

ACCEPTANCE / REJECTION REPORT
FACILITIES ENGINEERING DEPARTMENTPage 1 of 1Vendor NWP Industries Vendor Rep. (print) Colleen Tysoe Vendor Shop No. N/AProject Name 4 x 3.0mm Line Heater Assemble Project No. N/A A.F.E. No. N/A P.O. No. PO44501Material Description: 1 x 3.0 MM BTU Metering/Line Heater Pkg. - Unit Tag 8806-002Status ☒ Conditional Acceptance (explain below) ☐ Rejected (explain below)

Item No.	Description
1	All documentation to be reviewed and accepted by the client.
2	All required QC documentation to be shipped with unit as per client requirements.
3	All skid edge openings to be sealed for shipping as per EnCana specifications.
4	All piping and instrumentation to comply to EnCana's specifications as stated in the PO.
5	All piping to be level and square, tube fittings removed for testing (on solinoids and ACL gas train) to be installed and tightened prior to shipping.
6	Paint touch-ups & caulking to be completed on all building penetrations & around hatch.

QUALITY INSPECTOR ACKNOWLEDGES:

Signing this release is solely for the purpose of authorizing the supplier to ship the goods in accordance with the order. Such authorization shall not relieve the supplier of its obligations set out in the purchase order, including without limitation the warranty that the goods are free from defects.

SUPPLIER'S CONFORMANCE STATEMENT: *We certify that the PO items listed, and the required QC / Shipping documentation meet or will meet the requirements at our costs all applicable Code, Standards, specification and other related documents as set forth in the purchase order document.*

The accepted preliminary QC documentation, bill of lading, packing slip, and all related shipping documents must accompany the shipped goods and be added as a line item on the packing list.

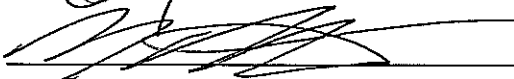
Vendor Rep. Signature



Date

July 30, 13

Inspectors Signature



Date

July 30/13

Issuing Authority: Marvin J. (Ty) DeBelser		Quality Control
Date of Issue: March 13, 2008		QCFO Final Inspection Release Certificate R00

FINAL INSPECTION RELEASE CERTIFICATE

CUSTOMER: Encana Corporation		
PRODUCT: 3.0 MM BTU/HR LINEHEATER PACKAGE	WO#: 08806-002	
		DATE: JUL 31 2013

FINAL INSPECTION DOCUMENTATION

REVIEWED BY:	ACCEPTED:	REJECTED:
STANDARD DOCUMENTATION REQUIREMENTS: (SEE DOCUMENT REQUIREMENT LIST)		
ADDITIONAL DOCUMENT REQUIREMENTS: (TO BE RECORDED HERE IF APPLICABLE I.E. DOCUMENT PACKAGE REQUIRED BY CUSTOMER ETC.)		

Q.C. FILE CLOSURE BY: <i>Karla Fox</i>	DATE: <i>AUG 8 2013</i>
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LOOSE COMPONENTS REQUIRED / PREPARED

ITEMS REQUIRED:	NO. OF BOXES OR PKGS. _____
<i>3.0 mm btu lineheater pkg</i>	
ADDITIONAL HARDWARE OR FASTENERS REQUIRED	YES ☒ NO ☐

PREPARATION FOR SHIPMENT / STORAGE

PREPARATION NEEDED / COMPLETED
<i>Ready to ship.</i>
S/N # NWP-08806-002
INVENTORY TAGS ATTACHED YES ☒ NO ☐

SHIPPING INSTRUCTIONS

CUSTOMER P.O. REVIEWED YES ☐ N/A ☒	
CONTACT PERSON AUTHORIZED TO RELEASE PRODUCT: _____	
PHONE: _____ FAX: _____	
RELEASED TO INVENTORY: <i>[Signature]</i>	DATE: _____
RELEASED TO CUSTOMER: <i>[Signature]</i>	DATE: JUL 31 2013

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: March 30 2012		FORM_NDE_001
Rev Status: 2.0		N.D.E Requirements

N.D.E Requirements

Client: Encana

JO# 08806-002

Project: Threaded Piping – 3.0 mm Lineheater

Date: 15/07/2013

Piping: ☒

Pressure Vessel: ☐

Tank: ☐

Other:

- ☐ X-Ray
☒ Gamma Ray
☐ Ultrasonics
☐ Liquid Penetrant
☐ Magnetic Particle
☐ Accoustic Emission
☐ Hardness test Max 200 BHN

- ☒ 100%
☐ Full
☐ 25%
☒ 10%
 Other(Define)
☐ Spot

- ☐ ASME Section VIII-UW-51
☐ ASME Section VIII-UW-52
☐ Customer Specification
☐ ASME B31.3 NFS
 Other (Specify)
☒ Customer Spec
☐ CSA W47.1/W59

General Instructions:

Vessel S/N

P1 Material

Welder ID

Shell-T=

Pipe-T= 1" XH

Total Welds 11 x threaded shots as per attached drawings (first # is XT-1)

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots 11

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero UC and Zero IP
 Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
 Encana Spec for Threaded Piping- acceptance is 7 threads engaged
 HT is a 5 Point Traverse

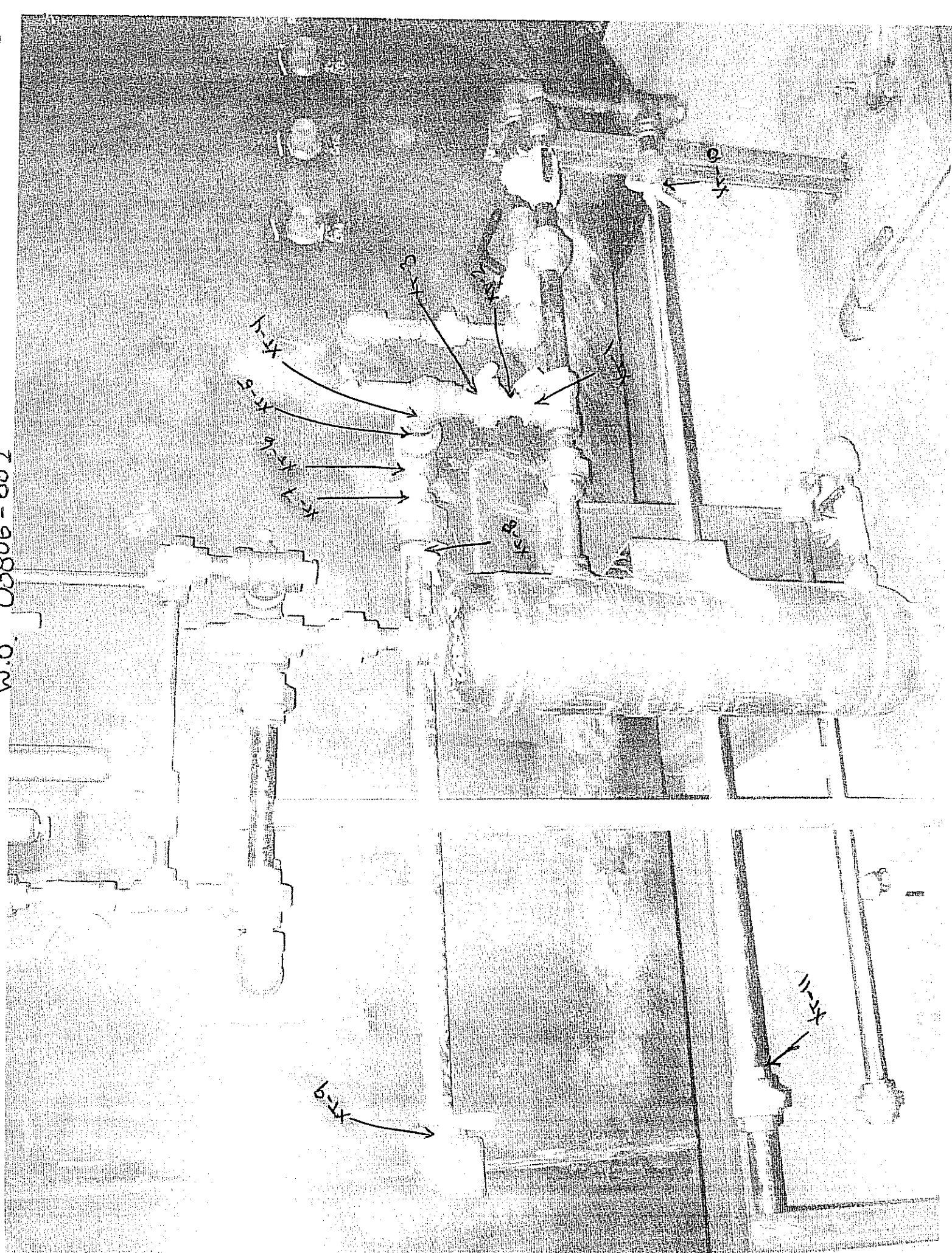
Prepared By: Lance Raven

Date: 15/07/2013

Job / P.O. #: 08806-002 IRISNDT #: 4227 Date: 15-Jul-13
Client: ENCANA C/O NWP
Location: INNISFAIL, AB
Item Inspected: Threaded - 3.0MM LINE HEATER Material: P1

(201) 476-4444
(713) 722-7177
(918) 448-8773

700-90800
W.O.



PNEUMATIC TEST AFFIDAVIT

Customer: Encana Corporation

Project: Fire Tube

Test Pressure: 24 oz

Code Requirements: CSA W47.1 and W59

Product Description:JO# 08806-002-D

Project#

Hold Time: AS REQUIREDDate: 17/07/2013Tank Serial # 08806-002-D

DWG#

REV#

Test-

#1.All Welded Connections

NO LEAKS

Repairs

Ground to sound metal by:	Repair preparation. QC witness by:
Reweld using E7018. QC:	Repaired by:
Procedure approved by QC:	Completed repair checked by QC:

Additional Comments

PSV Used:	Range:	Calibration Due:
<u>014391-676</u>	<u>0003</u>	<u>Sept-10/13</u>

Test #	Test By:	Q.C.	Date	Test Gauge ID.	Range	Calibration Due:
1	<u>CD</u>	<u>EF</u>	<u>JULY 17.13</u>	<u>NWPG- 117 119</u>	<u>0-5 PSI</u>	<u>Sept-27/13 E Dec 27/13</u>
Test(s) Approved By: <u>Ceri Steen</u>				Date: <u>17/07/2013</u>		



Box 6280, 4017-60th Avenue, Innisfail, AB T4G 1S6 Phone: 403.227.4100 Fax: 403.227.4102
www.nwip.ca

SHIPPING MANIFEST FOR SHIPPED LOOSE ITEMS

Work Order # 8806 Serial Number: 06506-002
Description of Product: 3.0 mm Lineheater Package
Completed By: Colleen Tysoe Date: July 31, 2013

QTY	UNIT	ITEM DESCRIPTION
	in cabinet	
2	ea	R38 ring gaskets
1	ea	30 psi gauge
1	ea	1500 psi gauge
1	ea	10000 psi gauge
1	ea	stack gasket
1	ea	filter cartridge
18	ea	1.5" x 11" studs with nuts
20	ea	stack bolts with nuts
1	ea	length of 1/2" tubing
1	set	components for choke
	in firelube	
5	lengths	tubing of various shapes
	in yard	
1	ea	MasterFlo choke
1	ea	vent stack
3	ea	Flare Bolts

a third party release certificate required
 I parts are boxed/on pallets
 there is no visible Damage
 I openings are plugged

Yes ☒ No ☐
 Yes ☒ No ☐
 Yes ☒ No ☐
 Yes ☒ No ☐

Signature by QC: [Signature]
 Signature by Assembly Worker:
 Signature by Warehouse Personnel:

Date: July 31, 13
 Date:
 Date:

NWP INDUSTRIES INCORPORATED

SKIDDED EQUIPMENT TRAVEL SHEET

APPROVED BY:

DATE:

JUN 18 2013

WO #: 08806-002

DESCRIPTION: 3.0 MM BTU/HR LINEHEATER PACKAGE

DRAWING #:

08806-001-004-P-001 REV 0; 08806-001-004-G-001 REV 0; 08562-2B REV 0

	REQ.	HOLD	EMPLOYEE INT.	DATE COMPLETE	QC INIT.	DATE
QUOTATION REVIEWED	✓					
WORK INSTRUCTIONS ISSUED	✓					
WORK INSTRUCTIONS REVIEWED	✓	✓				
ABSA NOTIFIED FOR INSTALLATION INSPECTION	NA					
MATERIAL & PARTS RELEASED	✓	✓				
HYDRO TEST PIPING	✓	✓				
INSTRUMENTATION	✓		TA	July 30/13		
PNEUMATIC LEAK TEST	✓	✓	TA	July 30/13		
INSTRUMENTATION VALVES/FUNCTION TEST	✓		TA	July 30/13		
VISUAL INSPECTION P & ID CHECKED	✓	✓				
VISUAL INSPECTION OF BUILDING & RECEIVING OF P.O.	✓					
ANY CHANGE ORDERS VERIFIED COMPLETE	✓	✓				
PREPARED FOR SHIPMENT & PACKAGE LOOSE ITEMS, TEST, CRATED AND DOCUMENTED	✓	✓				
VISUAL INSPECTION AFTER PAINT & RECEIVING OF P.O.	✓	✓				
PACKAGING / PRESERVATION REQUIREMENTS COMPLETE	✓	✓				
SERVICING REQUIREMENTS DEFINED AND APPROVED	NA					
QC INSPECTION & FINAL RELEASE AND STICKER ATTACHED	✓					

ACCEPTED BY CUSTOMER

DATE

**Project Data List
Work Orders 08806**

ORIGINAL

May 9, 2013

Project Coordinator : Shannon Fischer

Sales Rep : Brent Warner

Quote Reference: QUOTE # 1522

Client: **Encana Corporation**
c/o Solaris Management Consultants Inc.
5588 Panorama Drive
Surrey, BC
V3S 1B7

Contact: **Justin Zacharias**
Email: Justin.Zacharias@encana.com
Phone: 403.645.4921

Customer P.O.: PO44501

3.0 MM BTU Lineheater Package

GENERAL DESCRIPTION

Quantity	Description
4	3.0 MM BTU Lineheater Package • 4 Sch XXH, 2500# RTJ x 2500# RTJ Preheat Coil, sour service • 4 Sch XXH, 2500# RTJ x 2500# RTJ Reheat Coil, sour service • 4" ANSI 2500# RTJ MasterFlo Choke Valve • Skidded, Insulated with Instrument Enclosure • W/ Instrumentation, Burner, Fire Tube, and Stack • Delivery: First Unit July 12 and one every two weeks following • Encana MSSA # 101012 • Vendor # 216051 • Ex Works: Innisfail, Alberta

AS BUILT

8806-002 JUN 18 2013

ORIGINAL

1.0 VESSEL

1.1 GENERAL DESCRIPTION

Tag #: V-100

- 72" OD x 24'-0" Long
- Horizontal design
- 24" Sch 10, 0.250" wall, SA-53-ERW removable non code firetube, Flux Rate: 10,000 BTU/ft²
- Rated at 3,000,000 BTU / Hr
- 24" Ø x 0.250" wall firetube stack
- 24" Ø x 120" Surge Tank c/w Thief Hatch, Wenco, 16 oz pressure, 0.4 oz vacuum (TH 100)
- Two Support Saddles
- One Expansion Tank Access Ladder
- "D" Shape Coil Inspection Opening

2.0 COIL

- One (1) 4" Sch XXH, SA333-Gr6, 10 pass (260 ft²) preheat coil with Class 2500 RTJ flanged outer ends, 5171 PSIG @ -20° to 200° F, 100% Radiography, Post Weld Heat Treat, 1/16" C.A., constructed in accordance with ASME B31.3 Normal Fluid Service.
CRN: Alberta, British Columbia, Saskatchewan
- One (1) 4" Sch XXH, SA333-Gr6, 6 pass (170 ft²) reheat coil with Class 2500 RTJ flanged outer ends, 5171 PSIG @ -20° to 200° F, 100% Radiography, Post Weld Heat Treat, 1/16" C.A., constructed in accordance with ASME B31.3 Normal Fluid Service.
CRN: Alberta, British Columbia, Saskatchewan

Heater is packaged in accordance with ASME Section VIII / B31.3

3.0 PIPING

- Fuel Gas Preheat Line – 1" Sch 160, SA-106-B, 6000# fittings
- Fuel Gas Thread Piping – 1" NPT Sch 80, SA-106-B, 6000# fittings
- Coil Tie In Spool - 4" Sch XXH, SA-350-LF2/SA420-WPL6 Spool Piece with Class 2500 RTJ flanged outer ends to tie in one 4" choke valve between coils.

4.0 INSTRUMENTATION

Tag #	Quantity	Description
BE 200	(1)	Burner – Wenco (or equal) Model SB 42/24-24 Flame Arrested Burner, 3,000,000 BTU/HR (net) 2 piece aluminum construction to fit a 24" fire tube c/w 42" Flame cell element (2) ACL-M2000 air/gas mixers (2) ACL-B20016 venturi barrels, ACL-2XON220024 High Efficiency burner nozzle. 2" Peepsite (PS 300)

AS BUILT

8806-002 JUN 18 2013

ORIGINAL

BMC 100	(1)	Burner Ignition Controller - ACL Model 5500 Microprocessor based flame fail/ignition system with auto relight, shutdown input, remote stop and remote start, proof of closure contacts and alarm output relay. 24 VDC operation Speed control valve 1/4" x 1/4" F x F NPT (SC101) CSA approved for Class 1, Div 2 location CSA approved C22.2 No 199-M89. Combustion Safety Controls and Solid State Ignitors for Gas & Oil Burning Equipment. Meets and exceeds CSA B149.3 guidelines. NEMA 4x enclosure, corrosion resistant and weather proof
EY 100	(1)	ASCO 3-Way Solenoid Model EF8314H301 1/4" NPT Pilot Solenoid 130 psig Maximum Operating Pressure Differential 1/4" NPT SST Body 24VDC Coil, C/I Rated, CSA 6.5-2000 Certification Low Power 0.55 Watts
FG-100	(1)	Filter – Headline - Model 365A-70C 1/2" NPT Inlet/Outlet MAWP 500 PSIG c/w disposable element 25-64 25 Micron Cartridge
FG-101	(1)	Filter – Headline - Model 370A-70C 1/2" NPT Inlet/Outlet MAWP 500 PSIG c/w 25-178-CC Filters
FY 100	(1)	Valve Positioner Fisher Fieldvue DVS 6030 <i>SUPPLIED BY CUSTOMER</i>
HIC 100	(1)	Conant Selector Valve – Model AL4TSL 1/4" NPT aluminum construction 2 stack 4-way valve body Provides for block & vent on actuator supply
LG 100	(1)	Level Gauge - Kenco Model 5700-22-CTRH-GS-ATM-AMB-NS Level Gauge, 1/2" NPT, 22" OAL
LSLL 100	(1)	Level Switch – SOR Model 1510C-G2A-C-L9-ES-CSCVMC Level Switch, 2" NPT, electric, 24 VDC, Low Power SPST 25 Watts Max Manual Check – Nace Compliant c/w 2" x 3" SS float
PI 101/9/10	(3)	Pressure Gauge – Wika Model 233.54 Liquid Filled, Dual Scale 4" Face x 1/2" NPT bottom mount end connection

AS BUILT

8806-002 JUN 19 2003

ORIGINAL

8806-002 JUN 19 2012

AS BUILT

		Stainless Steel Construction 0 to 200 PSIG
PI 105	(1)	Pressure Gauge – Wika Liquid Filled, Dual Scale 2-1/2" Face x 1/4" NPT bottom mount end connection Stainless Steel Construction 0 to 30 PSIG, dual scale
PI 106	(1)	Pressure Gauge – Wika Model 233.54 Liquid Filled, Dual Scale 4" Face x 1/2" NPT bottom mount end connection Stainless Steel Construction 0 to 10,000 PSIG
PI 107	(1)	Pressure Gauge – Wika Model 233.54 Liquid Filled, Dual Scale 4" Face x 1/2" NPT bottom mount end connection Stainless Steel Construction 0 to 1500 PSIG
PRV 102	(1)	Pressure Regulator – Fisher Model 67CFR Pressure Filter / Regulator, 1/4" NPT, 250 PSIG MAWP, 0-35 PSIG Spring, Std trim 0-35 PSI Pressure Indicator
PRV 103/107	(2)	Pressure Regulator – Fisher Model 67CFR Pressure Filter / Regulator, 1/4" NPT, 250 PSIG MAWP, 0-125 PSIG Spring, Std trim 0-160 PSI Pressure Indicator
PSV-300	(1)	Relief Valve – Taylor Model 8200, 1" x 1-1/2" NPT Set @ 150 psi, "F" Orifice NACE trim
PV 100	(1)	4" ANSI 2500# RTJ MasterFlo Choke Valve SUPPLIED BY CUSTOMER <i>Master Flo P3E choke, 4In 2500RTJ x 4In 2500RTJ Nace EE, Trim TC, TC outlet wear sleeve 34J8S-4J8MT72PBY2 Master Flo 100DA actuator, PDA-100PDA100203AAC3E10IV</i>
SC 100	(1)	Speed Control Valve SMC Model AS4000-N02 1/4" NPT, 1/4" Port Maximum Operating Pressure 1MPa
TC 100	(1)	Temperature Controller - Kimray Model HT-12 Temperature Controller, 1/2" MNPT, -30 F to 750 F Temp range

ORIGINAL

TW 102	(1)	5 to 30 psig output signal, 12" probe 1/2" FNPT x 1" MNPT x 12" long SS separable socket
TI 100	(1)	Temperature Gauge - Trend Model 33060 Temperature Gauge, 1/2" NPT Back Mount connection, 0-250 F dual scale 3" dial, 6" stem c/w 304 SS thermowell 1/2" FNPT x 1" MNPT x 6" "U" dimension length 304SS thermowell
TW 101	(1)	
TSHH 100	(1)	High Temperature Shut-down - CCS Model CCS6900TE14 High Temp. Shut-down Switch 1/2" MNPT End Connection 24 VDC, Factory set @ 90 C 1/2" FNPT x 1" MNPT x 4.5" "U" 316SS thermowell (Part 113-34-1-316)
TW 100	(1)	

8808-002 JUN 14 2013

5.0 VALVE TRAIN V-200

Tag #	Quantity	Description
BA-1	(2)	1" Ball Valve, NEO 2500, Two-Piece Full Bore, SS, 2000 psi WOG, Lockable Handle CSA 3.16 Certified, B149 Complaint
BA-10	(6)	1/4" Ball Valve, NEO 2500, Two-Piece Full Bore, SS, 2000 psi WOG, Lockable Handle CSA 3.16 Certified, B149 Complaint
PI 102/103	(2)	Pressure Gauges 2-1/2" Dial, SS 1/4" NPT, 0 - 30 psi Liquid Filled/ Dual Scale Center Back Mount Wika Model 233.53
PSHH 100	(1)	High Fuel Pressure Shutdown Switch CCS Dual Snap Model 6900GZE12 1/2" NPT, SS CONSTRUCTION, CSA APPROVED SET @ 14 psi Rising (97KpA) CALIBRATION CERTIFICATE IS REQUIRED
PSLL 100	(1)	Low Fuel Pressure Shutdown Switch CCS Dual Snap Model 6900GZE12 1/2" NPT, SS CONSTRUCTION, CSA APPROVED SET @ 4 psi Falling (28KpA) CALIBRATION CERTIFICATE IS REQUIRED
PRV 101	(1)	Main Regulator - Fisher 627 Maximum Inlet Pressure 250 PSIG Outlet Pressure Range 5 to 20 PSIG Spring Range 1" FNPT / Orifice Size 1/2" 3/4" Tapped Bonnet, Body Material: Ductile Iron Spring Case Material: Aluminum

AS BUILT

ORIGINAL

		Nitrile Disk, Set @ 9 psi
PRV 104	(1)	Pilot Regulator -- Fisher 67CFR c/w PI 1/4" NPT Tapped-Bonnet Maximum Inlet Pressure 250 psig Outlet Pressure Range 0-35 psig c/w gauge (PI 104) Adjustable spring range, 5 micron filter Adjustable screw with closing cap Temperature Range: -40 to 180 Deg F
SOV 100 / UY 100	(1)	Fossil Main Gas Safety Valve, Pneumatic Actuator Fossil Series 1" ESD 24 VDC Series 88 -- Explosion Proof -- Fail Closed P/N: 9650-0240-2006-1112-0022 Connection: 1" NPT Cv:34 Body Type: 3 Piece Design, Reduced Port Body Material: CF8M Ball & Trim: 316SS, Seats: PTFE End Connection NPT Actuator: Rack and Pinion Spring Return Actuator Min Air Pressure: 70psig Actuator Max Air Pressure: 120 psig Limit Switch: 2 SPDT switches with Beacon Indicator, Hazardous Area Classified Solenoid: ASCO 8551 Series 24 VDC (6.9 watts), NEMA 7-9 Hazardous Area Classified Approvals: CSA 6.5-2000/ANSI Z21.21-Automatic Valves For Gas Appliances CGA 3.9-M94 Automatic Safety Shut-Off Gas Valves CSA C/I -- Commercial/Industrial API 604 4 th Edition Firesafe
TCV 100	(1)	Fisher Pneumatic Temperature Control Valve Fisher Model 119 1" NPT -- 9/16" Port 5-35 PSI Range, Cast Iron Body 150 PSI MAWP, STD Service
ST-1	(1)	Y STRAINER 1" 3000 ALTA Model YS 3000 1/32 Perf 304SS Strainer ASTM A105N Body
UY 101	(1)	1/2" NPT Pilot Solenoid ASCO 2-Way Solenoid 1/4" NPT SST Body 24VDC EPNC C/I SAFETY SHUT OFF CSA/NACE -40 DEG C 72" LEADS

8806-002 JUN 18 2013

AS BUILT

ORIGINAL

6.0 FUEL GAS SYSTEM

V-300	(1)	Vertical Fuel Gas Scrubber 8" X 23" 285 PSI c/w Alberta, BC and Saskatchewan registration, 1" NPT inlet, 2" NPT outlet, 3/4" NPT drain
HLSD-300	(1)	High level shut off – PVC float construction

7.0 MANUAL VALVES

Tag #	Quantity	Description
BA-3	(3)	Nutron Ball Valve, 1/4" NPT, 3000# WOG, CS body, std trim, Full Port
BA-4	(4)	Nutron Ball Valve, 1/2" NPT, 3000# WOG, CS body, std trim, Full Port
BA-5	(4)	Nutron Ball Valve, 1" NPT, 3000# WOG, CS body, Regular Port, std trim
BA-6	(1)	Nutron Ball Valve, 2" NPT, 3000# WOG, CS body, std trim, Regular Port
BA-7	(1)	Nutron Ball Valve, 3/4" NPT, 3000# WOG, CS body, std trim, Regular Port
BA-8	(3)	Nutron Ball Valve, 1" NPT, 3000# WOG, Low Temp body, std trim, Regular Port, lever operated
BA-9	(1)	Nutron Ball Valve, 1/4" NPT, 3000# WOG, Low Temp body, std trim, Regular Port., lever operated
CH-1	(1)	Wheatley Swing Check Valve, 1" NPT 2160 psi, NACE
NE-2	(2)	Century Needle Valve, 3/4"x1/2" NPT, 6,000 psi, stainless steel body and trim

8.0 PACKAGE MATERIALS

Coils

Pipe:	SA 333 Gr6
Flanges:	SA 350 LF2
Fittings:	SA 420 WPL6

Firetube

SA 53 ERW Sch 10, 0.250"

Threaded Piping

Pipe Fuel gas:	SA-106-B, Sch. 80 SMLS
Threaded Fittings:	SA-105-N, 6000#

Fuel Gas Preheat Line

Pipe:	SA-106-B Sch 160
Fittings:	SA-105-N, 6000#, Socket weld

Tubing:	316 SS
Fittings:	316 SS Swagelok
Ferrules:	316 SS

AS BUILT

0006-002 JUN 19 2013

ORIGINAL

9.0 TESTING / POST WELD HEAT TREAT (PWHT)

Hydro-Testing:	Coils:	Tested to 1.5 times MAWP
Testing:	Pressure Piping:	As per B31.3
	Firetube:	Pneumatic Air Test
	Instrumentation:	Subjected to an operational test to ensure proper functioning (excluding electrical)
Radiography:	Instrument Tubing:	As Per ABB-522
	Coil:	100% Radiography
	Weld Piping:	100% Radiography
	Firetube:	None
	Threaded Piping:	10% (To show thread engagement only)
	PSV Thread Piping:	100%
PWHT:	Coil:	Yes
	Piping:	Yes
Ultrasonic Test:	UT baseline of all coil return bends	
Hardness Test:	Max 200 BHN on 10% of coil & piping butt welds	
MPI Inspections:	10% MPI on Fuel Gas Preheat	

10.0 SKID / BUILDING

SK-100	(1)	Skid 7' W x 36" L Main skid members 12" @ 50# Wide Flange Beam
B-100	(1)	Foam Panel Enclosure 24" W x 84" L x 80" H 1-1/2" polyurethane foam panel (R12) Galvalume Interior / Exterior One double foam panel door c/w whicomb, barrel bolt, check chain and weather strip

11.0 PAINT

- SSPC-SP 6-63 Commercial Blast, Cloverdale Universal Phenolic Primer Series 83, 1.5 – 2 mils DFT, Cloverdale 835 Series DTM Polyurethane Enamel 2 - 3 mils DFT
- Skid, Vessels, Piping, Pipe Supports: Encana Taupe
- Fire Tube Stack: High Heat Black.

12.0 INSULATION

- Heater shell, no ends, is insulated with 1-1/2" Fiber Glass (Microflex) Insulation with 0.020 stucco embossed aluminum outer cladding held with stainless steel banding. Expansion tank not insulated.

13.0 ELECTRICAL

- Wire of ACL Burner Management System to skid edge junction box.
- All wiring Class 1, Div. 1

AS BUILT

14.0 DOCUMENTATION

- TWO Equipment Manuals and QC manuals on CD are included.
- Documents provided in accordance with NWP's Standard Document Index

8806-002 JUN 19 2013

ORIGINAL

15.0 ADDITIONAL NOTES

- P. Eng. stamped drawings have not been included.
- Any additional NDE customer requirements will be additional to above.
- NWP reviews all specifications provided to us. NWP, however, cannot accept responsibility for any omissions made in our quotations which are not in compliance. We require that customers review the quotation for compliance to their specifications and request a revision for any errors / omissions which may have been made.
- Engineering review is not done at time of quotation. If material and / or specifications change due to engineering review, price adjustment will apply.
- Packages will be dismantled only to the extent required for shipping.
- All instrumentation has been quoted for sweet fuel gas.
- Unit tagged with Asset Tags – pricing extra based on quantity of tags.
- Heater Stack to be shipped loose with unit.
- NWP Terms & Conditions apply.

16.0 PROGRESS PAYMENTS

The following Progress Payment Schedule shall apply to this order:

45% invoiced upon receipt of approved drawings
45% upon unit completion and acceptance by Encana
10% invoiced upon completion of Documentation

AS BUILT

8806-002 JUN 1 2008

1. PIPE SUPPORTS WHERE REQUIRED.
2. SHIP LOOSE ITEMS TO BE BOXED AND SEALED PRIOR TO SHIPMENT.
3. PLUG ALL OUTLETS PRIOR TO SHIPMENT.
4. BWC WIRED BY NWP.
5. FUEL GAS SYSTEM DESIGNED FOR SWEET GAS ONLY.
6. REMOVABLE COIL INSPECTION PLATE.
7. 10% XRAY ON NWP MANUFACTURED THREADED PIPING, 100% XRAY ON PSV-300 CONNECTIONS.
8. 3/8" (0.085" WT) SS TUBING.
9. 3/8" (0.035" WT) SS TUBING.
10. AIR TEST TO 75 PSI AND ALL PNEUMATIC INSTRUMENTS TO BE TESTED AS PER ABB-522.
11. BUILT TO FOLLOWING ENCAPA SPECS: PIPING MATERIAL -
ECA-PWF-5-03
12. TUBING CONFIGURATION SHOWN IN AUTO POSITION.
13. PORTION OF LINEHEATER SHELL INSIDE INSTRUMENT ENCLOSURE NOT BE INSULATED.

	MAJOR PROCESS LINE
	UTILITY LINE
	BUILDING LIMITS
	PROCESS/UTILITY TUBING LINE
	INSTRUMENT PNEUMATIC LINE
	INSTRUMENT CAPILLARY LINE
	ELECTRICAL, DATALINK LINE
	ELECTRICAL, CONNECTION LINE
	BALL VALVE
	GLOBE VALVE
	GATE VALVE
	CHECK VALVE
	PLUG VALVE
	NEEDLE VALVE
	STRAIGHT CHOKE VALVE
	SOCKET WELD VALVE
	RUPTURE VALVE
	SOLENOID VALVE
	BUTTERFLY VALVE
	3-WAY VALVE
	4-WAY VALVE
	DIAPHRAGM ACTUATED CONTROL VALVE
	PRESSURE REGULATOR
	3-WAY DIAPHRAGM CONTROL VALVE

```

      XX-X"-X-XXXX-XXX
      |   |   |   |   |
CONDENSATE - C   100-199 MAJOR PROCESS FLUIDS
DRAIN - D       200-249 MINOR PROCESS FLUIDS
FUEL GAS - FG   250-299 RELIEF, DRAINS
LIQUID - L      300-399 UTILITY VAPOURS
LEAN GLYCOL - LG 400-499 UTILITY LIQUIDS
METHANOL - M
OIL - O
PROCESS FLUID - PF
PROCESS GAS - PG
PRESSURE RELIEF - PR
RICH GLYCOL - RG
WATER - W

NOMINAL PIPE SIZE

CLASS 2000 THREADED - A
CLASS 3000 THREADED - B
CLASS 8000 THREADED - C
150 ANSI FLANGED - D
300 ANSI FLANGED - E
600 ANSI FLANGED - F
900 ANSI FLANGED - G
1500 ANSI FLANGED - H
2500 ANSI FLANGED - I

INSTRUMENT TUBING
A - GALVANIZED TUBING w/ CS FITTINGS
B - 304 SS TUBING w/ CS FITTINGS
C - 304 SS TUBING w/ 316 SS FITTINGS
D - 316 SS TUBING w/ 316 SS FITTINGS
E - NOT APPLICABLE

PIPE GRADE
A - SA-106B
B - SA-333 GR.B

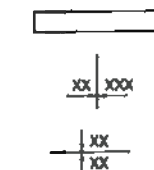
PIPE SCHEDULE

```

XX-X

START WITH 1

BALL VALVE - BA
NEEDLE VALVE - NE
GLOBE VALVE - GL
CHECK VALVE - CH
GATE VALVE - GA
BUTTERFLY VALVE - BU



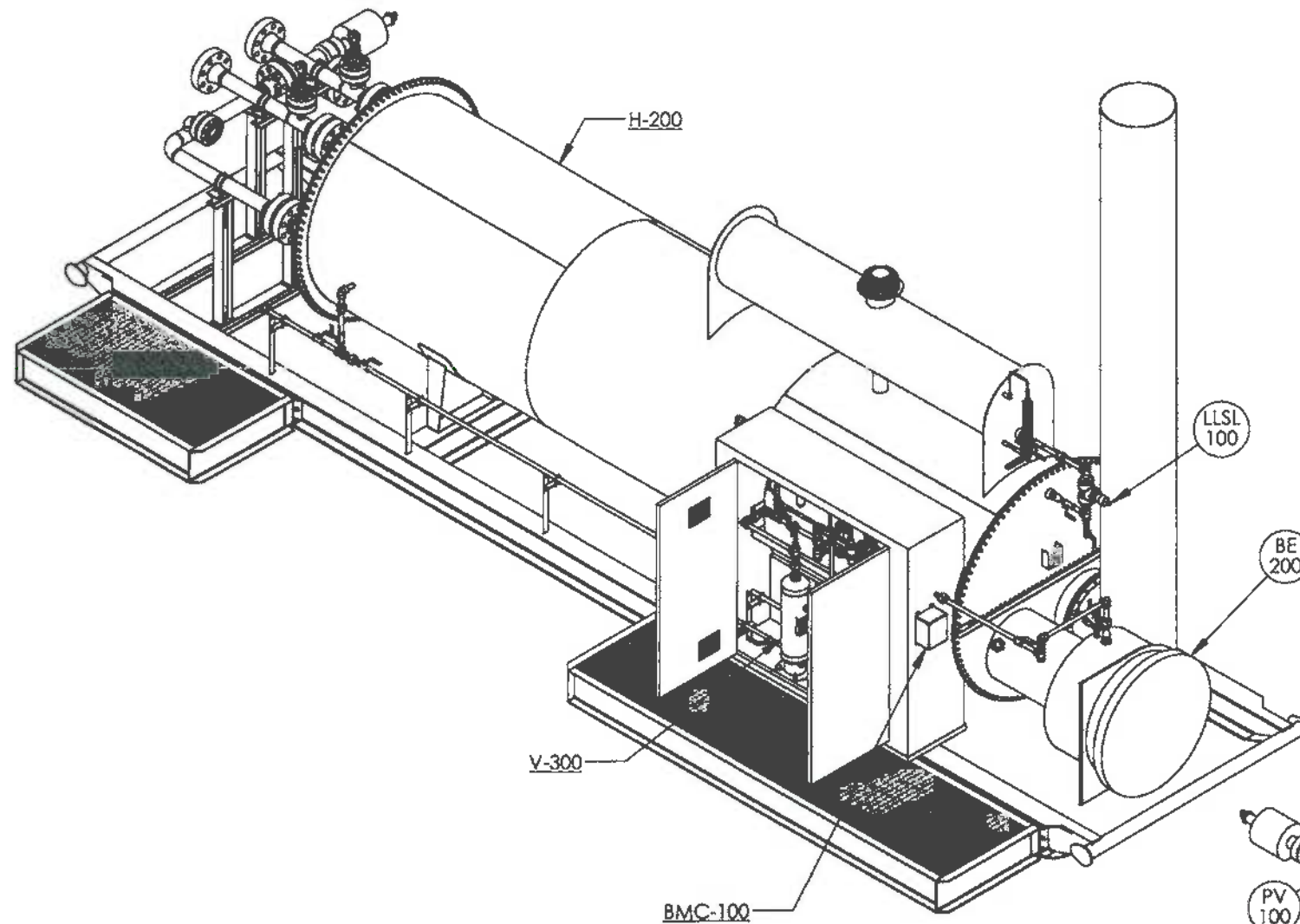
**SPEC/RESPONSIBILITY
BREAK**

L/G TO AND FROM

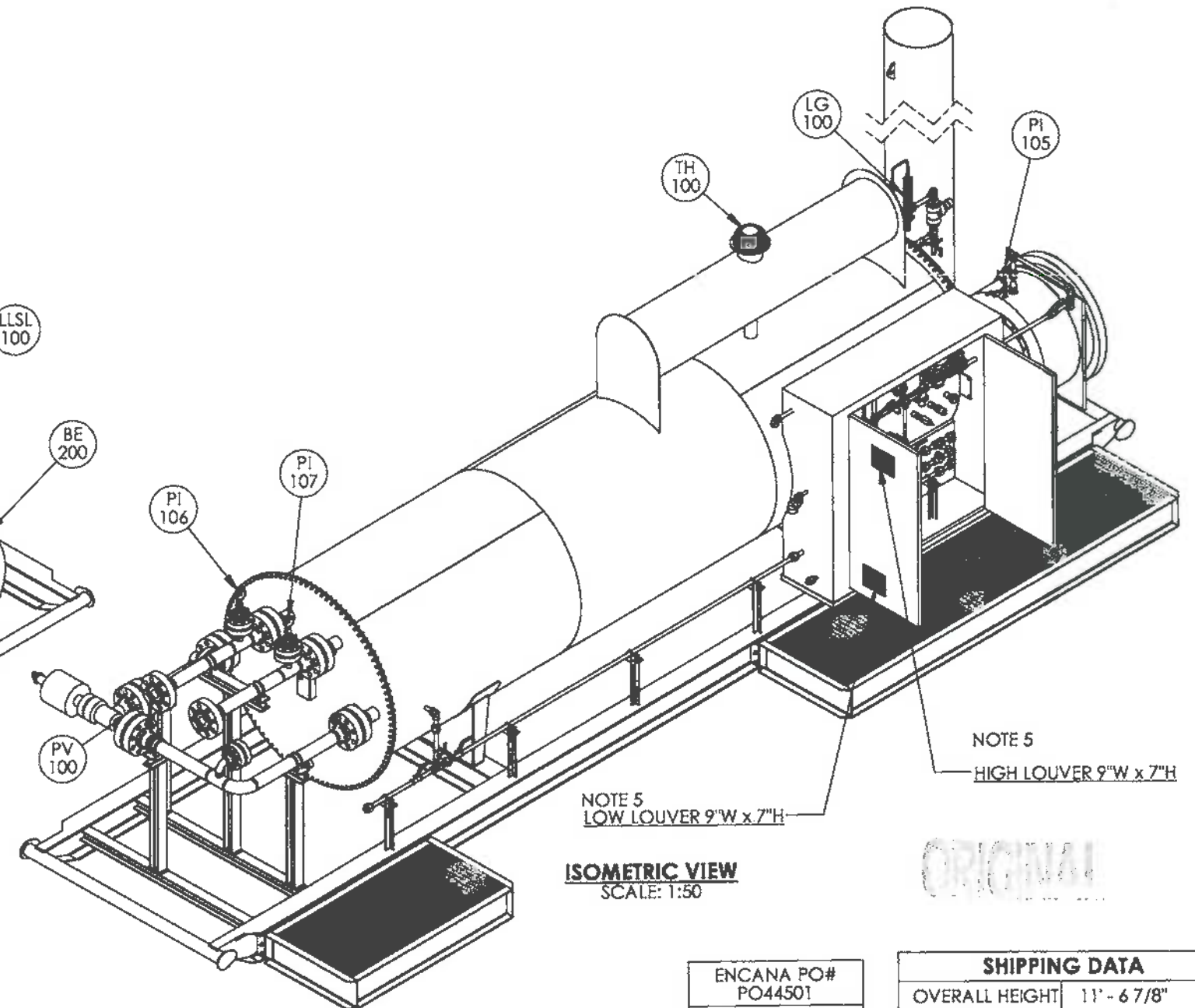
ORIGINAL

ENCANA PO#
PO44501
08806-001
08806-002
08806-003
08806-004

08562-6	BATH ASSEMBLY									AS BUILT	ISSUED FOR CONSTRUCTION SIGNED: JUN 18 2013 DATE: 8806-002 W.O. NWP-08806-002 S.O. NWP-08806-002 ALL DIMENSIONS IN INCHES	 NWP INDUSTRIES INC. Total oilfield supply. P.O. BOX 6280, INNISFAIR, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.	ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU/HR c/w 4" 2500# RTJ SPLIT COILS PIPING AND INSTRUMENTATION DIAGRAM			
08562-4	COIL ASSEMBLY															
08562-3	SKID ASSEMBLY															
08562-2B	PIPING ASSEMBLY															
08562-2A	WELDED PIPING	0	MAY 22/13	EP	2	4	ISSUED FOR CONSTRUCTION									
08806-001-004-P-001	GENERAL ARRANGEMENT	A	05/10/2013	EP	-	-	ISSUED FOR APPROVAL									
DOCUMENT NO	DESCRIPTION	REV	DATE	BY	CHK	APP										
REFERENCE DRAWINGS							DRAWING REVISIONS									



ISOMETRIC VIEW
SCALE: 1:50



ISOMETRIC VIEW
SCALE: 1:50

NOTE 5
HIGH LOUVER 9"W x 7"H

NOTES

1. 24 oz. PNEUMATIC TEST REQUIRED ON SHELL & FIRETUBE.
2. PIPE SUPPORTS WHERE REQUIRED.
3. SHIP LOOSE ITEMS TO BE BOXED AND SEALED PRIOR TO SHIPMENT.
4. PLUG ALL OUTLETS PRIOR TO SHIPMENT.
5. LOUVERS MUST BE LOCATED AS SHOWN IN THIS ORIENTATION.
6. HEAT MEDIUM APPROXIMATE VOLUME IS 470 CU FT.

ENCANA PO#	PO44501
08806-001	
08806-002	
08806-003	
08806-004	

SHIPPING DATA

OVERALL HEIGHT	11' - 6 7/8"
OVERALL LENGTH	37' - 5"
OVERALL WIDTH	10' - 5"
APPROX. WEIGHT	33200 BLS

LH-FIRSTK-24-2	WELDED FIRETUBE / STACK ASSEMBLY
08562-6	BATH ASSEMBLY
08562-4	COIL ASSEMBLY
08562-3	SKID ASSEMBLY
08562-2B	PIPING ASSEMBLY
08562-2A	WELDED PIPING
08806-001-004-P-001	P&ID
DOCUMENT NO.	DESCRIPTION

AS BUILT					
0	MAY 22/13	VW	0	0	ISSUED FOR CONSTRUCTION
A	MAY 16/13	VW			ISSUED FOR APPROVAL
REV.	DATE	BY:	CHK:	APP:	DESCRIPTION

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*

DATE: **JUN 18 2013**

W.O.: **8806-002**

S/N: **NWP-08806-002**

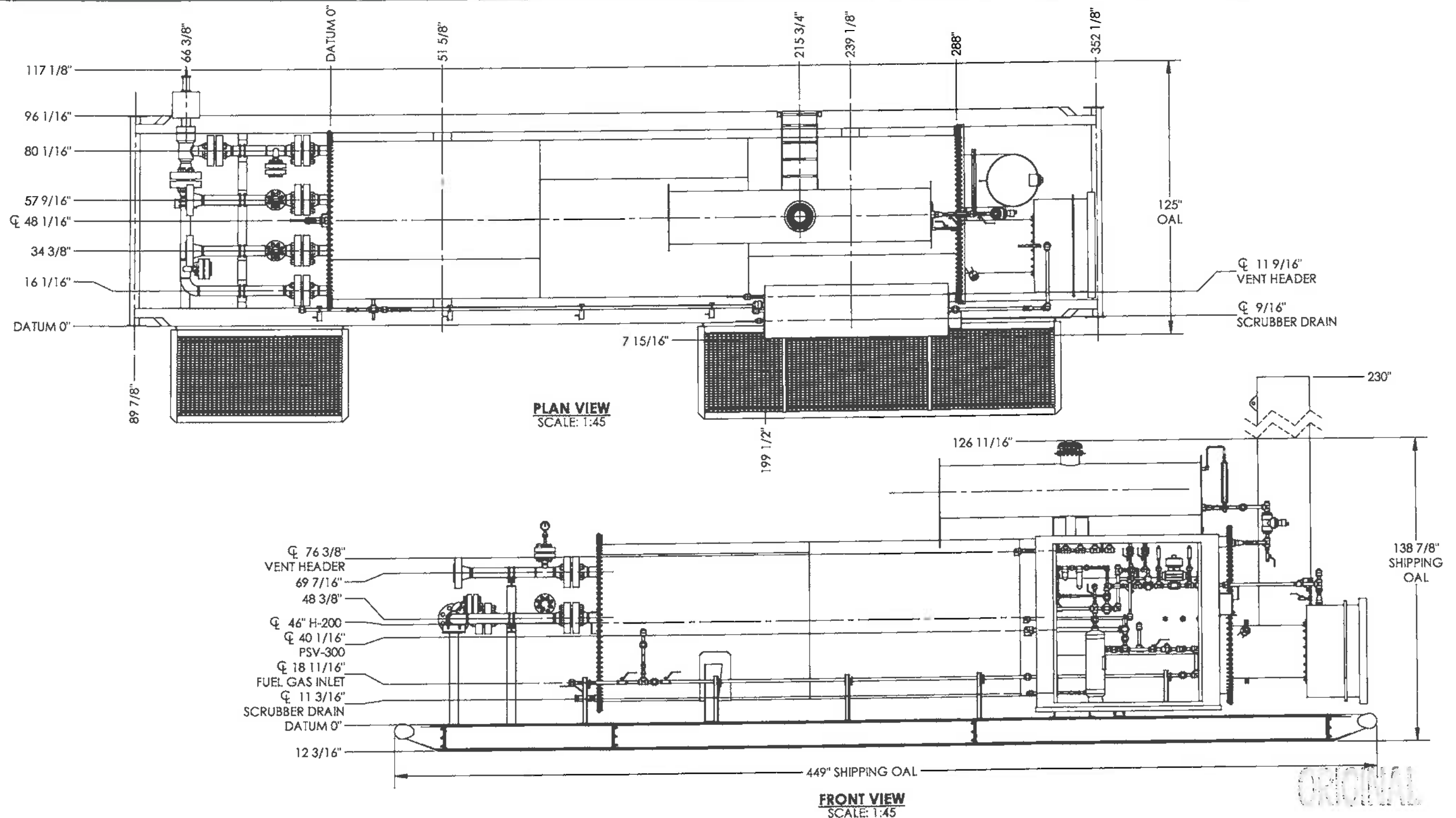
ALL DIMENSIONS IN INCHES

NWP
INDUSTRIES INC.
Total oilfield supply.

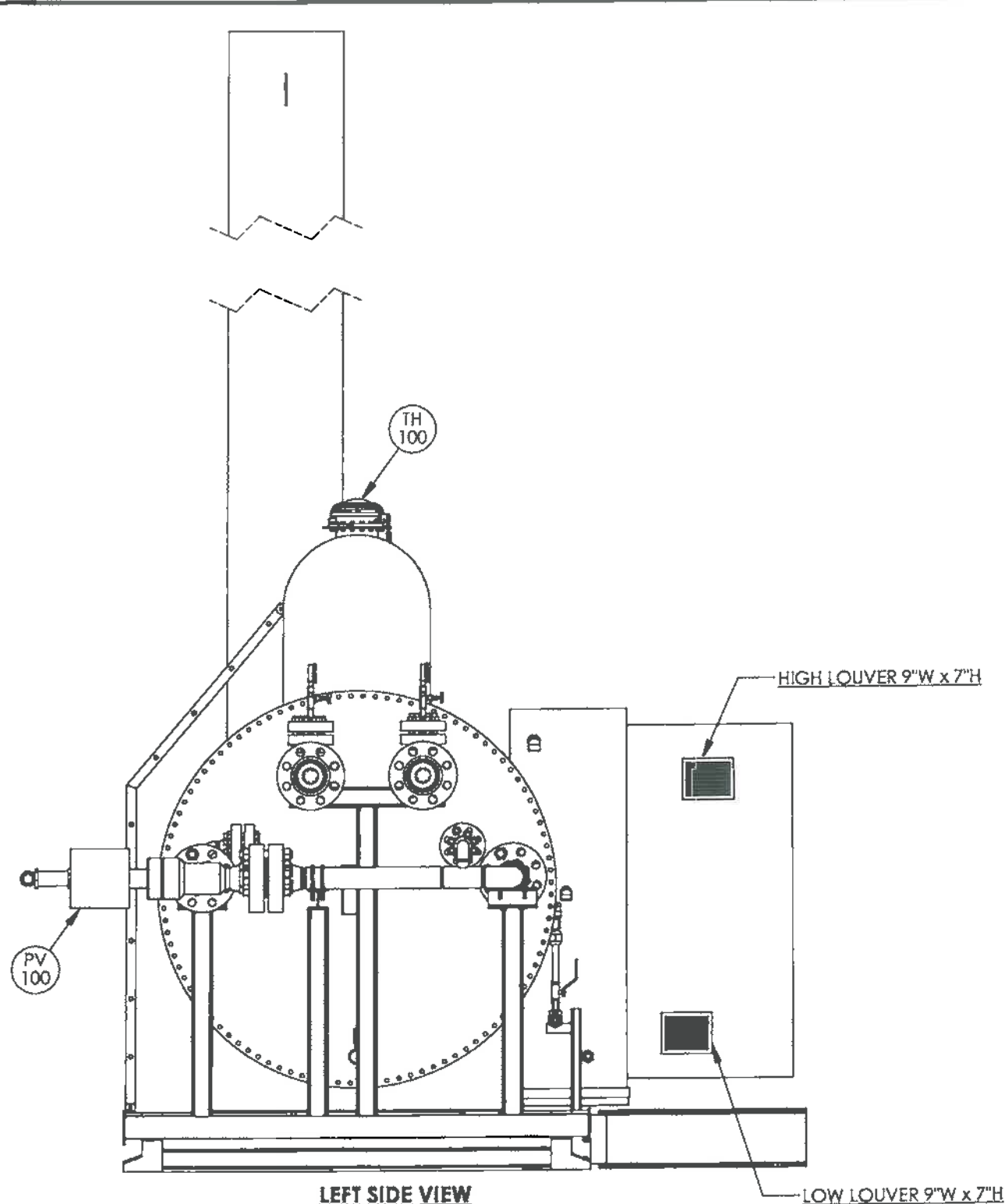
P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

SCALE: AS NOTED

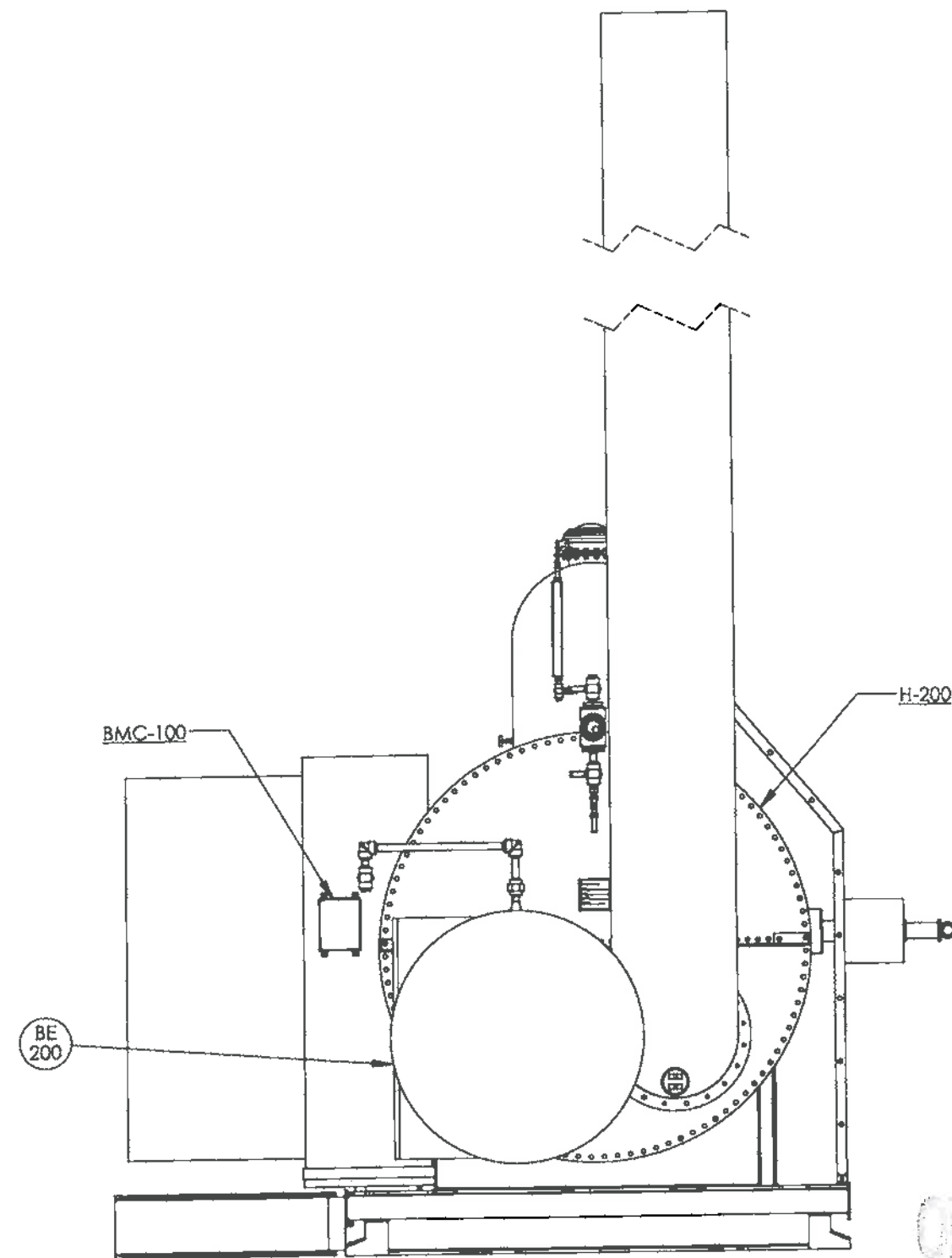
ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU c/w 4"-2500# RTJ SPLIT COILS GENERAL ARRANGEMENT			
DWG: VW	CHK: 0	APP: 0	
DATE: MAY 16/13	DATE: JUN 04 2013	DATE: JUN 04 2013	
SHEET: 1 OF 3	DWG: 08806-001-004-G-001	REV: 0	



LH-FIRSTX-24-2	WELDED FIRETUBE / STACK ASSEMBLY	AS BUILT						ISSUED FOR CONSTRUCTION SIGNED:  DATE: JUN 18 2013 W: 8806-002 S/N:  ALL DIMENSIONS IN INCHES		 NWP INDUSTRIES INC. Total oilfield supply. P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102  SCALE: AS NOTED		ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU c/w 4"-2500# RTJ SPLIT COILS GENERAL ARRANGEMENT <table><tr><td>DWN: VW</td><td>CHK: </td><td>APP: </td></tr><tr><td>DATE: MAY 16/13</td><td>DATE: JUN 04 2013</td><td>DATE: JUN 04 2013</td></tr><tr><td>SHEET: 2 OF 3</td><td>DWG: 08806-001-004-G-001</td><td>REV: 0</td></tr></table>				DWN: VW	CHK: 	APP: 	DATE: MAY 16/13	DATE: JUN 04 2013	DATE: JUN 04 2013	SHEET: 2 OF 3	DWG: 08806-001-004-G-001	REV: 0
DWN: VW	CHK: 															APP: 								
DATE: MAY 16/13	DATE: JUN 04 2013															DATE: JUN 04 2013								
SHEET: 2 OF 3	DWG: 08806-001-004-G-001															REV: 0								
08562-6	BATH ASSEMBLY																							
08562-4	COIL ASSEMBLY																							
08562-3	SKID ASSEMBLY																							
08562-2B	PIPING ASSEMBLY																							
08562-2A	WELDED PIPING	0	MAY 22/13	VW			ISSUED FOR CONSTRUCTION																	
08806-001-004-P-001	P&ID	A	MAY 16/13	VW			ISSUED FOR APPROVAL																	
DOCUMENT NO.	DESCRIPTION	REV.	DATE	BY:	CHK:	APP:	DESCRIPTION																	
REFERENCE DRAWINGS		DRAWING REVISIONS																						



LEFT SIDE VIEW
SCALE: 1:30



RIGHT SIDE VIEW
SCALE: 1:30

ORIGINAL

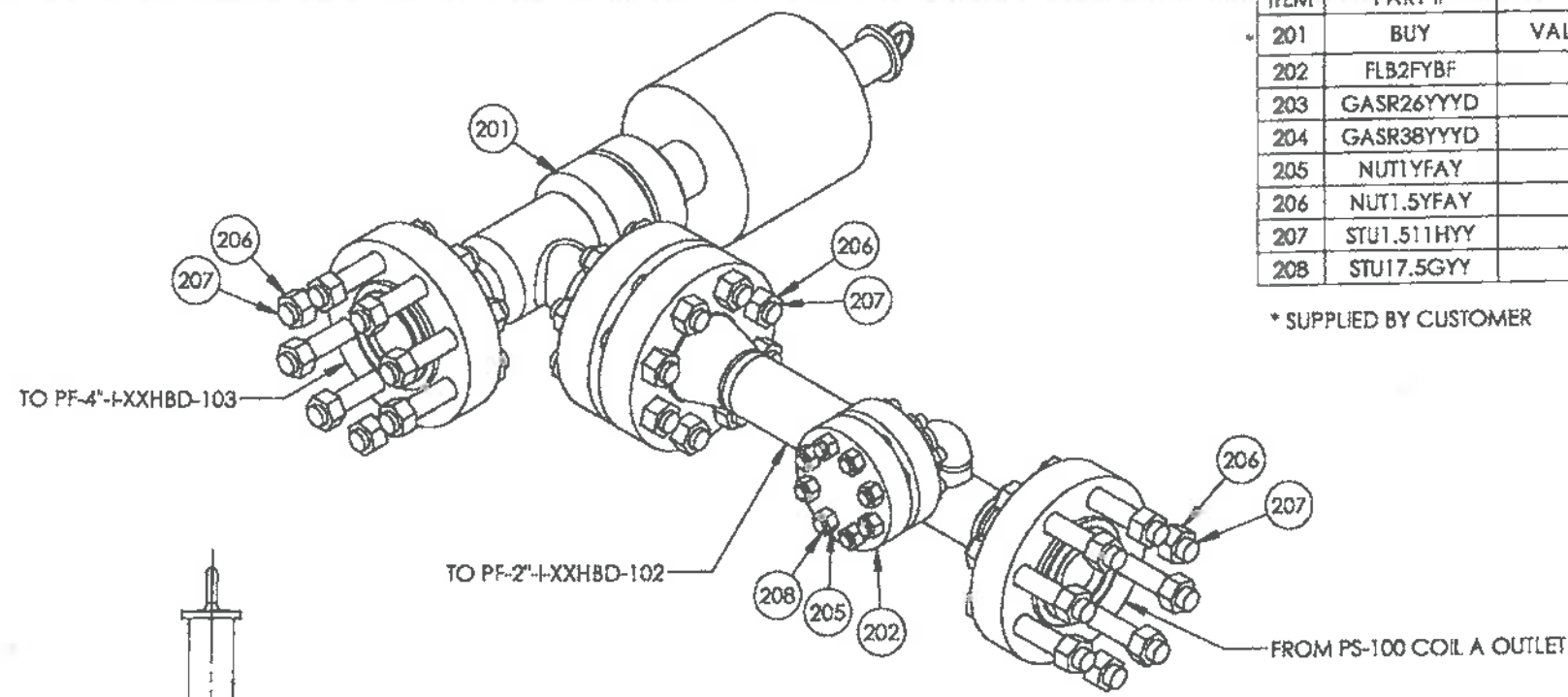
LH-FIRSTK-24-2	WELDED FIRETUBE / STACK ASSEMBLY
08562-6	BATH ASSEMBLY
08562-4	COIL ASSEMBLY
08562-3	SKID ASSEMBLY
08562-2B	PIPING ASSEMBLY
08562-2A	WELDED PIPING
08806-001-004-P-001	P&ID
DOCUMENT NO.	DESCRIPTION
REFERENCE DRAWINGS	

AS BUILT					
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A	MAY 16/13	VW			ISSUED FOR APPROVAL
REV.	DATE	BY:	CHK:	APP:	DESCRIPTION
DRAWING REVISIONS					

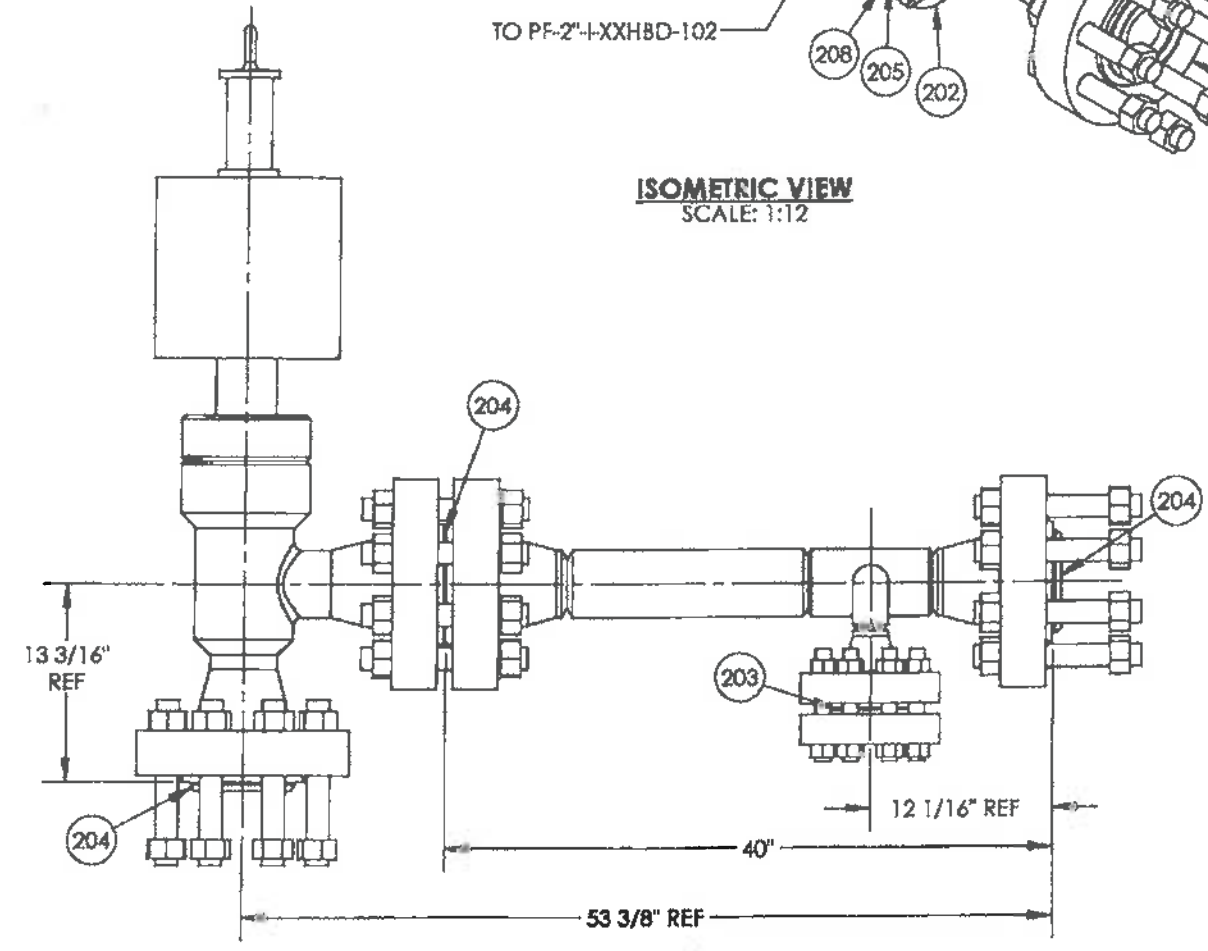
ISSUED FOR CONSTRUCTION	
SIGNED:	<i>[Signature]</i>
DATE:	JUN 18 2013
W.O. NO.	8806-002
S/N:	NWP-08806-002
ALL DIMENSIONS IN INCHES	

P.O. BOX 6280, INNISFAIL, AB T4G 1S9	
PH: (403) 227-4100 FAX: (403) 227-4102	
SCALE: AS NOTED	

ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU c/w 4"-2500# RTJ SPLIT COILS GENERAL ARRANGEMENT			
OWN: VW	CHK: <i>[Signature]</i>	APP: <i>[Signature]</i>	
DATE: MAY 16/13	DATE: JUN 04 2013	DATE: JUN 04 2013	
SHEET: 3 OF 3	DWG: 08806-001-004-G-001	REV: 0	



ISOMETRIC VIEW
SCALE: 1:12



PLAN VIEW
SCALE: 1:12

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
201	BUY	VALVE CHOKE MASTERFLO P3E 4" x 4" 2500 ANSI RTJ w/ MASTERFLO PDA100 ACTUATOR			1
202	FLB2FYBF	Blind 2" 2500 ANSI RTJ SA350LF2-CL1			1
203	GASR26YYD	GASKET 2" 2500 ANSI R26 RTJ MILD STEEL			1
204	GASR38YYD	GASKET 4" 2500 ANSI R38 RTJ MILD STEEL			3
205	NUT1YFAY	NUT 1" 2HM HEX			16
206	NUT1.5YFAY	NUT 1 1/2" 2HM HEX			48
207	STU1.511HYY	STUD 1 1/2" x 11" LG B7M			24
208	STU17.5GY	STUD 1" x 7 1/2" LG B7M			8

* SUPPLIED BY CUSTOMER

ORIGINAL

NOTES

1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS INCLUDE $1/8"$ ROOT GAP.
3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED.
5. HARDNESS TESTING - MAX 200 BNH 10%.

DESIGN DATA

LINE NUMBER:	PF-4"-I-XXHBD-101
CLIENT SPECIFICATION:	ENCANA FAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
DESIGN PRESSURE:	5171 PSIG
MAXIMUM DESIGN TEMPERATURE:	200°F
MINIMUM DESIGN TEMPERATURE:	-49°F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	7757 PSIG
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 5
POST WELD HEAT TREATMENT:	1150°F TO 1175°F FOR 1HR MIN.
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

AS BUILT

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*
DATE: JUN 10 2013
W.O. # 8806-002
S/N: NWP-08806-002
ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102
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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTUJ
C/W 4"-2500# RTJ SPLIT COILS
PIPING ASSEMBLY

DWN: VW CHK: APP: *[Signature]*
DATE: OCT 05/12 DATE: NOV 20 2012 DATE: NOV 19 2012
SCALE: 1:12 DWG: 08562-2B REV: 0
SHEET: 2 OF 8

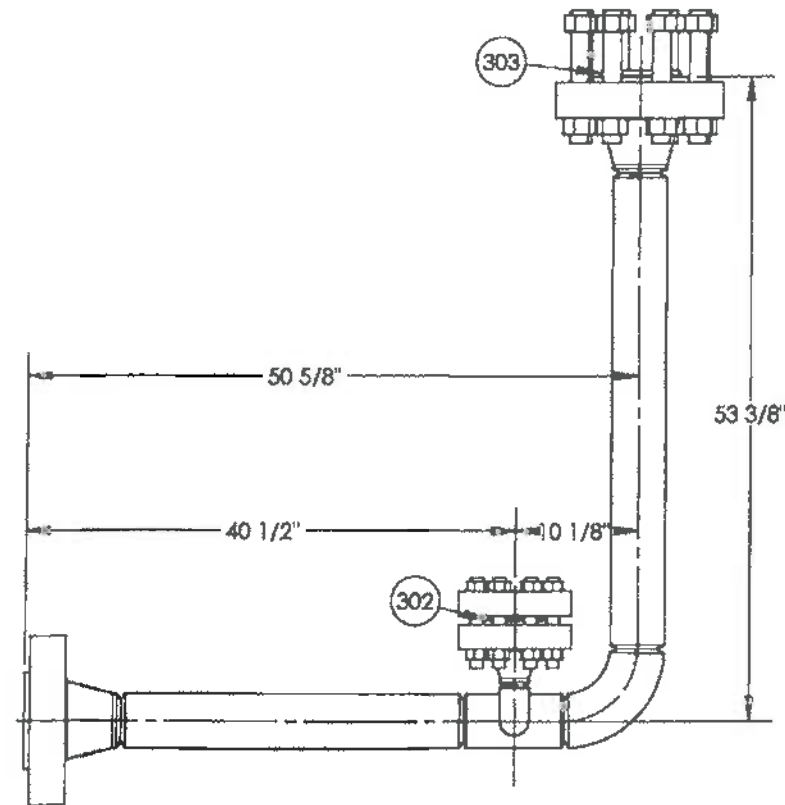
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-6	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2A	WELDED PIPING					
08562-1	PIPING AND INSTRUMENTATION DIAGRAM					
08562	GENERAL ARRANGEMENT	0	OCT 05/12	VW	<i>[Signature]</i>	<i>[Signature]</i>

DRAWING REVISIONS

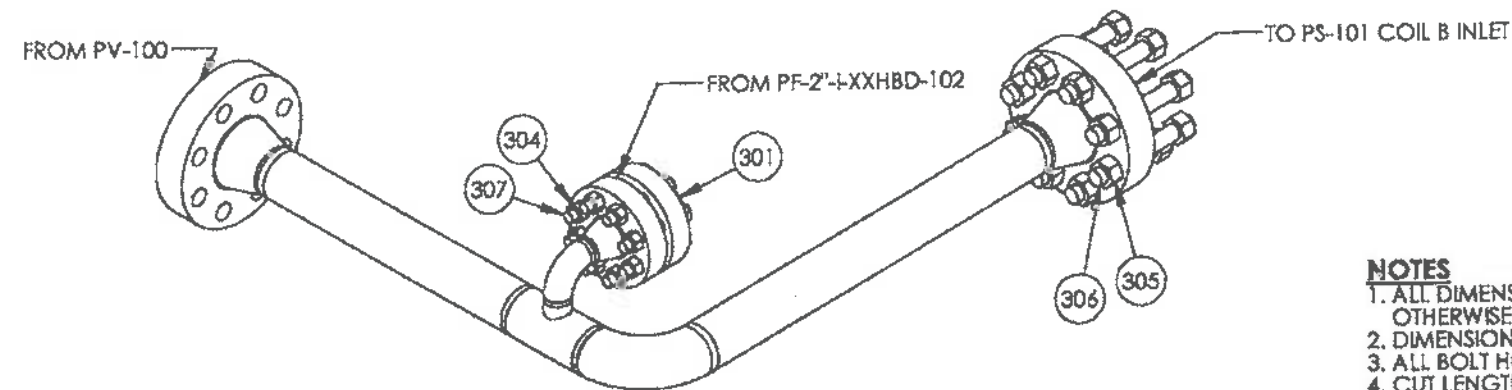
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08806

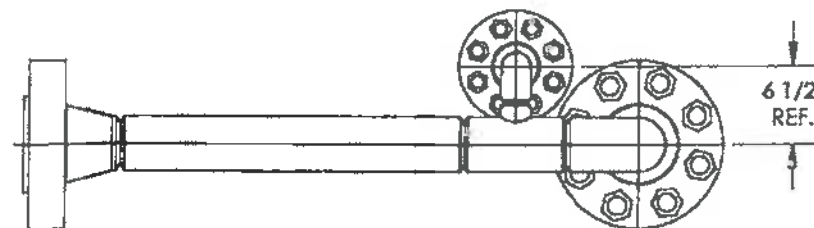
ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
301	FLB2FYBF	Blind 2" 2500 ANSI RTJ SA350LF2-CL1			1
302	GASR26YYYD	GASKET 2" 2500 ANSI R26 RTJ MILD STEEL			1
303	GASR38YYYD	GASKET 4" 2500 ANSI R38 RTJ MILD STEEL			1
304	NUT1YFAY	NUT 1" 2HM HEX			16
305	NUT1.5YFAY	NUT 1 1/2" 2HM HEX			16
306	STU1.51THYY	STUD 1 1/2" x 11" LG B7M			8
307	STU17.5GY	STUD 1" x 7 1/2" LG B7M			8



PLAN VIEW
SCALE: 1:15



ISOMETRIC VIEW
SCALE: 1:15



FRONT VIEW
SCALE: 1:15

NOTES

1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS INCLUDE $1/8"$ ROOT GAP.
3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED.
5. HARDNESS TESTING - MAX 200 BNH 10%.

DESIGN DATA

LINE NUMBER:	PF-4"-I-XXHBD-103
CLIENT SPECIFICATION:	ENCANA FAB <i>2012</i>
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS <i>2010</i> EDITION
DESIGN PRESSURE:	5171 PSIG
MAXIMUM DESIGN TEMPERATURE:	200 °F
MINIMUM DESIGN TEMPERATURE:	-49 °F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	7757 PSIG
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 5
POST WELD HEAT TREATMENT:	1150 °F TO 1175 °F FOR 1HR MIN.
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-16042

AS BUILT

ISSUED FOR
CONSTRUCTION

SIGNED:

DATE:

W.O. **8806-002**

S/N: *NWP-08806-002*

ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
C/W 4"-2500# RTJ SPLIT COILS
PIPING ASSEMBLY

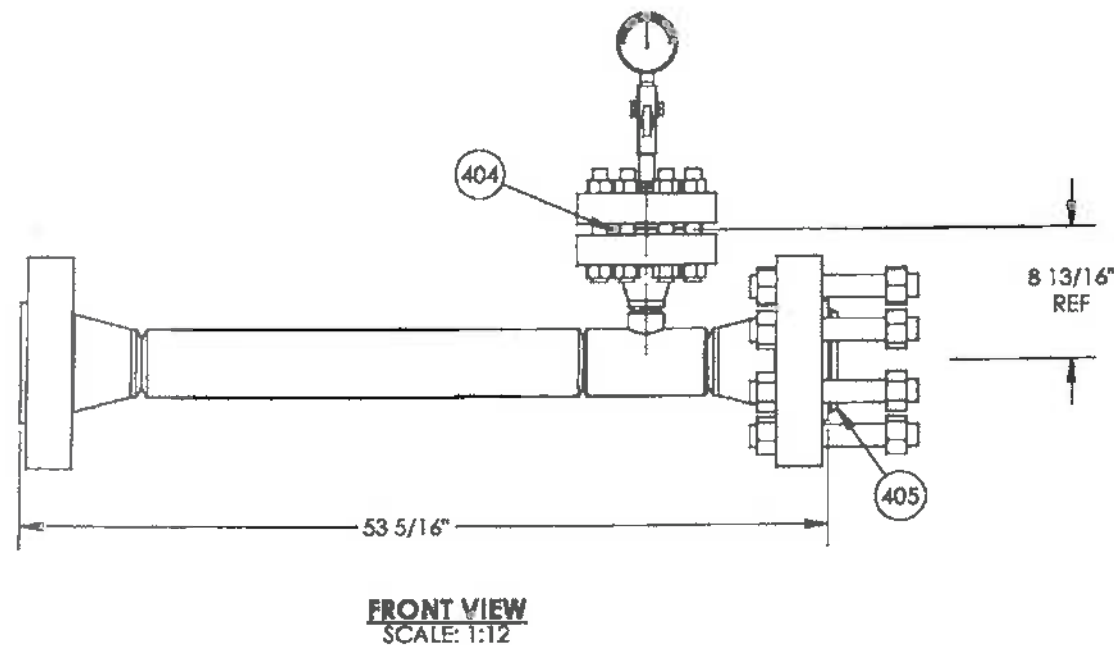
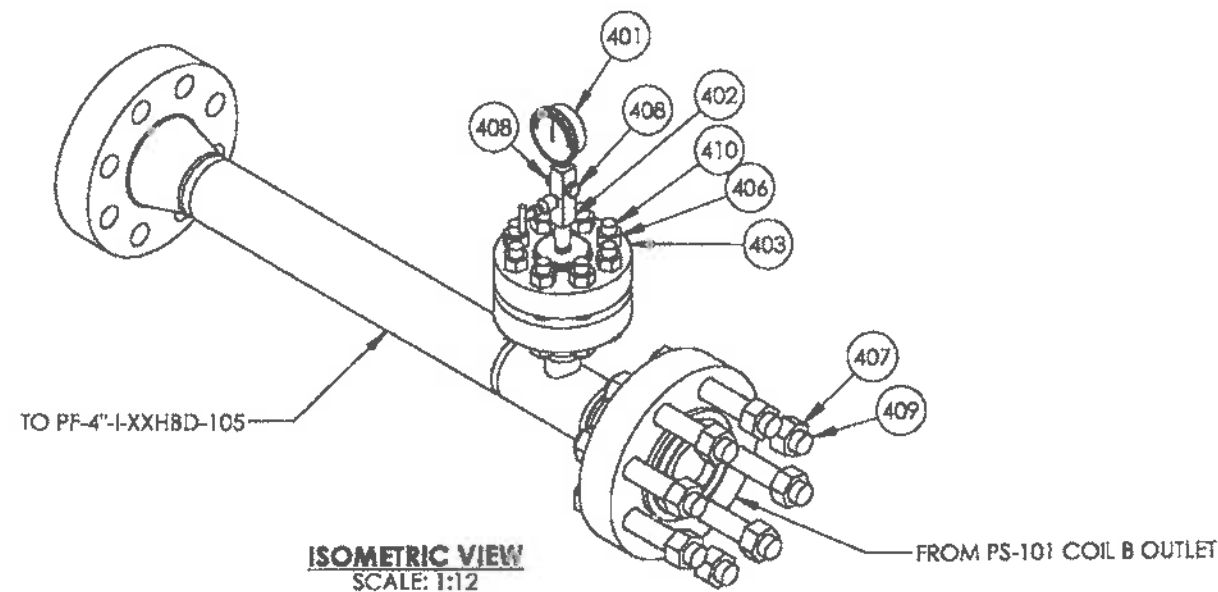
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DATE: OCT 05/12	DATE: <i>NOV 20 2012</i>	DATE: <i>NOV 19 2012</i>
SCALE: 1:15	DWG: 08562-26	REV: 0
SHEET: 3 OF 8		

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	ISSUED FOR CONSTRUCTION
08562-6	BATH ASSEMBLY						
08562-3	SKID ASSEMBLY						
08562-2A	WELDED PIPING						
08562-1	PIPING AND INSTRUMENTATION DIAGRAM						
08562	GENERAL ARRANGEMENT	0	OCT 05/12	VW	<i>R</i>	<i>[Signature]</i>	ISSUED FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING REVISIONS

08806



ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
401	233.54-10000	PRESSURE GAUGE WIKA 0-10000 PSI MODEL 233.54 SS			1
402	BUY	VALVE NEEDLE CENTURY 3/4\" M x 1/2\" F NPT CM111M44TCNTSSP100			1
403	FLH2.75FYBF	FLANGE HUBBED 2\" 2500 ANSI TAPPED 3/4\" NPT RTJ SA350LF2-CL1			1
404	GASR26YYD	GASKET 2\" 2500 ANSI R26 RTJ MILD STEEL			1
405	GASR38YYD	GASKET 4\" 2500 ANSI R38 RTJ MILD STEEL			1
406	NUT1YFAY	NUT 1\" 2HM HEX			16
407	NUT1.5YFAY	NUT 1 1/2\" 2HM HEX			16
408	PLH.5HYEE	PLUG HEX 1/2\" 6M THRD SA105N			2
409	STU1.511HY	STUD 1 1/2\" x 11\" LG B7M			8
410	STU17.5GY	STUD 1\" x 7 1/2\" LG B7M			8

NOTES

1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8$ \" UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS INCLUDE $1/8$ \" ROOT GAP.
3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED.
5. HARDNESS TESTING - MAX 200 BHN 10%.

DESIGN DATA

LINE NUMBER:	PF-4\"-I-XXHBD-104
CLIENT SPECIFICATION:	ENCANA FAB <i>2012</i>
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS <i>2010</i> EDITION
DESIGN PRESSURE:	5171 PSIG
MAXIMUM DESIGN TEMPERATURE:	200 °F
MINIMUM DESIGN TEMPERATURE:	-49 °F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	7757 PSIG
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 5
POST WELD HEAT TREATMENT:	1150 °F TO 1175 °F FOR 1 HR MIN.
CORROSION ALLOWANCE:	1/16\"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

AS BUILT

ISSUED FOR
CONSTRUCTION

SIGNED: *[Signature]*
DATE: **JUN 18 2013**
W.O. **8806-002**
S/N: *NWP-08806-002*
ALL DIMENSIONS IN INCHES



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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
c/w 4\"-2500# RTJ SPLIT COILS
PIPING ASSEMBLY

DWN: VW CHK: *[Signature]* APP: *[Signature]*
DATE: OCT 05/12 DATE: **NOV 20 2012** DATE: **NOV 19 2012**
SCALE: 1:12 DWG: **08562-23** REV: **0**
SHEET: 4 OF 8

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-6	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2A	WELDED PIPING					
08562-1	PIPING AND INSTRUMENTATION DIAGRAM					
08562	GENERAL ARRANGEMENT	0	OCT 05/12	VW	<i>[Signature]</i>	<i>[Signature]</i>

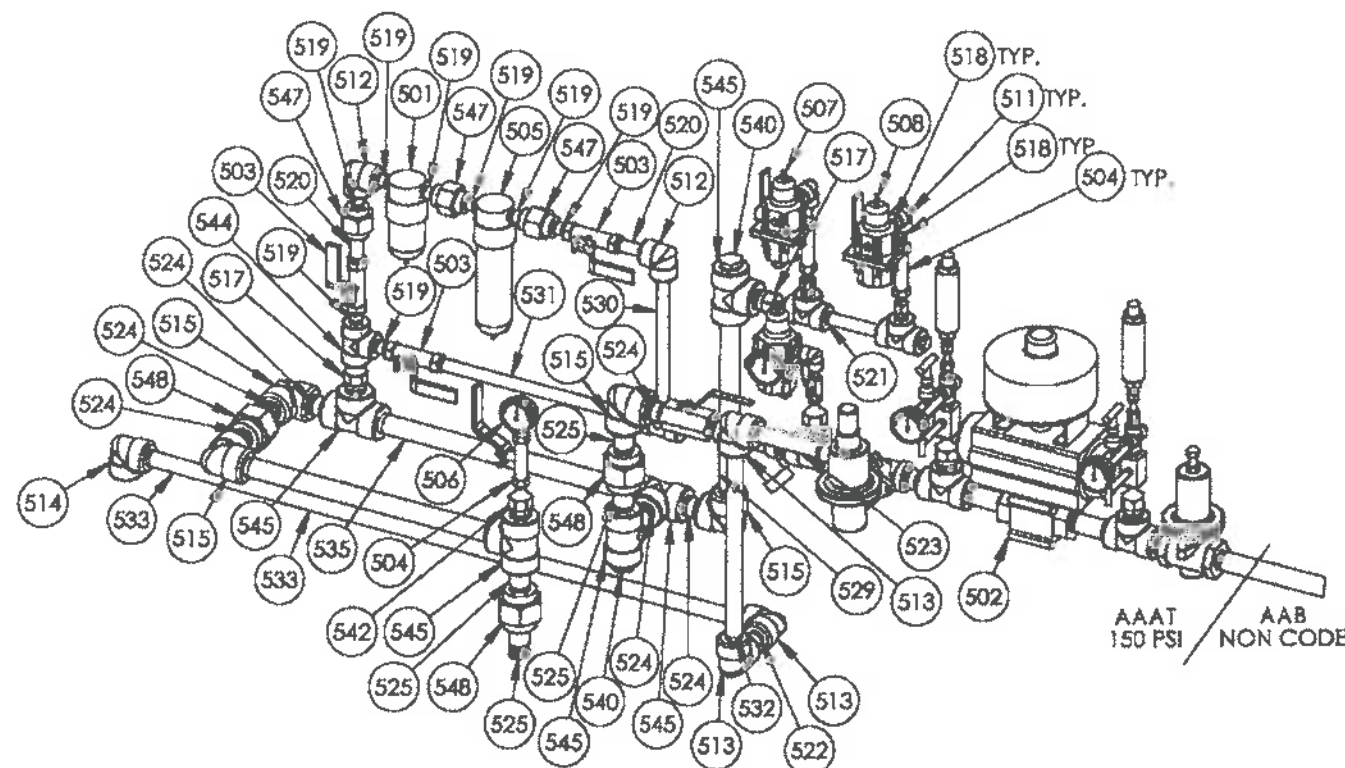
REFERENCE DRAWINGS

DRAWING REVISIONS

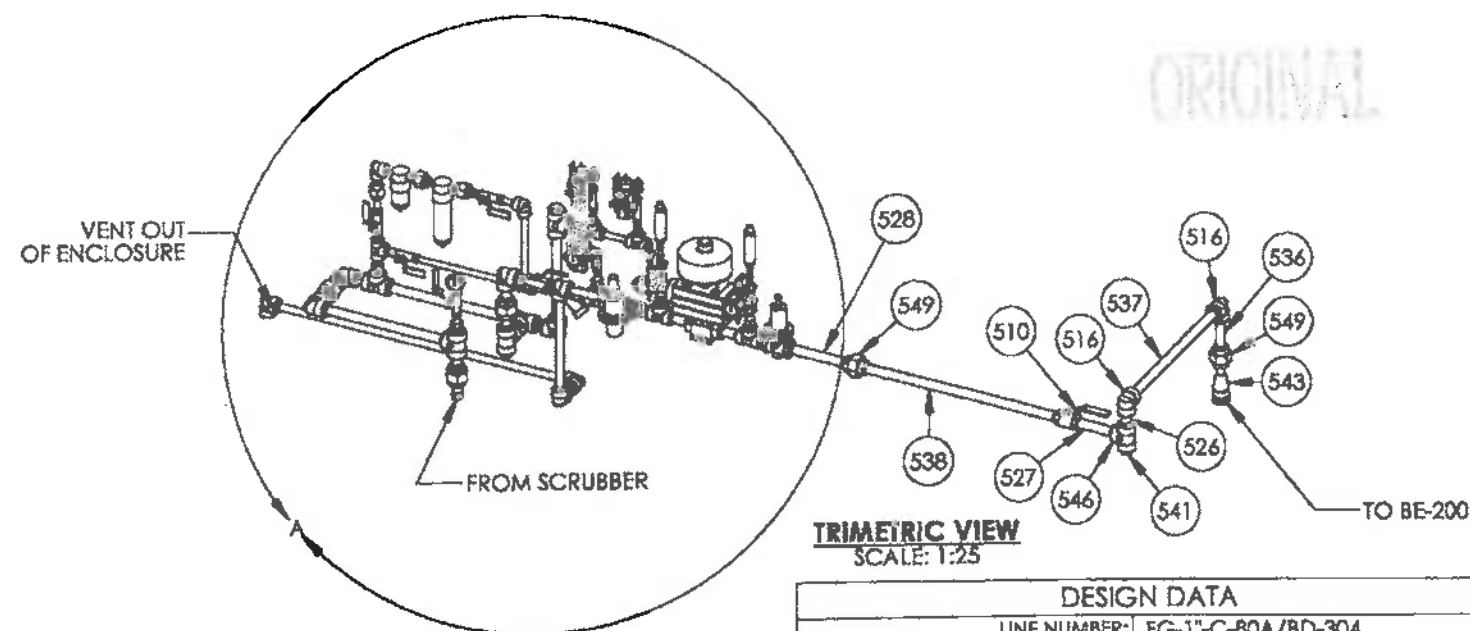
08806

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
501	100218	FILTER HEADLINE MDL 360A-70, MAWP 500 PSI, 1/2" NPT			1
502	100963	VALVE TRAIN ENCANA SPEC L-R FLOW			1
503	BUY	BALL VALVE NUTRON 1/2" 3000 PSI NPT FF NACE T3			3
504	BUY	BALL VALVE NUTRON 1/4" 3000 PSI NPT FF STD T3			3
505	BUY	FILTER HEADLINE MDL 370A, MAWP 500 PSI, 1/2" NPT			1
506	BUY	PRESSURE INDICATOR WKA 2 1/2" FACE x 1/4" NPT 0-200 PSI SS			1
507	BUY	PRESSURE REGULATOR FISHER 67CFR 0-35 PSI SPRING STD TRIM			1
508	BUY	PRESSURE REGULATOR FISHER 67CFR 0-125 PSI SPRING STD TRIM			1
509	BUY	SWAGE 1/2" x 1/4" SCH XH/80 THRD 316 SST			2
510	BUY	VALVE BALL EMICO 1" NPT 720 SERIES 600 PSI WOG FP			1
511	EL9.25HYEE	Elbow 90 Deg 1/4" 6M THRD SA105N			2
512	EL9.5HYEE	Elbow 90 Deg 1/2" 6M THRD SA105N			2
513	EL9.75HYEE	Elbow 90 Deg 3/4" 6M THRD SA105N			3
514	EL9.75HYEF	ELBOW 90 DEG 3/4" 6M THRD SA350-LF2-CL1			1
515	EL9THYEE	Elbow 90 Deg 1" 6M THRD SA105N			4
516	EL9THYEF	ELBOW 90 DEG 1" 6M THRD SA350-LF2-CL1			2
517	SWA1.5Y80EE	SWAGE 1" x 1/2" SCH XH/80 THRD SA105N			2
518	NIP.25Y80EK	NIPPLE 1/4" x 2" SCH XH/80 316/316L SST			4
519	NIP.52Y80EA	NIPPLE 1/2" x 2" SCH XH/80 SA106-B			8
520	NIP.53Y80EA	NIPPLE 1/2" x 3" SCH XH/80 SA106-B			2
521	NIP.55Y80EA	NIPPLE 1/2" x 5" SCH XH/80 SA106-B			1
522	NIP.752.5Y80EA	NIPPLE 3/4" x 2 1/2" SCH XH/80 SA106-B			1
523	NIP.756Y80EA	NIPPLE 3/4" x 6" SCH XH/80 SA106-B			1
524	NIP12.5Y80EA	NIPPLE 1" x 2 1/2" SCH XH/80 SA106-B			6
525	NIP13Y80EA	NIPPLE 1" x 3" SCH XH/80 SA106-B			4
526	NIP13Y80EB	NIPPLE 1" x 3" SCH XH/80 SA333-6			1
527	NIP18Y80EB	NIPPLE 1" x 8" SCH XH/80 SA333-6			1

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
528	NIP110Y80EB	NIPPLE 1" x 10" SCH XH/80 SA333-6			1
529	NIP115Y80EA	NIPPLE 1" x 15" SCH XH/80 SA106-B			1
530	PIP.580A	PIPE 1/2" SCH XH/80 SA106B TE		11"	1
531	PIP.580A	PIPE 1/2" SCH XH/80 SA106B TE		16 3/16"	1
532	PIP.7580A	PIPE 3/4" SCH XH/80 SA106B TE		15 5/8"	1
533	PIP.7580B	PIPE 3/4" SCH XH/80 SA333-6 TE		45 11/16"	1
534	PIP180A	PIPE 1" SCH XH/80 SA106B		19 11/16"	1
535	PIP180A	PIPE 1" SCH XH/80 SA106B		20 1/16"	1
536	PIP180B	PIPE 1" SCH XH/80 SA333-6 TE		57/8"	1
537	PIP180B	PIPE 1" SCH XH/80 SA333-6 TE		25 13/16"	1
538	PIP180B	PIPE 1" SCH XH/80 SA333-6 TE		31 5/16"	1
539	PLH.5HYEE	PLUG HEX 1/2" 6M THRD SA105N			2
540	PLH1HYEE	PLUG HEX 1" 6M THRD SA105N			1
541	PLH1HYEF	PLUG HEX 1" 6M THRD SA350-LF2-CL1			1
542	SWA1.25Y80EK	SWAGE 1" x 1/4" SCH XH/80 THRD 316 SST			1
543	SWA21Y80EF	SWAGE 2" x 1" SCH XH/80 THRD SA350-LF2-CL1			1
544	TEE.5HYEE	Tee 1/2" 6M THRD SA105N			4
545	TEE1HYEE	Tee 1" 6M THRD SA105N			5
546	TEE1HYEF	TEE 1" 6M THRD SA350-LF2-CL1			1
547	UNN.5HYEE	UNION 1/2" 6M THRD SA105N			3
548	UNN1HYEE	UNION 1" 6M THRD SA105N			3
549	UNN1HYEF	UNION 1" 6M THRD SA350-LF2-CL1			2



DETAIL 'A'
SCALE: 1:8



TRIMEIRIC VIEW
SCALE: 1:25

DESIGN DATA	
LINE NUMBER:	FG-1"-C-80A/BD-304
CLIENT SPECIFICATION:	ENCANA AAAT/AAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NPS 2010 EDITION
DESIGN PRESSURE:	150 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 °F
MINIMUM DESIGN TEMPERATURE:	-20 °F/-49 °F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	225 PSIG
JOINT SEALANT:	JET LUBE TF-15
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253

NOTES

1. SHOP TO ADJUST RANDOM PIPE LENGTHS AS REQUIRED.
2. 10% XRAY ON NWP MANUFACTURED THREADED PIPING.

AS BUILT

ISSUED FOR
CONSTRUCTION

SIGNED:

DATE:

8806-002

W.O.:

S/N: NWP-08806-002

ALL DIMENSIONS IN INCHES



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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
C/W 4"-2500# RTJ SPLIT COILS
PIPING ASSEMBLY

DWN: VW	CHK:	APP:
DATE: OCT 05/12	DATE: NOV 21 2012	DATE: NOV 21 2012
SCALE: 1:25	DWG: 08562-2B	REV: 0
SHEET: 5 OF 8		

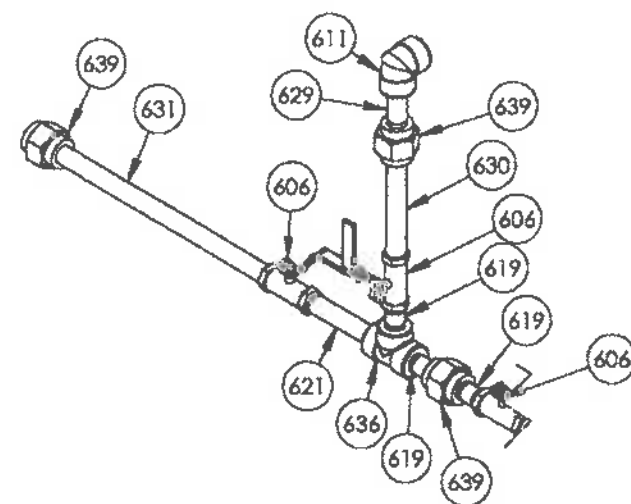
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	ISSUED FOR CONSTRUCTION
08562-6	BATH ASSEMBLY						
08562-3	SKID ASSEMBLY						
08562-2A	WELDED PIPING						
08562-1	PIPING AND INSTRUMENTATION DIAGRAM						
08562	GENERAL ARRANGEMENT	0	OCT 05/12	VW	B		

REFERENCE DRAWINGS

DRAWING REVISIONS

08806

TO PREHEAT PIPING



DESIGN DATA	
LINE NUMBER:	FG-1"-C-80A/BD-300/304
CLIENT SPECIFICATION:	ENCANA AAAT/AAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS 2008 EDITION
DESIGN PRESSURE:	150 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 ° F
MINIMUM DESIGN TEMPERATURE:	-20 ° F/-49 ° F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	225 PSIG
JOINT SEALANT:	JET LUBE TF-15
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253

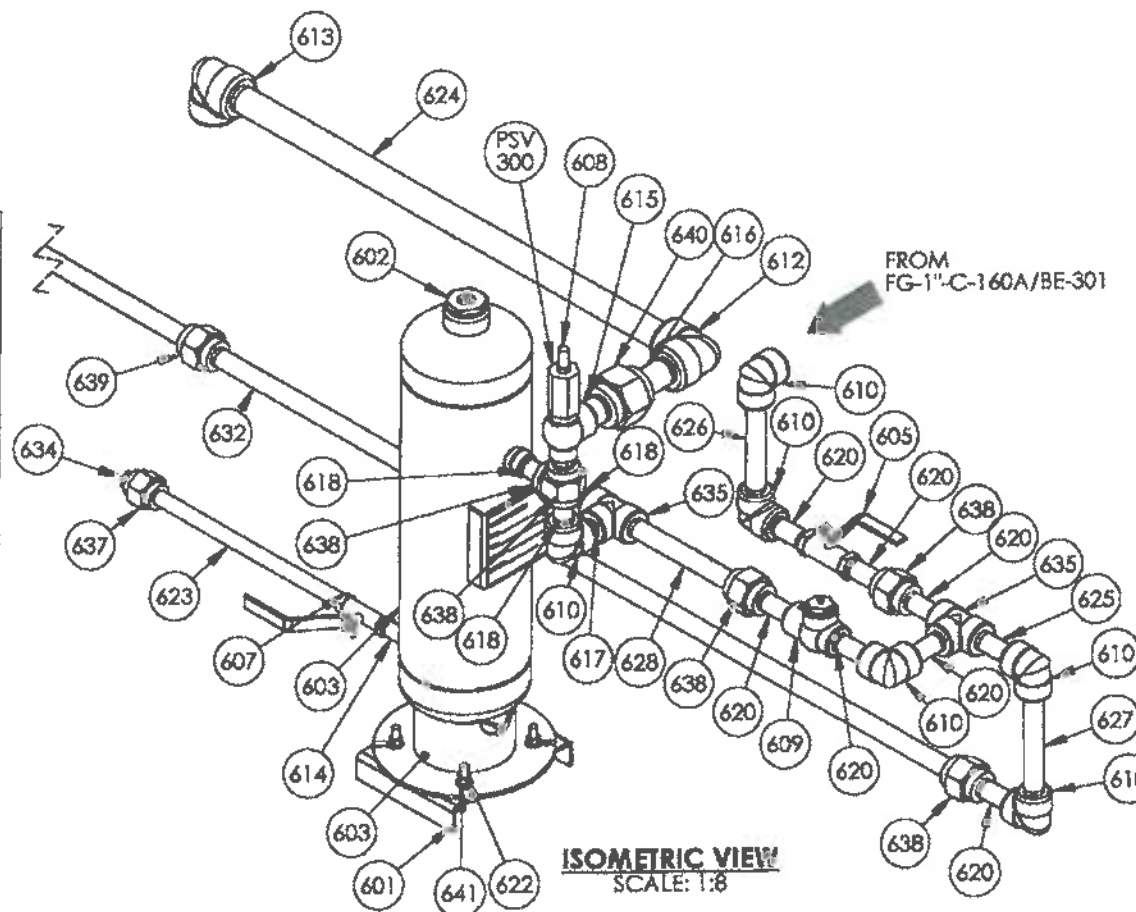
2010-2012
JUN 18 2013

NOTES

1. SHOP TO ADJUST RANDOM PIPE LENGTHS AS REQUIRED.
2. 10% XRAY ON NWP MANUFACTURED THREADED PIPING.
100% XRAY ON PSV-300 CONNECTIONS.

DESIGN DATA	
LINE NUMBER:	D-3/4"-C-80A/BD-250
CLIENT SPECIFICATION:	ENCANA AAAT/AAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
DESIGN PRESSURE:	150 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 ° F
MINIMUM DESIGN TEMPERATURE:	-20 ° F/-49 ° F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	225 PSIG
JOINT SEALANT:	JET LUBE TF-15
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253

DESIGN DATA	
LINE NUMBER:	FG-1"-C-80AD-302/303
CLIENT SPECIFICATION:	ENCANA AAAT
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
DESIGN PRESSURE:	150 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 ° F
MINIMUM DESIGN TEMPERATURE:	-20 ° F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	225 PSIG
JOINT SEALANT:	JET LUBE TF-15
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253



ISOMETRIC VIEW
SCALE: 1:8

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
601	385935	SCRUBBER BASE FORMED 9" W x 11" LG x 2" H x 10 GA. SA-36/44W			1
602	599928	SCRUBBER FLOAT - 2" FOR HUSD			1
603	926312	8 5/8" OD x 23" S/S SWEET FUEL GAS SCRUBBER			1
604	BOL.52KY	BOLT 1/2" x 2" LG GR. 5 HEX HEAD			4
605	BUY	BALL VALVE NUTRON 1" 3000 PSI T3			1
606	BUY	BALL VALVE NUTRON 1" 3000 PSI NPT RP LOW TEMP T3			3
607	BUY	BALL VALVE NUTRON 3/4" 3000 PSI T3			1
608	BUY	TAYLOR RELIEF VALVE 1" x 1 1/2", SET @ 150 PSI, NACE TRIM (8200 SERIES)			1
609	BUY	VALVE SWING CHECK WHEATLEY 1" NPT 2160 PSI P/N 9D-822-013216-166			1
610	EL91HYEE	Elbow 90 Deg 1" 6M THRD SA105N			6
611	EL91HYEF	ELBOW 90 DEG 1" 6M THRD SA350-LF2-CL1			1
612	EL91.5HYEE	ELBOW 90 DEG 1 1/2" 6M THRD SA105N			1
613	EL91.5HYEF	ELBOW 90 DEG 1 1/2" 6M THRD SA350-LF2-CL1			1
614	NIP.753Y80EA	NIPPLE 3/4" x 3" SCH XH/80 SA106-B			1
615	NIP1.53Y80EA	Nipple 1-1/2" x 3" S/80 SA106B			1
616	NIP1.54Y80EA	Nipple 1-1/2" x 4" S/80 SA106B			1
617	NIP12Y80EA	NIPPLE 1 x 2" SCH XH/80 SA106-B			1
618	NIP13Y80EA	NIPPLE 1" x 3" SCH XH/80 SA106-B			3
619	NIP13Y80EB	NIPPLE 1" x 3" SCH XH/80 SA333-6			3
620	NIP14Y80EA	NIPPLE 1" x 4" SCH XH/80 SA106-B			7
621	NIP17Y80EB	NIPPLE 1" x 7" SCH XH/80 SA333-6			1
622	NUT.5YBAA	NUT 1/2" GR. 2 HEX PLATED			4
623	PIP.7580B	PIPE 3/4" SCH XH/80 SA333-6 TE		18 5/16"	1
624	PIPT.580B	PIPE 1 1/2" SCH XH/80 SA333-6 TE		41 3/16"	1
625	PIPT80A	PIPE 1" SCH XH/80 SA106B		4 1/16"	1
626	PIPT80A	PIPE 1" SCH XH/80 SA106B		8 1/2"	1
627	PIPT80A	PIPE 1" SCH XH/80 SA106B		9 5/16"	1
628	PIPT80A	PIPE 1" SCH XH/80 SA106B		10 5/8"	1
629	PIPT80B	PIPE 1" SCH XH/80 SA333-6 TE		4 1/16"	1
630	PIPT80B	PIPE 1" SCH XH/80 SA333-6 TE		9"	1
631	PIPT80B	PIPE 1" SCH XH/80 SA333-6 TE		20 7/8"	1
632	PIPT80B	PIPE 1" SCH XH/80 SA333-6 TE		15 1/16"	1
633	PIPT80B	PIPE 1" SCH XH/80 SA333-6 TE		162 13/16"	1
634	PLH.75HYEF	PLUG HEX 3/4" 6M THRD SA350-LF2-CL1			1
635	TEETHYEE	Tee 1" 6M THRD SA105N			2
636	TEETHYEF	TEE 1" 6M THRD SA350-LF2-CL1			1
637	UNN.75HYEF	UNION 3/4" 6M THRD SA350-LF2-CL1			1
638	UNNTHYEE	UNION 1" 6M THRD SA105N			5
639	UNNTHYEF	UNION 1" 6M THRD SA350-LF2-CL1			4
640	UNN1.5HYEE	UNION 1 1/2" 6M THRD SA105N			1
641	WAS.5YKYA	FLAT WASHER 1/2" GR. 5 PLATED			8

AS BUILT

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*
DATE: JUN 18 2013
W.O. 8806-002
S/N: NWP-08806-002
ALL DIMENSIONS IN INCHES



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3.0 MMBTU
C/W 4"-2500# RTJ SPLIT COILS
PIPING ASSEMBLY

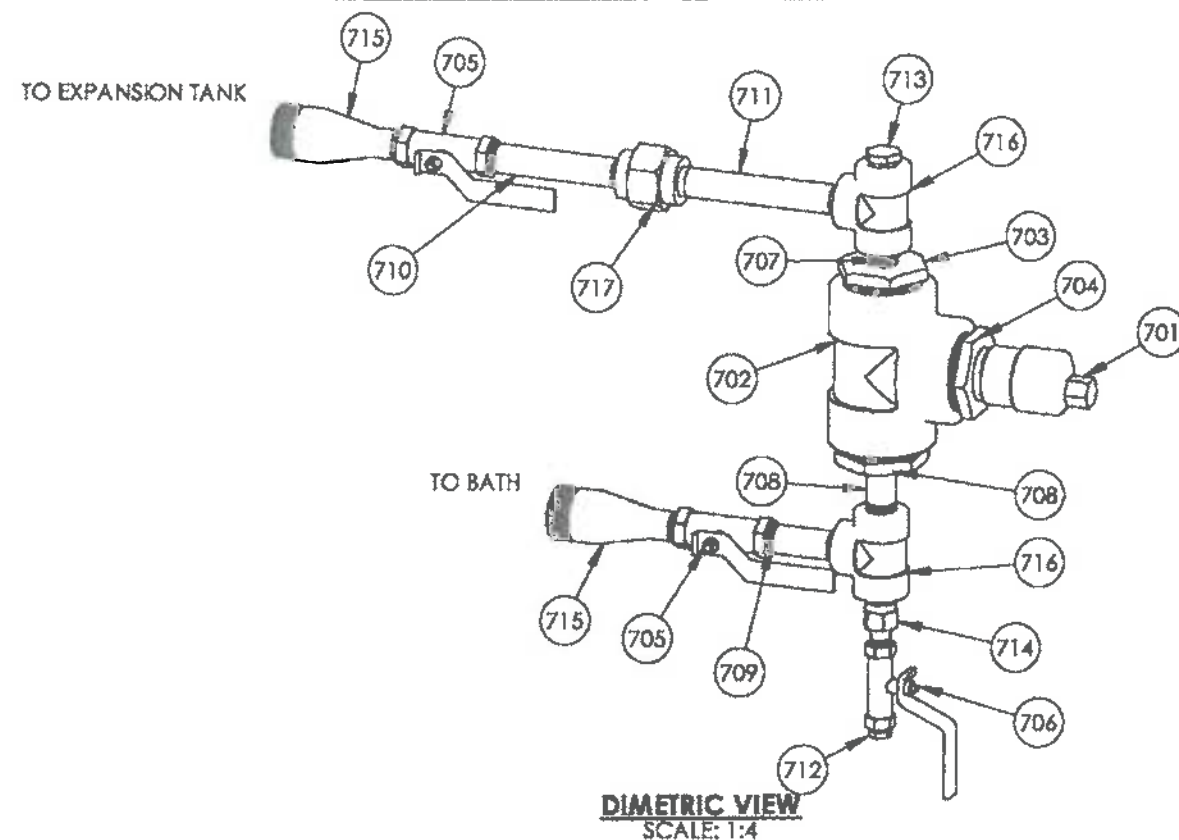
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SCALE: 1:8
SHEET: 6 OF 8
CHK: *[Signature]*
DATE: NOV 20 2012
APP: *[Signature]*
DATE: NOV 20 2012
DWG: 08562-28
REV: 0

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-6	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2A	WELDED PIPING					
08562-1	PIPING AND INSTRUMENTATION DIAGRAM					
08562	GENERAL ARRANGEMENT	0	OCT 05/12	VW	<i>[Signature]</i>	<i>[Signature]</i>

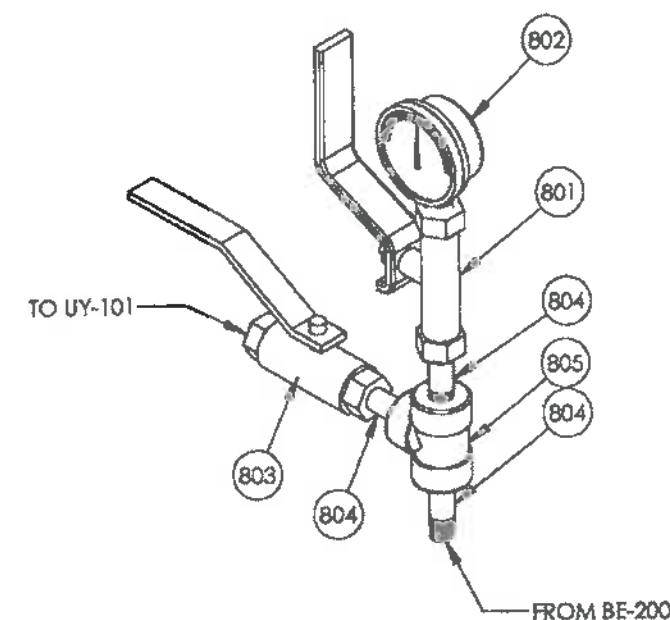
DRAWING REVISIONS

08806

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
701	BUY	LEVEL SWITCH ELECTRIC SOR 2" NPT MODEL T5T0C-G2A-C-L9-ES-CSNCCVMC			1
702	140813	TEE 3" FS 3M THREADED			1
703	BUS31YYEE	BUSHING 3" x 1" SA105N			2
704	BUS32YYEE	BUSHING 3" x 2" SA105N			1
705	BUY	BALL VALVE NUTRON 1" 3000 PSI NPT RP NACE T3			2
706	BUY	BALL VALVE NUTRON 1/2" 3000 PSI NPT FP STD T3			1
707	NIP12Y80EA	NIPPLE 1" x 2" SCH XH/80 SA106-B		-	1
708	NIP13.5Y80EA	NIPPLE 1" x 3 1/2" SCH XH/80 SA106-B		-	1
709	NIP14.5Y80EA	NIPPLE 1" x 4 1/2" SCH XH/80 SA106-B		-	1
710	NIP17.5Y80EA	NIPPLE 1" x 7 1/2" SCH XH/80 SA106-B		-	1
711	PIPI80A	PIPE 1" SCH XH/80 SA106B		8 3/4"	1
712	PLH.5HYEE	PLUG HEX 1/2" 6M THRD SA105N			1
713	PLH1HYEE	PLUG HEX 1" 6M THRD SA105N			1
714	SWA1.5Y80EE	SWAGE 1" x 1/2" SCH XH/80 THRD SA105N			1
715	SWA21Y80EE	SWAGE 2" x 1" SCH XH/80 THRD SA105N			2
716	TEETHYEE	Tee 1" 6M THRD SA105N			2
717	UNN1HYEE	UNION 1" 6M THRD SA105N			1



ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
801	BUY	BALL VALVE NUTRON 1/4" 3000 PSI LOW TEMP T3			1
802	BUY	PRESSURE INDICATOR WIKA 2 1/2" FACE x 1/4" NPT 0-30 PSI SS			1
803	BUY	VALVE BALL EMICO 1/4" NPT 720 SERIES 600 PSI SS FP			1
804	NIP.252Y80EB	NIPPLE 1/4" x 2" SCH XH/80 SA333-6		-	3
805	TEE.25HYFF	TEE 1/4" 6M SW SA350-LF2-CL1			1



ISOMETRIC VIEW
SCALE: 1:4

NOTES
1. SHOP TO ADJUST RANDOM PIPE LENGTHS AS REQUIRED.

ORIGINAL

AS BUILT

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-6	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2A	WELDED PIPING					
08562-1	PIPING AND INSTRUMENTATION DIAGRAM					
08562	GENERAL ARRANGEMENT	0	OCT 05/12	VW		
ISSUED FOR CONSTRUCTION						
DRAWING REVISIONS						

ISSUED FOR
CONSTRUCTION

SIGNED: *[Signature]*
DATE: JUN 18 2013
W. 8806-002
S/N: NWP-08806-002
ALL DIMENSIONS IN INCHES



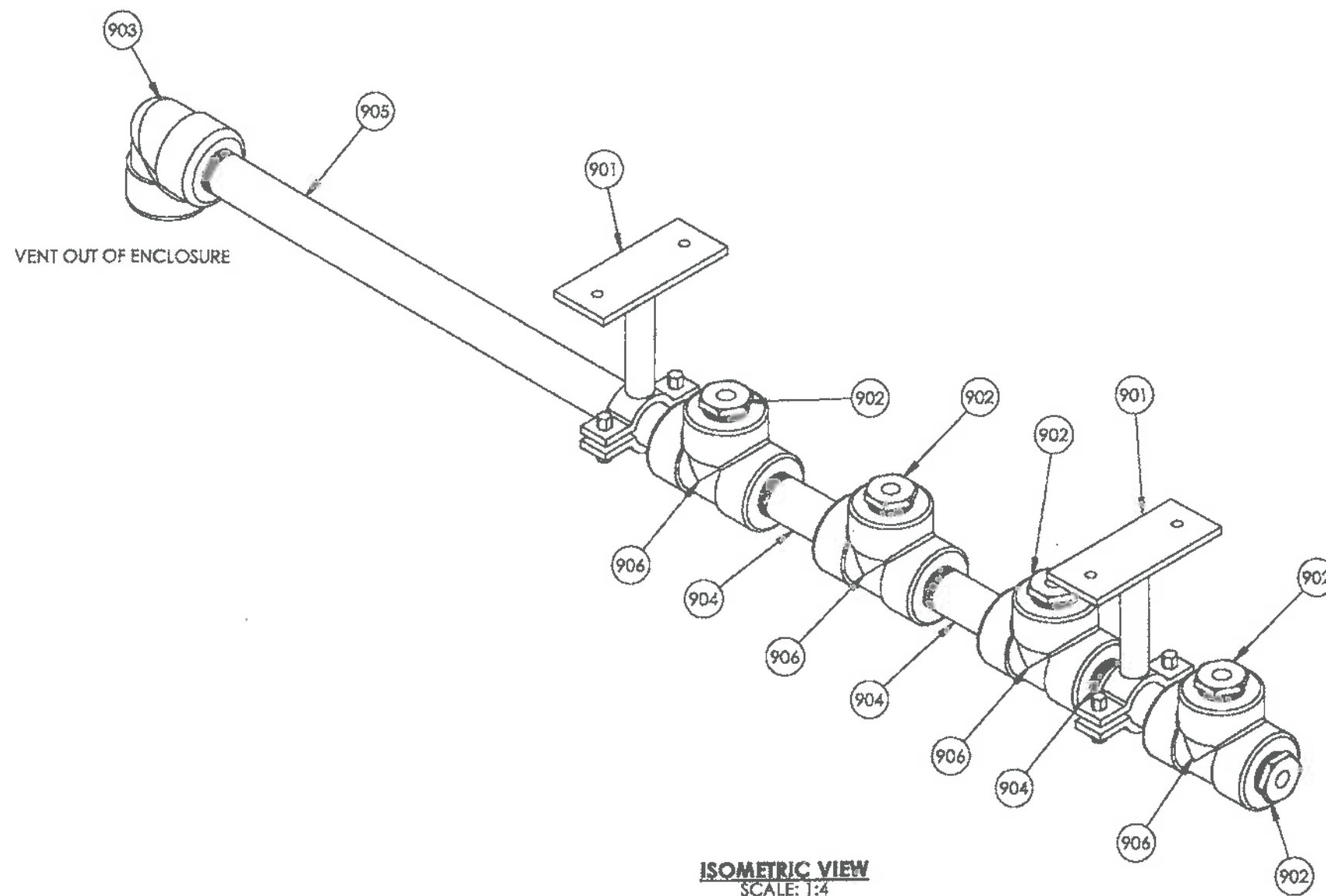
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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
c/w 4"-2500# RTJ SPLIT COILS
PIPING ASSEMBLY

DWN: VW CHK: *[Signature]* APP: *[Signature]*
DATE: OCT 05/12 DATE: NOV 20 2012 DATE: NOV 19 2012
SCALE: 1:4 DWG: 08562-2B REV: 0
SHEET: 7 OF 8

08806



ISOMETRIC VIEW
SCALE: 1:4

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
901	100812	BRACKET, FUEL GAS VENT HEADER 1"			2
902	706720	1" x 1/4" FS THRD HEX BUSHING			5
903	EL91HYEF	ELBOW 90 DEG 1" 6M THRD SA350-LF2-CL1			1
904	NIP14Y80EA	NIPPLE 1" x 4" SCH XH/80 SA106-B		-	3
905	NIP120Y80EB	NIPPLE 1" x 20 SCH XH/80 SA333-6		-	1
906	TEE1HYEE	Tee 1" 6M THRD SA105N			4

ORIGINAL

NOTES

1. SHOP TO ADJUST RANDOM PIPE LENGTHS AS REQUIRED.
2. 10% XRAY ON NWP MANUFACTURED THREADED PIPING.

						AS BUILT		ISSUED FOR CONSTRUCTION		 NWP INDUSTRIES INC. Total oilfield supply. P.O. BOX 6280, INNISFAIR, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.		ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU C/W 4"-2500# RTJ SPLIT COILS PIPING ASSEMBLY			
08562-6	BATH ASSEMBLY							SIGNED: <i>[Signature]</i>					DWN: VW	CHK: <i>[Signature]</i>	APP: <i>[Signature]</i>
08562-3	SKID ASSEMBLY							DATE: JUN 11 2012			DATE: OCT 05/12	DATE: NOV 20 2012	DATE: NOV 19 2012		
08562-2A	WELDED PIPING							W.O. # 8806-002			SCALE: 1:4	DWG: 08562-2B	REV: 0		
08562-1	PIPING AND INSTRUMENTATION DIAGRAM							S/N: NWP-08806-002			SHEET: 8 OF 8				
08562	GENERAL ARRANGEMENT	0	OCT 05/12	VW	<i>[Signature]</i>	<i>[Signature]</i>	ISSUED FOR CONSTRUCTION								
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP									
REFERENCE DRAWINGS							DRAWING REVISIONS								

08806

NWP Industries Inc™		Website: www.nwp.ca
PO Box 6280 4017-60 Ave.		Phone: (403) 227-4100
T4G 1S9		Fax: (403) 227-4102

CHECKLIST FOR CLEANING OF INDIRECT FIRED HEATER COILS

Initial

- MJS Operator has reviewed safe work practice and signed permit
- MJS Operator has inspected pig receiver to ensure it is in good operating condition and verified that transition spools are correct size and rating for coil to be cleaned
- MJS Operator has verified system is not under pressure
- MJS Operator has ensured
- block valve is in the proper position
 - valves and seal on blind flange are tight and secure
 - closure on receiver is properly installed and secure
 - working pressure of the system and pig receiver are not exceeded
- MJS Operator has reported to supervisor any material collected
- MJS Operator certifies that indirect fired heater coil is free of debris

Serial Number: 08806 - 002

Date: July 17/13

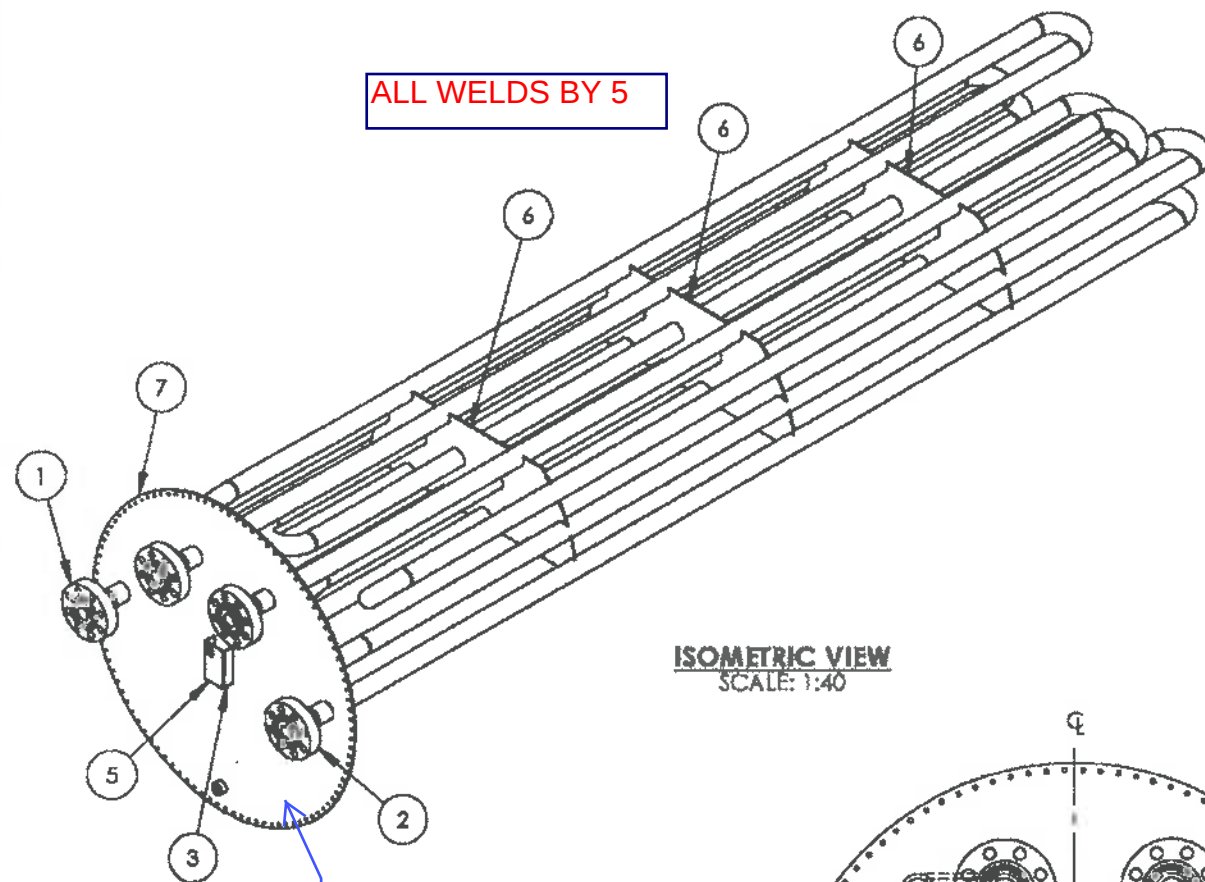
Operator: Morcel Jacques
Print

Morcel Jacques
Signature

Witness: Cassidy Cakes
Print

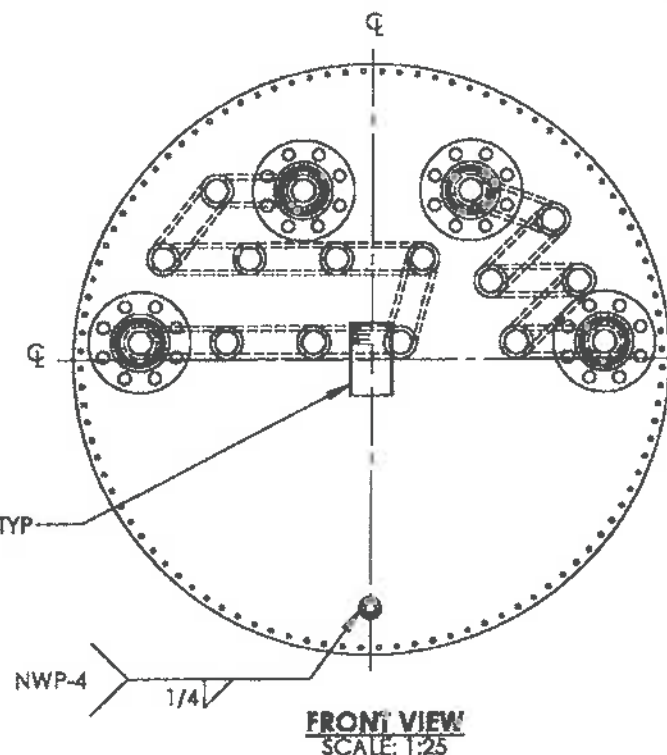
Cassidy Cakes
Signature

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
1	-	PS-100/COIL A - SEE SHEET 2			1
2	-	PS-101/COIL B - SEE SHEET 3			1
3	BRACKET-NAME-3	COIL NAME PLATE BRACKET SA36/44W			1
4	COH2GYEE	Coupling Half 2" 3M THRD SA105N			1
5	COIL-NAMEPLATE-1	COIL NAME PLATE BLACK/SILVER DEEP ETCHED			1
6	PLABYA	COIL TRAY PLATE 1/4" SA36/44W			3
7	PLACYA	COIL END PLATE 3/8" x 82" DIA. SA36/44W			1

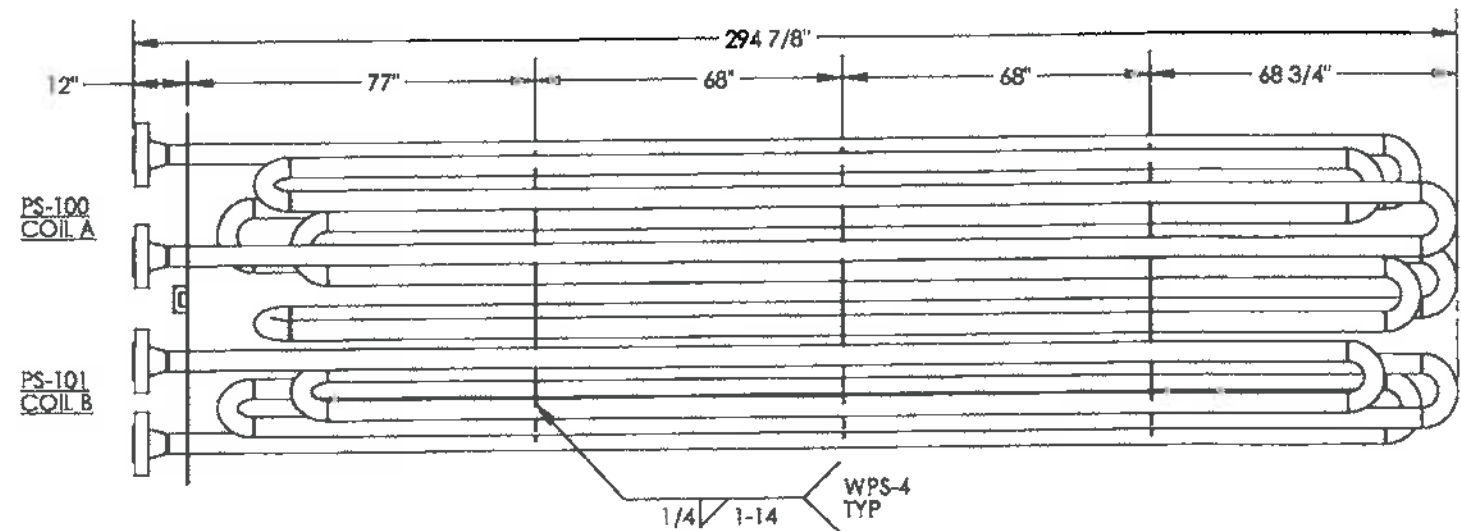


ISOMETRIC VIEW
SCALE: 1:40

FRONT WELDS BY L



FRONT VIEW
SCALE: 1:25

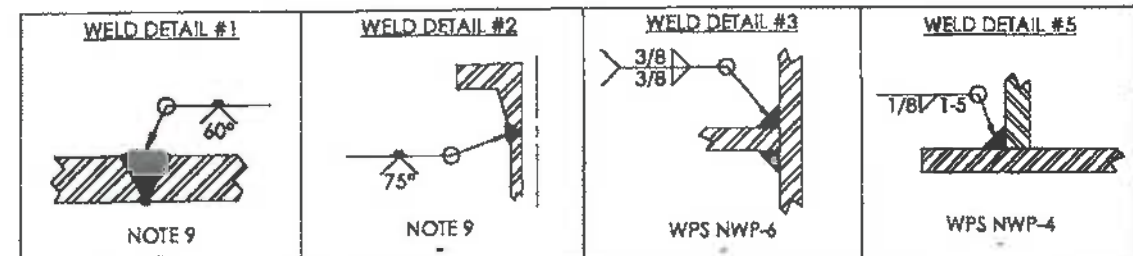


PLAN VIEW
SCALE: 1:40

ORIGINAL

NOTES

1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8$ " UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS INCLUDE $1/8$ " ROOT GAP.
3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY.
5. COIL TO BE CLEANED BEFORE SHIPMENT.
6. USE WELD PROCEDURE NWP-4 OR NWP-6 FOR ALL TACK WELDS.
7. HARDNESS TESTING - MAX 200 BNH 100% OF COIL BUTTWELD. BASELINE UT ON COIL RETURN BENDS.
8. APPROXIMATE WEIGHT: 11,100 LBS.
9. ROLL WELDS TO BE NWP-6. POSITION WELDS TO BE NWP-4. REFERENCE WELD DETAILS 1 & 2.



AS BUILT

ISSUED FOR
CONSTRUCTION

SIGNED: *[Signature]*

DATE: JUN 1 2012

W: 0806-002-A

S/N: NWP-08806-002-A

ALL DIMENSIONS IN INCHES



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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
C/W 4" 2500# RTJ SPLIT COILS
COIL ASSEMBLY

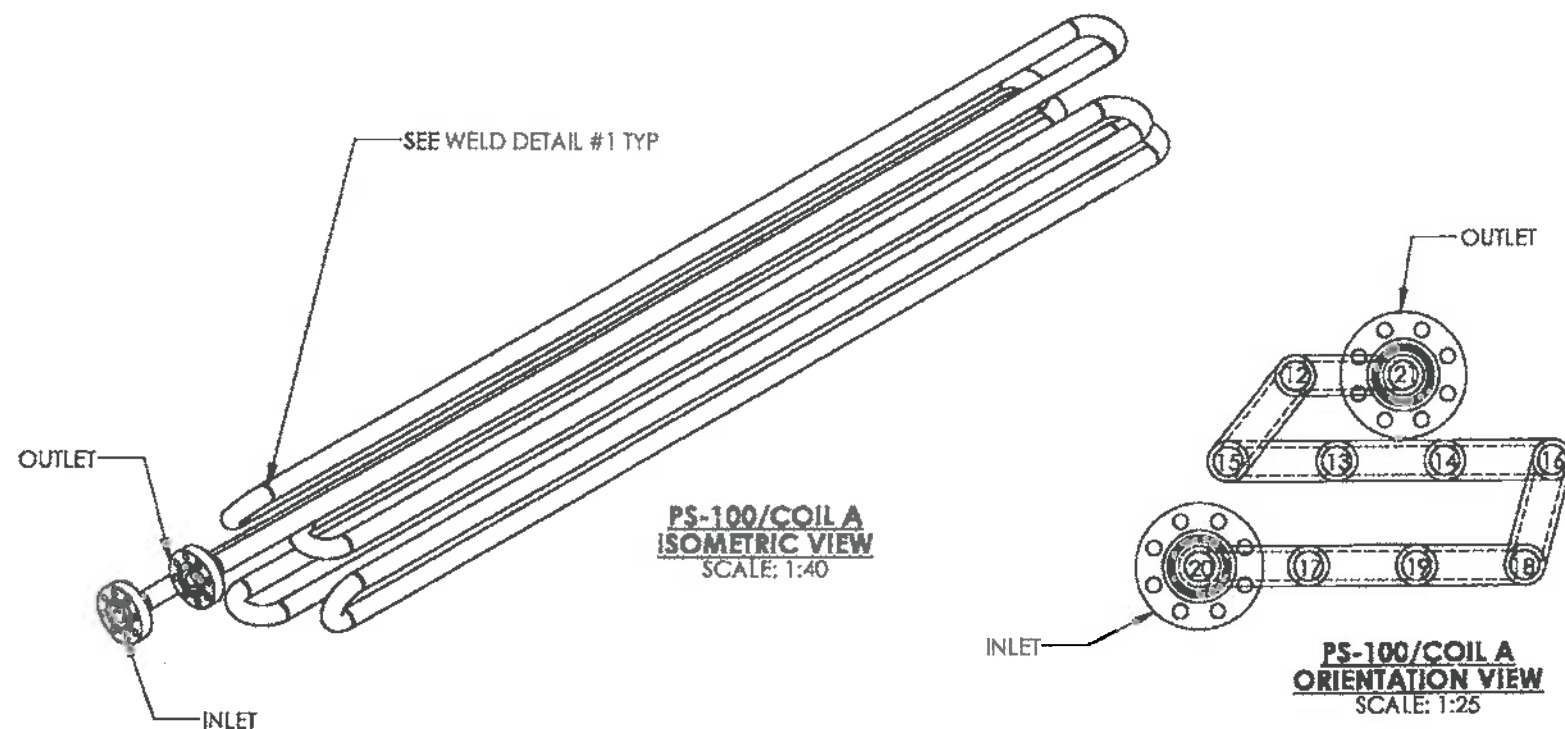
DWN: VW CHK: APP: *[Signature]*

DATE: OCT 05/12 DATE: OCT 29 2012 DATE: OCT 29 2012

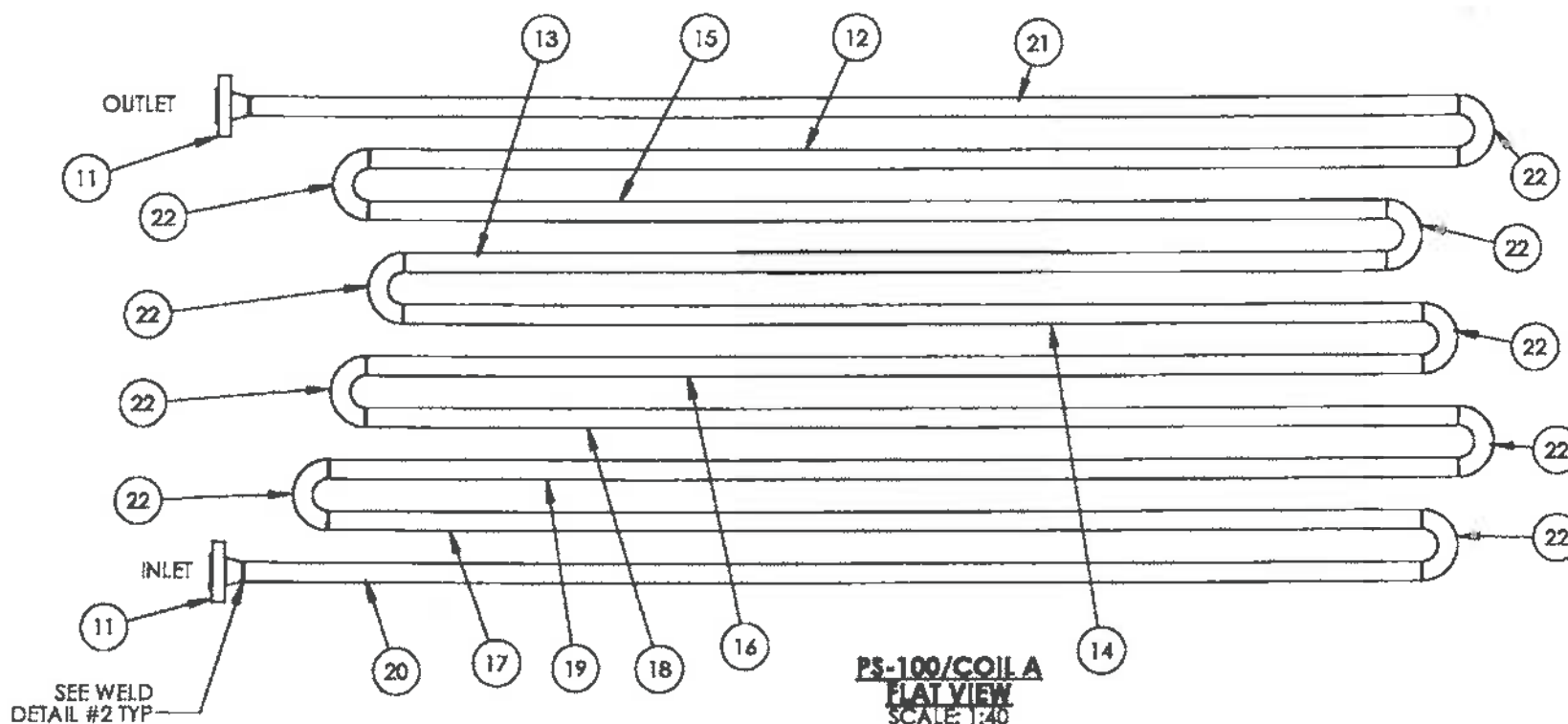
SCALE: 1:40 DWG: 08562-4 REV: 0

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	DRAWING REVISIONS
08562-6	BATH ASSEMBLY						
08562-3	SKID ASSEMBLY						
08562-2B	PIPING ASSEMBLY	0	OCT 22/12	VW			ISSUED FOR CONSTRUCTION
08562-2A	WELDED PIPING	A	OCT 05/12	VW			ISSUED FOR APPROVAL

08806



ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
11	FLA4FXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
12	PIP3XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
13	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		226 1/2"	1
14	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		234 3/4"	1
15	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		234 3/4"	1
16	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		243"	1
17	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
18	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
19	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		259 1/2"	1
20	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		270 7/16"	1
21	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		278 1 1/16"	1
22	RET4LXXHGD	Return 180 Deg 4" LR S/XXH BW SA420WPL6			9



WELD SEQUENCE
21
12
15
13
14
16
18
19
17
20

ORIGINAL

PS-100/COIL A DESIGN DATA	
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
CLIENT SPECIFICATION:	ECA-PVF-S-03 REV D SPEC FAB
DESIGN PRESSURE:	5171 PSI
MAX. DESIGN METAL TEMPERATURE:	200°F
MIN. DESIGN METAL TEMPERATURE:	-20°F
IMPACT TEST:	EXEMPT PER TABLE 323.2.2 COLUMN A
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 7 175°F & 7/16" <i>2 JUN 04/2012</i>
POST WELD HEAT TREATMENT:	1150°F ± 50°F FOR 1 HOUR MIN.
HYDROSTATIC TEST PRESSURE:	7757 PSIG
CORROSION ALLOWANCE:	1/16"
PRE-HEAT:	50°F
WEIGHT EMPTY:	6356 LBS
WEIGHT FULL:	7113 LBS
CAPACITY:	12.2 CU FT
SURFACE AREA:	264 SQ FT
QUALITY CONTROL PROGRAM:	AGP-1253
WELDING PROCEDURE REGISTRATION NO.:	1604.2
WELD PROCEDURES:	NWP-4, NWP-6
SERVICE:	HYDROCARBONS
CRN NO.:	P-9417.213
DESIGN REGISTRATION DRAWINGS:	BDD-400A REV1
REFERENCE CALCULATIONS:	BDD-400A REV4

AS BUILT

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*
DATE: **JUN 4 2012**
W.O.: **8806-002-A**
S/N: **NWP-08806-002-A**
ALL DIMENSIONS IN INCHES



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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
C/W 4" 2500# RTJ SPLIT COILS
COIL ASSEMBLY

DWN: VW CHK: *[Signature]* APP: *[Signature]*
DATE: OCT 05/12 DA **OCT 29 2012** **08806**
SCALE: 1:40
SHEET: 2 OF 4 DWG: **08562-4** REV: **0**

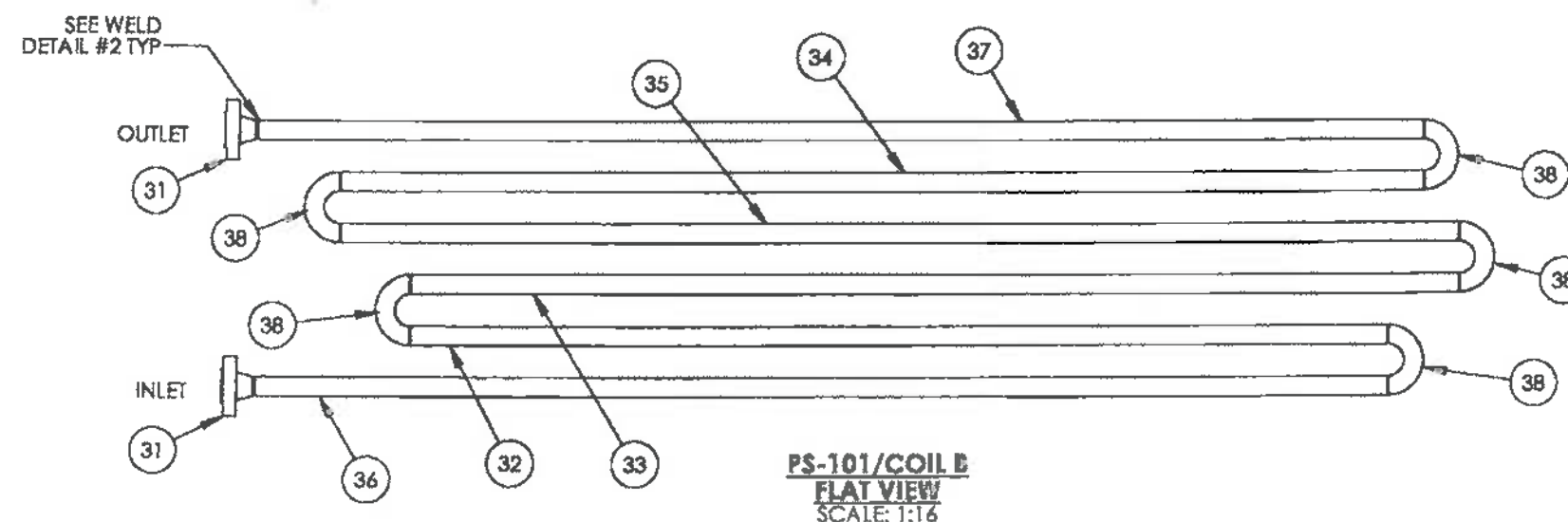
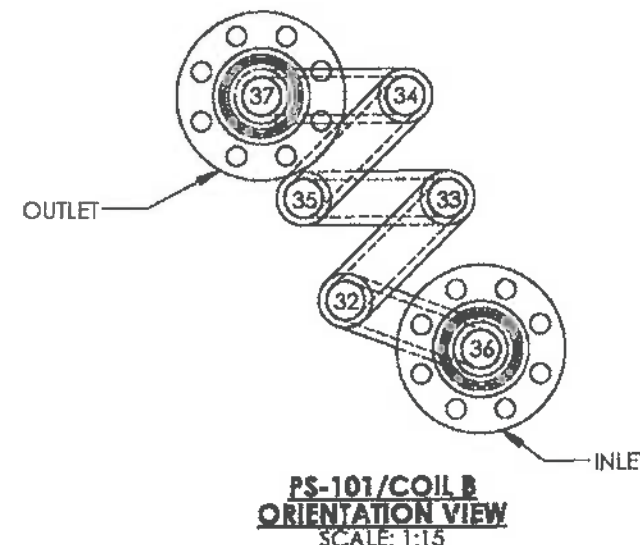
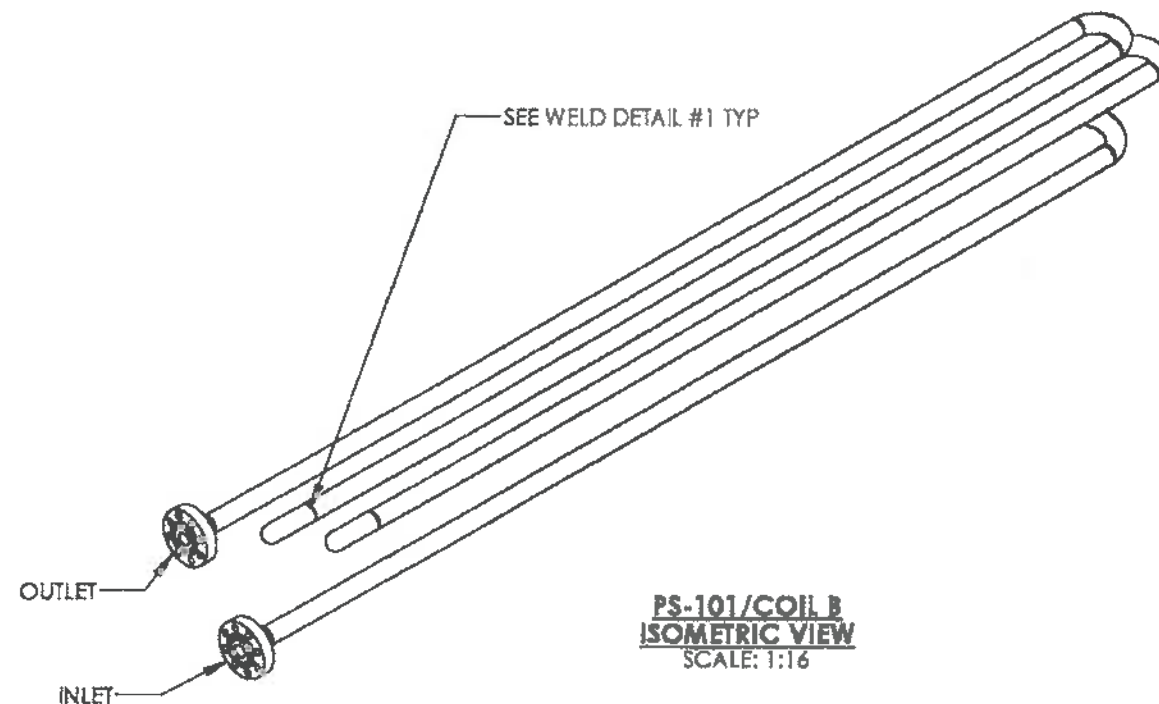
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-6	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2B	WELDED PIPING	0	OCT 22/12	VW	<i>[Signature]</i>	ISSUED FOR CONSTRUCTION
08562-2A	WELDED PIPING	A	OCT 05/12	VW	<i>[Signature]</i>	ISSUED FOR APPROVAL

REFERENCE DRAWINGS

DRAWING REVISIONS

08806

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
31	FLA4FXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
32	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		226 1/2"	1
33	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		243"	1
34	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
35	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		259 1/2"	1
36	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		262 3/16"	1
37	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		270 7/16"	1
38	RET4LXXHGD	Return 180 Deg 4" LR S/XXH BW SA420WPL6			5



WELD SEQUENCE
37
34
35
33
32
36

ORIGINAL

PS-101/COIL B DESIGN DATA	
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
CLIENT SPECIFICATION:	ECA-PVF-S-03 REV 0 SPEC. FAB. FAB. 04/12
DESIGN PRESSURE:	5171 PSI
MAX. DESIGN METAL TEMPERATURE:	200°F
MIN. DESIGN METAL TEMPERATURE:	-20°F
IMPACT TEST:	EXEMPT PER TABLE 323.2.2 COLUMN A
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 7
POST WELD HEAT TREATMENT:	1150°F ±50°F FOR 1 HOUR MIN.
HYDROSTATIC TEST PRESSURE:	7757 PSIG
CORROSION ALLOWANCE:	1/16"
PRE-HEAT:	50°F
WEIGHT EMPTY:	3930 LBS
WEIGHT FULL:	4388 LBS
CAPACITY:	7.4 CU FT
SURFACE AREA:	160 SQ FT
QUALITY CONTROL PROGRAM:	AGP-1253
WELDING PROCEDURE REGISTRATION NO.:	1604.2
WELD PROCEDURES:	NWP-4, NWP-6
SERVICE:	HYDROCARBONS
CRN NO.:	P-9417.213
DESIGN REGISTRATION DRAWINGS:	BDD-400A REV1
REFERENCE CALCULATIONS:	BDD-400A REV4

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-4	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2B	PIPING ASSEMBLY	0	OCT 22/12	VW		
08562-2A	WELDED PIPING	A	OCT 05/12	VW		

AS BUILT

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*
DATE: JUN - 4 2012
W. 8806-002-A
S/N: NWP-08806-002-A
ALL DIMENSIONS IN INCHES



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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
c/w 4" 2500# RTJ SPLIT COILS
COIL ASSEMBLY

DWN: VW CHK: *[Signature]* APP: *[Signature]*
DATE: OCT 05/12 DATE: 06-29-2012
SCALE: 1:40 DWG: 08562-4 REV: 0
SHEET: 3 OF 4

08806

PARTIAL ☐

A# 631821

Manufactured By: NWP Industries Inc. 4017 60th Ave Innisfail Alberta, T4G 1S9
 Manufactured For: Encana Corporation, PO Box 2850, 500 Centre Street SE Calgary Alberta T2G 1A6
 Ultimate Owner: Encana Corporation, PO Box 2850, 500 Centre Street SE Calgary Alberta T2G 1A6
 Location of Installation: Encana Corporation, PO Box 2850, 500 Centre Street SE Calgary Alberta T2G 1A6

Manufacturer's Serial No.	Construction Drawing No.	CODE: ASME B31.3	Year Built
NWP-08806-002-A	08562-4 Rev.0	Edition 2012 Addenda	2013

CONSTRUCTION

Coil ID/Purpose	Design Pressure	Design Temp	Design Minimum Temp	Corrosion Allowance	Registered Drawing No.	CRN
a Coil - A / PS-100	5171 PSIG	200°F	-20°F	0.0625"	BDD-400A Rev.1	P-9417.213
b Coil - B / PS-101	5171 PSIG	200 °F	-20°F	0.0625"	BDD-400A Rev.1	P-9417.213
c						
d						
e						

COIL

Tubes			End Closures				Openings		
Mat'l Spec.	Diameter	Thickness	Return Bend	Thickness	Flatflanges	Rating	Mat'l Spec.	Size/Type	Rating
a SA-333-6	4" NPS	SCH XXH	SA-420-WPL6	SCH XXH	SA-350-LF2-CL1	CL 2500	NA	NA	NA
b SA-333-6	4" NPS	SCH XXH	SA-420-WPL6	SCH XXH	SA-350-LF2-CL1	CL 2500	NA	NA	NA
c									
d									
e									

HEADERS/MANIFOLDS

Purpose	Size	Shell	Thickness	Ends	Thickness	No	Openings	Size/Type	Rating
a NA	NA	Mat'l Spec.	NA	Mat'l Spec.	NA	NA	Mat'l Spec.	NA	NA
b NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
c									
d									
e									

TEST PRESSURE, NDE, POSTWELD HEAT TREATMENT AND SIZE

Hydrostatic Test Pressure	Radiography (100% or % Random)	Other NDE (MT) (PT) (UT)	Postweld Heat Treatment		Overall Length	Heating Surface	Volume
			Temp.	Time			
a 7757 PSI	100%	NA	1160 °F	60 Mins	294.875"	264 sq ft.	12.2 cu ft.
b 7757 PSI	100%	NA	1160 °F	60 Mins	294.875"	160 sq ft.	7.4 cu ft.
c							
d							
e							
f							
g							

IMPACT TESTING: Exempt Per Table 323.2.2 Column A

REMARKS:

CERTIFICATE OF COMPLIANCE

We certify that the statements in this report are correct and that all details of design, material, construction, and workmanship of this coil bundle are in accordance with the above Provincial Registered Design.

Date July 17, 2013

Signed Lance Raven

(Representative)

For

NWP Industries Inc.

(Manufacturer)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, a duly authorized boiler and pressure vessel inspector employed by ABSA of Alberta have inspected the above Heater Coils and state that, to the best of my knowledge and belief, the constructed is in accordance with the Alberta Safety Codes Act and Regulations. By signing this certificate, neither the inspector nor his or her employer makes any warranty, expressed or implied, concerning the vessel described in this manufacturer's data report. Furthermore, neither the inspector nor his or her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date July 17, 2013

Signed

Scott Forbes

AB 357 NB 13790 A



TECTUBI RACCORDI S.p.A.

Work and Office: Via Roma, 150 - 29027 Podenzano (PC)
Ph.: +39 0523 555 311 / Fax: +39 0523 559 621
E-MAIL: info@teclubi.com



- CERTIFICAT DE RECEPTION - INSPECTION CERTIFICATE - ABNAHMEPRUFZEUGNIS N. 12301692/00
(EN 10204 - 3.1)

ACC. TO EU DIRECTIVE 97/23/EC ANNEX I SECT. 4.3 & 7.5

Fig. 1 di 2 Date/Datum : 03/12/12

AVIS/DISPATCH/VERSAND/JOB : V2000499
ACHETEUR/PURCHASER/BESTELLER :
COMMANDE N./ORDER N./BESTELLER NR : 90512ari
SPECIFICATION/SPECIFICATION/LIEFERBEDING : ASTM A420/10 ASME SA420/07
STANDARD DE CONSTRUCTION/CONSTRUCTION STANDARDS/ANFORDERUNGEN : ASME B16.9/07 - ASME B16.25/07

ITEM
VOTRE NOTRE COULEE
Y/R D/R HEAT
I/REF U/REF SCHMELZE
7 001 50,00 ELBOW 4" LR 180° XXS WPL6 00110536

TYPE DE CONSTRUCTION / TYPE OF CONSTRUCTION / ERZEUGNISFORM : SEAMLESS PRODUCED BY PIPE
METHODE DE FABRICATION / METHOD OF MANUFACTURE / HERSTELLVERFAHREN : HOT FORMING BTW 780°C AND 980°C
TRAITEMENT THERMIQUE / HEAT TREATMENT / WARMEBEHANDLUNG : QUENCHING AT 900°C TEMPERING AT 680°C
CERTIFICAT DE FERRERIE N./MILL TEST REPORT N./ABNAHMEPRUFZEUGNIS N. : 311210/2
FOURNISSEUR/SUPPLIER/HERSTELLER : TUBOS REUNID

ANALYSE SUR COULEE / LADLE ANALYSIS / SCHMELZANALYSE (%)

ITEM
VOTRE NOTRE COULEE
Y/R D/R HEAT
I/REF U/REF SCHMELZE
7 001 00110536
CHECK
C % = 0,160
Mn % = 0,150
Si % = 0,240
P % = 0,015
S % = 0,001
Cr % = 0,100
Mo % = 0,050
Ni % = 0,100
Cu % = 0,260
Al % = 0,000
V % = 0,001
Nb % = 0,000
B % = 0,000
N % = 0,000
O % = 0,000

CE1 = C + Mn = 0,28
CE2 = C + Si = 0,32
CE3 = C + Mn + Cr + V + Mo + Cu + Ni = 0,33

CE1 - CE2 : ANALYSE SUR COULEE / LADLE ANALYSIS / SCHMELZANALYSE (%)

ESSAI DE TRACTION / TENSILE TEST / ZUGVERSUCH

SENS / DIRECTION / LAGE : LONG.

ITEM
VOTRE NOTRE ESSAI COULEE
Y/R D/R TEST HEAT
I/REF U/REF PROBE SCHMELZE
7 001 02314/12 00110536
LIM. ELAST. Y.S. 392,00
RESISTANCE T.S. 542,00
ALLONGEMENT ELONGATION 32,66
DURETE' HARDNESS TEST 197 HBW

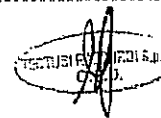
FITTINGS COMPLY WITH NACE MR 01 75 - 03

MECHANICAL TEST CARRIED OUT ON FINISHED FITTINGS : YES (NOT)

* ALL FITTINGS MARKED WITH LOW STRESS DIE STAMPS OR INTERRUPTED DOT STAMPS
* ASPECT ET DIMENSIONS : SATISFAISANT / SURFACE & DIMENSIONS : SATISFACTORY / BESICHTIG - ABMESSUNG: OHNE BEAN STANDING 100%
* TOUS LES RACCORDS SONT CONFORMES AUX STIPULATIONS DE LA COMMANDE ET AUX SPECIFICATIONS DESSUS MENTIONNES
* WE CERTIFY THAT THE FITTINGS COMPLY WITH ORDER REQUIREMENTS AND ABOVE MENTIONED SPECIFICATIONS
* DIE GESTELLTEN ANFORDERUNGEN SIND IN ANLAGE ERFULT

* MARQUE DE FABRIQUE/TRADE MARK *
* ZEICHEN DES LIEFERWERKES *

* CONTROLE DE QUALITE/QUALITY CONTROL
* DER WERKS - SACHVERSTANDIGE



MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EnCana
Date: MAY 07 2013

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"
MAY 07 2013



TECTUBI RACCORDI S.p.A.

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E-MAIL: info@tectubi.com



- CERTIFICAT DE RECEPTION - INSPECTION CERTIFICATE - ABNAHMEPRUFZEUGNIS N. 12301692/00
(EN 10204 - 3.1)

ACC. TO EU DIRECTIVE 97/23/EC ANNEX 1 SECT. 4.3 & 7.5

Fg. 2 di 2 Date/Datum : 03/12/12

ESSAI DE RESILIENCE/IMPACT TEST/KERBSCHLAGVERSUCH				SENS/DIRECTION/LAGE : LONG.		TEMP. : -50°C		TYPE : ASTM KCV	
ITEM		DIMENSION	SECTION	TRAVAIL DE RUPT.		IMPACT VALUE		SHEAR AREA	
VOTRE NOTRE	ESSAI	SIZE	SECTION	KERBSCHLAGARBEIT					
Y/R O/R	TEST	ABMESSUNGEN	QUERSCH.	J 1+2+3/3					
I/REF U/REF	PROBE	MM	CH2						
7	001 02314/12	10,8 x 10,0	0,80000	1.	115,0	1.	0,0		
				2.	123,0	120,0	2.	0,0	
				3.	122,0		3.	0,0	

AUTRES ESSAIS / OTHER TESTS / ANDERE PRUFUNGEN :

Note :

- FITTINGS ACCORDING TO NACE MR-01-75 / NACE MR0103/ ISO 15156-2
- BASE MATERIAL ACCORDING TO ASME II PART.D TAB.Y1
- FITTINGS ACCORDING TO (PED) 97/23/EC
- All material supplied is certified to be free of Mercury contamination and no mercury bearing equipment was used during manufacturing
- VISUAL and DIMENSIONAL CHECK CARRIED OUT ON 10% OF TOTAL PIECES
- HARDNESS TEST CARRIED OUT ON 10% OF TOTAL PIECES
- Results (Min./Max.) : 158/166 HBW ✓

- FITTINGS ACCORDING TO: WILLIAMS GAS PIPELINE SPEC 50.14.07.03 REV.3
- ENRON SPEC ES-4900 REV.5 DATED 6/94. ELPASO SPEC. EP-HY WELD FIT
- SPEC REV.1 DATED 11/01/01, DUKE ENERGY SPEC ES-PF1.4 DATED 3/01/02,
- KINDER MORGAN SPEC B120 DATED 1/03, ENERGY TRANSFER SPEC ETC-HY
- WEDFIT DATED 1/14/05. SOUTHWEST GAS SPEC B.2, KINDER MORGAN M8120
- DATED 07/05, CONOCO PHILLIPS SPEC-PT-NS-80014 REV.1, BP SPEC SPC-PP-
- 00028 REV.0, MSS SP-75/04.

- * ALL FITTINGS MARKED WITH LOW STRESS DIE STAMPS OR INTERRUPTED DOT STAMPS
- * ASPECT ET DIMENSIONS : SATISFAISANT / SURFACE & DIMENSIONS : SATISFACTORY / BESICHTIG - ABMESSUNG: OHNE BEAN STANDUNG 100%
- * TOUS LES RACCORDS SONT CONFORMES AUX STIPULATIONS DE LA COMMANDE ET AUX SPECIFICATIONS DESSUS MENTIONNES
- * WE CERTIFY THAT THE FITTINGS COMPLY WITH ORDER REQUIREMENTS AND ABOVE MENTIONED SPECIFICATIONS
- * DIE GESTELLTEN ANFORDERUNGEN SIND IN ANLAGE ERFÜLLT

- * MARQUE DE FABRIQUE/TRADE MARK *
- * ZEICHEN DES LIEFERWERKES *
- * CONTROLE DE QUALITE/QUALITY CONTROL *
- * DER WERKS - SACHVERSTANDIGE *



Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

N.D.E Requirements

Client: NWP Industries Inc.

JO#

Project: Return Bends

Date: 13/05/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other:

☐ X-Ray

☐ 100%

☐ ASME Section VIII-UW-51

☐ Gamma Ray

☒ Full

☐ ASME Section VIII-UW-52

☒ Ultrasonics

☐ 25%

☐ Customer Specification

☐ Liquid Penetrant

☐ 10%

☐ ASME B31.3 NFS

☐ Magnetic Particle

☐ Other(Define)

ASME SECTION II Other (Specify)

☐ Accoustic Emission

☐ Spot

☐ Hardness test Max 200 BHN

☐ CSA W47.1/W59

General Instructions:

Vessel S/N

P1 Material

Welder ID

Shell-T=

Pipe-T= 4" ~~XX~~ XXH

Total Welds 1 x 4" XXH 180 degree return bends for baseline thickness. Please report low and average recordings as well as mill tolerance. HT# 387032

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects
 Encana Spec is Zero Elongated Indications
 Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
 Encana Spec for Threaded Piping- acceptance is 7 threads engaged
 HT is a 5 Point Traverse

Prepared By: Lance Raven

Date: 07/05/2013

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

NDE Requirements

Client: NWP Industries Inc.

JO#

Project: Return Bends

Date: 07/05/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other:

☐ X-Ray

☐ 100%

☐ ASME Section VIII-UW-51

☐ Gamma Ray

☒ Full

☐ ASME Section VIII-UW-52

☒ Ultrasonics

☐ 25%

☐ Customer Specification

☐ Liquid Penetrant

☐ 10%

☐ ASME B31.3 NFS

☐ Magnetic Particle

☐ Other(Define)

ASME SECTION II Other (Specify)

☐ Acoustic Emission

☐ Spot

☐ Hardness test Max 200 BHN

☐ CSA W47.1/W59

General Instructions:

Vessel S/N

P1 Material

Welder ID *WJ*

Shell-T=

Pipe-T= 4" XXH

Total Welds 58 x 4" XXH 180 degree return bends for baseline thickness. Please report low and average recordings as well as mill tolerance.

5 x 4" XH 180°

Started at UT-1

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects
Encana Spec is Zero Elongated Indications
Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
Encana Spec for Threaded Piping- acceptance is 7 threads engaged
HT is a 5 Point Traverse

*674
084
MT = 590*

Prepared By: Lance Raven

Date: 07/05/2013

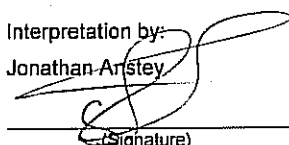
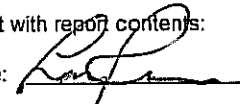
Procedures: IRIS#4.2, ASME V SE.797.2 Code: Customer Evaluation (Nominal-12.5%) (Encana Spec)		Job / P.O. #: _____ IRISNDT #: 170471 Client: NWP Industries Inc Location: Innisfail Item Inspected: UTTK scan of 180 deg 4" return bends		Date: 13-May-13	
Material: P1		Surface Condition: As Forged		Heat Treatment: Not Applicable	
Equipment: Krautkramer DMS 2		Mfg. S/N: 31087		Calibration Date: 23-Nov-12	
Calibration Block(s): IIW ☐ Other ☒ C.S L-BLOCK		Transducer: S/N _____ Angle _____ Frequency (MHz) _____ Crystal Size _____		Q23M25	
Test Piece: 33335				0	
Cable: Type: COAXIAL Length: 4'				8	
Dis. AMPL. Calibration: 0-1"		Couplant: ECHOGEL		Batch #: 1182	
Transfer Loss Calibration: Direct Comparison: ☐ Other: ☐				TL: db	
Reference Flaw Size: Back Wall		Primary Reference Level: 80% FSH		Reference Gain: 58 db	
Lamination ☒ Shear Wave ☐ Volumetric ☐ Thickness ☒		Scan Methods: Contact ☒ Immersion ☐			

SCOPE#1: To perform UT THICKNESS scan of 4" xs (qty#5) & xxh (qty#59) 180° return bends for baseline thickness. Mark any readings which are below mill tolerance of 12.5%. Take 10 readings on each bend and report the lowest and avg thickness. The lowest area of the bend is typically the extrados where most of the statistics are considered. Each bend was given a UT# and written on the piece.

IRISNDT



* Customer to evaluate test results. 4 Bends are below mill tolerance see data page

Inspection Limitation(s): n/a		
Unit #: 500 In: 0730 In: _____ Personnel: Jonathan Anstey	Kilometers: 60 km Out: 1400 Out: _____ Hrs: 6.5 hrs Hrs: _____	Consumables: N/A Interpretation by:  Jonathan Anstey (Signature) I am in full agreement with report contents: Client Representative: 
		SNT-TC-1A II C.G.S.B. II C.G.S.B. # 7794

Edmonton (780) 437-4747
Calgary (403) 279-6121
Nisku (780) 955-7616
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High Level (780) 841-0470
Lloydminster (780) 875-6455

Cold Lake (780) 594-1114
Red Deer (403) 347-1742
Tulsa, OK (918) 446-8773
Houston, TX (713) 722-7177

Mailing Address
5311-86 Street
Edmonton, Alberta
T6E 5T8

MAY 13/13 RDO4-UT522

UT#	min	avg	DIA	SCH	MIL T	Lowest allowed	min diff from MIL T
1	0.719	0.744	4"	0.674	0.084	0.590	0.129
2	0.714	0.739	4"	0.674	0.084	0.590	0.124
3	0.667	0.714	4"	0.674	0.084	0.590	0.077
4	0.748	0.775	4"	0.674	0.084	0.590	0.158
5	0.749	0.765	4"	0.674	0.084	0.590	0.159
6	0.699	0.73	4"	0.674	0.084	0.590	0.109
7	0.731	0.759	4"	0.674	0.084	0.590	0.141
8	0.538	0.718	4"	0.674	0.084	0.590	0.052
9	0.659	0.704	4"	0.674	0.084	0.590	0.069
10	0.752	0.76	4"	0.674	0.084	0.590	0.162
11	0.741	0.755	4"	0.674	0.084	0.590	0.151
12	0.687	0.721	4"	0.674	0.084	0.590	0.097
13	0.705	0.722	4"	0.674	0.084	0.590	0.115
14	0.734	0.754	4"	0.674	0.084	0.590	0.144
15	0.68	0.705	4"	0.674	0.084	0.590	0.090
16	0.268	0.677	4"	0.674	0.084	0.590	0.322
17	0.691	0.712	4"	0.674	0.084	0.590	0.101
18	0.723	0.751	4"	0.674	0.084	0.590	0.133
19	0.699	0.738	4"	0.674	0.084	0.590	0.109
20	0.724	0.746	4"	0.674	0.084	0.590	0.134
21	0.737	0.752	4"	0.674	0.084	0.590	0.147
22	0.694	0.711	4"	0.674	0.084	0.590	0.104
23	0.725	0.74	4"	0.674	0.084	0.590	0.135
24	0.734	0.759	4"	0.674	0.084	0.590	0.144
25	0.681	0.695	4"	0.674	0.084	0.590	0.091
26	0.718	0.741	4"	0.674	0.084	0.590	0.128
27	0.707	0.73	4"	0.674	0.084	0.590	0.117
28	0.697	0.726	4"	0.674	0.084	0.590	0.107
29	0.699	0.722	4"	0.674	0.084	0.590	PAGE 2 0.109

HTX 110536 XXX LR

h/2

3/4

[Handwritten signature]

UT#	min	avg	DIA	SCH	MIL T	Lowest allowed	min diff from MIL T
30	0.691	0.707	4"	0.674	0.084	0.590	0.101
31	0.716	0.741	4"	0.674	0.084	0.590	0.126
32	0.662	0.706	4"	0.674	0.084	0.590	0.072
33	0.674	0.701	4"	0.674	0.084	0.590	0.084
34	0.676	0.706	4"	0.674	0.084	0.590	0.086
35	0.659	0.689	4"	0.674	0.084	0.590	0.069
36	0.741	0.761	4"	0.674	0.084	0.590	0.151
37	0.719	0.749	4"	0.674	0.084	0.590	0.129
38	0.69	0.712	4"	0.674	0.084	0.590	0.100
39	0.719	0.739	4"	0.674	0.084	0.590	0.129
40	0.673	0.69	4"	0.674	0.084	0.590	0.083
41	0.695	0.739	4"	0.674	0.084	0.590	0.105
42	0.7	0.723	4"	0.674	0.084	0.590	0.110
43	0.657	0.701	4"	0.674	0.084	0.590	0.067
44	0.699	0.734	4"	0.674	0.084	0.590	0.109
45	0.719	0.736	4"	0.674	0.084	0.590	0.129
46	0.714	0.733	4"	0.674	0.084	0.590	0.124
47	0.705	0.735	4"	0.674	0.084	0.590	0.115
48	0.745	0.776	4"	0.674	0.084	0.590	0.155
49	0.683	0.699	4"	0.674	0.084	0.590	0.093
50	0.731	0.749	4"	0.674	0.084	0.590	0.141
51	0.703	0.721	4"	0.674	0.084	0.590	0.113
52	0.71	0.729	4"	0.674	0.084	0.590	0.120
53	0.711	0.731	4"	0.674	0.084	0.590	0.121
54	0.699	0.718	4"	0.674	0.084	0.590	0.109
55	0.711	0.73	4"	0.674	0.084	0.590	0.121
56	0.725	0.754	4"	0.674	0.084	0.590	0.135
57	0.718	0.735	4"	0.674	0.084	0.590	0.128
58	0.761	0.765	4"	0.674	0.084	0.590	0.171
59	0.332	0.336	4"	0.337	0.042	0.295	0.037
60	0.333	0.345	4"	0.337	0.042	0.295	0.038
PAGE 3							
61	0.281	0.293	4"	0.337	0.042	0.295	0.014
62	0.289	0.31	4"	0.337	0.042	0.295	-0.006

HT# 110536 AR

HT# 02130

✓ mag 1/10/17

HT# 55H00315

UT#	min	avg	DIA	SCH	Mill T	Lowest allowed	min diff from Mill T
63	0.319	0.329	4"	0.337	0.042	0.295	0.024
333	0.694	0.702	4"	0.674	0.084	0.590	0.104

HT# FOR UT#333 HT#387032 •

HT# 387032

✓

✓

4/4

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

NDE Requirements

Client: NWP Industries Inc.

JO#

Project: Return Bends

Date: 27/05/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other:

☐ X-Ray

☐ 100%

☐ ASME Section VIII-UW-51

☐ Gamma Ray

☒ Full

☐ ASME Section VIII-UW-52

☒ Ultrasonics

☐ 25%

☐ Customer Specification

☐ Liquid Penetrant

☐ 10%

☐ ASME B31.3 NFS

☐ Magnetic Particle

☐ Other(Define)

ASME SECTION II Other (Specify)

☐ Acoustic Emission

☐ Spot

☐ Hardness test Max 200 BHN

☐ CSA W47.1/W59

General Instructions:

Vessel S/N

P1 Material

Welder ID

Shell-T=

Pipe-T= 4" XXH – HT# 110536, 4"XH – HT# 29A58

Total Welds 2 x 4" XXH and 2 x 4" XH 180 degree return bends for baseline thickness. Please report low and average recordings as well as mill tolerance. Please add heat #s to the return bends on the reports.

Please use wire type iCi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects

Encana Spec is Zero Elongated Indications

Encana Spec for Socket Welds-acceptance is minimum 1/16" gap

Encana Spec for Threaded Piping- acceptance is 7 threads engaged

HT is a 5 Point Traverse

Prepared By: Lance Raven

Date: 27/05/2013

Procedures: IRIS#4.2, ASME V SE.797.2
Code: Customer Evaluation (Nominal-12.5%)
(Encana Spec)

Job / P.O. #: _____ IRISNDT #: _____ Date: 27-May-13
Client: NWP Industries Inc
Location: Innisfail
Item Inspected: UTTK scan of 180 deg 4" return bends

Material: P1		Surface Condition: As Forged		Heat Treatment: Not Applicable	
Equipment: Krautkramer DMS 2		Mfg. S/N: 31087		Calibration Date: 23-Nov-12	
Calibration Block(s): IIW ☐ Other ☒ C.S.L-BLOCK		Transducer:		S/N	O23M25
Test Piece: 33335		Angle		0	
Cable: Type: COAXIAL Length: 4'		Frequency (MHz)		8	
		Crystal Size		.375"	
Dis. AMPL. Calibration: 0-1"		Couplant: ECHO GEL		Batch #: 1182	
Transfer Loss Calibration: Direct Comparison: ☐ Other: ☐				TL: db	
Reference Flaw Size: Back Wall		Primary Reference Level: 80% FSH		Reference Gain: 57 db	
Lamination ☒ Shear Wave ☐ Volumetric ☐ Thickness ☒				Scan Methods: Contact ☒ Immersion ☐	

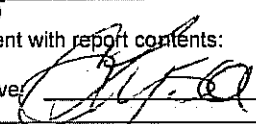
SCOPE#1: To perform UT THICKNESS scan of 4" xs (qty#2) & xxh (qty#2) 180° return bends for baseline thickness. Mark any readings which are below mill tolerance of 12.5%. Take 10 readings on each bend and report the lowest and avg thickness. The lowest area of the bend is typically the extrados where most of the statistics are considered. Each bend was given a UT# and written on the piece.

UT#	Heat#	min	avg	DIA	SCH	Mill T	Lowest allowed	min diff
1	110536	0.213	0.542	4"	0.674	0.084	0.590	-0.377
2	110536	0.697	0.719	4"	0.674	0.084	0.590	0.107
3	29A58	0.320	0.330	4"	0.337	0.042	0.295	0.025
4	29A58	0.290	0.306	4"	0.337	0.042	0.295	-0.005

IRISNDT 

* Customer to evaluate test results. 2 Bends are below mill tolerance.

Inspection Limitation(s): n/a

Unit #: 500	Kilometers: 60 km	Consumables: N/A	Interpretation by: SNT-TC-1A II
In: _____	Out: _____ Hrs: 1.5 hrs		C.G.S.B. II
In: _____	Out: _____ Hrs: _____		C.G.S.B. # 7794
Personnel: Jonathan Anstey			(Signature)
		I am in full agreement with report contents:	
		Client Representative: 	

Edmonton (780) 437-4747
Calgary (403) 279-6121
Nisku (780) 955-7616
Barrhead (780) 674-3018

Fort McMurray (780) 743-1536
Grande Prairie (780) 532-2283
High Level (780) 841-0470
Lloydminster (780) 875-6455

Cold Lake (780) 594-1114
Red Deer (403) 347-1742
Tulsa, OK (918) 446-8773
Houston, TX (713) 722-7177

Mailing Address
5311-86 Street
Edmonton, Alberta
T6E 5T8

Issuing Authority: Marvin J. (Ty) DeBolsler/Dale Karg		ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

N.D.E Requirements

Client: NWP Industries Inc.

JO#

Project: Return Bends

Date: 03/06/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other:

☐ X-Ray

☐ 100%

☐ ASME Section VIII-UW-51

☐ Gamma Ray

☒ Full

☐ ASME Section VIII-UW-52

☒ Ultrasonics

☐ 25%

☐ Customer Specification

☐ Liquid Penetrant

☐ 10%

☐ ASME B31.3 NFS

☐ Magnetic Particle

☐ Other(Define)

ASME SECTION II Other (Specify)

☐ Acoustic Emission

☐ Spot

☐ Hardness test Max 200 BHN

☐ CSA W47.1/W59

General Instructions:

Vessel S/N

P1 Material

Welder ID

Shell-T=

Pipe-T= 4" XXH HT#s 110536

Total Welds 20 4" x 4" XXH 180 degree return bends for baseline thickness. Please report low and average recordings as well as mill tolerance. Please add the HT# on the report with the return bends. Start @ UT- 63

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects
 Encana Spec is Zero Elongated Indications
 Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
 Encana Spec for Threaded Piping- acceptance is 7 threads engaged
 HT is a 5 Point Traverse

Prepared By: Lance Raven

Date: 03/06/2013

Procedures: IRIS#4.2, ASME V SE.797.2	Job / P.O. #: _____	IRISNDT #: 170386	Date: 3-Jun-13
Code: Customer Evaluation (Nominal-12.5%) (Encana Spec)	Client: NWP Industries Inc		
	Location: Innisfail		
	Item Inspected: Return bends		

Material: P1	Surface Condition: As Forged	Heat Treatment: Not Applicable
Equipment: Krautkramer DMS 2	Mfg. S/N: 31087	Calibration Date: 23-Nov-12
Calibration Block(s): IIW ☐ Other ☒ C.S L-BLOCK	Transducer:	S/N
Test Piece: 33335	Angle	0
Cable: Type: COAXIAL Length: 4'	Frequency (MHz)	8
	Crystal Size	.375"
Dis. AMPL. Calibration: 0-1"	Couplant: ECHO GEL	Batch #: 1182
Transfer Loss Calibration: Direct Comparison: ☐ Other: ☐		TL: db
Reference Flaw Size: Back Wall	Primary Reference Level: 80% FSH	Reference Gain: 59 db
Lamination ☒ Shear Wave ☐ Volumetric ☐ Thickness ☒	Scan Methods: Contact ☒ Immersion ☐	

SCOPE#1: To perform UT THICKNESS scan of 4" xxh (qty#22) 180° return bends for baseline thickness. Mark any readings which are below mill tolerance of 12.5%. Take 10 readings on each bend and report the lowest and avg thickness. The lowest area of the bend is typically the extrados where most of the statistics are considered.

UT#	Heat#	min	avg	DIA	SCH	Mill T	Lowest allowed	min diff
63	110536	0.686	0.701	4"	0.674	0.084	0.590	0.096
64	110536	0.222	0.596	4"	0.674	0.084	0.590	-0.368
65	110536	0.709	0.724	4"	0.674	0.084	0.590	0.119
66	110536	0.708	0.732	4"	0.674	0.084	0.590	0.118
67	110536	0.695	0.726	4"	0.674	0.084	0.590	0.105
68	110536	0.354	0.701	4"	0.674	0.084	0.590	-0.236
69	110536	0.669	0.688	4"	0.674	0.084	0.590	0.079
70	110536	0.236	0.555	4"	0.674	0.084	0.590	-0.354
71	110536	0.709	0.731	4"	0.674	0.084	0.590	0.119
72	110536	0.658	0.687	4"	0.674	0.084	0.590	0.068
73	110536	0.711	0.733	4"	0.674	0.084	0.590	0.121

IRISNDT

* Customer to evaluate test results.

Inspection Limitation(s): n/a		
Unit #: 500	Kilometers: 60	Consumables: N/A
In: _____	Out: _____	Hrs: 3
In: _____	Out: _____	Hrs: _____
Personnel: Jonathan Ansley		Interpretation by: Jonathan Ansley SNT-TC-1A II C.G.S.B. II C.G.S.B. # 7794 I am in full agreement with report contents: Client Representative:

Edmonton (780) 437-4747
 Calgary (403) 279-6121
 Nisku (780) 955-7616
 Barrhead (780) 674-3018

Fort McMurray (780) 743-1536
 Grande Prairie (780) 532-2283
 High Level (780) 841-0470
 Lloydminster (780) 875-6455

Cold Lake (780) 594-1114
 Red Deer (403) 347-1742
 Tulsa, OK (918) 446-8773
 Houston, TX (713) 722-7177

Mailing Address
 5311-86 Street
 Edmonton, Alberta
 T6E 5T8

Procedures: IRIS#4.2, ASME V SE.797.2
Code: Customer Evaluation (Nominal-12.5%)
(Encana Spec)

Job / P.O. #: _____
Client: NWP Industries Inc
Location: Innisfail
Item Inspected: Return bends

IRISNDT #: 170386

Date: 3-Jun-13

Material: P1

Surface Condition: As Forged

Heat Treatment: Not Applicable

Equipment: Krautkramer DMS 2

Mfg. S/N: 31087

Calibration Date: 23-Nov-12

Calibration Block(s): IIW ☐ Other ☒ C.S L-BLOCK

Transducer:

S/N

O23M25

Angle

0

Test Piece: 33335

Frequency (MHz)

8

Cable: Type: COAXIAL

Length: 4'

Crystal Size

.375"

Dis. AMPL. Calibration: 0-1"

Couplant: ECHO GEL

Batch #: 1182

Transfer Loss Calibration: Direct Comparison: ☐ Other: ☐

TL: db

Reference Flaw Size: Back Wall

Primary Reference Level: 80% FSH

Reference Gain: 59 db

Lamination ☒ Shear Wave ☐ Volumetric ☐ Thickness ☒Scan Methods: Contact ☒ Immersion ☐

SCOPE#1: To perform UT THICKNESS scan of 4" xxh (qty#22) 180° return bends for baseline thickness. Mark any readings which are below mill tolerance of 12.5%. Take 10 readings on each bend and report the lowest and avg thickness. The lowest area of the bend is typically the extrados where most of the statistics are considered.

UT#	Heat#	min	avg	DIA	SCH	Mill T	Lowest allowed	min diff
74	110536	0.717	0.743	4"	0.674	0.084	0.590	0.127
75	110536	0.724	0.744	4"	0.674	0.084	0.590	0.134
76	110536	0.732	0.759	4"	0.674	0.084	0.590	0.142
77	110536	0.704	0.724	4"	0.674	0.084	0.590	0.114
78	110536	0.685	0.720	4"	0.674	0.084	0.590	0.095
79	110536	0.669	0.715	4"	0.674	0.084	0.590	0.079
80	110536	0.712	0.728	4"	0.674	0.084	0.590	0.122
81	110536	0.714	0.731	4"	0.674	0.084	0.590	0.124
82	110536	0.698	0.729	4"	0.674	0.084	0.590	0.108
83	110536	0.268	0.704	4"	0.674	0.084	0.590	-0.322
84	110536	0.671	0.694	4"	0.674	0.084	0.590	0.081

IRISNDT



* Customer to evaluate test results.

Inspection Limitation(s): n/a

Unit #: 500

Kilometers:

Consumables:
N/A

In: Out: Hrs:

In: Out: Hrs:

Personnel:

Jonathan Anstey

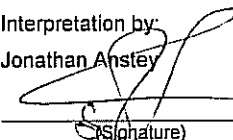
Interpretation by:

Jonathan Anstey

SNT-TC-1A II

C.G.S.B. II

C.G.S.B. # 7794



(Signature)

I am in full agreement with report contents:

Client Representative:



Edmonton (780) 437-4747
Calgary (403) 279-6121
Nisku (780) 955-7616
Barrhead (780) 674-3018

Fort McMurray (780) 743-1536
Grande Prairie (780) 532-2283
High Level (780) 841-0470
Lloydminster (780) 875-6455

Cold Lake (780) 594-1114
Red Deer (403) 347-1742
Tulsa, OK (918) 446-8773
Houston, TX (713) 722-7177

Mailing Address
5311-86 Street
Edmonton, Alberta
T6E 5T8

NWP Industries Inc.

INDIRECT FIRED HEATER COIL EXAMINATION AND INSPECTION REPORT

DO NOT START CONSTRUCTION WITHOUT AI REVIEW					EXAMINATION AND INSPECTION REPORT				
					REVISION NO.: 0				
AI REVIEW: <i>[Signature]</i>			REVIEW DATE: 7 JUNE 2013						
SERIAL NO. <i>NWR/08806-002-A</i> JOB NO.: <i>08806-002-A</i> COIL TYPE: <i>4" 2500 #RTJ SPLIT COIL for 3.0m LH</i>									
DRAWING NO.: <i>08562-4</i> DWG. REVISION NO.: <i>0</i> EXAMINATION AND INSPECTION REPORT									
INITIATION BY: <i>[Signature]</i>									
Seq.	Item	Comments	Q.C.I.	Date	A.I. Hold Points	A.I.	Date	Owner	Date
1.	Calculations in File		LR	June 6/13	*	<i>[Signature]</i>	6-7-13		
2.	Release of App'd Dwg.		LR	June 6/13	*	<i>[Signature]</i>	6-7-13		
3.	Heat Numbers Recorded		LR	July 12/13	*	<i>[Signature]</i>	JUL 17 2013		
4.	MTRs Checked		LR	July 12/13	*	<i>[Signature]</i>	JUL 17 2013		
5.	Materials Checked Against Drawings and Specs	<i>HOLD</i>	LR	July 12/13					
6.	W.P.S. Checked		LR	June 6/13	*	<i>[Signature]</i>	6-7-13		
7.	Welders Qualified	<i>HOLD</i>	LR	June 6/13	*				
8.	Thicknesses Recorded		LR	July 12/13					
9.	Fit-up Examination(s)		LR	July 12/13	*	<i>[Signature]</i>	JUL 17 2013		
10.	Impact Tests	<i>NA</i>							
11.	Welds Examined		LR	July 15/13	*	<i>[Signature]</i>	JUL 17 2013		
12.	Welder I.D. Checked		LR	July 12/13	*	<i>[Signature]</i>	JUL 17 2013		
13.	Final External Inspection				*	<i>[Signature]</i>	JUL 17 2013		
14.	Radiography	<i>HOLD</i>	LR	July 12/13	*	<i>[Signature]</i>	JUL 17 2013	<i>[Signature]</i>	<i>July 17/13</i>
15.	Other N.D.E.	<i>HOLD</i>	LR	July 17/13				<i>[Signature]</i>	<i>July 17/13</i>
16.	Final Ext. Prior to P.W.H.T.	<i>HOLD</i>	LR	July 17/13	*				
17.	PWHT Chart Checked	<i>HOLD</i>	LR	July 17/13	*	<i>[Signature]</i>	JUL 17 2013	<i>[Signature]</i>	<i>July 17/13</i>
18.	Hydrostatic Test	<i>HOLD</i>							
		Coil No. 1 Gauge #	LR	July 17/13	**	<i>[Signature]</i>	JUL 17 2013	<i>[Signature]</i>	<i>July 17/13</i>
		Coil No. 2 Gauge #							
19.	CRN Drawing	CRN# <i>P9417.213</i>	LR	June 6/13	*	<i>[Signature]</i>	6-7-13		
20.	N.C.R. #								
21.	Nameplate Stamping		LR	July 12/13	**	<i>[Signature]</i>	JUL 17 2013		
22.	Data Report (AB-28) completed		LR	July 12/13	**	<i>[Signature]</i>	JUL 17 2013		
23.	Nameplate Installation								

The Authorized Inspector shall be presented with the Examination and Inspection Report prior to construction so that he can designate additional inspection points and/or Hold Points. Any revisions shall be marked with a delta symbol with revision number and described at the bottom of this page.

* Denotes an A.I. Inspection Point ** Denotes an A.I. Hold Point

NWP Industries Inc™		Website: www.nwp.ca
PO Box 6280		Phone: (403) 227-4100
4017-60 Ave.		
T4G 1S9		Fax: (403) 227-4102

HYDROSTATIC TEST AFFIDAVIT

Customer: Encana Corporation

JO# 08806-002-A

Project: Coil for 3.0mm Lineheater

Project#

Test Pressure: 7757 PSI

Hold Time: 60 mins

Code Requirements: ASME B31.3 2012 edition

All Personnel Advised of Test ☐ All Signs & Flagging Posted ☒

Prior to Filling – Fitting/Hoses & Component Meet Required Test Pressure

Sign-Off Supervisor: ☒ Tester: ☒

Date: 19/07/2013

Product Description:

Coil A and Coil B = 7757 psi

50% Test Pressure Leak/Systems Check Completed ☒

50% test = 3879 psi

Test Temperature: _____ °F

Equipment Drained & Flushed to Prevent Freezing:

Yes: ☒

No: ☐

Start Time:	Finish Time: <u>1:53 pm</u>
<u>10:40 AM</u>	

Test Gauge Identification #	Pressure Range	Calibration Date
NWPG- 20000 -1	0-20000 PSI	29 - AUGUST 2012
NWPG- 20000 -20000	0-20000 PSI	5th - DEC - 2012
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	

Test By: <u>Maurice P. [Signature]</u>	Date: <u>17/07/2013</u>
NWP Representative: <u>[Signature]</u>	Date: <u>17/07/2013</u>
Customer Representative:	Date:

W

FT 100%

H7

CERTIFIED BY



MADE IN CANADA

SERIAL NO. NWP- 08806-002-A

COIL A 4" CL 2500 PS = 100

MAWP 5171 PSI AT 200 °F

MDMT -20 °F AT 5171 PSI

CRN P = 0417.213 YEAR BUILT 2013

COIL B 4" CL 2500 PS = 101

MAWP 5171 PSI AT 200 °F

MDMT -20 °F AT 5171 PSI

CRN P = 0417.213

COIL C

MAWP PSI AT °F

MDMT °F AT PSI

CRN

COIL D

MAWP PSI AT °F

MDMT °F AT PSI

CRN

(A) 631821

Issuing Authority: Marvin J. (Ty)

DeBelser/Dale Karg

Date of Issue: November 13 2012

Rev Status: 2.1

NWP
Industries Inc.™

ABSA

FORM_NDE_001

N.D.E Requirements

N D E Requirements

Client: Encana

JO# 08806-002-A

Project: 4" Coil – 3.0mm Lineheater

Date: 25/06/2013

Piping: ☒

Pressure Vessel: ☐

Tank: ☐

Other:

☐

X-Ray

☒

100%

☐

ASME Section VIII-UW-51

☒

Gamma Ray

☐

Full

☐

ASME Section VIII-UW-52

☐

Ultrasonics

☐

25%

☒

Customer Specification

☐

Liquid Penetrant

☐

10%

☒

ASME B31.3 NFS

☐

Magnetic Particle

Other(Define)

Other (Specify)

☐

Acoustic Emission

☐

Spot

☐

Hardness test Max 200 BHN

☐

CSA W47.1/W59

General Instructions:

P1 Material

Welder ID N

Shell-T=

pe-T= 4" XXH

otal Welds Start shooting pkg (first # is X-1)

Vessel S/N NWP-08806-002-A

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

Shots about 16 shots

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects

Encana Spec is Zero Elongated Indications

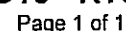
Encana Spec for Socket Welds-acceptance is minimum 1/16" gap

Encana Spec for Threaded Piping- acceptance is 7 threads engaged

HT is a 5 Point Traverse

Prepared By: Lance Raven

Date: 25/06/2013



Material: P1

Interpretation by:
JEFF BAJEMA

SNT-TC-1A

II

C.G.S.B.

II

(Print)

C.G.S.B. #

10853

(Signature)

Client Representative:

(Print)

I am in full
agreement with
report contents

(Sign)

Deer Park, TX (281) 476-4444
Matrix, Houston, TX (713) 722-7177
Tulsa, OK (918) 446-0773

CUSTOMER COPY

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

N.D.E Requirements

Client: Encana JO# 08806-002-A
 Project: 4" Coil – 3.0mm Lineheater Date: 11/07/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other: ☐

- | | | |
|---|--|--|
| ☐ X-Ray | ☒ 100% | ☐ ASME Section VIII-UW-51 |
| ☒ Gamma Ray | ☐ Full | ☐ ASME Section VIII-UW-52 |
| ☐ Ultrasonics | ☐ 25% | ☒ Customer Specification |
| ☐ Liquid Penetrant | ☐ 10% | ☒ ASME B31.3 NFS |
| ☐ Magnetic Particle | ☐ Other(Define) | Other (Specify) |
| ☐ Accoustic Emission | ☐ Spot | |

☐ Hardness test Max 200 BHN

☐ CSA W47.1/W59

General Instructions:

Vessel S/N NWP-08806-002-A

P1 Material

Welder ID N, S, L

Shell-T=

pe-T= 4" XXH

ototal Welds Continue shooting pkg (first # is X-17)

Please use wire type iQI

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots 16

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects
 Encana Spec is Zero Elongated Indications
 Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
 Encana Spec for Threaded Piping- acceptance is 7 threads engaged
 HT is a 5 Point Traverse

Prepared By: Lance Raven

Date: 11/07/2013

X17 S, L
 8 N
 9 N
 20 S, L
 1 N
 2 N
 3 S, L
 4 S, L
 5 N
 6 S, L
 7 N
 8 S, L
 9 N
 30 N
 1 N
 2 N

Exposure Device #: D5934 Source #: 88959B
Cobalt 60 ☐ IR 192 ☒ X-Ray ☐ EFSS: .155"
Film Brand: AGFA #Film/cassette: 1
Code: ASME B31.3 NFS/ Encana spec.

Job / P.O. #: 08806-002-A IRISNDT #: 167303 Date: 11-Jul-13
Client: ENCANA C/O NWP
Location: INNISFAIL, AB
Item Inspected: 4" COIL - 3.0MM LINE HEATER Material: P1

Film #	Size, Location, Thickness	Welder ID	IRISNDT Proc.	S.O.D. Inches	O.F.D. Inches	# of Exp.	Work Loc.	Film Type	Type and Location of Discontinuities (rejectable discontinuities in square brackets [])	(A) ccept (R) eject
X17	4"XXH	5,L	RT 3A	3.70	.799	4	1	D5		A
X18	4"XXH	N	RT 3A	3.70	.799	4	1	D5	IC(flush) @ 0.5	A
X19	4"XXH	N	RT 3A	3.70	.799	4	1	D5		A
X20	4"XXH	5,L	RT 3A	3.70	.799	4	1	D5		A
X21	4"XXH	N	RT 3A	3.70	.799	4	1	D5		A
X22	4"XXH	N	RT 3A	3.70	.799	4	1	D5		A
X23	4"XXH	5,L	RT 3A	3.70	.799	4	1	D5		A
X24	4"XXH	5,L	RT 3A	3.70	.799	4	1	D5		A
X25	4"XXH	N	RT 3A	3.70	.799	4	1	D5		A
X26	4"XXH	5,L	RT 3A	3.70	.799	4	1	D5	flush @ 6	A
X27	4"XXH	N	RT 3A	3.70	.799	4	1	D5	S@12.75 (inclusion - non linear)	A
X28	4"XXH	5,L	RT 3A	3.70	.799	4	1	D5		A
X29	4"XXH	N	RT 3A	3.70	.799	4	1	D5	root profile @ 12.25-13	A
X30	4"XXH	N	RT 3A	3.70	.799	4	1	D5		A
X31	4"XXH	N	RT 3A	3.70	.799	4	1	D5	root profile @ 9.5	A
X32	4"XXH	N	RT 3A	3.70	.799	4	1	D5	IC(flush) @ 12	A

Number of Radiation Barrier Warning Signs Erected: 2-spool

Number of Radiation Barrier Warning Signs Returned: 2-spool

Work Location Legend: [1] Inside Fab. Shop [2] Yard/Lay-down Area [3] Piping/Modular Fab. Area [4] N/A (Other)

IRIS Procedure: S.O.D. = Source-to-object distance (D) AB - Arc Burns EUC - External Undercut IC - Internal Concavity
Single Wall Exposure: RT 1, 2, 2A, 6, 7 BT - Burn Through IUC - Internal Undercut LF - Lack of Fusion
Double Wall Exposure: RT 3, 3A, 4, 5, 8 O.F.D. = Distance from source side of object to film (d) CK - Crack HB - Hollow Bead LC - Low Cover
EP - Excessive Penetration IP - Incomplete Penetration MA - Misalignment
P - Porosity S - Slag

Unit#: 677 Kilometers: SEE	Film Quantity:	Interpretation by: JEFF BAJEMA SNT-TC-1A II
In: Out: Hrs: TS	64 (2 3/4 x 8 1/2) D5	C.G.S.B. II
In: Out: Hrs:		(Level) 10863
Personnel: JEFF BAJEMA, JEFF WHYTE		(Signature) (Print) Client Representative: (Print) I am in full agreement with report contents (Sign)

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: March 30 2012		FORM_NDE_001
Rev Status: 2.0		N.D.E Requirements

N.D.E Requirements

Client: Encana

JO# 08806-002-A

Project: 4" Coil - 3.0 mm Lineheater after PWHT

Date: 17/07/2013

Piping: ☒

Pressure Vessel: ☐

Tank: ☐

Other:

☐ X-Ray

☐ 100%

☐ ASME Section VIII-UW-51

☐ Gamma Ray

☐ Full

☐ ASME Section VIII-UW-52

☐ Ultrasonics

☐ 25%

☒ Customer Specification

☐ Liquid Penetrant

☒ 10%

☒ ASME B31.3 NFS

☐ Magnetic Particle

Other(Define)

Other (Specify)

☐ Accoustic Emission

☐ Spot

☐ Customer Spec

☒ Hardness test Max 200 BHN

☐ CSA W47.1/W59

General Instructions:

Vessel S/N NWP - 08806 - 002 - A

Material

Welder ID N, L, 5

Shell-T=

Pipe-T= 4" XXH

Total Welds: HT x 6 bw (Start with HT-1). All after post weld heat treat.

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots 6

Butt weld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all Indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero UC and Zero IP
Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
Encana Spec for Threaded Piping- acceptance is 7 threads engaged
HT is a 5 Point Traverse

1 X-15-N 152, 137, 159, 157, 155

2 X-4, U 141, 152, 158, 153, 154

3 X-14, N 151, 153, 162, 142, 142

4 X-17, 53L 148, 148, 156, 121, 123

5 X-13, N 155, 149, 161, 152, 158

6 X-26, L85 152, 141, 155, 125, 122

Prepared By: Tom Ewashen

Date: 17/07/2013

Complete

Procedures: HT-2 IRIS Procedure#9 (sec 10.0)
Code: ASME B31.3NFS
Acceptance / Rejection Criteria: Encana spec
Min. Hardness: eng review Max. Hardness: 200bhn

Job / P.O. #: JO#08806-002-A
Client: NWP (Encana)
Location: Innisfail
Item Inspected: 3.0mm Lineheater after PWHT

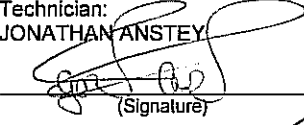
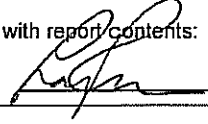
Date: 17-Jul-13

Material Type: P1 Surface Condition: BUFFED GRIT#60 Heat Treatment: After PWHT
Equipment: GE Inspection Tech (MIC-10) IRISNDT #: 45049 Calibration Date: 7-Nov-12
Calibration Block(s): 130,151,170,200 Brinell Bars
Hardness Scale Readings: Rockwell B ☐ Rockwell C ☐ Vickers ☐ Brinell ☒

Item	Component Identification and Location of Reading		Brinell Impression		Brinell Bar Hardness	Hardness Value	(A)ccept (R)eject
			Bar	Material			
	JO#08806-002-A, Welded piping-3.0mm Lineheater						
		Parent	HAZ	WELD	HAZ	Parent	
HT#	xray#						
1	X-15, Welder:N, 4"XXH	152	139	159	157	155	A
2	X-4, Welder:N, 4"XXH	141	152	158	129	134	A
3	X-14, Welder:N, 4"XXH	151	153	162	142	142	A
4	X-17, Welder:5&L, 4"XXH	148	148	150 ¹⁰	121	123	A
5	X-13, Welder:N, 4"XXH	155	149	161	152	158	A
6	X-26, Welder:L&5, 4"XXH	152	141	155	125	122	A

Remarks:

NOTE: When testing weldments the precise location of the test must be clearly identified i.e. Parent Material or Heat Affected Zone or Weld.

Unit #: 361	Kilometres:	Consumables:	Technician:
In:	Out:	AVG OF 5HITS PER location,	JONATHAN ANSTEY
In:	Out:	avg reading 3-5 hits for location.	
Personnel:			(Signature)
Jonathan Anstey, Derek Lofstrom		# of Hits: 30 hits	I am in full agreement with report contents:
			Client Representative: 

Edmonton (780) 437-4747
Calgary (403) 279-6121
Nisku (780) 955-7616
Barrhead (780) 674-3018

Fort McMurray (780) 743-1536
Grande Prairie (780) 532-2283
High Level (780) 841-0470
Lloydminster (780) 875-6455

Cold Lake (780) 594-1114
Red Deer (403) 347-1742
Tulsa, OK (918) 446-8773
Houston, TX (713) 722-7177

Mailing Address
5311-86 Street
Edmonton, Alberta
T6E 5T8



HEAT TREATMENT REQUIREMENTS

Serial#: NWP-08806-002-A

PO# 713473

JOB NO.: 08806-002-A

CUSTOMER: EnCana Corporation

DATE: July 16 2013

COMPONENT DESCRIPTION: 3.0 mm btu/hr Line Heater Coil

DWG. NO. AND LINE NO.	DIAMETER	THICKNESS	MATERIAL	LENGTH	WEIGHT
08562-4 REV 0 Coil A	4" NPS	XXH	SA-333-6	294.875	6356
Coil B	4" NPS	XXH	SA-333-6	294.875	3930
Total:					10286 lbs

TYPE OF HEAT TREATMENT: PRESSURE VESSEL or Process Piping STRESS RELIEVE P1 and Materials

HEATING

Temperature to be raised from 800°F (427°C) to 1150°F (621°C) at a maximum rate of 400 ° F

() ° C per hour. NOTE: THIS VALUE MUST NEVER EXCEED 400°F (204°C) PER HOUR.

[Calculated rate = 400 degrees F/hr. (204 degrees C/hr) Divided by the maximum metal thickness of the shell or head plate in inches]

HOLDING

Temperature to be held in range of 1150F to 1175°F for 60 minutes.

[Holding time to be determined by Table UCS-56 for Nominal Thickness as specified in UW-40(f)]

COOLING

Temperature to be lowered from 1150°F (621°C) to 800°F (427°C) at a maximum rate of 500 ° F

() ° C per hour. NOTE: THIS VALUE MUST NEVER EXCEED 500°F (260°C) PER HOUR.

[Calculated rate = 500 degrees F/hr. (260 degrees C/hr.) Divided by the maximum metal thickness of the shell or head plate in inches]

From 800°F (427°C) items may be cooled in still air.

Additional Requirements:

- ☐ Job number and description required on heat treatment charts along with the operator's signature & date.
- ☐ Reporting of thermocouple attachment method and location, and verification of furnace thermocouple calibration is required.
- ☐ A sufficient number of thermocouples shall be located to control and maintain uniform distribution of temperature on all vessels and parts. Thermocouples shall be directly attached to the item or provision shall be made for thermocouple placement at bottom, centre and top of the furnace charge in accordance with the ASME Code.
- ☐ During the heating period, there shall not be a greater variation in temperature throughout the portion of the vessel being heated than 250° F (121° C) within any 15 ft. (4.6 m) interval of length. An adequate number of thermocouples must be used to ensure this Code requirement is met.
- ☐ During the holding period, there shall not be a greater difference than 150° F (66° C) between the highest and lowest temperature throughout the portion of the vessel being heat treated, except where the range is further limited by these instructions.
- ☐ If Capacitor Discharge welding is used to attach thermocouples an ASME Code Section IX Welding Procedure Specification is required (WPS qualification is not required), and the energy output must be limited to 125 Watt-Seconds.
- ☐ No other welding is permitted on vessels or parts. [0.5 x Capacitance in farads X Voltage ² = W-Sec.]
- ☐ The method of thermocouple removal shall not damage the heat treated item.

Q.C. Inspector Signature

Date: July 17, 2013

Thermocouple Attachment Method: CAPACITOR DISCHARGE

Location (s) On Coil, Top West End., Middle, Bottom East End

Furnace Heat Number BF32-13-425

Furnace Operator Signature Chris Lewis

Date: July 16th/13

Form Prepared by: Kasha Fox

Date: July 12 2013



Date: July 16, 2013

°F TC's: 3

Recorder: IR-181

Client: NWP Industries Inc.

Job #: PO #: 713473

Operator: Chris Lewis

Chart Speed: 50mm/hr

Chart #: BF32-13-425

Description:

- (1) Coil. Job# 08806-002-A.
S/N: NWP-08806-002-A
(4) Spools. Job# 08806-002-B.
(1) Spool. Job# 08806-001-B.

LR
July 17/13

10:00 1: BURN°F 2: 500 BURN°F 3: BURN°F 4: BURN°F 5: 150 1096°F 6: BURN°F
7: BURN°F 8: 1050°F 9: BURN°F 10: 1072°F 11: BURN°F 12: BURN°F

09:00 1: BURN°F 2: BURN°F 3: BURN°F 4: BURN°F 5: 627°F 6: BURN°F
7: BURN°F 8: 581°F 9: BURN°F 10: 606°F 11: BURN°F 12: BURN°F

50MM/H
2013.07.16.08:30 Chris Lewis

LR
July 17/13



R & R Stress Relieving Service Ltd.

Nisku: 2103 - 6th Street, T9E 7X8 Tel: (780) 955-7559 Fax: (780) 955-2903
Blackfalds: #13 Burbank Industrial Park Tel: (403) 885-2280 Fax: (403) 885-0177
Toll Free: 1-800-499-HEAT(4328)

CERTIFICATE OF CONFORMANCE OF RECORDING INSTRUMENTS

CERTIFIED BY: R & R Stress Relieving Service Ltd.
TEST NUMBER: RR0513
DATE: May 10, 2013
DATE DUE: August 10, 2013
INSTRUMENT MFG: Chino
MODEL NUMBER: AH-3725 N00
SERIAL NUMBER: AH-057C171
RECORDER NUMBER: IR-181

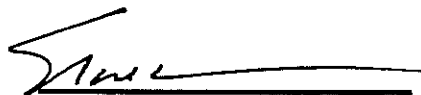
This instrument has been calibrated and it is within the manufacturers specifications.

REFERENCE STANDARDS

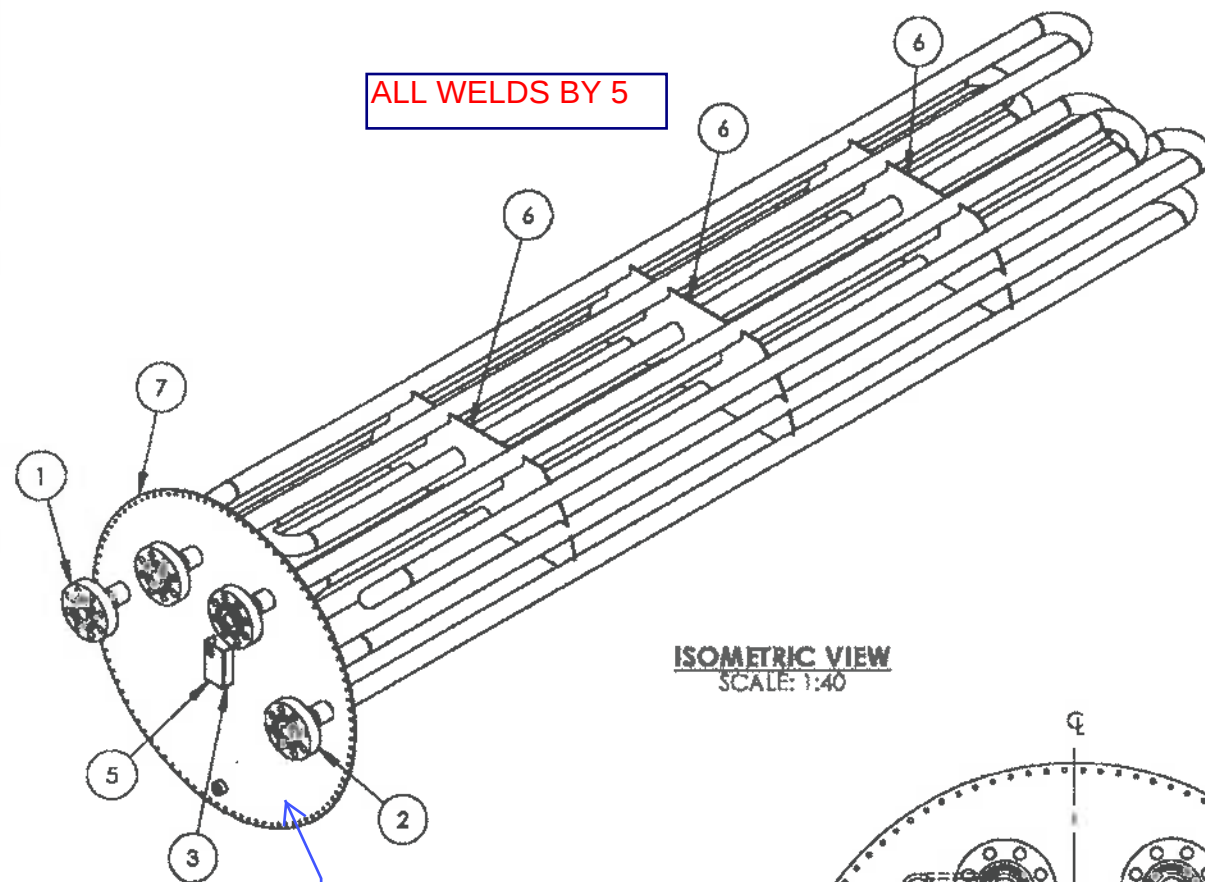
DIGI MITE 311600 S/N48430-5522

CERT DATE Oct 22/12

The calibration of all standards and measuring instruments used in the calibration are traceable to the National Research Council of Canada in Ottawa or to the National Bureau of Standards in Washington, D.C.

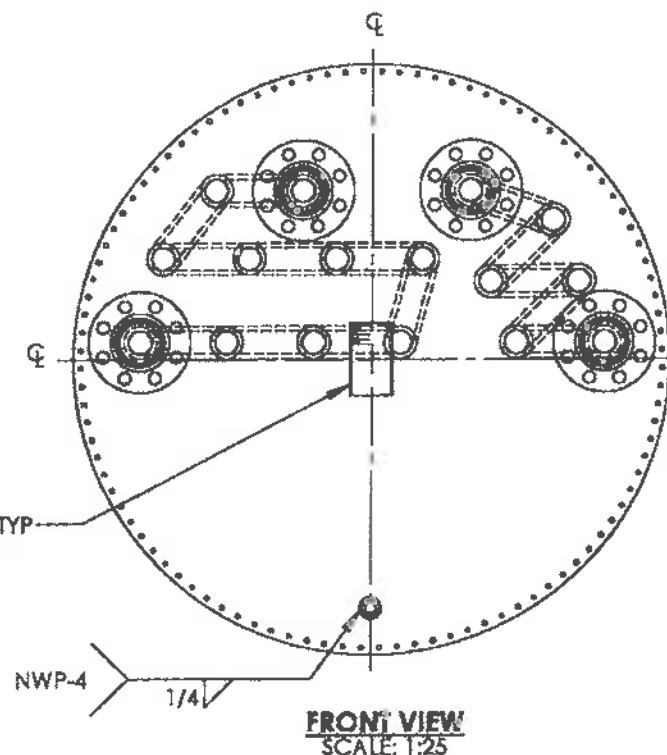

Shane Stimson

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
1	-	PS-100/COIL A - SEE SHEET 2			1
2	-	PS-101/COIL B - SEE SHEET 3			1
3	BRACKET-NAME-3	COIL NAME PLATE BRACKET SA36/44W			1
4	COH2GYEE	Coupling Half 2" 3M THRD SA105N			1
5	COIL-NAMEPLATE-1	COIL NAME PLATE BLACK/SILVER DEEP ETCHED			1
6	PLABYA	COIL TRAY PLATE 1/4" SA36/44W			3
7	PLACYA	COIL END PLATE 3/8" x 82" DIA. SA36/44W			1

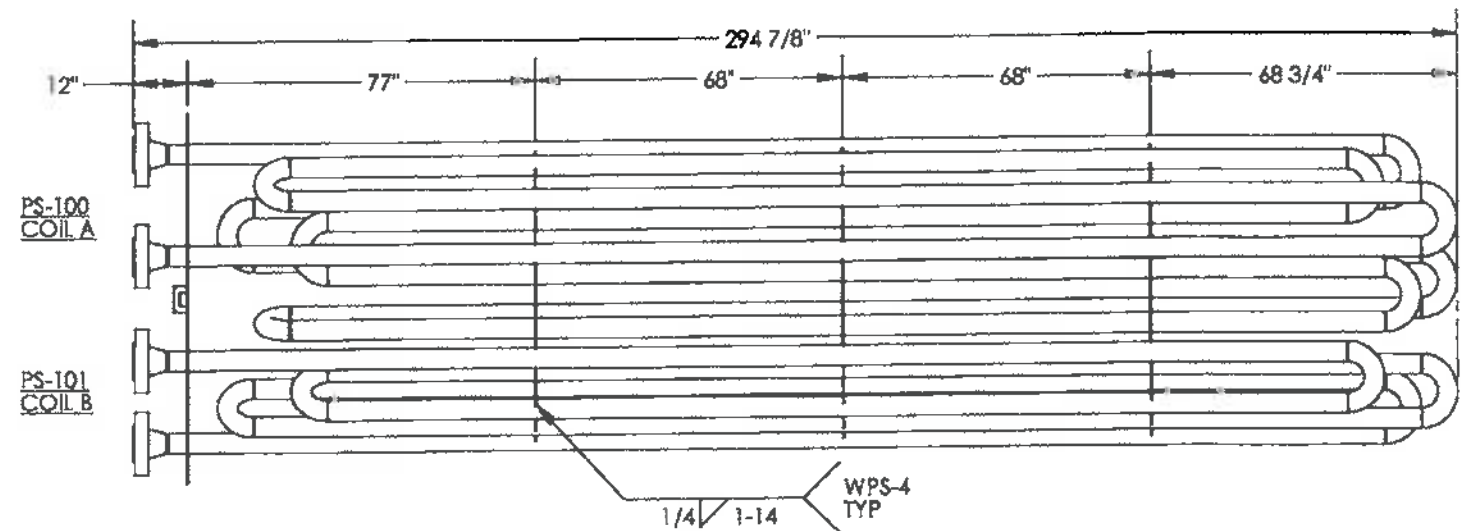


ISOMETRIC VIEW
SCALE: 1:40

FRONT WELDS BY L



FRONT VIEW
SCALE: 1:25

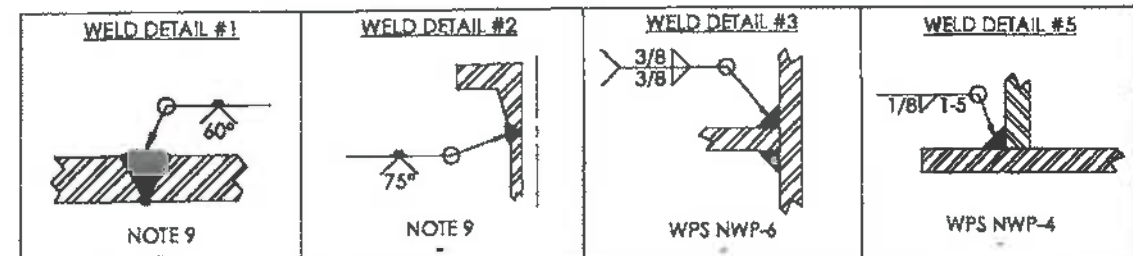


PLAN VIEW
SCALE: 1:40

ORIGINAL

NOTES

1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8$ " UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS INCLUDE $1/8$ " ROOT GAP.
3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY.
5. COIL TO BE CLEANED BEFORE SHIPMENT.
6. USE WELD PROCEDURE NWP-4 OR NWP-6 FOR ALL TACK WELDS.
7. HARDNESS TESTING - MAX 200 BNH 100% OF COIL BUTTWELD. BASELINE UT ON COIL RETURN BENDS.
8. APPROXIMATE WEIGHT: 11,100 LBS.
9. ROLL WELDS TO BE NWP-6. POSITION WELDS TO BE NWP-4. REFERENCE WELD DETAILS 1 & 2.



AS BUILT

ISSUED FOR
CONSTRUCTION

SIGNED: *[Signature]*

DATE: JUN 1 2012

W: 0806-002-A

S/N: NWP-08806-002-A

ALL DIMENSIONS IN INCHES



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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
C/W 4" 2500# RTJ SPLIT COILS
COIL ASSEMBLY

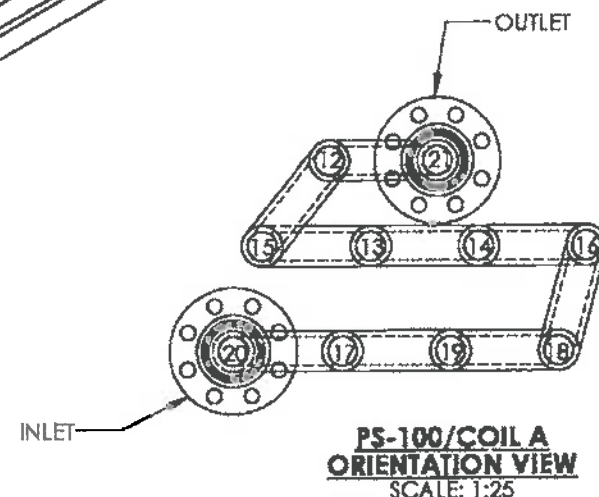
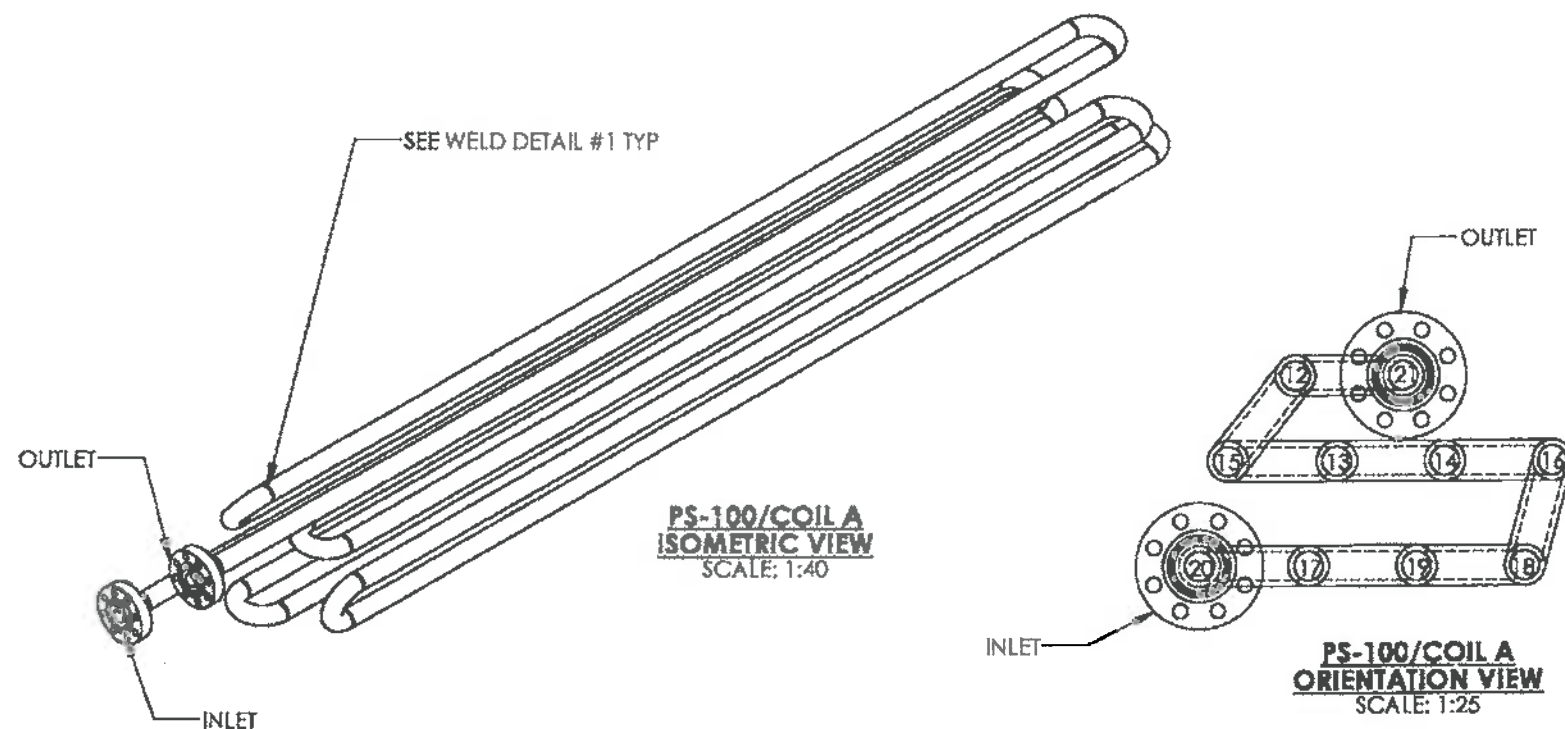
DWN: VW CHK: APP: *[Signature]*

DATE: OCT 05/12 DA: OCT 29 2012 OCT 29 2012

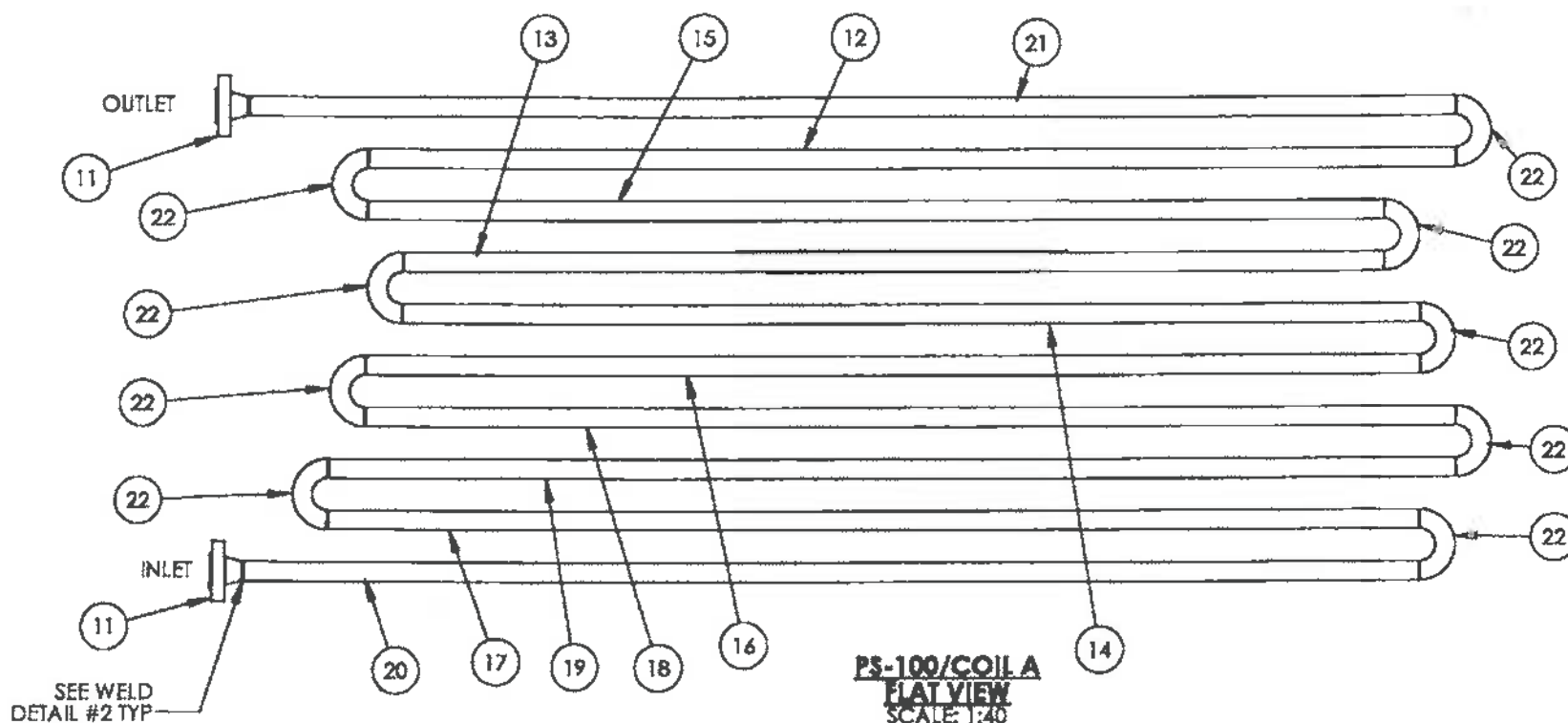
SCALE: 1:40 SHEET: 1 OF 4 DWG: 08562-4 REV: 0

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	DRAWING REVISIONS
08562-6	BATH ASSEMBLY						
08562-3	SKID ASSEMBLY						
08562-2B	PIPING ASSEMBLY	0	OCT 22/12	VW			ISSUED FOR CONSTRUCTION
08562-2A	WELDED PIPING	A	OCT 05/12	VW			ISSUED FOR APPROVAL

08806



ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
11	FLA4FXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
12	PIP3XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
13	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		226 1/2"	1
14	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		234 3/4"	1
15	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		234 3/4"	1
16	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		243"	1
17	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
18	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
19	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		259 1/2"	1
20	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		270 7/16"	1
21	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		278 11/16"	1
22	RET4LXXHGD	Return 180 Deg 4" LR S/XXH BW SA420WPL6			9



WELD SEQUENCE
21
12
15
13
14
16
18
19
17
20

ORIGINAL

PS-100/COIL A DESIGN DATA	
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
CLIENT SPECIFICATION:	ECA-PVF-S-03 REV D SPEC FAB
DESIGN PRESSURE:	5171 PSI
MAX. DESIGN METAL TEMPERATURE:	200°F
MIN. DESIGN METAL TEMPERATURE:	-20°F
IMPACT TEST:	EXEMPT PER TABLE 323.2.2 COLUMN A
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 7 175°F & 7/16" JUN 04/2012
POST WELD HEAT TREATMENT:	1150°F ± 50°F FOR 1 HOUR MIN.
HYDROSTATIC TEST PRESSURE:	7757 PSIG
CORROSION ALLOWANCE:	1/16"
PRE-HEAT:	50°F
WEIGHT EMPTY:	6356 LBS
WEIGHT FULL:	7113 LBS
CAPACITY:	12.2 CU FT
SURFACE AREA:	264 SQ FT
QUALITY CONTROL PROGRAM:	AGP-1253
WELDING PROCEDURE REGISTRATION NO.:	1604.2
WELD PROCEDURES:	NWP-4, NWP-6
SERVICE:	HYDROCARBONS
CRN NO.:	P-9417.213
DESIGN REGISTRATION DRAWINGS:	BDD-400A REV1
REFERENCE CALCULATIONS:	BDD-400A REV4

AS BUILT

ISSUED FOR
CONSTRUCTION

SIGNED: **JUN 4 2012**
DATE: **8806-002-A**
W.O.: **NWP-08806-002-A**
S/N: **NWP-08806-002-A**
ALL DIMENSIONS IN INCHES



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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
C/W 4" 2500# RTJ SPLIT COILS
COIL ASSEMBLY

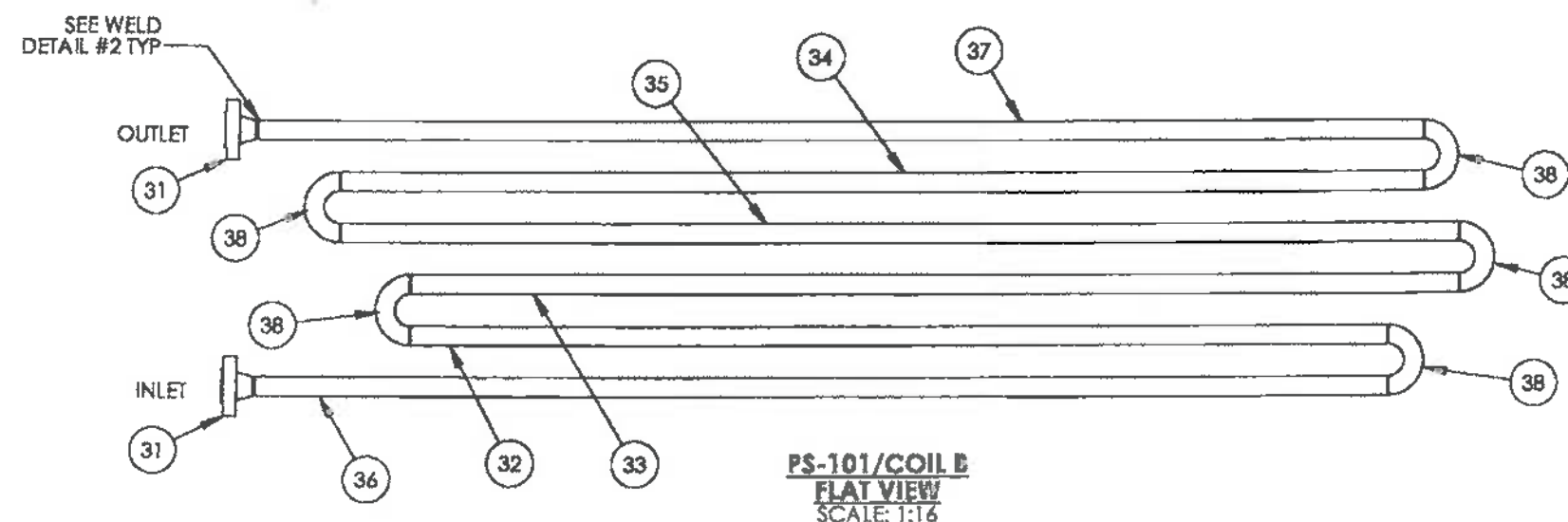
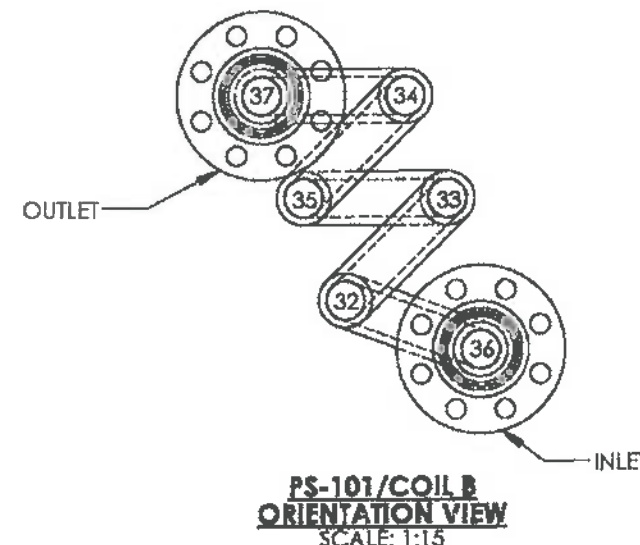
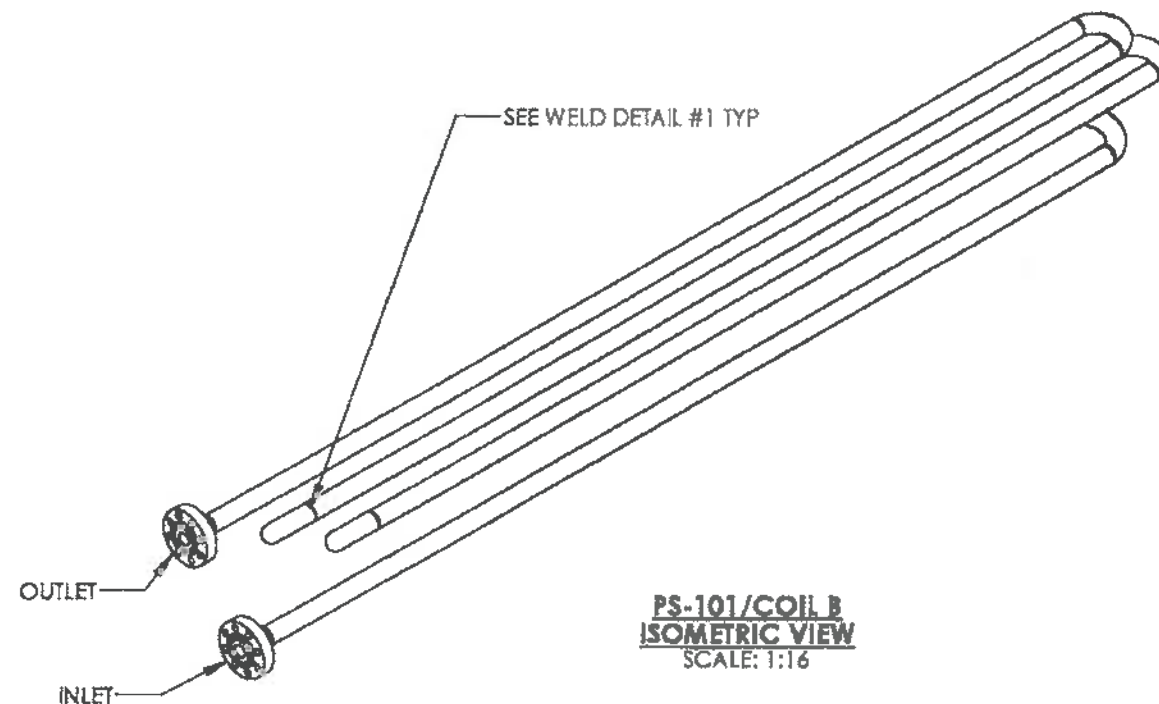
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DATE: OCT 05/12 DA **OCT 29 2012** **08806**
SCALE: 1:40
SHEET: 2 OF 4 DWG: **08562-4** REV: **0**

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-6	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2B	WELDED PIPING	0	OCT 22/12	VW	Q	Q
08562-2A	WELDED PIPING	A	OCT 05/12	VW	Q	Q

DRAWING REVISIONS

REFERENCE DRAWINGS

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
31	FLA4FXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
32	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		226 1/2"	1
33	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		243"	1
34	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		251 1/4"	1
35	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		259 1/2"	1
36	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		262 3/16"	1
37	PIP4XXHB	PIPE 4" SCH. XXH SA333-GR6		270 7/16"	1
38	RET4LXXHGD	Return 180 Deg 4" LR S/XXH BW SA420WPL6			5



WELD SEQUENCE
37
34
35
33
32
36

ORIGINAL

PS-101/COIL B DESIGN DATA	
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
CLIENT SPECIFICATION:	ECA-PVF-S-03 REV 0 SPEC. FAB. FAB. 04/12
DESIGN PRESSURE:	5171 PSI
MAX. DESIGN METAL TEMPERATURE:	200°F
MIN. DESIGN METAL TEMPERATURE:	-20°F
IMPACT TEST:	EXEMPT PER TABLE 323.2.2 COLUMN A
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 7
POST WELD HEAT TREATMENT:	1150°F ±50°F FOR 1 HOUR MIN.
HYDROSTATIC TEST PRESSURE:	7757 PSIG
CORROSION ALLOWANCE:	1/16"
PRE-HEAT:	50°F
WEIGHT EMPTY:	3930 LBS
WEIGHT FULL:	4388 LBS
CAPACITY:	7.4 CU FT
SURFACE AREA:	160 SQ FT
QUALITY CONTROL PROGRAM:	AGP-1253
WELDING PROCEDURE REGISTRATION NO.:	1604.2
WELD PROCEDURES:	NWP-4, NWP-6
SERVICE:	HYDROCARBONS
CRN NO.:	P-9417.213
DESIGN REGISTRATION DRAWINGS:	BDD-400A REV1
REFERENCE CALCULATIONS:	BDD-400A REV4

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-4	BATH ASSEMBLY					
08562-3	SKID ASSEMBLY					
08562-2B	PIPING ASSEMBLY	0	OCT 22/12	VW		
08562-2A	WELDED PIPING	A	OCT 05/12	VW		

AS BUILT

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*
DATE: JUN - 4 2012
W: 8806-002-A
S/N: NWP-08806-002-A
ALL DIMENSIONS IN INCHES



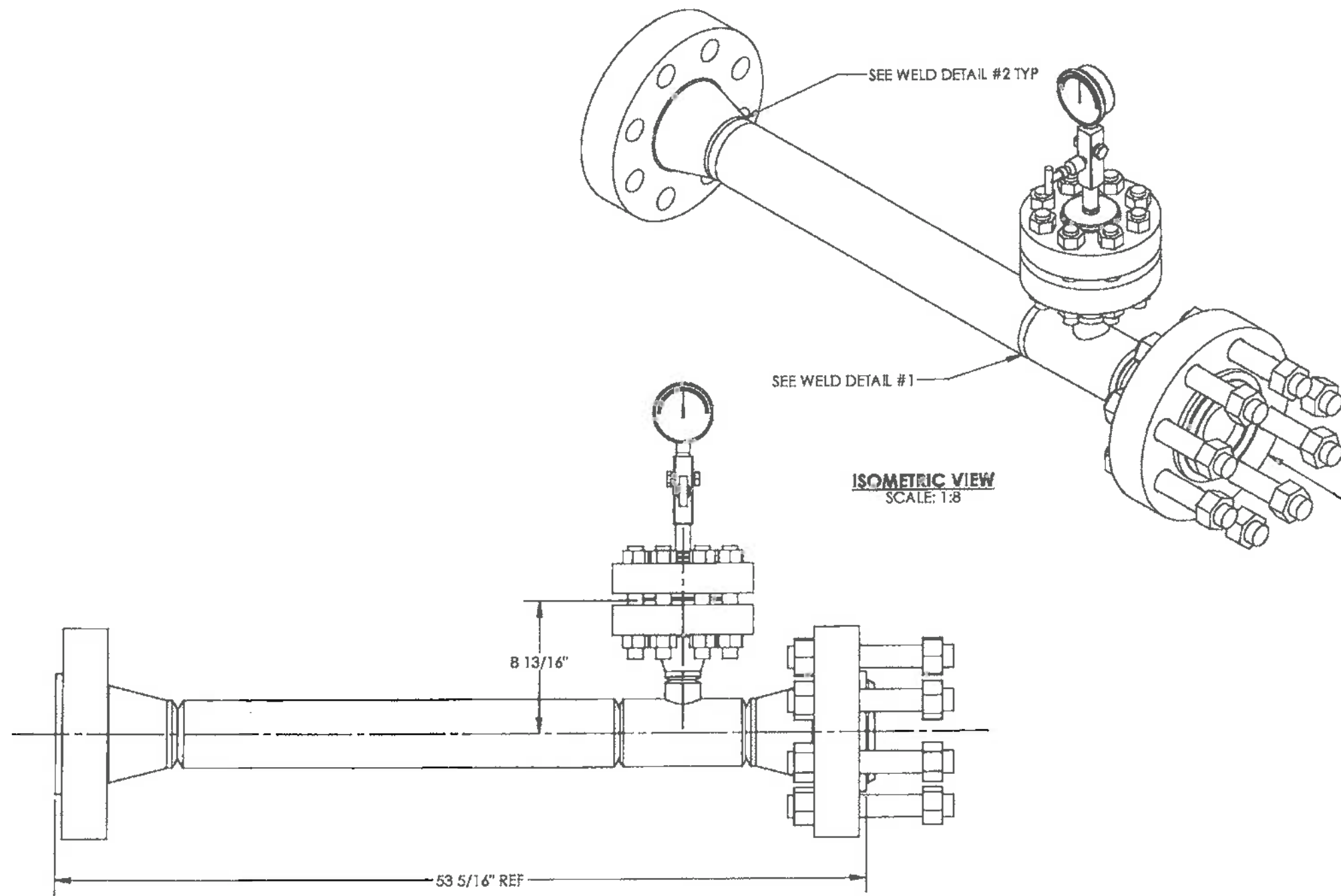
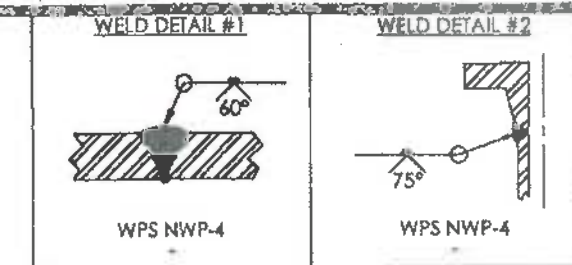
P.O. BOX 6280, INNISFAIR, AB T4G 1S9
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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
c/w 4" 2500# RTJ SPLIT COILS
COIL ASSEMBLY

DWN: VW CHK: *[Signature]* APP: *[Signature]*
DATE: OCT 05/12 DATE: 29 2012
SCALE: 1:40 DWG: 08562-4 REV: 0
SHEET: 3 OF 4

08806



ISOMETRIC VIEW
SCALE: 1:8

FRONT VIEW
SCALE: 1:8

- NOTES**
1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
 2. DIMENSIONS INCLUDE $1/8"$ ROOT GAP.
 3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
 4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED.
 5. HARDNESS TESTING - MAX 200 BNH 10%.

DESIGN DATA	
LINE NUMBER:	PF-4"-I-XXHBD-100
CLIENT SPECIFICATION:	ENCANA FAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
DESIGN PRESSURE:	5171 PSIG
MAXIMUM DESIGN TEMPERATURE:	200°F
MINIMUM DESIGN TEMPERATURE:	-49°F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	7757 PSIG
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 5
POST WELD HEAT TREATMENT:	1150°F TO 1175°F FOR 1HR MIN.
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

LH-7224-BARE	WELDED BATH ASSEMBLY						
LH-PH-7224-1	PREHEAT PIPING						
LH-LAD-72	LADDER ASSEMBLY						
LH-FIRSTK-24-2	WELDED FIRETUBE / STACK ASSEMBLY						
08562-6	SKID, SHELL, LADDER, PREHEAT PIPING ASSEMBLY						
08562-3/08562-4	SKID ASSEMBLY / COIL ASSEMBLY						
08562/08562-1	GA / P&ID	0	OCT05/12	VW	8	8	ISSUED FOR CONSTRUCTION
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	
REFERENCE DRAWINGS		DRAWING REVISIONS					

ISSUED FOR CONSTRUCTION

SIGNED:

DATE: JUN - 4 2013

W.O. NO. 8806-002-B

S/N: _____

ALL DIMENSIONS IN INCHES

NWP INDUSTRIES INC.
Total oilfield supply.

P.O. BOX 6280, INNISFAIL, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

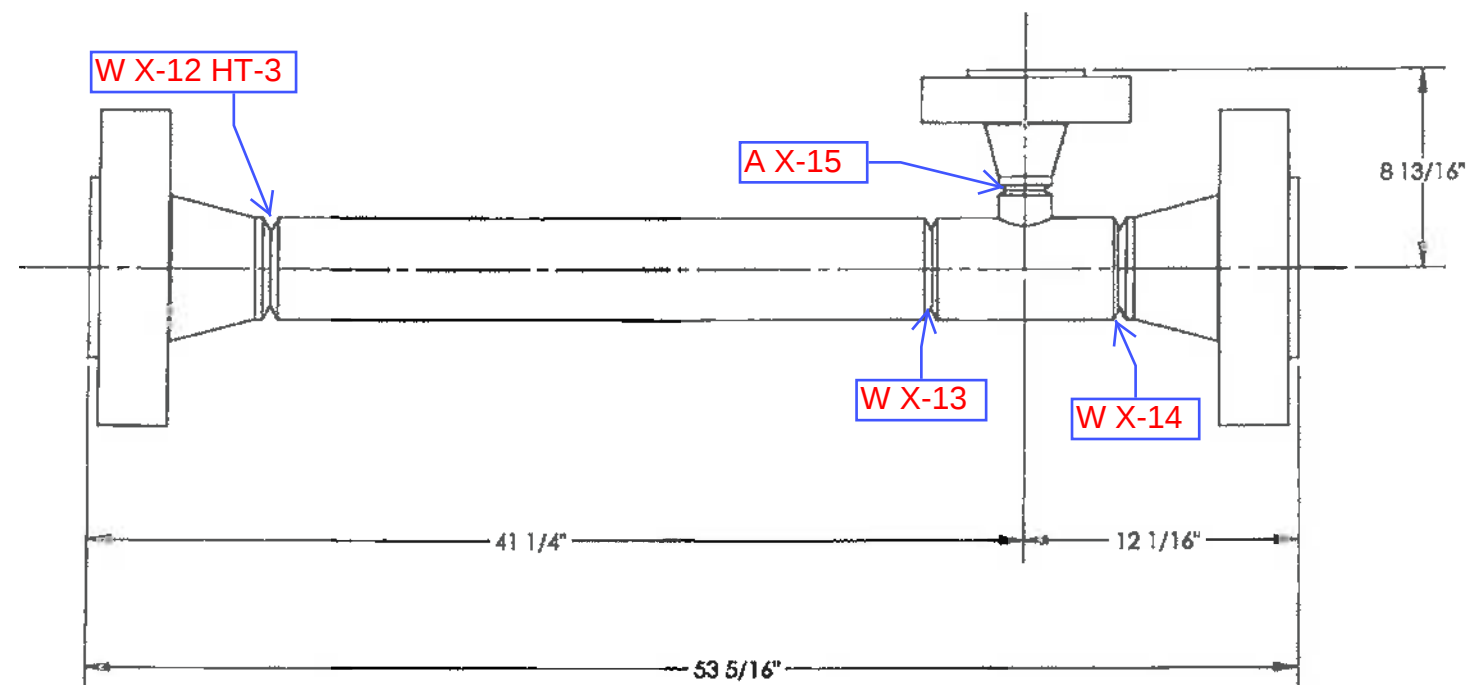
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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
C/W 4"-2500# RTJ SPLIT COILS
WELDED PIPING

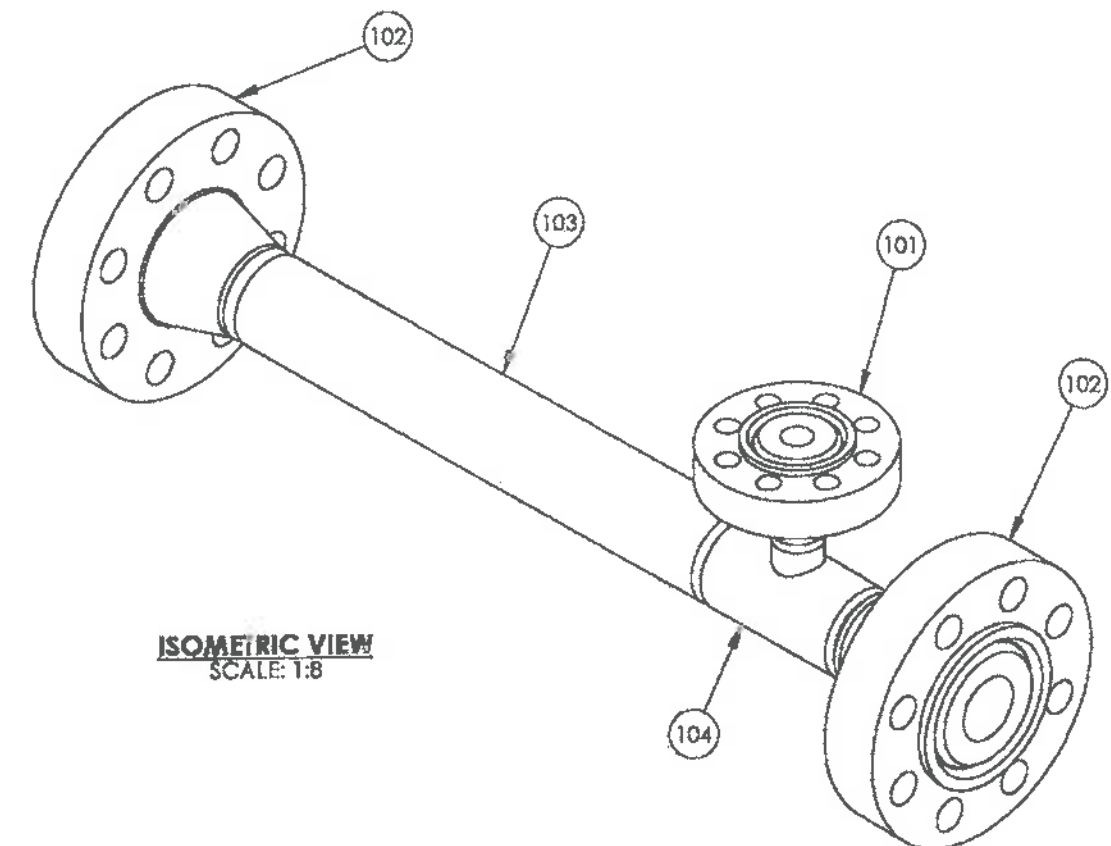
DWN: VW	CHK: 8	APP: 8
DATE: OCT 05/12	DATE: NOV 14 2012	DATE: NOV 14 2012
SCALE: 1:8	DWG: 08562-2A	REV: 0
SHEET: 1 OF 6		

08806

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
101	FLA2FXXHBF	FLANGE 2" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			1
102	FLA4FXXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
103	PIP4XXHB	PIPE 4" SCH XXH SA333-6		29 3/16"	1
104	TEE42YXXHGD	TEE REDUCING 4" x 2" SCH XXH BW SA420-WPL6			1



FRONT VIEW
SCALE: 1:8

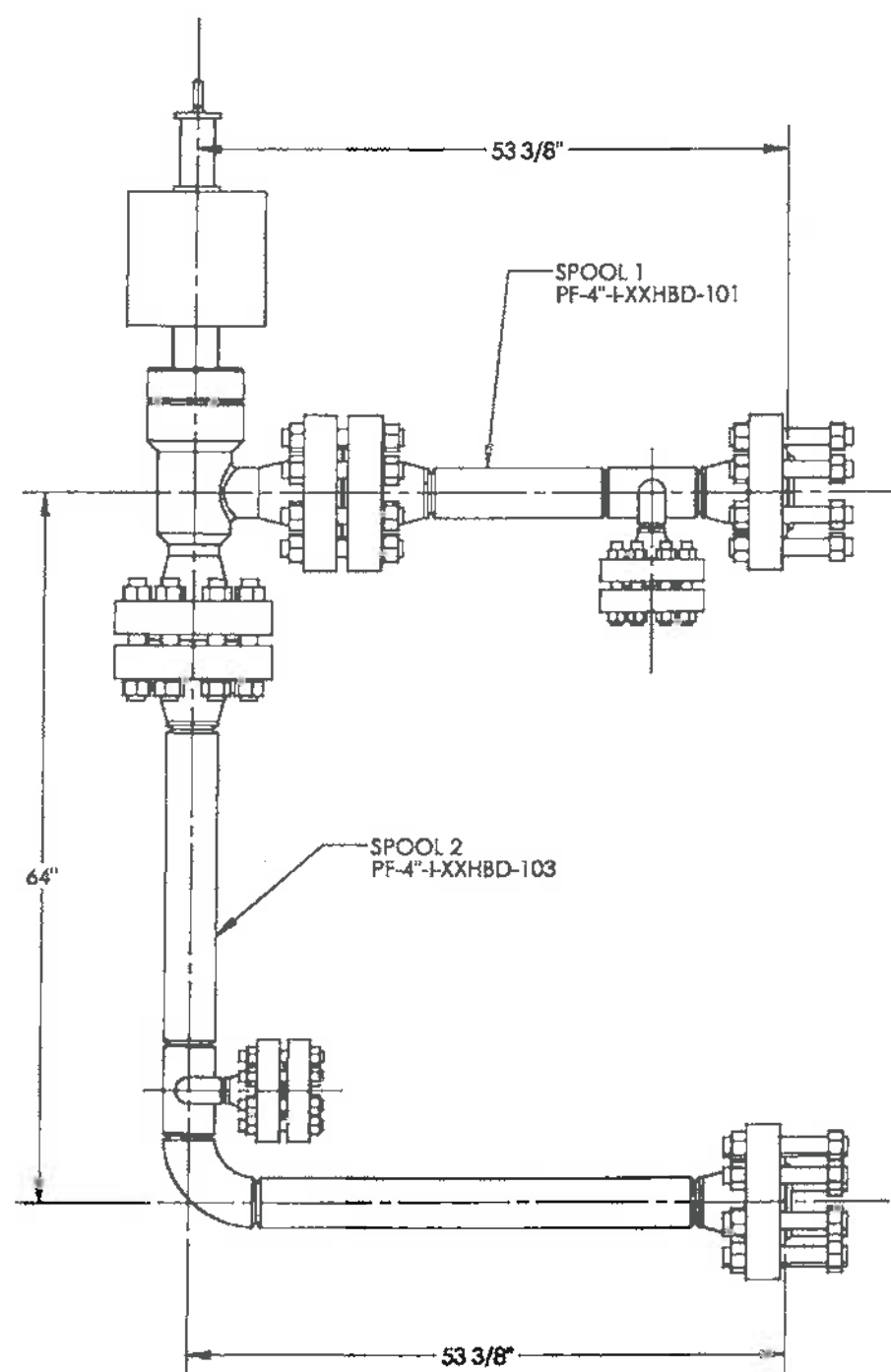


ISOMETRIC VIEW
SCALE: 1:8

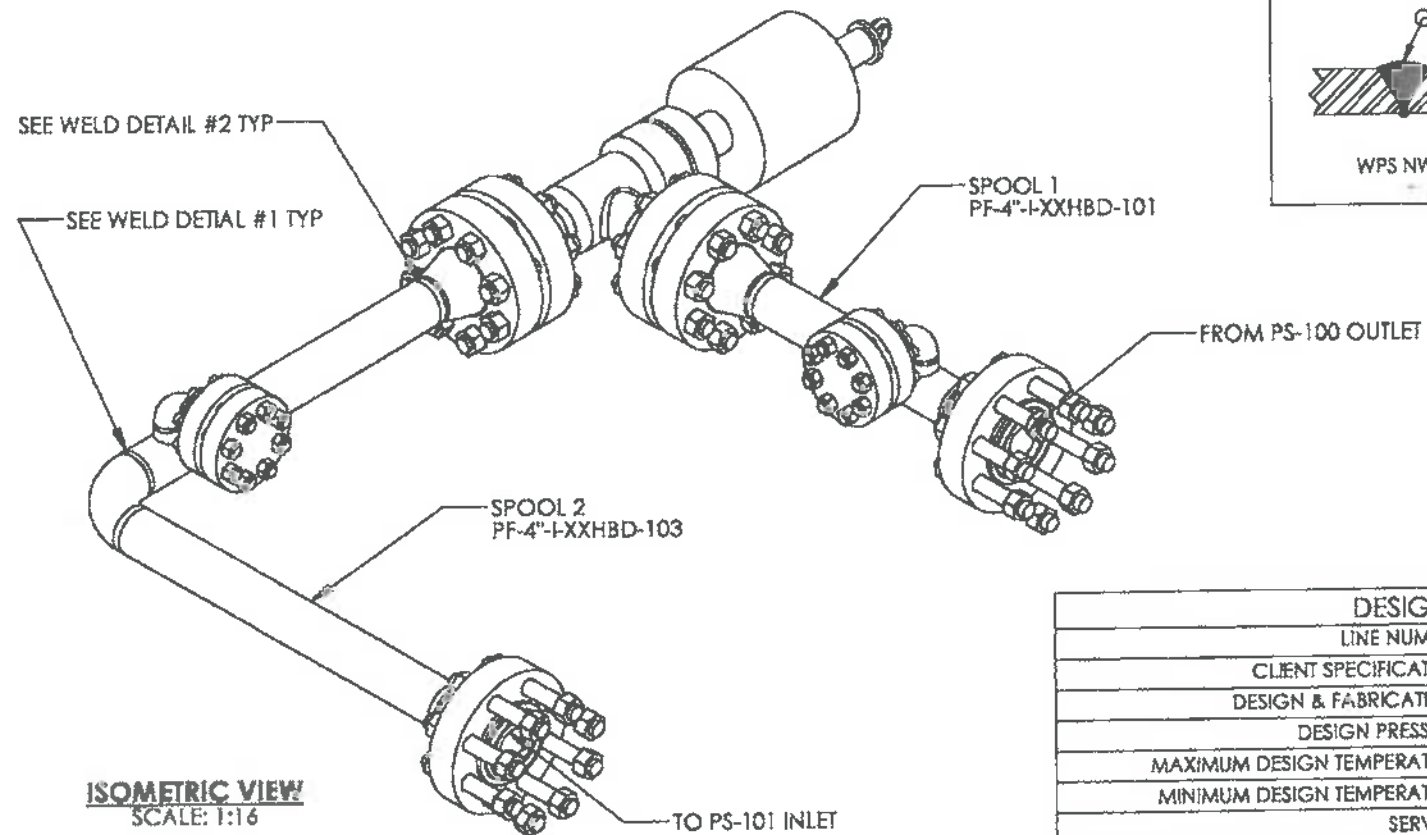
ORIGINAL

LH-7224-BARE	WELDED BATH ASSEMBLY								ISSUED FOR CONSTRUCTION SIGNED:  DATE: JUN - 4 2013 W.O.: 8806-002-4 S/N:  ALL DIMENSIONS IN INCHES	 NWP INDUSTRIES INC. Total offfield supply. P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.	ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU C/W 4"-2500# RTJ SPLIT COILS WELDED PIPING		
LH-PH-7224-1	PREHEAT PIPING										DWN: VW	CHK: 	APP: 
LH-LAD-72	LADDER ASSEMBLY										DATE: OCT 05/12	DATE: NOV 14 2011	DATE: NOV 14 2012
LH-FIRSTK-24-2	WELDED FIRETUBE / STACK ASSEMBLY										SCALE: 1:8	DWG: 08562-2A	
08562-6	SKID, SHELL, LADDER, PREHEAT PIPING ASSEMBLY										SHEET: 2 OF 6		REV: 0
08562-3/08562-4	SKID ASSEMBLY / COIL ASSEMBLY												
08562/08562-1	GA / P&ID	0	OCT05/12	VW			ISSUED FOR CONSTRUCTION						
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP							
REFERENCE DRAWINGS							DRAWING REVISIONS						

08806



PLAN VIEW
SCALE: 1:16

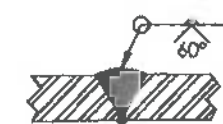


ISOMETRIC VIEW
SCALE: 1:16

NOTES

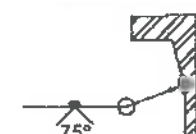
1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS INCLUDE $1/8"$ ROOT GAP.
3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED.
5. HARDNESS TESTING - MAX 200 BNH 10%.

WELD DETAIL #1



WPS NWP-4

WELD DETAIL #2



WPS NWP-4

ORIGINAL

DESIGN DATA

LINE NUMBER:	PF-4"-I-XXHBD-101
CLIENT SPECIFICATION:	ENCANA FAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NPS 2010 EDITION
DESIGN PRESSURE:	5171 PSIG
MAXIMUM DESIGN TEMPERATURE:	200 °F
MINIMUM DESIGN TEMPERATURE:	-49 °F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	7757 PSIG
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 5
POST WELD HEAT TREATMENT:	1150 °F TO 1175 °F FOR 1HR MIN.
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

DESIGN DATA

LINE NUMBER:	PF-4"-I-XXHBD-103
CLIENT SPECIFICATION:	ENCANA FAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NPS 2010 EDITION
DESIGN PRESSURE:	5171 PSIG
MAXIMUM DESIGN TEMPERATURE:	200 °F
MINIMUM DESIGN TEMPERATURE:	-49 °F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	7757 PSIG
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 5
POST WELD HEAT TREATMENT:	1150 °F TO 1175 °F FOR 1HR MIN.
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

LH-7224-BARE	WELDED BATH ASSEMBLY								
LH-PH-7224-1	PREHEAT PIPING								
LH-LAD-72	LADDER ASSEMBLY								
LH-FIRSTK-24-2	WELDED FIRETUBE / STACK ASSEMBLY								
08562-6	SKID, SHELL, LADDER, PREHEAT PIPING ASSEMBLY								
08562-3/08562-4	SKID ASSEMBLY / COIL ASSEMBLY								
08562/08562-1	GA / P&ID	0	OCT05/12	VW	D	APP	ISSUED FOR CONSTRUCTION		
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP			

REFERENCE DRAWINGS

DRAWING REVISIONS

ISSUED FOR
CONSTRUCTION

SIGNED:

DATE: JUN - 4 2013

W.O. 8806-002-B

S/N:

ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

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ENCANA CORPORATION

LINEHEATER PACKAGE

3.0 MMBTU

c/w 4"-2500# RTJ SPLIT COILS

WELDED PIPING

DWN: VW

CHK: D

APP: A

DATE: OCT05/12

DATE: NOV 14 2012

DATE: NOV 14 2012

SCALE: 1:16

DWG: 08562-2A

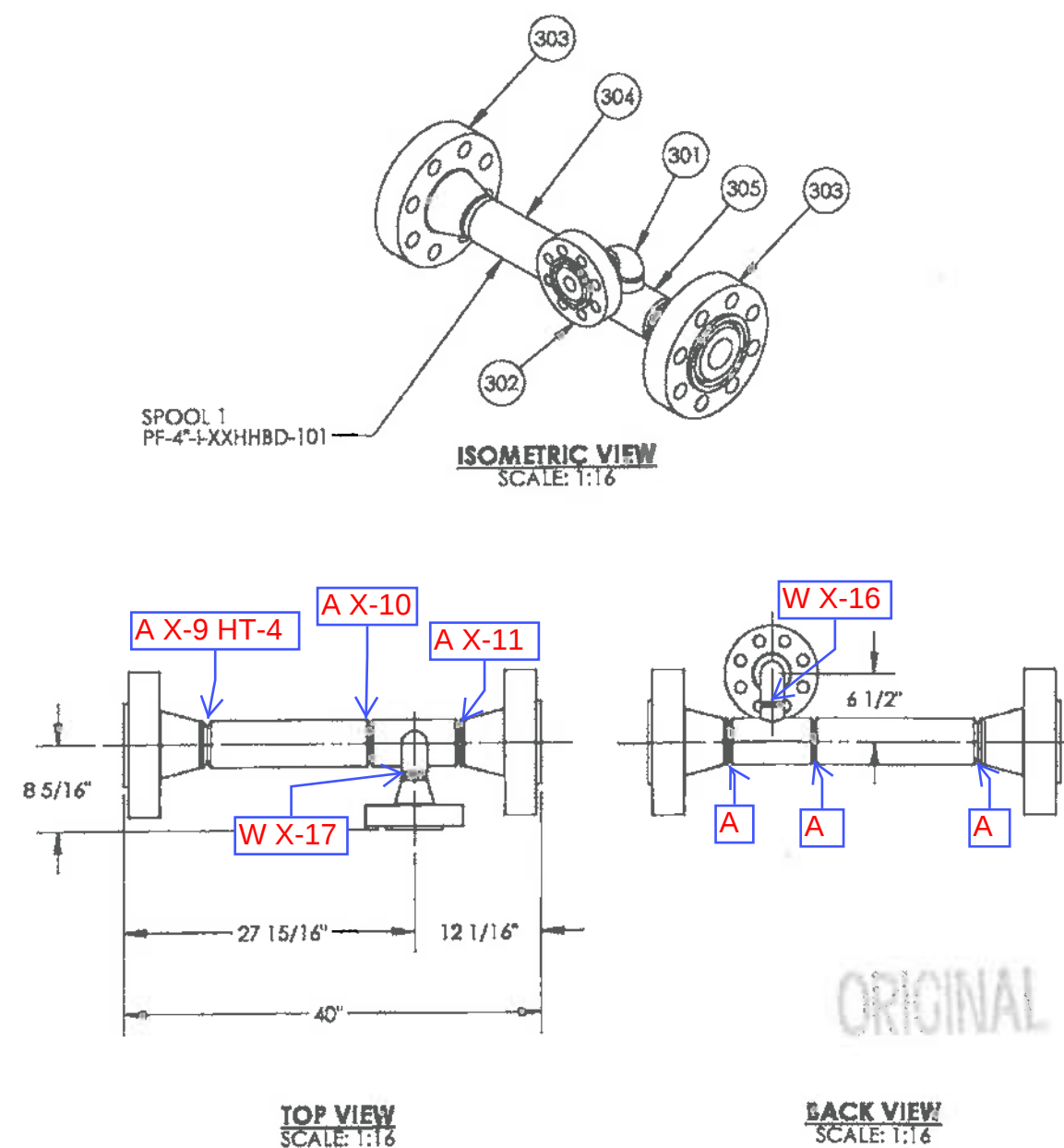
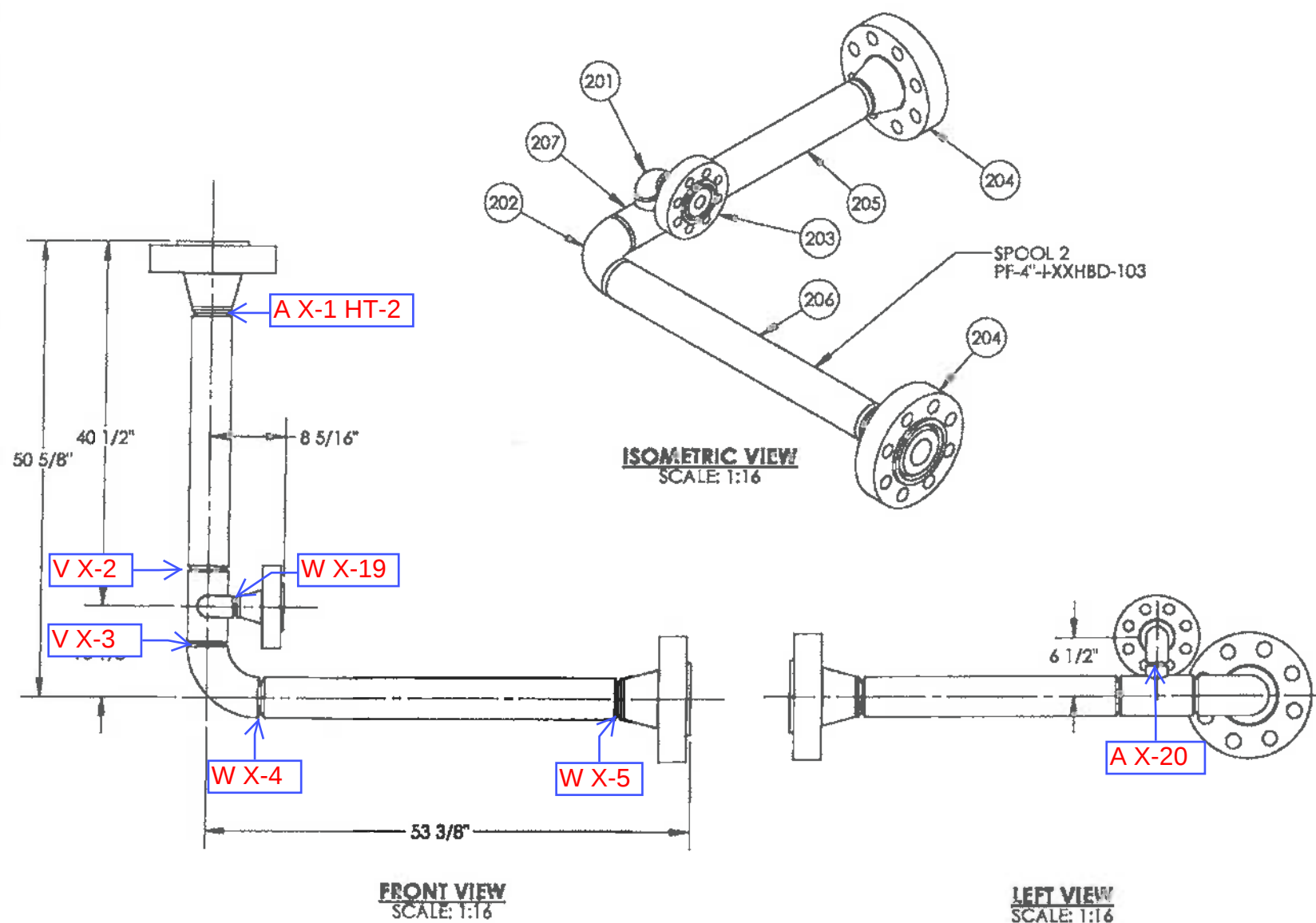
REV: 0

SHEET: 3 OF 6

08806

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
201	EL92LXXHGD	ELBOW 90 DEG 2" LR SCH XXH BW SA420-WPL6			1
202	EL94LXXHGD	ELBOW 90 DEG 4" LR SCH XXH BW SA420-WPL6			1
203	FLA2FXHBF	FLANGE 2" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			1
204	FLA4FXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
205	PIP4XXHB	PIPE 4" SCH XXH SA333-6		28 7/16"	1
206	PIP4XXHB	PIPE 4" SCH XXH SA333-6		39 7/16"	1
207	TEE42YXXHGD	TEE REDUCING 4" x 2" SCH XXH BW SA420-WPL6			1

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
301	EL92LXXHGD	ELBOW 90 DEG 2" LR SCH XXH BW SA420-WPL6			1
302	FLA2FXHBF	FLANGE 2" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			1
303	FLA4FXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
304	PIP4XXHB	PIPE 4" SCH XXH SA333-6		15 7/8"	1
305	TEE42YXXHGD	TEE REDUCING 4" x 2" SCH XXH BW SA420-WPL6			1



LH-7224-BARE	WELDED BATH ASSEMBLY						
LH-PH-7224-1	PREHEAT PIPING						
LH-LAD-72	LADDER ASSEMBLY						
LH-FIRSTK-24-2	WELDED FIRETUBE / STACK ASSEMBLY						
08562-6	SKID, SHELL, LADDER, PREHEAT PIPING ASSEMBLY						
08562-3/08562-4	SKID ASSEMBLY / COIL ASSEMBLY						
08562/08562-1	GA / P&ID	0	OCT05/12	VW	D		ISSUED FOR CONSTRUCTION
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	
REFERENCE DRAWINGS		DRAWING REVISIONS					

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*

DATE: JUN - 4 2013

W.O. #: 8806-002

S/N: _____

ALL DIMENSIONS IN INCHES

NWP
INDUSTRIES INC.
Total offfield supply.

P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

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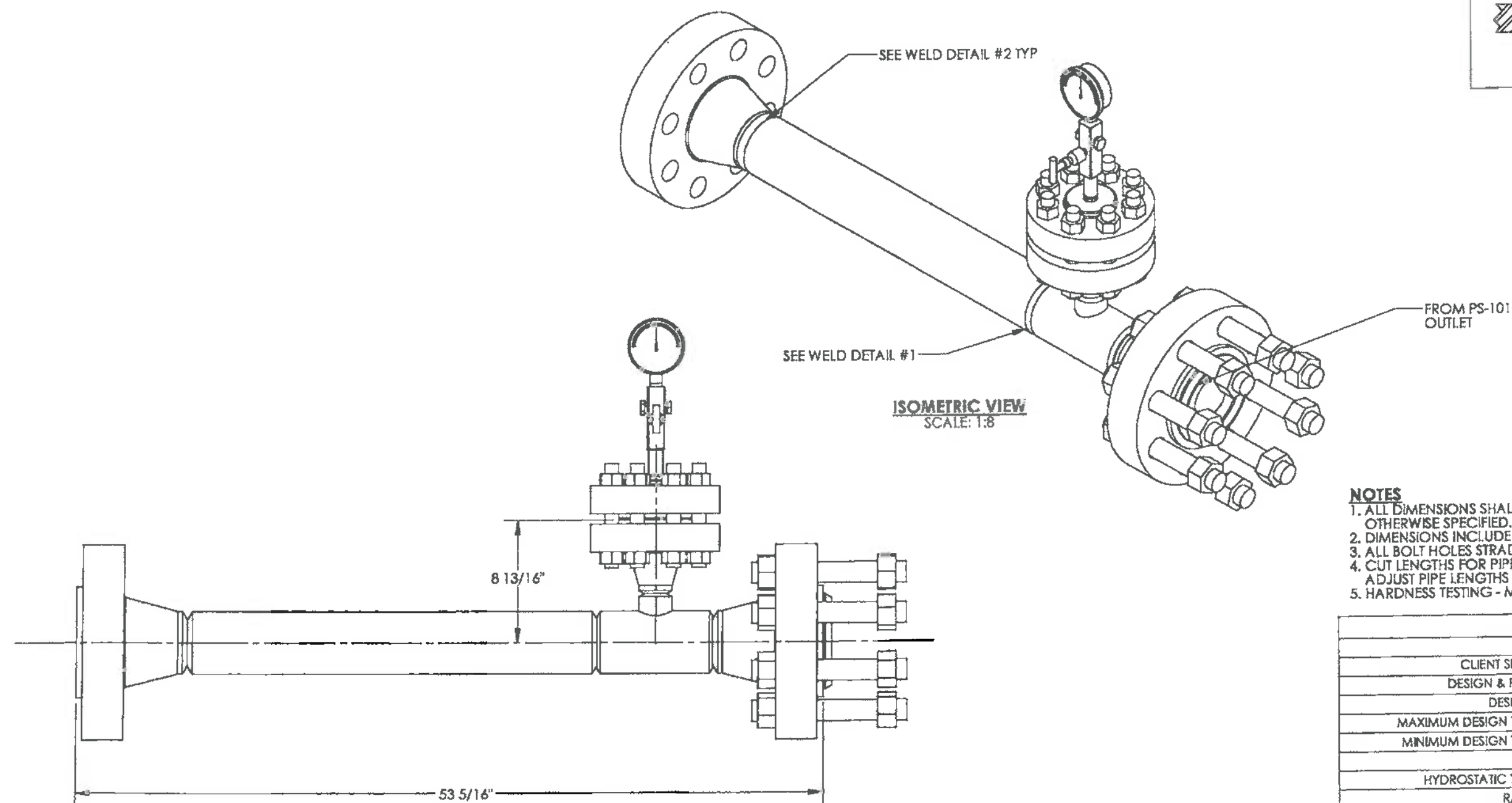
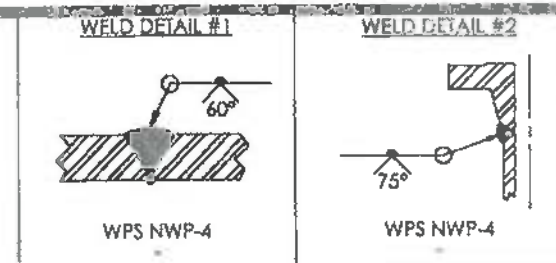
ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
C/W 4"-2500# RTJ SPLIT COILS
WELDED PIPING

DWN: VW
DATE: OCT 05/12
SCALE: 1:16
SHEET: 4 OF 6

CHK: *[Signature]*
DATE: NOV 14 2012
DWG: 08562-2A
REV: 0

APP: *[Signature]*
DATE: NOV 14 2012

08806



- NOTES**
1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
 2. DIMENSIONS INCLUDE $1/8"$ ROOT GAP.
 3. ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
 4. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED.
 5. HARDNESS TESTING - MAX 200 BNH 10%.

DESIGN DATA	
LINE NUMBER:	PF-4"-I-XXHBD-104
CLIENT SPECIFICATION:	ENCANA FAB
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
DESIGN PRESSURE:	5171 PSIG
MAXIMUM DESIGN TEMPERATURE:	200°F
MINIMUM DESIGN TEMPERATURE:	-49°F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	7757 PSIG
RADIOGRAPHY:	100%
OTHER NDE:	SEE NOTE 5
POST WELD HEAT TREATMENT:	1150°F TO 1175°F FOR 1HR MIN.
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

LH-7224-BARE	WELDED BATH ASSEMBLY								
LH-PH-7224-1	PREHEAT PIPING								
LH-LAD-72	LADDER ASSEMBLY								
LH-FIRSTK-24-2	WELDED FIRETUBE / STACK ASSEMBLY								
08562-6	SKID, SHELL, LADDER, PREHEAT PIPING ASSEMBLY								
08562-3/08562-4	SKID ASSEMBLY / COIL ASSEMBLY								
08562/08562-1	GA / P&ID	0	OCT05/12	VW	B	PA	ISSUED FOR CONSTRUCTION		
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP			
REFERENCE DRAWINGS									

ISSUED FOR CONSTRUCTION

SIGNED:

DATE: JUN - 4 2013

W.O.: 8806-002

S/N: _____

ALL DIMENSIONS IN INCHES

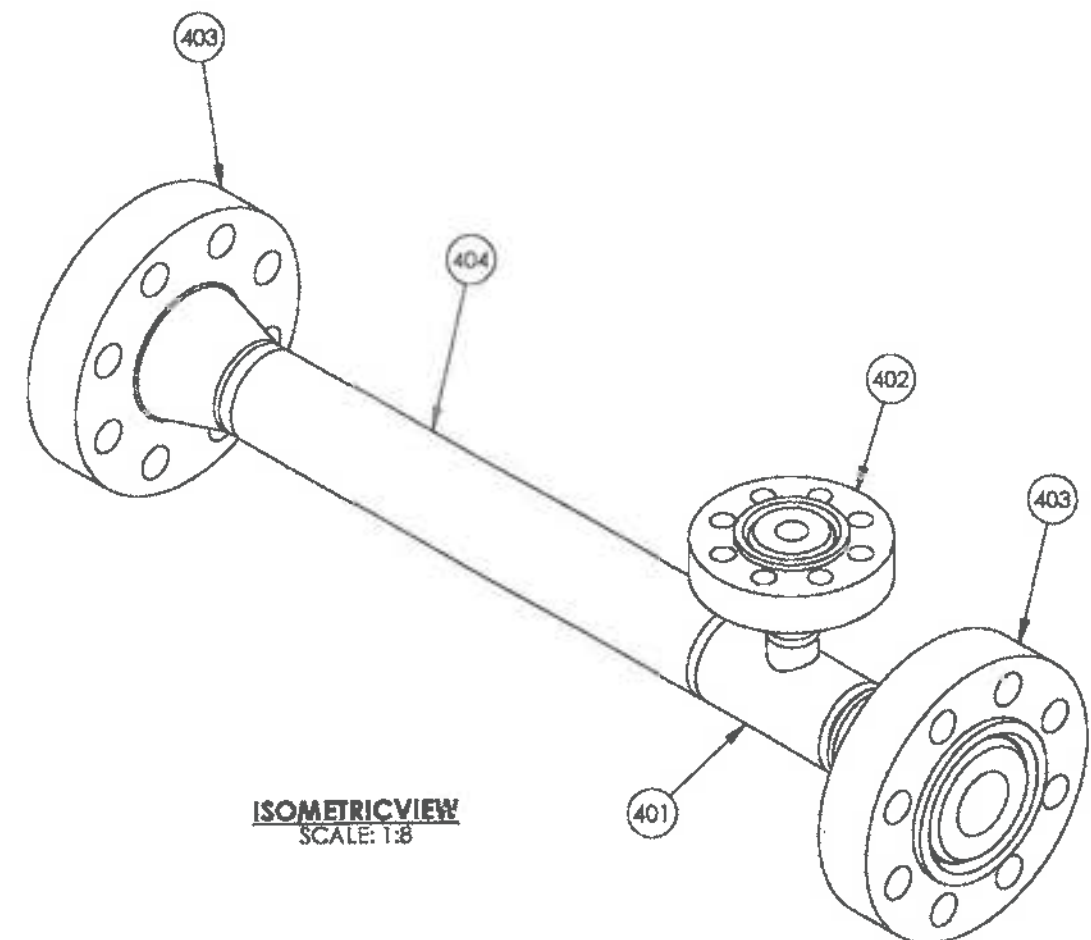
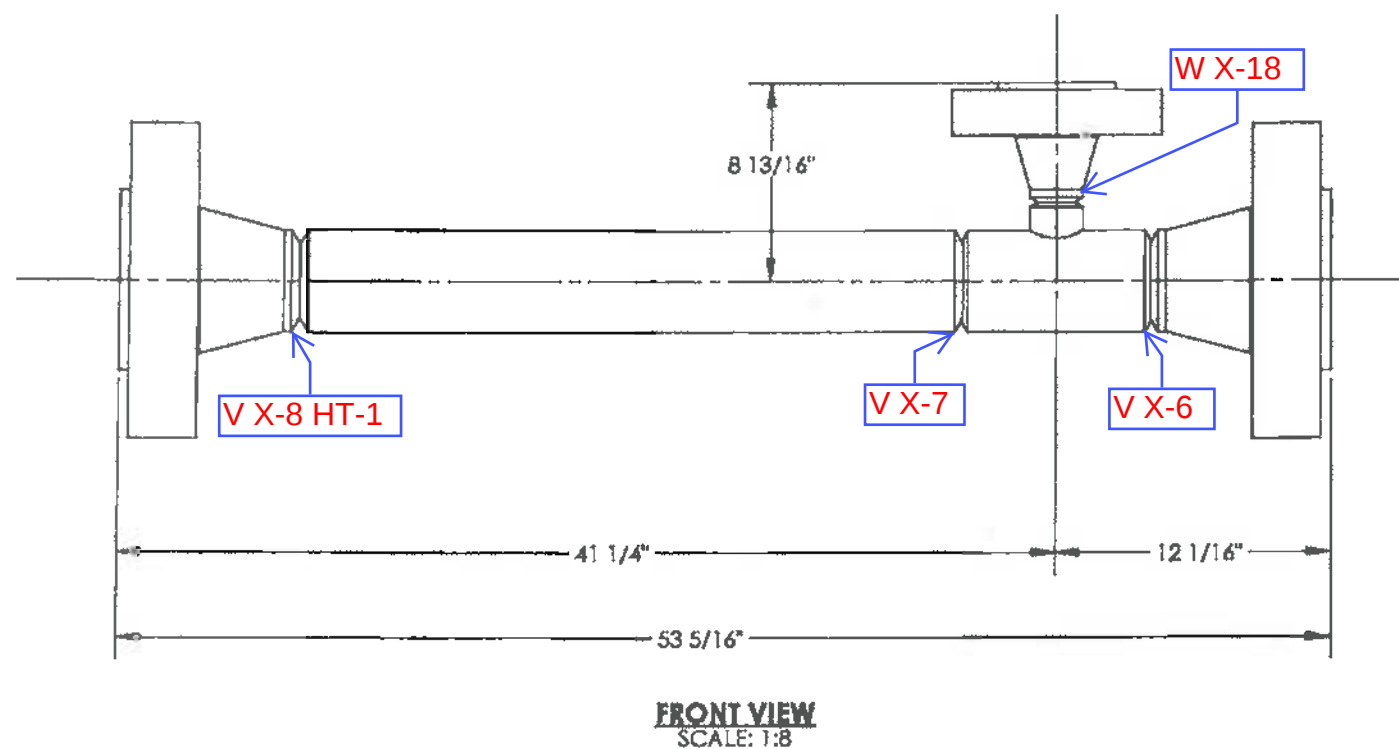
NWP
INDUSTRIES INC.
Total oilfield supply.

P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

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THIS DRAWING MUST BE RETURNED UPON REQUEST.

ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU c/w 4"-2500# RTJ SPLIT COILS WELDED PIPING			
DWN: VW	CHK: B	APP: PA	
DATE: OCT 05/12	DATE: NOV 14 2012	DATE: NOV 14 2012	
SCALE: 1:8	DWG: 08542-2A	REV: 0	
SHEET: 5 OF 6			

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
401	TEE42YXXHGD	TEE REDUCING 4" x 2" SCH XXH BW SA420-WPL6			1
402	FLA2FXXHBF	FLANGE 2" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			1
403	FLA4FXXHBF	FLANGE 4" 2500 ANSI SCH XXH RTJWN SA350-LF2-CL1			2
404	PIP4XXHBB	PIPE 4" SCH XXH SA333-6		29 3/16"	1



ORIGINAL

LH-7224-BARE	WELDED BATH ASSEMBLY									ISSUED FOR CONSTRUCTION SIGNED:  DATE: JUN - 4 2012 8806-002-6 W/O:  S/N: 	 INDUSTRIES INC. Total offfield supply. P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.	ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU c/w 4"-2500# RTJ SPLIT COILS WELDED PIPING		
LH-PH-7224-1	PREHEAT PIPING											DWN: VW	CHK: 	APP: 
LH-LAD-72	LADDER ASSEMBLY											DATE: OCT 05/12	DATE: NOV 14 2012	DATE: NOV 14 2012
LH-FIRSTK-24-2	WELDED FRETUBE / STACK ASSEMBLY											SCALE: 1:8	DWG: 08562-2A	REV: 0
08562-6	SKID, SHELL, LADDER, PREHEAT PIPING ASSEMBLY											SHEET: 6 OF 6		
08562-3/08562-4	SKID ASSEMBLY / COIL ASSEMBLY													
08562/08562-1	GA / P&ID	0	OCT05/12	VW			ISSUED FOR CONSTRUCTION							
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP								
REFERENCE DRAWINGS							DRAWING REVISIONS			ALL DIMENSIONS IN INCHES				

08806

NWP Industries Inc™		Website: www.nwp.ca
PO Box 6280		Phone: (403) 227-4100
4017-60 Ave.		
T4G 1S9		Fax: (403) 227-4102

HYDROSTATIC TEST AFFIDAVIT

Customer: Encana Corporation

JO# 08806-002-B

Project: Welded Piping for 3.0mm Lineheater

Project#

Test Pressure: 7757 PSI

Hold Time: 60 mins

Code Requirements: ASME B31.3 2012 edition

All Personnel Advised of Test ☒ All Signs & Flagging Posted ☒

Prior to Filling – Fitting/Hoses & Component Meet Required Test Pressure

Sign-Off Supervisor: _____ Tester: _____ Date: 19/07/2013

Product Description:

PF-4"-I-XXHBD-100 & PF-4"-I-XXHBD-101 & PF-4"-I-XXHBD-103 & PF-4"-I-XXHBD-104
= 7757PSI

50% Test Pressure Leak/Systems Check Completed ☒

50% test=3879 psi

Test Temperature: _____ °F

Equipment Drained & Flushed to Prevent Freezing: Yes: ☐ No: ☐

Start Time:	Finish Time:
<u>9:00 AM</u>	<u>11:15 AM</u>

Test Gauge Identification #	Pressure Range	Calibration Date
NWPG- 20000 - 1	0-20000 PSI	31 Aug 2013
NWPG- 20000 - 20000	0-20000 PSI	11 Dec 2013
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	

Test By: <u>M. J. Ferguson</u>	Date: 17/07/2013
NWP Representative: <u>Tom Ferguson</u>	Date: 17/07/2013
Customer Representative: _____	Date: _____

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg	 NWP Industries Inc.™	ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

N D E Requirements

Client: Encana JO# 08806-002-B
 Project: Welded Piping – 3.0mm Lineheater Date: 08/07/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other: ☐

- | | | |
|---|--|---|
| ☐ X-Ray
☒ Gamma Ray

☐ Ultrasonics
☐ Liquid Penetrant
☐ Magnetic Particle
☐ Accoustic Emission

☐ Hardness test Max 200 BHN | ☒ 100%
☐ Full
☐ 25%
☐ 10%
☐ Other(Define)

☐ Spot | ☐ ASME Section VIII-UW-51
☐ ASME Section VIII-UW-52
☒ Customer Specification
☒ ASME B31.3 NFS
Other (Specify)

☐ CSA W47.1/W59 |
|---|--|---|

General Instructions:

Vessel S/N

P1 Material

Welder ID A, V, W

Shell-T=

Pipe-T= 2"XXH, 4"XXH

Total Welds Start shooting pkg (first # is X-1)

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots 20

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects
 Encana Spec is Zero Elongated Indications
 Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
 Encana Spec for Threaded Piping- acceptance is 7 threads engaged
 HT is a 5 Point Traverse

Prepared By: Tom Ewashen

Date: 08/07/2013

Exposure Device #: D5934 Cobalt 60 ☐ IR 192 ☒ X-Ray ☐ EFSS: .155" Film Brand: AGFA #Film/cassette: 1 Code: B31.3 NFS Encana spec	Source #: 93678B Job / P.O. #: 08806-002-B IRISNDT #: 167276 Client: NWP (Encana) Location: Innisfail Item Inspected: BW	Date: 10-Jul-13 Material: P1
---	--	---

Film #	Size, Location, Thickness	Welder ID	IRISNDT Proc.	S.O.D. Inches	O.F.D. Inches	# of Exp.	Work Location	Film Type	Type and Location of Discontinuities (rejectable discontinuities in square brackets [])	(A)ccept (R)ect
									JO#08806-002-B, 3.0mm Lineheater	
X-1	4" XXH	A	RT 3A	3.70	.799	4	2	D5		A
X-2	4" XXH	V	RT 3A	3.70	.799	4	2	D5		A
X-3	4" XXH	V	RT 3A	3.70	.799	4	2	D5		A
X-4	4" XXH	W	RT 3A	3.70	.799	4	2	D5		A
X-5	4" XXH	W	RT 3A	3.70	.799	4	2	D5		A
X-6	4" XXH	V	RT 3A	3.70	.799	4	2	D5		A
X-7	4" XXH	V	RT 3A	3.70	.799	4	2	D5		A
X-8	4" XXH	V	RT 3A	3.70	.799	4	2	D5		A
X-9	4" XXH	A	RT 3A	3.70	.799	4	2	D5		A
X-10	4" XXH	A	RT 3A	3.70	.799	4	2	D5		A
X-11	4" XXH	A	RT 3A	3.70	.799	4	2	D5		A
X-12	4" XXH	W	RT 3A	3.70	.799	4	2	D5		A
X-13	4" XXH	W	RT 3A	3.70	.799	4	2	D5		A
X-14	4" XXH	W	RT 3A	3.70	.799	4	2	D5		A
X-15	2" XXH	A	RT 3A	1.81	.561	4	2	D4		A
X-16	2" XXH	W	RT 3A	1.81	.561	4	2	D4		A
X-17	2" XXH	W	RT 3A	1.81	.561	4	2	D4		A
X-18	2" XXH	W	RT 3A	1.81	.561	4	2	D4		A
X-19	2" XXH	W	RT 3A	1.81	.561	4	2	D4		A
X-20	2" XXH	A	RT 3A	1.81	.561	4	2	D4		A

Number of Radiation Barrier Warning Signs Erected: 1 SPOOL

Number of Radiation Barrier Warning Signs Returned: 1 SPOOL

Work Location Legend: [1] Inside Fab. Shop [2] Yard/Lay-down Area [3] Piping/Modular Fab. Area [4] N/A (Other)

IRIS Procedure: Single Wall Exposure: RT 1, 2, 2A, 6, 7 Double Wall Exposure: RT 3, 3A, 4, 5, 8	S.O.D. = Source-to-object distance (D) O.F.D. = Source-object distance (D in T-274.1)	AB - Arc Burns BT - Burn Through CK - Crack EP - Excessive Penetration P - Porosity	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
---	--	---	---	---

Unit #: 361 Kilometers: 60 In: Out: Hrs: 4 hr In: Out: Hrs:	Film Quantity: <table border="1" style="width:100%"> <tr> <td>24</td> <td>(2 ¼ x 5 ½)</td> <td>D5</td> </tr> <tr> <td>56</td> <td>(2 ¼ x 8 ½)</td> <td>D4</td> </tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>D4</td></tr> </table>	24	(2 ¼ x 5 ½)	D5	56	(2 ¼ x 8 ½)	D4																		D4	Technician: Jonathan Anstey SNT-TC-1A II C.G.S.B II C.G.S.B.# 7794 I am in full agreement with report contents: Client:
24	(2 ¼ x 5 ½)	D5																								
56	(2 ¼ x 8 ½)	D4																								
		D4																								
Personnel: Jonathan Anstey, Adam Birch																										

Edmonton (780) 437-4747
 Calgary (403) 279-6121
 Nisku (780) 955-7616
 Barrhead (780) 674-3018

Fort McMurray (780) 743-1536
 Medicine Hat (403) 527-6284
 High Level (780) 841-0470
 Lloydminster (780) 875-6455

Cold Lake (780) 594-1114
 Red Deer (403) 347-1742
 Tulsa, OK (918) 446-8773
 Houston, TX (713) 722-7177

Mailing Address
 5311-86 Street
 Edmonton, Alberta
 T6E 5T8

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: March 30 2012		FORM_NDE_001
Rev Status: 2.0		N.D.E Requirements

N.D.E Requirements

Client: Encana JO# 08806-002-B
 Project: Welded Piping – 3.0 mm Lineheater after PWHT Date: 17/07/2013

Piping: ☒	Pressure Vessel: ☐	Tank: ☐	Other:
☐ X-Ray	☐ 100%	☐ ASME Section VIII-UW-51	
☐ Gamma Ray	☐ Full	☐ ASME Section VIII-UW-52	
☐ Ultrasonics	☐ 25%	☒ Customer Specification	
☐ Liquid Penetrant	☒ 10%	☒ ASME B31.3 NFS	
☐ Magnetic Particle	Other(Define)	Other (Specify)	
☐ Accoustic Emission	☐ Spot	☐ Customer Spec	
☒ Hardness test Max 200 BHN		☐ CSA W47.1/W59	

General Instructions: Vessel S/N

P1 Material

Welder ID A, V, W
 Shell-T=
 Pipe-T= 2" XXH, 4" XXH
 Total Welds HT x 4 bw (Start with HT-1). All after post weld heat treat.

Please use wire type IQi
 Please Note locations of all indications on films on reports
 Please include O.F.D-S.O.D S.F.D on reports

Special Requirements: Shots 4

Buttweld Xray to be identified as X-#
 Gap Shots to be identified as GS-#
 Threaded Shots to be identified as XT-#
 Identify on Envelope part of package being shot ie. Coil, Piping, ect.
 Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date
 Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero UC and Zero IP
 Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
 Encana Spec for Threaded Piping- acceptance is 7 threads engaged
 HT is a 5 Point Traverse

1 X-8-V-4" 147, 137, 167 147 151
 2 X-1-A-4" 140, 140, 160, 140, 152
 3 X-12-W-4" 146, 143, 165, 155, 163
 4 X-9-A-4" 139, 132, 154, 141, 154

Complete

Prepared By: Tom Ewashen

Date: 17/07/2013



HARDNESS TESTING INSPECTION REPORT

RD04 - HT369

Page 1 of 1

Procedures: HT-2 IRIS Procedure#9 (sec 10.0)
Code: ASME B31.3NFS
Acceptance / Rejection Criteria: Encana spec
Min. Hardness: eng review Max. Hardness: 200bhn

Job / P.O. #: JO#08806-002-B
Client: NWP (Encana)
Location: Innisfail
Item Inspected: 3.0mm Lineheater after PWHT

IRISNDT #: 167300

Date: 17-Jul-13

Material Type: P1

Surface Condition: BUFFED GRIT#60

Heat Treatment: After PWHT

Equipment: GE Inspection Tech (MIC-10)

IRISNDT #: 45049

Calibration Date: 7-Nov-12

Calibration Block(s): 130,151,170,200 Brinell Bars

Hardness Scale Readings: Rockwell B ☐ Rockwell C ☐ Vickers ☐ Brinell ☒

Item	Component Identification and Location of Reading		Brinell Impression		Brinell Bar Hardness	Hardness Value	(A)ccept (R)reject
			Bar	Material			
	JO#08806-002-B, Welded piping-3.0mm Lineheater						
		Parent	HAZ	WELD	HAZ	Parent	
HT#	xray#						
1	X-8, Welder:V, 4"XXH	147	137	167	147	151	A
2	X-1, Welder:A, 4"XXH	140	140	160	148	152	A
3	X-12, Welder:W, 4"XXH	146	143	165	155	163	A
4	X-9, Welder:A, 4"XXH	139	132	154	141	154	A

Remarks:

NOTE: When testing weldments the precise location of the test must be clearly identified i.e. Parent Material or Heat Affected Zone or Weld.

Unit #: 361

Kilometres: 60km

In: Out: Hrs: .5 hrs

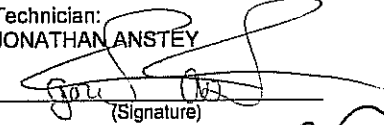
In: Out: Hrs:

Personnel:
Jonathan Anstey, Derek Lofstrom

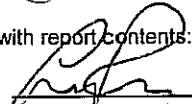
Consumables:
AVG OF 5HITS PER location,
avg reading 3-5 hits for location.

of Hits: 20 hits

Technician:
JONATHAN ANSTEY


(Signature)

I am in full agreement with report contents:

Client Representative: 

Edmonton (780) 437-4747
Calgary (403) 279-6121
Nisku (780) 955-7616
Barrhead (780) 674-3018

Fort McMurray (780) 743-1536
Grande Prairie (780) 532-2283
High Level (780) 841-0470
Lloydminster (780) 875-6455

Cold Lake (780) 594-1114
Red Deer (403) 347-1742
Tulsa, OK (918) 446-8773
Houston, TX (713) 722-7177

Mailing Address
5311-86 Street
Edmonton, Alberta
T6E 5T8

JUN 05 2013

WELDED PIPING for 3.0 mm BTU/HR LH PKG.

PRESSURE PIPING EXAMINATION CHECKLIST

DRWG # 08562-2A REV 0

JOB NUMBER: 08806-002-B

NO.	FUNCTION	SIGNATURE OR INITIAL AND DATE	
		Q.C. INSPECTOR	OWNERS INSPECTOR
1	DRAWINGS: ABSA registration over 0.5 Cu.M. Approved by Owner. Approved for Construction (signed & dated).		
2	Owner's Inspector notified.		
3	Registered Welding Procedure Specifications, Q.C. Manual and Forms available at site, Job File started.	Jom JUN 6/13	
4	Welders qualified for WPS's and have valid Performance Qualification cards. Welders Log completed. WPS reviewed with Welders. <i>HOLD</i>	Jom JUL 8/13	
5	Material checked against P.O., drawings, and specifications. Identification confirmed. Colour coding applied. <i>HOLD</i>	Jom JUL 8/13	
6	Sample of each Welder's work examined, including root spacing, alignment, cleaning, joint preparation, preheat and electrode control.	Jom JUL 8/13	
7	Nondestructive Examination completed. Reports and radiographs reviewed, signed by Level II or III, Radiograph I.D. detailed on drawings. <i>HOLD</i>	Jom JUL 11/13	
8	Visual Examination of all completed welds. Welders I.D. stamped and recorded on drawings.	Jom JUL 8/13	
9	Heat Treatment verified and recorded on drawings. <i>HOLD</i>	<i>(Signature)</i> JUL 24 2013	
10	Each system checked against specifications and drawings before test.	<i>(Signature)</i> JUL 24 2013	
11	All deficiencies recorded and signed off by Q.C.I. and Owner's Inspector before test.	<i>(Signature)</i> JUL 24 2013	
12	Pressure Test checked. Gauge calibration verified, gauge #'s recorded. <i>HOLD</i>	<i>(Signature)</i> JUL 24 2013	
13	System checked after test. Deficiencies recorded and corrected.	<i>(Signature)</i> JUL 24 2013	
14	Construction data reports (AB-83) prepared and signed by Q.C.I. and Owner's Inspector. <i>see assembly work order</i>		
15	Declaration form (AB-81) submitted to ABSA		
16	As built drawings accepted by Owner.		



R & R Stress Relieving Service Ltd.

Nisku: 2103 - 6th Street, T9E 7X8 Tel: (780) 955-7559 Fax: (780) 955-2903
Blackfalds: #13 Burbank Industrial Park Tel: (403) 885-2280 Fax: (403) 885-0177
Toll Free: 1-800-499-HEAT(4328)

CERTIFICATE OF CONFORMANCE OF RECORDING INSTRUMENTS

CERTIFIED BY: R & R Stress Relieving Service Ltd.
TEST NUMBER: RR0513
DATE: May 10, 2013
DATE DUE: August 10, 2013
INSTRUMENT MFG: Chino
MODEL NUMBER: AH-3725 N00
SERIAL NUMBER: AH-057C171
RECORDER NUMBER: IR-181

This instrument has been calibrated and it is within the manufacturers specifications.

REFERENCE STANDARDS

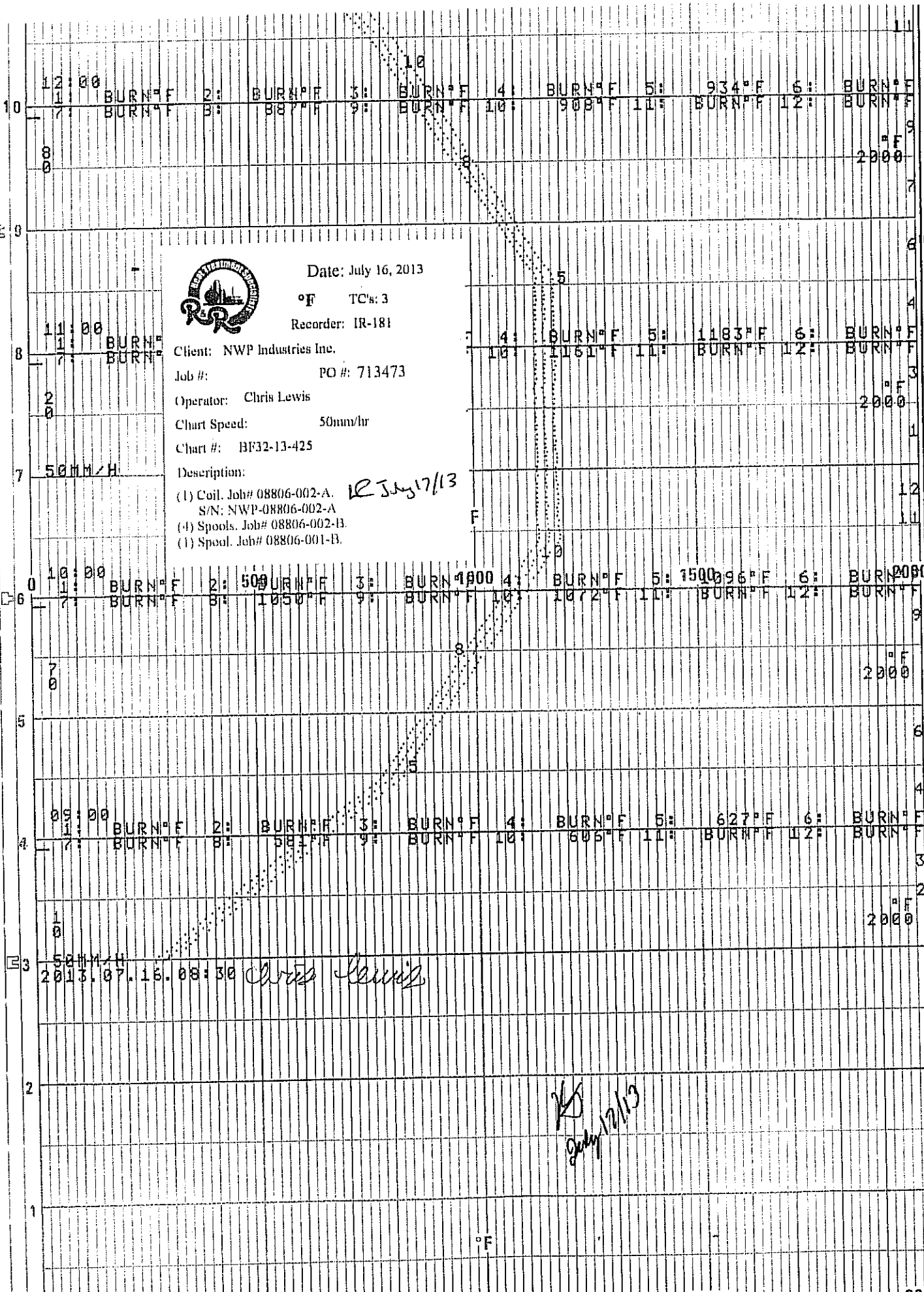
DIGI MITE 311600 S/N48430-5522 CERT DATE Oct 22/12

The calibration of all standards and measuring instruments used in the calibration are traceable to the National Research Council of Canada in Ottawa or to the National Bureau of Standards in Washington, D.C.



Shane Stimson

CHINA



Date: July 16, 2013

°F TC's: 3

Recorder: IR-181

Client: NWP Industries Inc.

Job #: PO #: 713473

Operator: Chris Lewis

Chart Speed: 50mm/hr

Chart #: BF32-13-425

Description:

- (1) Coil. Job# 08806-002-A. *RJ July 17/13*
- S/N: NWP-08806-002-A
- (4) Spools. Job# 08806-002-13.
- (1) Spool. Job# 08806-001-B.

1040cm

1050cm

1060cm

500

1000

1500

2000



HEAT TREATMENT REQUIREMENTS

PO# 713473

JOB NO.: 08806-002-B

CUSTOMER: EnCana Corporation

DATE: July 16 2013

COMPONENT DESCRIPTION: Welded Piping for 3.0 mm Line Heater Package

Total Spools: 4

DWG. NO. AND LINE NO.	DIAMETER	THICKNESS	MATERIAL	LENGTH	WEIGHT
08562-4 Rev 0	4" NPS	SCH XXH	SA-333-6	Various	Unknown

TYPE OF HEAT TREATMENT: PRESSURE VESSEL or Process Piping STRESS RELIEVE P1 and Materials

HEATING

Temperature to be raised from 800°F (427°C) to 1150°F (621°C) at a maximum rate of 400 ° F

(_____ ° C) per hour. NOTE: THIS VALUE MUST NEVER EXCEED 400°F (204°C) PER HOUR.

[Calculated rate = 400 degrees F/hr. (204 degrees C/hr) Divided by the maximum metal thickness of the shell or head plate in inches]

HOLDING

Temperature to be held in range of 1150°F to 1175°F for 60 minutes.

[Holding time to be determined by Table UCS-56 for Nominal Thickness as specified in UW-40(f)]

COOLING

Temperature to be lowered from 1150°F (621°C) to 800°F (427°C) at a maximum rate of 500 ° F

(_____ ° C) per hour. NOTE: THIS VALUE MUST NEVER EXCEED 500°F (260°C) PER HOUR.

[Calculated rate = 500 degrees F/hr. (260 degrees C/hr.) Divided by the maximum metal thickness of the shell or head plate in inches]

From 800°F (427°C) items may be cooled in still air.

Additional Requirements:

- ☐ Job number and description required on heat treatment charts along with the operator's signature & date.
- ☐ Reporting of thermocouple attachment method and location, and verification of furnace thermocouple calibration is required.
- ☐ A sufficient number of thermocouples shall be located to control and maintain uniform distribution of temperature on all vessels and parts. Thermocouples shall be directly attached to the item or provision shall be made for thermocouple placement at bottom, centre and top of the furnace charge in accordance with the ASME Code.
- ☐ During the heating period, there shall not be a greater variation in temperature throughout the portion of the vessel being heated than 250° F (121° C) within any 15 ft. (4.6 m) interval of length. An adequate number of thermocouples must be used to ensure this Code requirement is met.
- ☐ During the holding period, there shall not be a greater difference than 150° F (66° C) between the highest and lowest temperature throughout the portion of the vessel being heat treated, except where the range is further limited by these instructions.
- ☐ If Capacitor Discharge welding is used to attach thermocouples an ASME Code Section IX Welding Procedure Specification is required (WPS qualification is not required), and the energy output must be limited to 125 Watt-Seconds.
- ☐ No other welding is permitted on vessels or parts. [0.5 x Capacitance in farads X Voltage ² = W-Sec.]
- ☐ The method of thermocouple removal shall not damage the heat treated item.

Q.C. Inspector Signature

Date: July 17, 2013

Thermocouple Attachment Method: CAPACITOR DISCHARGE

Location (s) On Coil, Top West End., Middle, Bottom East End

Furnace Heat Number BF32-13-125

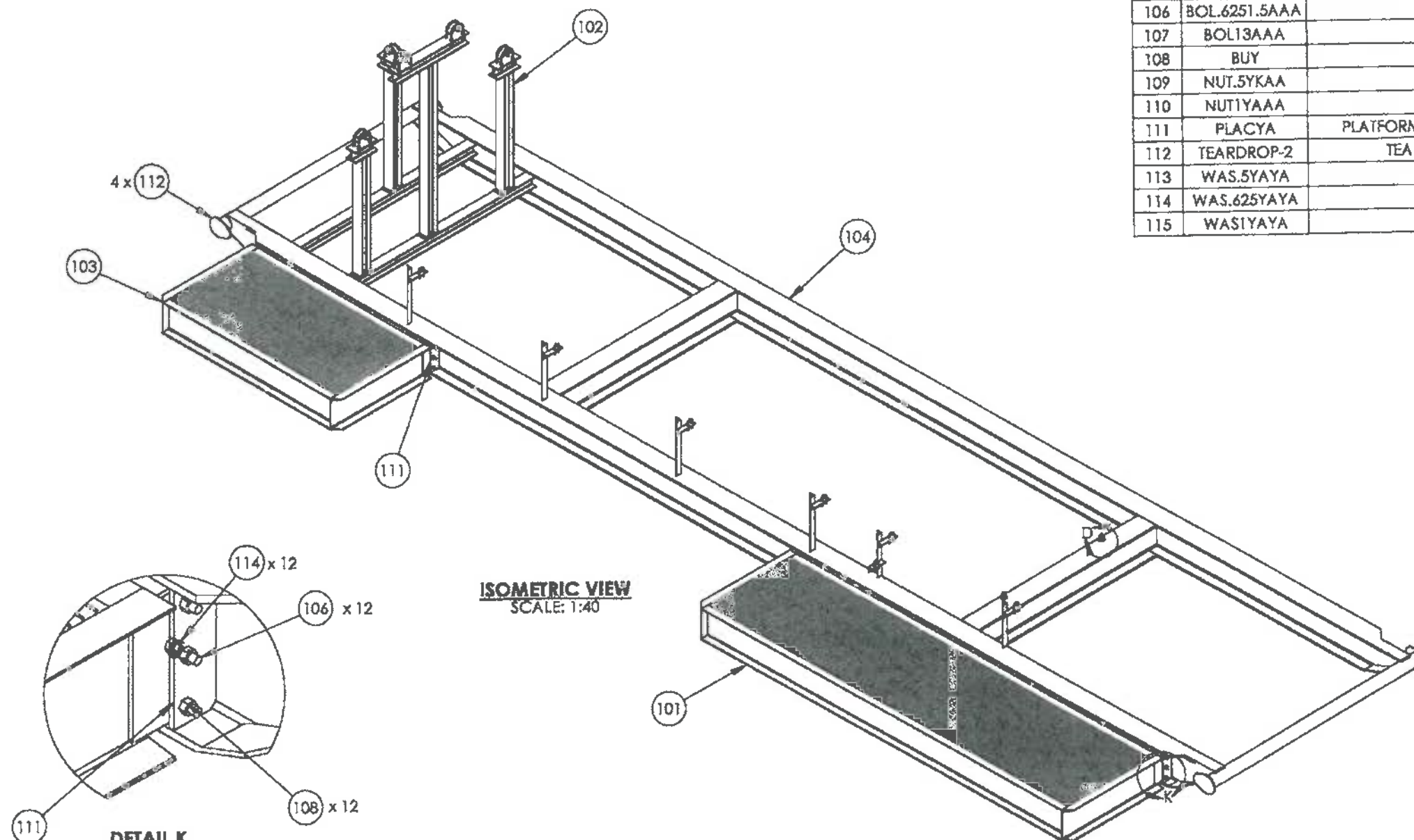
Furnace Operator Signature

Date: July 16th/13

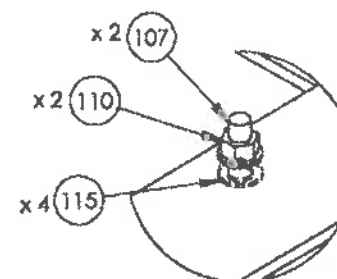
Form Prepared by: Kasha Fox

Date: July 12 2013

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
101	-	SEE ENCLOSURE PLATFORM DETAIL			1
102	-	SEE PIPE SUPPORT CUT LIST			1
103	-	SEE PIPING PLATFORM DETAIL			1
104	-	SEE SKID BASE CUT LIST			1
105	BOL.51.5BAA	BOLT 1/2" x 1 1/2" LG GR. 2 HEX HEAD			8
106	BOL.6251.5AAA	BOLT 5/8" x 2" GR. 8 HEX HEAD			12
107	BOL13AAA	BOLT 1" x 3" LG GR. 8 HEX HEAD			2
108	BUY	NUT 5/8" GR. 8 HEX PLATED			12
109	NUT.5YKAA	NUT 1/2" GR. 5 HEX PLATED			8
110	NUT1YAAA	NUT 1" GR. 8 HEX PLATED			2
111	PLACYA	PLATFORM SKID LUG PLATE 3/8" x 10 7/8" x 3 3/4" SA36/44W			4
112	TEARDROP-2	TEAR DROP FOR ROLL ENDS 3/8" THK SA36/44W			4
113	WAS.5YAYA	FLAT WASHER 1/2" GR. 8 PLATED			16
114	WAS.625YAYA	FLAT WASHER 5/8" GR. 8 PLATED			12
115	WAS1YAYA	FLAT WASHER 1" GR. 8 PLATED			4



ISOMETRIC VIEW
SCALE: 1:40



DETAIL Y
SCALE: 1:8

ORIGINAL

NOTES

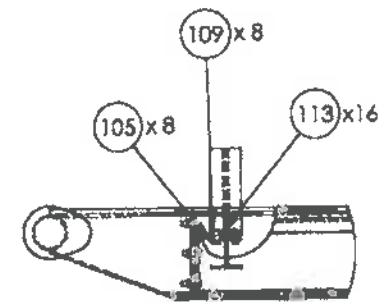
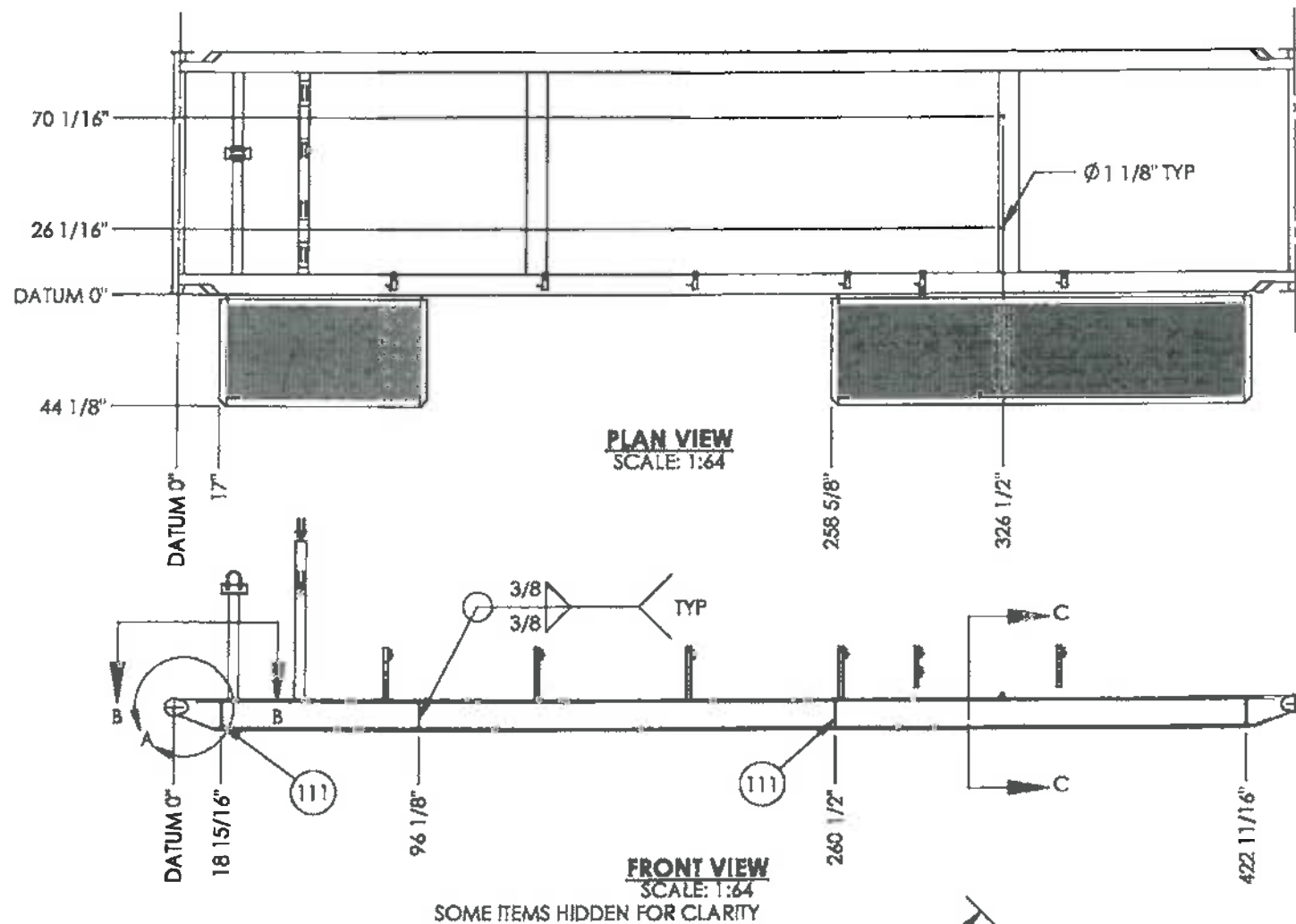
1. FABRICATE TO CSA W47.1 AND W59.
2. ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
3. DEBURR AND RADIUS ALL SHARP EDGES.
4. WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS-FC1-15, FC1-10.
5. ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.

APPROX. WEIGHT: 7500 LBS

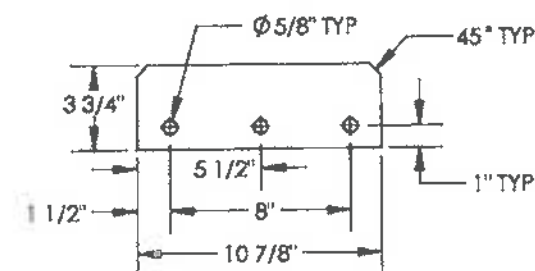
										ISSUED FOR CONSTRUCTION		 INDUSTRIES INC. Total offfield supply. P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.	ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU/HR c/w 4" 2500# RTJ SPLIT COILS SKID ASSEMBLY		
										SIGNED: 	DWN: VW				
										DATE: JUN 1 2012	CHK: 				
										NO: 8806-002-C	APP: 				
										S/N: _____	DATE: OCT 01/12				
										ALL DIMENSIONS IN INCHES					
										SCALE: 1:40					
										SHEET: 1 OF 7					
										DWG: 08562-3					
										REV: 0					

LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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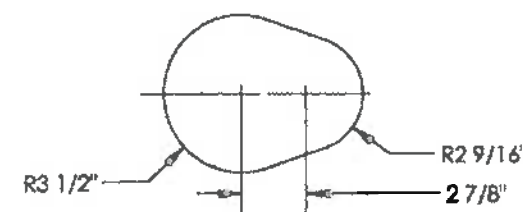
08806



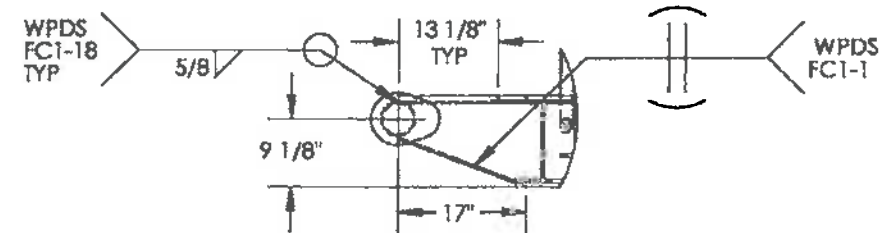
BROKEN SECTION A
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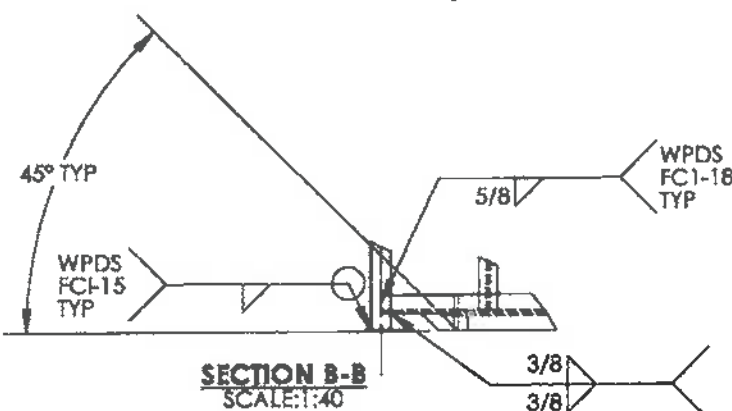
PLATFORM SKID LUG
3/8" THK
SCALE: 1:8



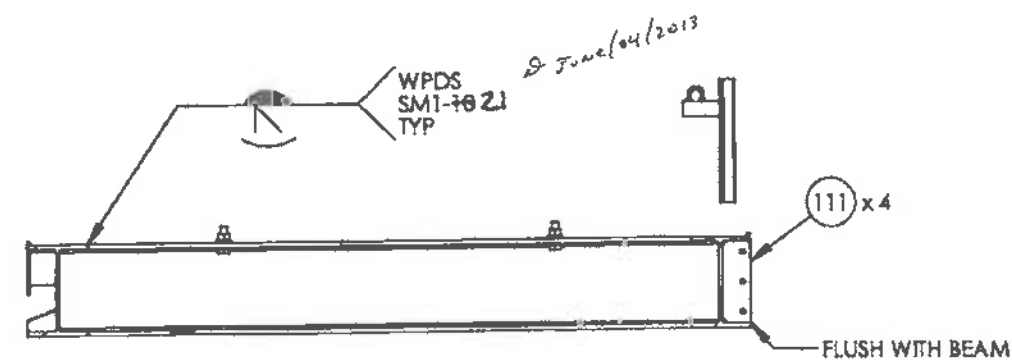
ROLL END TEAR DROP
3/8" THK
SCALE: 1:8



DETAIL A
SCALE: 1:24



SECTION B-B
SCALE: 1:40



SECTION C-C
SCALE: 1:40

ORIGINAL

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY					
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY					
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	0	OCT 31/12	VW		
08562-6	LINEHEATER PACKAGE BATH ASSEMBLY	A	OCT 01/12	VW		

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*

DATE: **JUN - 5 2013**

W.O.: **8806-002**

S/N: *[Signature]*

ALL DIMENSIONS IN INCHES

NWP INDUSTRIES INC.
Total offsite supply.

P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

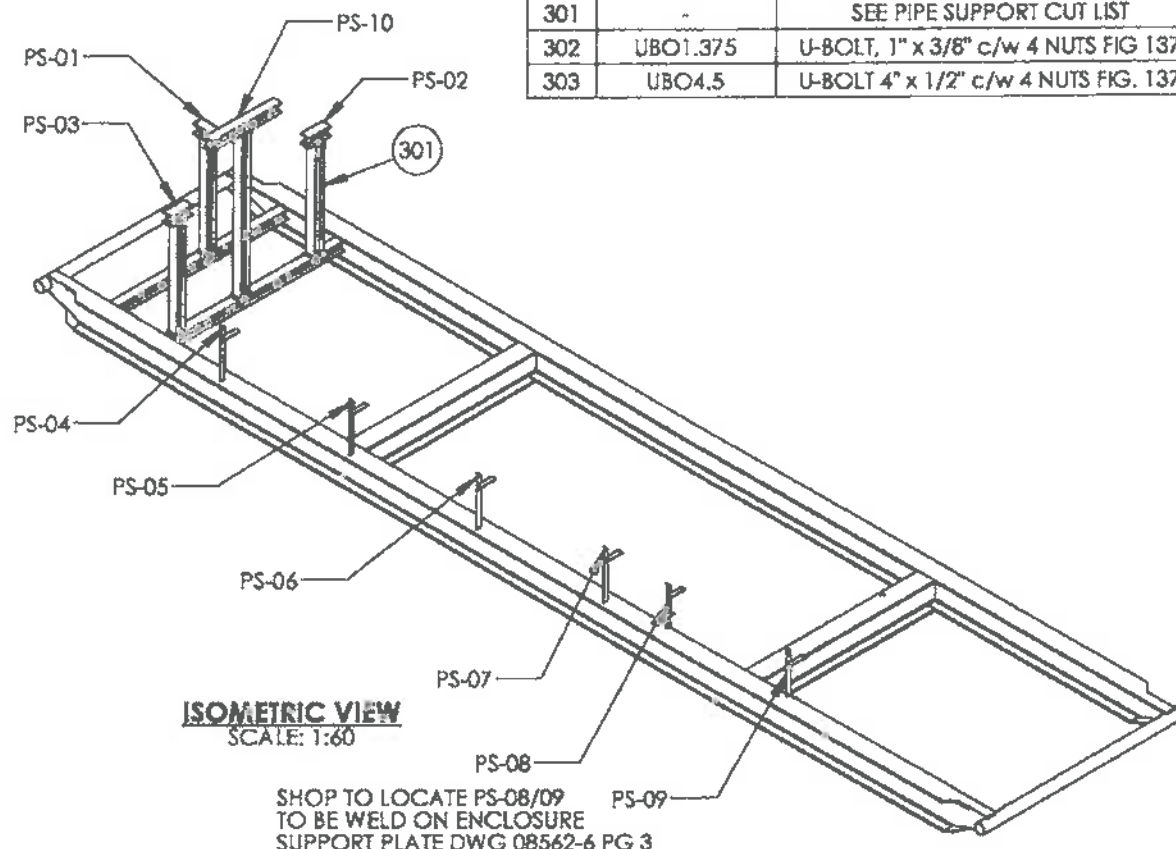
THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.

ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
C/W 4" 2500# RTJ SPLIT COILS
SKID ASSEMBLY

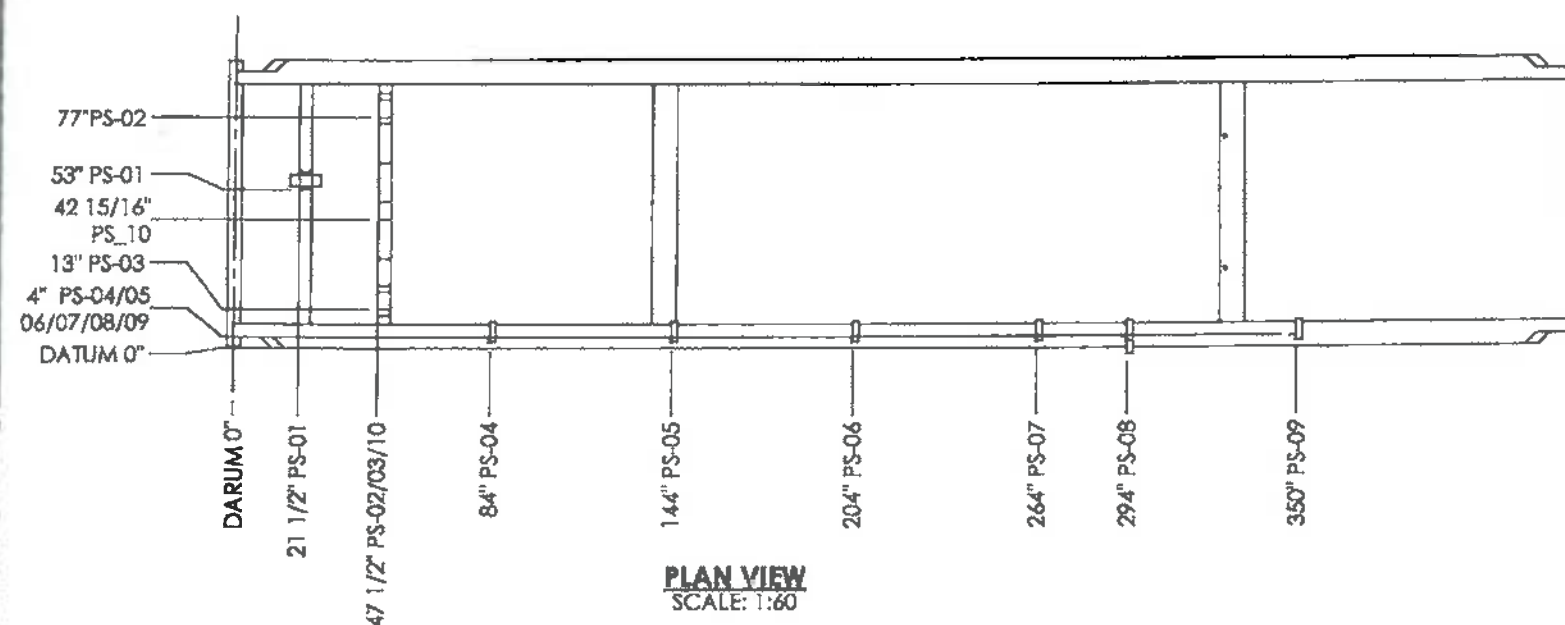
DWN: VW
DATE: OCT 01/12
SCALE: 1:64
SHEET: 2 OF 7

CHK: *[Signature]*
DATE: **NOV 02 2012**
DWG: 08562-3
REV: 0

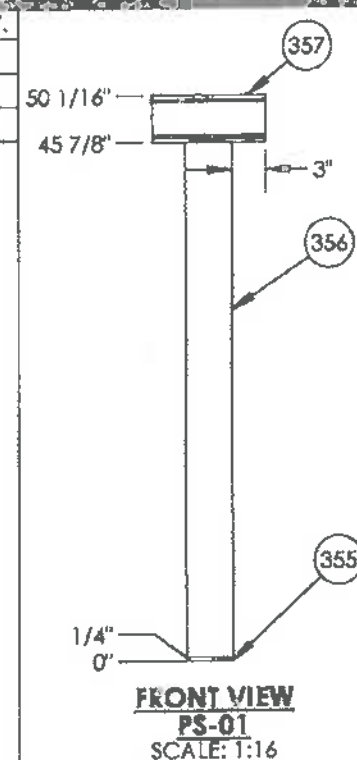
08806



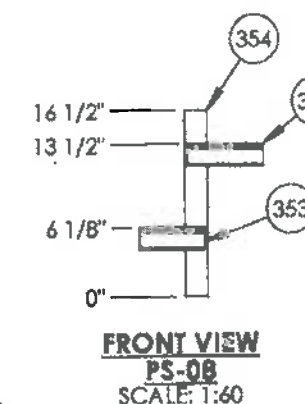
ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
301	-	SEE PIPE SUPPORT CUT LIST			1
302	UBO1.375	U-BOLT, 1" x 3/8" c/w 4 NUTS FIG 137			7
303	UBO4.5	U-BOLT 4" x 1/2" c/w 4 NUTS FIG. 137			10



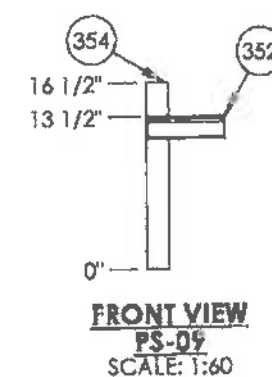
PLAN VIEW
SCALE: 1:60



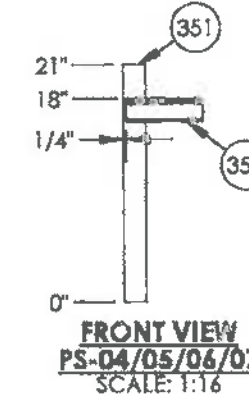
FRONT VIEW
PS-01
SCALE: 1:16



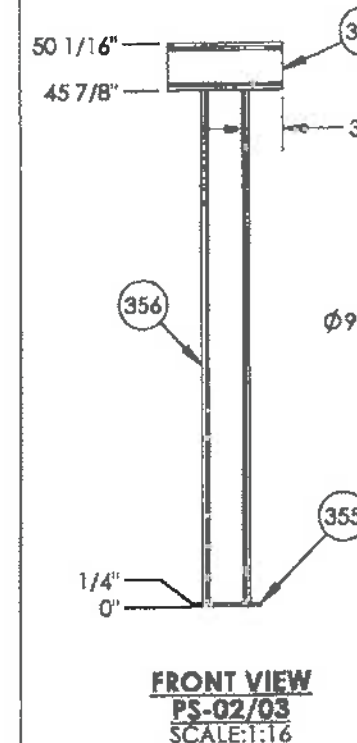
FRONT VIEW
PS-08
SCALE: 1:60



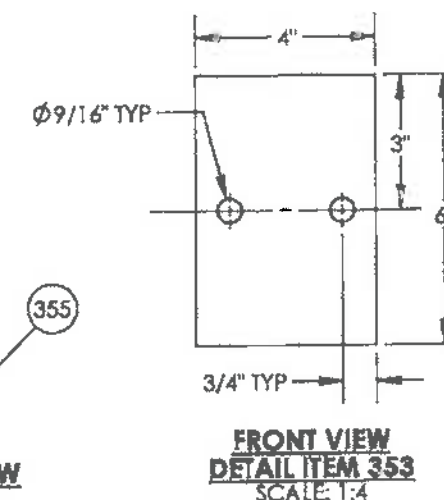
FRONT VIEW
PS-09
SCALE: 1:60



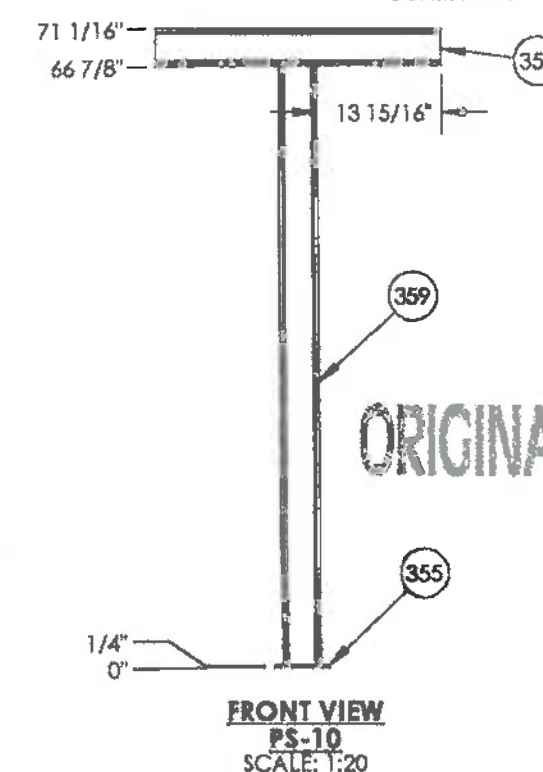
FRONT VIEW
PS-04/05/06/07
SCALE: 1:16



FRONT VIEW
PS-02/03
SCALE: 1:16



FRONT VIEW
DETAIL ITEM 353
SCALE: 1:4



FRONT VIEW
PS-10
SCALE: 1:20

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY					
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY					
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	0	OCT 31/12	VW		
08562-6	LINEHEATER PACKAGE BATH ASSEMBLY	A	OCT 01/12	VW		

REFERENCE DRAWINGS

DRAWING REVISIONS

ISSUED FOR
CONSTRUCTION

SIGNED: *[Signature]*
DATE: JUN - 5 2013

0806-002-C

S/N: _____
ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

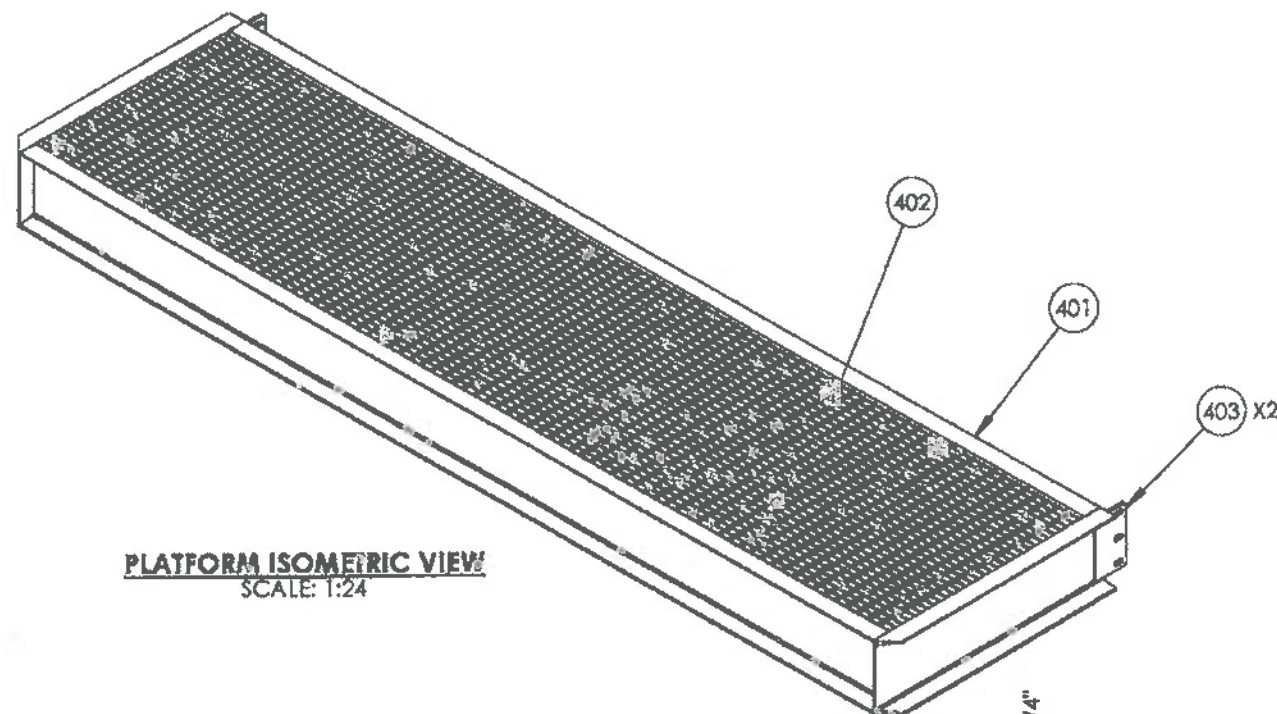
THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC.
AND MAY NOT BE REPRODUCED WITHOUT PERMISSION.
THIS DRAWING MUST BE RETURNED UPON REQUEST.

ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
c/w 4" 2500# RTJ SPLIT COILS
SKID ASSEMBLY

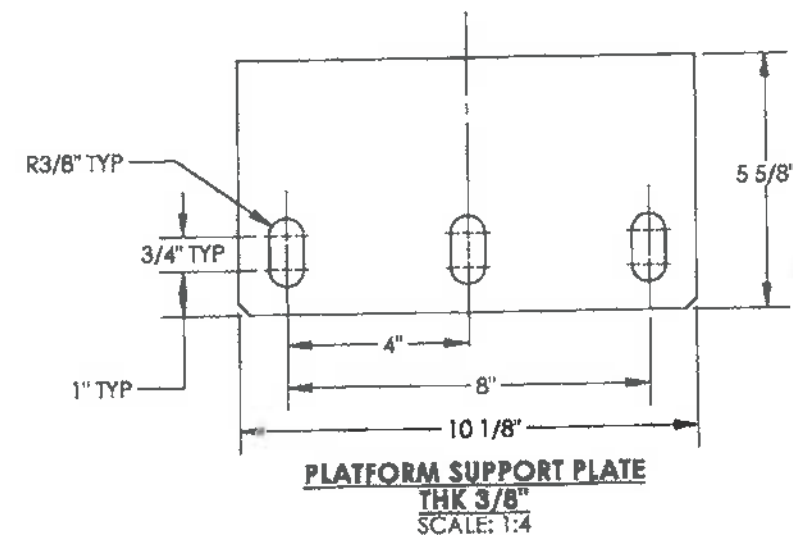
DWN: VW	CHK: <i>[Signature]</i>	APP: <i>[Signature]</i>
DATE: OCT 01/12	DATE: NOV 02 2012	DATE: NOV 02 2012
SCALE: 1:60	DWG: 08562-6	REV: 0
SHEET: 4 OF 7		

08806

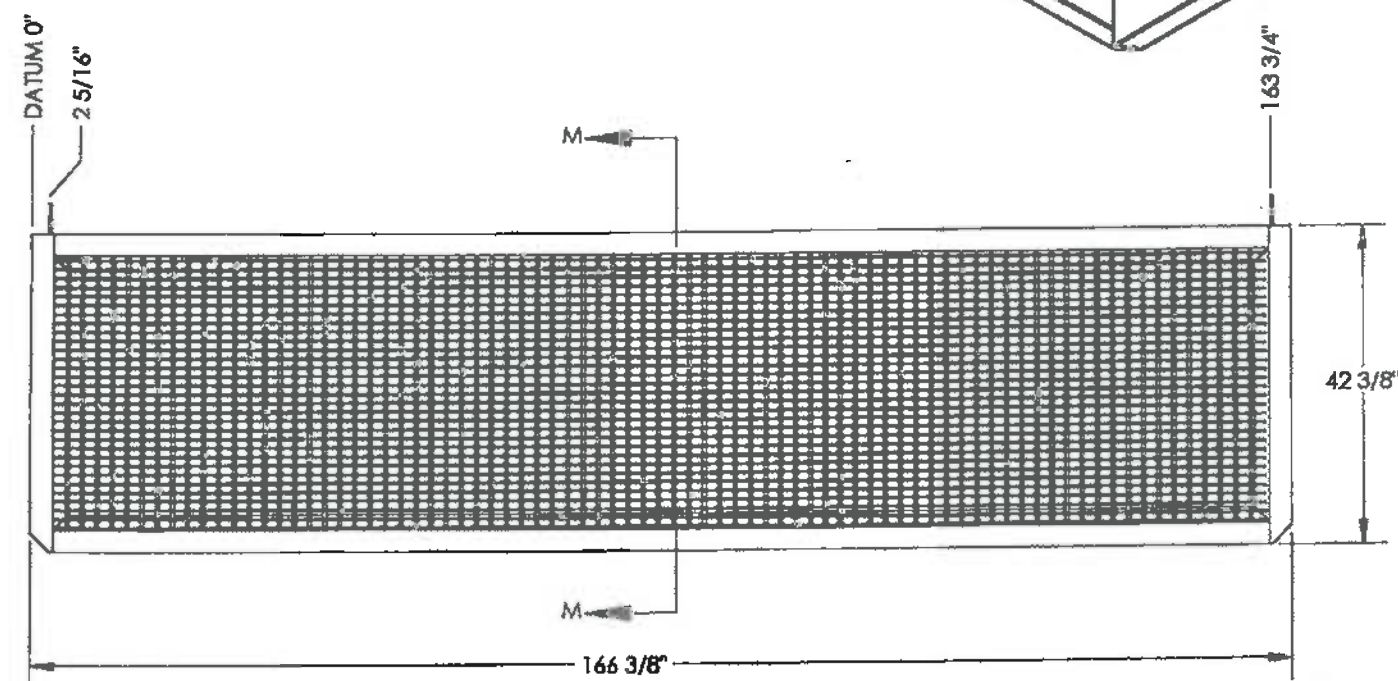
ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
401	-	SEE ENCLOSURE PLATFORM CUT LIST			1
402	BARCAA	BAR GRATING 3/16" x 1-1/2" SERRATED 3' x 160"		160'	1
403	PLACYA	PLATFORM SUPPORT PLATE 3/8" x 10 1/8" x 5 5/8" SA36/44W			2



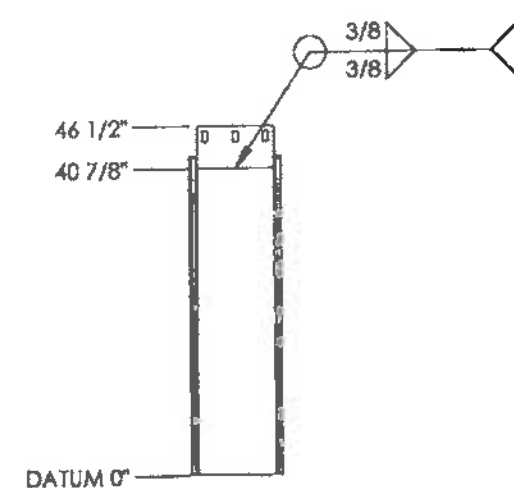
PLATFORM ISOMETRIC VIEW
SCALE: 1:24



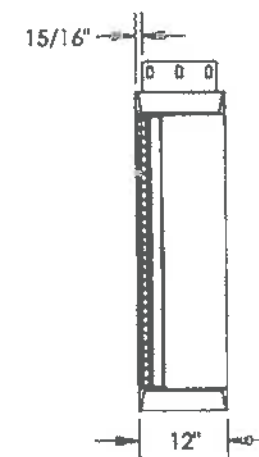
PLATFORM SUPPORT PLATE
THK 3/8"
SCALE: 1:4



PLATFORM
PLAN VIEW
SCALE: 1:24



PLATFORM
SIDE VIEW
SCALE: 1:24



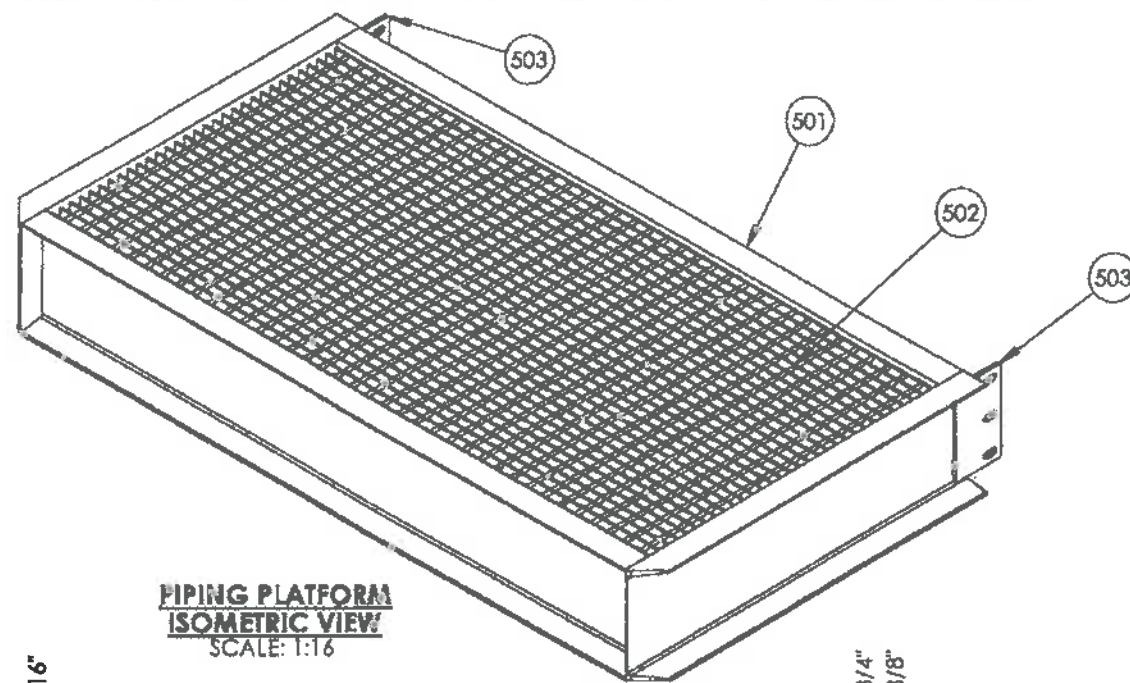
PLATFORM
SECTION M-M
SCALE: 1:24

ORIGINAL

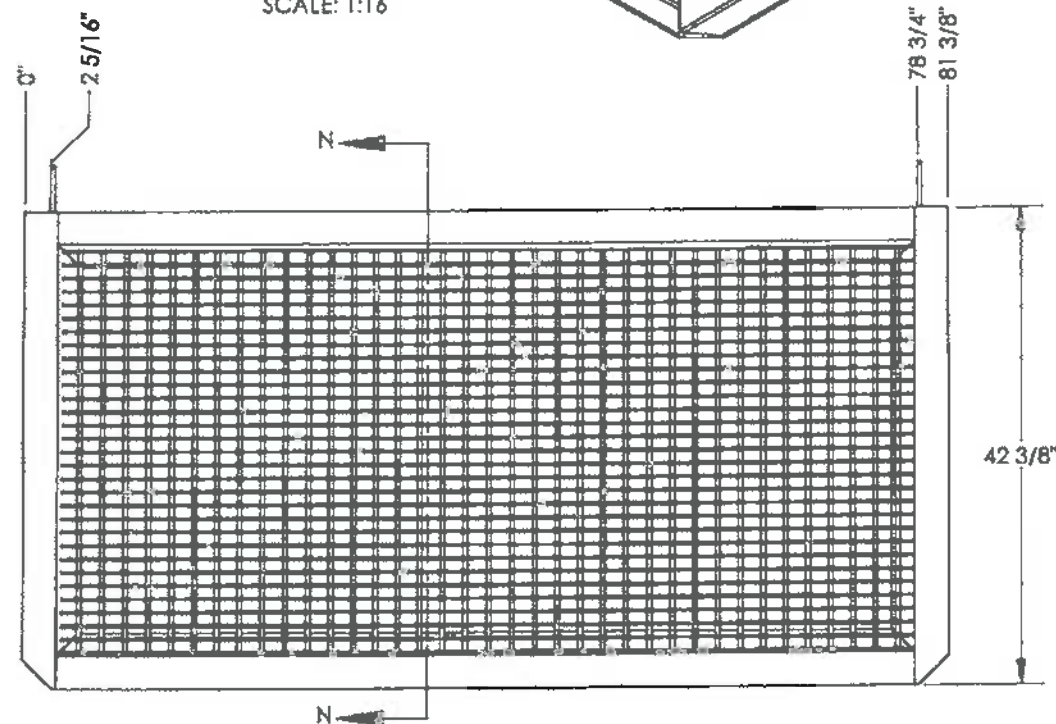
ENCLOSURE PLATFORM APPROX. WEIGHT 1230 LBS

						ISSUED FOR CONSTRUCTION		NWP INDUSTRIES INC. Total oilfield supply. P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.	ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU/HR c/w 4" 2500# RTJ SPLIT COILS SKID ASSEMBLY		
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY					SIGNED: <i>[Signature]</i>			DWN: VW	CHK: <i>[Signature]</i>	APP: <i>[Signature]</i>
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY					DATE: JUN - 5 2013			DATE: OCT 01/12	DATE: NOV 02 2012	DATE: NOV 02 2012
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	0	OCT 31/12	VW	<i>[Signature]</i>	8806-002			SCALE: 1:24	DWG: 00542-3	REV: 0
08562-6	LINEHEATER PACKAGE BATH ASSEMBLY	A	OCT 01/12	VW					SHEET: 5 OF 7		
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP					
REFERENCE DRAWINGS						DRAWING REVISIONS					

08806

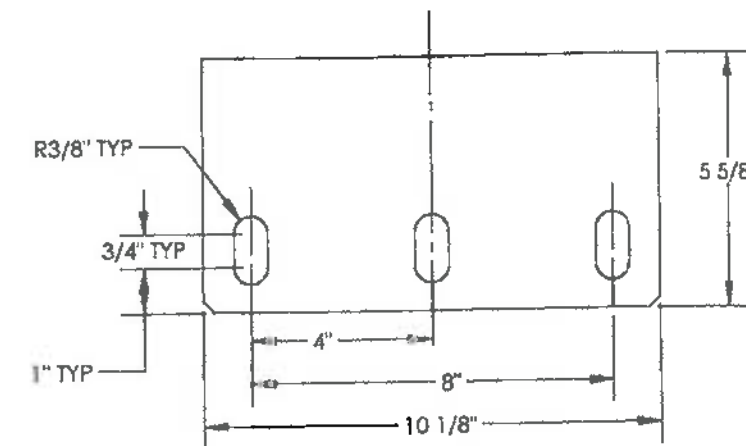


PIPING PLATFORM
ISOMETRIC VIEW
SCALE: 1:16

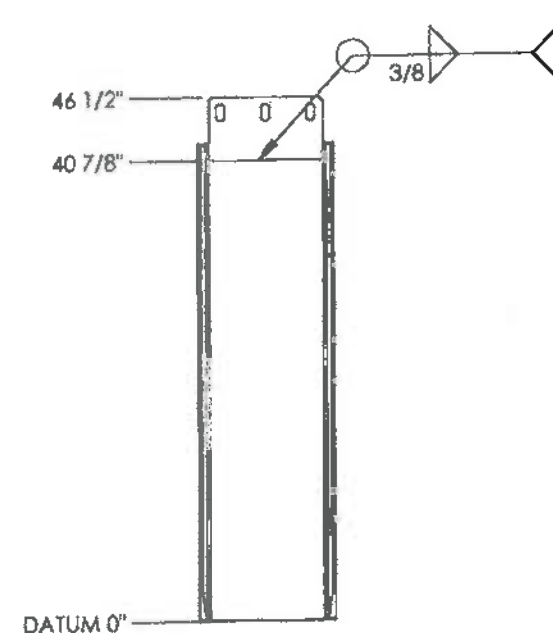


PIPING PLATFORM
PLAN VIEW
SCALE: 1:16

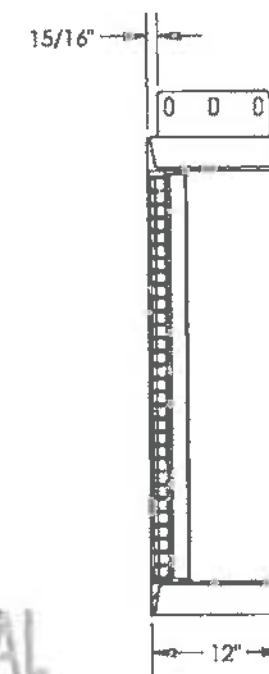
ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
501	-	SEE PIPING PLATFORM CUT LIST			1
502	BARCAA	BAR GRATING 3/16" X 1 1/2" SERRATED 3' 75" LG		75"	1
503	PLACYA	PLATFORM SUPPORT PLATE 3/8" X 10 1/8" X 5 5/8" SA36/44W			2



PLATFORM SUPPORT PLATE
3/8" THK
SCALE: 1:4



PIPING PLATFORM
SIDE VIEW
SCALE: 1:16



PIPING PLATFORM
SECTION N-N
SCALE: 1:16

PIPING PLATFORM APPROX. WEIGHT 665 LBS

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY					
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY					
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	0	OCT 31/12	VW	B	AW
08562-6	LINEHEATER PACKAGE BATH ASSEMBLY	A	OCT 01/12	VW		

REFERENCE DRAWINGS

DRAWING REVISIONS

ISSUED FOR
CONSTRUCTION

SIGNED:

DATE:

W.O.:

S/N:

JUN - 5 2013

8806-002

ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

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THIS DRAWING MUST BE RETURNED UPON REQUEST.

ENCAÑA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
c/w 4" 2500# RTJ SPLIT COILS
SKID ASSEMBLY

DWN: VW

CHK: B

APP: AW

DATE: OCT 01/12

DATE: NOV 02 2012

DATE: NOV 02 2012

SCALE: 1:16

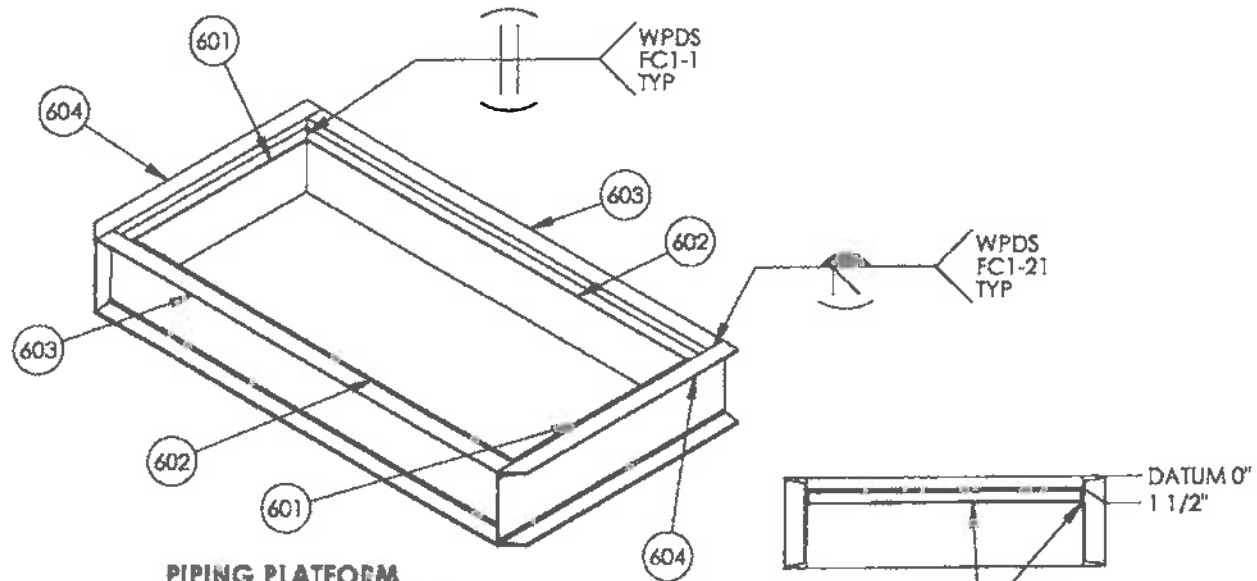
DWG: 08562-3

REV: 0

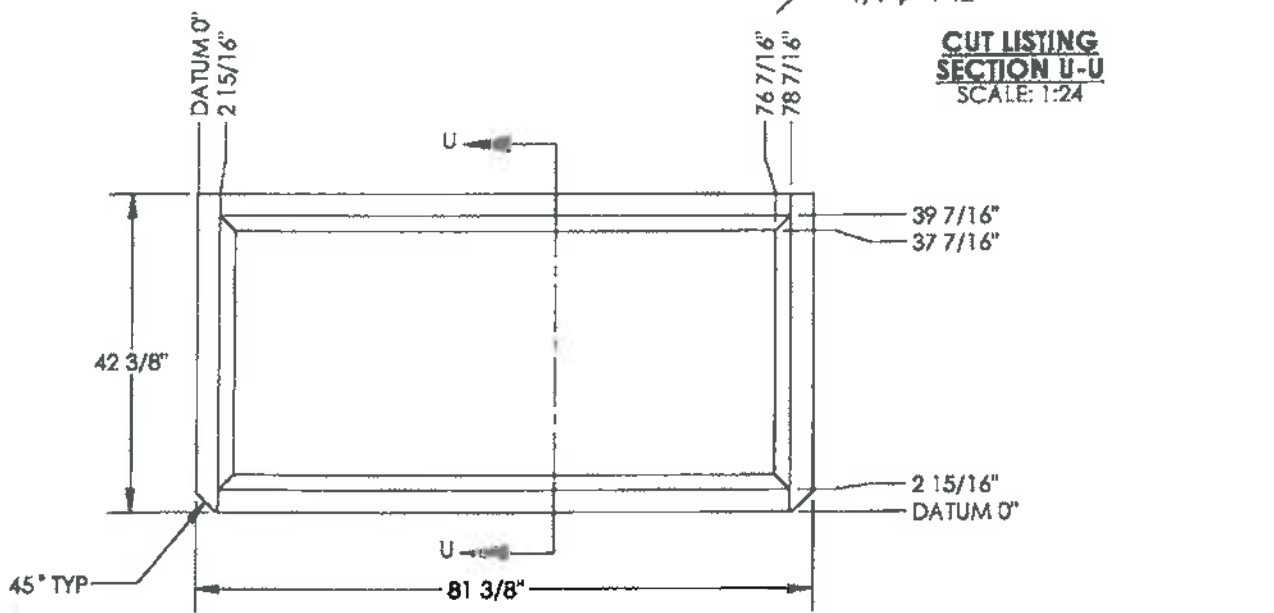
SHEET: 6 OF 7

08806

ITEM NO.	QTY.	DESCRIPTION	PART #	LENGTH
601	2	ANGLE IRON 1/4" x 2" x 2" 300W	ANGC22A	36 1/2"
602	2	ANGLE IRON 1/4" x 2" x 2" 300W	ANGC22A	75 1/2"
603	2	C-CHANNEL 12" @ 20.7# 300W	CHA1220R	75 1/2"
604	2	C-CHANNEL 12" @ 20.7# 300W	CHA1220R	42 3/8"

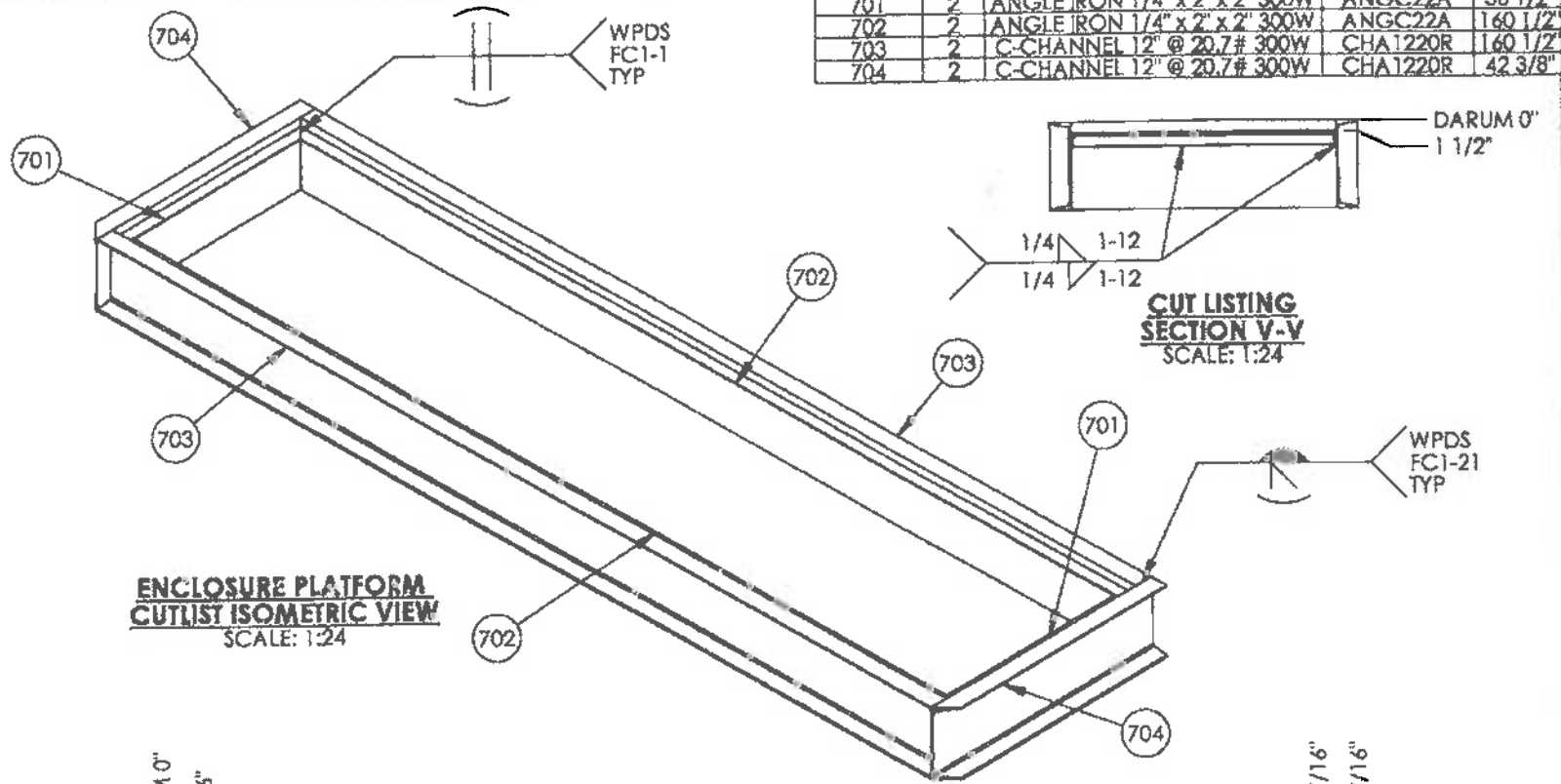


**PIPING PLATFORM
CUTLIST ISOMETRIC VIEW**
SCALE: 1:24

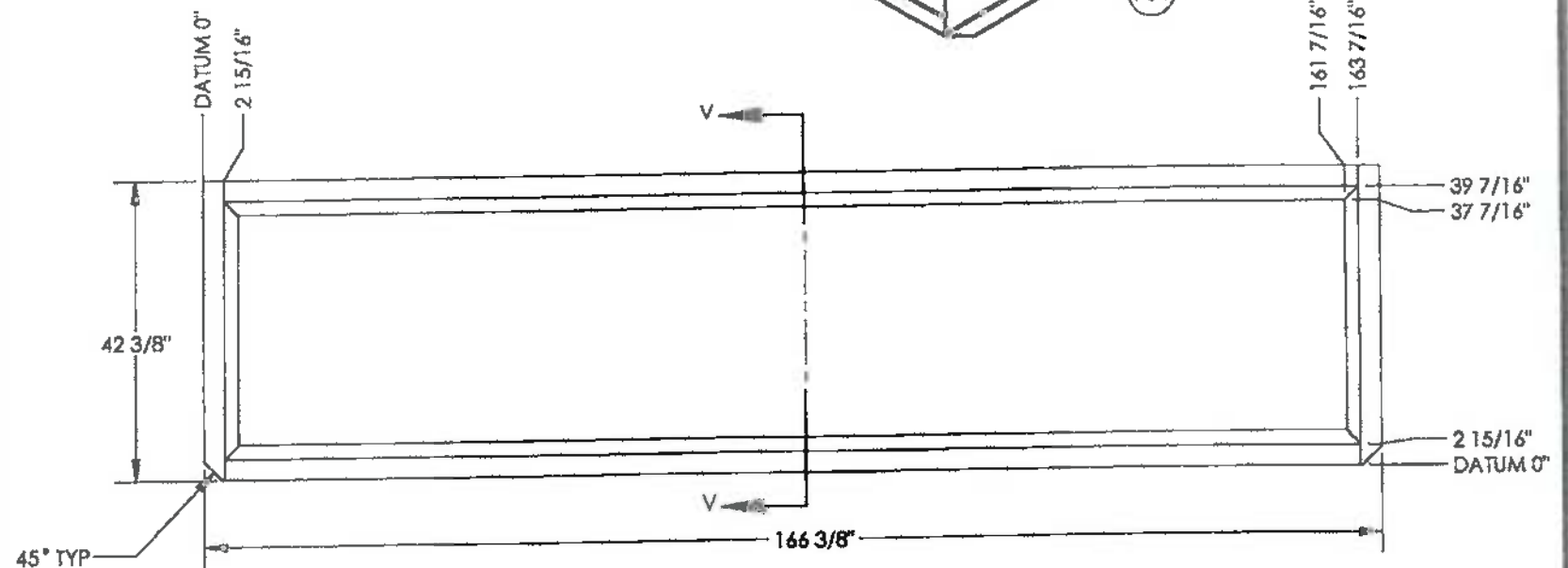


**PIPING PLATFORM
CUT LISTING PLAN VIEW**
SCALE: 1:24

ITEM NO.	QTY.	DESCRIPTION	PART NO	LENGTH
701	2	ANGLE IRON 1/4" x 2" x 2" 300W	ANGC22A	36 1/2"
702	2	ANGLE IRON 1/4" x 2" x 2" 300W	ANGC22A	160 1/2"
703	2	C-CHANNEL 12" @ 20.7# 300W	CHA1220R	160 1/2"
704	2	C-CHANNEL 12" @ 20.7# 300W	CHA1220R	42 3/8"



**ENCLOSURE PLATFORM
CUTLIST ISOMETRIC VIEW**
SCALE: 1:24



**ENCLOSURE PLATFORM
CUTLISTING PLAN VIEW**
SCALE: 1:24

ORIGINAL

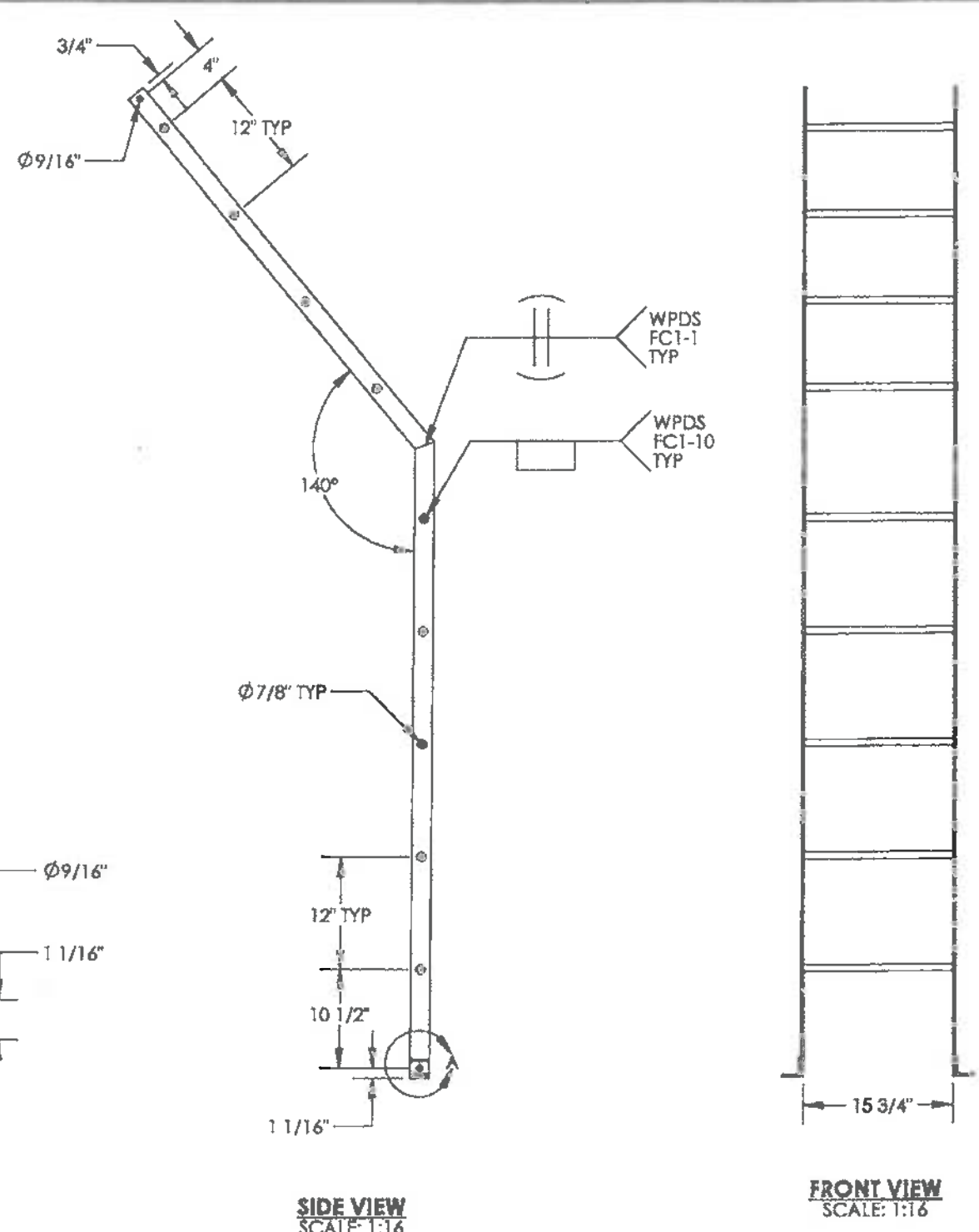
DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY					
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY					
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	0	OCT 31/12	VW		
08562-6	LINEHEATER PACKAGE BATH ASSEMBLY	A	OCT 01/12	VW		

ISSUED FOR CONSTRUCTION
SIGNED: *[Signature]*
DATE: JUN 5 2013
W.O. 8806-002
S/N: *[Signature]*
ALL DIMENSIONS IN INCHES

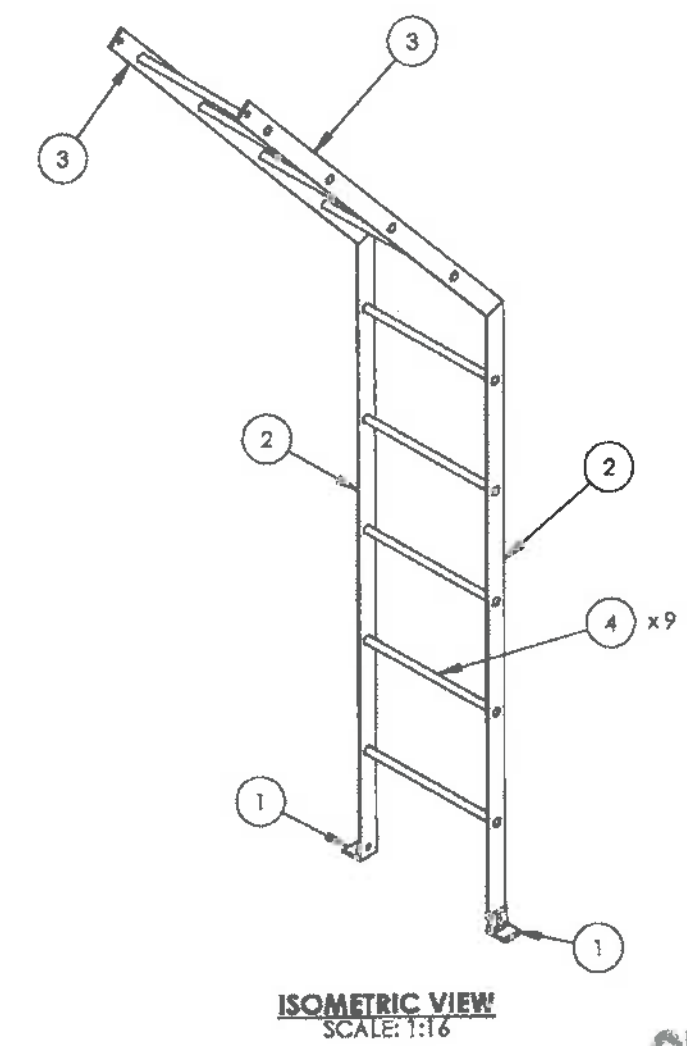
NWP INDUSTRIES INC.
Total offfield supply.
P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102
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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU/HR
C/W 4" 2500# RTJ SPLIT COILS
SKID ASSEMBLY
DWN: VW
DATE: OCT 01/12
SCALE: 1:24
SHEET: 7 OF 7
DWG: 08562-3
REV: 0

08806



ITEM	QTY.	DESCRIPTION	PART #	Material	LENGTH
1	2	ANGLE IRON 1/4" x 2" x 2" SA36/44W	ANGC22A		2"
2	2	FLAT BAR 1/4" x 2" SA36/44W	FLBC2A		67 11/16"
3	2	FLAT BAR 1/4" x 2" SA36/44W	FLBC2A		49"
4	9	ROUND BAR 3/4" SA36/44W	RBRGYA		16"



ORIGINAL

- NOTES**
1. FABRICATE TO CSA W47.1 AND W59.
 2. ALL DIMENSIONS TO HAVE A TOLERANCE OF ±1/8" UNLESS OTHERWISE SPECIFIED.
 3. DEBURR AND RADIUS ALL SHARP EDGES.
 4. WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS-FC1-15.
 5. ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.

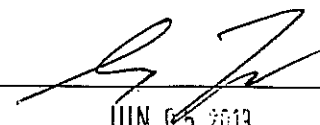
						ISSUED FOR CONSTRUCTION			NWP INDUSTRIES INC LINEHEATER SKID		
						SIGNED: <i>[Signature]</i>			TO FIT 72"OD BATH LADDER ASSEMBLY		
						DATE: JUN - 5 2013			DWN: DJ		
						W.O. 8806-002			CHK: GH		
						S/N NWP			APP: DF		
						ALL DIMENSIONS IN INCHES			DATE: 2011.04.21		
						THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.			DATE: 2011.05.13		
									DATE: 2011.05.13		
									SCALE: 1:16		
									SHEET: 1 OF 1		
									DWG: LH-LAD-72		
									REV: 1		

08806

NWP INDUSTRIES INCORPORATED

SKID TRAVEL SHEET

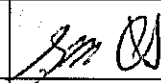
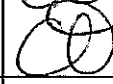
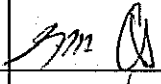
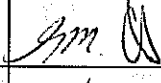
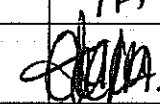
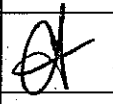
APPROVED

BY: 

DATE: JUN 05 2013

WO #: 08806-002-C DESCRIPTION: Structural for 3.0 mm Lineheater/Metering Pkg

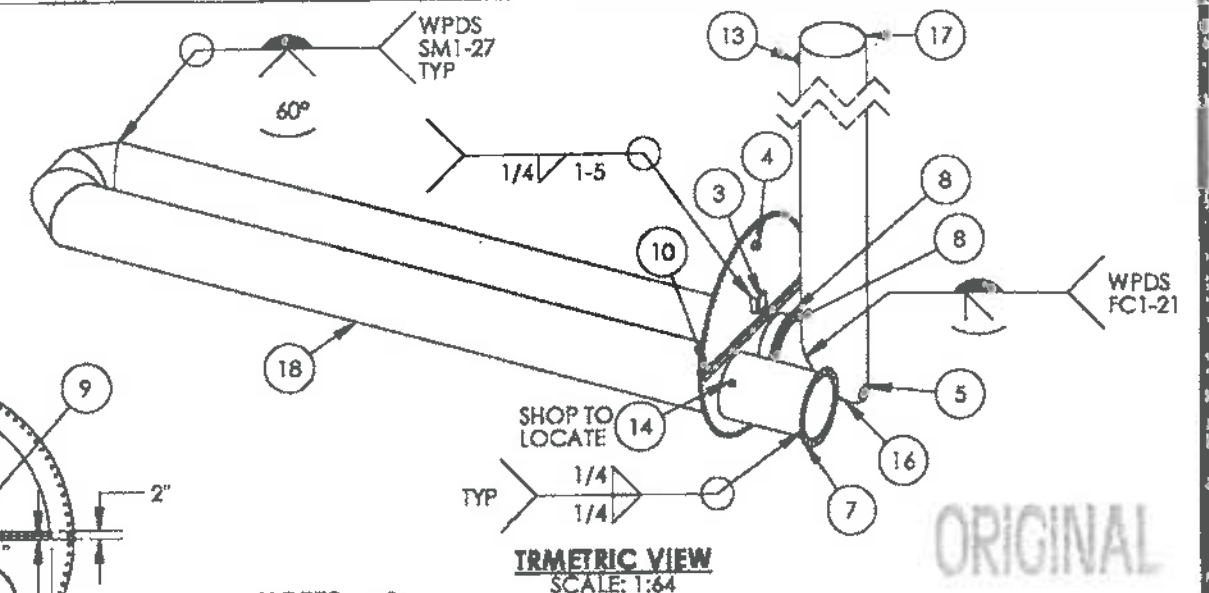
DRAWING #: 08562-3 REV 0; LH-LAD-72 REV.1

	REQ.	HOLD	EMPLOYEE INT.	DATE COMPLETE	QC INIT.	DATE
WORK INSTRUCTIONS/DRAWINGS ISSUED	✓					JUN 07 2013
WORK INSTRUCTIONS/DRAWINGS REVIEWED	✓	✓				JUN 07 2013
MATERIAL & PARTS RELEASED	✓	✓				JUL 24 2013
WELDING PERSONNEL ASSIGNED	✓	✓				JUL 24 2013
VISUAL CHECKS ON WELDS	✓	✓				JUL 24 2013
NDE REQUIREMENTS	✓	✓	N/A	N/A	N/A	N/A
DIMENSIONAL CHECK (FINAL)	✓	✓				June 26/13
SURFACE PREP./SANDBLAST ETC. & P.O. RECEIVED	N/A					
PRIMER PAINT	N/A					
FINAL PAINT & P.O. RECEIVED	N/A					
QC INSPECTION & FINAL RELEASE	✓	✓				June 26/13

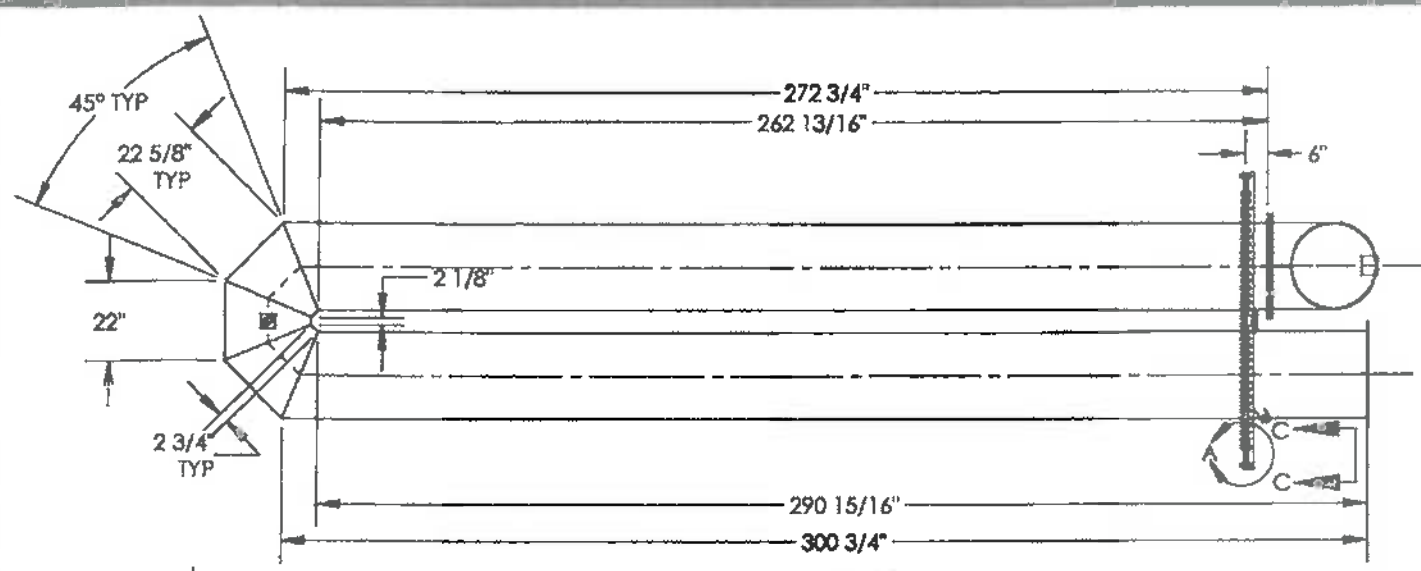
ACCEPTED BY CUSTOMER _____

DATE _____

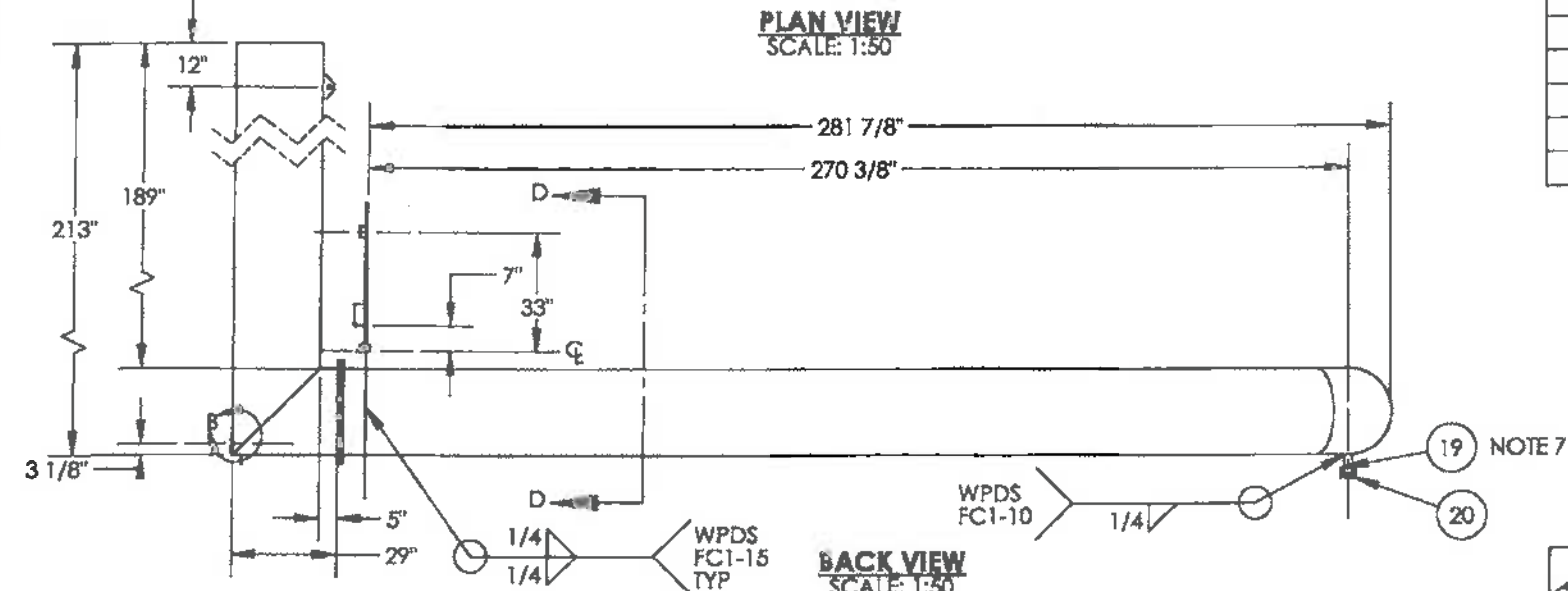
ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
1	BOL.52.5BAA	BOLT 1/2" x 2 1/2" LG GR. 2 HEX HEAD			2
2	BOL.52BAA	BOLT 1/2" x 2" LG GR. 2 HEX HEAD			36
3	BRACKET-NAME-1A	TANK/VESSEL NAME PLATE BRACKET SA36/44W			1
4	COH2GYEE	Coupling Half 2" 3M THRD SA105N			1
5	COR4YSTDEH	COUPLING 4" STD THRD RECESSED STEEL			1
6	LH-DPLATE-FIR7224	LINEHEATER FIRETUBE END PLATE 3/8" THK FOR 72" BATH x 24" FIRETUBE w/ INSPECTION HOLE AND DRAIN			1
7	LH-FLA-24.25	LH FIRETUBE/STACK FLANGE FOR 24" OD 1/4" THK			1
8	LH-FLA-24.75	LH FIRETUBE/STACK FLANGE 24" OD 3/4" THK			2
9	LH-IBAR1-FIR7224	LH INSPECTION BAR 1/4" THK FOR 72" BATH x 24" FIRETUBE			1
10	LH-IBAR2-FIR7224	LH INSPECTION BRACE 3/8" THK FOR 72" BATH x 24" FIRETUBE			2
11	LH-IGASKET-72	LH INSPECTION GASKET FOR 72" OD BATH			1
12	LH-IPLATE-FIR7224	LH INSPECTION PLATE 1/4" THK FOR 72" OD BATH x 24" FIRETUBE			1
13	LL-D63A	LIFT LUG 3/8" x 6 5/8" x 3 3/8" SA36/44W			1
14	NIP26Y80EA	Nipple 2" x 6" S/80 SA106B			1
15	NUT.5YBAA	NUT 1/2" GR. 2 HEX PLATED			38
16	PIP1210E	PIPE 24" SCH 10 SA53		29"	1
17	PIP2410E	PIPE 24" SCH 10 SA53		213"	1
18	PIP2410E	PIPE 24" SCH 10 SA53		640 3/4"	1
19	PIP280A	PIPE 2" SCH XH/80 SA106B		5 1/8"	1
20	SLIDER-2	TANK SLIDER BLOCK ASSEMBLY			1



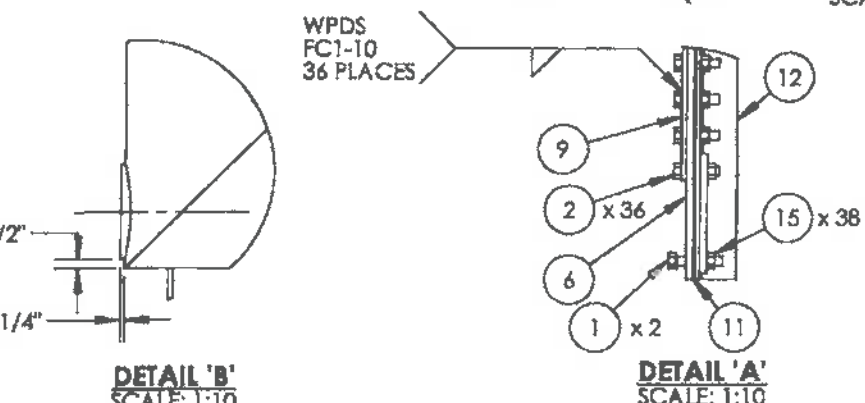
- NOTES**
- DESIGN AND FABRICATE TO CSA W47.1 AND W59.
 - ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
 - DEBURR AND RADIUS ALL SHARP EDGES.
 - WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS-FC1-15, FC1-10.
 - ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.
 - 24 oz. PNEUMATIC TEST REQUIRED.
 - PIPE LENGTH TO BE VERIFIED PRIOR TO PLACEMENT OF FIRETUBE IN BATH.
 - ALL BOLT HOLES STRADDLE COMMON CENTER LINE.



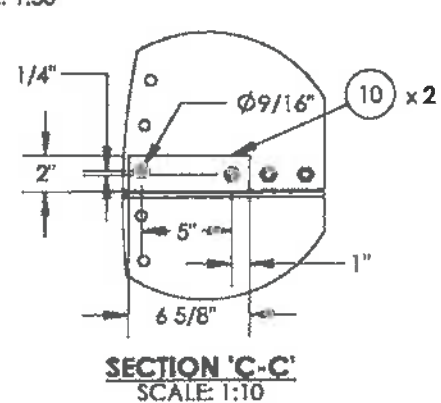
PLAN VIEW
SCALE: 1:50



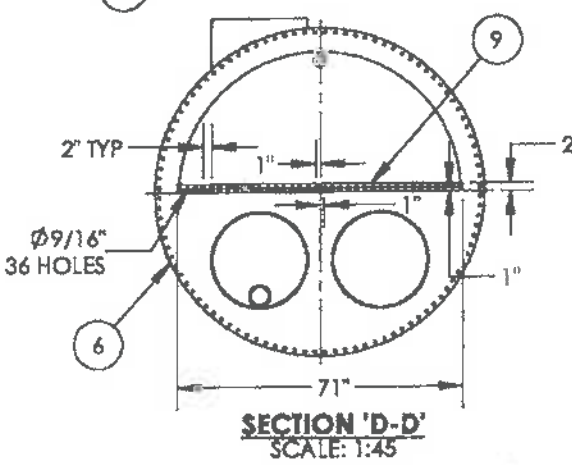
BACK VIEW
SCALE: 1:50



DETAIL 'A'
SCALE: 1:10



SECTION 'C-C'
SCALE: 1:10



SECTION 'D-D'
SCALE: 1:45

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	DESCRIPTION
		1	2012.10.30	VW			RFDC #01217 CHANGES TO WELD SYMBOL AS MARKUP
		0	2011.04.21	DJ	GH	DF	ISSUED FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*

DATE: JUN - 5 2013

W.O. 8806-002

S.O. _____

ALL DIMENSIONS IN INCHES

NWP INDUSTRIES INC.
INDUSTRIES INC.
Total offfield supply.

P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

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NWP INDUSTRIES INC
LINEHEATER FIRETUBE/STACK
24" OD
STANDARD
ASSEMBLY DRAWING

DWN: DJ CHK: GH APP: DF

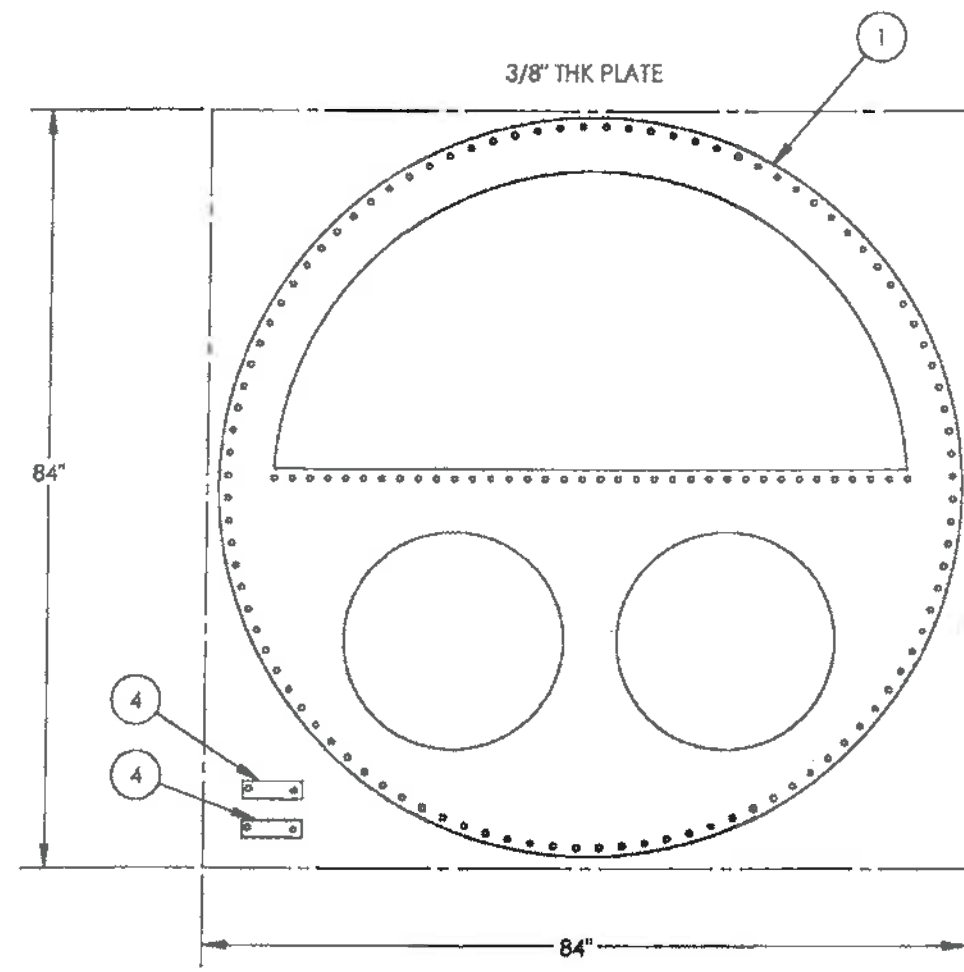
DATE: 2011.04.21 DATE: 2011.05.13 DATE: 2011.05.13

SCALE: 1:64

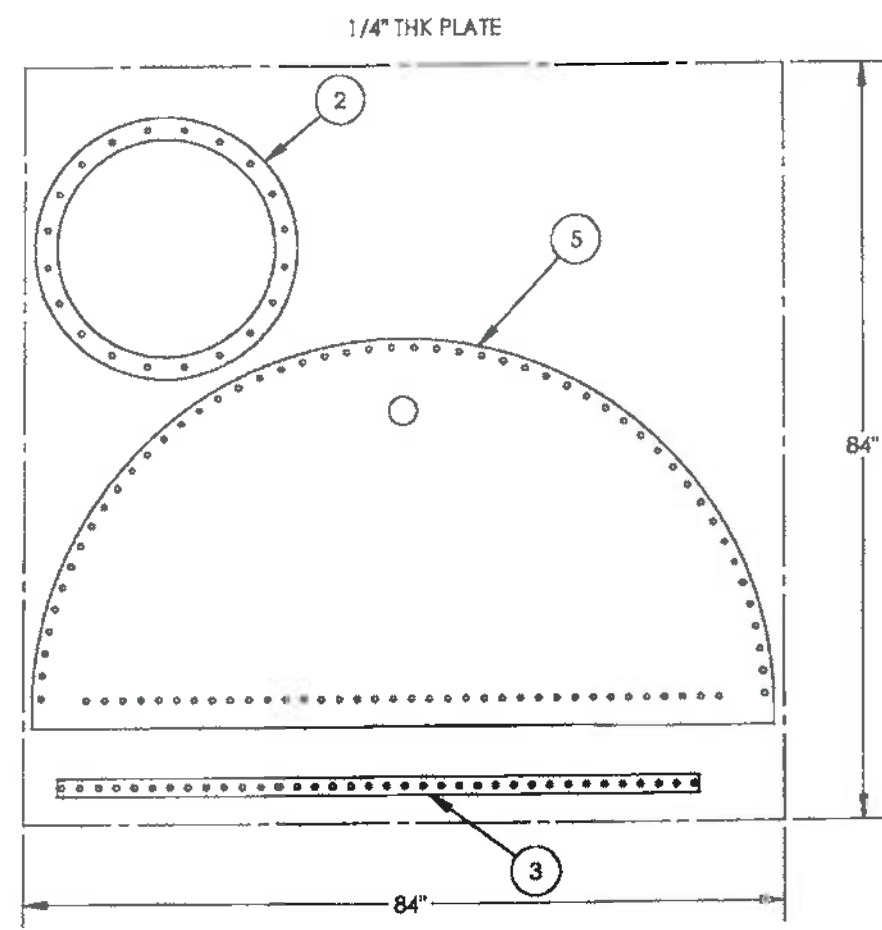
SHEET: 1 OF 2

DWG: LH-FIRSTK-24-2 REV: 1

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
1	LH-DPLATE-FIR7224	LINEHEATER FIRETUBE END PLATE 3/8" THK FOR 72" BATH x 24" FIRETUBE w/ INSPECTION HOLE AND DRAIN			1
2	LH-FLA-24.25	LH FIRETUBE/STACK FLANGE FOR 24" OD 1/4" THK			1
3	LH-IBAR1-FIR7224	LH INSPECTION BAR 1/4" THK FOR 72" BATH x 24" FIRETUBE			1
4	LH-IBAR2-FIR7224	LH INSPECTION BRACE 3/8" THK FOR 72" BATH x 24" FIRETUBE			2
5	LH-IPLATE-FIR7224	LH INSPECTION PLATE FOR 72" BATH x 24" FIRETUBE			1



CNC LAYOUT - QTY OF PARTS
SCALE: 1:20



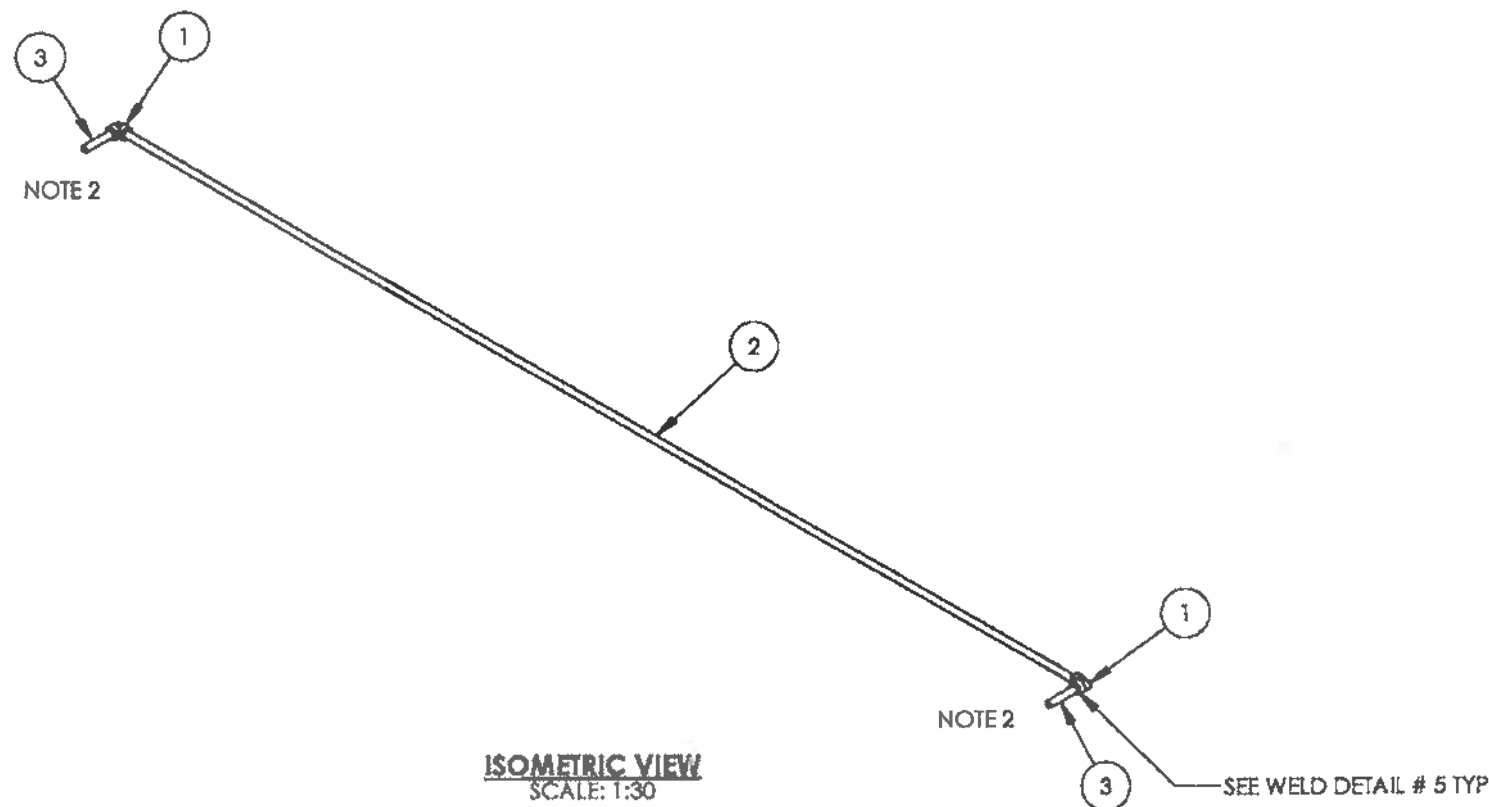
CNC LAYOUT - QTY OF PARTS
SCALE: 1:20

- NOTES**
1. HEAT NUMBER TO BE CLEARLY MARKED ON EACH PIECE WITH PAINT PEN AS A MINIMUM.
 2. ALL DOCUMENTATION MUST ACCOMPANY SHIPMENT OF PARTS IF PART IS OUTSOURCED.
 3. ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8$ " UNLESS OTHERWISE SPECIFIED.
 4. DEBURR AND RADIUS ALL SHARP EDGES.

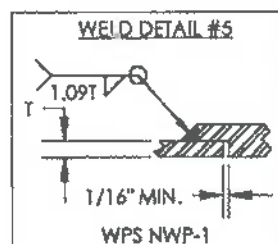
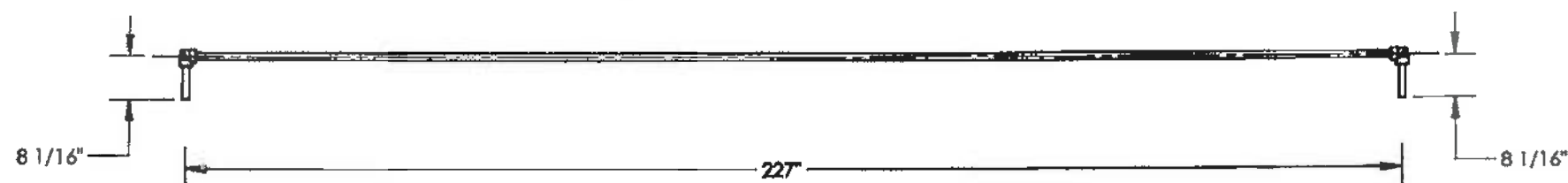
ORIGINAL

ISSUED FOR CONSTRUCTION SIGNED: <i>[Signature]</i> DATE: JUN 5 2013 W.D.: 8806-002D S.O.: _____ ALL DIMENSIONS IN INCHES						NWP INDUSTRIES INC. Total oilfield supply. P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.		NWP INDUSTRIES INC LINEHEATER FIRETUBE/STACK 24" OD STANDARD ASSEMBLY DRAWING			
RFDC #01217 CHANGES TO WELD SYMBOL AS MARKUP ISSUED FOR CONSTRUCTION						DWN: DJ DATE: 2011.04.21 SCALE: 1:20 SHEET: 2 OF 2		CHK: GH DATE: 2011.05.13 DWG: LH-FIR5TK-24-2		APP: DF DATE: 2011.05.13 REV: 1	
DOCUMENT NO. DESCRIPTION						REV DATE BY CHK APP		REFERENCE DRAWINGS		DRAWING REVISIONS	

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
1	EL91HYFE	Elbow 90 Deg 1" 6M SW SA105N			2
2	PIP1160A	PIPE 1" SCH 160 SA106B		225 1/4"	1
3	PIP1160B	PIPE 1" SCH 160 SA333-6		7"	2



- NOTES**
1. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
 2. SHOP TO THREAD END OF PIPE PRIOR TO WELDING.
 3. CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY.
 4. REVIEW CLIENT SPECIFICATIONS PRIOR TO ISSUE FOR CONSTRUCTION



ORIGINAL

DESIGN DATA	
LINE NUMBER:	FG-1"-C-160A/BE-301
CLIENT SPECIFICATION:	SEE NOTE 4
DESIGN & FABRICATE TO:	ANSI/ASME B31.3 NFS 2010 EDITION
DESIGN PRESSURE:	1440 PSIG
MAXIMUM DESIGN TEMPERATURE:	200°F
MINIMUM DESIGN TEMPERATURE:	-20°F
SERVICE:	HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	2160 PSIG
RADIOGRAPHY:	10% OF SW FOR GAP
OTHER NDE:	10% MPI ON SW
POST WELD HEAT TREATMENT:	NONE
CORROSION ALLOWANCE:	1/16"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	DRAWING REVISIONS
		3	2012.10.22	VW			RFDC #01215 REVISED DESIGN DATA AS PER REQUEST
		2	2012.03.01	JHK	GH	DF	RFDC #00821 REVISED ELBOWS
		1	2011.06.06	DJ	GH	DF	REVISED AS PER RFDC #00492
		0	2011.05.06	DJ	GH	DF	ISSUED FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*

DATE: JUN 5 2013

W.O. 8806-002-D

S.O.:

ALL DIMENSIONS IN INCHES

NWP INDUSTRIES INC.
Total oilfield supply.

P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.

ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
C/W 4"-2500# RTJ SPLIT COILS
PREHEAT PIPING

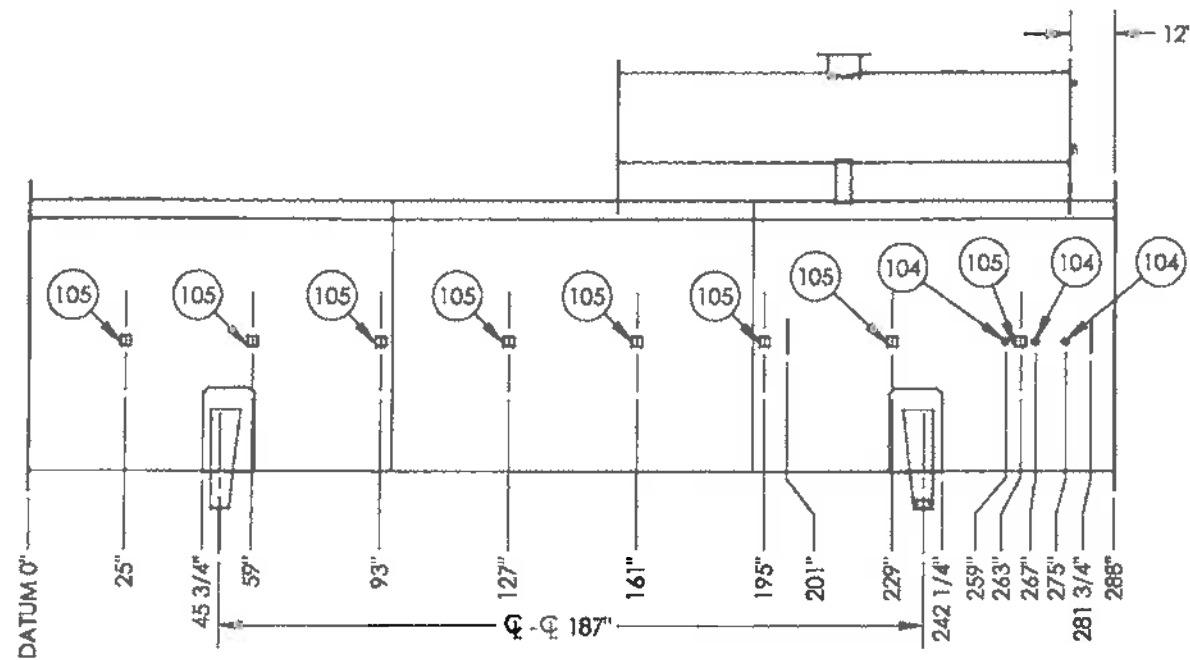
DWN: DJ CHK: *[Signature]* APP: *[Signature]*

DATE: 2011.05.06 DATE: 2011.05.27 DATE: 2011.05.30

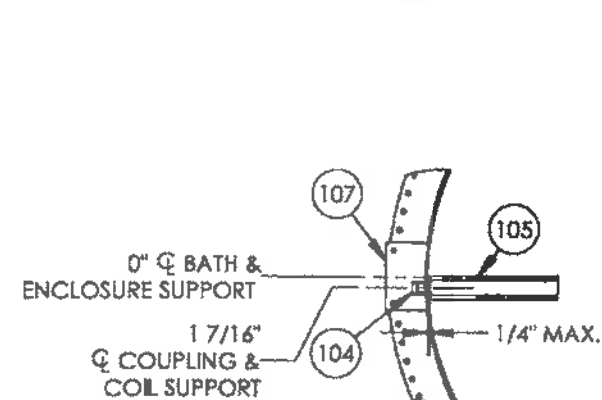
SCALE: 1:30 DWG: LH-PH-7224-1 REV: 3

SHEET: 1 OF 1

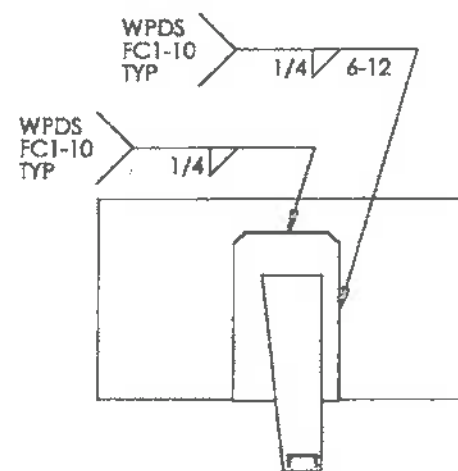
08806



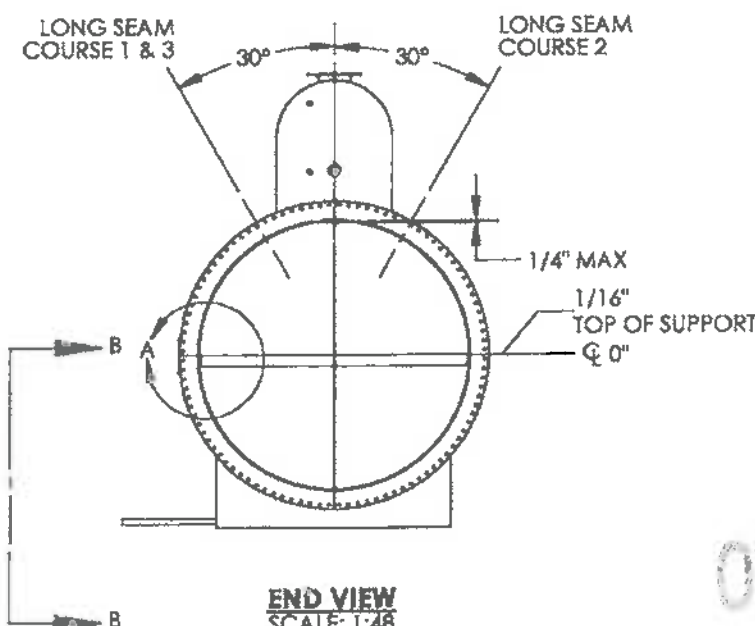
FRONT VIEW
SCALE: 1:48



DETAIL 'A'
SCALE: 1:24

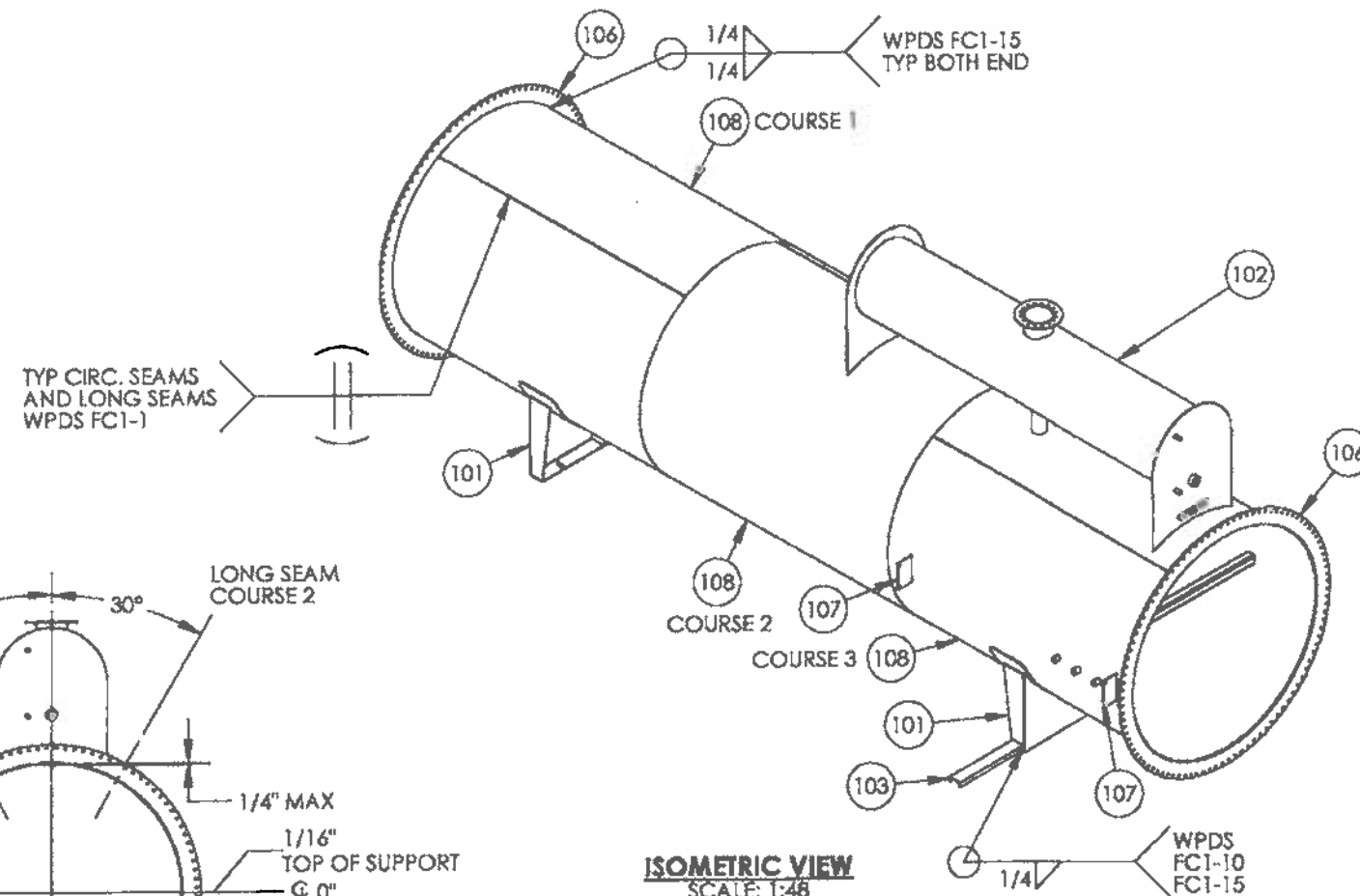


SECTION B-B
SCALE: 1:24



END VIEW
SCALE: 1:48

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
101	-	SEE SADDLE DETAIL			2
102	-	SEE EXPANSION TANK DETAIL			1
103	CHA45R	CHANNEL 4" @ 5.4# 300W		24 3/4"	1
104	COF1GYEE	Coupling 1" 3M SA105N			3
105	HSSC3A	SQUARE TUBE 1/4" x 3" x 3" 350W/ASTM A500		71 1/2"	8
106	LH-FLA-72.375	LH BATH FLANGE FOR 72" OD 3/8" THK			2
107	LH-PLATE-ENCL72	LH ENCLOSURE SUPPORT TAB TO FIT 72" OD BATH			2
108	LH-SHELL-728.25	LH BATH SHELL 72" OD x 8' LG x 1/4" THK SA36/44W			3



ISOMETRIC VIEW
SCALE: 1:48

NOTES

- DESIGN AND FABRICATE TO CSA W47.1 AND W59.
- ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8$ " UNLESS OTHERWISE SPECIFIED.
- DEBURR AND RADIUS ALL SHARP EDGES.
- WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS-FC1-15, FC1-10.
- ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.
- BOLT HOLES TO STRADDLE COMMON CENTERLINE.
- APPROXIMATE WEIGHT: 6400 LBS.

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP	REVISIONS
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY	3	2012.10.30	VW	DF	DF	REVISED AS PER RFDC #01219 ADDED REF. DWGS
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	2	2011.07.14	DJ	GH	DF	REVISED AS PER RFDC #00535, ADDED WELD SYMBOL
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY	1	2011.05.30	JHK	GH	DF	REVISED AS PER RFDC #00483
		0	2011.04.20	JHK	GH	DF	ISSUED FOR CONSTRUCTION

ISSUED FOR
CONSTRUCTION

SIGNED:

DATE: JUN 5 2013
8806-002

W.O.:

S.O.:

ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

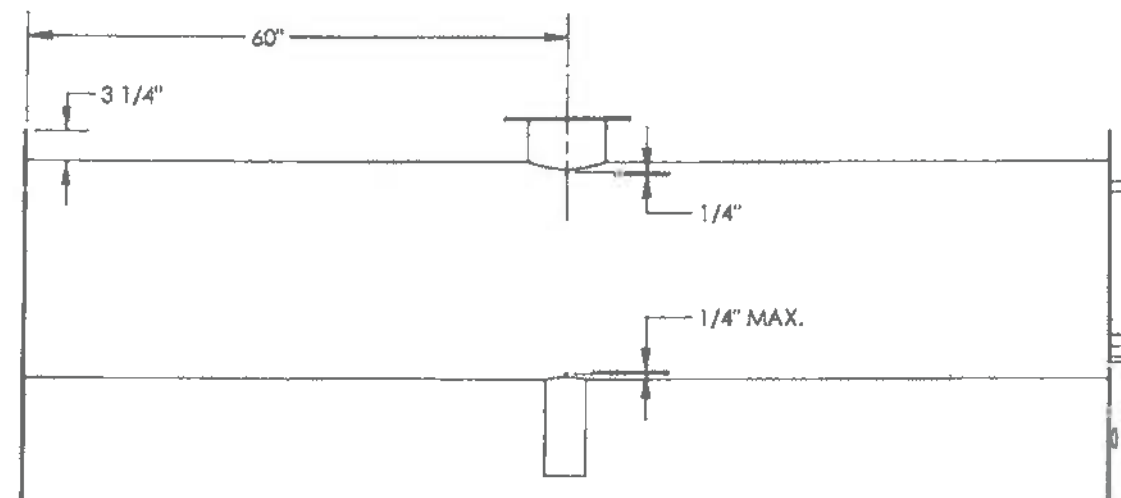
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NWP INDUSTRIES INC
LINEHEATER BATH
72" OD x 24' LONG

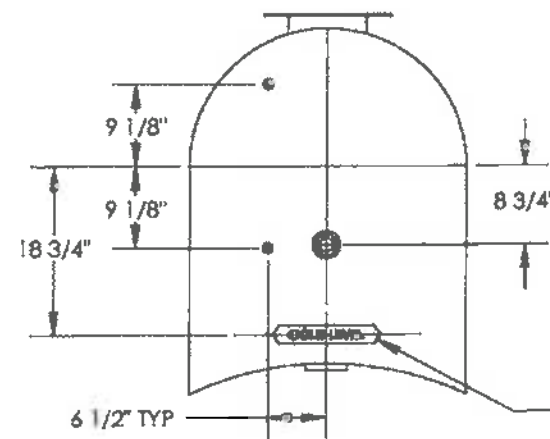
ASSEMBLY DRAWING

DWN: JHK	CHK: GH	APP: DF
DATE: 2011.04.20	DATE: 2011.05.13	DATE: 2011.05.13
SCALE: 1:48	DWG: LH-7224-BARE	REV: 3
SHEET: 1 OF 4		

08806

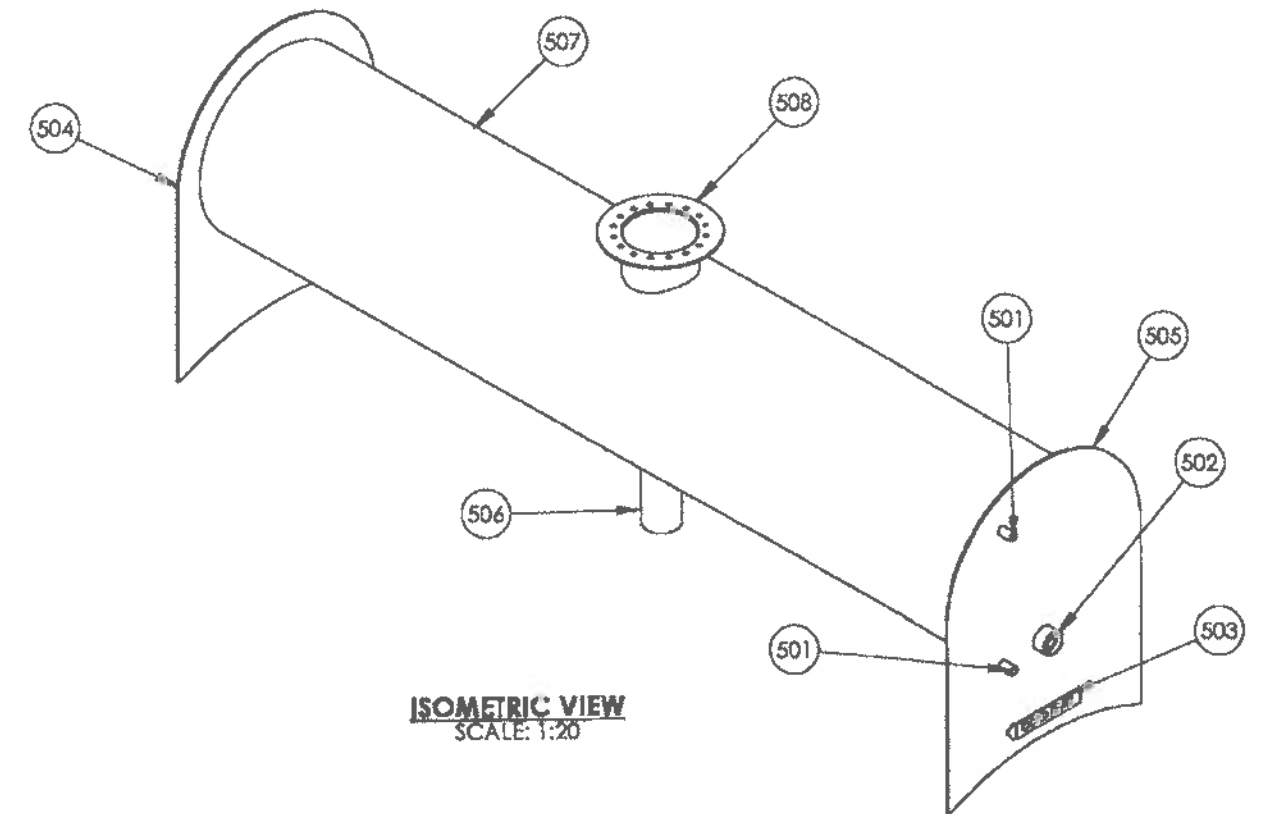


FRONT VIEW
SCALE: 1:20



END VIEW
SCALE: 1:20

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
501	COF.5GYEE	Coupling 1/2" 3M THRD SA105N			2
502	COH2GYEE	Coupling Half 2" 3M THRD SA105N			1
503	COLDLEVEL-1	LH COLD LEVEL INDICATOR			1
504	EXP-END2472	EXP. TANK END PLATE TO FIT 24" OD TANK x 72" OD BATH			1
505	EXP-END2472-LGD	EXP. TANK LG END PLATE TO FIT 24" OD TANK x 72" OD BATH			1
506	PIP440A	PIPE 4" SCH STD/40 SA106B		11 1/2"	1
507	PIP2410E	PIPE 24" SCH 10 SA53 ERW		120"	1
508	THIEFBASE-1	THIEF HATCH BASE ASSEMBLY 8 5/8" OD			1



ISOMETRIC VIEW
SCALE: 1:20

NOTES

1. DESIGN AND FABRICATE TO CSA W47.1 AND W59.
2. ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
3. DEBURR AND RADIUS ALL SHARP EDGES.
4. WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS-FC1-15, FC1-10.
5. ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.
6. BOLT HOLES TO STRADDLE COMMON CENTERLINE.

WPDS
FC1-15
TYP.

ORIGINAL

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY	3	2012.10.30	VW		
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	2	2011.07.14	DJ	GH	DF
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY	1	2011.05.30	JHK	GH	DF
		0	2011.04.20	JHK	GH	DF

REFERENCE DRAWINGS

DRAWING REVISIONS

ISSUED FOR CONSTRUCTION

SIGNED:

DATE: JUN 5 2013

8806-002-D

S.O.:

ALL DIMENSIONS IN INCHES



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NWP INDUSTRIES INC
LINEHEATER BATH
72" OD x 24' LONG

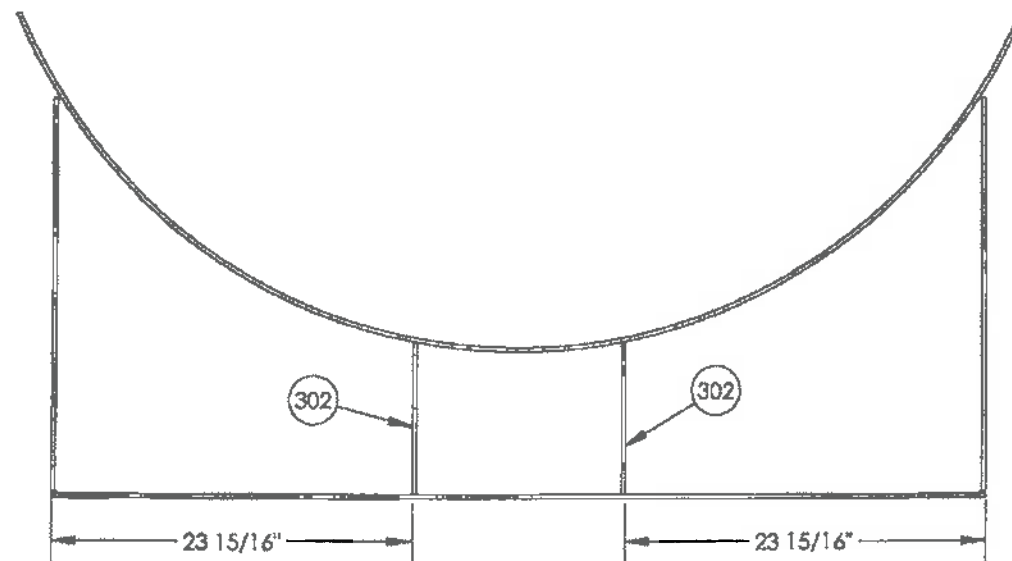
ASSEMBLY DRAWING

DWN: JHK CHK: GH APP: DF
DATE: 2011.04.20 DATE: 2011.05.13 DATE: 2011.05.13

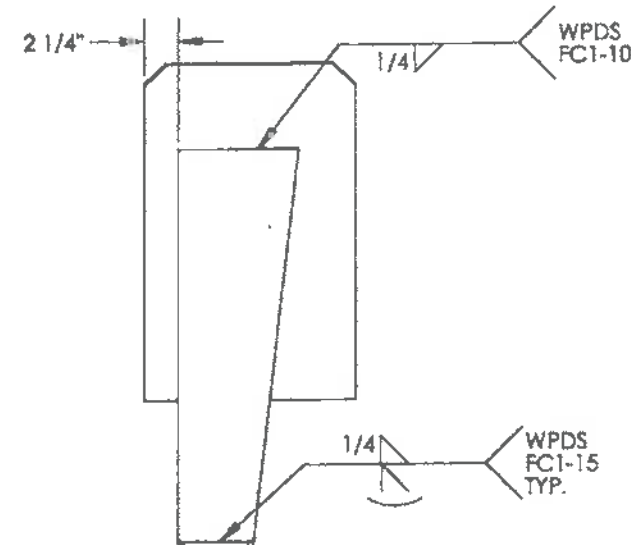
SCALE: 1:20 DWG: LH-7224-BASE REV: 3
SHEET: 2 OF 4

08806

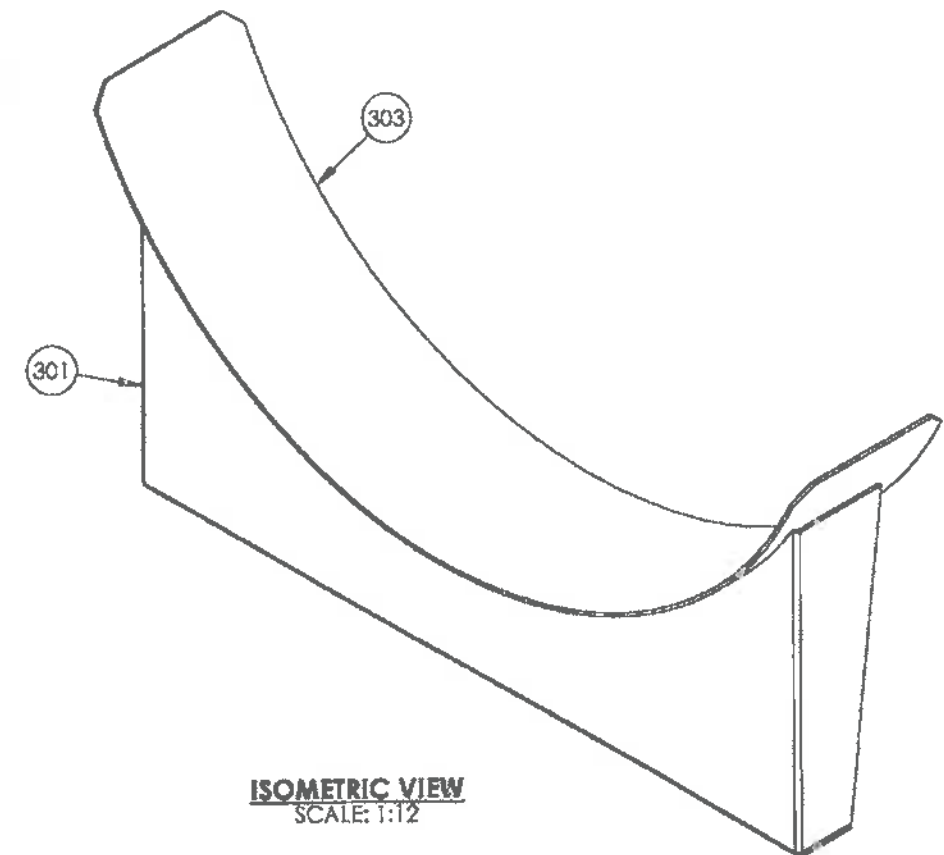
ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
301	LHSAD72-PLATE	LH SADDLE PLATE FOR 72" OD			1
302	LHSAD72-SUPPORT	LH SADDLE SUPPORT FOR 72" OD			2
303	LHSAD72-WEAR	LH SADDLE WEAR PLATE FOR 72" OD			1



BACK VIEW
SCALE: 1:12



END VIEW
SCALE: 1:12



ISOMETRIC VIEW
SCALE: 1:12

NOTES

- DESIGN AND FABRICATE TO CSA W47.1 AND W59.
- ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8$ " UNLESS OTHERWISE SPECIFIED.
- DEBURR AND RADIUS ALL SHARP EDGES.
- WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS-FC1-15, FC1-10.
- ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.

ORIGINAL

LH-FIRSTK-24-2		3	2012.10.30	VW	DF	REVISED AS PER RFDC #01219 ADDED REF. DWGS
LH-PH-7224-1		2	2011.07.14	DJ	GH	REVISED AS PER RFDC #00535, ADDED WELD SYMBOL
LH-LAD-72		1	2011.05.30	JHK	GH	REVISED AS PER RFDC #00483
DOCUMENT NO.		0	2011.04.20	JHK	GH	ISSUED FOR CONSTRUCTION
REFERENCE DRAWINGS		REV	DATE	BY	CHK	APP
DRAWING REVISIONS						

ISSUED FOR
CONSTRUCTION

SIGNED:

DATE:

8806-002-D

S.O.:

ALL DIMENSIONS IN INCHES



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PH: (403) 227-4100 FAX: (403) 227-4102

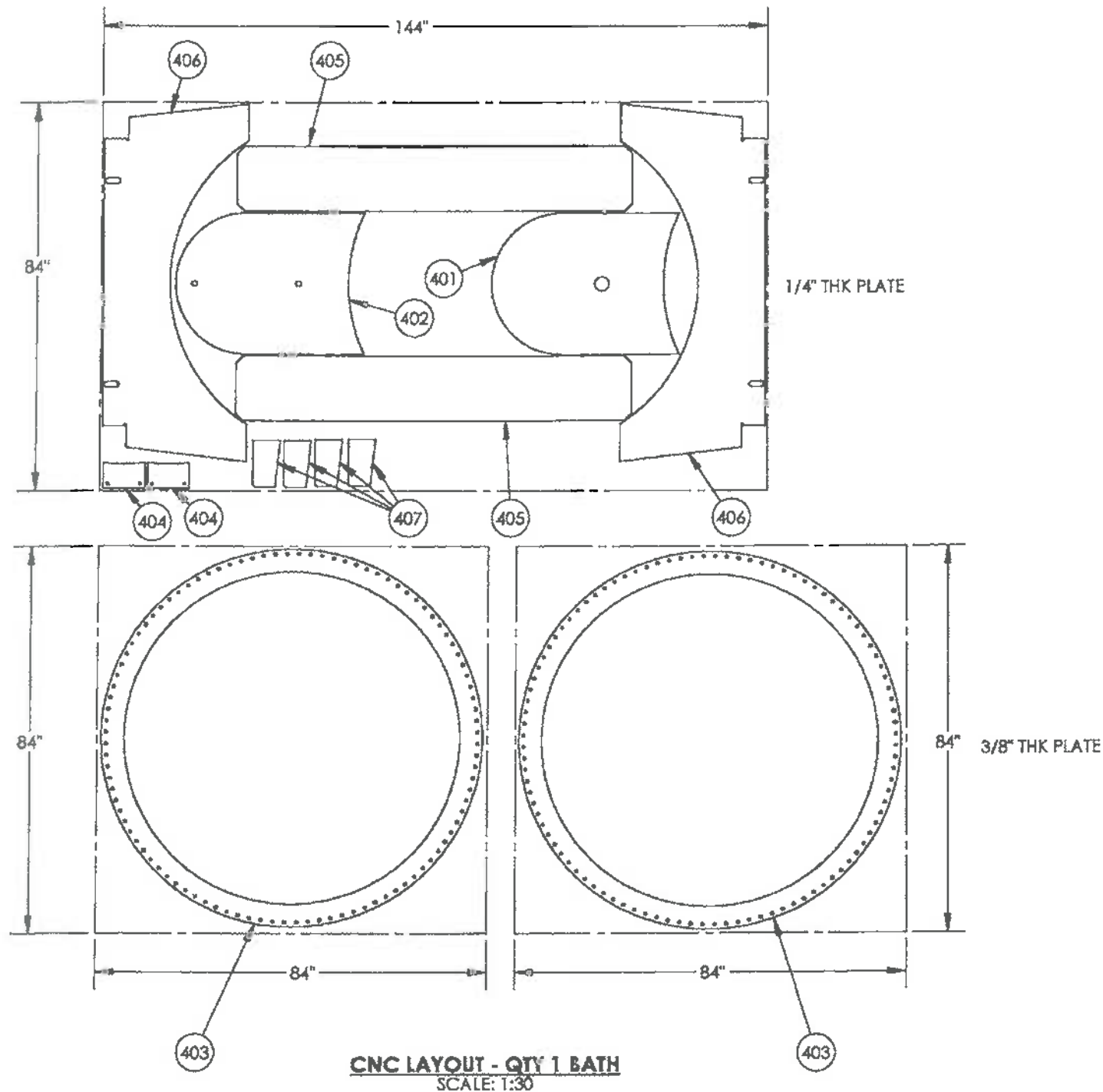
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NWP INDUSTRIES INC
LINEHEATER BATH
72" OD x 24' LONG

ASSEMBLY DRAWING

DWN: JHK	CHK: GH	APP: DF
DATE: 2011.04.20	DATE: 2011.05.13	DATE: 2011.05.13
SCALE: 1:12	DWG: LH-7224-BARE	REV: 3
SHEET: 3 OF 4		

08806



ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
401	EXP-END2472-D	EXP. TANK LC END PLATE TO FIT 24" OD TANK x 72" OD BATH			1
402	EXP-END2472-LG	EXP. TANK LG END PLATE TO FIT 24" OD TANK x 72" OD BATH			1
403	LH-FLA-72.375	LH BATH FLANGE FOR 72" OD 3/8" THK			2
404	LH-PLATE-ENCL72	LH ENCLOSURE SUPPORT TAB TO FIT 72" OD BATH			2
405	LHSAD72-WEAR	LH SADDLE WEAR PLATE FOR 72" OD		-	2
406	LHSAD72-PLATE	LH SADDLE PLATE FOR 72" OD		-	2
407	LHSAD72-SUPPORT	LH SADDLE SUPPORT FOR 72" OD			4

ORIGINAL

NOTES

1. HEAT NUMBER TO BE CLEARLY MARKED ON EACH PIECE WITH PAINT PEN AS A MINIMUM.
2. ALL DOCUMENTATION MUST ACCOMPANY SHIPMENT OF PARTS IF PART IS OUTSOURCED.
3. ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8"$ UNLESS OTHERWISE SPECIFIED.
4. DEBURR AND RADIUS ALL SHARP EDGES.

LH-FIRSTK-24-2		LINEHEATER FIRETUBE/STACK ASSEMBLY	3	2012.10.30	VW	REVISED AS PER RFDC #01219 ADDED REF. DWGS
LH-PH-7224-1		LINEHEATER PREHEAT PIPING	2	2011.07.14	DJ	REVISED AS PER RFDC #00535, ADDED WELD SYMBOL
LH-LAD-72		LINEHEATER SKID LADDER ASSEMBLY	1	2011.05.30	JHK	REVISED AS PER RFDC #00483
DOCUMENT NO.		DESCRIPTION	REV	DATE	BY	APP
REFERENCE DRAWINGS		DRAWING REVISIONS				

ISSUED FOR
CONSTRUCTION

SIGNED:

JUN - 5 2013
8806-0020

W.O.:

S.O.:

ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

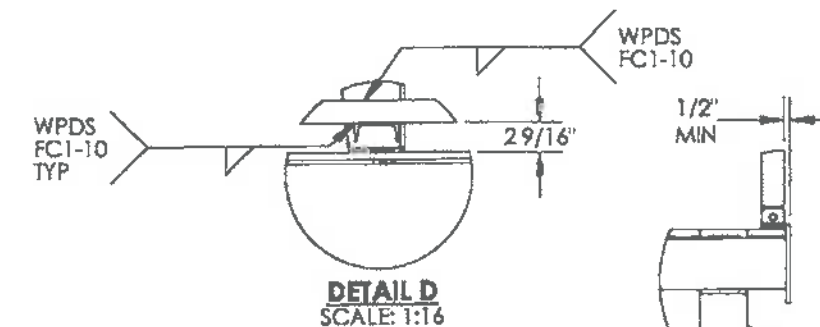
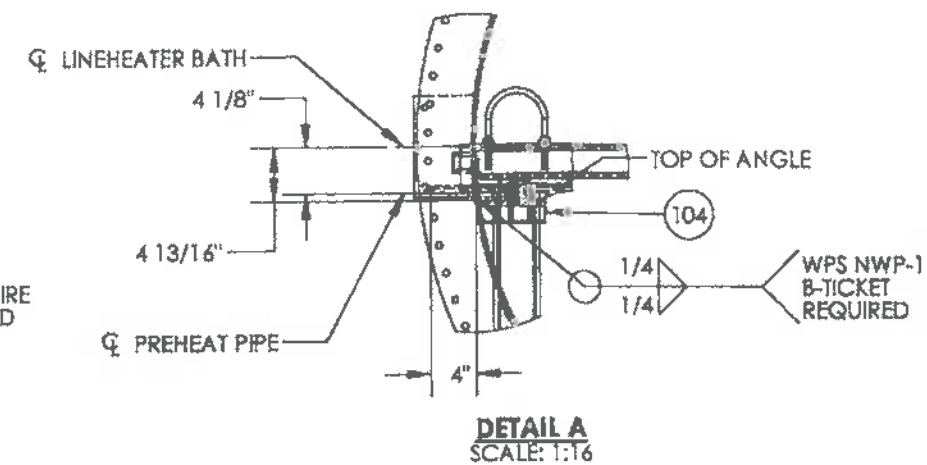
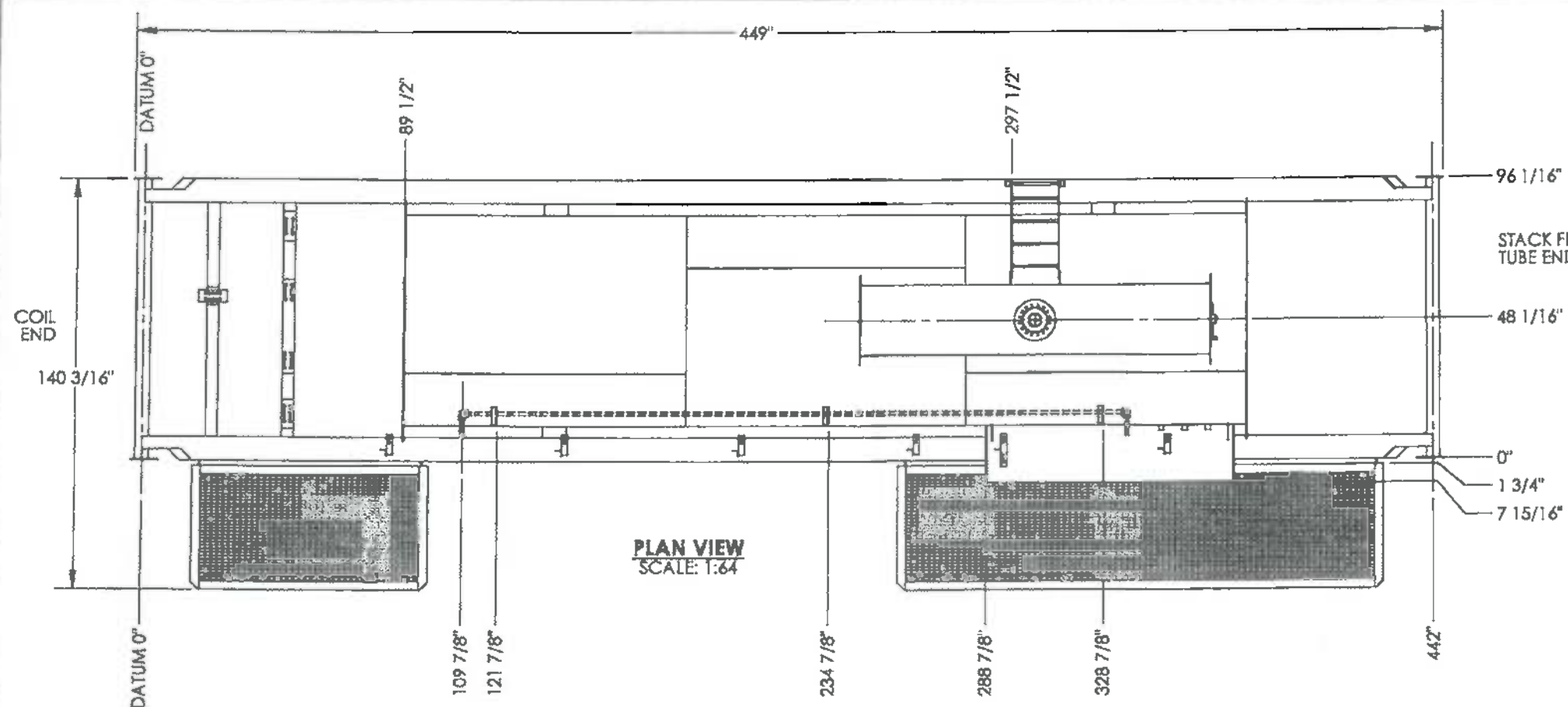
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NWP INDUSTRIES INC
LINEHEATER BATH
72" OD x 24' LONG

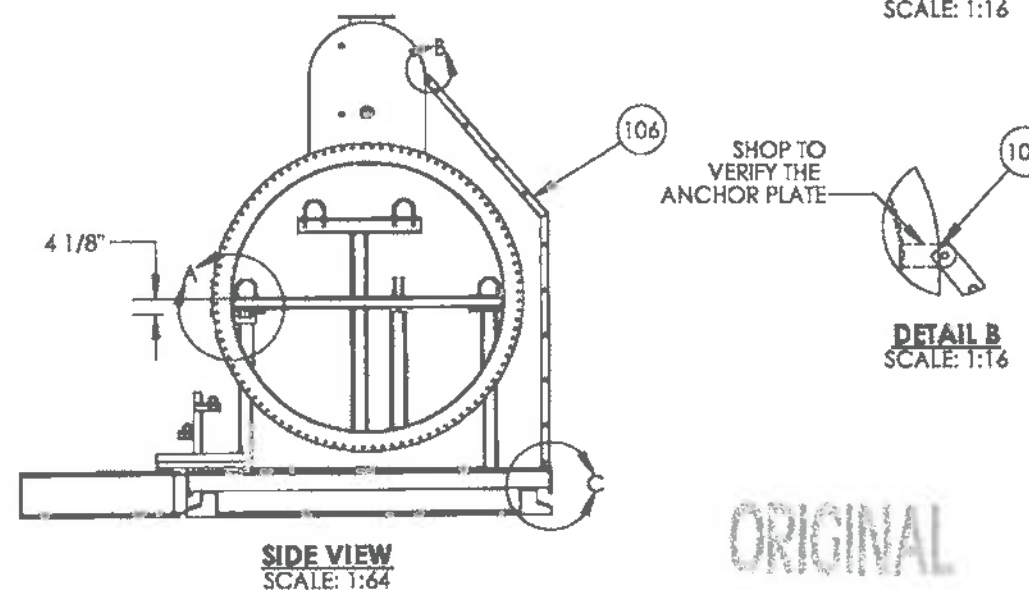
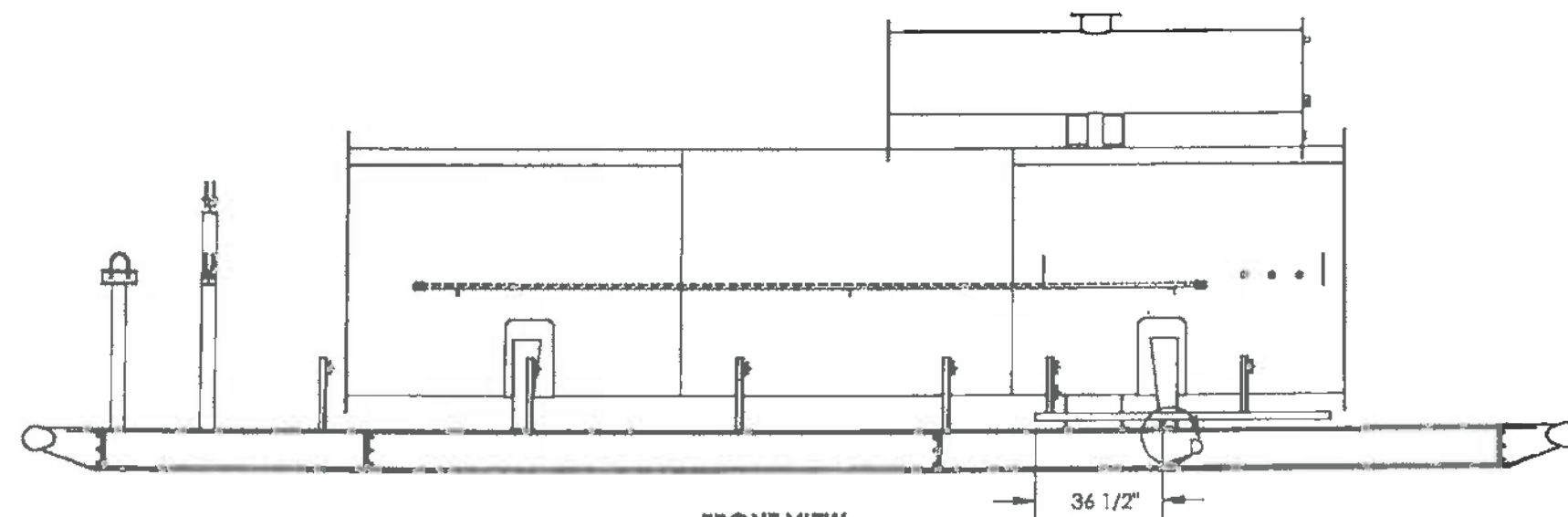
ASSEMBLY DRAWING

DWN: JHK	CHK: GH	APP: DF
DATE: 2011.04.20	DATE: 2011.05.13	DATE: 2011.05.13
SCALE: 1:30	DWG: LH-7224-BARE	REV: 3
SHEET: 4 OF 4		

08806



DETAIL C
SCALE: 1:16



DETAIL B
SCALE: 1:16

ORIGINAL

DOCUMENT NO.	DESCRIPTION	REV	DATE	BY	CHK	APP
08562-3	LINEHEATER SKID ASSEMBLY					
LH-FIRSTK-24-2	LINEHEATER FIRETUBE/STACK ASSEMBLY					
LH-LAD-72	LINEHEATER SKID LADDER ASSEMBLY	0	OCT 31/12	VW		
LH-PH-7224-1	LINEHEATER PREHEAT PIPING	A	OCT 23/12	VW		

ISSUED FOR
CONSTRUCTION

SIGNED:

DATE: JUN - 5 2013

8806-002

S/N:

ALL DIMENSIONS IN INCHES



P.O. BOX 6280, INNISFAIR, AB T4G 1S9
PH: (403) 227-4100 FAX: (403) 227-4102

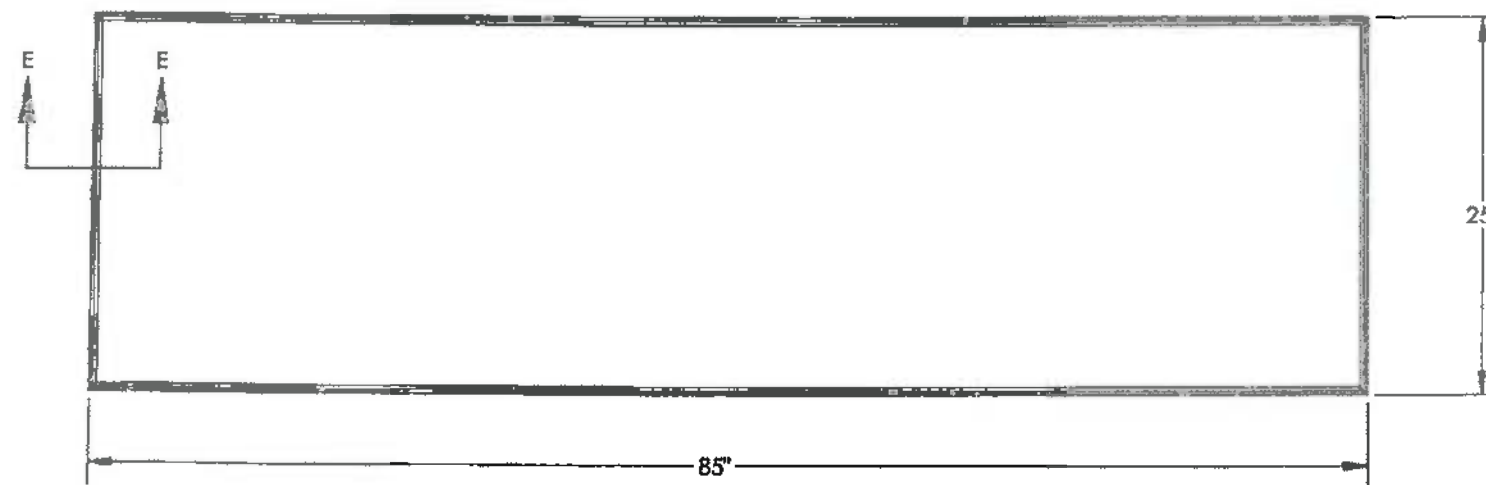
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ENCANA CORPORATION
LINEHEATER PACKAGE
3.0 MMBTU
C/W 4"-2500# RTJ SPLIT COILS
BATH ASSEMBLY

DWN: VW CHK: APP: DATE: OCT 05/12 DATE: NOV 14 2012 DATE: NOV 14 2012 SCALE: 1:48 SHEET: 2 OF 3 DWG: 08562-4 REV: 0

8806

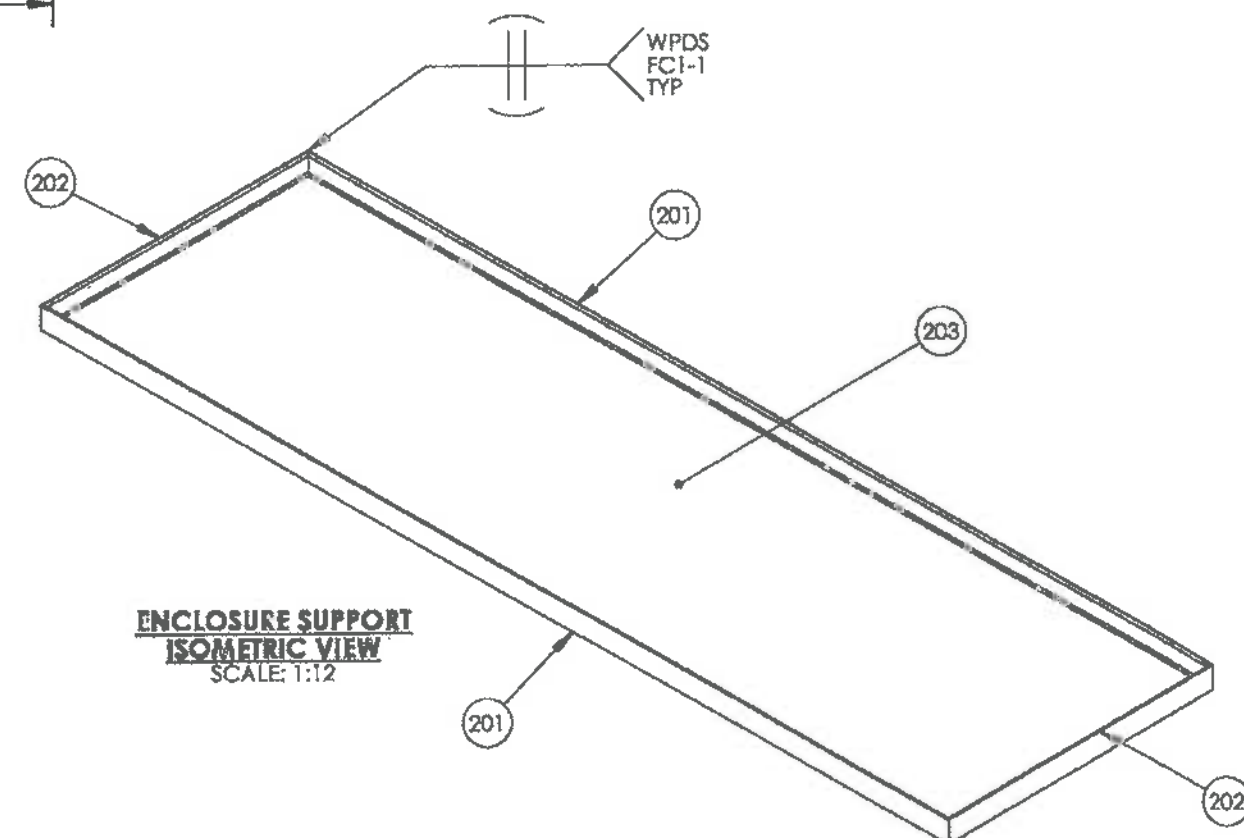
ITEM	QTY.	Description	PART #	LENGTH
201	2	ANGLE IRON 1/4" x 2" x 2" SA36/44W	ANGC22A	85"
202	2	ANGLE IRON 1/4" x 2" x 2" SA36/44W	ANGC22A	25"
203	1	PLATE 3/16" x 24" x 84" SA36/44W	PLAA2484A	14 sq. ft.



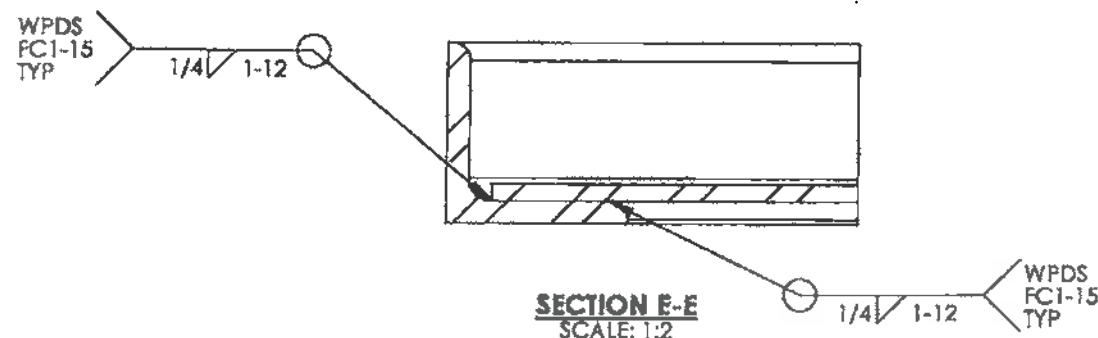
ENCLOSURE SUPPORT
PLAN VIEW
SCALE: 1:12

NOTES

1. FABRICATE TO W47.1 AND W59.
2. RADIUS ALL SHARP EDGES.
3. ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.
4. WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTE. WPDS FC1-15



ENCLOSURE SUPPORT
ISOMETRIC VIEW
SCALE: 1:12



SECTION E-E
SCALE: 1:2

ORIGINAL

08562-3		LINEHEATER SKID ASSEMBLY								ISSUED FOR CONSTRUCTION SIGNED: DATE: JUN - 5 2013 W.O. 8806-002-D S/N: _____ ALL DIMENSIONS IN INCHES	 NWP INDUSTRIES INC. Total oilfield supply. P.O. BOX 6280, INNISFAIR, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102 THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.	ENCANA CORPORATION LINEHEATER PACKAGE 3.0 MMBTU c/w 4"-2500# RTJ SPLIT COILS BATH ASSEMBLY		
LH-FIRSTK-24-2		LINEHEATER FIRETUBE/STACK ASSEMBLY										DWN: VW	CHK:	APP:
LH-LAD-72		LINEHEATER SKID LADDER ASSEMBLY	0	OCT 31/12	VW			ISSUED FOR CONSTRUCTION				DATE: OCT 05/12	DATE: NOV 14 2012	DATE: NOV 14 2012
LH-PH-7224-1		LINEHEATER PREHEAT PIPING	A	OCT 23/12	VW			ISSUED FOR APPROVAL				SCALE: 1:12	DWG: 08562-6	REV: 0
DOCUMENT NO.		DESCRIPTION	REV	DATE	BY	CHK	APP					SHEET: 3 OF 3		
REFERENCE DRAWINGS		DRAWING REVISIONS												

08806

NWP Industries Inc.	Website: www.nwp.ca
PO Box 6280	Phone: (403) 227-4100
4017-60 Ave.	
T4G 1S9	Fax: (403) 227-4102



HYDROSTATIC TEST AFFIDAVIT

Customer: Encana Corporation

JO# 08806-002-D

Project: Preheat Line for 3.0mm Lineheater

Project#

Test Pressure: 2160 PSI

Hold Time: 60 mins

Code Requirements: ASME B31.3 2012 edition

All Personnel Advised of Test ☒ All Signs & Flagging Posted ☒

Prior to Filling – Fitting/Hoses & Component Meet Required Test Pressure

Sign-Off Supervisor: ✓ Tester: ✓ Date: 19/07/2013

Product Description:

FG-1"-C-160A/BE-301=2160 psi

50% Test Pressure Leak/Systems Check Completed ☒

50% test=1080 psi

Test Temperature: _____ °F

Equipment Drained & Flushed to Prevent Freezing:

Yes: ☒

No: ☐

Start Time: <u>9:30 am</u>	Finish Time: <u>1:45 pm</u>
----------------------------	-----------------------------

Test Gauge Identification #	Pressure Range	Calibration Date
NWPG- 5000 <u>16</u>	0-5000 PSI	<u>14TH MAR 2013</u>
NWPG- 5000 <u>23</u>	0-5000 PSI	<u>14TH MAY 2013</u>
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	

Test By: <u>[Signature]</u>	Date: <u>17/07/2013</u>
NWP Representative: <u>[Signature]</u>	Date: <u>17/07/2013</u>
Customer Representative:	Date:

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg		ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

N D E Requirements

Client: Encana JO# 08806-002-D
 Project: Welded Piping -3.0mm Lineheater (preheat -line) Date: 03/07/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other: ☐

☐ X-Ray

☒ Gamma Ray

☐ Ultrasonics

☐ Liquid Penetrant

☐ Magnetic Particle

☐ Acoustic Emission

☐ Hardness test Max 200 BHN

☐ 100%

☐ Full

☐ 25%

☒ 10%

Other(Define) _____

☐ Spot

☐ ASME Section VIII-UW-51

☐ ASME Section VIII-UW-52

☒ Customer Specification

☒ ASME B31.3 NFS

Other (Specify) _____

☐ CSA W47.1/W59

General Instructions:

Vessel S/N _____

P1 Material _____

Welder ID W

Shell-T= _____

Pipe-T= 1" sch 160

Total Welds 2 x gap shot (first # is GS-1)

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots 2

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects

Encana Spec is Zero Elongated Indications

Encana Spec for Socket Welds-acceptance is minimum 1/16" gap

Encana Spec for Threaded Piping- acceptance is 7 threads engaged

HT is a 5 Point Traverse

Prepared By: Tom Ewashen

Date: 03/07/2013

Issuing Authority: Marvin J. (Ty) DeBelser/Dale Karg	NWIP Industries Inc.™	ABSA
Date of Issue: November 13 2012		FORM_NDE_001
Rev Status: 2.1		N.D.E Requirements

NDE Requirements

LB

Client: Encana JO# 08806-002-D

Project: Welded Piping -3.0mm Lineheater (preheat-line) Date: 03/07/2013

Piping: ☒ Pressure Vessel: ☐ Tank: ☐ Other: ☐

- | | | |
|---|---|--|
| ☐ X-Ray | ☐ 100% | ☐ ASME Section VIII-UW-51 |
| ☐ Gamma Ray | ☐ Full | ☐ ASME Section VIII-UW-52 |
| ☐ Ultrasonics | ☐ 25% | ☒ Customer Specification |
| ☐ Liquid Penetrant | ☒ 10% | ☒ ASME B31.3 NFS |
| ☒ Magnetic Particle | Other(Define) _____ | Other (Specify) _____ |
| ☐ Acoustic Emission | ☐ Spot | |
| ☐ Hardness test Max 200 BHN | | ☐ CSA W47.1/W59 |

General Instructions:

Vessel S/N _____

P1 Material _____

Welder ID W

Shell-T= _____

Pipe-T= 1" sch 160

Total Welds 2 x mpi (first # is MT-1)

Please use wire type iQi

Please Note locations of all indications on films on reports

Please include O.F.D-S.O.D S.F.D on reports

Special Requirements:

Shots 2

Buttweld Xray to be identified as X-#

Gap Shots to be identified as GS-#

Threaded Shots to be identified as XT-#

Identify on Envelope part of package being shot ie. Coil, Piping, ect.

Flashes must contain: Customer, JO#, Spool Identification, Xray number, Clock tape, Welder's ID Symbol, Date

Mark all indicated repairs on the project

NOTE: Encana Spec for Welded Piping-acceptance is zero root defects
 Encana Spec is Zero Elongated Indications
 Encana Spec for Socket Welds-acceptance is minimum 1/16" gap
 Encana Spec for Threaded Piping- acceptance is 7 threads engaged
 HT is a 5 Point Traverse

Prepared By: Tom Ewashen

Date: 03/07/2013



MAGNETIC PARTICLE INSPECTION REPORT

RD16 - MT281

Page 1 of 1

Procedures: MT-2V IRISNDT 5.0

Code: ASME B31.3 / CUSTOMER SPEC.

Job / P.O. #: 08806-002-D

IRISNDT #: 167255

Date: 03-Jul-13

Client: ENCANA C/O NWP

Location: INNISFAIL, ALBERTA

Item Inspected: PIPING - 3.0MM Line Heater (preheat line)

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

Material: P1

Thickness: VARIOUS

Heat Treatment: N/A

Magnetizing Equipment: Yoke ☒ Coil ☐ Prod ☐Bench: Headshot ☐ Central Conductor ☐ Coil ☐

IRISNDT #: 40120

Mfg: PARKER

Calibration Date: 17-Jun-13

Blacklight: ☐

IRISNDT #:

Mfg:

Calibration Date: - -13

☐

Verification per ASME V Art 7 T.777.2

Whitelight:

Battery Powered Min. 3V

110V Power Min. 60W Bulb

☒☐Held within 30 cm (12in) of the inspection surface
provides minimum 1000 Lx (100fc)Method of Magnetization: AC ☒ DC ☐ Continuous ☒ Residual ☐Magnetic Particles: Dry ☐ Wet ☒Red ☐ Grey ☐ Black ☒ Fluorescent ☐

Batch #: 1283

Mfg: ARDROX

Type: 8031

Background: ☒

Batch #: 1243

Mfg: ARDROX

Type: 8901W

MPI was carried out the following**1" S160 SOCKET WELDS****MT1 → MT2****WELDER: 'W'****Results: No rejectable indications were found at time of inspection.
Acceptable to code****Inspection Limitation(s):**

Unit#: _____ Kilometers: SEE

In: _____ Out: _____ Hrs: TS

In: _____ Out: _____ Hrs: _____

Personnel:

JEFF BAJEMA, JEFF WHYTE

Consumables:
MIN.Interpretation by:
JEFF BAJEMA

SNT-TC-1A

II

C.G.S.B.

II

(Print)

C.G.S.B. #

(Level)

10863

(Signature)

Client Representative:

(Print)

I am in full
agreement with
report contents

(Sign)

5311 - 86 Street Edmonton, Alberta, T6E 5T6 Phone: (780) 437-2022 Fax: (780) 438-1438

Calgary (403) 278-8121
Lloydminster (780) 875-8455
Banff (780) 674-3018
Nisku (780) 955-7016Cold Lake
Fort McMurray
Red Deer(780) 828-6105
(780) 743-1536
(403) 347-1742Deer Park, TX
Matrix, Houston, TX
Tulsa, OK(281) 476-4444
(713) 722-7177
(918) 446-8773

CUSTOMER COPY

IRISNDT E-2003F

NWP Industries Inc. TM		Website: www.nwp.ca
PO Box 6280 4017-60 Ave.		Phone: (403) 227-4100
T4G 1S9		Fax: (403) 227-4102

PNEUMATIC TEST AFFIDAVIT

Customer: Encana Corporation
 Project: Shell Assembly
 Test Pressure: 24 oz
 Code Requirements: CSA W47.1 and W59, API 12F
Product Description:

JO# 08806-002-C
 Project#
 Hold Time: AS REQUIRED
 Date: 17/07/2013

Tank Serial # 08806-002-C DWG# REV#

Test- _____

#1.All Welded and Bolted Connections

No leaks

Repairs

Ground to sound metal by:	Repair preparation, QC witness by:
Reweld using E7018, QC:	Repaired by:
Procedure approved by QC:	Completed repair checked by QC:

Additional Comments

PSV Used:	Range:	Calibration Due:
014391-676	0-28 oz	

Test #	Test By:	Q.C.	Date	Test Gauge ID.	Range	Calibration Due:
1			JULY 18, 13	NWPG- 117 119	0-5 PSI	
Test(s) Approved By:				Date: 17/07/2013		

JUN 05 2013

PRE-HEAT LINE for 3.0 mm BTU/HR LH. PKG.

PRESSURE PIPING EXAMINATION CHECKLIST

DRWG. # LH-PH-7224-1 REV 3; 08562-6R0; (FID) Pg 1 of 3 JOB NUMBER: 08806-002-D

NO.	FUNCTION	SIGNATURE OR INITIAL AND DATE	
		Q.C. INSPECTOR	OWNERS INSPECTOR
1	DRAWINGS: ABSA registration over 0.5 Cu.M. Approved by Owner. Approved for Construction (signed & dated).		
2	Owner's Inspector notified.		
3	Registered Welding Procedure Specifications, Q.C. Manual and Forms available at site, Job File started.	John JUNE 7/13	
4	Welders qualified for WPS's and have valid Performance Qualification cards. Welders Log completed. WPS reviewed with Welders. <i>HOLD</i>	John JULY 2013	
5	Material checked against P.O., drawings, and specifications. Identification confirmed. Colour coding applied. <i>HOLD</i>	John JULY 2013	
6	Sample of each Welder's work examined, including root spacing, alignment, cleaning, joint preparation, preheat and electrode control.	John JULY 2013	
7	Nondestructive Examination completed. Reports and radiographs reviewed, signed by Level II or III, Radiograph I.D. detailed on drawings. <i>HOLD</i>	John JULY 5 2013	
8	Visual Examination of all completed welds. Welders I.D. stamped and recorded on drawings.	John JULY 2013	
9	Heat Treatment verified and recorded on drawings. <i>NA</i>		
10	Each system checked against specifications and drawings before test.	<i>(Signature)</i> AUG 01 2013	
11	All deficiencies recorded and signed off by Q.C.I. and Owner's Inspector before test.	<i>(Signature)</i> AUG 01 2013	
12	Pressure Test checked. Gauge calibration verified, gauge #'s recorded. <i>HOLD</i>	<i>(Signature)</i> AUG 01 2013	
13	System checked after test. Deficiencies recorded and corrected.	<i>(Signature)</i> AUG 01 2013	
14	Construction data reports (AB-83) prepared and signed by Q.C.I. and Owner's Inspector. <i>See assembly work order</i>		
15	Declaration form (AB-81) submitted to ABSA		
16	As built drawings accepted by Owner.		

Issuing Authority: Marvin J. (Ty) DeBelser / Dale Karg Date of Issue: November 30, 2007 Rev Status: 1.0	 NWP INDUSTRIES INC.	Manufacturing FORM-LHTS-001 Line Heater Travel Sheet (Shell, Skid & Firetube Assembly)				
By: <u>LT</u>		Date: <u>JUN 05 2013</u>				
W.O. # <u>D8806-002-D</u>	Description: <u>FIRETUBE 3 STACK for 3.0 mm BTU/HR LH PKG.</u>					
Drawing # <u>LH-FIRSTK-24-2 REV 1</u>						
	Req.	Hold	Employee Initial	Date Complete	QC Initial	Date
Work Instructions/Drawings Issued	✓		MSP JH	JUN 25/13	(Signature)	JUN 07 2013
Work Instructions/Drawings Reviewed	✓	✓	MSP JH		(Signature)	JUN 07 2013
Material & Parts Released	✓	✓	MSP JH		(Signature)	AUG 01 2013
Welding Personnel Assigned	✓	✓	MSP JH		(Signature)	AUG 01 2013
Visual Dimension Inspection - Firetube/Stack	✓				(Signature)	AUG 01 2013
Visual Dimension Inspection - Skid	NA					
Visual Dimension Inspection - Expansion Tank	NA					
Visual Dimension Inspection - Preheat Line	NA					
Visual Dimension Inspection - Shell Assy.	NA					
Pneumatic Test - Firetube	✓	✓			(Signature)	AUG 01 2013
Hydro Test - Preheat Line	NA					
Pneumatic Test - Shell Assy.	NA					
Installation of All Welded Components Complete	✓				(Signature)	AUG 01 2013
Final Inspection Release	✓				(Signature)	AUG 01 2013
Accepted By Customer: _____ _____ Date: _____ _____						

Issuing Authority: Marvin J. (Ty) DeBelser / Dale Karg Date of Issue: November 30, 2007 Rev Status: 1.0	 NWP INDUSTRIES INC.	Manufacturing FORM-LHTS-001 Line Heater Travel Sheet (Shell, Skid & Firetube Assembly)				
By: <u>[Signature]</u>		Date: JUN 05 2013				
W.O. # 08806-002-D		Description: SHELL & EXPANSION TANK for 30 MM BTU/HR LH PKG				
Drawing # LH-7224-BARE REV 3; 08562-6 REV 0						
	Req.	Hold	Employee Initial	Date Complete	QC Initial	Date
Work Instructions/Drawings Issued	✓		[Signature]	03/07/13	[Signature]	JUN 07 2013
Work Instructions/Drawings Reviewed	✓	✓	[Signature]	03/07/13	[Signature]	JUN 07 2013
Material & Parts Released	✓	✓	[Signature]	03/07/13	[Signature]	AUG 01 2013
Welding Personnel Assigned	✓	✓	[Signature]	03/07/13	[Signature]	AUG 01 2013
Visual Dimension Inspection - Firetube/Stack	NA					
Visual Dimension Inspection - Skid	NA					
Visual Dimension Inspection - Expansion Tank	✓				[Signature]	July 2/13
Visual Dimension Inspection - Preheat Line <i>INSTALL</i>	✓	✓			[Signature]	AUG 01 2013
Visual Dimension Inspection - Shell Assy.	✓		[Signature]	03/07/13	[Signature]	July 3/13
Pneumatic Test - Firetube	NA					
Hydro Test - Preheat Line	✓	✓			[Signature]	AUG 01 2013
Pneumatic Test - Shell Assy.	✓	✓			[Signature]	AUG 01 2013
Installation of All Welded Components Complete	✓				[Signature]	AUG 01 2013
Final Inspection Release	✓				[Signature]	July 08/13
Accepted By Customer: _____ _____ Date: _____ _____						

NWP Industries
Job Order Paperwork

INSTRUM.

Order: 08806-002-E



Item: Valve Train
Description: 3.0 MM BTU Lineheater Package
Ordered: 1.00
Qty To Mfg: 1.00
Entered: 05/21/13
Delv Req: 07/26/13

Customer: ENCANACORP
Name: Encana Corporation (Open Inv)
Customer PO: PO44501
Contact: Justin Zacharias
Parent Order: 08806-002
Drawing: LH-VALVETRN-1 REV 1

JUN 10 2013

OPER	S	WORK CENTER	QTY	SETUP	RUN	START/END	DESCRIPTION	U/M	QTY
------	---	-------------	-----	-------	-----	-----------	-------------	-----	-----

200 Instrum. 1.00 0.00 4.00
Instrumentation

OPER:

WC:

Structural Welding As Per CSA W47.1 and W59

Employee Identification: _____

NTR _____

Fabrication: _____

Date: _____

Quality:

Date: 3.1.13

YS-868205 Each 1.00
Y STRAINER 1" 3000 ALTA 1/32 Perf



NWP Industries
Job Order Paperwork

Order: 08806-002-E

Item: Valve Train
Description: 3.0 MM BTU Lineheater Package
Ordered: 1.00
Qty To Mfg: 1.00
Entered: 05/21/13
Delv Req: 07/26/13

Customer: ENCANACORP
Name: Encana Corporation (Open Inv)
Customer PO: PO44501
Contact: Justin Zacharias
Parent Order: 08806-002
Drawing: LH-VALVETRN-1 REV 1

Direct Purchases						
OPER	WORK CENTER	DESCRIPTION	U/M	QTY	PO / VENDOR	DUE DT
200	Instrum.	BA-NEO-BF025GT	Each	6.00	712833	06/03/13
	Instrumentation	Ball Valve 1/4" NEO, Two-Piece Full Bore, SS, 2000 psi WOG, Lockable Handle CSA 3.16 Certified B149 Complaint			MRC Canada ULC	
200	Instrum.	BA-NEO-BF100GT	Each	2.00	712833	06/03/13
	Instrumentation	Ball Valve 1" NEO, Two-Piece Full Bore, SS, 2000 psi WOG, Lockable Handle CSA 3.16 Certified B149 Complaint			MRC Canada ULC	
200	Instrum.	PI-233.53(0-30)2.5F	Each	2.00	712843	06/03/13
	Instrumentation	PRESSURE GAUGE WIKA 2-1/2" F 1/4" 0 - 30 PSI, DUAL SCALE, STAINLESS STEEL MODEL 233.53, CENTER BACK MOUNT			Wika Instruments Ltd.	
200	Instrum.	PS-6900GZE12.14R	Each	1.00	712838	06/03/13
	Instrumentation	PRESSURE SWITCH, CCS DUAL SNAP MODEL 6900GZE12, 1/2" NPT, SS CONSTRUCTION, CCS APPROVED, SET @ 14 PSI RISING CALIBRATION CERTIFICATE IS REQUIRED			Telematic Controls Inc.	
200	Instrum.	PS-6900GZE12.4F	Each	1.00	712838	06/03/13
	Instrumentation	PRESSURE SWITCH, CCS DUAL SNAP MODEL 6900GZE12, 1/2" NPT, SS CONSTRUCTION, CCS APPROVED, SET @ 4 PSI FALLING CALIBRATION CERTIFICATE IS REQUIRED			Telematic Controls Inc.	
200	Instrum.	PRV-627121729855	Each	1.00	712837	06/03/13
	Instrumentation	Regulator, Fisher 627, 5-20psi Outlet Pressure Spring Range, 1" FNPT, Orifice Size 1/2" 3/4" Tapped Bonnet Body Material: Ductile Iron Spring Case Material: Aluminum Nitrile Disk Maximum Inlet Pressure: 250 psig			Spartan Controls Ltd.	
200	Instrum.	PRV-67CFR362SCSG30	Each	1.00	712837	06/03/13
	Instrumentation	Regulator, Fisher 67 CFR, 0-35 psi pressure range c/w gauge, 1/4" NPT Tapped-Bonnet, Adjustable spring range, 5 micron filter, adjustable screw with closing cap, temperature range: -20 to 180 Deg F			Spartan Controls Ltd.	
200	Instrum.	FOSSIL-24	Each	1.00	712848	06/05/13
	Instrumentation	Valve 1" Fossil Proof of Closure Pneumatic Actuator 24 VDC C/W solenoid and Quick Exhaust Valve CSA 6.5-2000 C/I Approved See Notes			Zirco Ltd. (1989)	
200	Instrum.	PCV-100696	Each	1.00	712837	06/03/13
	Instrumentation	VALVE, CONTROL, FISHER MODEL 119, 1" NPT, 9/16" PORT, 5-35 PSI RANGE, CAST IRON BODY, 150 PSI MAWP, STD SERVICE			Spartan Controls Ltd.	

NWP Industries
Job Order Paperwork

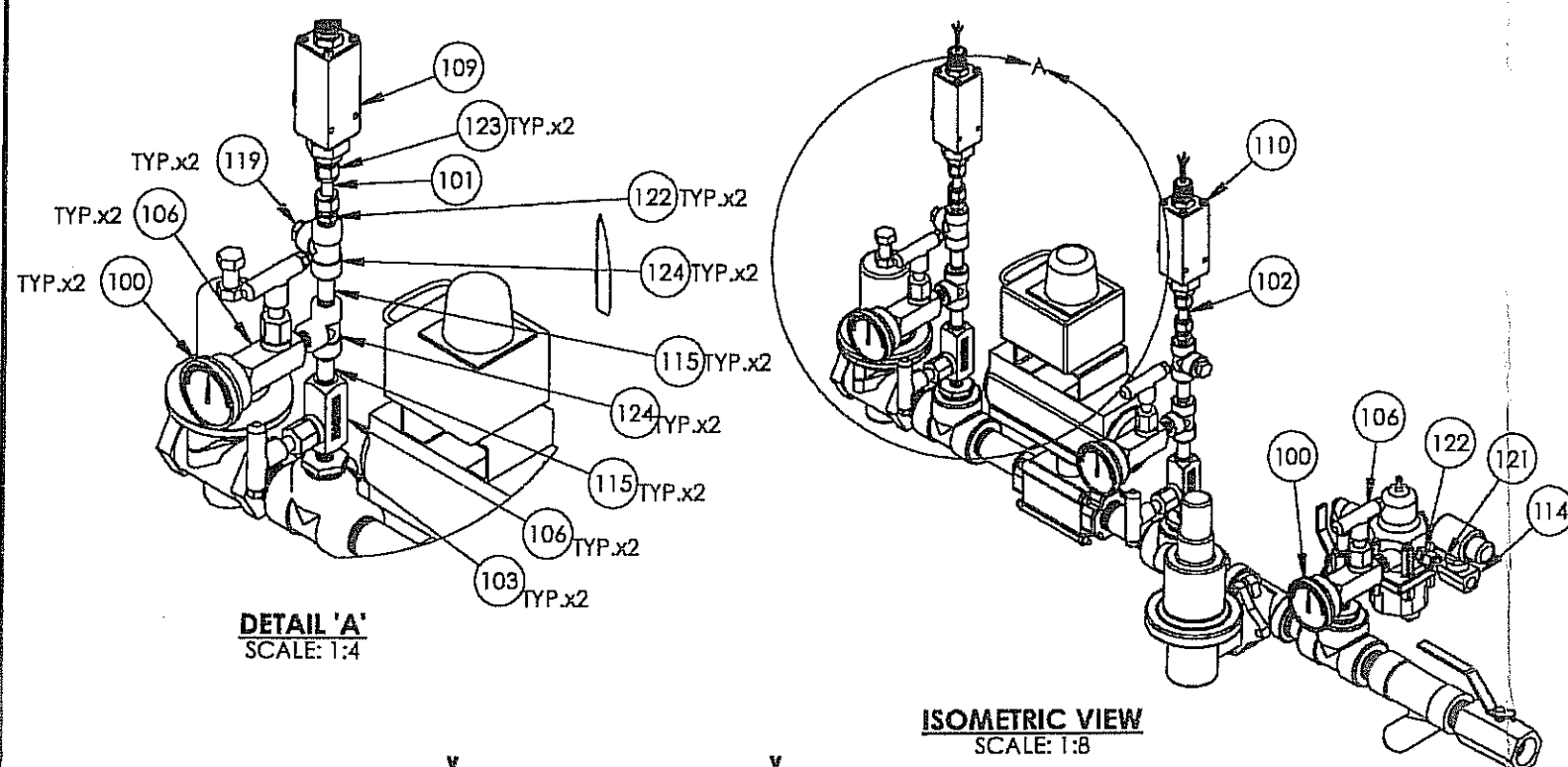
Order: 08806-002-E

Item: Valve Train
Description: 3.0 MM BTU Lineheater Package
Ordered: 1.00
Qty To Mfg: 1.00
Entered: 05/21/13
Delv Req: 07/26/13

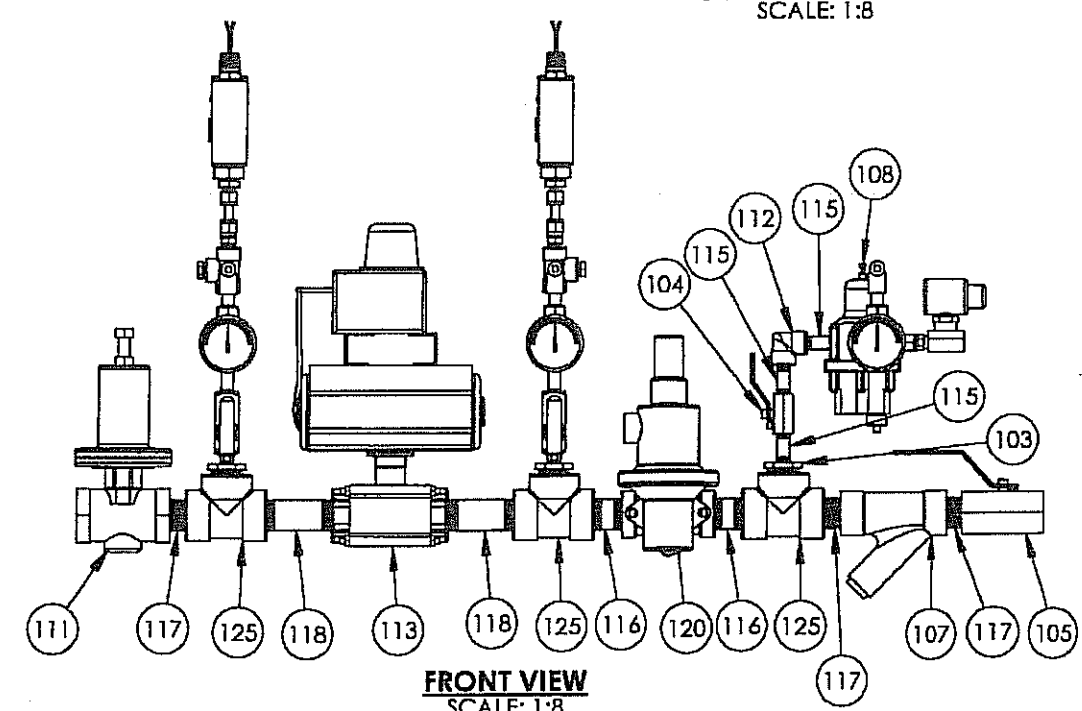
Customer: ENCANACORP
Name: Encana Corporation (Open Inv)
Customer PO: PO44501
Contact: Justin Zacharias
Parent Order: 08806-002
Drawing: LH-VALVETRN-1 REV 1

Direct Purchases					
OPER WORK CENTER	DESCRIPTION	U/M	QTY	PO / VENDOR	DUE DT
200 Instrum.	HV426716002	Each	1.00	712837	06/03/13
Instrumentation	Asco 24VDC Solenoid C/I Rated			Spartan Controls Ltd.	
	ANSIZ21.21 & CSA6.5 Certification 1/4" NPT 10.6				
	Watts				

FOR INFORMATION ONLY



DETAIL 'A'
SCALE: 1:4



FRONT VIEW
SCALE: 1:8

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
100	233.53	PRESSURE GAUGE WIKA 2 1/2" FACE 1/4" NPT, 0-30 PSI, MODEL NO. 233.53 CENTER BACK MOUNT			3
101	SS-T6-S-035-20	TUBING, 0.035" WT SMLS 3/8"		2 3/4"	1
102	SS-T6-S-035-20	TUBING, 0.035" WT SMLS 3/8"		2 3/4"	1
103	BUS1.25YEE	Bushing 1" x 1/4" THRD SA105N	869		3
104	BUY	NEO BALL VALVE EMICO 1/4" 600-PSI 2000 PSI			1
105	BUY	NEO BALL VALVE EMICO 1" 600-PSI 2000 PSI			2
106	BUY	VALVE NEEDLE MAGNUM 1/4" 6000 PSI MF-25-SS			5
107	BUY	STRAINER ALTA STRAINER 1" NPT CL 3000 MDL YS3000			1
108	BUY	PRESSURE REGULATOR FISHER 67CFR 0-35 PSI SPRING STD TRIM			1
109	BUY	PRESSURE SWITCH CCS MODEL 6900GZE12 SET @ 14 PSI RISING			1
110	BUY	PRESSURE SWITCH CCS MODEL 6900GZE12 SET @ 4 PSI FALLING			1
111	CV-1198869383	Fisher 119 1" NPT 9/16" Orifice Spring Range: 5 to 35 psig			1
112	EL9.25GYEE	Elbow 90 Deg 1/4" 3M THRD SA105N 6M	LF2		1
113	FOSSIL-24	PROOF OF CLOSURE VALVE FOSSIL 1" NPT			1
114	HV426716002	SOLENOID VALVE ASCO 1/4" NPT			1
115	NIP.252Y80EK	NIPPLE 1/4" x 2" SCH XH/80 316/316L SST		-	7
116	NIP12.5Y80EA	NIPPLE 1" x 2 1/2" SCH XH/80 SA106-B		-	2
117	NIP12Y80EA	NIPPLE 1 x 2" SCH XH/80 SA106-B		-	3
118	NIP14Y80EA	NIPPLE 1" x 1/2" SCH XH/80 SA106-B 1" x 5/8"		-	2
119	PLH.25HYEE	PLUG HEX 1/4" 6M THRD SA105N			2
120	PRV-627121729855	PRESSURE REGULATOR FISHER 627-489 1" NPT 5-20 PSI 1/2" ORIFICE STD TRIM 250 MAWP			1
121	SS-6-TA-1-4	TUBE ADAPTOR 3/8" TUBE x 1/4" MNPT MDL SS-6-TA-1-4			1
122	SS-600-1-4	TUBING, STRAIGHT CONNECTOR, 3/8" TUBING x 1/4" MNPT, SS-600-1-4			3
123	SS-600-1-8	TUBING, STRAIGHT CONNECTOR, 3/8" TUBING x 1/2" MNPT, SS-600-1-8			2
124	TEE.25GYEE	Tee 1/4" CL 3M THRD SA105N 6M	LF3		4
125	TEE1GYEE	Tee 1" 3M THRD SA105N 6M	LF30		3

FOR INFORMATION ONLY

BUILD LEFT TO RIGHT
6M Fittings

FOR INFORMATION ONLY

ORIGINAL

REFERENCE DRAWINGS							DRAWING REVISIONS							ISSUED FOR CONSTRUCTION		NWP INDUSTRIES INC. Total oilfield supply.		NWP INDUSTRIES INC VALVE TRAIN ASSEMBLY 1" NPT LEFT TO RIGHT RIGHT TO LEFT FLOW ASSEMBLY DRAWING		
1 2012.09.27 EP Q 2012.06.22 JHK							RE-ISSUED FOR CONSTRUCTION (UPDATED PART NUMBERS)							SIGNED: JUN - 5 2013		P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102		DWN: JHK		
0 2012.06.22 JHK							ISSUED FOR CONSTRUCTION							DATE: 8806-002-E		PH: (403) 227-4100 FAX: (403) 227-4102		CHK: APP: DATE: 2012.06.22		
DOCUMENT NO. DESCRIPTION REV. DATE BY CHK APP DESCRIPTION														S.O.:		ALL DIMENSIONS IN INCHES		SCALE: 1:8		
																		SHEET: 1 OF 1		
																		DWG: LH-VALVETR-1		
																		REV: 1		

NWP Industries
Job Order Paperwork



Order: 08517-C

Item: BRACKET-FG-1

Description: Fuel Gas Vent Header Bracket 1"

Ordered: 40.00

Qty To Mfg: 40.00

Entered: 12/05/12

Delv Req: 12/12/12

Customer: STOCK

Name: STOCK

Customer PO:

Contact:

Parent Order: 08517

Drawing: BRACKET-FG-1 REV 1

OPER	S	WORK CENTER	QTY	SETUP	RUN	START/END	DESCRIPTION	U/M	QTY
10		CNC	40.00	0.00	1.33		Shear		

Plasma/Shear/Brk

OPER:



WC:



Structural Welding As Per CSA W47.1 and W59

Employee Identification:

CYRUS HARKONEN

MTR

NI USED

HT #'s Listed Below

Fabrication:

C.W.-C

Date:

Dec 12/2012

Quality:

Date:

FLTC2A

Flat Bar 1/4" x 2" SA36/44W

Foot

16.80

PIP.580A

Pipe 1/2" S/80 SA106B

Foot

13.20

NI HT #'s

100 HT# 488386

10 HT# 0138M

100 HT# 507558

190 HT# NW0915

NWP Industries
Job Order Paperwork



Order: 08517-C

Item: BRACKET-FG-1

Description Fuel Gas Vent Header Bracket 1"

Ordered: 40.00

Qty To Mfg: 40.00

Entered: 12/05/12

Delv Req: 12/12/12

Customer: STOCK

Name: STOCK

Customer PO:

Contact:

Parent Order: 08517

Drawing: BRACKET-FG-1 REV 1

OPER	S	WORK CENTER	QTY	SETUP	RUN	START/END	DESCRIPTION	U/M	QTY
------	---	-------------	-----	-------	-----	-----------	-------------	-----	-----

20		G_Weld	40.00	0.00	10.00				
----	--	--------	-------	------	-------	--	--	--	--

G Weld

OPER:



WC:



Structural Welding As Per CSA W47.1 and W59

Employee Identification:

Chris Craig

MTR

3/4" Round Bar HT#PL12100119

Fabrication:

G-weld

Date:

Dec 12 / Dec 13

Quality:

Date:

PCL1

Pipe Clamp 1" Flg 212

Each

40.00



DEC 05 2012



EVRAZ INC. NA

8250 130th Street, Surrey, BC, V3W 8J9

Test Certificate

Form TC1: Revision 1: Date 31 Oct 2000

Customer: VARSTEEL LTD. 330-220 4TH STREET LETHBRIDGE AB T1J4J7	Customer P.O. No.: RD-938608	Mill Order No.: 41-240671-03	Shipping Manifest : ST046657
	Product Description: CSA G40.21(2004)44W/300W / ASTM A36(05) A709(01A)36/ASME SA36(01ED)		Ship Date: 31 May 11 Cert Date: 31 May 11
	Size: 0.250 X 96.00 X 288.0 (IN)		Cert No: 011125727 (Page 1 of 1)

Tested Pieces				Tensiles					Charpy Impact Tests													
Heat Id	Piece Id	Piece Dimensions	Tst Loc	YS (PSI)	UTS (PSI)	%RA	Elong % 2in 8in	Tst Dir	Average Hardness	Abs. Energy(FTLB)				% Shear				Tst Tmp	Tst Dir	Tst Siz (mm)		
										1	2	3	Avg	1	2	3	Avg				BDWTT Tst %Shr	
NW0915	A22	0.250 X 96.00 (CUT)	L	56000	74000		28	T														
			C	56000	73000		26	T														
NW0916	A20	0.250 X 96.00 (CUT)	L	57000	74000		27	T														
			C	58000	72000		27	T														

Heat Id	Chemical Analysis																ORGN
	C	Mn	P	S	Si	Tot Al	Cu	Ni	Cr	Mo	Ch	V	Ti	B	N		
NW0915	.14	.85	.012	.006	.21	.033	.02	.05	.02	.00	.005	.011	.002	.0000	.0037		CAN
NW0916	.14	.85	.011	.008	.25	.044	.02	.05	.02	.00	.005	.008	.002	.0000	.0038		CAN

MATERIAL MARKED WITH AN ASTERISK IS PRODUCED FROM COIL
 * NW0915 A22 PCES: 25, WGT: 49006

* NW0916

A20

PCES: 5, WGT: 9801

"Conforms with ASME
 Sec II, Part A, 2010 edition,
 2011a addenda"

2012/8/22 S. Nelson

ENCANA
 MATERIAL CONFORMS
 TO CUSTOMER
 SPECIFICATIONS
 AS PER P.O.
 REQUIREMENTS

Name: S. Nelson

Date: 2012/8/22

(C)

Cust Part # :

WE HEREBY CERTIFY THAT THIS MATERIAL
 WAS TESTED IN ACCORDANCE WITH THE
 APPROPRIATE SPECIFICATION

Greg Balsdon

CHECKED BY

Customer Name
NWP INDUSTRIES INC.Customer PO#
708727Shipper No
418748Heat Number
NW0915



EVRAZ

EVRAZ INC. NA

Test Certificate

8250 130th Street, Surrey, BC, V3W 8J9

Form TC1: Revision 1: Date 31 Oct 2000

Customer: VARSTEEL LTD. 330-220 4TH STREET LETHBRIDGE AB T1J4J7			Customer P.O. No.: MH-952526			Mill Order No.: 41-245717-01			Shipping Manifest : ST050522													
			Product Description: CSA G40.21(2004)44W/300W / ASTM A36(05) A709(01A)36/ASME SA36(01ED)						Ship Date: 19 Jun 12 Cert Date: 19 Jun 12		Cert No: 011140097 (Page 1 of 1)											
			Size: 0.250 X 48.00 X 96.00 (IN)																			
Tested Pieces			Tensiles						Charpy Impact Tests													
Heat Id	Piece Id	Piece Dimensions	Tst Loc	YS (PSI)	UTS (PSI)	%RA	Elong % 2in 8in	Tst Dir	Average Hardness	Abs. Energy(FTLB)				% Shear				Tst Temp	Tst Dir	Tst Siz (mm)	BDWTT	
507558	B0119	0.245 X 48.00 (CUT)	L	68000	77000		25	T														
507558	V0118	0.245 X 48.00 (CUT)	C	65000	76000		26	T														
			G	67000	76000		24	T														
			G	74000	77000		25	T														
Chemical Analysis																						
Heat Id	C	Mn	P	S	Si	Tot Al	Ca	Ni	Cr	Mo	Cb	V	Ti	B	N	ORGN						
507558	.05	.80	.009	.002	.27	.030	.30	.11	.10	.04	.024	.001	.020	.0002	.0097	CAN						
MERCURY IS NOT A METALLURGICAL COMPONENT OF THE STEEL AND NO MERCURY WAS INTENTIONALLY ADDED DURING THE MANUFACTURE OF THIS PRODUCT MATERIAL MARKED WITH AN ASTERISK IS PRODUCED FROM COIL * 507558 B0115 PCES: 15, WGT: 4901																						
"Conforms with ASME Sec II, Part A, 2010 edition, 2011a addenda" Oct 16 2012 <i>JD</i>												MATERIAL CONFORMS TO CUSTOMER SPECIFICATIONS AS PER P.O. REQUIREMENTS <i>Structural</i> Name: <i>Encana</i> Date: <i>Oct 16 2012</i>										
Cust Part # :												WE HEREBY CERTIFY THAT THIS MATERIAL WAS TESTED IN ACCORDANCE WITH THE APPROPRIATE SPECIFICATION Greg Balsdon CHECKED BY										



EVRAZ INC. NA

Test Certificate

Form TCI: Revision 1: Date 31 Oct 2000

Customer:
WILKINSON
A DIVISION OF PREMETAL CO INC.
6125 51ST ST. S.E.
CALGARY
AB T2C3V2

Customer P.O. No.: P20117ME001C

Mill Order No.: 41-244124-03

Shipping Manifest: C1031508

Product Description: CSA G40.21(2004)44W/300W / ASTM A36(05)

A709(01A)36/ASME SA36(01ED)

Ship Date: 22 Feb 12
Cert Date: 22 Feb 12
Cert No: 051061366
(Page 1 of 1)

Size: 0.250 X 72.00 X 150.0 (IN)

Tested Pieces

Heat Id	Piece Id	Piece Dimensions	Tst Loc	YS (PSI)	UTS (PSI)	%RA	Elong % 2in 8in	Tst Dir	Average Hardness	Abs. Energy(FTLB)	% Shear	Tst Temp	Tst Dir	Tst Size (mm)	BDVTT Temp %Shear
488386	B0011	0.245 X 72.00 (CUT)	L67000	67000	75000	35	17	T							
488386	B0014	0.308 X 72.00 (CUT)	L62000	62000	73000	45	22	T							
			L66000	66000	75000	43	22	T							
			C60000	60000	72000	46	25	T							

Chemical Analysis

Heat Id	C	Mn	P	S	Si	Al	Cu	Ni	Cr	Mo	Co	V	Ti	B	N	ORGN
488386	0.05	0.73	0.015	0.005	0.25	0.029	0.39	0.12	0.19	0.05	0.024	0.002	0.018	0.001	0.0078	CAN

MERCURY IS NOT A METALLURGICAL COMPONENT OF THE STEEL AND NO MERCURY WAS INTENTIONALLY ADDED DURING THE MANUFACTURE OF THIS PRODUCT
MATERIAL MARKED WITH AN ASTERISK IS PRODUCED FROM COIL
* 488386 B0012 PCS: 43, WGT: 32924

"Conforms with ASME
Sec II, Part A, 2010 edition,
2014a addenda"

60138112
[Signature]

(9) Cust Part # :

WE HEREBY CERTIFY THAT THIS MATERIAL
WAS TESTED IN ACCORDANCE WITH THE
APPROPRIATE SPECIFICATION

Jason Wall
Checked by

ESSAR Steel Alberta Inc.

CUSTOMER/ADDRESS ORDER NUMBER 15157-B8 EXPIRATION DATE 2011/10/26 ORDER DATE 2011/11/28 ORDER NUMBER 251758 ORDER TYPE NO. 105 West Street, Suite 200, Calgary, Alberta T2P 0G6

ALBERTA INDUSTRIAL METALS LTD
4821 - 78TH STREET
RED DEER ALBERTA
T4P 1N5

ALBERTA INDUSTRIAL METALS LTD
7660 49TH AVENUE
CALGARY, ALBERTA
T2P 0G6

CUSTOMER SPECIFICATION
HOT ROLLED STEEL SHEET - HSLA - TO CHEMISTRIES OF CSA G40.21 44W/ASTM A36
(04) (08) - CHEM OF CSA G40.21 38W - STRL 0 - TEMPER ROLLED - RESTRICTED GAUGE
3/4 TOL - TOP SEMI-CRITICAL SURFACE - STANDARD SHADE

SUPPLEMENTARY INSTRUCTIONS
TEST CERT 1: BRADABIN.CA TEST CERT 2: PLATE TEST COUPON:

TEST REPORTS REQUIRED
TEST VETTED RESALE

2000204562 MS
2011/11/21 19:02

MEETS EN 10204:2004 TYPE 3.1
ISO QUALITY AND ENVIRONMENTAL CERTIFICATES AVAILABLE AT WWW.ESSARSTEELALGONA.COM
HEATS INDICATED WITH (+) MADE IN CANADA WITH DOMESTIC AND NORTH AMERICAN MATERIALS

CUSTOMER ITEM 00007 OUR ITEM 002 DIMENSIONS .240 MIN X .72 X COIL

COIL NUMBER 447010000 HEAT-MS PIECES 1 NO. WEIGHT 36020

COIL NUMBER HEAT-MS PIECES NO. WEIGHT

TENSILE TESTS:

HEAT 0138M * SAMPLE * TEST * YIELD TENSILE *
106" GAUGE COND METR DIR KSI KSI
2400 AR 2 79.9 27(20)

HEAT (WT %) C MN P S SI CR NI CU MO AL CB V B
0138M + .17 .86 .012 .008 .02 .02 .04 .00 .031 .019 .060

"Conforms with ASME

Sec II, Part A, 2010 edition,

2013a addenda"

MAIL TEST REPORTS

ESSAR STEEL ALGONA INC. HEREBY CERTIFIES THAT THE MATERIAL HEREIN DESCRIBED WAS MADE AND TESTED IN ACCORDANCE WITH THE RULES OF THE SPECIFICATION SHOWN. ALL RESULTS ARE RETAINED IN ACCORDANCE WITH THE COMPANY'S STANDARD RECORD KEEPING PRACTICES.

K. UGHADPAGA

MANAGER METALLURGICAL SERVICES

THIS MAIL TEST REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF ESSAR STEEL ALGONA INC. IF YOU RECEIVE THIS DOCUMENT AND ARE NOT THE INTENDED RECIPIER, PLEASE CALL (780) 565-3523 FOR INSTRUCTIONS ON METHOD OF DISPOSAL OF DOCUMENT.

WARNING** THE TEST RESULTS AND VALUES REPORTED HEREIN INDICATE ONLY THAT (1) THE PARTICULAR STEEL FOR WHICH THIS CERTIFICATE IS ISSUED MEETS THE MINIMUM SPECIFIED YIELD STRENGTH AND (2) THE CHEMICAL ANALYSIS AND PHYSICAL PROPERTIES OF SUCH STEEL ARE IN CONFORMANCE WITH THE REQUIREMENTS OF THE SPECIFICATION INDICATED. THE RESULTS OR VALUES REPORTED HEREIN CAN NOT BE USED TO QUALIFY THE STEEL FOR ANY SPECIFICATION OTHER THAN THE ONE INDICATED AND CAN NOT BE RELIED UPON FOR ANY PURPOSE (INCLUDING DESIGN OR CALCULATIONS) AS REPRESENTING THE ACTUAL STRENGTH OF SUCH STEEL.

2011/11/20
K. UGHADPAGA

NWP Industries
Job Order Paperwork



GWELD

Order: 08800-A

Item: BRACKET-FG-1
Description: Fuel Gas Vent Header Bracket 1"
Ordered: 40.00
Qty To Mfg: 40.00
Entered: 05/07/13
Delv Req: 05/10/13

Customer: STOCK
Name: STOCK
Customer PO:
Contact:
Parent Order: 08800
Drawing: 100812

OPER	S	WORK CENTER	QTY	SETUP	RUN	START/END	DESCRIPTION	U/M	QTY
------	---	-------------	-----	-------	-----	-----------	-------------	-----	-----

20 G_Weld 40.00 0.00 10.00
G Weld

OPER:

WC:

Structural Welding As Per CSA W47.1 and W59

Employee Identification: _____

MTR _____

Fabrication: _____

Date: _____

Quality: _____

Date: _____

PCL1
Pipe Clamp 1" Fig 212

Each 40.00



Supervisor
Ba to
sign off for QC + #Ba
D

NWP Industries
Job Order Paperwork

CNC

Order: 08800-A

Item: BRACKET-FG-1
Description: Fuel Gas Vent Header Bracket 1"
Ordered: 40.00
Qty To Mfg: 40.00
Entered: 05/07/13
Delv Req: 05/10/13

Customer: STOCK
Name: STOCK
Customer PO:
Contact:
Parent Order: 08800
Drawing: 100812

OPER	S	WORK CENTER	QTY	SETUP	RUN	START/END	DESCRIPTION	U/M	QTY
10		CNC	40.00	0.00	1.33		Shear		
		Plasma/Shear/Brk							

OPER: 
Structural Welding As Per CSA W47.1 and W59

WC: 

Employee Identification: _____

MTR _____

Fabrication: _____

Date: _____

Quality: _____

Date: _____

FLB.25(2)ST
Flat Bar 1/4" x 2" SA36/44W

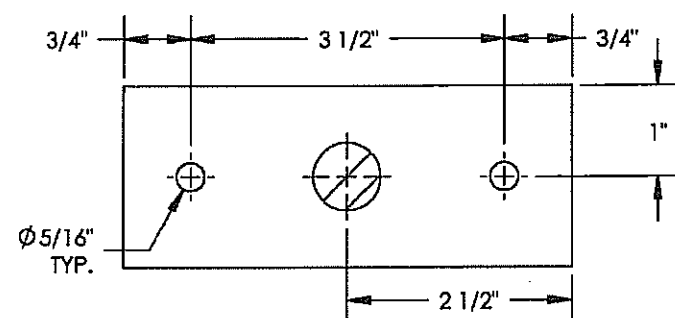
Foot 16.80

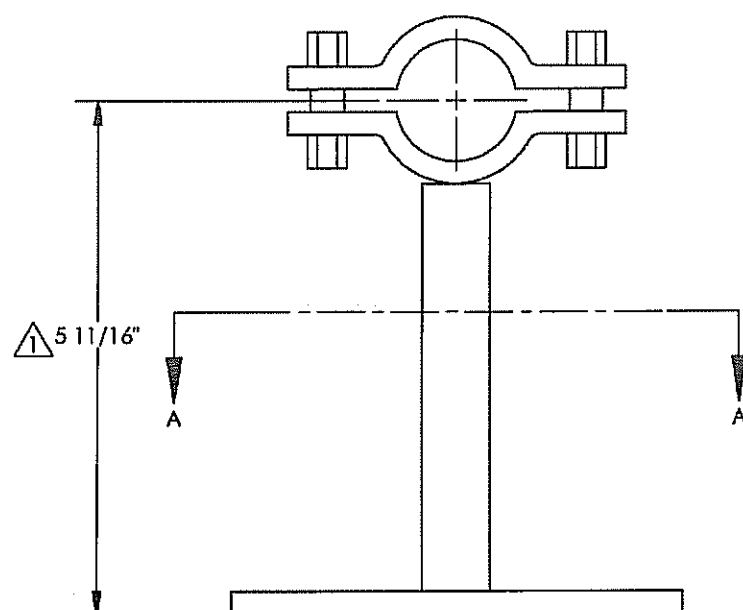
PIP.580C
Pipe 1/2" S/80 SA106B

Foot 13.20



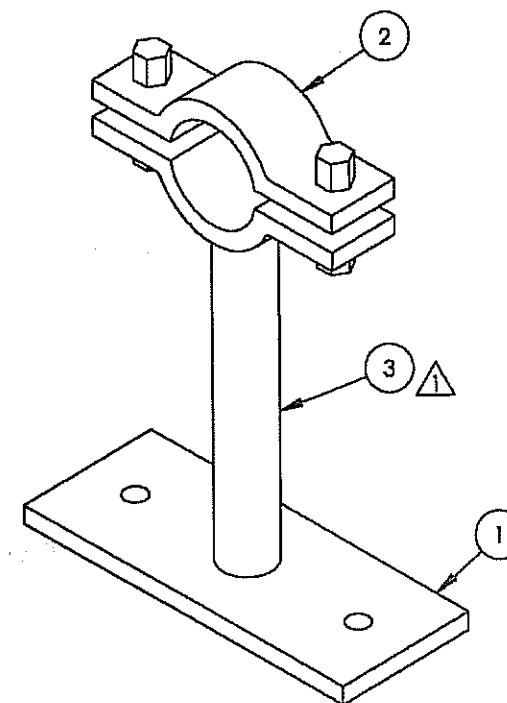


SECTION A-A
SCALE: 1:2



FRONT VIEW
SCALE: 1:2

ITEM	PART #	DESCRIPTION	MTR #	LENGTH	QTY.
1	FLTC2A	FLAT BAR 1/4" x 2" SA36/44W		5"	1
2	PCL1	PIPE CLAMP 1" FIG. 212	147497		1
3	RBRGYA	ROUND BAR 3/4" SA36/44W		4 1/2"	1



ISOMETRIC VIEW
SCALE: 1:2

ORIGINAL

- NOTES**
1. FABRICATE TO CSA W47.1 AND W59.
 2. ALL DIMENSIONS TO HAVE A TOLERANCE OF $\pm 1/8$ " UNLESS OTHERWISE SPECIFIED.
 3. DEBURR AND RADIUS ALL SHARP EDGES.
 4. WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS FC1-15, FC1-10.
 5. ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.

ISSUED FOR CONSTRUCTION		NWP INDUSTRIES INC.		NWP INDUSTRIES INC.	
SIGNED: <i>[Signature]</i>		INDUSTRIES INC.		FUEL GAS VENT HEADER BRACKET	
DATE: MAY 07 2013		Total oilfield supply.		FOR 1" PIPE	
W.D. 0800-A		P.O. BOX 6280, INNISFAIR, AB T4G 1S9		ASSEMBLY DRAWING	
S.O.:		PH: (403) 227-4100 FAX: (403) 227-4102		DWN: JHK	
ALL DIMENSIONS IN INCHES		THIS DRAWING IS PROPERTY OF NWP INDUSTRIES INC. AND MAY NOT BE REPRODUCED WITHOUT PERMISSION. THIS DRAWING MUST BE RETURNED UPON REQUEST.		CHK: KB	
REFERENCE DRAWINGS		DRAWING REVISIONS		APP: DF	
DOCUMENT NO.		DESCRIPTION		DATE: 2011.05.17	
REV		DATE		DATE: 2011.05.17	
BY		CHK		DATE: 2011.05.17	
1		2012.06.21		SCALE: 1:2	
JHK		JHK		SHEET: 1 OF 1	
0		2011.05.17		DWG: BRACKET-FG-1	
JHK		JHK		REV: 1	
KB		KB			
DF		DF			
RFDC #01070 REVISE PIPE TO ROUND BAR					
IFC, DWG CHANGED FROM 100812					

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUL 0 8 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

VT=.156-.160

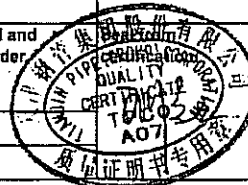
Name: Enlana

Date: JUL 0 8 2013 Licence No.:

No.: C13106523654

		ADD: JINTANG ROAD DONGLI DISTRICT, TIANJIN, CHINA TEL: 86-22-24801139 FAX: 86-22-24801291		TIANJIN PIPE(GROUP) CORPORATION QUALITY CERTIFICATE (EN10204 3.1)																						
Contract No. 2012SSG-CI-12-618		L/C No.		O.D. x W.T. 3/4" x S(26.7 x 3.91mm)		Packing IN LOOSE																				
Order Trans Am Piping Products Ltd.		Product Seamless Steel Line Pipe		Steel grade Gr.6		Total pieces																				
P.O.No. CI-12-618		desti.		Man. Method COLD DRAWN SEAMLESS		Total metres																				
Standard ASTM/ASME A/SA 333-2011				Length range SRL		Total weight																				
Heat No.	Lot No.	Quantity				Delivery condition	Sample No.	Tensile test(Mpa)								Impact test(J)										
		Pieces	Meters	Bundles	Tons			1*	Tem. °C	T.S.	Y.S.	Elong. %	Shrink %	2*	Tem. °C	Size	AK1	shear %	AK2	shear %	AK3	shear %	AVE	shear %		
100400	130					Normalized	130-2-457	A	22	569	R10.5	406	32.0			A	-56°C	10X2.5	25	81	24	82	21	84	23	82
Total						Note: A: L, Full, Lo=50mm		A: V/L, B: V/T																		
Heat No.	Lot No.	Sample No.	Hardness Brinell	Hardness Brinell(HB)(inside)					Hardness Brinell(HB)(middle)					Hardness Brinell(HB)(outside)					NDE	Fla. test(1)	Fla. test(2)					
				1	2	3	4	AVE	1	2	3	4	AVE	1	2	3	4	AVE								
100400	130	130-2-457		154	165	153	154	154	153	152	153	154	153	154	153	154	154	154	154	EMI/L4	G	G				
Heat No.		Chemical composition%(L: Ladle analysis P: Product analysis)																			Hydro. Test (Mpa/s)					
Steel speci.		C	Si	Mn	P	S	Ni	Cr	Mo	Cu	Al	V	Nb	Ti	B	Ca	N	H	O	CE(IW)						
100400		L	0.16	0.29	1.05	0.014	0.003	0.02	0.02	0.01	0.01	0.010	0.01	0.001	0.001	0.0002	0.0004				0.35	17.0/8				
A333 GR 6		P	0.16	0.30	1.05	0.014	0.004	0.03	0.02	0.01	0.02	0.010	0.01	0.001	0.001	0.0001	0.0004				0.35					
		P	0.16	0.30	1.05	0.014	0.004	0.03	0.02	0.01	0.02	0.010	0.01	0.001	0.001	0.0001	0.0004				0.35					
		L																								
		P																								
		P																								
		L																								
		P																								
		P																								
NDE(100%)		Visual and dimension		Hydro. Test		Pipe end NDE		Pipe and bevelling		Residual mag. Test		SSCC		HIC		We hereby state that all pipes are manufactured and inspected according to above standards and order.										
G		G		G		G		G		G						6.6 Ratio										
Note:		1. NACE MR 0175-2009/ISO 15156-2:2009; 2. CE II W=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15; 3. The pipe is produced from "fully killed" steel; 4. Silicon and calcium treated for inclusion morphology control in Steel Melting; Billet produced by TPCO; 5. Heat Treatment Condition For Pipe Normalized: 930°C X 20MIN;																			No. C13106523654		Date 2013-2-8			

Remark: destl.=destination; tem.=temperature; speci.=specification; Man.=Manufacture; Fla.=Flattening; G=Good; Hydro.=Hydrostatic; Mag.=Magnetic



CLIENTE / Customer / Client

Inspection Certificate - Certificat de Réception

DIN EN 10204 / 3.1
ISO 10474 / 3.1



ULTIMA
ULTIMA FORUA, S.COOP.

FINIS

SU PEDIDO N.º
Your Order No.

43

DE
01. - de 10/12/2010

Certified acc. PED 97/23/EC+AD2000-WC
by TÜV Rheinland
N° 01 202 EQ 02 7443

Bº Zubillaga, 3 - Apdo. 14
20560 Oñati (Gipuzkoa) SPAIN
Tel.: 34 - 943 780552
Fax: 34 - 943 781808
E-mail: ulina@ulmapping.com

NORMAS APLICABLES

ASME B16.11-03

Volume Code: N.

06 - de 10/12/2010

Certified acc. PED 97/2
by TÜV Rheinland
Nr. 01 202 E/Q 02 7443

E-mail: ပါးကေဩပါကေဩ@cfpku.org

MATERIAL CORRESPONDIENTE A/SA350LF2CL1-07

ASTM/A SMC

MODE DE FUSION (%)

NACE MR-01-75/ISO15156-2-05 & MR-01-03/03

Steel Making - Elaboration de l'acier
E = Elec. Y = Oxygène basico

DEPARTAMENTO QUALITY ASSURANCE

Deegan's

04102

• Las dimensiones y la cordición superficial se hallaron satisfactorias

- Dimension and surface condition were found acceptable.
- Les dimensions et états de surface sont satisfaisants.
- Los materiales citados cumplen las normas aplicables.
- Manufacturing requirements are satisfied.
- Les normes applicables sont respectées.

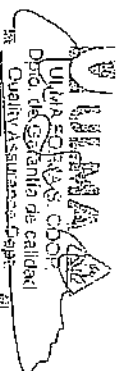
EL INSPECTOR

Words Inspector - L'inspecteur

(1) OBSERVACIONES
Remarks
Observations

NORMALIZED AT 900 C AND ALLOWED TO COOL IN STILL AIR

“Conforms with ASME
Sec II Part A, 2010 edition



Pennwest

MATERIAL CONFORMS

TO CUSTOMER SPECIFICATIONS

APPROVED

By Ceri Steen at 7:38 am, May 02, 2012

Order#: 194649 Seq: 6 PO#: 706464 Heat#: 283v8 Mill: ULMA
Part#: FS .75 6M HP T LF Part Desc: Forged Steel 3/4 (26.7mm O.D.) 6000# (41.4MPa) HEX HEAD PLUG THREADED A/SAS350-LF2 CL1

Heat Number: 348V2
Trans Am Piping Products Ltd.
Shipments/Seq #: S 12 - 1844

2" CL 2500 RTJ BLIND FLANGE
A350-LF2 CL 1

Rev'd By: SB

CLIENTE / Customer / Client

TRANS AM PIPING PRODUCTS LTD.
9335 ENDEAVOR DRIVE S.E.
CALGARY, ALBERTA T3S 0A1
CANADA

CERTIFICADO DE INSPECCION
Inspection Certificate - Certificat de Réception

DIN EN 10204 / 3.1
ISO 10474 / 3.1

FECHA: 04/10/2012
No. 151464

HOJA: 1
Page: 1



ULMA FORJA, S.COOP.

PRODUCTO
Article - Produit

FLANGES

SU PEDIDO N.º
Your Order No.
Votre Cde. N.º

PO# CI-12 - 312

DE
of - de 20/04/2012

Certified acc. PED 97/23/EC+AD2000-WO
by TÜV Rheinland
N.º 01 202 EI Q 02 7443

Bº Zubillaga, 3 - Apdo. 14
20560 OÑATI (Gipuzkoa) SPAIN
Tel.: 34 - 943 780552
Fax: 34 - 943 781808
E-mail: ulma@ulmapiping.com

NORMAS APLICABLES
Requirements - Normes Applicables

ASME B16.5-09

MATERIAL CORRESPONDIENTE ASTM/ASME A/SA105N-11 A/SA350LF2CL1-11 ✓
Material Correspondent - Qualité

MODO DE FUSION (*)
Steel Making - Elaboration de l'acier
E = Elec. Y = Oxígeno básico

NACE MR0175/ISO15156-2-09 & MR0103-10 ✓
Clause 7.2.1.4, Annex A.2 and SSC Region 3.
CSA-Z245.12-09 GR248 CAT II -SS (WN&BLIND FLANGES ONLY)

MARCA DEL FABRICANTE
Mark of factory
Marque du fabricant



Packing List: 96447

DEPARTAMENTO QUALITY ASSURANCE
Section
Département

PARTIDA Item Posto	CANTIDAD Quantity Quantité	DESCRIPCION Description Description	LOTE	OBSERVACIONES Remarks Observations (*)	COLADA N. ^o	RESISTENCIA	LIMITE ELAST.	ALARGAM. Elongation	ESTRICCION	RESILIENCIA		CHARPY V 10x10mm		DUREZA		
					Heat No N. ^o Coude	T.Strength Resist Rupt N/mm2	Y.Strength 0.2 % N/mm2	%	Red. Area Striction %	Impact test Résilience Joules	MEDIA Average Moyenne	°C	Hardness Dureté HBW			
9	39	WN 2 300LB XS/80 RF A350LF2	1071	NE	209M1	537	377	27,30	53,20	75	83	90	83	-50	154	159
9	141	WN 2 300LB XS/80 RF A350LF2	2582	NE	417V2	528	325	25,60	54,00	50	64	58	57	-50	156	161
29	3	BLIND 4 900LB RF A350LF2	2622	NE	417V2	524	322	26,90	56,00	47	62	57	55	-50	154	161
29	7	BLIND 4 900LB RF A350LF2	2622	NE	429V2	512	294	34,20	65,00	48	52	48	49	-50	148	157
38	1	WN 2 1500LB S160 RTJ A350LF2	952	NE	149V2	522	337	28,80	59,70	47	57	52	52	-50	152	156
38	34	WN 2 1500LB S160 RTJ A350LF2	1912	NE	387V2	508	320	31,70	63,50	51	42	47	48	-50	148	158
41	20	WN 4 1500LB S160 RTJ A350LF2	1922	NE	44V2	515	314	34,00	59,10	45	51	46	47	-50	151	158
46	20	BLIND 2 2500LB RTJ A350LF2	2072	NE	348V2	514	313	30,80	63,90	41	51	56	49	-50	150	160

COLADA N.º Heat No N.º Coudée	COMPOSICION QUIMICA - STEEL MAKER'S LADLE ANALYSIS - ANALYSE CHIMIQUE														
	C %	SI %	Mn %	P %	S %	Cr %	NI %	Mo %	Nb %	V %	Cu %	Al %	TI %	N %	CEq %
149V2	0,200	0,200	0,960	0,020	0,009	0,070	0,130	0,050	0,000	0,002	0,350	0,026	0,000	0,000	0,416
209M1	0,150	0,210	1,270	0,012	0,008	0,090	0,090	0,005	0,001	0,070	0,210	0,045	0,000	0,000	0,415
348V2	0,195	0,223	0,940	0,015	0,008	0,100	0,140	0,033	0,000	0,004	0,299	0,022	0,000	0,000	0,408
387V2	0,200	0,280	0,840	0,008	0,002	0,200	0,100	0,040	0,003	0,003	0,170	0,026	0,000	0,000	0,407
417V2	0,207	0,193	0,930	0,012	0,003	0,070	0,140	0,032	0,000	0,004	0,242	0,023	0,000	0,000	0,409
429V2	0,196	0,208	0,960	0,015	0,004	0,090	0,130	0,028	0,000	0,004	0,287	0,024	0,000	0,000	0,408
44V2	0,200	0,210	0,940	0,021	0,005	0,100	0,150	0,040	0,000	0,002	0,400	0,021	0,000	0,000	0,422

4.8 Ratio

- Las dimensiones y la condición superficial se hallaron satisfactorias.
- Dimension and surface condition were found acceptable.
- Les dimensions et états de surface sont satisfaisants.

- Los materiales citados cumplen las normas aplicables.
- Manufacturing requirements are satisfied.
- Les normes applicables sont respectées.

(*) OBSERVACIONES:
Remarks
Observations

N, NORMALIZED AT 900 C AND ALLOWED TO COOL IN STILL AIR

"Conforms with ASME
Sec II, Part A, 2010 edition, XJ
2011a addenda" MAY 31 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EnCana

Date: MAY 31 2013

EL INSPECTOR
Works Inspector - L'inspecteur

ULMA

ULMA FORJA S. COOP.
Dpto. de Garantía de calidad
Quality Assurance Dept.

APPROVED
By Ceri Steen at 6:45 am, May 08, 2012

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Encana

MILL TEST & INSPECTION CERTIFICATE

ACCORDING TO EN 10204 : 2004 3.1

CUSTOMER : TRANS AM
CERT. NO : 120703
ORDER NO : 7004918
INVOICE NO : BW0110010052
L/C NO :
DATE : 03/16/2012
PAGE : 12 ORIGIN : TAIWAN



拾得鐵工股份有限公司
高雄市仁武區烏林里仁心路 303 號
BOTH-WEEL STEEL FITTINGS CO., LTD.
NO. 303, JEN-HSIN ROAD JEN-WU DISTRICT
KAOHSIUNG CITY, TAIWAN R.O.C. (81460)
TEL: 886-7-871-0497, 871-1536, 872-0260 FAX: 886-7-371-3864, 371-3882
Web site: <http://www.bothwell.com.tw> e-mail: bothwell@bothwell.com.tw

An ISO 9001:2008 Registered Manufacturer

ISO 9001
BUREAU VERITAS
Certification
No. TW170820

BUREAU VERITAS
1828

ANAB
CERTIFIED

ITEM	BW HT. CD.	RAW MATERIAL HEAT NO.	DESCRIPTION	QUANTITY	SPECIFICATION FOR		INSPECTION	
					MATERIAL	FITTING	SURFACE	DIM
044	3542	320882	90D ELBOW 1.1/2" 6000# NPT		ASTM A105N -05	ASME B16.11 - 2009	GOOD	GOOD
045	3694	324967	90D ELBOW 2" 6000# NPT		ASME SA105N -A08			
046	3651	324003	TEE 1/2" 6000# NPT					
047	3676	324353	TEE 3/4" 6000# NPT					
047	3693	325194	TEE 3/4" 6000# NPT					

ITEM	BW HT. CD.	CHEMICAL COMPOSITION (%)																MATERIAL SUPPLIER	
		C	Si	Mn	P	S	Cu	Cr	Ni	Mo	V	Co(Nb)	N	Al	Ti	Zr	CE		
Max		0.350	0.350	1.050	0.035	0.040	0.400	0.300	0.400	0.120	0.080	-	-	-	-	-	-	0.430	MATERIAL SUPPLIER
044	3542	0.200	0.210	0.840	0.018	0.011	0.190	0.080	0.070	0.020	0.002	0.001	-	-	-	-	-	0.378	
045	3694	0.200	0.190	0.860	0.016	0.010	0.130	0.070	0.040	0.010	0.002	0.001	-	-	-	-	-	0.371	
046	3651	0.210	0.200	0.820	0.013	0.009	0.100	0.080	0.050	0.020	0.002	0.001	-	-	-	-	-	0.377	
047	3676	0.190	0.200	0.830	0.018	0.011	0.160	0.130	0.060	0.010	0.002	0.001	-	-	-	-	-	0.371	
047	3693	0.190	0.190	0.800	0.014	0.009	0.200	0.070	0.050	0.010	0.002	0.001	-	-	-	-	-	0.356	
ITEM	BW HT. CD.	MECHANICAL PROPERTIES																HEAT TREATMENT	ADDITIONAL TEST / REMARKS
		T. S. (KSI)	Y. S. (KSI)	EL. (%)	R of A (%)	Hardness (HB)(AVG)	Charpy Impact Ft / 0 °C												
		70.0	36.0	22.0	30.0	-	1	2	3	AVG.									
Min																			NORMALIZED
Max																			
044	3542	74.5	50.7	33.4	64.5	143 143													
045	3694	75.7	54.6	35.0	67.3	141 141													
046	3651	73.5	53.4	36.0	67.3	141 141												860°C A.C.	
047	3676	75.3	52.0	35.6	63.6	141 141													
047	3693	75.1	53.6	35.6	65.5	144 144													

WE HEREBY CERTIFY, THAT THE MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE TERMS OF THE ORDER CONTRACT.

BW-D0839 REV:1

"Conforms with ASME
2011a addenda"

C.C. Huang
O.C. MANAGER
CHEN CHI HUANG

Y.Y. Qian
INSPECTOR
YUAN YAO CHANG

3" CL 3000 FS SCRD TEE A105N
Heat Number: 409A1
Trans Am Piping Products Ltd.
Shipments/Seq #: 9

CLIENTE / Customer / Client

TRANS AM PIPING PRODUCTS LTD.
9335 ENDEAVOR DRIVE S.E.
CALGARY, ALBERTA T3S 0A1
CANADA

CERTIFICADO DE INSPECCION
Inspection Certificate - Certificat de Réception

DIN EN 10204 / 3.1
ISO 10474 / 3.1

FECHA:
Date:

13/03/2012

N.º
No.

146536

HOJA:
Page:

1



ULMA FORJAS, S.COOP.

PRODUCTO
Article - Produit

FITTING

SU PEDIDO N.º

Your Order No. PO# CI-11 - 686

DE

of. - de 01/12/2011

Certified acc. PED 97/23/EC+AD2000-W0
by TÜV Rheinland
N.º 01 202 EQ 02 7443

Bº Zubillaga, 3 - Apdo. 14
20560 ONATI (Gipuzkoa) SPAIN
Tel.: 34 - 943 780552
Fax: 34 - 943 781808
E-mail: ulma@ulmapiping.com

NORMAS APLICABLES
Requirements - Normes Applicables

ASME B16.11-09

MATERIAL CORRESPONDIENTE
Material Correspondent - Qualité

ASTMA105N-10
ASME SA105N-10

MODO DE FUSION (*)
Steel Making - Elaboration de l'acier
E = Elec. Y = Oxígeno básico

NACE MR-01-75/ISO15156-2-09 & MR-01-03/10 ✓

MARCA DEL FABRICANTE
Mark of factory
Marque du fabricant



91537

DEPARTAMENTO
Socion
Département

QUALITY ASSURANCE

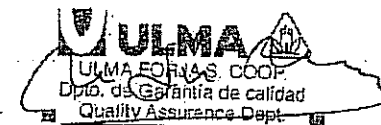
PARTIDA Item Poste	CANTIDAD Quantity Quantité	DESCRIPCION Description Description	OBSERVACIONES Remarks Observations (*)	COLADA N.º Heat No. N.º Coulée	RESISTENCIA T.Strength Resist Rupt N/mm2	LONGITUDINAL Y.Strength 0.2 % N/mm2	ALARGAM. Elongation Alongement Lo: 4 d %	ESTRICCION Red. Area Striction %	RESILIENCIA Impact test Résilience Joules	PROBETA: 150x75x10		DUREZA Hardness Dureté HB
										MEDIA Average Moyenne	°C	
5- 8		CODO 90 2.1/2 3000LB NPT A105N TE 3 3000LB NPT A105N ✓	NE NE	466A1 409A1	✓ 517 ✓ 516	✓ 312 ✓ 320	✓ 29,80 ✓ 31,20	55,30 58,40				151 158 150 158

COLADA N.º Heat No. N.º Coulée	COMPOSICION QUIMICA - STEEL MAKER'S LADLE ANALYSIS - ANALYSE CHIMIQUE														
	C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	Nb %	V %	Cu %	Al %	Ti %	N %	CEq %
409A1	0,200	0,300	0,840	0,007	0,001	0,130	0,090	0,050	0,001	0,002	0,240	0,042	0,000	0,000	0,398
466A1	0,190	0,280	0,900	0,008	0,001	0,150	0,140	0,070	0,001	0,002	0,300	0,028	0,000	0,000	0,414

- Las dimensiones y la condición superficial se hallaron satisfactorias.
- Dimension and surface condition were found acceptable.
- Les dimensions et états de surface sont satisfaisants.

- Los materiales citados cumplen las normas aplicables.
- Manufacturing requirements are satisfied.
- Les normes applicables sont respectées.

EL INSPECTOR
Works Inspector - L'Inspecteur



(*) OBSERVACIONES:
Remarks
Observations

N_NORMALIZED AT 900 C AND ALLOWED TO COOL IN STILL AIR

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EnCana

Date: MAY 08 2013

"Conforms with ASME
Sec II, Part A, 2010 edition
2011a addenda" *EF*

MAY 08 2013

2" CL 2500 BLIND FLGE FULL
FACE C/W SOLID HUB
A350-LF2 CL1
DRILL AND TAP 3/4" RECESSED NPT ON

Heat Number: 4510819
Trans Am Piping Products Ltd.
P.O./Seq #: EL 13
CENTER & RTJ

Rev'd By: JES
8104



SAN ENG STEEL FORGING CO LTD
311, Jen Hsin Road, Jen Wu District
Kaohsiung, Taiwan, R.O.C.
TEL: 07-3724249; FAX: 07-3712923
URL: www.saneng.com.tw
e-mail: saneng@ksts.sead.net.tw

MILL TEST CERTIFICATE

EN10204-3.1.B/DIN5049/3.1.B)

Customer: TRANS AM PIPING PRODUCTS LTD.

Order No.: 7005689/5-T/A

Certificate No.: SE-5889E

Date: 10/29/2012

Page: 1 OF 1

PRODUCT		MATERIAL SPECIFICATIONS										DIMENSIONAL SPECIFICATIONS									
FORGED CARBON STEEL FLANGES		ASTM A350 LF2-11 CL.1/ASME SA350 LF2-11 CL.1										ASME B16.5-09 CSA Z245.12									
Item No.	CODE NO	DESCRIPTION	QUANTITY	CHEMICAL COMPOSITION (%)																CE(%)	
				C	Si	Mn	P	S	Cu	Cr	Ni	Mo	V	Nb	N						
				Min	0.300	0.150	0.600	0.035	0.040	0.400	0.300	0.400	0.120	0.080	0.020						
			Max	0.300	0.300	1.350	0.035	0.040	0.400	0.300	0.400	0.120	0.080	0.020							
1		800 WNRF S120 12" LF2	8 PCE	0.210	0.180	1.140	0.015	0.005	0.130	0.090	0.060	0.010	0.002	0.002	0.005			0.433			
2		2500 HUB BLFF(FULL FACE)2" LF2	20 PCE	0.210	0.180	1.130	0.019	0.008	0.008	0.010	0.010	0.002	0.005	0.001	0.007			0.403			
3		900/1500 THRF 1" LF2	7 PCE	0.200	0.200	1.000	0.007	0.012	0.120	0.070	0.070	0.005	0.003	0.005	0.009			0.395			
4		150 SWRF S160 3/4" LF2	25 PCE	0.200	0.210	1.250	0.022	0.006	0.150	0.060	0.050	0.011	0.012	0.002	0.008			0.438			
5		150 SWRF XXS 1/2" LF2	5 PCE	0.200	0.220	1.100	0.012	0.004	0.150	0.080	0.060	0.012	0.009	0.001	0.011			0.418			
6		900/1500 SWRF XXS 1 1/2" LF2	10 PCE	0.209	0.220	1.020	0.014	0.008	0.008	0.012	0.054	0.002	0.005	0.005	0.008			0.387			
7		900 WNRTJ XS 6" LF2	8 PCE	0.220	0.220	1.170	0.017	0.002	0.008	0.020	0.010	0.002	0.004	0.001	0.007			0.421			
8		900 WNRTJ S120 6" LF2	8 PCE	0.220	0.220	1.170	0.017	0.002	0.008	0.020	0.010	0.002	0.004	0.001	0.007			0.421			
9		900/1500 WNRTJ S160 1 1/2" LF2	25 PCE	0.222	0.240	1.010	0.015	0.014	0.022	0.063	0.122	0.009	0.016	0.005	0.003			0.417			
10		1500 BLRTJ 10" LF2	5 PCE	0.200	0.210	1.130	0.018	0.003	0.200	0.130	0.070	0.030	0.010	0.002	0.007			0.440			

Item No.	Heat No.	T.S.(*) (MPA)	Y.S.(*) (MPA)	E.L.(*) (%)	Hardness (HB)	R.A.(*) (%)	Impact Test Temp: -46°C Minimum: 20.0 Joule			Material Supplier	HEAT TREATMENT(*) ☒ N	REMARKS
							1	2	3			
1	198658	525.6	361.9	34.4	154/151	70.4	74.0	81.0	60.0	SEAH BESTEEL		890°CX3HRS CONFORMS WITH NACE MR0103-10 AND NACE MR0175/ISO15156.2-09 CONFORMS WITH Z245.12 CAT II GR.248 SOUR SERVICE-09(FOR USE AS WELDING NECK AND BLIND FLANGES ONLY) TEST SPECIMEN SIZE: 10X10 TEST SPECIMEN ORIENTATION: TRANSVERSE IMPACT TEST TEMP.: -46°C 5.3 Ratio
2	4510819	562.0	408.0	74.6	163/160	32.0	93.0	107.0	45.0	ACOMINAS		
3	10939	489.2	296.2	40.0	153/150	57.7	25.0	29.0	21.0	OEMK		
4	83752	553.1	391.3	34.8	158/155	70.4	57.0	28.0	98.0	WEI CHIH STEEL		
5	82004	531.5	367.4	32.6	155/152	70.4	88.0	88.0	64.0	WEI CHIH STEEL		
6	921027	511.9	343.2	32.6	155/163	88.0	32.0	67.0	28.0	NTMK		
7	4417687	529.6	365.8	38.8	153/152	71.3	70.0	45.0	43.0	ACOMINAS		
8	4417687	529.6	365.8	38.8	153/162	71.3	70.0	45.0	43.0	ACOMINAS		
9	931232	517.8	339.3	32.2	157/154	64.0	35.0	38.0	27.0	NTMK		
10	802893	543.0	378.0	38.0	155/153	70.4	105.0	100.0	73.0	SEAH BESTEEL		

*1: T.S. = Tensile Strength, Y.S.=Yield Strength, E.L.=Elongation, R.A.=Reduction of Area.
*2: N=Normalized, A=Annealed, Q=Quenched, T=Tempered, S.T=Solution Treated, S.R=Stress Relieved,
A.C=Air Cooled, F.C=Furnace Cooled, W.C=Water Cooled, O.C=Oil Cooled.
*3: C.E. Value = C + (Mn/16) + (Cr + Mo + V) / 5 + (Ni + Cu) / 15

We hereby certify that the material has been tested in accordance with the above specification and
also with the requirements called for by the above order.

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Manager of Quality Assurance Dept

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUN 1 0 2013

Name: _____
Date: JUN 1 0 2013



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CERTIFIED MILL TEST REPORT

LOG NO. F00000000018035

Page 6 of 12

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330
(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4808

www.bonneyforge.com

CUSTOMER: CCTF CORPORATION

CUSTOMER

ORDER NO.: 4029307-00

SHIP TO: CCTF CORPORATION (OAKVILLE)

1387 CORNWALL ROAD
OAKVILLE ON L6J 7T5
Canada

DATE 08/17/2011

BONNEY ORDER NO. B000102444

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

7/2 Apr 19.12

Name:

7/2 Apr 19.12

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:
23		4677	11/2 6000 A105N UNAR T	SA/A105N
7527136		NUT	Al 0.023 C 0.195 Cr 0.140 Cu 0.190 Mn 0.990 Mo 0.040 N 0.010 Nb 0.020 Ni 0.110 P 0.012 S 0.020 Si 0.260 V 0.002 CE(Long Formula) = 0.42 T/S(PSI) 78,750 Y/S(PSI) 46,875 EL(%) 32.60 RA(%) 62.05 Brinell 147 BHN 150 BHN	
7527136		4896	11/2 6000 A105N UNAR T	SA/A105N
		FEMALE	Al 0.022 C 0.210 Co 0.004 Cr 0.040 Cu 0.180 Mn 1.050 Mo 0.010 Nb 0.014 Ni 0.040 P 0.009 S 0.020 Si 0.200 V 0.004 CE(Long Formula) = 0.41 T/S(PSI) 75,000 Y/S(PSI) 52,500 EL(%) 30.95 RA(%) 63.25 Brinell 139 BHN 132 BHN	
23	9	4745	11/2 6000 A105N UNAR T	SA/A105N
7527136		MALE	Al 0.021 C 0.210 Co 0.000 Cr 0.050 Cu 0.180 Mn 1.010 Mo 0.010 N 0.006 Nb 0.012 Ni 0.040 P 0.007 S 0.023 Si 0.190 V 0.003 CE(Long Formula) = 0.41 T/S(PSI) 70,625 Y/S(PSI) 45,500 EL(%) 31.75 RA(%) 63.75 Brinell 135 BHN 132 BHN	
26		58343	2 3000 A105N TEE S	SA/A105N
7525869			Al 0.019 C 0.200 Co 0.003 Cr 0.030 Cu 0.130 Mn 1.050 Mo 0.020 N 0.006 Nb 0.014 Ni 0.050 P 0.007 S 0.022 Si 0.180 V 0.004 CE(Long Formula) = 0.40 T/S(PSI) 74,121 Y/S(PSI) 51,508 EL(%) 31.05 RA(%) 61.61 Brinell 132 BHN 132 BHN	

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by Meloney Specht
Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



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LOG NO. F00000000018035

Page 12 of 12

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14486 CROGHAN PIKE • MOUNT UNION, PA 17066-0330
(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4806

www.bonneyforge.com

CUSTOMER: CCTF CORPORATION

DATE 08/17/2011

CUSTOMER

ORDER NO.: 4029307-00

BONNEY ORDER NO. B000102444

SHIP TO: CCTF CORPORATION (OAKVILLE)
1387 CORNWALL ROAD
OAKVILLE ON L6J 7T5
Canada

ITEM QUANTITY LOT NO.

GRADE OR SPECIFICATION NO.

CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
3. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
4. CERTIFYING ASTM A105-10 / ASME SA105-10 EDITION.
5. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
6. THE MATERIAL SUPPLIED IDENTIFIED AS SA/A105-QT WAS QUENCHED AND TEMPERED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
7. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

CMTR: REV2

by

Meloney Specht

Meloney Specht
QUALITY PROCESS MANAGER

08214-001

Order#: 130652 Seq: 8 PO#: 701782 Heat#: 4875/4644/4391 Mill: Bonney Forge
 Part#: FS 1 6M U T 5 Part Desc: Forged Steel 1 (33.4mm O.D.) 6000# (41.4MPa) UNION THREADED A/SA105N
CERTIFIED MILL TEST REPORT



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LOG NO. F00000000015006

Page 2 of 4

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17056-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: COMCO PIPE & SUPPLY (PUSLINCH)

DATE 05/26/2011

CUSTOMER

BONNEY ORDER NO. B000096024

ORDER NO.: G1-2341

SHIP TO: COMCO PIPE & SUPPLY (PUSLINCH)

14 KERR CRESCENT

PUSLINCH ON NOB 2JO

Canada

"Conforms with ASME
 Sec II, Part A, 2010 edition"

8011a addenda

Jan 31/2

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS	PHYSICAL PROPERTIES	REMARKS
------	----------	---------	----------------------------	-------------------	---------------------	---------

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS	PHYSICAL PROPERTIES	REMARKS
24	25	4644	1 6M A105N UNAR T	SA/A105N		
		MALE		Al 0.025 C 0.200 Co 0.000 Cr 0.030 Cu 0.070 Mn 1.040 Mo 0.010		
				N 0.003 Nb 0.013 Ni 0.020 P 0.007 S 0.025 Si 0.220 V 0.004		
				CE(Long Formula) = 0.39		
				T/S(Psi) 71,250 Y/S(Psi) 50,625 EL(%) 32.05 RA(%) 57.00		
				Brinell 130 BHN 132 BHN		

Shell Canada

PARAMOUNT
 MATERIAL CONFORMS
 TO CUSTOMER
 SPECIFICATIONS
 AS PER P.O.
 REQUIREMENTS

Name: Roy L. SmithDate: Jul 13/11

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS	PHYSICAL PROPERTIES	REMARKS
		4169	1 6M A105N UNAR T	SA/A105N		
		FEMALE		Al 0.028 C 0.200 Co 0.002 Cr 0.030 Cu 0.040 Mn 1.100 Mo 0.010 Nb 0.015		
				Ni 0.010 P 0.008 S 0.020 Si 0.230 V 0.000		
				CE(Long Formula) = 0.39		
				T/S(Psi) 74,885 Y/S(Psi) 48,904 EL(%) 33.50 RA(%) 65.60		
				Brinell 139 BHN 139 BHN		

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS	PHYSICAL PROPERTIES	REMARKS
		4391	1 6M A105N UNAR T	SA/A105N		
		FEMALE		Al 0.028 C 0.200 Co 0.004 Cr 0.040 Cu 0.110 Mn 1.040 Mo 0.020 Nb 0.014		
				Ni 0.040 P 0.009 S 0.018 Si 0.230 V 0.001		
				CE(Long Formula) = 0.40		
				T/S(Psi) 75,000 Y/S(Psi) 52,500 EL(%) 32.20 RA(%) 61.55		
				Brinell 130 BHN 130 BHN		



ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS	PHYSICAL PROPERTIES	REMARKS
		4875	1 6M A105N UNAR T	SA/A105N		
		NUT		Al 0.024 C 0.185 Co 0.000 Cr 0.120 Cu 0.120 Mn 0.970 Mo 0.030 N 0.008		
				Nb 0.000 Ni 0.100 P 0.010 S 0.024 Si 0.250 V 0.002		
				CE(Long Formula) = 0.39		
				T/S(Psi) 72,500 Y/S(Psi) 50,000 EL(%) 32.55 RA(%) 64.45		
				Brinell 135 BHN 135 BHN		

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Kylee Ruiz

Kylee Ruiz
 QUALITY PROCESS MANAGER

CMTR: REV2

Order#: 130652 Seq: 8 PO#: 701782 Heat#: 4875/4644/4391 Mill: Bonney Forge
Part#: FS 1 6M U T 5 Part Desc: Forged Steel 1 (33.4mm O.D.) 6000# (41.4MPa) UNION THREADED A/SA105N

CERTIFIED MILL TEST REPORT



The Best Value -
Price, Quality, Service
All The Time.

LOG NO. F00000000015006

Page 4 of 4

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: COMCO PIPE & SUPPLY (PUSLINCH)

DATE 05/26/2011

CUSTOMER

BONNEY ORDER NO. B000096024

ORDER NO.: G1-2341

SHIP TO: COMCO PIPE & SUPPLY (PUSLINCH)

14 KERR CRESCENT

PUSLINCH ON NOB 210

Canada

Rec'd JUL 13/11
"Conforms with ASME

Sec II, Part A, 2010 edition" *2011a addenda*

CO Jan 3.12

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS
------	----------	---------	----------------------------	---

4870

1 1/2 3M A105N UNAR T

SA/A105N

NUT-HD

AI 0.025 C 0.200 Co 0.000 Cr 0.140 Cu 0.140 Mn 0.980 Mo 0.050 Nb 0.000

Ni 0.100 P 0.013 S 0.020 Si 0.250 V 0.002

CE(Long Formula) = 0.42

T/S(PSI) 75,000 Y/S(PSI) 48,375 EL(%) 28.45 RA(%) 62.56

Brinell

135 BHN

135 BHN

PERMANENT
MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

4811

3/4X1/2 3M/6M A105N/GALV HXBU

SA/A105N

AI 0.025 C 0.200 Co 0.004 Cr 0.090 Cu 0.170 Mn 0.990 Mo 0.010 N 0.004

Nb 0.013 Ni 0.040 P 0.014 S 0.017 Si 0.200 V 0.004

CE(Long Formula) = 0.40

T/S(PSI) 74,375 Y/S(PSI) 51,875 EL(%) 33.05 RA(%) 65.40

Brinell

137 BHN

139 BHN

Name: *COMCO*

Date: *JUL 13/11*

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.

2. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.

3. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.

4. CERTIFYING ASTM A105-09 / ASME SA105-07 EDITION.

5. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)

6. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE IN REPORTED IN PSI.

7. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

ENCANA

MATERIAL CONFORMS TO CUSTOMER SPEC

By ceris at 9:08:36 AM, 4/3/2012

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Kylee Ruiz

Kylee Ruiz

QUALITY PROCESS MANAGER

CMTR: REV2

HT # 4391	C	Mn	Cr	Mo	Ni	Cu	V
	Carbon	Manganese	Chromium	Molybdenum	Nickel	Copper	Vanadium
Fill in Product Analysis from MTR's	0.2	1.04	0.04	0.02	0.04	0.11	0.001

		Mn	C	Standard	Ratio
Do Not Fill in these Numbers	Ratio	Mn/C	1.04	0.2 >3.00	Ratio
					Ratio

	C	Mn	Cr	Mo	V	Ni	Cu
Do Not Fill in these Numbers	0.2	1.04	0.04	0.02	0.001	0.04	0.11

CE=C+(Mn/6)+((Cr+Mo+V)/5)+((Ni+Cu)/15)	CE	Ratio	Ratio
Do Not Fill in these Numbers	Standard	<45	Ratio

HT # 4875	C	Mn	Cr	Mo	Ni	Cu	V
	Carbon	Manganese	Chromium	Molybdenum	Nickel	Copper	Vanadium
Fill in Product Analysis from MTR's	0.185	0.97	0.12	0.03	0.1	0.12	0.002

		Mn	C	Standard	Ratio
Do Not Fill in these Numbers	Ratio	Mn/C	0.97	0.185 > 3.00	7.132/3.22

	C	Mn	Cr	Mo	V	Ni	Cu
Do Not Fill in these Numbers	0.185	0.97	0.12	0.03	0.002	0.1	0.12

CE=C+(Mn/6)+((Cr+Mo+V)/5)+((Ni+Cu)/15)		Standard	< 45
Do Not Fill in these Numbers			

HT # 4870	C	Mn	Cr	Mo	Ni	Cu	V
	Carbon	Manganese	Chromium	Molybdenum	Nickel	Copper	Vanadium
Fill in Product Analysis from MTR's	0.2	0.98	0.14	0.05	0.1	0.14	0.002

Do Not Fill in these Numbers						
C	Mn	Cr	Mo	V	Ni	Cu
0.2	0.98	0.14	0.05	0.002	0.1	0.14

$CE = C + (Mn/6) + ((Cr+Mo+V)/5) + ((Ni+Cu)/15)$	Standard	<45
Do Not Fill in these Numbers		

JD Jan 6.12
"Conforms with ASME
Sec II, Part A, 2010 edition"
Zolla addenda

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Encana

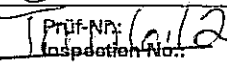
BENTELER 

Stahl/Rohr

Name: 

DEUTSCHES VERZEUGNIS EN 10204-3.1
SPECTRON CERTIFICATE EN 10204-3.1
CERTIFICATE RECEPTION EN 10204-3.1
V.10204:2005-01

Dokument-Nr.: 41-502692/001/P
Document No.:
No. du document:

Date: 
Prüf-Nr.:
Inspection No.:
No. du certificat:

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Kunden-Bestell-Nr.: 08-5860 / 106288
Purchase Order No.:
No. de commande du client:

Hersteller: Warmrohrwerk/Zieherei
Manufacturer: ISO/TS 16949 (ISO 9001) DNV CERT-11674A-2003
Producteur: PED 97/23/EC TÜV CERT 07-202-5635 WZ-0606/07

Benteler Auftrags-Nr.: 1532236
Benteler Order No.:
No. de commande Benteler:

Herstellerzeichen: 
Manufacturer's brand:
Marque du producteur:

Versandanzeigen-Nr.: 4138184
Dispatch Note No.:
No. d'avis d'expédition:

Stempel des Abnahmebeauftragten: WA
Stamp of the inspection representative:
Timbre du contrôleur:

Produkt: NAHTLOSE STAHLROHRE
Product: SEAMLESS STEEL TUBES
Produit: TUBES D'ACIER SANS SOUDURE

Stahlschmelzungsverfahren: ELEKTROSTAHL
Steelmaking process: ELECTRIC FURNACE
Procédé d'élaboration de l'acier: FOUR ELECTRIQUE

Lieferbedingungen:

ASME SA-333-CD, ASME Section II Part A Edition 2007, ASTM-A 333-2005-CD, CSA Standard Z245.1-07

Terms of delivery:

Category II, with agreed deviation: Pt. 9: Eddy current testing instead of hydrostatic test, NACE ✓

Conditions de livraison:

MR0175/ISO 15156-1:2001 NACE MR0175/ISO 15156-2:2003

Maße - Toleranzen:

ASME B36.10M-2004, ASME SA-999, ASME Section II Part A Edition 2007, ASTM-A 999-2004a

Dimensions-tolerances:

Dimensions-tolérances:

Stahlsorte:

GRADE 1, GRADE 290, GRADE 6

Steel grade:

Qualité d'acier:

Lieferzustand:

Normalized

Delivery condition:

État de livraison:

Produktkennzeichnung:

FS: BENTELER Z.245.1 -07- except section 9 - A/SA333 1/6/290.CAT II CATEGORIE 2HEAT-NO. NDE

Product marking:

M45C S HN DIMENSIONS SCHEDULE 2408 WA GERMANY P.O. 106288

Marquage du produit:

EZ = Ätztintenbeschriftung, Etching ink marking, Gravure à l'encre FK = Farbkennzeichnung, colour marking, marquage par couleur FS = Farbschablonierung, paint stencilling, marquage par peinture FSD = Farbstrahlprüfer, Colour jet printer, Imprimante à jet d'encre de c
S = Längsschablonierung, longitudinal stencilling, marquage longitudinal par peinture PKE = Etikettenkennzeichnung, tag marking, marquage sur étiquette PS = Prägestempel, die stamp, marquage par poinçonnage TS = Tintenstrahlkennzeichnung, Ink jet spray marking,
nprimante à jet d'encre

Intel: 49.5254.13666
stfau:
043 Paderborn,
alschne:
+49.5254.13666 Fax: +49.5254.13666

BNAMERPRÜFZEUGNIS EN 10204-3.1
SPECTION CERTIFICATE EN 10204-3.1
CERTIFICATE DE RECEPTION EN 10204-3.1

Dokument-Nr.: 41-502692/001/P
Document No.:
No. du document:

Prüf-Nr.:
Inspection No.:
No. du certificat:

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Page:
Page:

Pos.	Stück	Maße	Länge	Gewicht	Schmelzen-Nr.	Prüfdruck	Rohr-Nr.-Gruppe	Vielfachlängen
Item	Quantité	Dimensions	Length	Weight	Heat No.	Test pressure	Tube number group	Multiple lengths
Poste	Nombr	Dimensions	Longueur	Poids	No. de coulée	Pression d'épreuve	Série de no. des tubes	Longueurs multiples
		feet	feet	lbs				
002	412	1/4" NPS * Sched. 80 18 FT - 22 FT	8110,24	4273	549656			

Schmelzenanalyse [%] / Heat analysis [%] / Analyse sur coulée [%]

Pos.	Schmelzen-Nr.	C	SI	MN	P	S	CR	MO	NI	CU	V	NB	TI	B
Item	Heat No.													
Poste	No. de coulée													
002	549656	0,130	0,190	0,84	0,011	0,005	0,15	0,04	0,12	0,17	0,003	0,001	0,002	0,0001

Formel: $CE_{IIW} = C + (Mn/6) + ((Cr+Mo+V)/5) + ((Cu+Ni)/15) \leq 0,42 \%$
Formel: $CEV = C + F * ((Mn/6) + (Si/24) + (Cu/15) + (Ni/20) + ((Cr+Mo+V+Ni)/5) + (5*B)) \leq 0,40$
Formel: $Mn/C \geq 3/1$
Formel: $Cr+Cu+Mo+Ni+V \leq 1,00 \%$

Formelergbnisse / Formula results / Résultats des formules

Pos.	Schmelzen-Nr	1. Formel	2. Formel	3. Formel	4. Formel
Item	Heat No.	1. Formula	2. Formula	3. Formula	4. Formula
Poste	No. de coulée	1. Formule	2. Formule	3. Formule	4. Formule
0002	549656	0,294	0,328	6,462	0,483

Produktanalyse [%] / Product analysis [%] / Analyse sur produit [%]

Pos.	Schmelzen-Nr.	C	SI	MN	P	S	CR	MO	NI	CU	V	NB	TI	B
Item	Heat No.													
Poste	No. de coulée													
0002	549656	0,140	0,190	0,84	0,009	0,004	0,15	0,04	0,12	0,19	0,003	0,003	0,002	0,0003

Formel: $CE_{IIW} = C + (Mn/6) + ((Cr+Mo+V)/5) + ((Cu+Ni)/15) \leq 0,42 \%$
Formel: $CEV = C + F * ((Mn/6) + (Si/24) + (Cu/15) + (Ni/20) + ((Cr+Mo+V+Ni)/5) + (5*B)) \leq 0,40$
Formel: $Mn/C \geq 3/1$
Formel: $Cr+Cu+Mo+Ni+V \leq 1,00 \%$

Benteler Stahlrohr GmbH
Postfach
1043 Petersborn
Südwestfalen
Telefon +49 5254 13666
Fax +49 5254 13666

BENTELER 

Stahl/Rohr

BNATMEPRÜFZEUGNIS EN 10204-3.1

INSPECTION CERTIFICATE EN 10204-3.1

CERTIFICAT DE RÉCEPTION EN 10204-3.1

Dokument-Nr.:

41-502692/001/P

Document No.:

No. du document:

Prüf-Nr.:

Inspection No.:

No. du certificat:

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Ugversuch Vollprobe / Tensile test Full section test specimen / Essai de traction Eprouvette a section complete

Pos. Item Poste	Proben-Nr. Specimen No. No. de l'éprouvette	Schmelzen-Nr. Heat No. No. de coulée	Probenabmessung Specimen dimensions Dimensions de l'éprouv.	Streckgrenze Yield strength Limite élastique	Zugfestigkeit Tensile strength Résistance à la traction	Dehnung Elongation Allongement	Einschnürung Area reduction Coefficient de striction	Re/Rm Re/Rm Re/Rm
Anforderungen Requirements Exigences			mm	ReH MPa 290-495	Rm MPa 415-625	A2" % MIN 35	1. Formel 1. Formula 1. Formule	
002	000006	549656	13,50 X 3,00	364	474	38,00		
002	000007	549656	13,50 X 3,00	366	482	38,00		
002	000008	549656	13,50 X 3,00	368	482	38,00		

Härteprüfung / Hardness test / Essai de dureté

Pos. Item Poste	Proben-Nr. Specimen No. No. de l'éprouv.	Schmelzen-Nr. Heat No. No. de coulée	Härte Hardness Dureté	HRC	HB	HV	HRB	HBW
Anforderungen Requirements Exigences					MAX 200			
002	000001	549656			142			
002	000002	549656			142			
002	000003	549656			141			
002	000004	549656			141			
002	000005	549656			142			
002	000006	549656			141			
002	000007	549656			142			
002	000008	549656			142			

BNÄHMEERFZEUGNIS EN 10204-3.1

ISPECTION CERTIFICATE EN 10204-3.1

ERTIFICAÇÃO DE RECEPÇÃO EN 10204-3.1

Dokument-Nr.:

Document No.:

No. du document:

41-502692/001/P

Prüf-Nr.:

Inspection No.:

No. du certificat:

Blatt: 5 / 5

Page:

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erbtlagbiegeversuch Notched bar impact test / Essai de flexion par choc (résilience) [CHARPY_V]

Pos.	Proben-Nr.	Schmelzen-Nr.	Probenabmessung			Probenlage	Prüftemperatur	Kerbschlagarbeit		Kerbschlagzähigkeit		Verf.-Bruchanteil
Item	Specimen No.	Heat No.	Specimen dimensions			Specimen position	Test temperature	Absorbed energy		Impact strength		Shear fracture
Poste	No. de l'éprouv.	No. de coulée	Dimensions de l'éprouvette			Position de l'éprouvette	Température d'essai	Energie absorbée		Résistance au choc		Rupture ductile
Anforderungen			Länge	Breite	Höhe	längs (L)		einzel	mittel	einzel	mittel	
Requirements			Length	Width	Height	longitudinal (L)		single	average	single	average	
Exigences			Longueur	Largeur	Hauteur	longitudinal (L)		individuelle	moyenne	Individuelle	moyenne	
						quer (Q)	GRAD					
			mm	mm	mm	transversal (Q)	°C	J	J	J/cm²	J/cm²	
			55	3,00	10,00	transversal (Q)	-45	MIN 008				
0002	000001	549656	55	3,00	10,00	L	-45	28				
				3,00	10,00			27				
				3,00	10,00			29	28			

estmagnetismus / Demagnetize / Démagnétiser

Pos. / Item / Poste: 0002

Demagnetized tubes; 1 measurement per 4 hours on both tube ends Two readings 180° apart around the circumference. Average value max 3.0 Millitesla (24 A/cm), individual value max 3.5 Millitesla (28 A/cm)

ermerk / Remark / Remarque

Pos. / Item / Poste: 0002

NACE Standard: Hardness acc. to NACE MR0175/ISO 15156: HRC max 22., The material meets the requirements of NACE MR0103;
 Certificate remarks: The Material is Aluminium deoxydized and inclusion shape controlled with Calcium-Silicon treatment, CSA Z
 245.1 except section 9, This is to confirm that the seamless linepipe supplied by Benteler and verified to CSA Standard
 Z245.1-07 meets the requirement for micro hardness of max. 248 HV 500 gf.

erkäufer(in) / Salesman/woman in charge / Personne chargée : Mr Meunier, Tel.: 05254/81-4235, Fax: 4239

aderborn Schloß Neuhaus, 05.09.2008, TEL.: 05254.81-1767 FAX: 05254.81-1752

Alwin Pankratz
 Abnahmebeauftragter
 Inspection representative

Contrôleur

ALWIN PANKRATZ / TEM

s wird bestätigt, daß die gelieferten Erzeugnisse den techn. Lieferbedingungen des Auftrages entsprechen. Dieses Dokument wurde mittels EDV erstellt und ist ohne Unterschrift rechtsgültig.
 I certify that the supplied products comply with the order specification. This document was prepared by means of electronic data processing and is valid without signature.
 nous attestons que les produits livrés sont conformes aux stipulations de la commande. Ce document a été établi par traitement électronique de l'information et est valide sans signature.

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

BENTELER 
Stahl/Rohr

DEUTSCHE PRÜFZEUGNIS EN 10204-3.1
SPECTRON CERTIFICATE EN 10204-3.1
ERTIFICAT DE RÉCEPTION EN 10204-3.1
V.10204-2005-01

Benteler Stahlrohr GmbH - Postfach 1340 - 33043 Paderborn - Deutschland

Dokument-Nr.: 41-502692/001/P
Document No.:
No. du document:

Kunden-Bestell-Nr.: 08-5860 / 106288
Purchase Order No.:
No. de commande du client:

Benteler Auftrags-Nr.: 1532236
Benteler Order No.:
No. de commande Benteler:

Versandanzeigen-Nr.: 4138184
Dispatch Note No.:
No. d'avis d'expédition:

Produkt: NAHTLOSE STAHLROHRE
Product: SEAMLESS STEEL TUBES
Produit: TUBES D'ACIER SANS SOUDURE

Prüf-Nr.:
Inspection No.:
No. du certificat:

Hersteller: Warmrohrwerk/Zieherei
Manufacturer: ISO/TS 16949 (ISO 9001) DNV CERT-11674A-2003
Producteur: PED 97/23/EC TÜV CERT 07-202-5635 WZ-0606/07

Herstellerzeichen:
Manufacturer's brand:
Marque du producteur:

Stempel des Abnahmebeauftragten: WA
Stamp of the inspection representative:
Timbre du contrôleur:

Stahlerschmelzungsverfahren: ELEKTROSTAHL
Steelmaking process: ELECTRIC FURNACE
Procédé d'élaboration de l'acier: FOUR ELECTRIQUE

Lieferbedingungen: ASME SA-333-CD, ASME Section II Part A Edition 2007, ASTM-A 333-2005-CD, CSA Standard Z245.1-07.
Terms of delivery: Category II, with agreed deviation: Pt. 9: Eddy current testing instead of hydrostatic test, NACE
Conditions de livraison: MR0175/ISO 15156-1:2001, NACE MR0175/ISO 15156-2:2003

Maße - Toleranzen: ASME B36.10M-2004, ASME SA-999, ASME Section II Part A Edition 2007, ASTM-A 999-2004a

Dimensions-tolerances:
Dimensions-tolérances:

Stahlsorte: GRADE 1, GRADE 290, GRADE 6

Steel grade:

Qualité d'acier:

Lieferzustand: Normalized

Delivery condition:

État de livraison:

Produktkennzeichnung: FS: BENTELER Z.245.1 -07- except section 9 - A/SA333 1/6/290 CAT II CATEGORIE 2HEAT-NO. NDE

Product marking: M45C S HN DIMENSIONS SCHEDULE 2408 WA GERMANY P.O. 106288

Marquage du produit:

EZ = Ätzlinienbeschriftung, Etching ink marking, Gravure à l'encre FK = Farbkennzeichnung, colour marking, marquage par couleur FS = Farbschablonierung, paint stencilling, marquage par peinture FSD = Farbstrahlrucker, Colour jet printer, imprimante à jet d'encre de couleur
S = Längsschablonierung, longitudinal stencilling, marquage longitudinal par peinture PKE = Etikettenkennzeichnung, tag marking, marquage sur étiquette PS = Prägestempel, die stamp, marquage par poinçonnage TS = Tintenstrahlkennzeichnung, Ink jet spray marking, imprimante à jet d'encre

* for NIPPLE'S NO
WAT REQ

ABNAHMEPRÜFZEUGNIS EN 10204-3.1
INSPECTION CERTIFICATE EN 10204-3.1
CERTIFICAT DE RECEPTION EN 10204-3.1

Dokument-Nr.: 41-502692/001/P
Document No.:
No. du document:

Prüf-Nr.:
Inspection No.:
No. du certificat:

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Page:
Page:

Pos.	Stück	Maße	Länge	Gewicht	Schmelzen-Nr.	Prüfdruck	Rohr-Nr.-Gruppe	Vielfachlängen
Item	Number	Dimensions	Length	Weight	Heat No.	Test pressure	Tube number group	Multiple lengths
Poste	Nomère	Dimensions	Longueur	Poids	No. de coulée	Pression d'épreuve	Série de no. des tubes	Longueurs multiples
		feet	feet	lbs				
0002	412	1/4" NPS * Sched. 80 18 FT - 22 FT	8110,24	4273	549656			

Schmelzenanalyse [%] / Heat analysis [%] / Analyse sur coulée [%]

Pos.	Schmelzen-Nr.	C	SI	MN	P	S	CR	MO	NI	CU	V	NB	TI	B
Item	Heat No.													
Poste	No. de coulée													
0002	549656	0,130	0,190	0,84	0,011	0,005	0,15	0,04	0,12	0,17	0,003	0,001	0,002	0,0001

Formel: $CE_{IIW} = C + (Mn/6) + ((Cr+Mo+V)/5) + ((Cu+Ni)/15) \leq 0,42 \%$
Formel: $CEV = C + F * ((Mn/6) + (Si/24) + (Cu/15) + (Ni/20) + ((Cr+Mo+V+Nb)/5) + (5*B)) \leq 0,40$
Formel: $Mn/C \geq 3/1$
Formel: $Cr+Cu+Mo+Ni+V \leq 1,00 \%$

Formelergebnisse / Formula results / Résultats des formules

Pos.	Schmelzen-Nr.	1. Formel	2. Formel	3. Formel	4. Formel
Item	Heat No.	1. Formula	2. Formula	3. Formula	4. Formula
Poste	No. de coulée	1. Formule	2. Formule	3. Formule	4. Formule
0002	549656	0,294	0,328	6,462	0,483

Produktanalyse [%] / Product analysis [%] / Analyse sur produit [%]

Pos.	Schmelzen-Nr.	C	SI	MN	P	S	CR	MO	NI	CU	V	NB	TI	B
Item	Heat No.													
Poste	No. de coulée													
0002	549656	0,140 ✓	0,190 ✓	0,84 ✓	0,009 ✓	0,004 ✓	0,15	0,04	0,12	0,19	0,003	0,003	0,002	0,0003

Formel: $CE_{IIW} = C + (Mn/6) + ((Cr+Mo+V)/5) + ((Cu+Ni)/15) \leq 0,42 \%$
Formel: $CEV = C + F * ((Mn/6) + (Si/24) + (Cu/15) + (Ni/20) + ((Cr+Mo+V+Nb)/5) + (5*B)) \leq 0,40$
Formel: $Mn/C \geq 3/1$
Formel: $Cr+Cu+Mo+Ni+V \leq 1,00 \%$

ABRUF: MEPRÜFZEUGNIS EN 10204-3.1

INSPECTION CERTIFICATE EN 10204-3.1
 CERTIFICATE DE RECEPTION EN 10204-3.1

Dokument-Nr.: 41-502692/001/P
 Document No.:
 No. du document:

Prüf-Nr.:
 Inspection No.:
 No. du certificat:

Blatt: 3 / 5
 Page:
 Page:

Formelergebnisse / Formula results / Résultats des formules

Pos.	Schmelzen-Nr	1. Formel	2. Formel	3. Formel	4. Formel
Item	Heat No.	1. Formula	2. Formula	3. Formula	4. Formula
Poste	No. de coulée	1. Formule	2. Formule	3. Formule	4. Formule
0002	549656	0,339	0,316	6,000	0,503

Prüfergebnisse / Test results / Résultats des essais

Die Rohre sind auf Dichtheit geprüft durch: **Hydrostatic test: eddy current testing instead of hydrostatic test** PASSED
 The tubes have been submitted to a leak tightness test by:
 Les tubes ont passé un contrôle d'étanchéité par:

Die Rohre wurden zerstörungsfrei geprüft: ET-test: acc. to ASME SA-333, ASTM-A 333; acc. to ASTM-E 309; Imperfections PASSED
 The tubes are non destructive tested:
 Les tubes ont passé un essai non destructif:

Augensichtkontrolle: PASSED Maßkontrolle: PASSED Ringfaltversuch: PASSED
 Visual inspection: Dimension examination: Flattening test:
 Examen visuel: Vérification des dimensions: Essai d'aplatissement:

Ergebnisse der mechanischen Prüfung / Results of mechanical testing / Résultats des essais mécaniques

Die Probenahme erfolgte an Vielfachlängen.
 The sampling was carried out on multiple lengths.
 L'échantillonnage était réalisé aux longueurs multiples.

Zugversuch Vollprobe / Tensile test Full section test specimen / Essai de traction Eprouvette à section complète

Pos.	Proben-Nr.	Schmelzen-Nr.	Probenabmessung	Streckgrenze	Zugfestigkeit	Dehnung	Einschnürung	Re/Rm
Item	Specimen No.	Heat No.	Specimen dimensions	Yield strength	Tensile strength	Elongation	Area reduction	Re/Rm
Poste	No. de l'éprouvette	No. de coulée	Dimensions de l'éprouv.	Limite élastique	Résistance à la traction	Allongement	Coefficient de striction	Re/Rm
Anforderungen			mm	ReH	Rm	A2"		
Requirements				MPa	MPa	%		
Exigences				290-495	415-625	MIN 35		
0002	000001	549656	13,50 X 3,00	363 ✓	475 ✓	38,00 ✓		
0002	000002	549656	13,50 X 3,00	364 ✓	481 ✓	38,00 ✓		
0002	000003	549656	13,50 X 3,00	366 ✓	482 ✓	38,00 ✓		
0002	000004	549656	13,50 X 3,00	361 ✓	475 ✓	36,00 ✓		
0002	000005	549656	13,50 X 3,00	364 ✓	480 ✓	38,00 ✓		

Benteler Stahlrohr GmbH
Postfach
3043 Paderborn
Südwestfalen
Tel.: +49 5254 13666 Fax: +49 5254 13666

BENTELER 

Stahl/Rohr

ABNAHMEPRÜFZEUGNIS EN 10204-3.1

INSPECTION CERTIFICATE EN 10204-3.1

CERTIFICAT DE RECEPTION EN 10204-3.1

Dokument-Nr.:

Document No.:

No. du document:

41-502692/001/P

Prüf-Nr.:

Inspection No.:

No. du certificat:

Blatt: 4 / 5

Page:

Page:

Ugversuch Vollprobe / Tensile test Full section test specimen / Essai de traction Eprouvette a section complete

Pos. Item Poste	Proben-Nr. Specimen No. No. de l'éprouvette	Schmelzen-Nr. Heat No. No. de coulée	Probenabmessung Specimen dimensions Dimensions de l'éprouv.	Streckgrenze Yield strength Limite élastique	Zugfestigkeit Tensile strength Résistance à la traction	Dehnung Elongation Allongement	Einschnürung Area reduction Coefficient de striction	Re/Rm Re/Rm Re/Rm
Anforderungen Requirements Exigences			mm	ReH MPa 290-495	Rm MPa 415-625	A2" % MIN 35	1. Formel 1. Formula 1. Formule	
0002	000006	549656	13,50 X 3,00	364	474	38,00		
0002	000007	549656	13,50 X 3,00	366	482	38,00		
0002	000008	549656	13,50 X 3,00	368	482	38,00		

Härteprüfung / Hardness test / Essai de dureté

Pos. Item Poste	Proben-Nr. Specimen No. No. de l'éprouv.	Schmelzen-Nr. Heat No. No. de coulée	Härte Hardness Dureté
Anforderungen Requirements Exigences			HRC HB HV HRB HBW MAX 200
0002	000001	549656	142
0002	000002	549656	142
0002	000003	549656	141
0002	000004	549656	141
0002	000005	549656	142
0002	000006	549656	141
0002	000007	549656	142
0002	000008	549656	142

BNABMERKZEUGNIS EN 10204-3.1

Dokument-Nr.:
Document No.:
No. du document:

41-502692/001/P

Prüf-Nr.:
Inspection No.:
No. du certificat:

INSPECTION CERTIFICATE EN 10204-3.1
CERTIFICATE OF RECEIPT EN 10204-3.1

erbschlagbiegeversuch Notched bar impact test / Essai de flexion par choc (résilience) [CHARPY_V]

Pos.	Proben-Nr.	Schmelzen-Nr.	Probenabmessung			Probenlage	Prüftemperatur	Kerbschlagarbeit		Kerbschlagzähigkeit		Verf.-Bruchanteil
Item	Specimen No.	Heat No.	Specimen dimensions			Specimen position	Test temperature	Absorbed energy		Impact strength		Shear fracture
Poste	No. de l'éprouv.	No. de coulée	Dimensions de l'éprouvette			Position de l'éprouvette	Température d'essai	Energie absorbée		Résistance au choc		Rupture ductile
Anforderungen			Länge	Breite	Höhe	längs (L)		einzel	mittel	einzel	mittel	
Requirements			Length	Width	Height	longitudinal (L)		single	average	single	average	
Exigences			Longueur	Largeur	Hauteur	longitudinal (L)		Individuelle	moyenne	Individuelle	moyenne	
						quer (Q)	GRAD					
			mm	mm	mm	transversal (Q)	°C	J	J	J/cm²	J/cm²	
			55	3,00	10,00	transversal (Q)	-45	MIN 008				
0002	000001	549656	55	3,00	10,00	L	-45	28				
				3,00	10,00			27				
				3,00	10,00			29	28			

estmagnetismus / Demagnetize / Démagnétiser

Pos. / Item / Poste: 0002

demagnetized tubes; 1 measurement per 4 hours on both tube ends Two readings 180° apart around the circumference. Average value max 3.0 Millitesla (24 A/cm), individual value max 3.5 Millitesla (28 A/cm)

ermerk / Remark / Remarque

Pos. / Item / Poste: 0002

NACE Standard: Hardness acc. to NACE MR0175/ISO 15156: HRC max 22., The material meets the requirements of NACE MR0103; Certificate remarks: The Material is Aluminium deoxydized and inclusion shape controlled with Calcium-Silicon treatment, CSA Z 245.1 except section 9, This is to confirm that the seamless linepipe supplied by Benteler and verified to CSA Standard Z245.1-07 meets the requirement for micro hardness of max. 248 HV 500 gf.

erkäufer(in) / Salesman/woman in charge / Personne chargée : Mr Meunier, Tel.: 05254/81-4235, Fax: 4239

aderborn Schloß Neuhaus, 05.09.2008, TEL.: 05254.81-1767 FAX: 05254.81-1752

Alwin Pankratz
Abnahmebeauftragter
Inspection representative
Contrôleur

ALWIN PANKRATZ / TEM

es wird bestätigt, daß die gelieferten Erzeugnisse den techn. Lieferbedingungen des Auftrages entsprechen. Dieses Dokument wurde mittels EDV erstellt und ist ohne Unterschrift rechtsgültig.
I certify that the supplied products comply with the order specification. This document was prepared by means of electronic data processing and is valid without signature.
ous attestons que les produits livrés sont conformes aux stipulations de la commande. Ce document a été établi par traitement électronique de l'information et est valide sans signature.

CERTIFIED MILL TEST REPORT

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LOG NO. F00000000009650

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BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER:

DATE 01/06/2011

CUSTOMER
ORDER NO.:

BONNEY ORDER NO. B000088321

SHIP TO:

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:
1	21	58102	1/2 6000 LF2 TEE T	SA/A350 LF2 CL1
			Al 0.020 C 0.210 Cb 0.000 Co 0.004 Cr 0.030 Cu 0.080 Mn 1.010 Mo 0.000	
			N 0.005 Nb 0.013 Ni 0.020 P 0.005 S 0.018 Si 0.200 V 0.004	
			CE(Long Formula) = 0.39	
			T/S(PSI) 71,875 Y/S(PSI) 48,375 EL(%) 32.00 RA(%) 63.00	
			Brinell 144 BHN 144 BHN	
			Charpy -50 F 23/23/20 (Ft-Lbs)	
			Average 22.00	

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. CERTIFYING TO ASTM A350 LF2 07 REVISION.
3. THE MATERIAL OF THE FITTINGS SUPPLIED IS ASTM A350-LF2 BUT MEETS THE REQUIREMENTS OF ASME SA350-LF2.
4. THE CHARPY V-NOTCH IMPACT TEST WAS PERFORMED AT -50 DEGREES FAHRENHEIT IN ACCORDANCE WITH A350-LF2.
5. THE MATERIAL SUPPLIED AS A350-LF2 CL1 MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
6. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
7. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
8. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EncanaDate: JUN 18 2013

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUN 18 2013

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Kylee Ruiz

Kylee Ruiz

QUALITY PROCESS MANAGER



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LOG NO. F0000000021586

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BONNEY FORGE CORPORATION

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(814) 542-2545 • (800) 345-7548 • FAX (814) 542-4906

www.bonneyforge.com

Shell Canada

DATE 11/16/2011

BONNEY ORDER NO. B000108237

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS
17 7522711		58406	1 3000 A105N 90EL T SA/A105N	Al 0.024 C 0.200 Co 0.003 Cr 0.050 Cu 0.060 Mn 1.000 Mo 0.010 N 0.004 Nb 0.013 Ni 0.030 P 0.008 S 0.022 Si 0.200 V 0.004 CE(Long Formula) = 0.39 T/S(PSI) 73,125 Y/S(PSI) 49,375 EL(%) 33.00 RA(%) 64.45 Brinell 135 BHN 132 BHN
7522711		58314	1 3000 A105N 90EL T SA/A105N	Al 0.024 C 0.190 Co 0.004 Cr 0.030 Cu 0.200 Mn 1.000 Mo 0.010 N 0.007 Nb 0.014 Ni 0.050 P 0.008 S 0.018 Si 0.200 V 0.003 CE(Long Formula) = 0.38 T/S(PSI) 75,000 Y/S(PSI) 50,000 EL(%) 32.25 RA(%) 63.95 Brinell 135 BHN 135 BHN
55 7526547		58259	1/2 6000 A105N TEE T SA/A105N	Al 0.022 C 0.190 Co 0.000 Cr 0.040 Cu 0.100 Mn 1.020 Mo 0.010 ✓ N 0.005 Nb 0.012 Ni 0.040 P 0.007 S 0.016 Si 0.180 V 0.004 ✓ CE(Long Formula) = 0.38 T/S(PSI) 76,875 Y/S(PSI) 52,500 EL(%) 33.55 RA(%) 66.10 Brinell 137 BHN 137 BHN

"Conforms with ASME
Sec II, Part A, 2010 edition"

2011 addenda
LK Jan. 8/12

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Encana

Name: LE

Date: Dec. 8/12

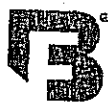
We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Meloney Specht

Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2



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LOG NO. F00000000021586

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www.bonneyforge.com

DATE 11/16/2011

BONNEY ORDER NO. B000108237

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS
------	----------	---------	----------------------------	---

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
3. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
4. CERTIFYING ASTM A105-10 / ASME SA105-10 EDITION.
5. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
6. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE IN REPORTED IN PSI.
7. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Meloney Specht

Meloney Specht

QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



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BONNEY FORGE CORPORATION

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(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4908

www.bonneyforge.com

CUSTOMER: CCTF CORPORATION

DATE 08/10/2011

CUSTOMER

ORDER NO.: 4890127-00

BONNEY ORDER NO. B000102451

SHIP TO: CCTF CORPORATION (EDMONTON)

5407 - 53RD AVE.

EDMONTON AB T6B 3G2

Canada

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:
1	200	58265	1/4 3000 LF2 90EL T	SA/A350 LF2 CLI
7680128		1097908		Al 0.022 C 0.190 Cb 0.000 Co 0.003 Cr 0.030 Cu 0.090 Mn 1.160 Mo 0.010 N 0.005 Nb 0.014 Ni 0.030 P 0.007 S 0.019 Si 0.190 V 0.004 CE(Long Formula) = 0.40 T/S(PSI) 75,000 Y/S(PSI) 51,000 EL(%) 29.00 RA(%) 67.00 Brinell 146 BHN 143 BHN Charpy -50 F 62/100/99 (Ft-Lbs) Average 87.00 <i>note #8</i>
2	90	58312	2 3000 LF2 45EL T	SA/A350 LF2 CLI
7680011				Al 0.025 C 0.210 Co 0.003 Cr 0.030 Cu 0.150 Mn 1.020 Mo 0.010 N 0.005 Nb 0.013 Ni 0.040 P 0.008 S 0.017 Si 0.290 V 0.003 CE(Long Formula) = 0.40 T/S(PSI) 76,250 Y/S(PSI) 51,250 EL(%) 31.40 RA(%) 64.20 Brinell 137 BHN 135 BHN Charpy -50 F 32/32/31 (Ft-Lbs) Average 31.70
4	500	58246	1 3000 LF2 TEE T	SA/A350 LF2 CLI
7680014				Al 0.028 C 0.210 Cb 0.000 Co 0.000 Cr 0.040 Cu 0.130 Mn 1.030 Mo 0.010 N 0.006 Nb 0.013 Ni 0.050 P 0.009 S 0.018 Si 0.180 V 0.004 CE(Long Formula) = 0.40 T/S(PSI) 73,408 Y/S(PSI) 47,433 EL(%) 33.90 RA(%) 64.90 Brinell 162 BHN 162 BHN Charpy -50 F 32/44/44 (Ft-Lbs) Average 40.00 <i>Incana</i> MATERIAL CONFORMS TO CUSTOMER SPECIFICATIONS AS PER P.O. REQUIREMENTS Name: <i>Cari Sleen</i> Date: <i>May/2011</i>

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

May/2011

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by *Meloney Specht*

Meloney Specht
QUALITY PROCESS MANAGER

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BONNEY FORGE CORPORATION

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(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: CCTF CORPORATION

DATE 08/10/2011

CUSTOMER

ORDER NO.: 4890127-00

BONNEY ORDER NO. B000102451

SHIP TO: CCTF CORPORATION (EDMONTON)

5407 - 53RD AVE.

EDMONTON AB T6B 3G2

Canada

ITEM QUANTITY UNIT

GRADE OR SPECIFICATION NO.

CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS.

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. CERTIFYING TO ASTM A350 LF2 07 REVISION.
3. THE MATERIAL OF THE FITTINGS SUPPLIED IS ASTM A350-LF2 BUT MEETS THE REQUIREMENTS OF ASME SA350-LF2.
4. THE CHARPY V-NOTCH IMPACT TEST WAS PERFORMED AT -50 DEGREES FAHRENHEIT IN ACCORDANCE WITH A350-LF2.
- * 5. THE MATERIAL SUPPLIED AS A350 LF2 CL1 MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
6. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
7. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
- * 8. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE IN REPORTED IN PSI.
- * 9. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by Meloney Specht

Meloney Specht

QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT

LOG NO. F00000000020173 Page 1 of 2

BONNEY FORGE CORPORATION
P.O. BOX 330 • 14495 CROGHAN PIKE • MOUNT UNION, PA 17066-0330
(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906
www.bonneyforge.com

CUSTOMER: MRC MIDFIELD

CUSTOMER

ORDER NO.: S759129296

SHIP TO: MRC MIDFIELD

502-25 AVENUE
NISKU AB T9E 0K6
Canada

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: C. STEEN

Date: Jan 24/10

DATE 10/11/2011
BONNEY ORDER NO. B000106349

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

Jan 24
E

ITEM QUANTITY LOT NO.

GRADE OR SPECIFICATION NO.
CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:

71 2,175 5007 1 3M/6M A105N HXPL T SA/A105N
18C12658
Al 0.023 C 0.200 Co 0.004 Cr 0.040 Cu 0.150 Mn 1.020 Mo 0.010 N 0.006
Nb 0.015 Ni 0.060 P 0.008 S 0.019 Si 0.170 V 0.003
CE(Long Formula) = 0.39
T/S(Psi) 72,500 Y/S(Psi) 51,250 EL(%) 31.45 RA(%) 65.60
Brinell 139 BHN 139 BHN

75 25 58294 1/4 6000 A105N TEE T SA/A105N
18C12877
Al 0.026 C 0.200 Co 0.004 Cr 0.060 Cu 0.140 Mn 1.020 Mo 0.010 N 0.005
Nb 0.014 Ni 0.040 P 0.011 S 0.023 Si 0.190 V 0.003
CE(Long Formula) = 0.40
T/S(Psi) 73,750 Y/S(Psi) 48,750 EL(%) 32.05 RA(%) 63.95
Brinell 135 BHN 135 BHN

76 28 58398 2 6000 A105N TEE T SA/A105N
18C12931
Al 0.026 C 0.160 Cb 0.002 Co 0.006 Cr 0.110 Cu 0.220 Mn 1.030 Mo 0.020
N 0.007 Ni 0.070 P 0.011 S 0.020 Si 0.260 V 0.034
CE(Long Formula) = 0.38
T/S(Psi) 72,500 Y/S(Psi) 51,250 EL(%) 31.50 RA(%) 68.18
Brinell 132 BHN 132 BHN

80 50 58267 10-3X1 S160 A105N WELD B SA/A105N
18C13039
Al 0.020 C 0.200 Cb 0.000 Co 0.002 Cr 0.030 Cu 0.080 Mn 1.010 Mo 0.010
N 0.005 Nb 0.015 Ni 0.020 P 0.006 S 0.019 Si 0.220 V 0.005
CE(Long Formula) = 0.38
T/S(Psi) 71,250 Y/S(Psi) 50,000 EL(%) 32.75 RA(%) 61.05
Brinell 130 BHN 132 BHN

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by Kylee Ruiz
Kylee Ruiz
QUALITY PROCESS MANAGER

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CUSTOMER: MRC MIDFIELD

DATE 10/11/2011

CUSTOMER

BONNEY ORDER NO. B000106349

ORDER NO.: S759129296

SHIP TO: MRC MIDFIELD
502-25 AVENUE
NISKU AB T9E 0K6
Canada

12

ITEM QUANTITY LOT NO.

GRADE OR SPECIFICATION NO.
CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. CERTIFYING TO ASTM A350 LF2 07 REVISION.
3. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
4. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
5. CERTIFYING ASTM A105-10 / ASME SA105-10 EDITION.
6. THE MATERIAL OF THE FITTINGS SUPPLIED IS ASTM A350-LF2 BUT MEETS THE REQUIREMENTS OF ASME SA350-LF2.
7. THE CHARPY V-NOTCH IMPACT TEST WAS PERFORMED AT -50 DEGREES FAHRENHEIT IN ACCORDANCE WITH A350-LF2.
8. THE MATERIAL SUPPLIED AS A350 LF2 CL1 MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
9. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
10. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
11. THE MATERIAL SUPPLIED IDENTIFIED AS SA/A105-QT WAS QUENCHED AND TEMPERED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
12. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE IN REPORTED IN PSI.
13. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Kylee Ruiz

Kylee Ruiz

QUALITY PROCESS MANAGER

CMTR: REV2



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CERTIFIED MILL TEST REPORT

LOG NO. F00000000022284

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BONNEY FORGE CORPORATION

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(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906
www.bonneyforge.com

CUSTOMER: CCTF CORPORATION

DATE 12/02/2011

CUSTOMER

ORDER NO.: 4890573-00

BONNEY ORDER NO. B000108237

SHIP TO: CCTF CORPORATION (EDMONTON)

5407 - 53RD AVE.
EDMONTON AB T6B 3G2
Canada

ENCANA

MATERIAL CONFORMS TO CUSTOMER SPECS

By ceris at 6:58:08 AM, 4/3/2012

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.
CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:			
49	180	4644	11/4 3M A105N UNAR T
7524099		MALE	SA/A105N
A1 0.025 C 0.200 Cb 0.000 Co 0.002 Cr 0.030 Cu 0.070 Mn 1.040 Mo 0.010			
N 0.003 Nb 0.013 Ni 0.020 P 0.007 S 0.025 Si 0.220 V 0.004			
CE(Long Formula) = 0.39			
T/S(PSI) 71,250 Y/S(PSI) 50,625 EL(%) 32.05 RA(%) 57.00			
Brinell 130 BHN 132 BHN			
		4733	11/4 3M A105N UNAR T
7524099		FEMALE	SA/A105N
A1 0.022 C 0.200 Cb 0.000 Co 0.004 Cr 0.040 Cu 0.160 Mn 1.000 Mo 0.010			
N 0.004 Nb 0.015 Ni 0.040 P 0.007 S 0.020 Si 0.180 V 0.004			
CE(Long Formula) = 0.39			
T/S(PSI) 76,250 Y/S(PSI) 53,125 EL(%) 30.40 RA(%) 62.05			
Brinell 132 BHN 132 BHN			
		4875	11/4 3M A105N UNAR T
7524099		NUT-EJ	SA/A105N
A1 0.024 C 0.185 Co 0.000 Cr 0.120 Cu 0.120 Mn 0.970 Mo 0.030 N 0.008			
Nb 0.000 Ni 0.100 P 0.010 S 0.024 Si 0.250 V 0.002			
CE(Long Formula) = 0.39			
T/S(PSI) 72,500 Y/S(PSI) 50,000 EL(%) 32.55 RA(%) 64.45			
Brinell 135 BHN 135 BHN			
51	50	58406	3/4 6000 A105N 90EL T
7526199			SA/A105N
A1 0.024 C 0.200 Co 0.003 Cr 0.050 Cu 0.060 Mn 1.000 Mo 0.010 N 0.004			
Nb 0.013 Ni 0.030 P 0.008 S 0.022 Si 0.200 V 0.004			
CE(Long Formula) = 0.39			
T/S(PSI) 73,125 Y/S(PSI) 49,375 EL(%) 33.00 RA(%) 64.45			
Brinell 135 BHN 132 BHN			

"Conforms with ASME
Sec II, Part A, 2010 edition"

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

2012 addenda 05/12

by

Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



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LOG NO. F00000000022284

Page 33 of 33

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: CCTF CORPORATION

DATE 12/02/2011

CUSTOMER

BONNEY ORDER NO. B000108237

ORDER NO.: 4890573-00

SHIP TO: CCTF CORPORATION (EDMONTON)

5407 - 53RD AVE.

EDMONTON AB T6B 3G2

Canada

ITEM QUANTITY LOT NO

GRADE OR SPECIFICATION NO
CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS.

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
3. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
4. CERTIFYING ASTM A105-10 / ASME SA105-10 EDITION.
5. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
6. THE MATERIAL SUPPLIED IDENTIFIED AS SA/A105-QT WAS QUENCHED AND TEMPERED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
7. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE IN REPORTED IN PSI.
8. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Meloney Specht

Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



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LOG NO. F00000000036925

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: MRC CANADA ULC

DATE 11/27/2012

CUSTOMER

BONNEY ORDER NO. B000132807

ORDER NO.: S759188163

SHIP TO: MRC CANADA ULC - BRCH 759

502-25 AVENUE

NISKU AB T9E 0K6

Canada

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	
			CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:	
16 18C10822	28	6193	4 3M A105N COUP T	SA/A105N
			Al 0.021 C 0.260 Co 0.000 Cr 0.140 Cu 0.230 Mn 0.860 Mo 0.020 Ni 0.080 P 0.014 S 0.025 Si 0.260 V 0.001 CE(Long Formula) = 0.46 T/S(Psi) 79,177 Y/S(Psi) 52,456 EL(%) 33.20 RA(%) 59.85 Brinell 150 BHN 144 BHN	
25 18C12067	9	58769	1 1/2 6000 LF2 90EL T	SA/A350 LF2 CL1
			Al 0.022 C 0.211 Co 0.002 Cr 0.030 Cu 0.040 Mn 1.030 Mo 0.007 N 0.004 Nb 0.016 Ni 0.020 P 0.004 S 0.019 Si 0.250 V 0.003 CE(Long Formula) = 0.39 T/S(Psi) 74,197 Y/S(Psi) 47,747 EL(%) 36.45 RA(%) 64.94 Brinell 130 BHN 132 BHN Charpy -50 F 20/24/14 (Ft-Lbs) Average 19.30	

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUN 1 8 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: ENCANA

Date: JUN 1 8 2013

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by

Meloney Specht

Meloney Specht

QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



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LOG NO. F00000000036925

BONNEY FORGE CORPORATION

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(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: MRC CANADA ULC

DATE 11/27/2012

CUSTOMER

BONNEY ORDER NO. B000132807

ORDER NO.: S759188163

SHIP TO: MRC CANADA ULC - BRCH 759
502-25 AVENUE
NISKU AB T9E 0K6
Canada

ITEM QUANTITY LOT NO.

GRADE OR SPECIFICATION NO.
CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. CERTIFYING TO ASTM A350 LF2 07 REVISION.
3. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
4. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2. ✓
5. CERTIFYING ASTM A105-10 / ASME SA105-10 EDITION.
6. THE MATERIAL OF THE FITTINGS SUPPLIED IS ASTM A350-LF2 BUT MEETS THE REQUIREMENTS OF ASME SA350-LF2.
7. THE CHARPY V-NOTCH IMPACT TEST WAS PERFORMED AT -50 DEGREES FAHRENHEIT IN ACCORDANCE WITH A350-LF2.
8. THE MATERIAL SUPPLIED AS A350 LF2 CL1 MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
9. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
10. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
11. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE REPORTED IN PSI.
12. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Meloney Specht

Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

2012/9/24 S. Nason
 "Conforms with ASME
 Sec II, Part A, 2010 edition,
 2011a addenda"

**MATERIAL CONFORMS
 TO CUSTOMER
 SPECIFICATIONS
 AS PER P.O.
 REQUIREMENTS**



Encana

MILL TEST REPORTS

Bonney Forge ✓
 14496 Croghan Pike
 Mt. Union, PA 17066

CERTIFIED MILL TEST REPORT

MRC Canada 9/11/2012

LOT NO.
 ✓ 6087

CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS

✓ 1" 3M/6M A350-LF2-CL1 Hexagon Plug Threaded ✓

C	0.210	MN	1.020	P	0.006	S	0.020	SI	0.220
NI	0.020	CR	0.040	MO	0.001	CU	0.040	CO	0.002
V	0.003	AL	0.024	Nb	0.012				

CE(LONG FORMULA) = 0.393

T/S(PSI) 74020 Y/S(PSI) 49197 EL(%) 34.800 RA(%) 64.000

BRINELL HARDNESS 127, 130

CHARPY -50 F 12/18/16(FT-LBS) AVG. 15.333(FT-LBS)

ORIGINAL STEEL MILL CERTIFICATION ON NEXT PAGE

1. CERTIFYING TO ASTM A350 LF2 07 REVISION.
2. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
3. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT.
4. THE MATERIAL SUPPLIED AS A350 LF2 CL1 MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.

THIS DOCUMENT HAS BEEN ELECTRONICALLY SUBMITTED.

CERTIFIED MILL TEST REPORT

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LOG NO. F00000000041974 Page 1 of 2

BONNEY FORGE CORPORATION
P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330
(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906
www.bonneyforge.com

CUSTOMER: MRC CANADA ULC

DATE 04/02/2013

CUSTOMER

BONNEY ORDER NO. B000141850

ORDER NO.: S759208484

SHIP TO: MRC CANADA ULC - BRCH 759
502-25 AVENUE
NISKU AB T9E 0K6
Canada

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO. CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:
41	50	6022	2X1 3M/6M LF2 HXBU T SA/A350 LF2 CL1
18C12481			Al 0.023 C 0.210 Co 0.002 Cr 0.030 Cu 0.040 Mn 1.060 Mo 0.010 N 0.004 Nb 0.015 Ni 0.010 P 0.004 S 0.020 Si 0.210 V 0.003 CE(Long Formula) = 0.40 T/S(PSI) 73,023 Y/S(PSI) 48,975 EL(%) 34.60 RA(%) 62.32 Brinell 130 BHN 130 BHN Charpy -50 F 14/15/34 (Ft-Lbs) Average 21.00
44	675	6253	1 3M/6M LF2 HXPL T SA/A350 LF2 CL1
18C12667			Al 0.023 C 0.200 Co 0.004 Cr 0.040 Cu 0.080 Mn 1.030 Mo 0.007 N 0.003 Nb 0.016 Ni 0.030 P 0.011 S 0.020 Si 0.210 V 0.004 CE(Long Formula) = 0.39 T/S(PSI) 70,686 Y/S(PSI) 48,376 EL(%) 36.50 RA(%) 62.56 Brinell 132 BHN 132 BHN Charpy -50 F 30/14/28 (Ft-Lbs) Average 24.00
18C1362	58638	2 X 1 3000 LF2 SOCK S	SA/A350 LF2 CL1
			Al 0.022 C 0.220 Co 0.002 Cr 0.030 Cu 0.050 Mn 1.050 Mo 0.000 N 0.003 Nb 0.013 Ni 0.020 P 0.006 S 0.020 Si 0.210 V 0.003 CE(Long Formula) = 0.41 T/S(PSI) 81,500 Y/S(PSI) 53,500 EL(%) 31.00 RA(%) 56.00 Brinell 163 BHN 163 BHN Charpy -50 F 19/28/29 (Ft-Lbs) Average 25.30

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: _____
Date: JUL 02 2013

"Conforms with ASME
Sec II, Part A, 2010 edition
2011a addenda"

JUL 02 2013

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by Meloney Specht
Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

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LOG NO. F00000000041974

Page 2 of 2

BONNEY FORGE CORPORATION

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(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: MRC CANADA ULC

DATE 04/02/2013

CUSTOMER

BONNEY ORDER NO. B000141850

ORDER NO.: S759208484

SHIP TO: MRC CANADA ULC - BRCH 759
502-25 AVENUE
NISKU AB T9E 0K6
Canada

ITEM QUANTITY LOT NO.

GRADE OR SPECIFICATION NO.
CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. CERTIFYING TO ASTM A350 LF2 07 REVISION.
3. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
4. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2. ✓
5. CERTIFYING ASTM A105-10 / ASME SA105-10 EDITION.
6. THE MATERIAL OF THE FITTINGS SUPPLIED IS ASTM A350-LF2 BUT MEETS THE REQUIREMENTS OF ASME SA350-LF2.
7. THE CHARPY V-NOTCH IMPACT TEST WAS PERFORMED AT -50 DEGREES FAHRENHEIT IN ACCORDANCE WITH A350-LF2.
8. THE MATERIAL SUPPLIED AS A350 LF2 CL1 MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
9. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
10. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
11. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE REPORTED IN PSI.
12. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

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by Meloney Specht

Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2



INSPECTION CERTIFICATE
CERTIFICAT DE INSPECTIE
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

Number / Numar:
02/12/07420

Page / Pagina:
1 / 5

Date / Data: April 06, 2012

Silcotub S.A. Plant
93, Mihai Viteazul Blvd.
450131 Zalău, Săleș
România
Tel: +40 260 620720
Fax: +40 260 601581

Customer / Client: C		Customer's Order Item / Comanda clientului - Item: 43059802		Customer's Reference / Referința clientului:		Manufacturer's Works Order N° / Comanda de vânzare: 2231481/001	
Manufacture Process / Proces de fabricație: NORMALIZED NORMALIZATE		Product Type / Tip de produs: See note nr.1 vezi nota nr.1		Surface / Suprafața: See note nr.2 vezi nota nr.2		Ends / Capete: PLAIN ENDS (SQUARE CUT) CAPETE NETEDE (TAIATE DREPT)	
Standard or Specification / Norma și specificație: ACCORDING TO ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1 NORMA ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1		Steel Grade / Grad de oțel: STEEL GR 6 ASTM A 333 OTEL GR 6 ASTM A 333		Quantity / Cantitate: 213Pcs/buc. 3923,00 ft 1195.73 mt		Nominal Weight / Greutate nominală: 8527,4 lb 3868 kg	
Dimensions / Dimensiuni: ø 1.315" O.D. x .179" W.T. ø 33.4mm O.D. x 4.55mm W.T.		Schedule / Program: 80		Length / Lungime: 5490 mm + 5850 mm			

DELIVERY NOTES / NOTE DE LIVRARE

Delivery Notes Nota de livrare	
Job Number / Nr. Comanda internă: 0031047029 / 000010	
Shipping Note / Aviz de expediție: 61917098 - 06/04/2012	
Address / Adresă: 18 FLR, 401 - 9 AVE SW.	

Delivery Notes Nota de livrare	
Town / Oraș:	T2P 2H CALGARY
Country / Țară:	Canada

TENSILE TEST / TEST DE TRACȚIUNE

Heat N° Sârja N°	Sample N° Proba N°	Specimen condition Condiția epruvetei				Specimen dimensions Dimensiuni epruvetei		Test temp Temp de încercare	Y.S.	U.T.S.	Elongation / Alungire							
		Ls	Sc	Type Tip	Ori	Size Dimensiune mm	Area Secțiune mm2		Min: 35.00 Max: --	Req. Min: 60.00 Max: --	Lo	Min.	Min.	Obt.				
								°C	KSI	KSI					cal.	mm	%	%
720371	C8226/T	B	N	Ss	L	4.63 x 33.44	418,10	+20	48.00	69.00	2"	50.0	24.0%	50.0%				
720371	C8226/T	B	N	Ss	L	4.50 x 33.42	408,80	+20	51.00	72.00	2"	50.0	24.0%	50.0%				

B: Body / Corp	Max: Maximum / Maxim	Ori: Orientation / Orientare	U.T.S: Ultimate Tensile Strength / Rezistența la rupere
L: Longitudinal / Longitudinal	Min: Minimum / Minim	Req: Required / Cerință	
Lo: Initial length / Lungime inițială	N: Normalized / Normalizat	Sc: Specimen condition / Starea epruvetei	Y.S: Yield Strength / Rezistența la curgere
Ls: Location of sample / Locația probei	Obt: Obtained / Obținut	Sa: Strip specimen / Rectangular	

This certificate is issued by a computerized system and it is valid with electronic signature. On the original certificate the trade-mark green colored "Tenaris" is stamped. In case the owner of the original certificate would release a copy of it, he must attest its conformity to the original one taking upon himself the responsibility for any unlawful or not allowed use. Any alteration and/or falsification will be subjected to the law.

Acest certificat a fost editat de un sistem computerizat și este valid cu semnătură electronică. Pe certificatul original brandul "Tenaris" este colorat în verde și stampat. În cazul în care proprietarul certificatului original va emite o copie a acestuia, el va atesta conformitatea cu originalul, asumându-și responsabilitatea pentru utilizarea nepermisă sau ilegală. Orice modificare și/sau falsificare va fi pedepsită de lege.

FOR03171



INSPECTION CERTIFICATE
CERTIFICAT DE INSPECTIE
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

Number / Numar:
02/12/07420

Page / Pagina:
2 / 5

Date / Data: April 06, 2012

Silcotub S.A. Plant
93, Mihai Viteazul Blvd.
450121 Zalau, Sălaj
România
Tel: + 40 260 626720
Fax: + 40 260 681581

Customer / Client: C		Customer's Order Item / Comanda clientului - Item: 43069802		Customer's Reference / Referința clientului:		Manufacturer's Works Order N° / Comanda de vânzare: 2231481/001	
Manufacture Process / Proces de fabricație: NORMALIZED NORMALIZATE		Product Type / Tip de produs: See note nr.1 vezi nota nr.1		Surface / Suprafața: See note nr.2 vezi nota nr.2		Ends / Capete: PLAIN ENDS (SQUARE CUT) CAPETE NETEDE (TAIATE DREPT)	
Standard or Specification / Normă sau specificație: ACCORDING TO ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1 NORMA ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1		Steel Grade / Grad de oțel: STEEL GR 6 ASTM A 333 OTEL GR 6 ASTM A 333		Quantity / Cantitate: 213Pcs/buc. 3923,00 ft 1195.73 mt		Nominal Weight / Greutate nominală: 8527,4 lb 3868 kg	
Dimensions / Dimensiuni: ø 1.315" O.D. x .179" W.T. ø 33.4mm O.D. x 4.55mm W.T.		Schedule / Program: 80		Length / Lungime: 5490 mm + 5850 mm			

CHEMICAL COMPOSITION / COMPOZITIE CHIMICA

		Composition % / Compoziția %											
		X 100						X 1000					
		C	Mn	Si	Cu	Ni	Cr	Mo	V	Ca LF	P	S	
Heat N° Sarja N°	Sample N° Proba N°	P	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	
720371	C8116/L	H	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	
720371	C8116/L	P	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	
720371	C8116/L	H	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	
720371	C8116/L	P	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	

		Composition % / Compoziția %											
		X 100						X 1000					
		C	Mn	Si	Cu	Ni	Cr	Mo	V	Ca LF	P	S	
Heat N° Sarja N°	Sample N° Proba N°	P	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	
720371	C8223/T	H	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	
720371	C8223/T	P	Max	30	106	--	--	--	--	42	25	10	
			Min	--	29	10	--	--	--	--	--	--	

Ca LF: C+Mn/5+(Cr+Mo+V)/5+(Ni+Cu)/15

Max: Maximum / Maxim

P: Product / Produs

H: Heat / Sarja

Min: Minimum / Minim

SUPERFICIAL HARDNESS / DURITATE SUPERFICIALA

Heat N° Sarja N°	Sample N° Proba N°	Ls	Sc	External / Exterior Scale / Scala: HBW Req. Min: -- Req. Max: 237.0		
720371	C8223/T	B	N	147.0	147.0	148.0

B: Body / Corp

Ls: Location of sample / Locația probei

N: Normalized / Normalizat

Sc: Specimen condition / Starea epruvetei

This certificate is issued by a computerized system and it is valid with electronic signature. On the original certificate the trade-mark green colored "Tenaris" is stamped. In case the owner of the original certificate would release a copy of it, he must attest its conformity to the original one taking upon himself the responsibility for any unlawful or not allowed use. Any alteration and/or falsification will be subjected to the law.

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FOR03171



INSPECTION CERTIFICATE
CERTIFICAT DE INSPECTIE
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

Number / Numar:

02/12/07420

Page / Pagina:

3 / 5

Date / Data: April 06, 2012

Silectub S.A. Plant
93, Mihai Viteazul Blvd.
460137 Zalău, Săleu
România
Tel : +40 260 626720
Fax : +40 260 661581

Customer / Client: C		Customer's Order Item / Comanda clientului - Item: 43059802		Customer's Reference / Referința clientului:		Manufacturer's Works Order N° / Comanda de vânzare: 2231481/001	
Manufacture Process / Proces de fabricație: NORMALIZED NORMALIZATE		Product Type / Tip de produs: See note nr.1 vezi nota nr.1		Surface / Suprafața: See note nr.2 vezi nota nr.2		Ends / Capete:	
Standard or Specification / Norma sau specificație: ACCORDING TO ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1 NORMA ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1		Steel Grade / Grad de oțel: STEEL GR 6 ASTM A 333 OTEL GR 6 ASTM A 333		Ends / Capete: PLAIN ENDS (SQUARE CUT) CAPETE NETEDE (TAIATE DREPT)			
Dimensions / Dimensiuni: ø 1.315" O.D. x .179" W.T. ø 33.4mm O.D. x 4.55mm W.T.		Schedule / Program: 80		Length / Lungime: 5490 mm ± 5850 mm		Quantity / Cantitate: 213Pcs/buc. 3923,00 ft 8527,4 lb 1195.73 mt 3868 kg	
				Nominal Weight / Greutate nominală:			

IMPACT TEST / TEST DE INCOVOIERE

Type/Tip: KCV			Orientation/Orientare: L			Unit / Unitate de masura: LB FT			
Position/Poziție:			Temp: -51			Unit/Unitate de m		Ind.Min.Req: 6 Req.Min.Avg: 8	
Heat N° Seriă N°	Sample N° Proba N°	Zone Zona	Ls Sc		Size / Dimensiune	Results / Rezultate			
					mm	1	2	3	Avg.
720371	C8224/T	outside	B	N	10 x 3.33	24	24	25	24

Avg: Average / Media	Carinta minima individuala	N: Normalized / Normalizat	Sc: Specimen condition / Starea epruvei
B: Body / Corp	L: Longitudinal / Longitudinal	Req. Min. Avg: Required minimum average / Carinta	Temp: Temperature / Temperatura
Ind. Min. Req: Individual Minimum Required /	La: Location of sample / Locația probei	pentru valoarea medie minima	

FLATTENING TEST / APLATISARE

Standard / Norma:						Standard / Norma:					
Heat N° Seriă N°	Sample N° Proba N°	Zone Zona	Sc	Test Frequency Frecvența încercării	Result Rezultat	Heat N° Seriă N°	Sample N° Proba N°	Zone Zona	Sc	Test Frequency Frecvența încercării	Result Rezultat
720371	C8224/T	E1	N	5% of the lot	Good / Conform	720371	C8224/T	E1	N	5% of the lot	Good / Conform

E1 / E2: Ends of Sampling / Capetele testate	N: Normalized / Normalizat	Sc: Specimen condition / Starea epruvei
--	----------------------------	---

This certificate is issued by a computerized system and it is valid with electronic signature. On the original certificate the trade-mark green colored "Tenaris" is stamped. In case the owner of the original certificate would release a copy of it, he must attest its conformity to the original one taking upon himself the responsibility for any unlawful or not allowed use. Any alteration and/or falsification will be subjected to the law.

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FOR03171



INSPECTION CERTIFICATE
CERTIFICAT DE INSPECTIE
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

Number / Numar:

02/12/07420

Page / Pagina:

4 / 5

Date / Data: April 06, 2012

Silcotub S.A. Plant
93, Mica Vinului Blvd.
461311 Zalău, Sălaj
România
Tel: +40 260 629720
Fax: +40 260 661581

Customer / Client: C		Customer's Order Item / Comanda clientului - Item: 43059802	Customer's Reference / Referinta clientului:	Manufacturer's Works Order N° / Comanda de vanzare: 2231481/001
Manufacture Process / Proces de fabricatie: NORMALIZED NORMALIZATE		Product Type / Tip de produs: See note nr.1 vezi nota nr.1		Surface / Suprafata: See note nr.2 vezi nota nr.2
Standard or Specification / Norma sau specificatie: ACCORDING TO ASTM A 333 ,SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1 NORMA ASTM A 333 ,SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1		Steel Grade / Grad de otel: STEEL GR 6 ASTM A 333 OTEL GR 6 ASTM A 333		Ends / Capete: PLAIN ENDS (SQUARE CUT) CAPE TE NETEDE (TAIATE DREPT)
Dimensions / Dimensiuni: ø 1.315" O.D. x .179" W.T. ø 33.4mm O.D. x 4.55mm W.T.	Schedule / Program: 80	Length / Lungime: 5490 mm + 5850 mm	Quantity / Cantitate: 213Pcs/buc. 3923,00 ft 8527,4 lb 1195.73 mt 3868 kg	

SUPPLEMENTARY INFORMATION / INFORMATIE SUPPLEMENTARA

STANDARD EDITIONS
EDITIILE NORMELOR

Standard: ASTM A 333 Year: 2010

Norma: ASTM A 333 An: 2010

PRODUCT DESCRIPTION NOTES
NOTE DESCRIERE PRODUS

Note 1 is the full description of the 'Product type'

SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES (WITH SUPPLEMENTARY REQUIREMENTS)

Note 2 is the full description of the 'Surface'

INTERNALLY BARE, EXTERNALLY VARNISHED , WITH BLACK LACQUER ,

Note 1 si descrierea completa a 'Tip de produs'

TEVI PT. TEMPERATURI JOASE LAMINATE LA CALD (CU CERINTE SUPLEMENTARE FATA DE NORMA)

Note 2 si descrierea completa a 'Suprafata'

INTERIOR NEPROTEJATE , EXTERIOR LACUITE , CU LAC NEGRU

Supplementary Information
Informatie Suplimentara

NONDESTRUCTIVE TEST-EDDY CURRENT ACC. TO ASTM E309+ HOLE DIAMETER
1,1mm max: WITHOUT OBJECTIONS

NONDESTRUCTIVE TEST - EMI ACC. TO ASTM E 570: WITHOUT OBJECTIONS
HEAT TREATMENT: NORMALIZED

MATERIAL ACCORDING TO NACE MR 01-75

VISUAL AND DIMENSIONAL CONTROL HAS BEEN CARRIED OUT WITH SATISFACTORY RESULT
STEEL IS FULLY KILLED AND PRODUCED BY ELECTRIC FURNACE TO A FINE GRAIN PRACTICE

THE PRODUCT SUPPLIED IS IN COMPLIANCE WITH THE REQUIREMENTS OF THE ORDER.

CONTROL NEDISTRUCTIV EDDY CURRENT CONFORM ASTM E 309, DIAMETRUL

GAURII max. 1,1 mm: FARA OBIECTII

CONTROL NEDISTRUCTIV EMI CONFORM ASTM E 570: FARA OBIECTII

TRATAMENT TERMIC: NORMALIZARE

MATERIAL CONFORM NACE MR 01-75

CONTROLUL VIZUAL DIMENSIONAL S-A REALIZAT CU REZULTATE SATISFACATOARE

OTELUL ESTE PRODUS IN CUPTOR ELECTRIC COMPLET CALMAT CONFORM UNEI PRACTICI DE OBTINERE A UNUI
GRAUNTE FIN

PRODUSUL LIVRAT ESTE IN CONFORMITATE CU CERINTELE COMENZII

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FOR03171



INSPECTION CERTIFICATE
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Page / Pagina:

5 / 5

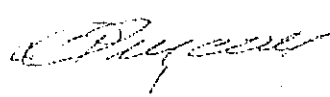
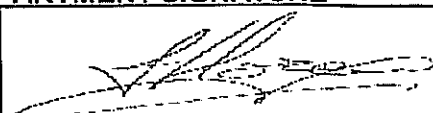
Date / Data: April 06, 2012

Silcotub S.A. Plant
 93, Mihai Viteazul Blvd.
 450191 Zalau, Salaj
 Romania
 Tel: +40 260 620720
 Fax: +40 260 681521

Customer / Client:		Customer's Order Item / Comanda clientului - Item: 43059802	Customer's Reference / Referinta clientului:	Manufacturer's Works Order N° / Comanda de vanzare: 2231481/001
Manufacture Process / Proces de fabricatie: NORMALIZED NORMALIZATE		Product Type / Tip de produs: See note nr.1 vezi nota nr.1		Surface / Suprafata: See note nr.2 vezi nota nr.2
Standard or Specification / Norma sau specificatie: ACCORDING TO ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1 NORMA ASTM A 333, SUR2-A0A-00-ENG-MST-0012, NACE MR 01.75 + TQC 20009114/1.1		Steel Grade / Grad de oel: STEEL GR 6 ASTM A 333 OTEL GR 6 ASTM A 333		Ends / Capete: PLAIN ENDS (SQUARE CUT) CAPETE NETEDE (TAIATE DREPT)
Dimensions / Dimensiuni: ø 1.315" O.D. x .179" W.T. ø 33.4mm O.D. x 4.55mm W.T.	Schedule / Program: 80	Length / Lungime: 5490 mm ± 5850 mm	Quantity / Cantitate: 213Pcs/buc. 3923,00 ft 8527,4 lb 1195.73 mt 3868 kg	

This is to certify that the product described here has been manufactured, sampled, tested, and inspected in accordance with purchaser order requirements. This certificate is not a declaration of origin nor may it be used as a declaration of origin.

Prin acest document certificam ca produsele descrise, au fost fabricate, esantionate, testate si inspectate in conformitate cu cerintele din comanda clientului. Acest certificat nu este o declaratie de origina si nu poate fi folosit in locul unei declaratii de origina.

CUSTOMER . THIRD PARTY		TENARIS QUALITY DEPARTMENT SIGNATURE	
INSPECTION COMPANY FIRMA TERTA DE INSPECTIE		 QUALITY CERTIFICATION DEPT. DEPARTAMENT CERTIFICARE CALITATE PUSCAS Daniela	 QUALITY REGIONAL MANAGER MANAGER REGIONAL DE CALITATE MORENT Laszlo

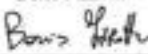
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FOR03171

 I.M.L. - INDUSTRIA MECCANICA LIGURE S.P.A. Via Giancarlo Farina, 25 - 16030 Casarza Ligure - GE - ITALY Tel. +39 0185 467661 - Fax +39 0185 466510 - E-mail quality.imi@farinagroup.com MATERIAL TEST DEPARTMENT		COMPANY WITH QUALITY SYSTEM ISO 9001: 2008 CERTIFIED BY RINA CERT. N° 23/91/S								
INSPECTION CERTIFICATE EN 10204:2004 / 3.1		Nr 23264	Dated 31.07.2012							
TRANS AM PIPING PRODUCTS LTD. 9335 Endeavor Drive S.E. Calgary, Alberta T3S 0A1 CA		Purchase Order Nr CI-12-335 Item Nr 087 Packing List Nr 897 Invoice Nr 810								
Heat Code 88F	Heat Nr 11/79860	Quantity 100,00	Description FITTING 90 ELB. THRD NPT 6M 1" A350/LF2							
Element	C	Si	Mn	S	P	Cr	Ni	Mo	Ti	Cu
ASTM A350 LF2 cl.1 (LADLE)	0,180	0,250	1,100	0,009	0,012	0,090	0,050	0,010	0,020	0,140
Element	V	Nb	N	AL					C.E.	PRE
ASTM A350 LF2 cl.1 (LADLE)	0,003	0,003	-	0,026					0,397	-
Test specimen Sect. mm2	Length mm	Shape 1=O - 2=□	Tensile N/mm2	Yield Point >0,2% N/mm2	Yield Point >1% N/mm2	Elongation %	Reduction of area %			
122,65	50,00	1	535,0	332,0	-	31,0	58,0			
HARDNESS		IMPACT TEST								
HBW	TYPE	Test specimen	°C	1-Joule	2-Joule	3-Joule				
163,0 - 165,0	KV	10x10mm	-46	50	48	45				
Heat treatment	Normalized at 900°C / Air Cool					ELECTRIC FURNACE				
Dimension in accordance	ASME B16.11 Ed.2011 - ANSI/ASME B1.20.1 Ed.1992 - MSS SP25 Ed.2008 - NACE MR 0175 ISO 15156 Ed.2009- NACE MR 0103 Ed. 2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS									
Material in accordance	ASME SA ASTM A350-11 Gr. LF2 cl.1									
Visual & Dimensional	SATISFACTORY	Origin	EUROPE	Our Ref.	2012-2E201-0000511-0087					
Notes -										

"Conforms with ASME
 Sec II, Part A, 2010 edition
 2011a addenda"
 2012/11/28 J. Nason

QUALITY CONTROL DEPT. Boris Fizzotti 	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL IML or 
--	----------------------	---



VALVES & MEASUREMENT

08806-002.

Thursday, 22-Nov-2012

From:

Cameron Canada
3707 97 Street
Edmonton, Alberta, Canada
T6E 6J2
Phone : 780-468-2732

To:

Subject:

Serial	2619627	Quantity/Series	200
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Comments:

Part #: 5A-T3R10S30LZ

Description: BV R10 FNPT NUTRON T3 3000 WOG SOUR LT

Sales Order: N/A

Customer PO: N/A



VALVES & MEASUREMENT

Thursday, 22-Nov-2012

From:

Cameron Canada
3707 97 Street
Edmonton, Alberta, Canada
T6E 6J2
Phone : 780-468-2732

To:

Document Summary Page

The documents are printed in the following order:

#	Heat #	Heat Code	Job/Serial #	Material #	Description
1	L	LOC			Nutron T3, B3, B2, TT Sour Low Temp.
2	Hydro Test	598			API 598
3	S6283				BALL,7/8",ASTM A351 GR CF8M
4	R4881				STEM,7/8",ASTM A564 17-4 H1150 NACE
5	HN60				CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2
6	Z95D546				CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2
7	322607				BODY,7/8" 4000 WOG,ASTM A105/LF2
8	Z95D545				CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2



VALVES & MEASUREMENT
Cameron Canada Corporation
3707 - 97 Street
Edmonton Alberta Canada T6E 6J2
Phone 780.463.6868
Fax 780.465.1244
www.c-a-m.com

GENERAL LETTER OF COMPLIANCE

for Valve Models:

T3, B3 & B2 & TT

Style 'L': Sour Low Temperature Service

Cameron Valves & Measurement hereby certifies that the design, fabrication, testing and quality control of the above NUTRON brand ball valves for Sour Low Temperature Service have been made in accordance with the following applicable standards (latest edition in effect at time of manufacture): API 598 (1-1/2" and smaller), API 6D (TT only), ASME B16.34, CSA Z245.15 Sour Service (2" FP and larger) and V&M Engineering Standards. As part of compliance to these specifications, the valves have been marked in accordance with MSS SP-25. The valve has also been marked "SOUR" as required by CSA Z245.15 marking requirements for Sour Service.

The materials of construction for this valve conform to the metallurgical requirements of NACE MR0175/ISO 15156:2003 (Parts 1 & 2 for Carbon & Alloy Steels in SSC Region 3 Sour Service and Parts 1 & 3 for CRA's as specified in CSA Z245.15 Chapter 13). According to NACE MR0175-2003/ISO 15156, it is the customer's/user's responsibility to ensure that the valve materials will be satisfactory in the intended service.

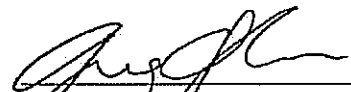
The minimum service temperature of these valves is -46°C/-50°F. Impact testing has been performed in accordance with applicable ASTM requirements and those of CSA Z245.15 for Category II M45C Service.

The 'Z' option code designation at the end of a figure number indicates that the valve meets the requirements of API-607 Fourth Edition, May 1993.

These valves (1-1/2" and larger) conform to the Pressure Equipment Directive requirements and are marked as CE certified (Certificate #8888-001-2002).

The B2 and TT valve models are constructed to be anti-static as standard.

Approved by:


Greg Ogarko, M.Eng., P.Eng.
Engineering Manager

09/13/10

EWR 7463-01 Rev.06.doc



VALVES & MEASUREMENT
Cameron Canada Corporation
3707-97th St.
Edmonton Alberta Canada T6E 6J2
Phone 780.468.2732
www.c-a-m.com

CERTIFICATE OF CONFORMANCE

API 598 Pressure Testing – Carbon and Low Alloy Steel (2" RP and Smaller)

COMPLIANCE: These valves are tested in accordance with Cameron Valves & Measurement's standard procedures and API Standard 598, as per the chart below.

Test durations are 15 seconds in length as a minimum. Test duration is defined as the period of inspection after the valve is fully prepared and is under full pressure.

Butt weld end valves shall be tested in accordance with the ANSI rating.

Actual test pressure is rounded to next highest increment on the gauge.

**Carbon & Low Alloy Steel
Shell and Seat Test Pressures**
(Table Based on Rating for Group 1.1 Materials per ANSI B16.34)

Valve Class	Maximum Working Pressure	Hydrostatic Shell Test Pressure (PSI)	Air Seat Test Pressure +/- 10 PSI
150 ANSI	285	450	80
300 ANSI	740	1125	80
600 ANSI	1480	2225	80
800 ANSI	1975	3000	80
900 ANSI	2220	3350	80
1500 ANSI	3705	5575	80
2500 ANSI	6170	9275	80
275 WOG	275	425	80
720 WOG	720	1100	80
1000 WOG	1000	1500	80
1440 WOG	1440	2175	80
1500 WOG	1500	2250	80
2000 WOG	2000	3000	80
2160 WOG	2160	3250	80
3000 WOG	3000	4500	80
3600 WOG	3600	5400	80
4000 WOG	4000	6000	80
5000 WOG	5000	7500	80
6000 WOG	6000	9000	80

Murray Aide, Quality Manager

Wen Zone

TUV

No. 0 100 529 86

原 璋 實 業 有 限 公 司**WON ZONE CORPORATION**

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

320 桃園縣中壢市中華路2段185號3樓 統一編號: 16879927

Tel: (03)4341 325 Fax: +886-3-4341 525 E-mail: wonzone.taiwan@msa.hinet.net

CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES					CERTIFICATE NO. 120516- 2 DATE: 16-May-12				
To. COOPER CAMERON CANADA LTD.-NUTRON 2125-64 AVENUE, EDMONTON AB T6P 1Z4, CANADA									
INVOICE NO. WZ-120516A					Your Order No. 4503305508				
Material Specification: ASTM A351 CF8M					Heat Treatment: Solution Annealed				
Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties					
				T.S.(KSI)	Y.S.(KSI)	ELO.(%)	HBW		
				<u>70 min</u>	<u>30 min</u>	<u>30 min</u>	<u>140-237</u>		
7,560	5A-11501041617 Ball 7/8"	#06002-010	S6283	76.8	48.3	43.7	161		
2,400	5A-11501541617 Ball 1½"	#06003-010	S6284	76.6	41.9	47	148		
1,116	5A-11502041617 Ball 2"	#06004-010	S6285	79.6	49.8	46	165		
500	5A-11503041617 Ball 3"	#06005-010	U2061	78.2	43.5	37.3	167		
100	5A-21504041220002 Ball 4"	#06040-041	S6286	80.6	46.7	38.1	162		
Heat Code	Chemical Composition (%)								
	C	Mn	Si	S	P	Cr	Ni	Mo	
	<u>0.08_{max}</u>	<u>1.5_{max}</u>	<u>1.5_{max}</u>	<u>.040_{max}</u>	<u>.040_{max}</u>	<u>18-21</u>	<u>9-12</u>	<u>2.0-3.0</u>	
S6283	0.0556	0.8772	0.4386	0.0078	0.0361	18.5973	9.3425	2.1756	
S6284	0.059	0.900	0.487	0.0083	0.033	18.61	9.24	2.18	
S6285	0.0454	0.8824	0.4592	0.0076	0.0311	18.4314	9.3032	2.2185	
U2061	0.0607	0.7500	1.1700	0.0066	0.0310	18.3667	9.1133	2.0400	
S6286	0.0610	0.7400	1.0700	0.0061	0.0230	18.2000	9.1900	2.0400	
NOTE: CERTIFICATE ACCORDING TO EN 10204/3.1B									
QUALITY CONTROL INSPECTOR					MANAGER				
Sandy Yeh					Grant Hsu				

Cameron Approved

By: Iala Date:05/28/12 12:36



ISO 9001
No. 01 100 029186

原 璋 實 業 有 限 公 司

WON ZONE CORPORATION

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

320 桃園縣中壢市中華路2段185號3樓 統一編號: 16879927

Tel: (03)4341 325 Fax: +886-3-4341 525 E-mail: wonzone.taiwan@msa.hinet.net

CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES				CERTIFICATE NO. 120808- 2 DATE: 8-Aug-12						
To: CAMERON CANADA CORPORATION 3707-97th Street, EDMONTON, AB T6E 6J2, CANADA										
INVOICE NO. WZ-120808A				Your Order No. 4503413884/417388/421312/446026						
MATERIAL SPECIFICATION: ASTM A-564 TYPE 630 H1150D										
Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties						
				Y.S.(KSI)	T.S.(KSI)	ELO.(%)	HRC	RA (%)	ft-lbf (-75°F)	
				<u>105 min</u>	<u>125 min</u>	<u>16 min</u>	<u>29-33</u>	<u>50 min</u>	<u>15 min</u>	
6,000	5A-11300513617 Stem 1/2"	#02001	R4941	123	136	22	32	71	93/86/88	
10,240	5A-11301013617 Stem 7/8"	#02002	R4881	129	140	23	32	71	77/76/83	
295	5A-11302013617005 Stem 2"	#02123	DY	128	140	23	32	73	83/84/82	
365	5A-11302013617005 Stem 2"	#02123	DV	133	141	21	32	72	59/50/56	
240	5A-11303013074 Stem 3"	#02005	DX	106	135	25	29	73	121/130/115	
200	5A-11304013074005 Stem 4"	#02125	DU	117	135	23	29	70	103/100/105	
528	5A-11501513617 Ball 1 1/2"	#06003	S6541	124	140	22	32	70	77/75/77	
Heat Code	Chemical Composition (%)									
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb+Ta
	<u>0.07max</u>	<u>1.0max</u>	<u>1.0max</u>	<u>.030max</u>	<u>.040max</u>	<u>15-17.5</u>	<u>3.0-5.0</u>	<u>0.5 max</u>	<u>3.0-5.0</u>	<u>0.15-0.45</u>
R4941	0.01	0.65	0.43	0.024	0.028	15.28	4.34	0.14	3.44	0.21
R4881	0.02	0.67	0.44	0.021	0.028	15.41	4.14	0.17	3.35	0.22
DU	0.01	0.63	0.50	0.028	0.028	15.21	4.22	0.13	3.45	0.23
DV	0.01	0.63	0.50	0.028	0.028	15.21	4.22	0.13	3.45	0.23
DX	0.02	0.65	0.46	0.024	0.029	15.45	4.27	0.17	3.50	0.22
DY	0.01	0.65	0.49	0.018	0.028	15.18	4.29	0.23	3.46	0.22
S6541	0.02	0.62	0.45	0.021	0.027	15.25	4.23	0.22	3.41	0.21
Solution Treatment: 1900°F for 30 Min/Inch (Minimum of 1 Hour), Fast Air Cooling to below 90°F										
Double Aged at 1150°F for 4 hours minimum and cooled to below 90°F in air										
Charpy Impact Test Specimens: 10*10*55mm(Longitudinal)										
NOTE: CERTIFICATE ACCORDING TO EN 10204/3.1B										
QUALITY CONTROL INSPECTOR						MANAGER				
Sandy Yeh						Grant Hsu				

Cameron Approved

By: laia Date:09/05/12 11:45

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-1010101032400	CAP, 1" RP 4000 WOG FNPT, ASTM A105/LF2	HN60		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Cb/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.18	.810	.018	.005	.210	.01	.02	0.0	.01	.002	0.320	0.0		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	74657	45751	33.2	87, 87, 93	-50	75.1	151

Additional Notes:

AUSTENITIZED @ 920°C 80 MIN OIL QUENCHED
TEMPERED @ 590-704°C 30 MIN/IN

Chemical Information Notes:

1. RES 0.042

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Aida
Quality Manager
Cameron Canada

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-1010101032400	CAP, 1" RP 4000 WOG FNPT, ASTM A105/LF2	Z95D546		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Co/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.2	.9	.008	.007	.21	.06	.087	.03	.025	.054	0.3899	.012		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	76145	53664	29	177, 186, 183	-50	76	160

Additional Notes:

QUENCHING @920°C 2HRS @800°C 2HRS TEMPERING @700°C 2HRS
--

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Cuda
 Quality Manager
 Cameron Canada

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2 Cameron			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-10001032400	BODY, 7/8" 4000 WOG, ASTM A105/LF2	322607		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Cl/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.2	.83	.027	.01	.21	.06	.12	.02	.16	.002	0.380	0.0		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft/lb	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	85281	64857	28.2	48, 57, 57	-50	68.6	173

Additional Notes:

AUSTENITIZED @920°C 80 MIN OIL QUENCHED
TEMPERED @590-704°C 30MIN/IN

Chemical Information Notes:
1. RES 0.362

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Cide
Quality Manager
Cameron Canada

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-1010101032400	CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2	Z95D545		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Cb/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.2	.9	.008	.007	.21	.06	.087	.03	.025	.054	0.3899	.012		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	76145	54664	29	177, 186, 183	-50	76	160

Additional Notes:

QUENCHING @920'C 2HRS @800'C 2HRS TEMPERING @700'C 2HRS
--

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Aida
 Quality Manager
 Cameron Canada



VALVES & MEASUREMENT

Thursday, 31-Jan-2013

From:

Cameron Canada Corporation
3707 97 St.
Edmonton, Alberta, Canada
T6E6J2
Phone : 780-468-2732
Web Site : www.c-a-m.com

To:

Subject:

Serial	2675421	Quantity/Series	175
--------	---------	-----------------	-----

Comments:

Part #: 5A-T3R10S30LZ
Description: BV R10 FNPT NUTRON T3 3000 WOG SOUR LT
Sales Order: n/a
Customer P/O: n/a



VALVES & MEASUREMENT

Thursday, 31-Jan-2013

From:

Cameron Canada Corporation
3707 97 St.
Edmonton, Alberta, Canada
T6E6J2
Phone : 780-468-2732
Web Site : www.c-a-m.com

To:

Document Summary Page

The documents are printed in the following order:

#	Heat #	Heat Code	Job/Serial #	Material #	Description
1	L	LOC			Nutron T3, B3, B2, TT Sour Low Temp.
2	Hydro Test	598			API 598
3	D95D536				BODY,7/8" 4000 WOG,ASTM A105/LF2
4	G94D515				BODY,7/8" 4000 WOG,ASTM A105/LF2
5	G29E003				CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2
6	G29D4562				CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2
7	R4991				STEM,7/8",ASTM A564 17-4 H1150 NACE
8	U2071				BALL,7/8",ASTM A351 GR CF8M



VALVES & MEASUREMENT
Cameron Canada Corporation
3707 - 97 Street
Edmonton Alberta Canada T6E 6J2
Phone 780.463.6868
Fax 780.465.1244
www.c-a-m.com

GENERAL LETTER OF COMPLIANCE

for Valve Models:

T3, B3 & B2 & TT

Style 'L': Sour Low Temperature Service

Cameron Valves & Measurement hereby certifies that the design, fabrication, testing and quality control of the above NUTRON brand ball valves for Sour Low Temperature Service have been made in accordance with the following applicable standards (latest edition in effect at time of manufacture): API 598 (1-1/2" and smaller), API 6D (TT only), ASME B16.34, CSA Z245.15 Sour Service (2" FP and larger) and V&M Engineering Standards. As part of compliance to these specifications, the valves have been marked in accordance with MSS SP-25. The valve has also been marked "SOUR" as required by CSA Z245.15 marking requirements for Sour Service.

The materials of construction for this valve conform to the metallurgical requirements of NACE MR0175/ISO 15156:2003 (Parts 1 & 2 for Carbon & Alloy Steels in SSC Region 3 Sour Service and Parts 1 & 3 for CRA's as specified in CSA Z245.15 Chapter 13). According to NACE MR0175-2003/ISO 15156, it is the customer's/user's responsibility to ensure that the valve materials will be satisfactory in the intended service.

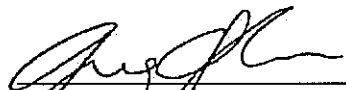
The minimum service temperature of these valves is -46°C/-50°F. Impact testing has been performed in accordance with applicable ASTM requirements and those of CSA Z245.15 for Category II M45C Service.

The 'Z' option code designation at the end of a figure number indicates that the valve meets the requirements of API-607 Fourth Edition, May 1993.

These valves (1-1/2" and larger) conform to the Pressure Equipment Directive requirements and are marked as CE certified (Certificate #8888-001-2002).

The B2 and TT valve models are constructed to be anti-static as standard.

Approved by:


Greg Ogaranko, M.Eng., P.Eng.
Engineering Manager



VALVES & MEASUREMENT
Cameron Canada Corporation
3707-97th St.
Edmonton Alberta Canada T6E 6J2
Phone 780.468.2732
www.c-a-m.com

CERTIFICATE OF CONFORMANCE

API 598 Pressure Testing – Carbon and Low Alloy Steel (2" RP and Smaller)

COMPLIANCE: These valves are tested in accordance with Cameron Valves & Measurement's standard procedures and API Standard 598, as per the chart below.

Test durations are 15 seconds in length as a minimum. Test duration is defined as the period of inspection after the valve is fully prepared and is under full pressure.

Butt weld end valves shall be tested in accordance with the ANSI rating.

Actual test pressure is rounded to next highest increment on the gauge.

Carbon & Low Alloy Steel
Shell and Seat Test Pressures
(Table Based on Rating for Group 1.1 Materials per ANSI B16.34)

Valve Class	Maximum Working Pressure	Hydrostatic Shell Test Pressure (PSI)	Air Seat Test Pressure +/- 10 PSI
150 ANSI	285	450	80
300 ANSI	740	1125	80
600 ANSI	1480	2225	80
800 ANSI	1975	3000	80
900 ANSI	2220	3350	80
1500 ANSI	3705	5575	80
2500 ANSI	6170	9275	80
275 WOG	275	425	80
720 WOG	720	1100	80
1000 WOG	1000	1500	80
1440 WOG	1440	2175	80
1500 WOG	1500	2250	80
2000 WOG	2000	3000	80
2160 WOG	2160	3250	80
3000 WOG	3000	4500	80
3600 WOG	3600	5400	80
4000 WOG	4000	6000	80
5000 WOG	5000	7500	80
6000 WOG	6000	9000	80

Murray Aide, Quality Manager

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-10001032400	BODY, 7/8" 4000 WOG, ASTM A105/LF2	D95D536		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Ch/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	0.2	0.9	0.008	0.007	0.21	0.06	0.087	0.03	0.025	0.054	0.3899	0.012		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	81221	58740	29.5	144, 194, 177	-50	74.5	160

Additional Notes:

QUENCHING AT 920°C 2 HOURS, 800°C 2 HRS. TEMPERING @ 700°C 2 HRS

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Ciola
Quality Manager
Cameron Canada

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-10001032400	BODY, 7/8" 4000 WOG T3	G94D515		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Cl/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.18	.89	.01	.007	.22	.03	.055	.03	.001	.05	0.3574	.01		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	71794	51488	31	174, 148, 187	-50	74	155

Additional Notes:

QUENCHING @920'C 2HRS @800'C 2HRS TEMPERING @700'C 2HRS
--

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Aida
 Quality Manager
 Cameron Canada

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2 Cameron			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-1010101032400	CAP, 1" RP 4000 WOG FNPT, ASTM A105/LF2	G29E003		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Cb/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.16	.88	.013	.008	.2	.02	.01	.01	.02	.06	0.3253	.01		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	76870	56565	27.5	18, 146, 125	-50	69.5	163

Additional Notes:

QUENCHING @920°C 2HRS @800°C 2HRS TEMPERING @700°C 2HRS
--

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Aida
Quality Manager
Cameron Canada

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2 Cameron			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-1010101032400	CAP, 1" RP 4000 WOG FNPT, ASTM A105/LF2	G29D4562		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Cb/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.16	.88	.013	.008	.2	.02	.01	.01	.02	.06	0.3253	.01		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	72519	51488	33.5	91, 127, 105	-50	64	153

Additional Notes:

QUENCHING @920°C 2HRS @800°C 2HRS TEMPERING @700°C 2HRS
--

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Cicala
 Quality Manager
 Cameron Canada



No. 0 100

原 璋 實 業 有 限 公 司

WON ZONE CORPORATION

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

320 桃園縣中壢市中華路2段185號3樓 統一編號: 16879927

Tel: (03)4341 325 Fax: +886-3-4341 525 E-mail: wonzone.taiwan@msa.hinet.net

CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES					CERTIFICATE NO. 121017- 2 DATE: 17-Oct-12					
To: CAMERON CANADA CORPORATION 3707-97th Street, EDMONTON, AB T6E 6J2, CANADA										
INVOICE NO. WZ-121017A					Your Order No. 4503466876/514818					
MATERIAL SPECIFICATION: ASTM A-564 TYPE 630 H1150D										
Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties						
				Y.S.(KSI)	T.S.(KSI)	ELO.(%)	HRC	RA (%)	ft-lbf (-75°F)	
				<u>105 min</u>	<u>125 min</u>	<u>16 min</u>	<u>29-33</u>	<u>50 min</u>	<u>15 min</u>	
10,240	5A-11301013617 Stem 7/8"	#02002	R4991	129	140	23	32	71	77/76/83	
95	5A-11302013617005 Stem 2"	#02123	DV	133	141	21	32	72	59/50/56	
565	5A-11302013617005 Stem 2"	#02123	DZ	122	140	23	31	71	87/94/90	
69	5A-11303013370005 Stem 3"	#02124	DX	106	135	25	29	73	121/130/115	
131	5A-11303013370005 Stem 3"	#02124	EA	106	135	25	29	73	121/130/115	
240	5A-11303013074 Stem 3"	#02005	EA	106	135	25	29	73	121/130/115	
1,400	5A-11500513617 Ball 1/2"	#06001	S6761	114	138	22	30	71	83/90/90	
528	5A-11501513617 Ball 1 1/2"	#06003	S6763	130	140	18.5	31	68	58/59/61	
Heat Code	Chemical Composition (%)									
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb+Ta
	<u>0.07max</u>	<u>1.0max</u>	<u>1.0max</u>	<u>.030max</u>	<u>.040max</u>	<u>15-17.5</u>	<u>3.0-5.0</u>	<u>0.5 max</u>	<u>3.0-5.0</u>	<u>0.15-0.45</u>
R4991	0.02	0.67	0.44	0.021	0.028	15.41	4.14	0.17	3.35	0.22
DV	0.01	0.63	0.50	0.028	0.028	15.21	4.22	0.13	3.45	0.23
DZ	0.01	0.63	0.44	0.027	0.032	15.28	4.33	0.13	3.47	0.23
DX/EA	0.02	0.65	0.46	0.024	0.029	15.45	4.27	0.17	3.50	0.22
S6761	0.02	0.63	0.42	0.027	0.027	15.15	4.23	0.19	3.40	0.22
S6763	0.02	0.64	0.47	0.017	0.027	15.12	4.31	0.17	3.43	0.22
Solution Treatment: 1900°F for 30 Min/Inch (Minimum of 1 Hour), Fast Air Cooling to below 90°F										
Double Aged at 1150°F for 4 hours minimum and cooled to below 90°F in air										
Charpy Impact Test Specimens: 10*10*55mm(Longitudinal)										
NOTE: CERTIFICATE ACCORDING TO EN 10204/3.1B										
QUALITY CONTROL INSPECTOR						MANAGER				
Sandy Yeh						Grand Hsu				

Cameron Approved

By: lala Date:11/13/12 8:33

Wen Zone

No. 0 100

原 璋 實 業 有 限 公 司**WON ZONE CORPORATION**

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

320 桃園縣中壢市中華路2段185號3樓 統一編號: 16879927

Tel: (03)4341 325 Fax: +886-3-4341 525 E-mail: wonzone.taiwan@msa.hinet.net

CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES					CERTIFICATE NO. 120704- 4 DATE: 4-Jul-12				
To. CAMERON CANADA CORPORATION 3707-97th Street, EDMONTON, AB T6E 6J2, CANADA									
INVOICE NO. WZ-120704A					Your Order No. 4503374619				
Material Specification: ASTM A351 CF8M					Heat Treatment: Solution Annealed				
Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties					
				T.S.(KSI)	Y.S.(KSI)	ELO.(%)	HBW		
				<u>70 min</u>	<u>30 min</u>	<u>30 min</u>	<u>140-237</u>		
5,000	5A-11500541617 Ball 1/2"	#06001-010	S6412	79.0	50.2	47	172		
10,080	5A-11501041617 Ball 7/8"	#06002-010	U2071	76.3	42.1	47	146		
1,536	5A-11501541617 Ball 1½"	#06003-010	S6413	82.5	52.6	47	167		
1,008	5A-11502041617 Ball 2"	#06004-010	S6414	81.1	52.6	47	166		
200	5A-11504041074 Ball 4"	#06011-010	U2072	77.3	39.7	48	155		
Heat Code	Chemical Composition (%)								
	C	Mn	Si	S	P	Cr	Ni	Mo	
	<u>0.08max</u>	<u>1.5max</u>	<u>1.5max</u>	<u>.040max</u>	<u>.040max</u>	<u>18-21</u>	<u>9-12</u>	<u>2.0-3.0</u>	
S6412	0.0614	0.8551	0.9618	0.0087	0.0309	18.3219	9.0845	2.0623	
S6413	0.0474	1.0291	0.5057	0.0075	0.0365	18.5048	9.2315	2.1905	
S6414	0.0551	0.7778	0.4675	0.0070	0.0312	18.5001	9.2520	2.2071	
U2071	0.0510	0.9200	0.438	0.0088	0.034	18.55	9.31	2.13	
U2072	0.0554	0.972	0.6293	0.0128	0.0303	18.515	9.41	2.133	
NOTE: CERTIFICATE ACCORDING TO EN 10204/3.1B									
QUALITY CONTROL INSPECTOR					MANAGER				
Sandy Yeh					Grant Hsu				

Cameron Approved

By: Iaja Date:07/16/12 9:25



VALVES & MEASUREMENT

Thursday, 15-Nov-2012

From:

Cameron Canada
3707 97 Street
Edmonton, Alberta, Canada
T6E 6J2
Phone : 780-468-2732

To:

Subject:

Serial	2607755	Quantity/Series	200
--------	---------	-----------------	-----

Comments:

Part #: 5A-T3R10S30LZ
Description: BV R10 FNPT NUTRON T3 3000 WOG SOUR LT
Sales Order: N/A
Customer PO: N/A



VALVES & MEASUREMENT

Thursday, 15-Nov-2012

From:

Cameron Canada
3707 97 Street
Edmonton, Alberta, Canada
T6E 6J2
Phone : 780-468-2732

To:

Document Summary Page

The documents are printed in the following order:

#	Heat #	Heat Code	Job/Serial #	Material #	Description
1	L	LOC			Nutron T3, B3, B2, TT Sour Low Temp.
2	Hydro Test	598			API 598
3	U2071				BALL,7/8",ASTM A351 GR CF8M
4	S6283				BALL,7/8",ASTM A351 GR CF8M
5	R4701				STEM,7/8",ASTM A564 17-4 H1150 NACE
6	R4881				STEM,7/8",ASTM A564 17-4 H1150 NACE
7	Z95D546				CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2
8	322607				BODY,7/8" 4000 WOG,ASTM A105/LF2



VALVES & MEASUREMENT
Cameron Canada Corporation
3707 - 97 Street
Edmonton Alberta Canada T6E 6J2
Phone 780.463.6868
Fax 780.465.1244
www.c-a-m.com

GENERAL LETTER OF COMPLIANCE

for Valve Models:

T3, B3 & B2 & TT

Style 'L': Sour Low Temperature Service

Cameron Valves & Measurement hereby certifies that the design, fabrication, testing and quality control of the above NUTRON brand ball valves for Sour Low Temperature Service have been made in accordance with the following applicable standards (latest edition in effect at time of manufacture): API 598 (1-1/2" and smaller), API 6D (TT only), ASME B16.34, CSA Z245.15 Sour Service (2" FP and larger) and V&M Engineering Standards. As part of compliance to these specifications, the valves have been marked in accordance with MSS SP-25. The valve has also been marked "SOUR" as required by CSA Z245.15 marking requirements for Sour Service.

The materials of construction for this valve conform to the metallurgical requirements of NACE MR0175/ISO 15156:2003 (Parts 1 & 2 for Carbon & Alloy Steels in SSC Region 3 Sour Service and Parts 1 & 3 for CRA's as specified in CSA Z245.15 Chapter 13). According to NACE MR0175-2003/ISO 15156, it is the customer's/user's responsibility to ensure that the valve materials will be satisfactory in the intended service.

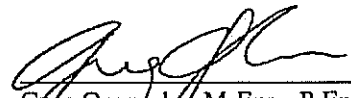
The minimum service temperature of these valves is -46°C/-50°F. Impact testing has been performed in accordance with applicable ASTM requirements and those of CSA Z245.15 for Category II M45C Service.

The 'Z' option code designation at the end of a figure number indicates that the valve meets the requirements of API-607 Fourth Edition, May 1993.

These valves (1-1/2" and larger) conform to the Pressure Equipment Directive requirements and are marked as CE certified (Certificate #8888-001-2002).

The B2 and TT valve models are constructed to be anti-static as standard.

Approved by:


Greg Ogarko, M.Eng., P.Eng.
Engineering Manager



VALVES & MEASUREMENT
Cameron Canada Corporation
3707-97th St.
Edmonton Alberta Canada T6E 6J2
Phone 780.468.2732
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CERTIFICATE OF CONFORMANCE

API 598 Pressure Testing – Carbon and Low Alloy Steel (2" RP and Smaller)

COMPLIANCE: These valves are tested in accordance with Cameron Valves & Measurement's standard procedures and API Standard 598, as per the chart below.

Test durations are 15 seconds in length as a minimum. Test duration is defined as the period of inspection after the valve is fully prepared and is under full pressure.

Butt weld end valves shall be tested in accordance with the ANSI rating.

Actual test pressure is rounded to next highest increment on the gauge.

**Carbon & Low Alloy Steel
Shell and Seat Test Pressures**
(Table Based on Rating for Group 1.1 Materials per ANSI B16.34)

Valve Class	Maximum Working Pressure	Hydrostatic Shell Test Pressure (PSI)	Air Seat Test Pressure +/- 10 PSI
150 ANSI	285	450	80
300 ANSI	740	1125	80
600 ANSI	1480	2225	80
800 ANSI	1975	3000	80
900 ANSI	2220	3350	80
1500 ANSI	3705	5575	80
2500 ANSI	6170	9275	80
275 WOG	275	425	80
720 WOG	720	1100	80
1000 WOG	1000	1500	80
1440 WOG	1440	2175	80
1500 WOG	1500	2250	80
2000 WOG	2000	3000	80
2160 WOG	2160	3250	80
3000 WOG	3000	4500	80
3600 WOG	3600	5400	80
4000 WOG	4000	6000	80
5000 WOG	5000	7500	80
6000 WOG	6000	9000	80

Murray Aide, Quality Manager

Wen Zone

No. 0 100

原 璋 實 業 有 限 公 司**WON ZONE CORPORATION**

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

320 桃園縣中壢市中華路2段185號3樓 統一編號: 16879927

Tel: (03)4341 325 Fax: +886-3-4341 525 E-mail: wonzone.taiwan@msa.hinet.net

CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES					CERTIFICATE NO. 120704- 4 DATE: 4-Jul-12				
To. CAMERON CANADA CORPORATION 3707-97th Street, EDMONTON, AB T6E 6J2, CANADA									
INVOICE NO. WZ-120704A					Your Order No. 4503374619				
Material Specification: ASTM A351 CF8M					Heat Treatment: Solution Annealed				
Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties					
				T.S.(KSI)	Y.S.(KSI)	ELO.(%)	HBW		
				<u>70 min</u>	<u>30 min</u>	<u>30 min</u>	<u>140-237</u>		
5,000	5A-11500541617 Ball 1/2"	#06001-010	S6412	79.0	50.2	47	172		
10,080	5A-11501041617 Ball 7/8"	#06002-010	U2071	76.3	42.1	47	146		
1,536	5A-11501541617 Ball 1½"	#06003-010	S6413	82.5	52.6	47	167		
1,008	5A-11502041617 Ball 2"	#06004-010	S6414	81.1	52.6	47	166		
200	5A-11504041074 Ball 4"	#06011-010	U2072	77.3	39.7	48	155		
Heat Code	Chemical Composition (%)								
	C	Mn	Si	S	P	Cr	Ni	Mo	
	<u>0.08_{max}</u>	<u>1.5_{max}</u>	<u>1.5_{max}</u>	<u>.040_{max}</u>	<u>.040_{max}</u>	<u>18-21</u>	<u>9-12</u>	<u>2.0-3.0</u>	
S6412	0.0614	0.8551	0.9618	0.0087	0.0309	18.3219	9.0845	2.0623	
S6413	0.0474	1.0291	0.5057	0.0075	0.0365	18.5048	9.2315	2.1905	
S6414	0.0551	0.7778	0.4675	0.0070	0.0312	18.5001	9.2520	2.2071	
U2071	0.0510	0.9200	0.438	0.0088	0.034	18.55	9.31	2.13	
U2072	0.0554	0.972	0.6293	0.0128	0.0303	18.515	9.41	2.133	
NOTE: <u>CERTIFICATE ACCORDING TO EN 10204/3.1B</u>									
QUALITY CONTROL INSPECTOR					MANAGER				
<i>Sandy Yeh</i>					<i>Grant Hsu</i>				

Cameron Approved

By: Iala Date:07/16/12 9:25

Wen Zone

UV

No. 0 100 029 44

原 璋 實 業 有 限 公 司**WON ZONE CORPORATION**

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

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CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES					CERTIFICATE NO. 120516- 2				
					DATE: 16-May-12				
To: COOPER CAMERON CANADA LTD.-NUTRON 2125-64 AVENUE, EDMONTON AB T6P 1Z4, CANADA									
INVOICE NO. WZ-120516A					Your Order No. 4503305508				
Material Specification: ASTM A351 CF8M					Heat Treatment: Solution Annealed				
Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties					
				T.S.(KSI)	Y.S.(KSI)	ELO.(%)	HBW		
				<u>70 min</u>	<u>30 min</u>	<u>30 min</u>	<u>140-237</u>		
7,560	5A-115010-1617 Ball 7/8"	#06002-010	S6283	76.8	48.3	43.7	161		
2,400	5A-115015-1617 Ball 1½"	#06003-010	S6284	76.6	41.9	47	148		
1,116	5A-115020-1617 Ball 2"	#06004-010	S6285	79.6	49.8	46	165		
500	5A-115030-1617 Ball 3"	#06005-010	U2061	78.2	43.5	37.3	167		
100	5A-215040-1220002 Ball 4"	#06040-041	S6286	80.6	46.7	38.1	162		
Heat Code	Chemical Composition (%)								
	C	Mn	Si	S	P	Cr	Ni	Mo	
	<u>0.08_{max}</u>	<u>1.5_{max}</u>	<u>1.5_{max}</u>	<u>.040_{max}</u>	<u>.040_{max}</u>	<u>18-21</u>	<u>9-12</u>	<u>2.0-3.0</u>	
S6283	0.0556	0.8772	0.4386	0.0078	0.0361	18.5973	9.3425	2.1756	
S6284	0.059	0.900	0.487	0.0083	0.033	18.61	9.24	2.18	
S6285	0.0454	0.8824	0.4592	0.0076	0.0311	18.4314	9.3032	2.2185	
U2061	0.0607	0.7500	1.1700	0.0066	0.0310	18.3667	9.1133	2.0400	
S6286	0.0610	0.7400	1.0700	0.0061	0.0230	18.2000	9.1900	2.0400	
NOTE: CERTIFICATE ACCORDING TO EN 10204/3.1B									
QUALITY CONTROL INSPECTOR					MANAGER				
<i>Sandy Yeh</i>					<i>Grant Hsu</i>				

Cameron Approved

By: Iala Date:05/28/12 12:36



TUV 9001
No. 0 100 029196

原 璋 實 業 有 限 公 司

WON ZONE CORPORATION

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

320 桃園縣中壢市中華路2段185號3樓 統一編號: 16879927

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CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES				CERTIFICATE NO. 120516-1 DATE: 16-May-12						
To: COOPER CAMERON CANADA LTD.-NUTRON 2125-64 AVENUE, EDMONTON AB T6P 1Z4, CANADA										
INVOICE NO. WZ-120516A				Your Order No. 4503233955/244872/305508						
MATERIAL SPECIFICATION: ASTM A-564 TYPE 630 H1150D										
Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties						
				Y.S.(KSI)	T.S.(KSI)	ELO.(%)	HRC	RA (%)	ft-lbf (-75°F)	
				105 min	125 min	16 min	29-33	50 min	15 min	
9,600	5A-11301013617 Stem 7/8"	#02002	R4701	142	146	20	32	72	106/94/89	
157	5A-11302013617005 Stem 2"	#02123	DU	117	135	23	29	70	103/100/105	
503	5A-11302013617005 Stem 2"	#02123	DV	133	141	21	32	72	59/50/56	
12	5A-11303013370005 Stem 3"	#02124	DX	106	135	25	29	73	121/130/115	
42	5A-11304013074005 Stem 4"	#02125	DU	117	135	23	29	70	103/100/105	
66	5A-11304013074005 Stem 4"	#02125	DP	141	146	20.0	32	71	118/108/109	
240	5A-11501513617 Ball 1½"	#06003	S6281	130	142	21.0	31	70	68/79/65	
72	5A-11502013617 Ball 2"	#06004	S6282	131	141	20	31	70	38/36/36	
Heat Code	Chemical Composition (%)									
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb+Ta
	0.07max	1.0max	1.0max	.030max	.040max	15-17.5	3.0-5.0	0.5 max	3.0-5.0	0.15-0.45
R4701	0.02	0.64	0.48	0.024	0.028	15.12	4.34	0.19	3.43	0.22
DU	0.01	0.63	0.50	0.028	0.028	15.21	4.22	0.13	3.45	0.23
DV	0.01	0.63	0.50	0.028	0.028	15.21	4.22	0.13	3.45	0.23
DX	0.02	0.65	0.46	0.024	0.029	15.45	4.27	0.17	3.50	0.22
DP	0.02	0.61	0.44	0.020	0.027	15.09	4.34	0.21	3.39	0.21
S6281	0.03	0.63	0.47	0.022	0.031	15.36	4.36	0.16	3.41	0.23
S6282	0.02	0.66	0.49	0.024	0.029	15.05	4.34	0.19	3.34	0.20
Solution Treatment: 1900°F for 30 Min/Inch (Minimum of 1 Hour), Fast Air Cooling to below 90°F										
Double Aged at 1150°F for 4 hours minimum and cooled to below 90°F in air										
Charpy Impact Test Specimens: 10*10*55mm(Longitudinal)										
NOTE: CERTIFICATE ACCORDING TO EN 10204/3.1B										
QUALITY CONTROL INSPECTOR						MANAGER				
Sandy Yeh						Grant Hsu				

Cameron Approved

By: lala Date:05/28/12 12:35



1-11 2009
No. 01 100 029186

原 璋 實 業 有 限 公 司

WON ZONE CORPORATION

3F No. 185 Chung Hwa Road Sec. 2, Chung Li City 320, Taiwan R.O.C.

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CERTIFICATE OF CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES	CERTIFICATE NO. 120808- 2 DATE: 8-Aug-12
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To. CAMERON CANADA CORPORATION

3707-97th Street, EDMONTON, AB T6E 6J2, CANADA

INVOICE NO. WZ-120808A

Your Order No. 4503413884/417388/421312/446026

MATERIAL SPECIFICATION: ASTM A-564 TYPE 630 H1150D

Q'TY	PART NAME	DRAWING No.	Heat Code	Mechanical Properties					
				Y.S.(KSI)	T.S.(KSI)	ELO.(%)	HRC	RA (%)	ft-lbf (-75°F)
				<u>105 min</u>	<u>125 min</u>	<u>16 min</u>	<u>29-33</u>	<u>50 min</u>	<u>15 min</u>
6,000	5A-11300513617 Stem 1/2"	#02001	R4941	123	136	22	32	71	93/86/88
10,240	5A-11301013617 Stem 7/8"	#02002	R4881	129	140	23	32	71	77/76/83
295	5A-11302013617005 Stem 2"	#02123	DY	128	140	23	32	73	83/84/82
365	5A-11302013617005 Stem 2"	#02123	DV	133	141	21	32	72	59/50/56
240	5A-11303013074 Stem 3"	#02005	DX	106	135	25	29	73	121/130/115
200	5A-11304013074005 Stem 4"	#02125	DU	117	135	23	29	70	103/100/105
528	5A-11501513617 Ball 1 1/2"	#06003	S6541	124	140	22	32	70	77/75/77

Heat Code	Chemical Composition (%)									
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb+Ta
	<u>0.07max</u>	<u>1.0max</u>	<u>1.0max</u>	<u>.030max</u>	<u>.040max</u>	<u>15-17.5</u>	<u>3.0-5.0</u>	<u>0.5 max</u>	<u>3.0-5.0</u>	<u>0.15-0.45</u>
R4941	0.01	0.65	0.43	0.024	0.028	15.28	4.34	0.14	3.44	0.21
R4881	0.02	0.67	0.44	0.021	0.028	15.41	4.14	0.17	3.35	0.22
DU	0.01	0.63	0.50	0.028	0.028	15.21	4.22	0.13	3.45	0.23
DV	0.01	0.63	0.50	0.028	0.028	15.21	4.22	0.13	3.45	0.23
DX	0.02	0.65	0.46	0.024	0.029	15.45	4.27	0.17	3.50	0.22
DY	0.01	0.65	0.49	0.018	0.028	15.18	4.29	0.23	3.46	0.22
S6541	0.02	0.62	0.45	0.021	0.027	15.25	4.23	0.22	3.41	0.21

Solution Treatment: 1900°F for 30 Min/Inch (Minimum of 1 Hour), Fast Air Cooling to below 90°F

Double Aged at 1150°F for 4 hours minimum and cooled to below 90°F in air

Charpy Impact Test Specimens: 10*10*55mm(Longitudinal)

NOTE: CERTIFICATE ACCORDING TO EN 10204/3.1B

Cameron Approved

By: laia Date:09/05/12 11:45

QUALITY CONTROL INSPECTOR

Sandy Yeh

MANAGER

Grant Hsu

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-1010101032400	CAP,1" RP 4000 WOG FNPT, ASTM A105/LF2	Z95D546		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Cb/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.2	.9	.008	.007	.21	.06	.087	.03	.025	.054	0.3899	.012		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft-lb (average of a set)	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	76145	53664	29	177, 186, 183	-50	76	160

Additional Notes:

QUENCHING @920°C 2HRS @800°C 2HRS TEMPERING @700°C 2HRS
--

We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Aida
 Quality Manager
 Cameron Canada

Material Test Report

Specification Notes:

Name	Revision	Grade	Description	Revision Year
ASTM A105/ASTM A350 GR LF2 Cameron			Carbon & Low-Alloy Steel Forgings	2011

Product Information:

Item #	Product Code	Description	Heat Number	Heat Code	PO #
1	5A-10001032400	BODY, 7/8" 4000 WOG, ASTM A105/LF2	322607		

Chemical Information:

Item #	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	CE	Co/Nb	Cu+Ni	Cr+Mo
Min		0.6			0.15									
Max	0.23	1.35	0.035	0.035	0.3	0.4	0.3	0.12	0.4	0.08	0.43	0.02	1.00	0.32
1	.2	.83	.027	.01	.21	.06	.12	.02	.16	.002	0.380	0.0		

Physical Information:

Item #	Tensile (psi)	Yield (psi)	% Elongation	Charpy ft/lb	Charpy Temp (°F)	% Red of Area	Hardness (Brinell)
Min	70000	36000	22	15	-80	30	137
Max	95000				-50		187
1	85281	64857	28.2	48, 57, 57	-50	68.6	173

Additional Notes:

AUSTENITIZED @920°C 80 MIN OIL QUENCHED TEMPERED @590-704°C 30MIN/IN Chemical Information Notes: 1. RES 0.362
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We certify that the items referenced in this document were manufactured and tested in accordance with Cameron Purchase Order requirements and EIH0204 3.1

M. Chida
Quality Manager
Cameron Canada

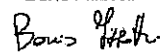
 I.M.L. - INDUSTRIA MECCANICA LIGURE S.P.A. Via Giancarlo Farina, 25 - 16030 Casarza Ligure - GE - ITALY Tel. +39 0185 487661 - Fax +39 0185 466510 - E-mail quality.ima@farinagroup.com MATERIAL TEST DEPARTMENT		COMPANY WITH QUALITY SYSTEM ISO 9001: 2008 CERTIFIED BY RINA CERT. N°23/91/S								
INSPECTION CERTIFICATE EN 10204:2004 / 3.1		Nr 22687	Dated 01.02.2012							
TRANS AM PIPING PRODUCTS LTD. 9335 Endeavor Drive S.E. Calgary, Alberta T3S 0A1 CA		Purchase Order Nr 3793 Item Nr 054 Packing List Nr 99 Invoice Nr 84								
Heat Code E5L	Heat Nr 33032	Quantity	Description FITTING 90 ELB. THRD NPT 6M 3/4" A350/LF2 ✓							
Element	C	SI	Mn	S	P	Cr	Ni	Mo	Ti	Cu
ASTM A350 LF2 cl.1 (LADLE)	0,180	0,200	1,100	0,008	0,010	0,100	0,050	0,010	0,018	0,120
Element	V	Nb	N	AL				C.E.	PRE	
ASTM A350 LF2 cl.1 (LADLE)	0,002	0,001	-	0,029				0,397	-	
Test specimen	Shape	Tensile	Yield Point >0.2%	Yield Point >1%	Elongation	Reduction of area				
Sect. mm2	Length mm	N/mm2	N/mm2	N/mm2	%	%				
122,65	50,00	518,0	338,0	-	33,0	56,0				
HARDNESS		IMPACT TEST								
HBW	TYPE	Test specimen	°C	1-Joule/cm2	2-Joule/cm2	3-Joule/cm2				
160,0 - 163,0	KV	10x10mm	-46	49	53	52				
Heat treatment		Normalized at 900°C / Air Cool				ELECTRIC FURNACE				
Dimension in accordance		ASME B16.11 Ed 2009 - ANSI/ASME B1.20.1 Ed 1992 - MSS SP25 Ed 2008 - NACE MR 0175 ISO 15166 Ed 2009 - NACE MR 0103 Ed 2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS ✓								
Material in accordance		ASME SA ASTM A350-11 Gr. LF2 cl.1 ✓								
Visual & Dimensional		SATISFACTORY		Origin	EUROPE		Our Ref.	101373		
Notes										

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUN 19 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: Enlana

Date: JUN 19 2013

QUALITY CONTROL DEPT. Boris Flizzotti 	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL IML or 
--	-----------------------------	--



Phoenix * Capitol * Camco
Cap Products

Commanding a Higher Standardsm

Certified Mill Test Report

7/12/2012

Customer

MRC MIDFIELD
MIDFIELD SUPPLY ULC
1600, 101-6TH AVENUE SW
CALGARY, AB T2P 3P4

P.O. S 759 170875

Heat No 8970G

Heat Code GZI

Phoenix Order # 867871

Material ASTM A106-2011 / ASME SA106-2010 Edition ✓

Part Number

15111506

Description

1-1/2 X 3" XHSML BK STL NIPL ✓

Chemical Properties

C ✓	Mn ✓	P ✓	S ✓	Si ✓	Cu ✓	Cr ✓	Ni ✓	C Eq. Long	
0.1620	0.7000	0.0140	0.0040	0.2400	0.1800	0.0800	0.0600	0.3159	✓
Mo	V ✓	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0240	0.0020		0.0230	0.0020			0.0130		0.0024

Additional Chemical Properties

					Cr + Cu + Ni	
					0.3200	

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
✓ 72,295	✓ 47,845	✓ 37.2%		136 ✓	

Charpy Minimum Impact - ft/lbs

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

* Hydro test passed. at 2500 psi.

* Eddy Current test passed.

* Bend test passed.

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

DEC 1 0 2012

This material meets the requirements of the governing specifications. We certify that the above material has been inspected and tested in accordance with the methods prescribed in the governing specification and the results of such inspections and test conform with applicable requirements.

We further certify this material was inspected with independent inspectors conforming to the requirements of EN10204 Section 3.1B.

Comments:

Meets Hardness Requirements of NACE MRO175/ISO 15156 latest editions. Meets ASME SA 106 Grade B Requirements. No weld repair was 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.

CapProducts. Ltd.

25 Winnipeg St

Vaughan, ON M0M 1L0

HEAT NUMBER : GZO
TRANS AM PIPING PRODUCTS - REV'D BY: 69
1" CL 6000 FS SCRD 90 ELBOW
A350-LF2 CL 1
Shipment/Seq #: S 7 - 1161



INDUSTRIA MECCANICA LIGURE SPA

16030 CASARZA LIGURE - Genova - Italy - P.zza Marco Cappelli,4 - Tel.0185.467661 - Fax 0185.466510 / MATERIAL TEST DEPARTMENT

INSPECTION CERTIFICATE EN 10204:2004 / 3.1
COMPANY WITH QUALITY SYSTEM ISO 9001:2000
CERTIFIED BY RINA

TRANS AM PIPING PRODUCTS LTD.

233001 Endeavor Drive S F
Calgary, Alberta T2P 2G5

Certificate Nr 1735/
Invoice Nr 289
Del. Note Nr 458

Dated 16.03.2011/
Dated 12.03.2011/
Dated 12.03.2007

CA

This certificate has been generated by computer and need not to be signed for validity according to DIN EN 10204 Page 4 - 11

HEAT CODE	HEAT	ITEM	YOUR P.O.	OUR REFERENCE	Q.TY	DESCRIPTION	DIM. ACC. TO	VISUAL & DIMENS.
UU4	22469	049	CI-06 - 799	2006-2E201-0001041-047		FITTING UNION F/F THRD NPT 3M 2" A105N	SEE NOTE	SATISFACTORY
	73851	059	CI-06 - 799	2006-2E201-0001041-057		FITTING COUPLING THRD NPT 3M 3" A105N	SEE NOTE	SATISFACTORY
GT3	73858	027	CI-06 - 799	2006-2E201-0001041-027		FITTING 90 ELB. THRD NPT 2/3M 1/8" A105N	SEE NOTE	SATISFACTORY
NT	025445	103	CI-06 - 799	2006-2E201-0001041-100		FITTING ROUND H.PLUG THRD NPT 1/4" A105N	SEE NOTE	SATISFACTORY
H95	77614	206	CI-06 - 799	2006-2E201-0001041-203		FITTING TEE SW 3M 1" A350/LF2	SEE NOTE	SATISFACTORY
GZO	73569	216	CI-06 - 799	2006-2E201-0001041-213		FITTING 90 ELB. THRD NPT 6M 1" A350/LF2	SEE NOTE	SATISFACTORY
H95	77614	217	CI-06 - 799	2006-2E201-0001041-214		FITTING TEE THRD NPT 6M 1/2" A350/LF2	SEE NOTE	SATISFACTORY
06A	73413	224	CI-06 - 799	2006-2E201-0001041-221		FITTING 90 ELB. SW 6M 1" A350/LF2	SEE NOTE	SATISFACTORY

HEAT CODE	HEAT	ITEM	MATERIAL	C%	SI%	Mn%	S%	P%	Cr%	NI%	Mo%	TI%	Cu%	V%	Nb%	N%	Al%	C.E.%	OTHER ELEMENTS
UU4	22469	049	ASTM A105	0,180	0,290	0,850	0,017	0,010	0,090	0,080	0,010	0,007	0,170	0,001	0,002	0,000	0,032	0,359	
	73851	059	ASTM A105	0,200	0,170	1,030	0,024	0,018	0,120	0,090	0,020	0,008	0,250	0,003	0,001	0,000	0,006	0,423	
GT3	73858	027	ASTM A105	0,190	0,220	1,000	0,008	0,015	0,120	0,050	0,010	0,019	0,150	0,020	0,000	0,000	0,023	0,400	
NT	025445	103	ASTM A105	0,215	0,150	0,615	0,003	0,015	0,050	0,080	0,010	0,019	0,150	0,020	0,000	0,000	0,023	0,400	
H95	77614	206	ASTM A350 LF2 cl.1	0,180	0,200	0,900	0,021	0,012	0,100	0,060	0,010	0,005	0,190	0,001	0,002	0,000	0,000	0,343	
GZO	73569	216	ASTM A350 LF2 cl.1	0,205	0,170	1,050	0,021	0,018	0,120	0,060	0,010	0,025	0,180	0,018	0,001	0,000	0,012	0,369	
H95	77614	217	ASTM A350 LF2 cl.1	0,180	0,200	0,900	0,021	0,012	0,100	0,060	0,010	0,005	0,190	0,001	0,001	0,000	0,023	0,426	
06A	73413	224	ASTM A350 LF2 cl.1	0,195	0,170	1,010	0,018	0,014	0,080	0,040	0,010	0,005	0,150	0,001	0,000	0,000	0,012	0,369	

HEAT CODE	HEAT	ITEM	TEST SPECIMEN	YIELD POINT	TENSILE STRENGTH	ELONGATION	REDUCTION OF AREA	HARDNESS HB	BEND TEST	FLATTENING TEST	IMPACT TEST - JOULE/cm2	SHAPE	YIELD POINT
			RECT. 0mm2	LENGTH 0mm	N/mm2 >=8,2%	N/mm2 >=	% >=	% >=			TYPE 10x10mm	1=O 2=□	N/mm2 >=1,8%
UU4	22469	049	122,65	50,00	309,0	569,0	31,0	56,0	158 - 164	0,0	0,0	1	0,0
	73851	059	122,65	50,00	327,0	522,0	30,5	54,0	159 - 165	0,0	0,0	1	0,0
GT3	73858	027	122,65	50,00	375,0	542,0	30,0	57,0	164 - 169	0,0	0,0	1	0,0
NT	025445	103	122,65	50,00	285,0	510,0	32,0	56,0	150 - 154	0,0	0,0	1	0,0
H95	77614	206	122,65	50,00	309,0	546,0	34,0	56,0	160 - 166	0,0	0,0	1	0,0
GZO	73569	216	122,65	50,00	309,0	564,0	30,0	54,0	160 - 166	0,0	0,0	1	0,0
H95	77614	217	122,65	50,00	309,0	546,0	34,0	56,0	160 - 166	0,0	0,0	1	0,0
06A	73413	224	122,65	50,00	331,0	546,0	34,0	56,0	160 - 168	0,0	0,0	1	0,0

HEAT CODE	HEAT	ITEM	MATERIAL IN ACCORDANCE TO	HEAT TREATMENT	FURNACE	STEEL MILL	Our Ref.
UU4	22469	049	ASME SA ASTM A105-05	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	LEALI SPA	061270
	73851	059	ASME SA ASTM A105-05	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	051056
GT3	73858	027	ASME SA ASTM A105-05	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	052042
NT	025445	103	ASME SA ASTM A105-05	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	930575
H95	77614	206	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	051377
GZO	73569	216	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	051166
H95	77614	217	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	051377
06A	73413	224	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	061500

NOTES ASME B16.11/05 - ANSI B31.1/B31.3 - IML STD - ANSI B1.1-B18.2.2 -
NACE MR0175 ISO 15156/1 - MSS SP 83 - SUPPLIED MATERIAL MEETS
SPECIFICATIONS AND P.O. REQUIREMENTS

INSPECTION AUTHORITY

QUALITY CONTROL DEPARTMENT MANUFACTURER'S SYMBOL : MANUFACTURER'S SYMBOL

Material Conforms

To Customer
Specifications
As Per P.O.
Requirements

ENCANA

**"Conforms With ASME
Sec II, Part A, 2010 edition,
2011a addenda"**

BORIS FIZZOTTI

FITTINGS

IML

STUDBOLTS



APPROVED

By Kasha at 10:13 am, Jul 25, 2013

Handwritten signature: J. Tanb

WESTBROOK

MATERIAL TEST REPORT

Sold To: **MRC CANADA ULC**
Order No.: **545781** Order Date: **9/24/2012**

Purchase Order: **S759181343**

Printed: **10/25/2012**

Line: **Description:**
12 1/2 X 1/4 S80 A234WPBN SP95 BARE CONC
SWG TBE

***** Specifications - Heat Code **W19545 ZZ: *******
A105/A105M-09, SA105, A234-07 WPB, SA234 WPB, ASME B16.5,
B16.9, B16.11, B16.36, MSS SP-25, SP-44, SP-79, SP-83,
SP-95, API-605, A.W.W.A.
STARTING MATERIAL: BAR/BILLET/FORGING
A234-07 WPBN, SA234 WPBN

Chemical Composition:

C:	Mn:	P:	S:	Si:	Cr:	Ni:	Mo:
0.240	0.670	0.008	0.013	0.210	0.090	0.040	0.020
Cu:	V:	Cb:	C.E.:				
0.080	0.003	0.008	.382				

Mechanical Properties:

Tensile(PSI):	Yield(PSI):	Elong(%):	RA(%):	Hardness:
75420	41336	22.50	62.50	HRB 78

Comments:

Hardness only to NACE MR-01-75/2009.
Normalized 1600F for 10-15 minutes then still air cooled.
Cold drawn. Also meets MR-01-03/2010 and ISO 15156/2009.

Line: **Description:**
13 1/2 X 1/4 S80 A420 WPL6 CONC SWG TBE

***** Specifications - Heat Code **H2089: ******* ←
A29 GRADE 1018 MODIFIED, SA29, A420-07-WPL6, SA420 WPL6,
ASME B16.9, B16.11, MSS SP-25, SP-95, A.W.W.A.
STARTING MATERIAL: BAR

Chemical Composition:

C:	Mn:	P:	S:	Si:	Cr:	Ni:	Mo:
0.190 ✓	0.830 ✓	0.020 ✓	0.021 ✓	0.260 ✓	0.150 ✓	0.120 ✓	0.020 ✓
Cu:	V:	Al:	Cb:	C.E.:			
0.250 ✓	0.029 ✓	0.002	0.001 ✓	.392 ✓			

Mechanical Properties:

Tensile(PSI):	Yield(PSI):	Elong(%):	RA(%):	Hardness:
81500 ✓	55500 ✓	30.50 ✓	62.00	BHN 156 ✓

Impact Results:

Test Temp:	Achieved Values:
-50F	16-14.5-10 FT/LBS

Comments:

Hardness only to NACE MR-01-75/2009.. ✓
Normalized.
Hot rolled. Also meets MR-01-03/2010 and ISO 15156/2009.

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" *LT*

JUN 03 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EnCana

Date: JUN 03 2013

WESTBROOK

MATERIAL TEST REPORT

Sold To: **MRC CANADA ULC**
Order No.: **558844** Order Date: **2/11/2013**

Purchase Order: **S759201569**

Printed: **3/07/2013**

Line: **Description:**
33 2 X 3/4 S80 A420 WPL6 CONC SWG TBE

***** Specifications - Heat Code **H2140: *******
A350/A350M-07 LF2, SA350 LF2, A105, SA105, A420-07 WPL6,
SA420 WPL6, A234-07 WPB, SA234 WPB, A788, ASME B16.5,
B16.9, B16.11, B16.47, B1.20.1, MSS SP-25, SP-44, SP-79,
SP-83, SP-95, API 605, A.W.W.A.
STARTING MATERIAL: BAR

Chemical Composition:

C:	Mn:	P:	S:	Si:	Cr:	Ni:	Mo:
0.170	0.700	0.018	0.020	0.250	0.100	0.070	0.030
Cu:	V:	Al:	Ca:	Ti:	C.E.:		
0.220	0.004	0.021	0.008	0.002	.332		

Mechanical Properties:

Tensile(PSI):	Yield(PSI):	Elong(%):	RA(%):	Hardness:
70000	42300	34.50	64.00	BHN 136

Impact Results:

Test Temp:	Achieved Values:
-50F	16-16-28 FT/LBS

Comments:

Hardness only to NACE MR-01-75/2009.
Normalized.
Also meets MR-01-03/2010 and ISO 15156/2009.

Line: **Description:**
34 2 X 1 S80 A420 WPL6 CONC SWG BXT

***** Specifications - Heat Code **H2197: *******
A350/A350M-07 LF2, SA350 LF2, A105, SA105, A420-07 WPL6,
SA420 WPL6, A234-07 WPB, SA234 WPB, A788, ASME B16.5,
B16.9, B16.11, B16.47, B1.20.1, MSS SP-25, SP-44, SP-79,
SP-83, SP-95, API 605, A.W.W.A.
STARTING MATERIAL: BAR

Chemical Composition:

C:	Mn:	P:	S:	Si:	Cr:	Ni:	Mo:
0.170	0.830	0.027	0.027	0.210	0.020	0.010	0.000
Cu:	V:	Al:	Ca:	Ti:	C.E.:		
0.000	0.004	0.031	0.001	0.009	.313		

Mechanical Properties:

Tensile(PSI):	Yield(PSI):	Elong(%):	RA(%):	Hardness:
70400	43700	38.50	69.50	BHN 124

Impact Results:

Test Temp:	Achieved Values:
-50F	20-20-35 FT/LBS

Comments:

Hardness only to NACE MR-01-75/2009.
Normalized.
Also meets MR-01-03/2010 and ISO 15156/2009.

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

JUN 0 3 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EnCana

Date: JUN 0 3 2013

P.O. Box 15614
Houston, Tx 77220-5614

Voice 713 675 6438
Fax 713 675 9742

To: 000005 Miscellaneous Good Customer

Printed: 7/17/2013

Description:

1 X 2 1/2 S80 A333 GR6 SMLS NPL
TBE

***** Specifications - Heat Code H2220: *****
A333/A333M-10 GR.6, SA333 GR.6, A420-10 WPL6, SA420 WPL6,
A540, A733, ASME B1.20.1, MSS SP-25, SP-95
STARTING MATERIAL: PIPE & TUBE

Chemical Composition:

C: 0.130 ✓	Mn: 1.070 ✓	P: 0.007 ✓	S: 0.003 ✓	Si: 0.240 ✓	Cr: 0.100	Ni: 0.090	Mo: 0.040
Cu: 0.240	V: 0.002	Cb: 0.001	C.E.: .358 ✓				

Mechanical Properties:

Tensile(PSI): 68269 ✓	Yield(PSI): 45102 ✓	Elong(%): 42.00 ✓	Hardness: HRB 76 ✓	Flattening: OK	Bend: OK
Hydro(PSI): 2500					

Impact Results:

Test Temp: -50F	Achieved Values: 68-68-72 LB/FT	Lateral Expansion: 1.30	% of Shear: 90%
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Comments:

Hardness only to NACE MR-01-75/2009, ✓
Normalized @ 900C - 5 min.
Hot finished.
Also meets MR-01-03/2010 & ISO 15156/2009.

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

JUL 17 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: _____

Date: JUL 17 2013

We certify only the chemistry and physical results shown for the referenced Heat Code as
furnished by the Producing Mill. The Description is the responsibility of the requesting party.
This document was electronically transmitted and is in accordance with EN10204 3.1 /DIN50049 3.1B.

 I.M.L. - INDUSTRIA MECCANICA LIGURE S.P.A. Via Giancarlo Farina, 25 - 16030 Casarza Ligure - GE - ITALY Tel. +39 0185 467661 - Fax +39 0185 466510 - E-mail quality.ilm@farinagroup.com MATERIAL TEST DEPARTMENT		COMPANY WITH QUALITY SYSTEM ISO 9001: 2008 CERTIFIED BY RINA CERT. N°23/91/S								
INSPECTION CERTIFICATE EN 10204:2004 / 3.1		Nr 22821	Dated 06.03.2012							
TRANS AM PIPING PRODUCTS LTD. 9335 Endeavor Drive S.E. Calgary, Alberta T3S 0A1		Purchase Order Nr 3830 Item Nr 074 Packing List Nr 263 Invoice Nr 237								
Heat Code H57	Heat Nr 74379	Quantity 30,00	Description FITTING 90 ELB. THRD NPT 6M 1/4" A105N							
Element	C	SI	Mn	S	P	Cr	NI	Mo	TI	Cu
ASTM A105 (LADLE)	0,190	0,220	0,820	0,019	0,013	0,120	0,050	0,010	0,014	0,230
Element	V	Nb	N	AL					C.E.	PRE
ASTM A105 (LADLE)	0,002	-	-	0,005					0,389	-
Test specimen	Shape	Tensile	Yield Point >0,2%	Yield Point >1%	Elongation	Reduction of area				
Sect. mm2	Length mm	1=O- 2=□	N/mm2	N/mm2	%	%				
122,65	50,00	1	549,0	367,0	31,0	49,0				
HARDNESS		IMPACT TEST								
HBW	TYPE	Test specimen	°C	1-Joule	2-Joule	3-Joule				
160,0-164,0	KV	10x10mm	-10	70	73	78				
Heat treatment	Normalized at 880±920°C / Air Cool									
Dimension in accordance	ASME B16.11 Ed.2009 - ANSI/ASME B1.20.1 Ed.1992 - MSS SP25 Ed.2000 - NACE MR 0175 ISO 15156 Ed.2009 - NACE MR 0103 Ed.2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS									
Material in accordance	ASME/SA ASTM A105-11									
Visual & Dimensional	SATISFACTORY	Origin	EUROPE			Our Ref.	051107			

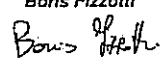
Notes -

**MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS**

Encana

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

May 15, 12

QUALITY CONTROL DEPT. Boris Fizzotti 	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL IML or 
---	-----------------------------	--

Petro Bakken

MATERIAL CONFORMS TO CUSTOMER SPECS
By ceris at 6:43:25 AM, 4/5/2012

SHELL CANADA



INDUSTRIA MECCANICA LIGURE SPA

COMPANY WITH QUALITY SYSTEM ISO 9001-2008
CERTIFIED BY RINA

INSPECTION CERTIFICATE EN 10204:2004 / 3.1

TRANS AM PIPING PRODUCTS LTD.	Certif. N. 22235	Dated 30.08.2011
9335 Endeavour Drive S.E.	Invoice Nr.	Dated
Calgary, Alberta T2S 0A1	Dal. Note Nr 1025	Dated 30.08.2011
CA		

16030 CASARZA LIGURE - Genova - Italy - Via Giancarlo Farina 25 - Tel. 0185.467661 - Fax 0185.466510 - Email quality.imal@tarms.com / MATERIAL TEST DEPARTMENT

Page 26 - 53

ITEM NO. 081 812
FITTING HEX.BUSHING M/F THRD NPT 3/4" A105N

ASTM A105 (LADLE) 0,180 / 0,210 1,090 0,008 0,009 0,100 0,050 0,010 0,022 0,130 0,001 0,001 0,000 0,026 0,396

122,65 50,00 1 352,0 522,0 35,0 59,0 161,0 -168,0 KV -10 65 65 61 112061

ASME SA ASTM A105-10

Normalized at 880°-920°C / Air Cool

ELECTRIC FURNACE EUROPE

ASME B16.11 Ed.2009 - ANSI/ASME B1.20.1 Ed.1992 - MSS SP25 Ed.2008 - NACE MR 0175 ISO 15156 Ed.2009 - NACE MR 0103 Ed.2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS

ITEM NO. 084 812
FITTING 90 ELB. SW 3M 3/4" A105N

ASTM A105 (LADLE) 0,180 0,210 1,090 0,008 0,009 0,100 0,050 0,010 0,022 0,130 0,001 0,001 0,000 0,026 0,396

122,65 50,00 1 352,0 508,0 33,0 56,0 157,0 -161,0 KV -10 58 60 61 112061

ASME SA ASTM A105-10

Normalized at 880°-920°C / Air Cool

ELECTRIC FURNACE EUROPE

ASME B16.11 Ed.2009 - NACE MR 0175 ISO 15156 Ed.2009 - MSS SP25 Ed.2008 - NACE MR 0103 Ed.2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS

"Conforms with ASME
Sec II, Part A, 2010 edition"
Della addenda

Sanbello

NOTES	QUALITY CONTROL DEPARTMENT	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL
	B. Fizzotti Boris Hefl		IML or

 I.M.L. - INDUSTRIA MECCANICA LIGURE S.P.A. Via Giancarlo Farina, 25 - 16030 Casarza Ligure - GE - ITALY Tel. +39 0185 467661 - Fax +39 0185 466510 - E-mail quality.ima@farinagroup.com MATERIAL TEST DEPARTMENT		COMPANY WITH QUALITY SYSTEM ISO 9001: 2008 CERTIFIED BY RINA CERT. N°23/91/S																							
INSPECTION CERTIFICATE EN 10204:2004 / 3.1		Nr 23902	Dated 18.03.2013																						
TRANS AM PIPING PRODUCTS LTD. 9335 Endeavor Drive S.E. Calgary, Alberta T3S 0A1 CA		Purchase Order Nr CI-13 - 189 C/O-1 Item Nr 162 Packing List Nr 346 Invoice Nr 319																							
Heat Code K207	Heat Nr 32887	Quantity 72,00	Description FITTING HEX.BUSHING M/F 3/8M THRD NPT 3"x1" A105N																						
<table border="1"> <tr> <td>Element</td> <td>C ✓</td> <td>SI ✓</td> <td>Mn ✓</td> <td>S ✓</td> <td>P ✓</td> <td>Cr ✓</td> <td>NI ✓</td> <td>Mo ✓</td> <td>TI</td> <td>Cu ✓</td> </tr> <tr> <td>ASTM A105 (LADLE)</td> <td>0,195</td> <td>0,230</td> <td>1,080</td> <td>0,010</td> <td>0,014</td> <td>0,130</td> <td>0,060</td> <td>0,010</td> <td>0,015</td> <td>0,110</td> </tr> </table>				Element	C ✓	SI ✓	Mn ✓	S ✓	P ✓	Cr ✓	NI ✓	Mo ✓	TI	Cu ✓	ASTM A105 (LADLE)	0,195	0,230	1,080	0,010	0,014	0,130	0,060	0,010	0,015	0,110
Element	C ✓	SI ✓	Mn ✓	S ✓	P ✓	Cr ✓	NI ✓	Mo ✓	TI	Cu ✓															
ASTM A105 (LADLE)	0,195	0,230	1,080	0,010	0,014	0,130	0,060	0,010	0,015	0,110															
<table border="1"> <tr> <td>Element</td> <td>V ✓</td> <td>Nb</td> <td>N</td> <td>AL</td> <td></td> <td></td> <td></td> <td></td> <td>C.E. ✓</td> <td>PRE</td> </tr> <tr> <td>ASTM A105 (LADLE)</td> <td>0,005</td> <td>0,004</td> <td>-</td> <td>0,026</td> <td></td> <td></td> <td></td> <td></td> <td>0,415</td> <td>-</td> </tr> </table>				Element	V ✓	Nb	N	AL					C.E. ✓	PRE	ASTM A105 (LADLE)	0,005	0,004	-	0,026					0,415	-
Element	V ✓	Nb	N	AL					C.E. ✓	PRE															
ASTM A105 (LADLE)	0,005	0,004	-	0,026					0,415	-															
<table border="1"> <tr> <td>Test specimen</td> <td>Shape</td> <td>Tensile</td> <td>Yield Strength > 0,2%</td> <td>Yield Strength > 1%</td> <td>Elongation</td> <td>Reduction of area</td> </tr> <tr> <td>Sect. mm2</td> <td>Length mm</td> <td>1=O - 2=□</td> <td>N/mm2</td> <td>N/mm2</td> <td>%</td> <td>%</td> </tr> <tr> <td>122,65</td> <td>50,00</td> <td>1</td> <td>515,0</td> <td>363,0</td> <td>35,0</td> <td>60,5</td> </tr> </table>				Test specimen	Shape	Tensile	Yield Strength > 0,2%	Yield Strength > 1%	Elongation	Reduction of area	Sect. mm2	Length mm	1=O - 2=□	N/mm2	N/mm2	%	%	122,65	50,00	1	515,0	363,0	35,0	60,5	
Test specimen	Shape	Tensile	Yield Strength > 0,2%	Yield Strength > 1%	Elongation	Reduction of area																			
Sect. mm2	Length mm	1=O - 2=□	N/mm2	N/mm2	%	%																			
122,65	50,00	1	515,0	363,0	35,0	60,5																			
<table border="1"> <tr> <td colspan="2">HARDNESS</td> <td colspan="3">IMPACT TEST</td> </tr> <tr> <td>HBW ✓</td> <td>TYPE</td> <td>Test specimen</td> <td>°C</td> <td>1-Joule</td> <td>2-Joule</td> <td>3-Joule</td> </tr> <tr> <td>160,0 - 167,0</td> <td>KV</td> <td>10x10mm</td> <td>-10</td> <td>66</td> <td>66</td> <td>60</td> </tr> </table>				HARDNESS		IMPACT TEST			HBW ✓	TYPE	Test specimen	°C	1-Joule	2-Joule	3-Joule	160,0 - 167,0	KV	10x10mm	-10	66	66	60			
HARDNESS		IMPACT TEST																							
HBW ✓	TYPE	Test specimen	°C	1-Joule	2-Joule	3-Joule																			
160,0 - 167,0	KV	10x10mm	-10	66	66	60																			
Heat treatment	Normalized at 880°-920°C / Air Cool			ELECTRIC FURNACE																					
Dimension in accordance	ASME B16.11 Ed.2011 - ANSI/ASME B1.20.1 Ed.1992 - MSS SP25 Ed.2008 - NACE MR 0175 ISO 15156 Ed.2009- NACE MR 0103 Ed. 2012 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS																								
Material in accordance	ASME SA ASTM A105-11a ✓																								
Visual & Dimensional	SATISFACTORY	Origin	EUROPEAN UNION	Our Ref.	2013-2E201-0000185-0162																				

Notes —

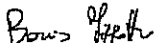
5.5 Ratio

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" MAY 31 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EnCana

Date: MAY 31 2013

QUALITY CONTROL DEPT. Boris Fizzotti 	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL IML or 
--	----------------------	---



Phoenix * Capitol * Camco Cap Products

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Certified Mill Test Report

11/5/2012

Customer

MRC CANADA ULC
7072 - 112 AVE SE
CALGARY, AB T2C 4Z1

P.O. S 759 186651

Heat No 22893

Heat Code KDI

Phoenix Order # 895928

Material ASTM A333 GR6 2011/ASME SA333 GR6 2010 Edition

Part Number

15111006LT

Description

1 X 3" XHSML BLK NIPL A333 GR6

Chemical Properties

C	Mn	P	S	Si	Cu	Cr	Ni	C Eq. Long	
0.1600	0.5300	0.0140	0.0080	0.2500	0.1800	0.0300	0.0500	0.2709	
Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0000	0.0060			0.0000					

Additional Chemical Properties

Cr + Cu + Ni
0.2600

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
67,140	50,610	29.0%			

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average
23	26	27	25.33

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

2012/11/27 S. Kaban

* Hydro test passed. at 2500 psi.

* Eddy Current test passed.

This material meets the requirements of the governing specifications. We certify that the above material has been inspected and tested in accordance with the methods prescribed in the governing specification and the results of such inspections and test conform with applicable requirements.

We further certify this material was inspected with independent inspectors conforming to the requirements of EN10204 Section 3.1B.

Comments:

Flattening test passed.

Charpy V Impact Tested at -53° C. Specimen size - 10 x 3.33 mm.

Meets Hardness Requirements of NACE MRO175/ISO 15156 latest editions. No weld repair was 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.

CapProducts, Ltd.

25 Winnipeg St

Vancouver, ON N0M 1L0



Phoenix * Capitol * Camco

Cap Products

Commanding a Higher Standard_{sm}

Certified Mill Test Report

1/4/2013

Customer

MRC CANADA ULC
7072 - 112 AVE SE
CALGARY, AB T2C 4Z1

P.O. S 759 195342

Heat No 22893

Heat Code KDI ✓

Phoenix Order # 909140

Material ASTM A333 GR6 2011/ASME SA333 GR6 2010 Edition

Part Number

15111016LT

Description

1 X 8" XHSM LBL NIPL A333-GR6

Chemical Properties

C ✓	Mn ✓	P ✓	S ✓	Si ✓	Cu	Cr	Ni	C Eq. Long	
0.1600	0.5300	0.0140	0.0080	0.2500	0.1800	0.0300	0.0500	0.2709 ✓	
Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0000	0.0060			0.0000					

Additional Chemical Properties

Cr + Cu + Ni

0.2600

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
67,140 ✓	50,610 ✓	29.0% ✓			

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average
23	26	27	25.33

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUN 2 4 2013

Name: _____

Date: JUN 2 4 2013

* Hydro test passed. at 2500 psi.

* Eddy Current test passed.

This material meets the requirements of the governing specifications. We certify that the above material has been inspected and tested in accordance with the methods prescribed in the governing specification and the results of such inspections and test conform with applicable requirements.

We further certify this material was inspected with independent inspectors conforming to the requirements of EN10204 Section 3.1B.

Comments:

Flattening test passed.

Charpy V Impact Tested at -53° C. Specimen size - 10 x 3.33 mm.

Meets Hardness Requirements of NACE MRO175/ISO 15156 latest editions. No weld repair was 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.

CapProducts, Ltd.

25 Winnipeg St

Vaughan, ON N0M 1L0

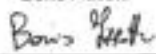
 IM.L. - INDUSTRIA MECCANICA LIGURE S.P.A. Via Giancarlo Farina, 25 - 16030 Casarza Ligure - GE - ITALY Tel. +39 0185 467661 - Fax +39 0185 466510 - E-mail quality.ima@farinagroup.com MATERIAL TEST DEPARTMENT		COMPANY WITH QUALITY SYSTEM ISO 9001: 2008 CERTIFIED BY RINA CERT. N°23/91/S								
INSPECTION CERTIFICATE EN 10204:2004 / 3.1		Nr 22603	Dated 23.12.2011							
TRANS AM PIPING PRODUCTS LTD. 9335 Endeavor Drive S.E. Calgary, Alberta T3S 0A1 CA		Purchase Order Nr 3840 Item Nr 087 Packing List Nr 1508 Invoice Nr 1312								
Heat Code L329	Heat Nr AD1814	Quantity	Description FITTING UNION F/F THIRD NPT 6M 3/4" A350/LF2							
Element	C	Si	Mn	S	P	Cr	Ni	Mo	Ti	Cu
ASTM A350 LF2 cl.1 (LADLE)	0,200	0,230	0,960	0,006	0,011	0,100	0,080	0,020	-	0,100
Element	V	Nb	N	AL	RATIO = 4.8			C.E.	PRE	
ASTM A350 LF2 cl.1 (LADLE)	0,004	0,001	-	0,023				0,397	-	
Test specimen Sect. mm2	Length mm	Shape 1=O - 2=□	Tensile N/mm2	Yield Point >0,2% N/mm2	Yield Point >1% N/mm2	Elongation %	Reduction of area %			
122,65	50,00	1	515,0	360,0	-	32,0	58,0			
HARDNESS		IMPACT TEST								
HBW	TYPE	Test specimen	°C	1-Joule/cm2	2-Joule/cm2	3-Joule/cm2				
152,0 - 160,0	KV	10x10mm	-10	49	53	50				
Heat treatment	Normalized at 900°C / Air Cool					ELECTRIC FURNACE				
Dimension in accordance	MSS SP83 Ed 2006 - ANSI/ASME B1.20.1 Ed 1992 - MSS SP25 Ed 2006 - NACE MR 0175 ISO 15156 Ed 2009 - NACE MR 0103 Ed 2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS									
Material in accordance	ASME SA ASTM A350-07 Gr. LF2 cl.1									
Visual & Dimensional	SATISFACTORY		Origin	EUROPE		Our Ref.	112126			
Notes										

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"
2012/12/6 S. Naschi

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: S. Naschi

Date: 2012/12/6

QUALITY CONTROL DEPT. Boris Fizzotti 	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL IML or 
--	----------------------	---



I.M.L.

INDUSTRIA MECCANICA LIGURE SPA

INSPECTION CERTIFICATE EN 10204:2004 / 3.1

COMPANY WITH QUALITY SYSTEM ISO 9001:2000
CERTIFIED BY RINA

TRANS AM PIPING PRODUCTS LTD.

Certificate Nr 15061

Dated 21.12.2003

Invoice Nr 1425

Dated 19.12.2005

Del. Note Nr 2110

Dated 19.12.2005

7025 - 44th Street S.E.

Calgary, Alberta T2C 4E8

CA

16030 CASARZA LIGURE - Genova - Italy - P.zza Marco Cappelletti, 4 - Tel. 0185.467801 - Fax 0185.466510 / MATERIAL TEST DEPARTMENT

This certificate has been generated by computer and need not to be signed for validity according to DIN EN 10204 Page

HEAT CODE	HEAT	ITEM	YOUR P.O.	OUR REFERENCE	Q.TY	DESCRIPTION	DIM. ACC. TO	VISUAL & DIMENS.
GZ1	73858	001	CI-05-813	2005-2E201-0001313-001		FITTING 90 ELB. THRD NPT 2/3M 1/4" A105N	SEE NOTE	SATISFACTORY
DIF	75751	019	CI-05-813	2005-2E201-0001313-019		FITTING CROSS THRD NPT 2M 2" A105N	SEE NOTE	SATISFACTORY
TM1	74884	026	CI-05-813	2005-2E201-0001313-026		FITTING TEE THRD NPT 2/3M 1/4" A105N	SEE NOTE	SATISFACTORY
GZ	74379	120	CI-05-813	2005-2E201-0001313-120		FITTING 45 ELB. SW 3M 1" A350/LF2	SEE NOTE	SATISFACTORY
H46	73851	121	CI-05-813	2005-2E201-0001313-121		FITTING TEE SW 3M 1" A350/LF2	SEE NOTE	SATISFACTORY
H11	70313	129	CI-05-813	2005-2E201-0001313-129		FITTING TEE THRD NPT 6M 1/2" A350/LF2	SEE NOTE	SATISFACTORY
ZE2	77501	129	CI-05-813	2005-2E201-0001313-129		FITTING TEE THRD NPT 6M 1/2" A350/LF2	SEE NOTE	SATISFACTORY
L609	77596	131	CI-05-813	2005-2E201-0001313-131		FITTING UNION F/F THRD NPT 6M 1" A350/LF2	SEE NOTE	SATISFACTORY

HEAT CODE	HEAT	ITEM	MATERIAL	C%	SI%	Mn%	S%	P%	Cr%	Ni%	Mo%	TP%	Cu%	V%	Nb%	N%	Al%	C.E.%	OTHER ELEMENTS
GZ1	73858	001	ASTM A105	0,190	0,220	1,000	0,008	0,015	0,120	0,050	0,010	0,019	0,150	0,020	0,000	0,000	0,023	0,400	
DIF	75751	019	ASTM A105	0,190	0,190	0,930	0,012	0,017	0,090	0,060	0,010	0,005	0,200	0,010	0,000	0,000	0,011	0,384	
TM1	74884	026	ASTM A105	0,185	0,180	0,910	0,006	0,012	0,090	0,070	0,010	0,015	0,180	0,021	0,000	0,000	0,020	0,378	
GZ	74379	120	ASTM A350 LF2 cl.1	0,190	0,220	0,920	0,019	0,013	0,120	0,050	0,010	0,014	0,230	0,002	0,000	0,000	0,005	0,389	
H46	73851	121	ASTM A350 LF2 cl.1	0,200	0,170	1,030	0,024	0,018	0,120	0,090	0,020	0,008	0,250	0,003	0,001	0,000	0,001	0,423	
H11	70313	129	ASTM A350 LF2 cl.1	0,180	0,220	0,980	0,021	0,016	0,120	0,060	0,010	0,000	0,240	0,002	0,001	0,000	0,000	0,386	
ZE2	77501	129	ASTM A350 LF2 cl.1	0,175	0,180	1,100	0,014	0,015	0,140	0,050	0,010	0,016	0,200	0,024	0,000	0,000	0,025	0,410	
L609	77596	131	ASTM A350 LF2 cl.1	0,190	0,250	0,910	0,010	0,013	0,100	0,070	0,010	0,023	0,190	0,023	0,001	0,000	0,024	0,386	

HEAT CODE	HEAT	ITEM	TEST SPECIMEN		YIELD POINT	TENSILE STRENGTH	ELONGATION	REDUCTION OF AREA	HARDNESS HRC	BEND TEST	FLATTENING TEST		IMPACT TEST - JOULES/cm ²			SHAPE	YIELD POINT	
			SECT. mm ²	LENGTH mm	N/mm ² >= 0,2%	N/mm ² >=	% >=	% >=			TYPE 10x10mm	°C	1	2	3	1-0 2-1	N/mm ² >= 0,2%	
GZ1	73858	001	122,65	50,00	350,0	525,0	30,0	53,0	160 - 166	0,0	0,0	KV	20	106	100	101	1	0,0
DIF	75751	019	122,65	50,00	330,0	533,0	34,0	60,0	163 - 165	0,0	0,0	KV	20	106	100	96	1	0,0
TM1	74884	026	122,65	50,00	320,0	515,0	34,0	55,0	152 - 158	0,0	0,0	KV	20	108	105	100	1	0,0
GZ	74379	120	122,65	50,00	325,0	520,0	34,0	54,0	152 - 160	0,0	0,0	KV	-46	56	59	62	1	0,0
H46	73851	121	122,65	50,00	361,0	548,0	32,0	54,0	160 - 166	0,0	0,0	KV	-46	54	58	57	1	0,0
H11	70313	129	122,65	50,00	364,0	522,0	31,0	56,0	160 - 168	0,0	0,0	KV	-46	54	60	60	1	0,0
ZE2	77501	129	122,65	50,00	356,0	533,0	34,0	56,0	160 - 166	0,0	0,0	KV	-46	54	60	60	1	0,0
L609	77596	131	122,65	50,00	316,0 ✓	510,0 ✓	32,8 ✓	57,1	150 - 158 ✓	0,0	0,0	KV	-46	48	52	51	1	0,0

HEAT CODE	HEAT	ITEM	MATERIAL IN ACCORDANCE TO	HEAT TREATMENT	FURNACE	STEEL MILL	Our Ref.
GZ1	73858	001	ASME SA ASTM A105-03	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	052081
DIF	75751	019	ASME SA ASTM A105-03	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	052099
TM1	74884	026	ASME SA ASTM A105-03	Normalized at 880°-920°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	052062
GZ	74379	120	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	051107
H46	73851	121	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	
H11	70313	129	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	041369
ZE2	77501	129	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	021318
L609	77596	131	ASME SA ASTM A350-04a Gr. LF2 cl.1	Normalized at 900°C / Air Cool	ELECTRIC FURNACE	RIVA ACCIAI	052025

NOTES ASME B16.11/01 - BS.3799 - ANSI B31.1/31.3 - IML STD - ANSI
B1.1-B18.2.2 - NACE MR0175 ISO 15156/1 - SUPPLIED MATERIAL MEETS
SPECIFICATIONS AND P.O. REQUIREMENTS

INSPECTION AUTHORITY

QUALITY CONTROL DEPARTMENT. MANUFACTURER'S SYMBOL

BORIS FIZZOTTI

FITTINGS

IML

APPROVED

By Kasha at 10:24 am, Jul 25, 2013

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

"Conforms with ASME
Sec II, Part A, 2010 edition"

Sept. 20. 2011

Material Conforms
To Customer
Specifications
As Per P.O.
Requirements

ENCANA

P.O.# 702799 Item# 1

HEAT NUMBER : L609

TRANS AM PIPING PRODUCTS - REV'D BY: 61

Shipment/Seq #: S 5 - 1790

1" 6000 FS SCRD UNION
A350-LF2

I.M.L. - INDUSTRIA MECCANICA LIGURE S.P.A. Via Giancarlo Farina, 25 - 16030 Casarza Ligure - GE - ITALY Tel. +39 0185 467661 - Fax +39 0185 466510 - E-mail quality.ima@farinagroup.com MATERIAL TEST DEPARTMENT				COMPANY WITH QUALITY SYSTEM ISO 9001: 2008 CERTIFIED BY RINA CERT. N°23/91/S						
INSPECTION CERTIFICATE EN 10204:2004 / 3.1				Nr 22603 Dated 23.12.2011						
TRANS AM PIPING PRODUCTS LTD. 9335 Endeavor Drive S.E. Calgary, Alberta T3S 0A1 CA				Purchase Order Nr 3840 Item Nr 088 Packing List Nr 1508 Invoice Nr 1312						
Heat Code L027	Heat Nr 78311	Quantity	Description FITTING UNION F/F THRD NPT 6M 1" A350/LF2							
Element	C	Si	Mn	S	P	Cr	Ni	Mo	Ti	Cu
ASTM A350 LF2 cl.1 (LADLE)	0,190	0,210	1,090	0,008	0,008	0,060	0,040	--	0,018	0,120
Element	V	Nb	N	AL	C.E. PRE					
ASTM A350 LF2 cl.1 (LADLE)	0,024	0,003	--	0,025	0,399 --					
Test specimen Sect. mm2 Length mm	Shape 1=O - 2=□	Tensile N/mm2	Yield Point >0,2% N/mm2	Yield Point >1% N/mm2	Elongation %	Reduction of area %				
122,65 50,00	1	536,0	331,0	--	33,0	54,0				
HARDNESS		IMPACT TEST								
HBW	TYPE	Test specimen	°C	1-Joule/cm2	2-Joule/cm2	3-Joule/cm2				
153,0 - 161,0	KV	10x10mm	-46	53	55	51				
Heat treatment	Normalized at 900°C / Air Cool					ELECTRIC FURNACE				
Dimension in accordance	MSS SP83 Ed.2006 - ANSI/ASME B1.20.1 Ed.1992 - MSS SP25 Ed.2008 - NACE MR 0175 ISO 15156 Ed.2009 - NACE MR 0103 Ed. 2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS									
Material in accordance	ASME SA ASTM A350-07 Gr. LF2 cl.1									
Visual & Dimensional	SATISFACTORY		Origin	EUROPE		Our Ref.	102080			

Notes ---

"Conforms with ASME
 Sec II, Part A, 2010 edition,
 2011a addenda"

June 15, 2012

MATERIAL CONFORMS
 TO CUSTOMER
 SPECIFICATIONS
 AS PER P.O.
 REQUIREMENTS

Name: *Chris Steen*

Date: *June 15/12*

*Alciana
 Taramand
 Kennelst
 Retrofaktion*

QUALITY CONTROL DEPT. Boris Fizzotti <i>Boris Fizzotti</i>	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL IML or 
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CERTIFIED MILL TEST REPORT



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LOG NO. F0000000022659

Page 2 of 3

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: MRC MIDFIELD

DATE 12/13/2011

CUSTOMER

ORDER NO.: S759140173

BONNEY ORDER NO. B000110384

SHIP TO: MRC MIDFIELD

502-25 AVENUE

NISKU AB T9E 0K6

Canada

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

June 04 2012
[Signature]

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS	PHYSICAL PROPERTIES	REMARKS
3C11803	➡	M1AE NUT	3/4 3000 LF2 UNAR T	SA/A350 LF2 CL1		
			Al 0.026 C 0.190 Co 0.000 Cr 0.080 Cu 0.130 Mn 1.010 Mo 0.030 Nb 0.001			
			Ni 0.080 P 0.012 S 0.020 Si 0.240 V 0.004			
			CE(Long Formula) = 0.40			
			T/S(PSI) 73,750 Y/S(PSI) 49,375 EL(%) 33.95 RA(%) 64.90			
			Brinell 132 BHN 135 BHN			
			Charpy -50 F 54/41/42 (Ft-Lbs)			
			Average 45.70			
3C11803	➡	4940 NUT	3/4 3000 LF2 UNAR T	SA/A350 LF2 CL1		
			Al 0.027 C 0.195 Co 0.000 Cr 0.150 Cu 0.160 Mn 0.970 Mo 0.030 N 0.008			
			Nb 0.001 Ni 0.120 P 0.012 S 0.021 Si 0.250 V 0.002			
			CE(Long Formula) = 0.41			
			T/S(PSI) 76,250 Y/S(PSI) 48,125 EL(%) 32.00 RA(%) 64.90			
			Brinell 137 BHN 137 BHN			
			Charpy -50 F 73/68/64 (Ft-Lbs)			
			Average 68.30			
38 8C11842	42	4945 MALE	1 1/2 3M LF2 UNAR T	SA/A350 LF2 CL1		
			Al 0.028 C 0.200 Co 0.003 Cr 0.040 Cu 0.100 Mn 1.030 Mo 0.010 N 0.005			
			Nb 0.014 Ni 0.050 P 0.007 S 0.021 Si 0.200 V 0.003			
			CE(Long Formula) = 0.39			
			T/S(PSI) 76,250 Y/S(PSI) 52,500 EL(%) 33.90 RA(%) 65.40			
			Brinell 135 BHN 135 BHN			
			Charpy -50 F 36/50/52 (Ft-Lbs)			
			Average 46.00			

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by Meloney Specht
Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



The Best Value -
Price, Quality, Service
All The Time.

LOG NO. F00000000022659

Page 3 of 3

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: MRC MIDFIELD

DATE 12/13/2011

CUSTOMER

BONNEY ORDER NO. B000110384

ORDER NO.: S759140173

SHIP TO: MRC MIDFIELD

502-25 AVENUE

NISKU AB T9E 0K6

Canada

ITEM	QUANTITY	LOT NO.	GRADE OR SPECIFICATION NO.	CHEMICAL ANALYSIS	PHYSICAL PROPERTIES	REMARKS
------	----------	---------	----------------------------	-------------------	---------------------	---------

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. CERTIFYING TO ASTM A350 LF2 07 REVISION.
3. THE MATERIAL OF THE FITTINGS SUPPLIED IS ASTM A350-LF2 BUT MEETS THE REQUIREMENTS OF ASME SA350-LF2.
4. THE CHARPY V-NOTCH IMPACT TEST WAS PERFORMED AT -50 DEGREES FAHRENHEIT IN ACCORDANCE WITH A350-LF2.
5. THE MATERIAL SUPPLIED AS A350 LF2 CLI MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
6. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
7. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
8. THE MATERIAL SUPPLIED IDENTIFIED AS SA/A105-QT WAS QUENCHED AND TEMPERED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
9. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE IN REPORTED IN PSI.
10. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by Meloney Specht
Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



The Best Value -
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LOG NO. F00000000040239

Page 16 of 31

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14495 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: MRC CANADA ULC

DATE 02/20/2013

CUSTOMER

BONNEY ORDER NO. B000139083

ORDER NO.: S759202673

SHIP TO: MRC CANADA ULC - BRCH 759
502-25 AVENUE
NISKU AB T9E 0K6
Canada

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUL 0 8 2013

ITEM QUANTITY LOT NO.

GRADE OR SPECIFICATION NO.

CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:

18C12943	4878 FEMALE	1/2 6000 A105N UNAR T	SA/A105N
Al 0.019 C 0.200 Co 0.004 Cr 0.030 Cu 0.110 Mn 1.010 Mo 0.010 N 0.005			
Nb 0.014 Ni 0.040 P 0.006 S 0.019 Si 0.220 V 0.003			
CE(Long Formula) = 0.39			
T/S(PSI) 72,500 Y/S(PSI) 50,000 EL(%) 33.65 RA(%) 63.50			
Brinell 132 BHN 135 BHN			

18C12943	MIAO NUT	1/2 6000 A105N UNAR T	SA/A105N
Al 0.022 C 0.210 Co 0.000 Cr 0.140 Cu 0.180 Mn 0.970 Mo 0.030 Nb 0.000			
Ni 0.090 P 0.017 S 0.025 Si 0.230 V 0.003			
CE(Long Formula) = 0.42			
T/S(PSI) 75,511 Y/S(PSI) 50,397 EL(%) 33.25 RA(%) 56.87			
Brinell 137 BHN 137 BHN			

MATERIAL CONFORMS
TO CUSTOMER

79 SPECIFICATIONS 4861

18C12952 AS PER P.O. MALE
REQUIREMENTS

Name: Enlana

Date: JUL 0 8 2013

18C12952	4801 FEMALE	3/4 6000 A105N UNAR T	SA/A105N
Al 0.018 C 0.210 Co 0.000 Cr 0.030 Cu 0.070 Mn 1.050 Mo 0.010			
Nb 0.014 Ni 0.030 P 0.008 S 0.019 Si 0.190 V 0.003			
CE(Long Formula) = 0.40			
T/S(PSI) 74,375 Y/S(PSI) 52,500 EL(%) 34.50 RA(%) 63.25			
Brinell 135 BHN 135 BHN			

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by Meloney Specht
Meloney Specht
QUALITY PROCESS MANAGER

CMTR: REV2

CERTIFIED MILL TEST REPORT



The Best Value -
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LOG NO. F00000000040239

Page 31 of 31

BONNEY FORGE CORPORATION

P.O. BOX 330 • 14496 CROGHAN PIKE • MOUNT UNION, PA 17066-0330

(814) 542-2545 • (800) 345-7546 • FAX (814) 542-4906

www.bonneyforge.com

CUSTOMER: MRC CANADA ULC

DATE 02/20/2013

CUSTOMER

BONNEY ORDER NO. B000139083

ORDER NO.: S759202673

SHIP TO: MRC CANADA ULC - BRCH 759

502-25 AVENUE

NISKU AB T9E 0K6

Canada

ITEM QUANTITY LOT NO.

GRADE OR SPECIFICATION NO.
CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS:

1. THE FITTINGS SUPPLIED ARE IN ACCORDANCE WITH PURCHASE ORDER SPECIFICATIONS.
2. CERTIFYING TO ASTM A350 LF2 07 REVISION.
3. THE MATERIAL SUPPLIED IDENTIFIED AS A105N WAS NORMALIZED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
4. THE MATERIAL SUPPLIED AS A105N MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
5. CERTIFYING ASTM A105-10 / ASME SA105-10 EDITION.
6. THE MATERIAL OF THE FITTINGS SUPPLIED IS ASTM A350-LF2 BUT MEETS THE REQUIREMENTS OF ASME SA350-LF2.
7. THE CHARPY V-NOTCH IMPACT TEST WAS PERFORMED AT -50 DEGREES FAHRENHEIT IN ACCORDANCE WITH A350-LF2.
8. THE MATERIAL SUPPLIED AS A350 LF2 CL1 MEETS THE REQUIREMENTS OF BOTH NACE MRO103-2007 AND NACE MRO175/ISO 15156-2.
9. THE MATERIAL SUPPLIED WAS NORMALIZED IN ACCORDANCE WITH ASTM A350 HEAT TREATING REQUIREMENTS.
10. THE PRODUCT SUPPLIED WAS INSPECTED IN ACCORDANCE WITH EN 10204:2004 EDITION TYPE 3.1 INSPECTION DOCUMENT. (EUROPEAN STANDARD)
11. THE MATERIAL SUPPLIED IDENTIFIED AS SA/A105-QT WAS QUENCHED AND TEMPERED IN ACCORDANCE WITH ASTM A105 HEAT TREATING REQUIREMENTS.
12. THE UNIT OF MEASURE FOR TENSILE AND YIELD (0.2%) STRENGTH ARE REPORTED IN PSI.
13. ELONGATION TEST RESULTS ARE OBTAINED USING STANDARD ROUND SPECIMEN, 2 INCH OR 50 MM GAGE LENGTH.

We certify that the data on this sheet is a true copy taken from our records of material furnished us by the production mill, or as obtained by additional laboratory checks.

by

Meloney Specht

Meloney Specht

QUALITY PROCESS MANAGER

CMTR: REV2



Phoenix * Capitol * Camco
Cap Products

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Certified Mill Test Report

12/6/2011

Customer

MRC MIDFIELD
MIDFIELD SUPPLY ULC
1600, 101-6TH AVENUE SW
CALGARY, AB T2P 3P4

Part Number
15110303

P.O. S 759 131470

Heat No. 121340

Heat Code OD7

Phoenix Order # 803698

Material ASTM A106-2008 / ASME SA106-2007 Edition, No Addenda

Description

1/4 X 1-1/2" XHSML BK STL NIPL

Chemical Properties

C	Mn	P	S	Si	Cu	Cr	Ni	C Eq. Long	
0.1900	0.4800	0.0180	0.0230	0.2500	0.0200	0.0300	0.0200	0.2797	
Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0020	0.0030								

Additional Chemical Properties

Cr + Cu + Ni

0.0700

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
74,500	52,000	31.0%			

Charpy Minimum Impact - ft/lbs

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

* Hydro test passed. at 2500 psi.

* Bend test passed.

This material meets the requirements of the governing specifications. We certify that the above material has been inspected and tested in accordance with the methods prescribed in the governing specification and the results of such inspections and test conform with applicable requirements.

We further certify this material was inspected with independent inspectors conforming to the requirements of EN10204 Section 3.1B.

Comments:

Meets Hardness Requirements of NACE MRO175 latest edition. Meets ASME SA 106 Grade B Requirements. No weld repair was 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.

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

CapProducts, Ltd.

25 Winnipeg St

Vancouver, BC V6M 1L0

Name: *Chris Steen*

Date: *May 23/12*

May 23/12
"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"



Phoenix * Capitol * Camco
Cap Products

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Certified Mill Test Report

2/1/2013

Customer

MRC CANADA ULC
7072 - 112 AVE SE
CALGARY, AB T2C 4Z1

P.O. S 759 199466

Heat No 106473

Heat Code OSO

Phoenix Order # 915539

Material ASTM A333 GR6 2005/ASME SA333 GR6 2007 Edition, No

Part Number

15111006LT

Description

1 X 3" XHSML BLK NIPL A333 GR6

Chemical Properties

C	Mn	P	S	Si	Cu	Cr	Ni	C Eq. Long	
0.1300	1.0500	0.0110	0.0010	0.2500	0.2500	0.0800	0.1000	0.3533	
Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0400	0.0050								

Additional Chemical Properties

Cr + Cu + Ni

0.4300

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
✓ 67,732	✓ 48,297	✓ 40.0%		144 ✓	

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average
99	101	100	100.00

* Hydro test passed. at 2500 psi.

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

JUL 1 2 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: _____

Date: JUL 1 2 2013

This material meets the requirements of the governing specifications. We certify that the above material has been inspected and tested in accordance with the methods prescribed in the governing specification and the results of such inspections and test conform with applicable requirements.

We further certify this material was inspected with independent inspectors conforming to the requirements of EN10204 Section 3.1B.

Comments:

Flattening test passed.

Charpy V Impact Tested at -45° C. Specimen size - 10 x 5 mm.

Meets Hardness Requirements of NACE MRO175/ISO 15156 latest editions. No weld repair was 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.

CapProducts, Ltd.

25 Winnipeg St

Vaughan, ON M0M 1L0



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Cap Products

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Certified Mill Test Report

11/9/2012

Customer

MRC CANADA ULC
7072 - 112 AVE SE
CALGARY, AB T2C 4Z1

P.O. S 759 188160

Heat No 106473

Heat Code **OSO** ✓

Phoenix Order # 898207

Material ASTM A333 GR6 2005/ASME SA333 GR6 2007 Edition, No

Part Number

15111014LT

Description

1 X 7" XH BLK SMLS NIP A333-GR6 ✓

Chemical Properties

C ✓	Mn ✓	P ✓	S ✓	Si ✓	Cu	Cr	Ni	C Eq. Long	
0.1300	1.0500	0.0110	0.0010	0.2500	0.2500	0.0800	0.1000	0.3533	✓
Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0400	0.0050								

Additional Chemical Properties

Cr + Cu + Ni

0.4300

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
67,732 ✓	48,297 ✓	40.0% ✓		144 ✓	

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average
99	101	100	100.00

* Hydro test passed, at 2500 psi.

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUN 1 8 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: EnLana.

Date: JUN 1 8 2013

This material meets the requirements of the governing specifications. We certify that the above material has been inspected and tested in accordance with the methods prescribed in the governing specification and the results of such inspections and test conform with applicable requirements.

We further certify this material was inspected with independent inspectors conforming to the requirements of EN10204 Section 3.1B.

Comments:

Flattening test passed. ✓

Meets Hardness Requirements of NACE MRO175/ISO 15156 latest editions. No weld repair was 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.

CapProducts, Ltd.

25 Winnipeg St

Vaughan, ON M0M 1L0

M.E.G.A.CLIENTE
Customer
Client

ALLIED FITTING CANADA

172 TURBO DRIVE
SHERWOOD PARK, ALBERTA T8H 2J6CERTIFICATO N.
Certificate N.
Certificat N.584390 8
Foglio
Sheet
Feuille

DATA / Date

15/02/12

COMMESSA
Job N.

94566

Confirmation de commande

CERTIFICATO DI COLLAUDO
TEST CERTIFICATE
CERTIFICAT DE CONTROLECOMPANY
WITH QUALITY SYSTEM
CERTIFIED BY DIN
ISO 9001ORDINE
Purchase order
Commande 032111AMG

PROVA Test Epreuve	MATERIALE Material / Matière	COLATA Heat / Coulée	C %	SI %	Mn %	S %	P %	Cr %	Ni %	Mo %	Ti %	Cu %	V %	Al %	CE %
NCDF	A350/04a LF2 C1.1	05/76364	0.180	0.190	0.930	0.010	0.013	00.07	00.04	0.010	0.000	0.150	0.017	0.024	0.367
KFAR	A350/04a LF2 C1.1	08/72129	0.185	Nb % = 0.001	0.920	0.010	0.015	00.10	00.05	0.010	0.018	0.180	0.015	0.023	0.378
KDXS	A350/04a LF2 C1.1	0835650/08	0.185	Nb % = 0.001	1.100	0.002	0.011	00.12	00.01	0.002	0.000	0.022	0.004	0.030	0.395
KWLU	A350/04a LF2 C1.1	0834855/08	0.180	Nb % = 0.0027	1.100	0.003	0.015	00.11	00.01	0.006	0.000	0.048	0.003	0.038	0.391
PKFL	A350/07 LF2 C1.1	10/71001	0.190	Nb % = 0.0014	0.860	0.010	0.011	00.12	00.07	0.010	0.018	0.150	0.018	0.026	0.377
LSAU	A350/02b LF2 C1.1	147605	0.161	Nb % = 0.001	1.132	0.010	0.011	00.17	00.16	0.026	0.001	0.300	0.001	0.025	0.420
				Nb % = 0.002			B % = 0.0005							CE % = 0.3497	

PROVA Test Epreuve	PROVETTA Test specimen / Epreuve		ENNEVAMENTO MPa Yield strength Limite d'élasticité	ROTTURA MPa Tensile strength Rupture	ALLUNGAMENTO % Elongation Allongement	CONTRAZIONE % Reduction of area Striction	DUREZZA HB Hardness Dureté	PIEGA Bend test Phage	SCHIACC. Flat. test Aplastiss.	RESILLENZA Impact test / Résilience			
	SEZIONE Section / Sect.	LUNGHEZZA Length / Longueur								UNITÀ MIS. UM	TIPO Type	T. °C Test temp	VALORE / Value / Données
NCDF	1	29.2	25.0	362.7	500.0	28.0	69.8	149-156		J	KV	-46	82-76-74
KFAR	1	58.4	35.0	363.4	511.9	30.1	73.5	160-165		J	KV	-46	60-68-76
KDXS	1	122.6	50.0	343.0	499.0	33.4	73.0	155-159		J	KV	-46	128-136-148
KWLU	1	119.1	50.0	360.4	545.8	30.6	73.9	146-149		J	KV	-46	92-108-118
PKFL	1	60.1	35.0	328.3	520.9	31.5	67.3	143-146		J	KV	-46	58-60-68
LSAU	1	122.7	50.0	388.0	523.4	38.0	75.6	149-152		J	KV	-46	290-288-286

PROVA Test Epreuve	NOTE / Remarks / Notes	FORMA Shape / Forme
	EN10204/3.1	1 = 0 2 = ☐

NCDF	ELECTRIC FURNACE-QUENCHED AT 900 C TEMPERED AT 600 C	/CERT.8607.06 MEGA/ISMA*531505 MEGA*
KFAR	ELECTRIC FURNACE-QUENCHED AT 900 C TEMPERED AT 600 C	/CERT.10032.MEGA/I*553587 MEGA*
KDXS	ELECTRIC FURNACE-QUENCHED AT 900 C TEMPERED AT 630 C	/CERT.9986.MEGA/I*553020MEGA*
KWLU	ELECTRIC FURNACE-QUENCHED AT 900 C TEMPERED AT 625 C	/CERT.10244.MEGA/I*556128MEGA
PKFL	ELECTRIC FURNACE-QUENCHED AT 920 C TEMPERED AT 590 C	/CERT.10890.MEGA/I*571708MEGA
LSAU	ELECT. FURNACE-NORMALIZED AT 900 C COOLED IN STILL AIR.	/CERT.72146.04 ACC.VENETE*247624 MEGA*

PROVA Test Epreuve	POS. Item Pos.	QUANTITÀ Quantity Quantité	CHOICE CLIENTE Customer code Code client	DESCRIZIONE / Description / Description	VISUAL AND DIMENSIONAL
NCDF	759	25		45 DEG. ELBOW S. 6000 NPT LF2 CL1 3/4	OK
KFAR	760	100		TEE S. 6000 NPT LF2 CL1 1/2	OK
KDXS	761	26		TEE S. 6000 NPT LF2 CL1 3/4	OK
KWLU	761	24		TEE S. 6000 NPT LF2 CL1 3/4	OK
PKFL	762	100		TEE S. 6000 NPT LF2 CL1 1	OK
LSAU	765	25		COUPLING S. 6000 NPT LF2 CL1 1.1/2	OK

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTSConforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda

MAR 1 2 2013

Name: _____

Date: MAR 1 2 2013

NOTE / Remarks / Notes	ENTE UFFICIALE DI COLLAUDO Inspection Authority Service Inspection Officiel	CAPIS COLLAUDO Chief Inspection DP1 Responsable assurance qualité
MATERIAL ACCORDING TO NACE MR0175/2003 MATERIAL ACCORDING TO NACE MR0103/2007		DOC. CERT. M.E.G.A. Emmanuel Centemeri



Phoenix * Capitol * Camco
Cap Products

Commanding a Higher Standard_{sm}

Certified Mill Test Report

1/4/2013

Customer

MRC CANADA ULC
7072 - 112 AVE SE
CALGARY, AB T2C 4Z1

P.O. S 759 195342

Heat No 1204G

Heat Code QTP

Phoenix Order # 909140

Material ASTM A106-2011 / ASME SA106-2010 Edition

Part Number

15111508

Description

1-1/2 X 4" XHSM BK STL NIPL

Chemical Properties

C ✓	Mn ✓	P ✓	S ✓	Si ✓	Cu ✓	Cr ✓	Ni ✓	C Eq. Long	
0.1400	1.1500	0.0160	0.0070	0.2400	0.1700	0.0400	0.0600	0.3574 ✓	
Mo ✓	V ✓	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0100	0.0020		0.0280				0.0150		0.0024

Additional Chemical Properties

Cr + Cu + Ni
0.2700

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
66,690 ✓	44,645 ✓	36.0% ✓		135 ✓	

Name: _____

MAR 06 2013

Date: _____

Charpy Minimum Impact - ft/lbs

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

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" *X7*
MAR 06 2013

* Hydro test passed. at 2500 psi.

This material meets the requirements of the governing specifications. We certify that the above material has been inspected and tested in accordance with the methods prescribed in the governing specification and the results of such inspections and test conform with applicable requirements.

We further certify this material was inspected with independent inspectors conforming to the requirements of EN10204 Section 3.1B.

Comments:

Flattening test passed.

Meets Hardness Requirements of NACE MRO175/ISO 15156 latest editions. No weld repair was 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.

CapProducts, Ltd.

25 Winnipeg St

Vancouver, BC V6M 1L0

 I.M.L. - INDUSTRIA MECCANICA LIGURE S.P.A. Via Giancarlo Farina, 25 - 16030 Casarza Ligure - GE - ITALY Tel. +39 0185 467661 - Fax +39 0185 466510 - E-mail quality.ima@farinagroup.com MATERIAL TEST DEPARTMENT		COMPANY WITH QUALITY SYSTEM ISO 9001: 2008 CERTIFIED BY RINA CERT. N°23/91/S																							
INSPECTION CERTIFICATE EN 10204:2004 / 3.1		Nr 22984	Dated 26.04.2012																						
TRANS AM PIPING PRODUCTS LTD. 9335 Endeavor Drive S.E. Calgary, Alberta T3S 0A1		Purchase Order Nr 3793 Item Nr 032 Packing List Nr 492 Invoice Nr 443	CA																						
Heat Code R63L	Heat Nr 815369	Quantity 2500,00	Description FITTING HEX.H.PLUG THRD NPT 1/2" A350/LF2																						
<table border="1"> <thead> <tr> <th>Element</th> <th>C</th> <th>Si</th> <th>Mn</th> <th>S</th> <th>P</th> <th>Cr</th> <th>Ni</th> <th>Mo</th> <th>Ti</th> <th>Cu</th> </tr> </thead> <tbody> <tr> <td>ASTM A350 LF2 cl.1 (LADLE)</td> <td>0,200</td> <td>0,230</td> <td>0,940</td> <td>0,008</td> <td>0,010</td> <td>0,160</td> <td>0,040</td> <td>0,010</td> <td>-</td> <td>0,040</td> </tr> </tbody> </table>				Element	C	Si	Mn	S	P	Cr	Ni	Mo	Ti	Cu	ASTM A350 LF2 cl.1 (LADLE)	0,200	0,230	0,940	0,008	0,010	0,160	0,040	0,010	-	0,040
Element	C	Si	Mn	S	P	Cr	Ni	Mo	Ti	Cu															
ASTM A350 LF2 cl.1 (LADLE)	0,200	0,230	0,940	0,008	0,010	0,160	0,040	0,010	-	0,040															
<table border="1"> <thead> <tr> <th>Element</th> <th>V</th> <th>Nb</th> <th>N</th> <th>AL</th> <th>C.E.</th> <th>PRE</th> </tr> </thead> <tbody> <tr> <td>ASTM A350 LF2 cl.1 (LADLE)</td> <td>0,003</td> <td>0,002</td> <td>-</td> <td>-</td> <td>0,397</td> <td>-</td> </tr> </tbody> </table>				Element	V	Nb	N	AL	C.E.	PRE	ASTM A350 LF2 cl.1 (LADLE)	0,003	0,002	-	-	0,397	-								
Element	V	Nb	N	AL	C.E.	PRE																			
ASTM A350 LF2 cl.1 (LADLE)	0,003	0,002	-	-	0,397	-																			
<table border="1"> <thead> <tr> <th>Test specimen</th> <th>Shape</th> <th>Tensile</th> <th>Yield Point >0,2%</th> <th>Yield Point >1%</th> <th>Elongation</th> <th>Reduction of area</th> </tr> <tr> <th>Sect. mm2</th> <th>Length mm</th> <th>N/mm2</th> <th>N/mm2</th> <th>N/mm2</th> <th>%</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>122,65</td> <td>50,00</td> <td>1</td> <td>522,0</td> <td>331,0</td> <td>-</td> <td>33,5</td> </tr> </tbody> </table>				Test specimen	Shape	Tensile	Yield Point >0,2%	Yield Point >1%	Elongation	Reduction of area	Sect. mm2	Length mm	N/mm2	N/mm2	N/mm2	%	%	122,65	50,00	1	522,0	331,0	-	33,5	
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160,0 - 168,0	KV	10x10mm	-46	54	50	51																			
Heat treatment		Normalized at 900°C / Air Cool		ELECTRIC FURNACE																					
Dimension in accordance		ASME B16.11 Ed.2009 - ANSI/ASME B1.20.1 Ed.1992 - MSS SP25 Ed.2008 - NACE MR 0175 ISO 15156 Ed.2009- NACE MR 0103 Ed. 2010 - SUPPLIED MATERIAL MEETS SPECIFICATIONS AND P.O. REQUIREMENTS																							
Material in accordance		ASME SA ASTM A350-11 Gr. LF2 cl.1																							
Visual & Dimensional		SATISFACTORY	Origin EUROPE	Our Ref. 2011-2E201-0001175-0032																					

Notes --

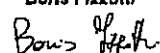
"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda"

JUL 08 2013

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Name: _____

Date: JUL 08 2013

QUALITY CONTROL DEPT. Boris Fizzotti 	INSPECTION AUTHORITY	MANUFACTURER'S SYMBOL IML or 
---	-----------------------------	--



CapProducts, Ltd.
25 Winnipeg St
Vanastra, ON N0M 1L0

Phoenix * Capitol * Camco

Cap Products

Commanding a Higher Standard_{sm}

Certified Mill Test Report

6/17/2013

Customer

MRC CANADA ULC
7072 - 112 AVE SE
CALGARY, AB T2C 4Z1

P.O. C 740 2697318J0
Tag

Heat No 2100629

Heat Code ST9 ✓

Phoenix Order # 949800

Material ASTM A333 GR6 2011/ASME SA333 GR6 2010 Edition

Part Number

15111020LT

Description

1 X 10 " XHSML BLK NIPL A333-GR6 ✓

Chemical Properties

C ✓	Mn ✓	P ✓	S ✓	Si ✓	Cu	Ni	Cr
0.1800	1.2000	0.0170	0.0090	0.2000	0.0060	0.0070	0.0060

C Eq. Long
0.3825 ✓

Mo	V	Co	Al	Cb	N	Pb	Sn	Ta	Ti
0.0020	0.0003								

Additional Chemical Properties

Cr + Cu + Ni
0.0190

Mechanical Properties

Tensile (PSI)	Yield (PSI)	Elong. % in 2 in.	R of A	HBW	HBW2
80,812 ✓	54,028 ✓	32.8% ✓		162 ✓	

MATERIAL CONFORMS
TO CUSTOMER
SPECIFICATIONS
AS PER P.O.
REQUIREMENTS

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Average
54	52	56	54.00

"Conforms with ASME
Sec II, Part A, 2010 edition,
2011a addenda" JUN 24 2013

Name: _____

Date: JUN 24 2013

* Hydro test passed. at 2500 psi.

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 hardness requirements of the latest editions of NACE MR0175 and NACE MR0103. 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

Comments:

Flattening test passed.

Charpy V Impact Tested at -45° C. Specimen size - 10 x 3.33 mm.

MILL TEST & INSPECTION CERTIFICATE

ACCORDING TO EN 10204 : 2004 3.1

CUSTOMER : PVP LTD

CELT. NO : 80257

ORDER NO : 7001217(601257)

INVOICE NO : 700003106

L/C NO :

DATE : 06/11/2009

PAGE : 8

ORIGIN : TAIWAN



Bothwell Steel Fittings Co., Ltd.

NO.303, JENHSUN ROAD, JEN-HU, HSIAO

KAOSHIUNG HSIEN, TAIWAN R.O.C. 814480

TEL: 886-7-371-0497, 371-1636, 372-0260

FAX: 886-7-371-3864, 371-3862

Web site: http://www.bwsteel.com.tw

An ISO 9001:2000 Registered Manufacturer



ITEM	HT. CO.	DATE MATERIAL	REAY NO.	DISCUSSION	QUANTITY	MATERIAL	INSPECTION
------	---------	---------------	----------	------------	----------	----------	------------

048	Y630	170637		THE 1/8" 30000 RT	25 PC	ASTM A152 - 04a	ASME B31.1-2001	6000	6000
049	Y640	170637		THE 1/4" 30000 RT	25 PC	ASTM A152 - 04a	ASME B31.1-2001	6000	6000
050	Y653	170637		THE 1/4" 60000 RT	25 PC	ASTM A152 - 04a	ASME B31.1-2001	6000	6000
051	Y653	170637		THE 1/4" 60000 RT	25 PC	ASTM A152 - 04a	ASME B31.1-2001	6000	6000
052	Y653	170637		THE 1/4" 60000 RT	25 PC	ASTM A152 - 04a	ASME B31.1-2001	6000	6000
053	Y653	170637		THE 1/4" 60000 RT	25 PC	ASTM A152 - 04a	ASME B31.1-2001	6000	6000
054	Y640	170637		THE 1/4" 60000 RT	25 PC	ASTM A152 - 04a	ASME B31.1-2001	6000	6000

ITEM	HT. CO.	C	SI	He	P	S	Ca	Cr	NI	Mo	V	CU(Tb)	N	Al	TI	CE	MATERIAL SUPPLIER
048	Y630	0.100	0.240	1.850	0.014	0.001	0.040	0.250	0.040	0.020	0.002	0.000	-	-	-	-	榮利
049	Y640	0.100	0.240	1.850	0.014	0.001	0.040	0.250	0.040	0.020	0.002	0.000	-	-	-	-	榮利
050	Y653	0.100	0.240	1.850	0.014	0.001	0.040	0.250	0.040	0.020	0.002	0.000	-	-	-	-	榮利
051	Y653	0.100	0.240	1.850	0.014	0.001	0.040	0.250	0.040	0.020	0.002	0.000	-	-	-	-	榮利
052	Y653	0.100	0.240	1.850	0.014	0.001	0.040	0.250	0.040	0.020	0.002	0.000	-	-	-	-	榮利
053	Y653	0.100	0.240	1.850	0.014	0.001	0.040	0.250	0.040	0.020	0.002	0.000	-	-	-	-	榮利
054	Y640	0.100	0.240	1.850	0.014	0.001	0.040	0.250	0.040	0.020	0.002	0.000	-	-	-	-	榮利

ITEM	HT. CO.	T. S. (Tb)	T. S. (Tb)	H. (S)	H. (S)	R of A (Tb)	Hardness (HV)	Charpy Impact (Joule)	MECHANICAL PROPERTIES	HEAT TREATMENT	ADDITIONAL TEST / REMARKS
048	Y630	76.2	54.8	32.8	88.1	142	124.2	125.5	116.1	122.533	CONFORM TO EN 10204-3.1
049	Y640	76.2	54.8	32.8	88.1	142	124.2	125.5	116.1	122.533	CONFORM TO EN 10204-3.1
050	Y653	76.2	54.8	32.8	88.1	142	124.2	125.5	116.1	122.533	CONFORM TO EN 10204-3.1
051	Y653	76.2	54.8	32.8	88.1	142	124.2	125.5	116.1	122.533	CONFORM TO EN 10204-3.1
052	Y653	76.2	54.8	32.8	88.1	142	124.2	125.5	116.1	122.533	CONFORM TO EN 10204-3.1
053	Y653	76.2	54.8	32.8	88.1	142	124.2	125.5	116.1	122.533	CONFORM TO EN 10204-3.1
054	Y640	76.2	54.8	32.8	88.1	142	124.2	125.5	116.1	122.533	CONFORM TO EN 10204-3.1

PDF created with pdfFactory trial version www.pdffactory.com

Sec II Part A, 2010 edition

Conforms with ASME

C.C. Manager

INSPECTOR

APPROVED

By Cert Steen at 9:18 am, Jan 02, 2013

Conforms with ASME
Sec II Part A, 2010 edition
2011a addenda

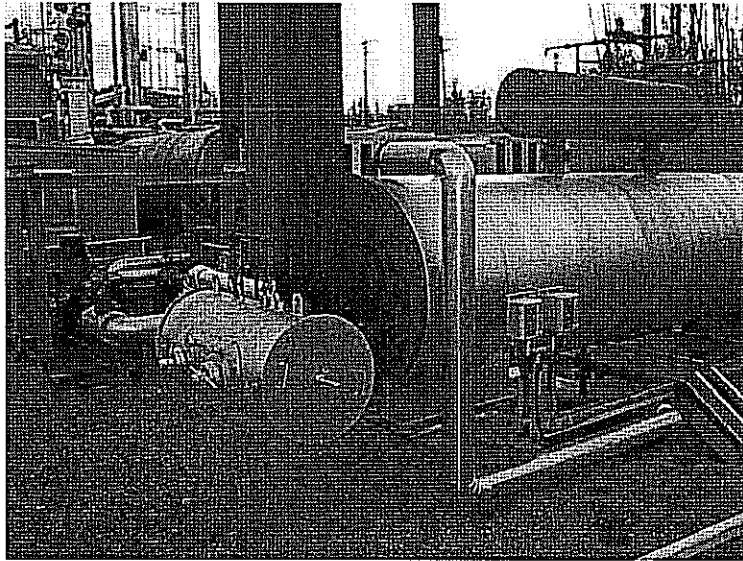
CONFORM TO EN 10204-3.1

STEEL MAKING PROCESS : ELECTRIC FURNACE

ACL

Manufacturing Inc.

ACL 5000 Ignition Control System

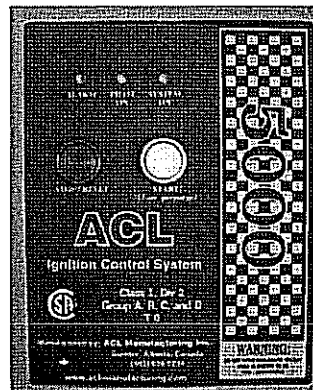
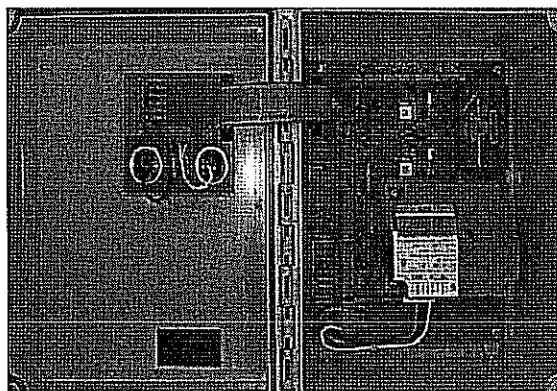


The ACL 5000 provides ignition, flame fail, alarm and shutdown capabilities for all gas fired heaters.

Features

- Simple to use, no programming necessary
- Built in logic allows for automatic ignition & re-light, shutdown interlocks, alarm out, remote stop & remote start.
- Versatile power supply 9-30 VDC, 120-240 VAC 50/60 Hz. & Solar.
- Fastest flame out response time of 0.8 seconds.
- CSA approved for Class 1, Div 2 location.
- CSA approved C22.2 No 199-M89. Combustion safety controls and solid-state Ignitors for Gas & Oil burning equipment.
- CSA B149.3 Compatible.
- Nema 4x enclosure, corrosion resistant and weatherproof.

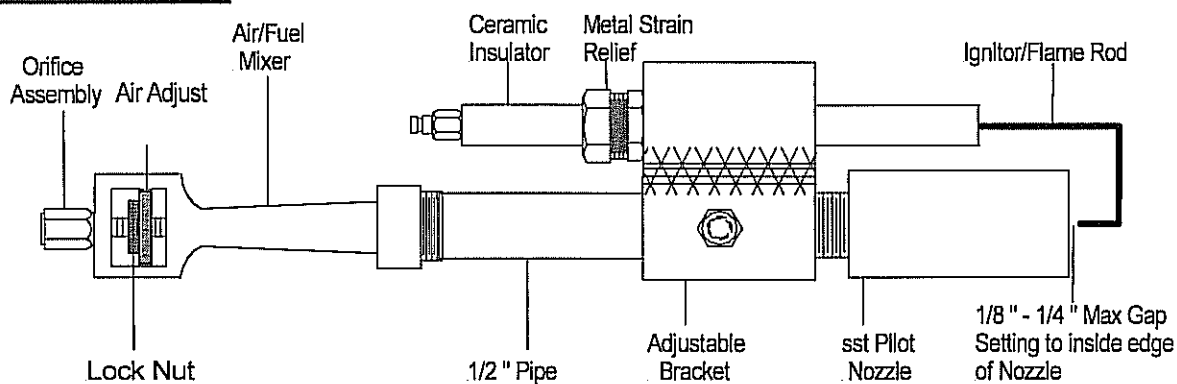
Bay #2 - 805 Main Ave West - Box 2002 -Sundre, Alberta, T0M 1X0
Ph: (403) 638-5234 Fax: (403) 638-4973 E-mail: acis@telusplanet.net
Visit our website - www.acl-manufacturing.com



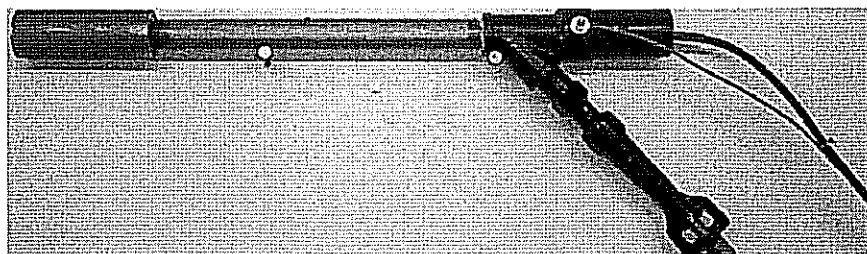
Simple Design

- No programming necessary
- Two button operation (Stop & Start)
- New innovative design allows ignition and flame fail with the use of one flame rod
- Control and ignition components are all housed in the Nema 4x enclosure control box
- Easily installed into any burner.

Pilot Assembly



Optional Pilot Assembly



Application

The ACL 5000 ignition control system is designed to be used for industrial sized single burner applications where a continuous pilot is used. The burners must not exceed 3,500,000 BTU/h at time of ignition. An approved slow opening valve must be used for larger BTU heaters.

Theory of Operation

The ACL 5000 utilizes a single ignitor/flame rod to provide both flame acknowledgement and ignition at the pilot tip. When the ACL 5000 starts its ignition sequence, fuel gas travels to the pilot tip where the ignitor/flame rod is located and sparking. Once the gas is lit, the flame becomes a current path for the ignitor/flame rod for flame acknowledgement and the unit stops sparking. If this flame is ever to blow out, the current path is broken and the ignitor/flame rod starts sparking within 1 second. At no time is the main burner activated while the controller is in ignition mode. Main burner is only activated when continuous pilot has been proven.

Sequence of Operation

	System On Light	Pilot Light	Solenoid #1	Solenoid #2	Alarm Light/ Alarm Contacts	Ignition
Stop/reset Pressed	OFF	OFF	OFF	OFF	OFF	OFF
Push start 5 second trial for ignition	ON	ON	ON	OFF	OFF	ON
Pilot flame Lit	ON	ON	ON	OFF	OFF	OFF
20 seconds later (T1 adjustable)	ON	ON	ON	ON	OFF	OFF
Pilot flame blows out	ON	ON	ON	OFF	OFF	ON
Fails to Light	ON	OFF	OFF	OFF	ON	OFF

Mounting

The ACL 5000 can be mounted in a Class 1 Div 2 area, usually close to the burner end. The unit comes with a maximum of 10' of ignition wire and a 7½' piece of non-metallic flex and connectors, which must be used. Do not use metallic flex for ignition wire and ground. The pilot assembly is to be mounted inside the fire tube and beside the burner. This assembly consists of an ignitor/flame rod, pilot mixing valve and pilot nozzle. The pilot assembly gas connection is 1/4" or 1/8" npt and requires approximately 3 –7 psi of clean dry fuel gas. The ignitor rod in the pilot assembly is connected with a high voltage ignition wire (provided) between it and the ignition module mounted in the control box. A ground wire (also provided) must be connected between the ground lug on the pilot assembly and the bonding ground terminal on the terminal strip inside the control box. Note: If the controller must be mounted farther away from the Burner Assembly, the ignition module, which is mounted in the controller, can be remotely mounted in the burner housing.

Power Connection

The ACL 5000 comes with different power supply voltages from solar to 12 VDC, 24 VDC, 120/240 VAC 50/60 Hz. These voltage requirements must be determined before they are ordered so they can be factory set. The supply voltage of each unit is clearly marked inside the cover and on the circuit board beside its respective terminal connection. The terminal marked Ground is for the power supply or system ground and the Bonding Ground is strictly for the ground wire going to the pilot assembly. It is very important to ensure that there is a ground wire connected between the pilot assembly and the bonding ground terminal inside the ACL 5000 control box to provide an uninterrupted current path for the flame acknowledgement.

Solenoid Outputs

There are 2 solenoid outputs marked solenoid #1 and solenoid #2. These solenoids operate at the same voltage as the power supply voltage and should be rated for Class 1 Div 2 areas and shouldn't have a rating of more than 12 watts for 12 VDC operation, 24 watts for 24 VDC operation or 30 watts for 120/240 VAC operation. In operation, solenoid #1, also considered as a pilot solenoid is energized when ignition begins. Solenoid #2, also considered as a main solenoid, doesn't get energized until pilot flame is proven. This time is factory set at 20 seconds and is adjusted by T1 selector switch on circuit board.

S/D Interlock

S/D or shutdown interlock provides the user with a means of connecting other shutdowns such as a low level switch to operate in conjunction with the ACL

5000 to shutdown the heater. A jumper is installed in the factory and should be removed if user wishes to utilize this shutdown feature. When utilized, the shutdown switch being used should have a set of normally closed contacts and when shutdown is in alarm state the contacts open. When this happens the ACL 5000 will de-energize both solenoid #1 and solenoid #2 therefore not allowing any fuel gas to the pilot or burner. The ignitor will continue with 1 attempt to ignite but will be unsuccessful and then go into alarm. The only way to restart the 5000 will be to clear the shutdown, press the stop/reset button and then press the start button.

Alarm Output

Alarm output status provides the user with a normally closed and normally open set of dry contacts. The only time these contacts change state is when the controller has been unsuccessful in lighting the pilot assembly after 1 try.

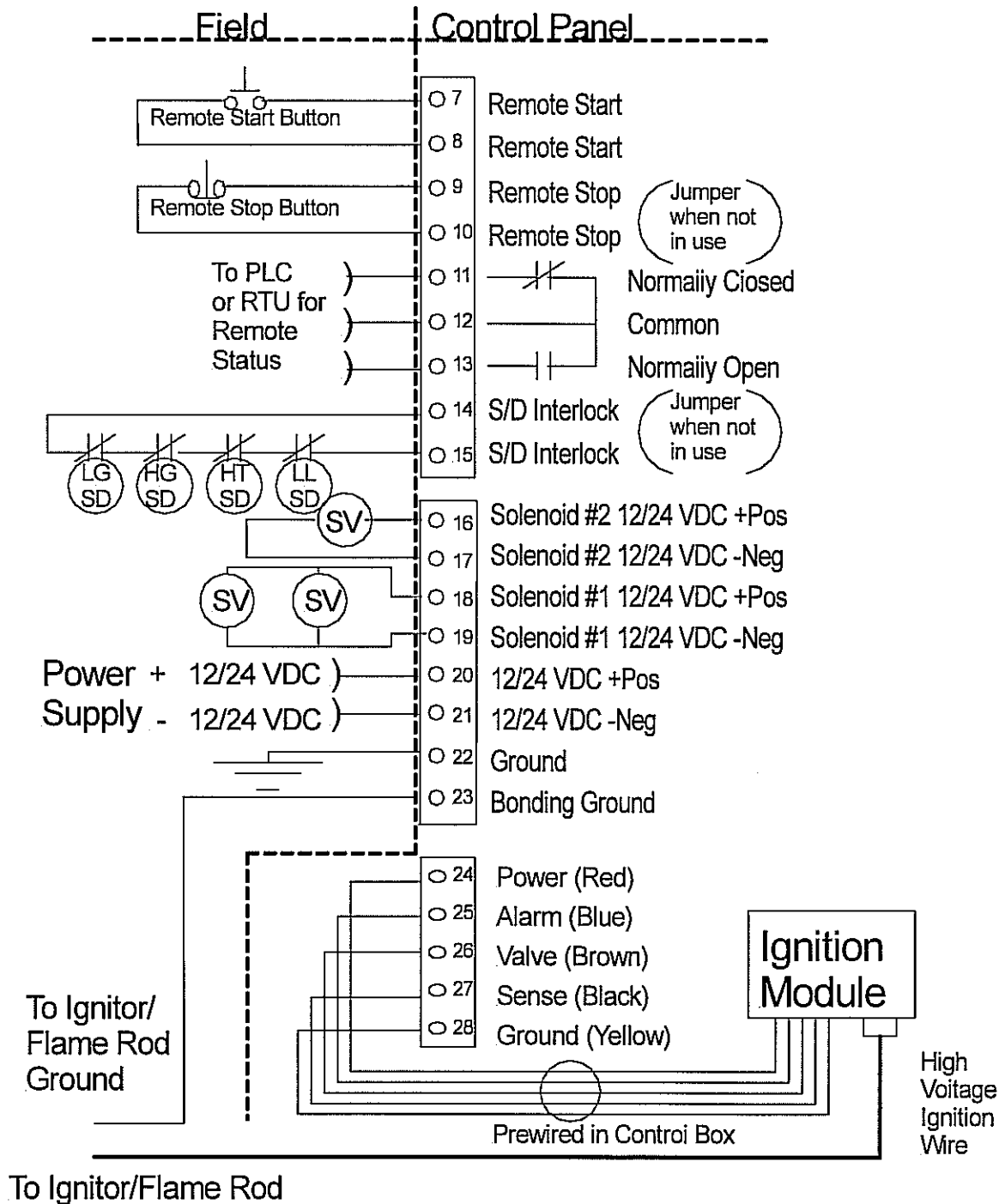
Remote Stop

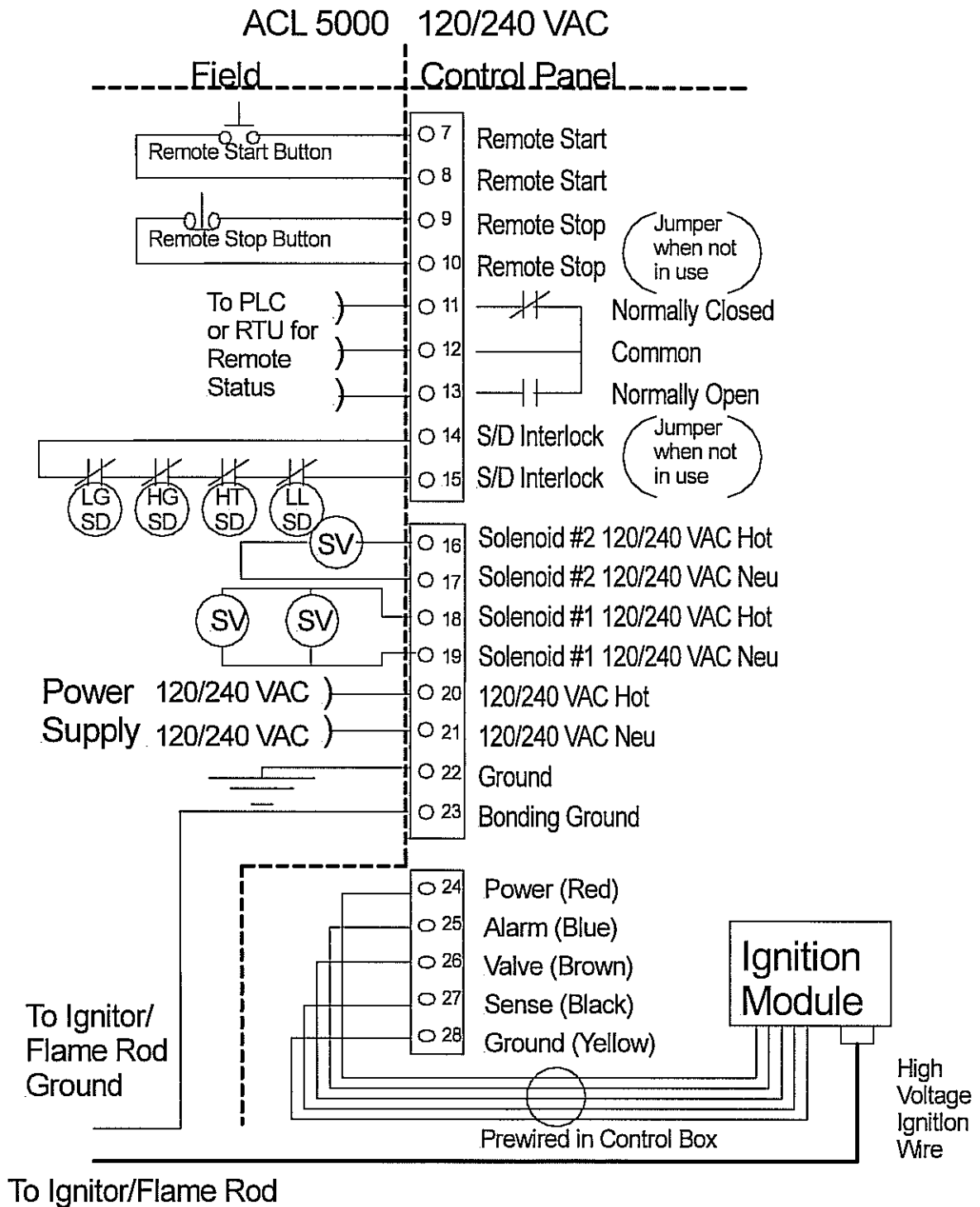
The remote stop function is available when the jumper is removed and a momentary normally closed contact button or remote relay contact (N/C) is utilized. This remote stop shuts down the ACL 5000 completely.

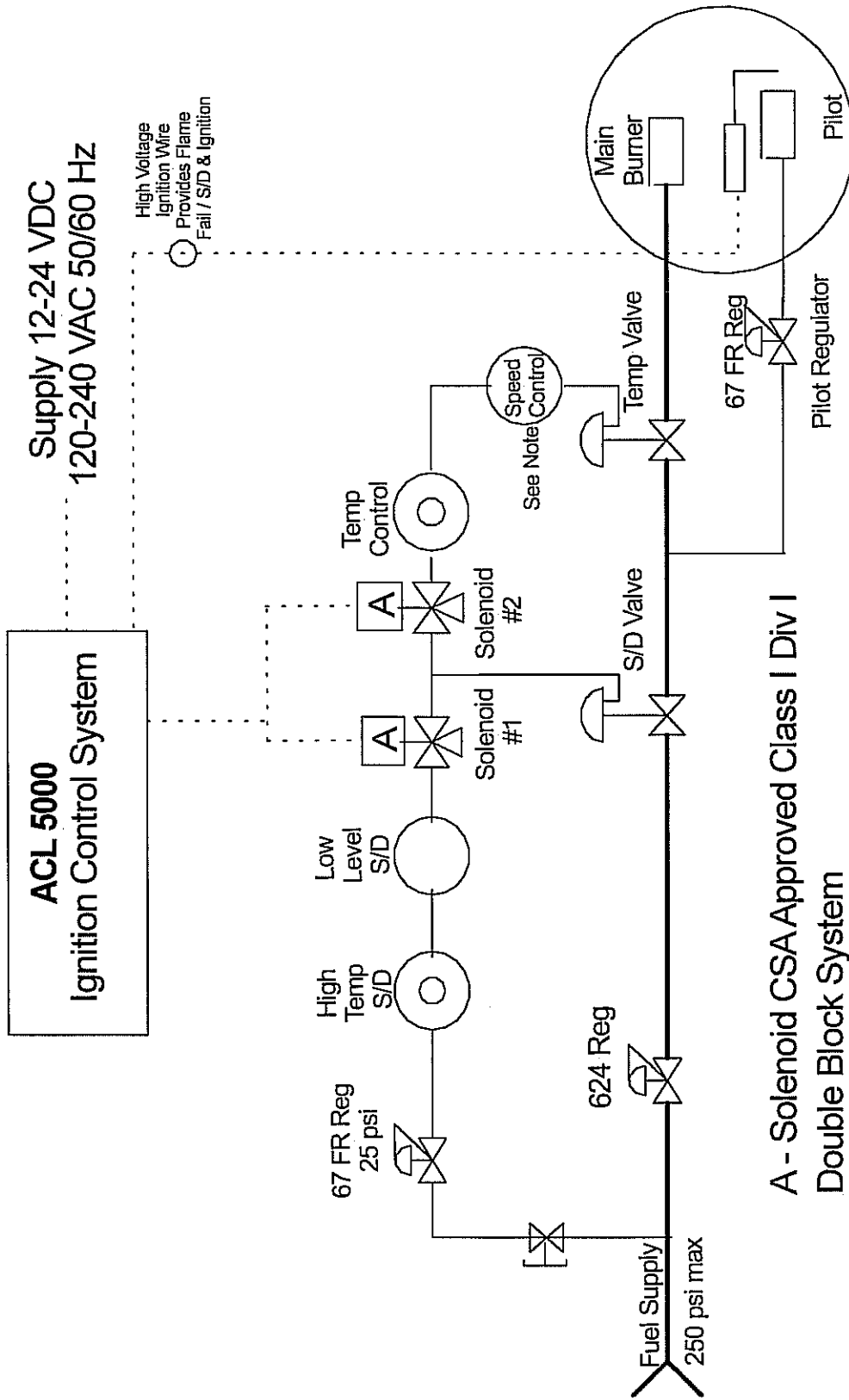
Remote Start

The remote start function is available when a momentary normally open contact button or remote relay contact (N/O) is utilized. When contacts close momentarily the unit initiates starting sequence.

ACL 5000 12/24 VDC

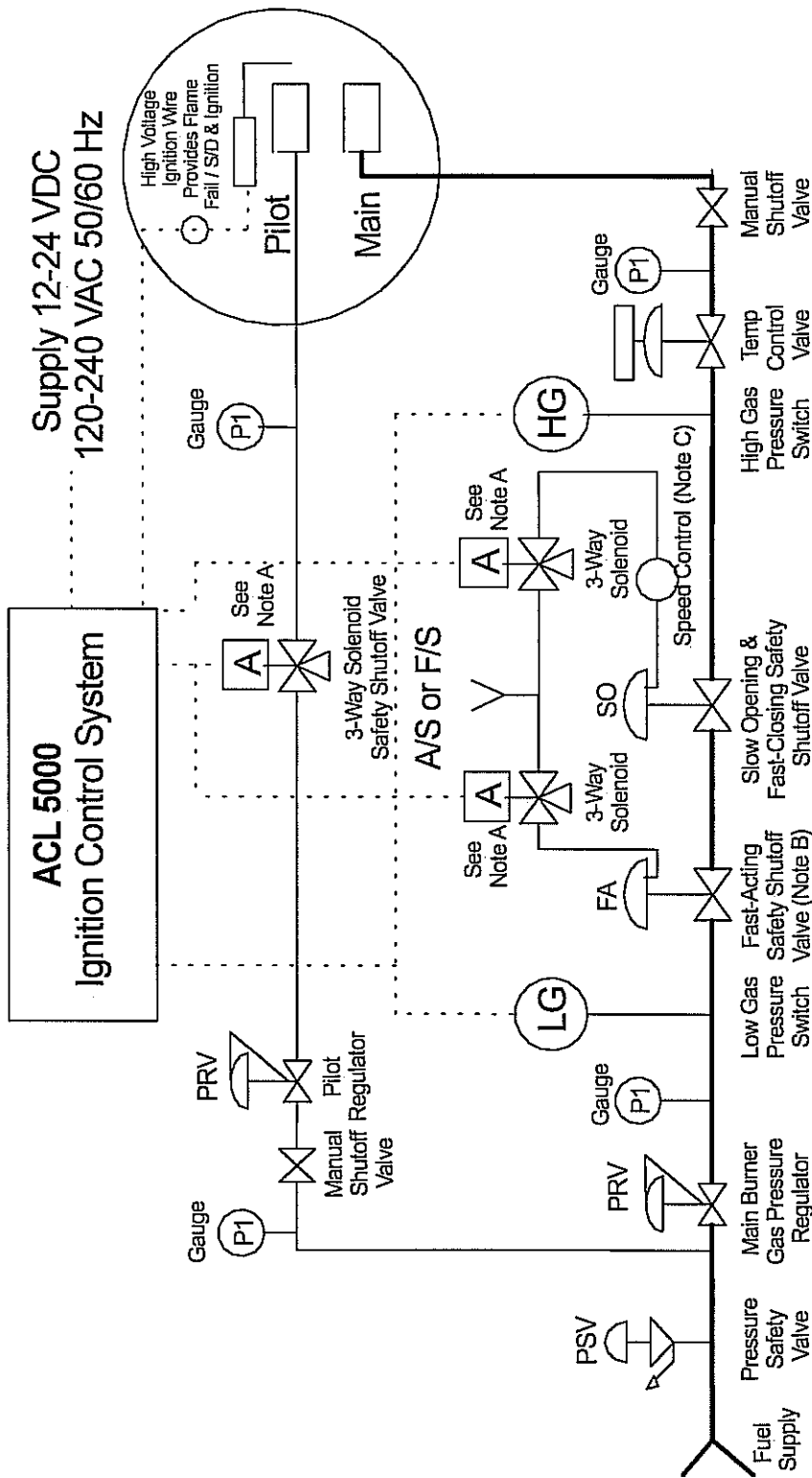






A - Solenoid CSA Approved Class I Div I Double Block System

Note: 1/4" x 1/4" Speed Control Valve Supplied



ACL 5000
Ignition Control System

Note A: Solenoid CSA Certified Class I Div I

Note B: Must be in accordance with CGA Standard 6.5/ANSI Z21.21 and marked C/1 or in accordance with CGA Standard 3.9

Note C: 1/4" x 1/4" Speed Control Valve Supplied

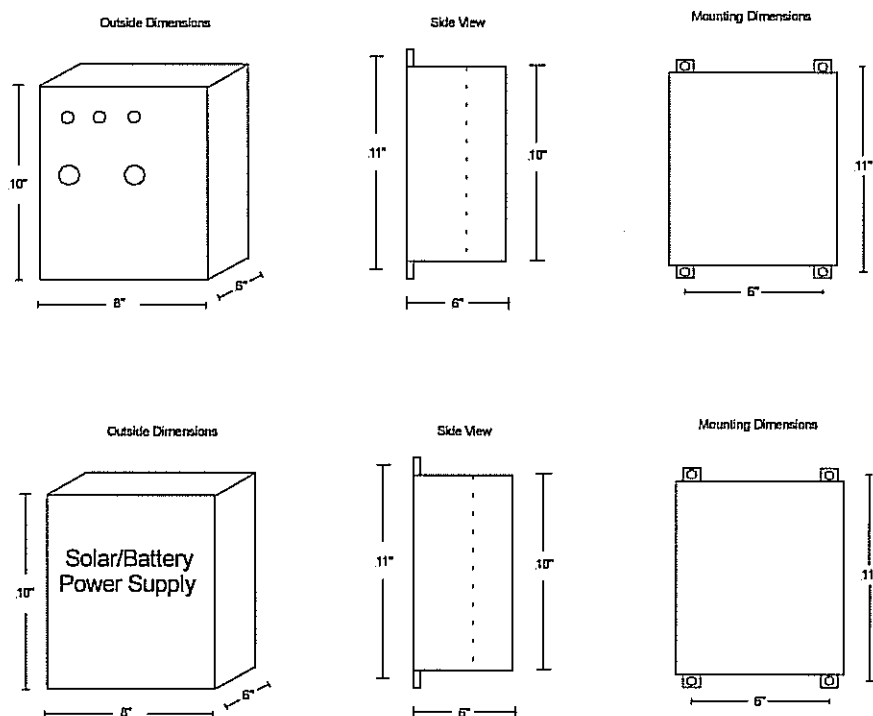
Note: This drawing is recommended for use with gas appliances that must conform to CSA B149.3. Valve Train diagram #3 Single Burner Application

Specifications

Voltage	12 VDC	24 VDC	120VAC	240VAC
Current	.204 amps	.102 amps	.058 amps	.029 amps
Power	2.45 W	2.45 W	12.75 W	12.75 W
Solenoid Valve Rating per solenoid output	12 W	24 W	30 W	30 W
Operating Temp	-40 C to 60 C			
Flame Sensitivity	1 micro amp minimum			
Flame Failure Response Time	0.8 seconds maximum			
Spark Rate	25 sparks/second			

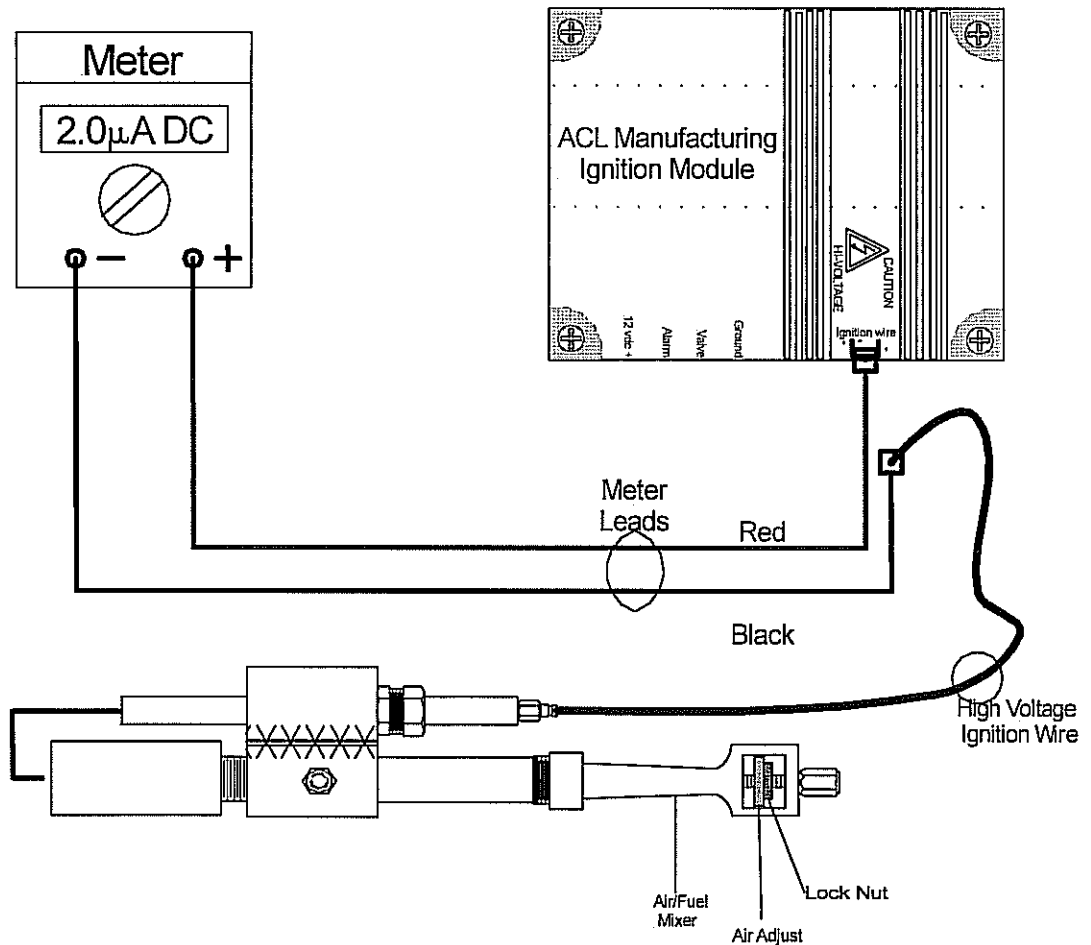
Note: Low power solenoids of .85 and 1.8 watts are available for solar power operations as well as all voltages

Control Box Dimensions



Flame Signal Test Procedure

1. Turn Power off to ACL Controller
2. Remove high-voltage ignition wire from ignition module and insert meter leads in series.
3. Turn on power and initiate start sequence.
4. Meter will give erratic readings during ignition period but should settle down between 1-2 μA reading on meter.
5. Adjust air shutter on pilot mixer and adjust pressure on regulator to achieve a flame signal close to 2 μA which is optimum.



Troubleshooting Guide

ACL 5000

1. Fails to Attempt Ignition

- | | |
|---|--|
| a) Blown fuse | a) Replace fuse 2 amp max – F1, F2 on circuit board |
| b) Battery voltage low (solar package only) | b) Charge battery to minimum of 11.5 volts. Check solar panel connections. |
| c) Poor power connections | c) Check connections on terminal strips |
| d) Defective ignition module | d) Remove module and send for repair/replace. |
| e) Defective control board | e) Remove control board & send for repair. |
| f) Electrode Shorted out | f) Ensure proper gap – 1/8" – 1/4" max |

2. Attempts Ignition But Doesn't Light

- | | |
|---|---|
| a) Fuel gas supply to pilot may be too high | a) Pilot fuel gas supply should be set at 5 pounds, adjust air/fuel mix on pilot, and adjust regulator. |
| b) Gap setting on ignitor/flame rod not correct | b) Gap should be approximately 1/8" – 1/4" max |
| c) Poor ground | c) Ensure ground connections are good in control box and at pilot assembly in fire tube. |
| d) Pilot solenoid failure | d) Replace solenoid |
| e) Plugged orifice on pilot | e) Clean out pilot orifice |

3. Weak or Erratic Spark

- | | |
|--|---|
| a) Ignition cable may be too long, optimum length is 10 ft. or less. | a) Shorten cable |
| b) Ignition wire installed in metallic sheathed flex | b) Install ignition wire in non-metallic sheathed flex or free air. |
| c) Defective ignition module | c) Replace ignition module |
| d) Gap setting too wide | d) Shorten gap setting - 1/8" – 1/4" max |
| e) Ignition cable defective or insulation worn | e) Replace cable |
| f) Poor ground | f) Check ground at both ends (control box & ignitor end) |

4. Pilot & Main Solenoid Cycle On/Off

- | | |
|---|--|
| a) Pilot flame may be moving off of flame rod | a) Adjust rod for more flame exposure |
| b) Weak pilot or plugged orifice | b) Clean orifice and check pilot gas pressure approx 3-5 psi |
| c) Main burner comes on too hard | c) Install optional speed control valve on burner valve signal. |
| d) Pilot may be distorted by main burner | d) Ensure main fuel gas pressure is correct depending on burner and pilot should be set back from burner |
| e) Flame rod not sensing flame correctly | e) Adjust flame rod into flame maintaining gap setting of less than 1/4". Replace flame rod. |

5. Erratic Sparking Sequence

- | | |
|--|---|
| a) Controller microprocessor locked up | a) Remove power to controller for 10 seconds. |
|--|---|



Bourdon Tube Pressure Gauges

All Stainless Steel Construction

Industrial Series Liquid Fillable • Type 23X.53

Pressure Gauges

Application

Suitable for corrosive environments compatible with 316 stainless steel wetted parts, dry and liquid fillable case, where vibration and/or pressure pulsation occur in liquid or gaseous media which will not obstruct the pressure system.

Sizes (All sizes not stocked)

2", 2½" and 4" (50, 63 and 100 mm)

Accuracy

2", 2½" ± 1.5% of span

4" ± 1.0% of span (ASME B40.1 Grade 1A)

Ranges (All ranges not stocked)

Vacuum / Compound to 30"HG / 0 / 200 PSI

Pressure from 15 PSI to 15,000 PSI

or other equivalent units of pressure or vacuum

Working Range

2" & 2½" Steady: 3/4 of full scale value

Fluctuating: 2/3 of full scale value

Short time: full scale value

4"

Steady: Full scale value

Fluctuating: 0.9 x full scale value

Short time: 1.3 x full scale value

Operating Temperature

Ambient: -40°F to 140°F (-40°C to 60°C) ^{Note 1}

Media: max. 212°F (+100°C)

Temperature Error

Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% for every 18°F (10°C) rising or falling. Percentage of span.

Standard Features

Connection

Material: 316 stainless steel

Lower mount (LM)

Center back mount (CBM) 2½"

Lower back mount (LBM) 4"

1/4" or 1/2" NPT limited to wrench flat area

Bourdon Tube

Material: 316 stainless steel

30"Hg (Vac) to 1000 PSI C-type - 2" & 2½"

30"Hg (Vac) to 1500 PSI C-type - 4"

1500 PSI to 15,000 PSI helical type - 2" & 2½"

2000 PSI to 15,000 PSI helical type - 4"

Movement

Stainless steel

Dial

White aluminum with black lettering. 2½" with stop pin.

Pointer

Black aluminum, non-adjustable

Case

304 stainless steel with vent plug and SS crimping ring.

Welded case/socket connection



Weather Protection

Weather resistant (NEMA 3 / IP 54) - dry case

Weather tight (NEMA 4X / IP 65) - liquid-filled case

Standard Scale

PSI

PSI, PSI/BAR, PSI/KPA, PSI/KG/CM² (2½" CBM)

Window Gasket

Buna-N

Case Filling

232.53 - None

233.53 - Glycerine

Window

Polycarbonate

Acrylic (4")

ORDER OPTIONS (min. order may apply)

Custom dial layout

Steel zinc plated u-clamp bracket (field installable)

Stainless steel u-clamp bracket (field installable)

Pressure compensating membrane window for filled gauges

Stainless steel polished front flange (CBM or LBM only)

Stainless steel rear flange

316 SS threaded restrictor

Glycerine, silicone, or fluorolube case filling (**Type 233.53**) ^(Note 1)

Special connections limited to wrench flat area

Other pressure scales available:

Bar, kPa, MPa, Kg/cm² and dual scales

DIN standards

Cleaned for oxygen service

Externally adjustable red drag pointer (max. hand)

Externally adjustable red mark pointer (set pointer)

Note 1 Temperature Ranges (Liquid filled gauges)

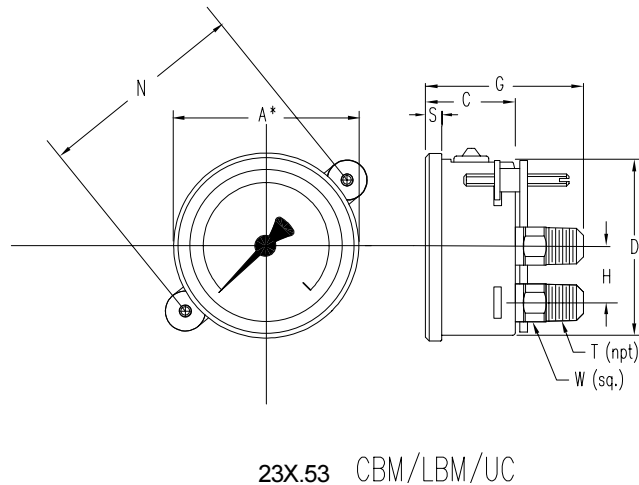
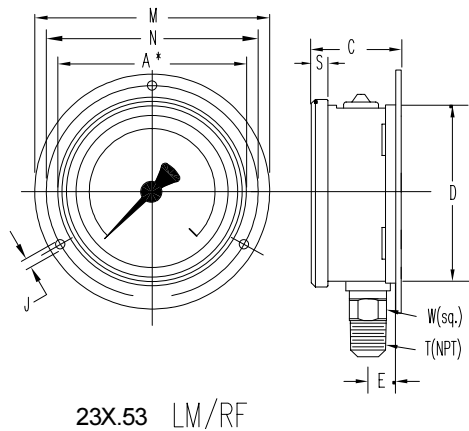
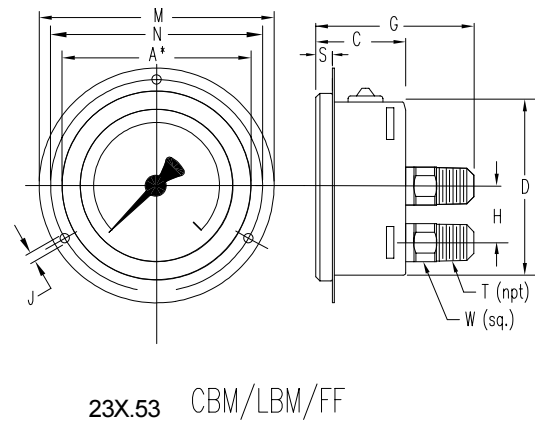
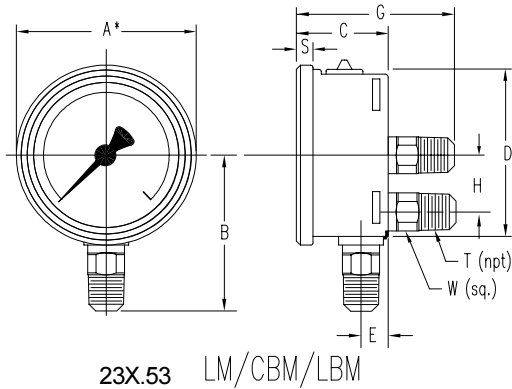
Glycerine: -4°F to 140°F (-20°C to 60°C)

Silicone: -40°F to 140°F (-40°C to 60°C)

APM 23X.53

(APM 02.13)

Dimensions:



A* NOMINAL SIZE

TYPE/SIZE	WEIGHT	KEY	A*	B	C	D	E	G	H	J	L	M	N	S	T	W
23X.53 2"	0.27 lbs. + 0.06 lbs. if filled	mm	50	48	30	50	12	53	--	3.6	6.5	71	60	5.5	--	14
		in	2	1.89	1.18	1.97	0.47	2.09		0.14	0.26	2.80	2.36	0.22	1/4"	0.55
23X.53 2.5"	0.36 lbs. + 0.08 lbs. if filled	mm	63	54	32	62	13	54	--	3.6	7.5	85	75	6.5	--	14
		in	2.5	2.13	1.26	2.44	0.51	2.13		0.14	0.30	3.35	2.95	0.26	1/4"	0.55
23X.53 4"	1.10 lbs. + 0.66 lbs. if filled	mm	100	87	48	100	15.5	79.5	30	4.8	9	132	116	8	--	22
		in	4	3.43	1.89	3.94	0.61	3.13	1.18	0.19	0.35	5.20	4.57	0.31	1/2"	0.87

NOTE: For 1/4" NPT connections on 3" and 4" gauges, reduce B* dimension by 5 mm / 0.02 in.

Panel cut-out dimensions: D + 1mm

THE MEASURE OF Total Performance™

Ordering Information:

State computer part number (if available) / type number / size / range / connection size and location / options required.

Specifications given in this price list represent the state of engineering at the time of printing. Modifications may take place and the specified materials may change without prior notice

05/02



WIK A Instrument Corporation

1000 Wiegand Boulevard

Lawrenceville, Georgia 30043-5868

Tel: 770-513-8200 Fax: 770-338-5118

<http://www.wika.com> e-mail: info@wika.com



Bourdon Tube Pressure Gauges

All Stainless Steel Construction

Industrial Series Liquid Fillable • Type 23X.53

Pressure Gauges

Application

Suitable for corrosive environments compatible with 316 stainless steel wetted parts, dry and liquid fillable case, where vibration and/or pressure pulsation occur in liquid or gaseous media which will not obstruct the pressure system.

Sizes (All sizes not stocked)

2", 2½" and 4" (50, 63 and 100 mm)

Accuracy

2", 2½" ± 1.5% of span

4" ± 1.0% of span (ASME B40.1 Grade 1A)

Ranges (All ranges not stocked)

Vacuum / Compound to 30"HG / 0 / 200 PSI

Pressure from 15 PSI to 15,000 PSI

or other equivalent units of pressure or vacuum

Working Range

2" & 2½" Steady: 3/4 of full scale value

Fluctuating: 2/3 of full scale value

Short time: full scale value

4"

Steady: Full scale value

Fluctuating: 0.9 x full scale value

Short time: 1.3 x full scale value

Operating Temperature

Ambient: -40°F to 140°F (-40°C to 60°C) ^{Note 1}

Media: max. 212°F (+100°C)

Temperature Error

Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% for every 18°F (10°C) rising or falling. Percentage of span.

Standard Features

Connection

Material: 316 stainless steel

Lower mount (LM)

Center back mount (CBM) 2½"

Lower back mount (LBM) 4"

1/4" or 1/2" NPT limited to wrench flat area

Bourdon Tube

Material: 316 stainless steel

30"Hg (Vac) to 1000 PSI C-type - 2" & 2½"

30"Hg (Vac) to 1500 PSI C-type - 4"

1500 PSI to 15,000 PSI helical type - 2" & 2½"

2000 PSI to 15,000 PSI helical type - 4"

Movement

Stainless steel

Dial

White aluminum with black lettering. 2½" with stop pin.

Pointer

Black aluminum, non-adjustable

Case

304 stainless steel with vent plug and SS crimping ring.

Welded case/socket connection



Weather Protection

Weather resistant (NEMA 3 / IP 54) - dry case

Weather tight (NEMA 4X / IP 65) - liquid-filled case

Standard Scale

PSI

PSI, PSI/BAR, PSI/KPA, PSI/KG/CM² (2½" CBM)

Window Gasket

Buna-N

Case Filling

232.53 - None

233.53 - Glycerine

Window

Polycarbonate

Acrylic (4")

ORDER OPTIONS (min. order may apply)

Custom dial layout

Steel zinc plated u-clamp bracket (field installable)

Stainless steel u-clamp bracket (field installable)

Pressure compensating membrane window for filled gauges

Stainless steel polished front flange (CBM or LBM only)

Stainless steel rear flange

316 SS threaded restrictor

Glycerine, silicone, or fluorolube case filling (**Type 233.53**) ^(Note 1)

Special connections limited to wrench flat area

Other pressure scales available:

Bar, kPa, MPa, Kg/cm² and dual scales

DIN standards

Cleaned for oxygen service

Externally adjustable red drag pointer (max. hand)

Externally adjustable red mark pointer (set pointer)

Note 1 Temperature Ranges (Liquid filled gauges)

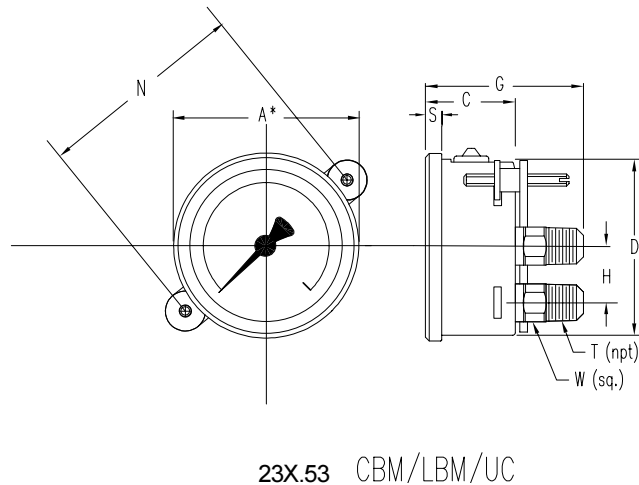
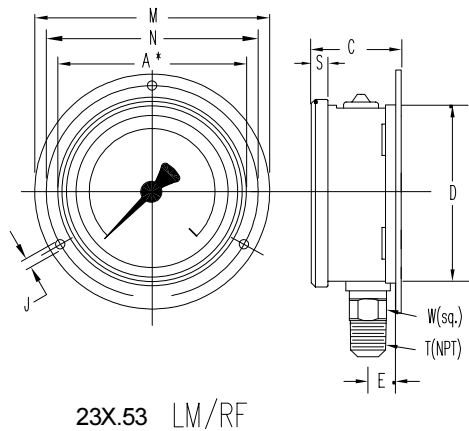
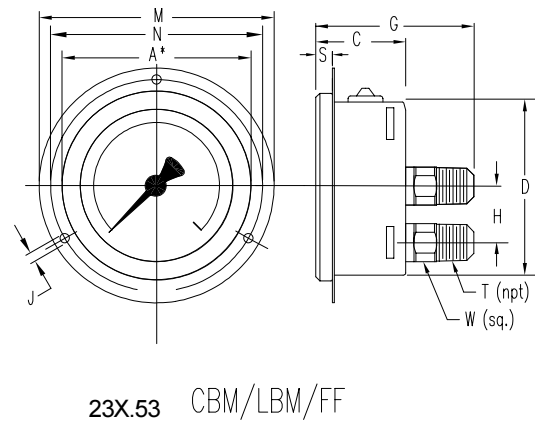
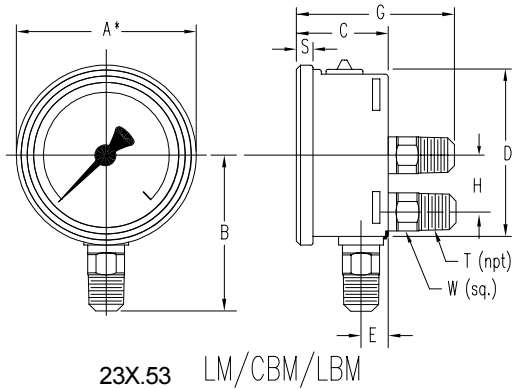
Glycerine: -4°F to 140°F (-20°C to 60°C)

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APM 23X.53

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		in	2.5	2.13	1.26	2.44	0.51	2.13		0.14	0.30	3.35	2.95	0.26	1/4"	0.55
23X.53 4"	1.10 lbs. + 0.66 lbs. if filled	mm	100	87	48	100	15.5	79.5	30	4.8	9	132	116	8	--	22
		in	4	3.43	1.89	3.94	0.61	3.13	1.18	0.19	0.35	5.20	4.57	0.31	1/2"	0.87

NOTE: For 1/4" NPT connections on 3" and 4" gauges, reduce B* dimension by 5 mm / 0.02 in.

Panel cut-out dimensions: D + 1mm

THE MEASURE OF Total Performance™

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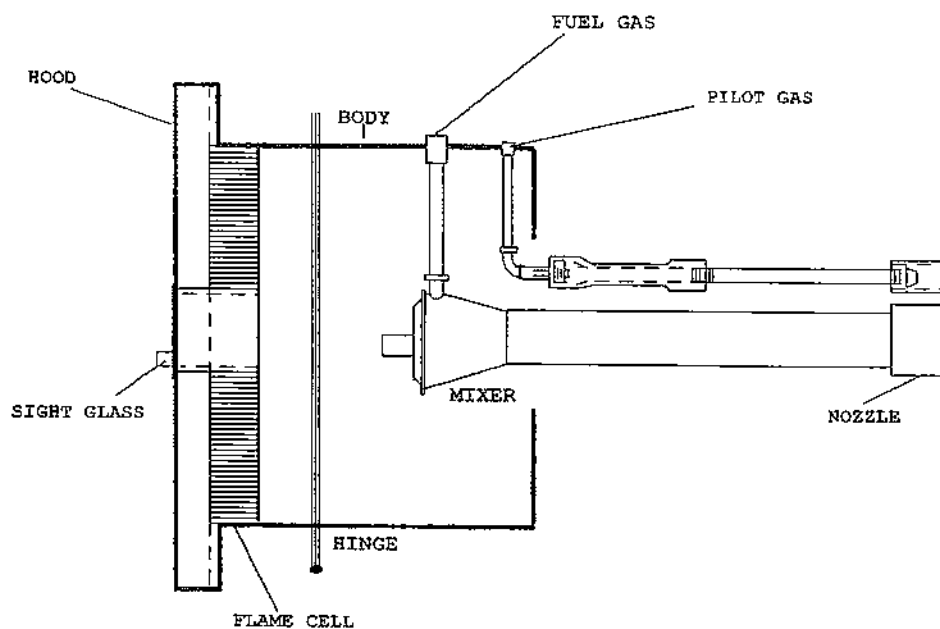
Tel: 770-513-8200 Fax: 770-338-5118

<http://www.wika.com> e-mail: info@wika.com



INCENDIUM SUPPLY LTD.

We provide and service Wenco Natural Draft Firebox Flame Arrestors complete with burner assemblies and accessories.



Tamper-Proof Bimetal Thermometers Models 33, 34, 53 & 54



TREND's Industrial Grade Bimetal Dial Thermometers offer performance equal to our Process-Grade thermometers, but without the reset feature and the 7Year Warranty. They are an ideal choice where a weather-resistant, tamperproof thermometer is needed. They are warranted for 1 year.

- Stainless Steel Case
- Hermetically Sealed
- Tamper-Proof

SPECIFICATIONS

CASE: 304 Stainless Steel

DIAL: Anti Parallax, heavy gauge aluminum with white matte finish.

CRYSTAL: Fully gasketed glass standard. Lexan, acrylic and shatterproof available.

HERMETIC SEAL: Per ASME B40.3

STEM: 304 Stainless Steel, TIG welded at tip and case connection. 1/4" diameter standard.

ACCURACY Guaranteed to 1 % of full scale (Grade A per ASME B40.3 Standard)

CONNECTION: 112" NPT, 304 Stainless Steel standard.

OPTIONS: Special ranges, custom dials, stems, connections and windows.

OVER RANGE: Temporary over or under range tolerance of 50% of scale up to 500°F (260°C).

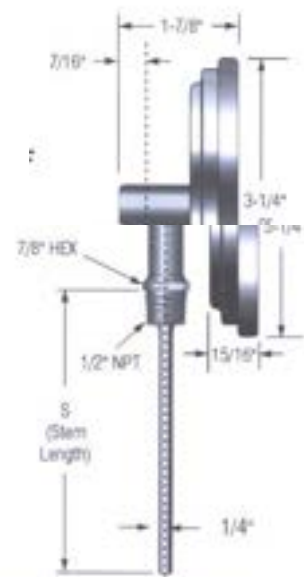
Stem lengths are available from 2-1/2" to 24". Ranges from -100°F (-70 °C) to 1000 °F (550°C) are available.



Back Connected Model 33



Back Connected Model 53



Bottom Connected (Models 34 & 54)

Assembly of 1" Safety Relief Valve 8200

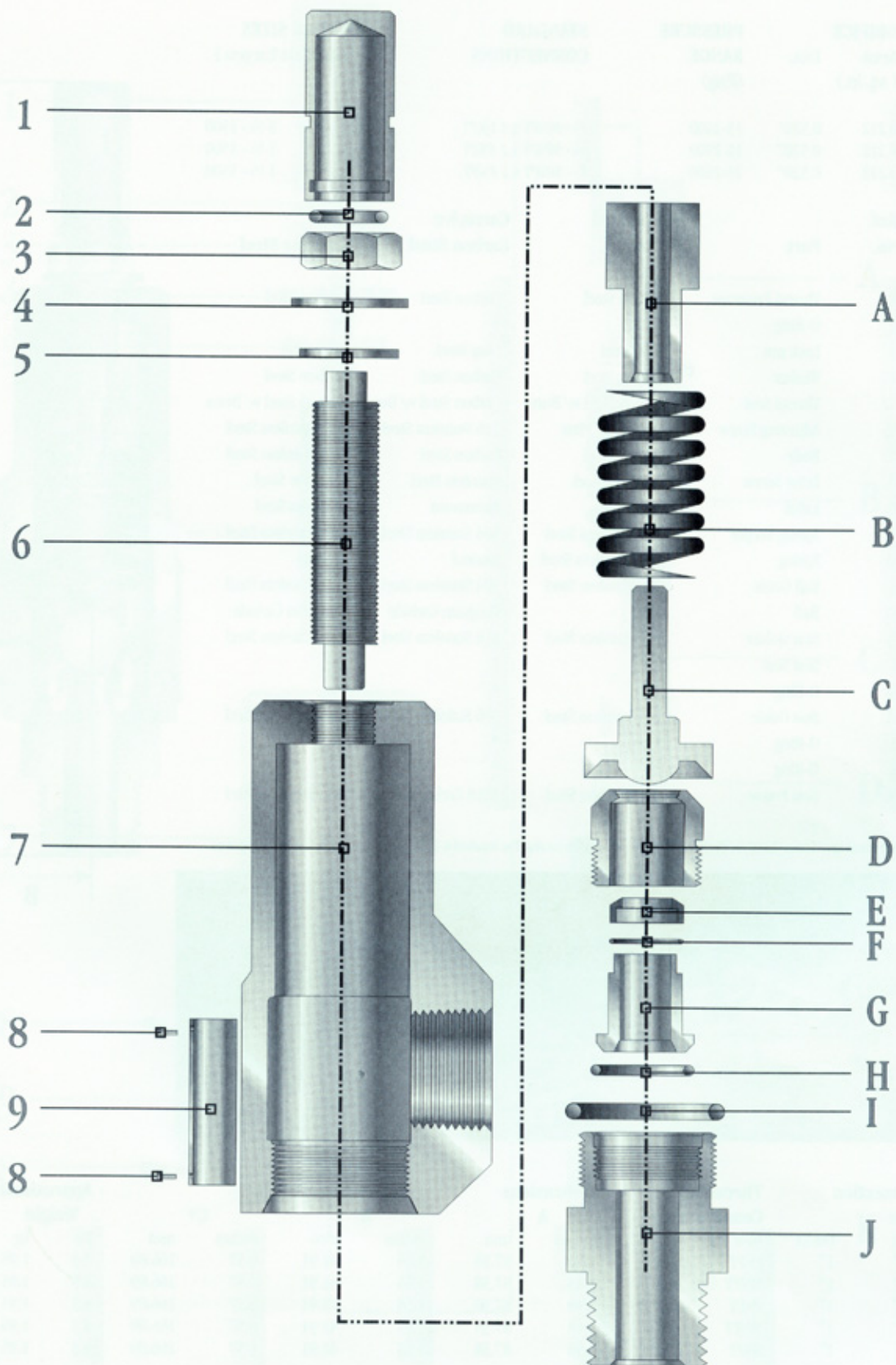
5/98

TAYLOR VALVE TECHNOLOGY, INC.

EXPLODED VIEW OF A 1 INCH A SAFETY RELIEF VALVE

SRV-98

Exploded View of 1" Safety Valve



✕

8300 SW 8th Street * Oklahoma City, Oklahoma 73128

Tel (405) 787 0145 * Fax (405) 789-8198 * Email: info@taylorvalve.com

Bill of Material 1" Safety Relief Valve 8200

5/98

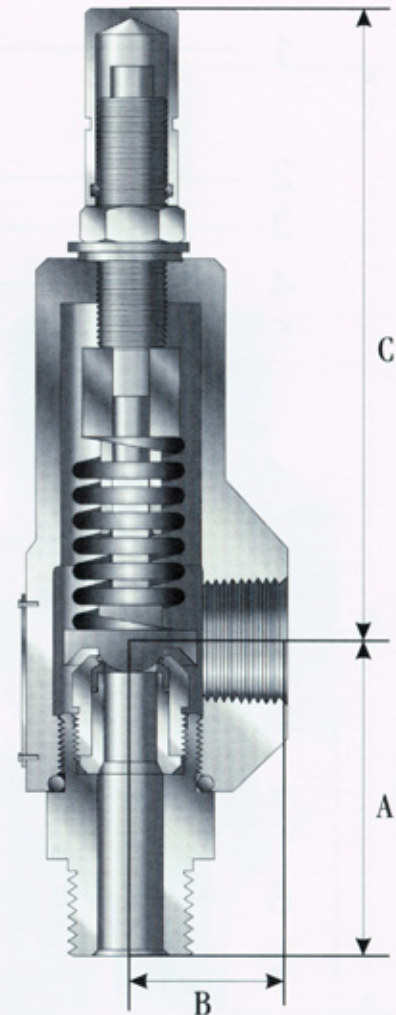
TAYLOR VALVE TECHNOLOGY, INC.

BILL OF MATERIALS 1 INCH SAFETY RELIEF VALVE

SRV-98

ORIFICE Area (sq. In.)	Dia.	PRESSURE RANGE (psig)	STANDARD CONNECTIONS	FLANGE SIZES (Smallest/Largest)	
0.128	D	15-4000	½ - MNPT x 1 FNPT	½ - 150	1 ½ - 1500
0.128	D	15-4000	¾ - MNPT x 1 FNPT	¾ - 150	1 ½ - 1500
0.128	D	15-4000	1 - MNPT x 1 FNPT	1 - 150	1 ½ - 900
0.212	E	15-2500	½ - MNPT x 1 FNPT	½ - 150	1 ½ - 900
0.212	E	15-2500	¾ - MNPT x 1 FNPT	¾ - 150	1 ½ - 900
0.212	E	15-2500	1 - MNPT x 1 FNPT	1 - 150	1 ½ - 900
0.357	F	1500-2000	¾ - FNPT x 1 FNPT	¾ - 150	1 ½ - 600
0.357	F	1500-2000	1 - FNPT x 1 FNPT	1 - 150	1 ½ - 600

Ref. No.	Part	Standard Service	Corrosive Carbon Steel	NACE Stainless Steel
1.	Thread Protector	Carbon Steel	Carbon Steel	Carbon Steel
2.	O-Ring	*	*	*
3.	Lock nut	Alloy Steel	Alloy Steel	Alloy Steel
4.	Washer	Carbon Steel	Carbon Steel	Carbon Steel
5.	Thread Seal	Carbon Steel w/ Buna	Carbon Steel w/ Buna	Carbon Steel w/ Buna
6.	Adjusting Screw	CS /w Zinc Plate	316 Stainless Steel	316 Stainless Steel
7.	Body	Carbon Steel	Carbon Steel	316 Stainless Steel
8.	Drive Screw	Stainless Steel	Stainless Steel	Stainless Steel
9.	Label	Aluminum	Aluminum	Stainless Steel
A.	Spring Keeper	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel
B.	Spring	17.7 Stainless Steel	Inconel	Inconel
C.	Disc	17.4 Stainless Steel	316 Stainless Steel	316 Stainless Steel
D.	Seat Holder	303 Stainless Steel	316 Stainless Steel	316 Stainless Steel
E.	Seat Seal	*	*	*
F.	O-Ring	*	*	*
G.	Seat Guide	303 Stainless Steel	316 Stainless Steel	316 Stainless Steel
H.	O-Ring	*	*	*
I.	O-Ring	*	*	*
J.	Seat Frame	1018 Carbon Steel	1018 Carbon Steel	316 Stainless Steel



* per customer specification based on *Elastomer Chart* provided in this catalog. The Standard is a 75 or 90 durometer fluorocarbon compound.

Connection Size		Threaded Connections		Dimensions A		B		C*		Approximate Weight	
Inlet	Outlet	Inlet	Outlet	inches	mm	inches	mm	inches	mm	lbs	kg
1/2"	1"	FNPT	FNPT	3.44	87.38	1.65	41.91	6.57	166.89	4.3	1.95
1/2"	1"	MNPT	FNPT	3.44	87.38	1.65	41.91	6.57	166.89	4.3	1.95
3/4"	1"	FNPT	FNPT	3.44	87.38	1.65	41.91	6.57	166.89	4.3	1.95
3/4"	1"	MNPT	FNPT	3.44	87.38	1.65	41.91	6.57	166.89	4.3	1.95
1"	1"	FNPT	FNPT	3.44	87.38	1.65	41.91	6.57	166.89	4.3	1.95

* With a lift lever the "C" dimension is 7.66" or 194.56 mm

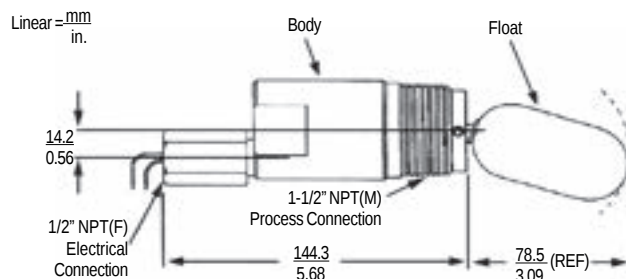


Bill of Materials for Safety Valve



Type 1510 Side-Mount Electric Level Switch

General Instructions



General

The SOR Type 1510 Electric Level Switch mounts into the side of a vessel.

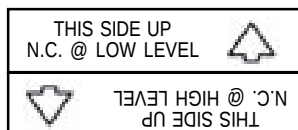
Electric switching action is provided by the float moving a magnet into the field of a hermetically sealed reed switch capsule.

The unit may be mounted for either high or low liquid level alarm by rotating the switch body to the proper position. The body wrench flats provide for ease of rotation and proper positioning. See decal on housing.

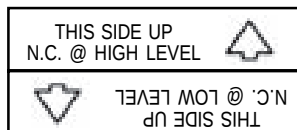
Design and specifications are subject to change without notice.

Before Installation of the Level Switch

1. Inspect the unit for any shipment damage.
2. Check for mechanical clearance of the float. Float must move freely without binding throughout its stroke.
3. Use an acceptable thread compound when installing unit to ensure a leak-free fit and avoid thread galling.
4. To achieve required function, install unit according to the nameplate instructions shown here.



Nameplate Position
for Low Level Alarm



Nameplate Position
for High Level Alarm

Installation

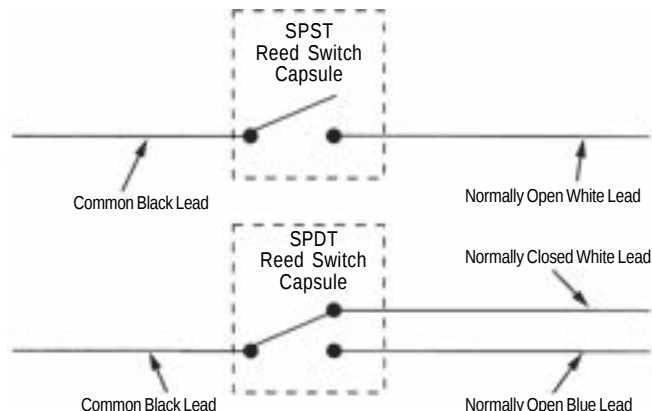
The unit may be mounted in any of the following installation arrangements.

- a. 1-1/2" NPT half coupling (No full coupling).
- b. 2" NPT full coupling. (Use in conjunction with 2 x 1-1/2" NPT bushing as required.)
- c. 2" NPT pipe tee. (Use in conjunction with 2 x 1-1/2" NPT bushing as required.)
- d. Optional flanged mounting.
- e. Optional chamber mounting.

Electrical Connection

Ensure that wiring conforms to all applicable local and national electrical codes and install unit(s) according to relevant national and local safety codes.

Electrical connection is free wire leads with a 1/2" NPT(F) conduit connection. Use two wrenches — one to hold hex conduit connection, the other to tighten conduit fitting. Switching element is a hermetically sealed reed switch.



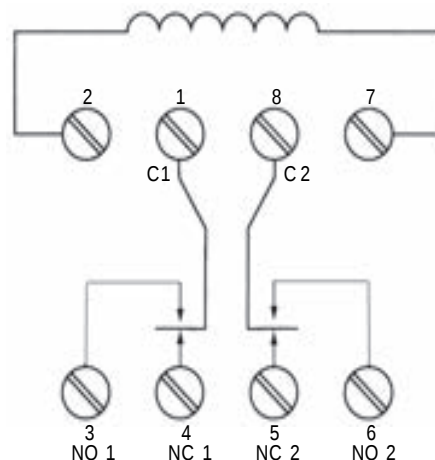
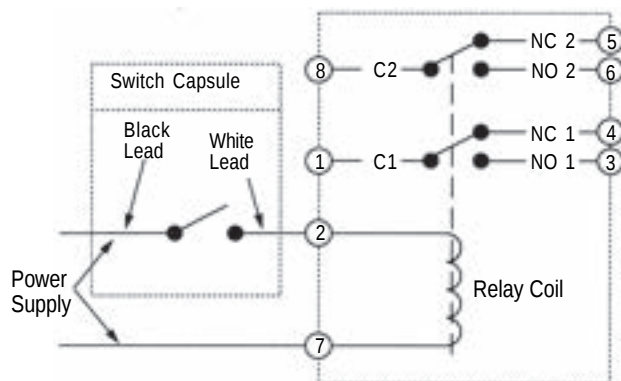
Wiring schematic for DPDT relay option shown on reverse.

NOTE: NC - indicates circuit is closed

CAUTION: Do not exceed 1 amp @ 110 VAC or 3 amps @ 28 VDC (resistive). High current input to switch will cause permanent damage to contacts.

Wiring for DPDT Relay

For Type 1510 Level Switches equipped with DPDT relays, a wiring schematic and pin position schematic is shown below. When the 1510 is actuated, the coil will energize and “make” both NO1 and NO2 while it will “break” NC1 and NC2. This provides a DPDT circuit.



Troubleshooting

Symptom	Probable Cause
1. Float in actuated position but no output signal.	a. No power supply. b. Switch damaged. (Replace.)
2. Float in de-actuated position but still receiving an output signal.	a. Switch damaged. (Replace.)
3. Control will not function when installed but operates when removed from process connection.	a. Inadequate float travel. Float travel restricted by mounting nozzle. See Mounting Requirements.
4. Liquid in vessel at the actuation level but unit does not respond.	a. Leaky or collapsed float. (Replace.) b. Liquid specific gravity too low. c. Float stem bound up or dirty. (Clean.)

Replacement Parts

Part Number	Description
3130-091	SPST Hermetically Sealed Reed Switch Capsule
3130-242	SPDT Hermetically Sealed Reed Switch Capsule
3130-106	SPST Hermetically Sealed Reed Switch Capsule for CSA Certified units
3130-243	SPDT Hermetically Sealed Reed Switch Capsule for CSA Certified units
3130-052	316SS Float Assembly

All information and specifications in this bulletin are current at the time of printing. Changes in product design and specifications may occur without notice. Contact the SOR representative in your area or the factory for the current revision of this bulletin.



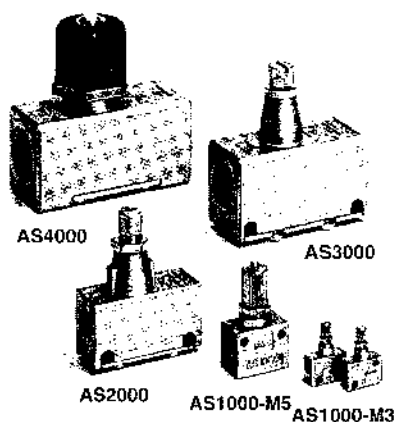
Speed Controller: Standard Type

Series AS

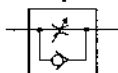
In-line Type

Compact size saves space.
Speed may be accurately controlled even at low speeds.

Constant speed easily set.
Retainer prevents an accidental loss of needle.



JIS Symbol



Model/Flow Rate and Effective Area

Model	Port size	Free flow		Controlled flow		Applicable cylinder bore size (mm)	Weight (g)
		Flow rate (l/min (ANR))	Effective area (mm ²)	Flow rate (l/min (ANR))	Effective area (mm ²)		
AS1000-M3	M3 x 0.5	20	0.3	20	0.3	2.5, 4, 6	4.7
AS1000-M5	M5 x 0.8	90	1.4	80	1.2	6, 10, 16, 20, 25	33
AS2000-01	1/8	340	5.2	250	3.8	20, 25, 32, 40	90
AS2000-02	1/4	340	5.2	250	3.8		115
AS3000-02	1/4	810	12.3	810	12.3	32, 40, 50, 63	130
AS3000-03	3/8	810	12.3	810	12.3		124
AS4000-02	1/4	1,670	25.5	1,670	25.5	40, 50, 63 80, 100	221
AS4000-03	3/8	1,670	25.5	1,670	25.5		214
AS4000-04	1/2	1,670	25.5	1,670	25.5		205
AS5000-02	1/4	2,840	44	2,840	44	40, 50, 63 80, 100	242
AS5000-03	3/8	4,270	66	4,270	66		233
AS5000-04	1/2	4,270	66	4,270	66		224

Note) Flow rate values are measured at 0.5 MPa and 20°C.

Specifications

Fluid	Air
Proof pressure (note)	1.5 MPa (1.05 MPa)
Max. operating pressure (note)	1 MPa (0.7 MPa)
Min. operating pressure (note)	0.05 MPa (0.1 MPa)
Ambient and fluid temperature	-5 to 60°C (No freezing)
Number of needle rotations (note)	8 turns (10 turns)

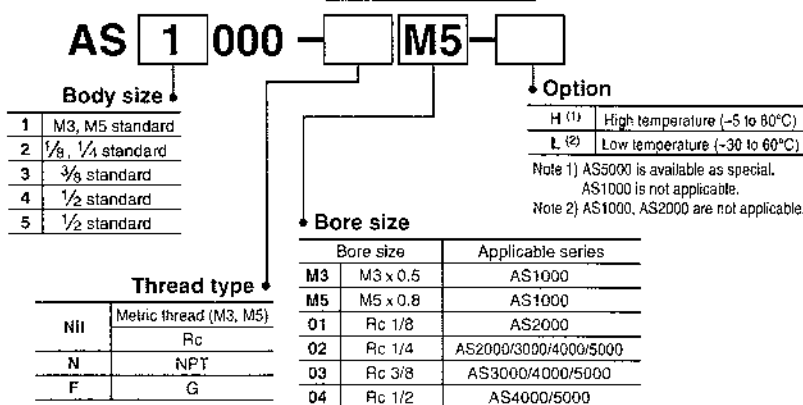
Note) (): Values for AS1000.

Accessory

Description	Part no.	Applicable model
Nipple	M-5N	AS1000

Note) AS1000 with nipple: AS1000-M5-N

How to Order



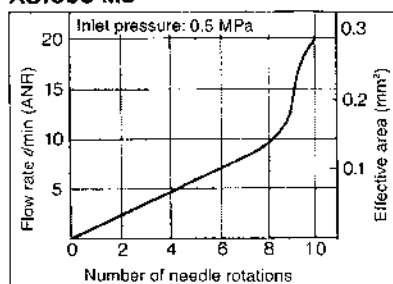
Caution

Be sure to read before handling. Refer to pages 15-18-3 to 15-18-4 for Safety Instructions and Common Precautions on the products mentioned in this catalog, and refer to pages 15-8-6 to 15-8-8 for Precautions on every series.

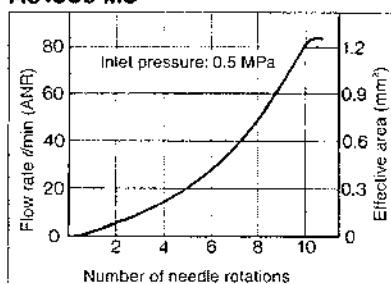
Speed Controller: Standard Type In-line Type **Series AS**

Needle Valve/Flow Characteristics

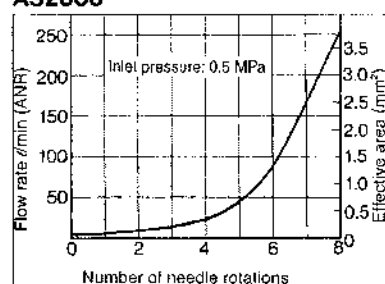
AS1000-M3



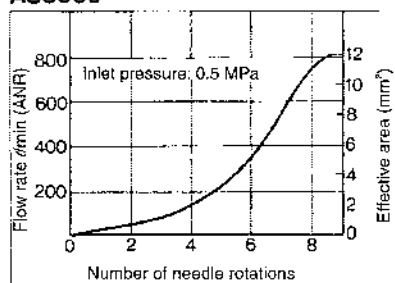
AS1000-M5



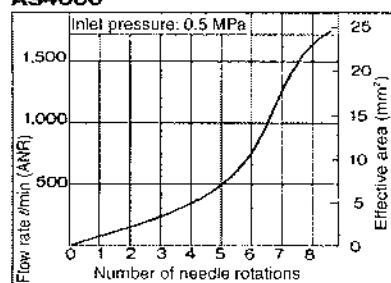
AS2000



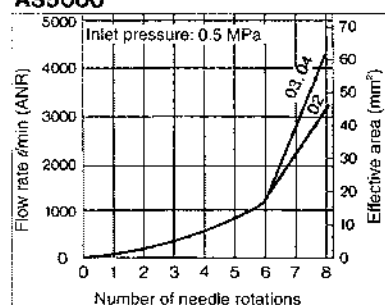
AS3000



AS4000



AS5000



AS

ASP

ASN

AQ

ASV

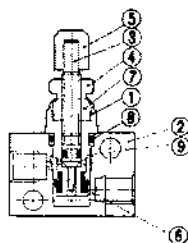
AK

ASS

ASR

ASF

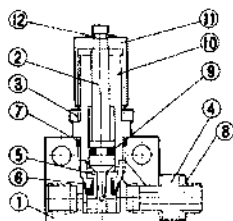
Construction: AS1000-M3



Component Parts

No.	Description	Material	Note
①	Body B	Brass	Electroless nickel plated
②	Body	Brass	Electroless nickel plated
③	Needle	Brass	Electroless nickel plated
④	Lock nut	Brass	Electroless nickel plated
⑤	Handle	Brass	Electroless nickel plated
⑥	U seal	HNBR	
⑦	Needle guide	Brass	Electroless nickel plated
⑧	O-ring	NBR	4.5 x 3 x 0.75
⑨	O-ring	NBR	2.2 x 0.8 x 0.7

Construction: AS1000-M5



Component Parts

No.	Description	Material	Note
①	Body	Zinc alloy	
②	Needle	Stainless steel	
③	Lock nut *	Brass	
④	Nipple	Stainless steel	

* Electroless nickel plated

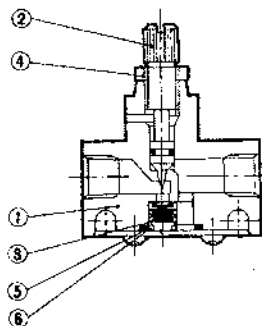
No.	Description	Material	Note
⑨	O-ring	NBR	
⑩	Needle guide	Brass	Electroless nickel plated
⑪	Handle	Brass	Electroless nickel plated
⑫	Etype snap ring	Steel	Black oxidized coated

Replacement Parts

No.	Description	Material	Part no.
⑤	Valve seal	Brass	1429138
⑥	U seal	HNBR	142964
⑦	O-ring	NBR	ø9 x ø7 x ø1
⑧	Gasket	PVC	M-5G1

Series AS

Construction: AS2000/3000



Component Parts

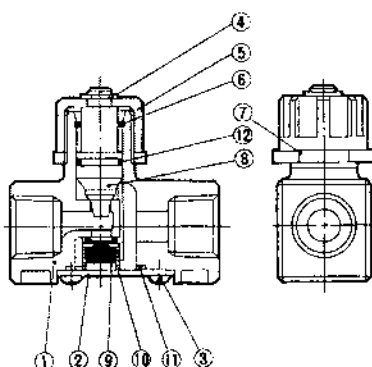
No.	Description	Model	
		AS2000	AS3000
①	Body	Zinc alloy	Aluminum alloy
②	Needle *	Brass	Brass
③	Lock nut *	Brass	Carbon steel

Replacement Parts

No.	Description	Model	
		AS2000	AS3000
③	Valve	143022	14283
⑤	O-ring	143021	14284
⑥	Spring	143023	14282

* Electroless nickel plated

Construction: AS4000



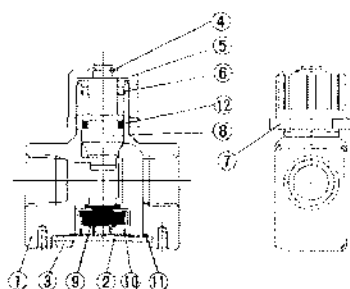
Component Parts

No.	Description	Material	Note
①	Body	Aluminum alloy	Chromated
②	Cap	Roller steel	Zinc chromated
③	Cross-recessed head cap screw	Steel wire	4 x 0.7 x 8
④	E type snap ring	Stainless steel	JIS B 2805 Nominal 6
⑤	Handle	Zinc alloy	Black zinc chromate plated
⑥	Ring	Steel wire	Zinc chromated
⑦	Lock nut	Zinc alloy	
⑧	Needle	Aluminum alloy	
⑫	O-ring	NBR	143112

Replacement Parts

No.	Description	Material	Parts no.
⑨	Valve	NBR, Brass	143145
⑩	Spring	Stainless steel	143146
⑪	O-ring	NBR	143147

Construction: AS5000



Component Parts

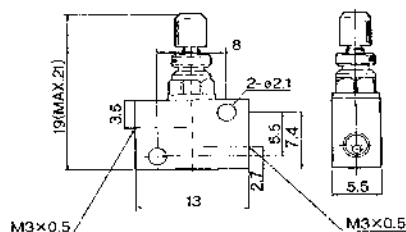
No.	Description	Material	Note
①	Body	Aluminum alloy	Chromated
②	Cap	Roller steel	Nickel plated
③	Cross-recessed head cap screw	Steel wire	M4 x 0.7 x 8 Nickel plated
④	E type snap ring	Stainless steel	JIS B 2805 Nominal 6
⑤	Handle	Zinc alloy	Chromated
⑥	Ring	Stainless steel	
⑦	Lock nut	Zinc alloy	Chromated
⑧	Needle	Aluminum alloy	Chromated
⑫	O-ring	NBR	JIS B 2401 P12

Replacement Parts

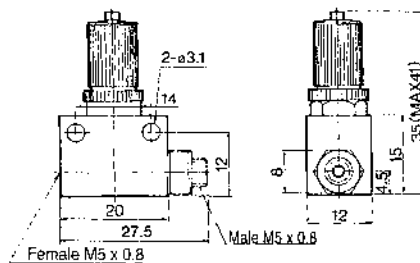
No.	Description	Material	Parts no.
⑨	Valve	NBR, Stainless steel	14143
⑩	Spring	Stainless steel	14144
⑪	Seal	NBR	14147

Speed Controller: Standard Type In-line Type **Series AS**

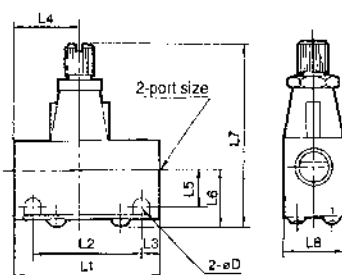
Dimensions: AS1000-M3



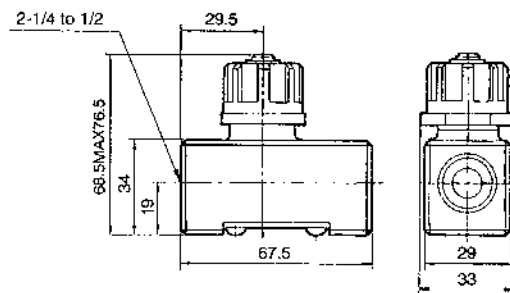
Dimensions: AS1000-M5



Dimensions: AS2000/3000



Dimensions: AS4000



AS

ASP

ASN

AQ

ASV

AK

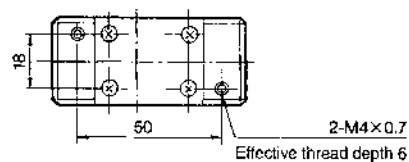
ASS

ASR

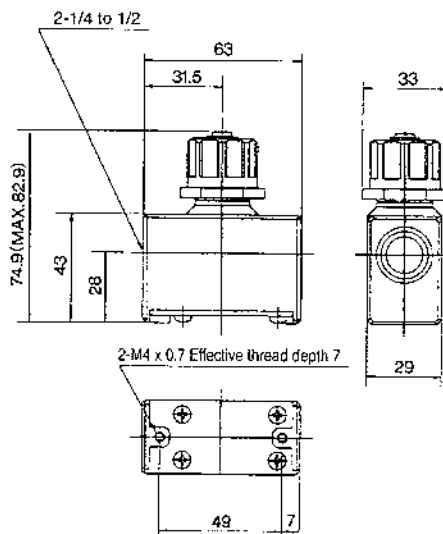
ASF

Dimensions

Model	Bore size	L1	L2	L3	L4	L5	L6	L7		L8	D
								Max.	Min.		
AS2000-01	Rc 1/8	40	30	5	17	10	15.5	54.5	50	16	4.5
AS2000-02	Rc 1/4	40	30	5	23	11.5	17	56	51.5	20	4.5
AS3000-02, 03	Rc 1/4, 3/8	56	45.5	5.25	25	13.2	20.6	68	61	26	5.5

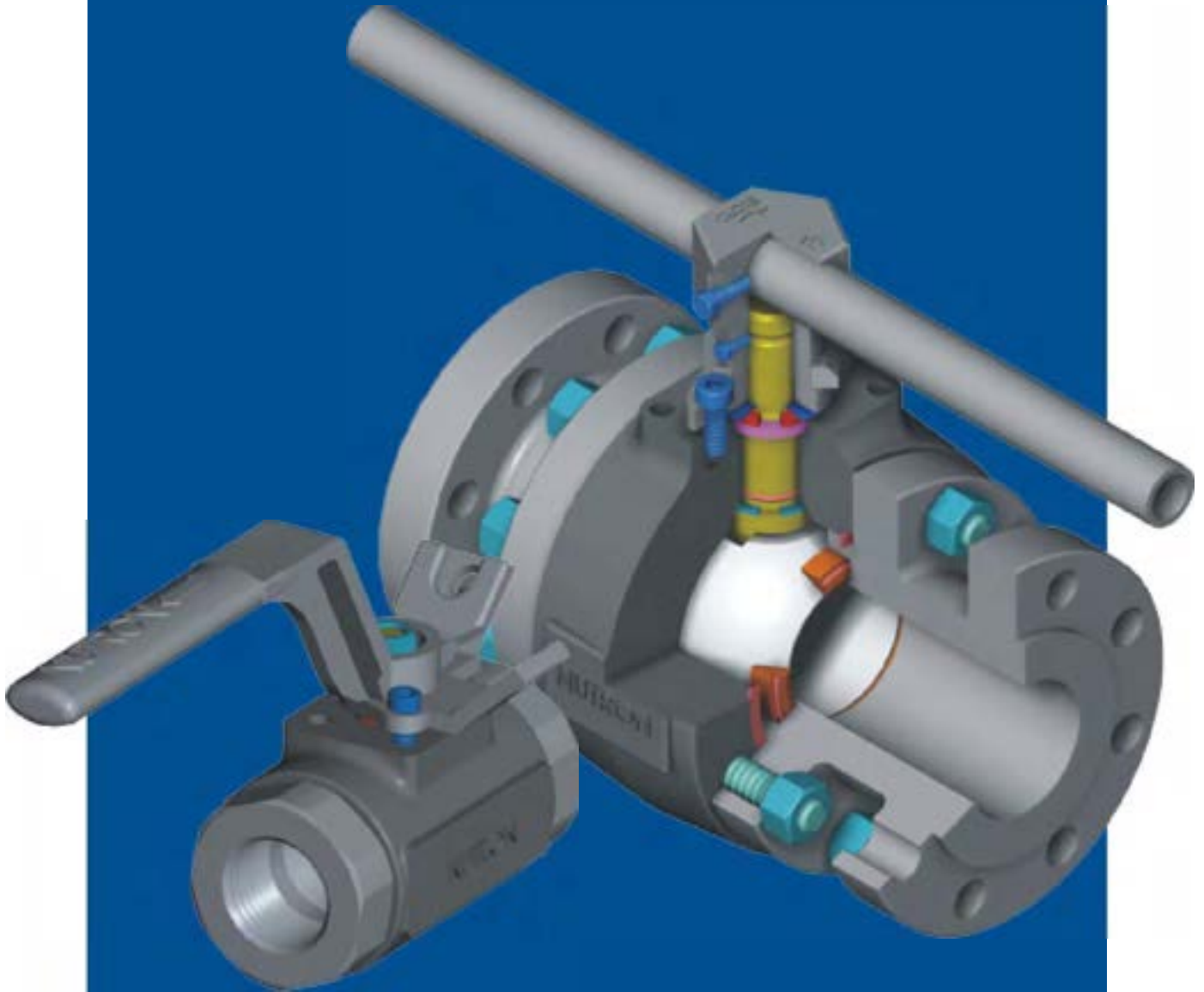


Dimensions: AS5000



NUTRON

**FORGED STEEL
FLOATING BALL VALVES
MODEL T3 & B3**



**COOPER CAMERON
VALVES**

NUTRON FLOATING BALL VALVES

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FLOATING BALL VALVES

MODEL T3 3 PIECE THREADED FLOATING BALL VALVES

- Full Port sizes 1/2 in. through 3 in. (15 mm through 80 mm)
- Reduced Port sizes 3/4 in. through 4 in. (20 mm through 100 mm)
- ASME Class 150 through 2500 (PN 20 through 420) (see page 3)
- WOG 1000 through 6000 psi (see page 3)
- End Connections: Threaded, Flanged, Socket Weld, Buttweld

MODEL B3 3 PIECE BOLTED FLOATING BALL VALVES

- Full Port sizes 1 1/2 in. through 4 in. (40 mm through 100 mm)
- Reduced Port sizes 2 in. and 6 in. (50 mm and 150 mm)
- ASME Class 150 through 1500 (PN 20 through 250) (see page 17)
- WOG 2000 and 4000 psi (see page 17)
- End Connections: Flanged, Threaded, Buttweld

MATERIALS AND ACTUATION

- Materials: Carbon Steel, Stainless Steel, Special Alloys
- Operator: Manual Lever Handle
- Actuation: Consult Cooper Cameron Valves - NUTRON Sales Department for information on various types of actuators including; Gear Operators (B3), Pneumatic, Hydro-Pneumatic, Electric, Electro-Pneumatic and Hydraulic

COMPLIANCE TO STANDARDS AND SPECIFICATIONS:

- ISO 9001-2000: Registered Quality System
- ASME B16.34
- API 598 and API 607 4th Edition (Fire Safe)
- CE Mark Number 0879
- ASME Section VIII Division 1 Boiler and Pressure Vessel Code
- CSA Z245.15 Steel Valves
- NACE MR0175 (Rev. 2002)
- Canadian Registration Number (CRN)

FLOATING BALL VALVES

STANDARD FEATURES

MODEL T3

BODY CONSTRUCTION

Forged steel three piece threaded construction. A machined pad area is drilled and tapped for actuation as a standard. Threaded construction allows for combinations of end connections.

STEM

Blowout proof stem is back-seated through the valve body.

HANDLE

Rugged cast handle. Handle position indicates flow position. When the handle is positioned in line with the pipe, the valve is open. When the handle is positioned perpendicular to the pipe, the valve is closed. Locking handle is standard for all 2 in. (50 mm) reduced port and smaller valves with either socket weld or FNPT end connections.

CAP SCREWS

Dual purpose; allows for easy stem packing adjustment without handle removal while providing a stop for the handle.

PACKING

Self adjusting by means of a Belleville washer. Allows for long service life before manual packing adjustment is necessary.

THRUST WASHER

Acts as a bearing between the body and stem.

BALL

The floating ball design allows for positive shut off in either flow direction. Includes pressure equalization hole to prevent trapping of pressure in the body cavity.

SEATS

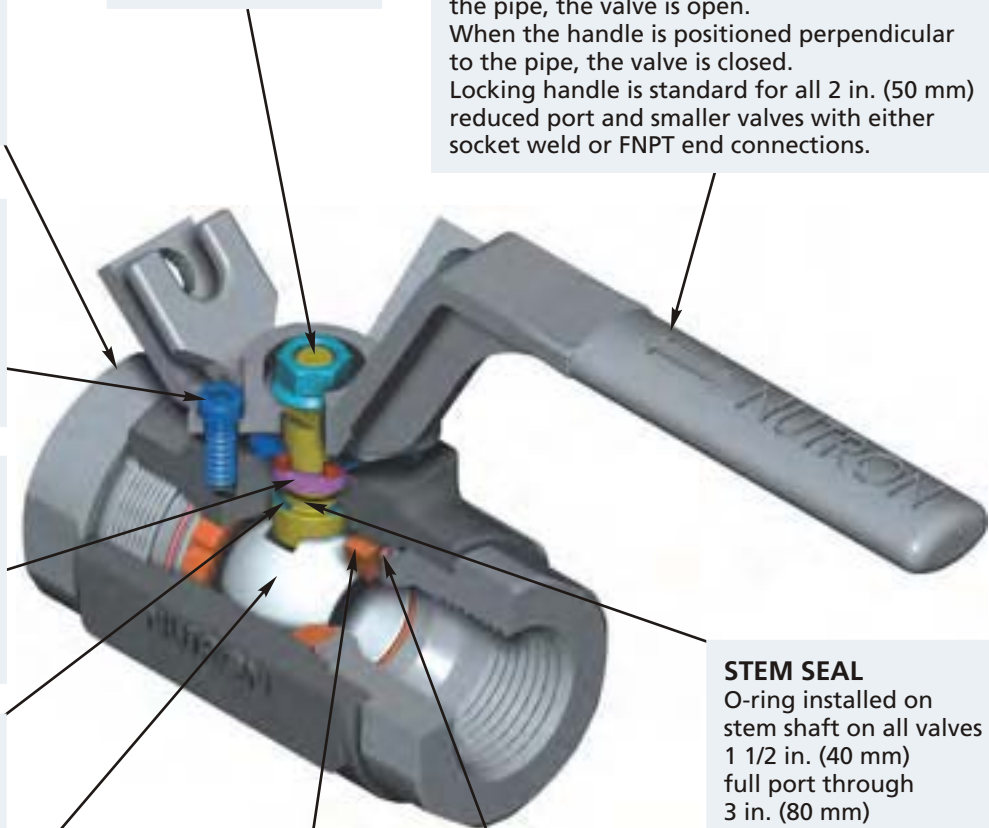
Materials available are Teflon, Delrin, PEEK and Devlon.

BODY SEALS

Body seal O-rings are placed ahead of the body cap threads to protect the threads from the flow media.

STEM SEAL

O-ring installed on stem shaft on all valves 1 1/2 in. (40 mm) full port through 3 in. (80 mm) reduced port.

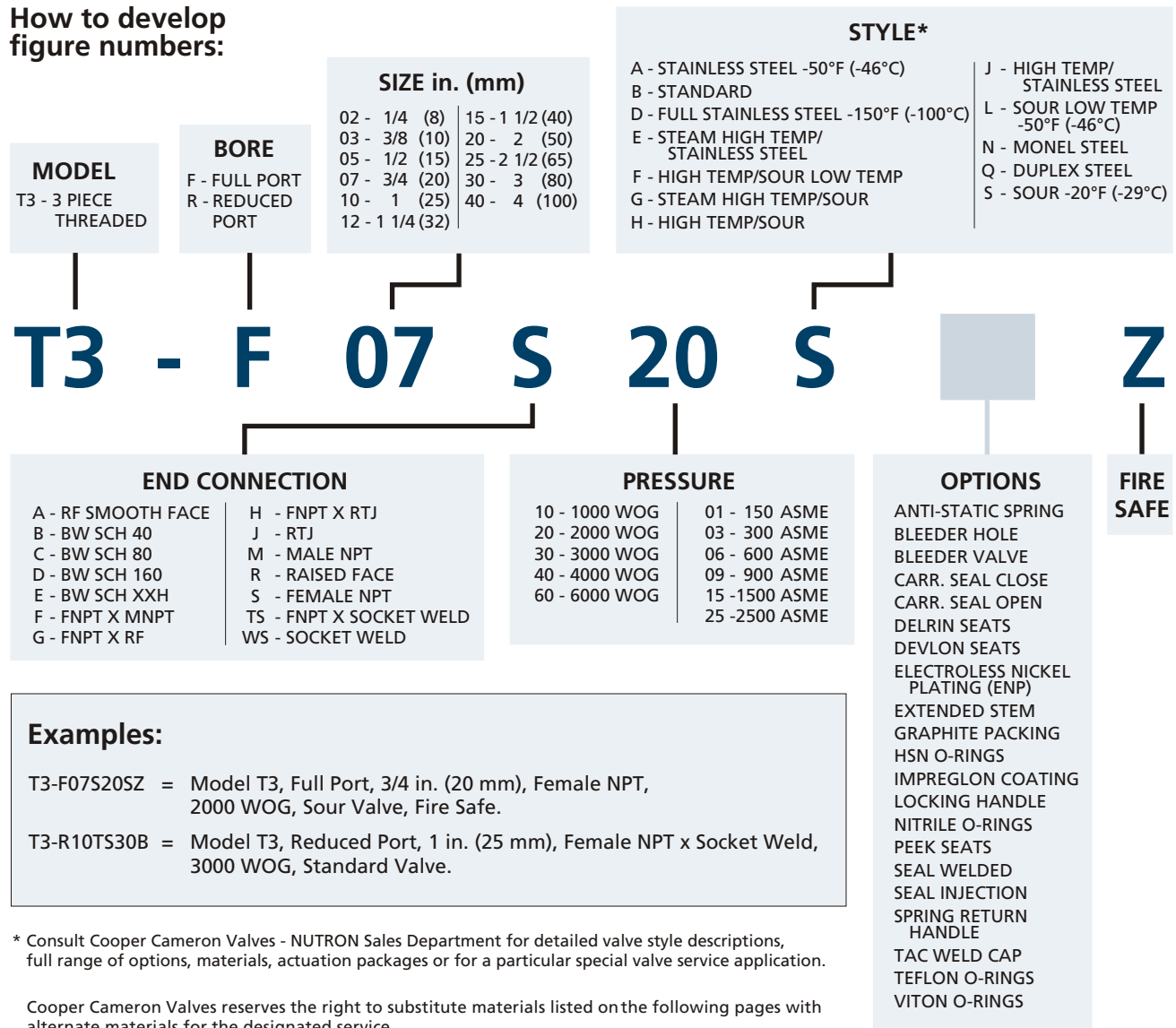


MODEL T3 SIZES AVAILABLE

ASME CLASS (PN)		150 (20)	300 (50)	600 (100)	900 (150)	1500 (250)	2500 (420)
Full Port	in. (mm)	1/2 thru 3 (15 thru 80)	1/2 thru 3 (15 thru 80)	1/2 thru 2 (15 thru 50)	1/2 thru 2 (15 thru 50)	1/2 thru 2 (15 thru 50)	1/2 thru 2 (15 thru 50)
Reduced Port		3/4 thru 4 (20 thru 100)	3/4 thru 4 (20 thru 100)	3/4 thru 3 (20 thru 100)	3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)
WOG (psi)			1000	2000	3000	4000	6000
Full Port, Threaded	in. (mm)		3 (80)	1/4 thru 3 (8 thru 80)	1/4 thru 2 (8 thru 50)	1/4 thru 2 (8 thru 50)	1/4 thru 2 (8 thru 50)
Reduced Port, Threaded			4 (100)	3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)
Full Port, Socket Weld				1/2 thru 2 (15 thru 50)	1/2 thru 2 (15 thru 50)	1/2 thru 2 (15 thru 50)	1/2 thru 2 (15 thru 50)
Reduced Port, Socket Weld				3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)	3/4 thru 3 (20 thru 80)

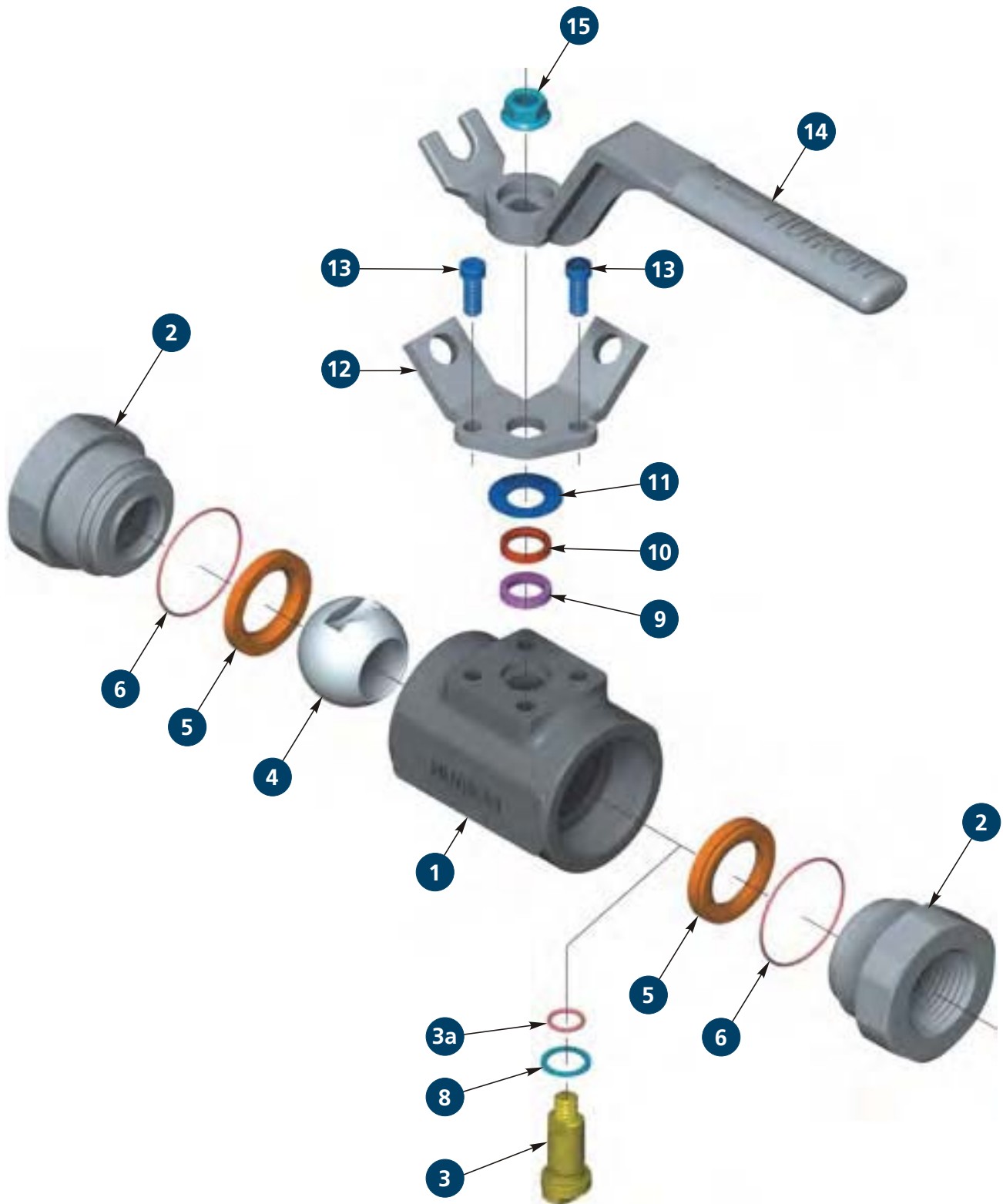
ORDERING INFORMATION

How to develop figure numbers:



FLOATING BALL VALVES

THREADED END CONNECTIONS



MATERIALS LIST - THREADED END CONNECTIONS

ITEM	PART	WORKING PRESSURE	STANDARD -20°F (-29°C)	SOUR -20°F (-29°C)
1	Body	All	ASTM A105	ASTM A105
2	End Caps	All	ASTM A105	ASTM A105
■ 3	Stem	2000 & 3000 4000 & 6000	ASTM A108, Plated ASTM A564 17-4PH	ASTM A564 17-4PH ASTM A564 17-4PH
■● 3a*	Stem O-Ring	All	Nitrile	Viton
■ 4	Ball	2000, 3000 & 4000 6000	Carbon Steel, Chrome Plated ASTM A564 17-4PH	ASTM A351 Gr. CF8M ASTM A564 17-4PH
■● 5	Seats	2000 3000 & 4000 6000	Teflon Delrin PEEK	Teflon Delrin PEEK
■● 6	Body O-Rings	All	Nitrile	Viton
■● 8	Thrust Washer	2000 3000 & 4000 6000	Teflon Delrin PEEK	Teflon Delrin PEEK
■● 9	Packing	All	Teflon	Teflon (Graphite 6000 psi)
10	Packing Follower	All	Carbon Steel, Plated	Stainless Steel
11	Belleville Washer	All	Carbon Steel	Stainless Steel
12	Gland Flange **	All	Carbon Steel, Plated	Carbon Steel, Plated
13	Cap Screws	All	Carbon Steel	Stainless Steel
14	Handle	All	Carbon Steel	Carbon Steel
15	Handle Nut	All	Carbon Steel, Plated	Carbon Steel, Plated

ITEM	PART	WORKING PRESSURE	SOUR & LOW TEMP -50°F (-46°C)	STAINLESS STEEL -50°F (-46°C)
1	Body	All	ASTM A350 LF2	ASTM A479 TYPE 316
2	End Caps	All	ASTM A350 LF2	ASTM A479 TYPE 316
■ 3	Stem	All	ASTM A564 17-4PH	ASTM A564 17-4PH with Nitriding
■● 3a*	Stem O-Ring	All	Viton	HSN
■ 4	Ball	2000 3000 & 4000 6000	ASTM A351 Gr. CF8M ASTM A351 Gr. CF8M ASTM A564 17-4PH	ASTM A351 Gr. CF8M ASTM A564 17-4PH ASTM A564 17-4PH
■● 5	Seats	2000 3000 & 4000 6000	Teflon Delrin PEEK	Teflon PEEK PEEK
■● 6	Body O-Rings	All	Viton	Teflon
■● 8	Thrust Washer	2000 3000 & 4000 6000	Teflon Delrin PEEK	Teflon PEEK PEEK
■● 9	Packing	All	Teflon (Graphite 6000 psi)	Teflon (Graphite 6000 psi)
10	Packing Follower	All	Stainless Steel	Stainless Steel
11	Belleville Washer	All	Stainless Steel	Stainless Steel
12	Gland Flange **	All	Carbon Steel, Plated	Carbon Steel, Plated
13	Cap Screws	All	Stainless Steel	Stainless Steel
14	Handle	All	Carbon Steel	Carbon Steel
15	Handle Nut	All	Carbon Steel, Plated	Carbon Steel, Plated

- Major repair kit.
- Minor repair kit.

* Item 3a is only available on sizes 1 1/2 in. full port through 3 in. reduced port (40 mm through 80 mm) valves.

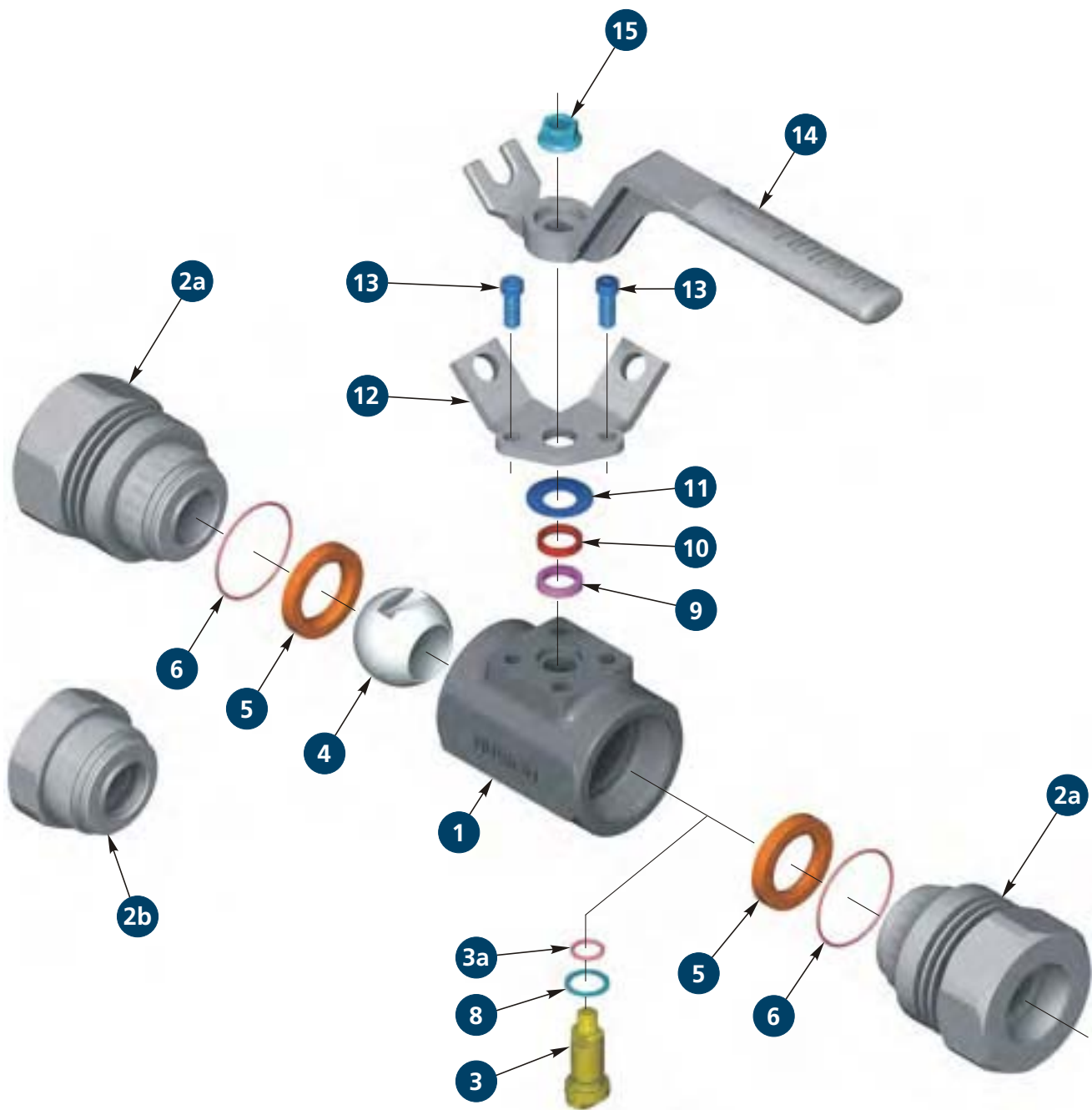
** Locking device is standard on 1/4 in. full port through 2 in. reduced port (8 mm through 50 mm) valves.

Note: Fire safe trim offered as standard whenever possible.

Consult Cooper Cameron Valves - NUTRON Sales Department for fire safe trim.

FLOATING BALL VALVES

SOCKET WELD and THREADED x SOCKET WELD END CONNECTIONS



MATERIALS LIST

SOCKET WELD and THREADED x SOCKET WELD END CONNECTIONS

ITEM	PART	WORKING PRESSURE	STANDARD -20°F (-29°C)	SOUR -20°F (-29°C)
1	Body	All	ASTM A105	ASTM A105
2a	End Caps - SW	All	ASTM A350 Gr. LF2	ASTM A350 Gr. LF2
2b	End Cap - NPT	All	ASTM A105	ASTM A105
■ 3	Stem	2000 & 3000 4000 & 6000	ASTM A108, Plated ASTM A564 17-4PH	ASTM A564 17-4PH ASTM A564 17-4PH
■● 3a*	Stem O-Ring	All	HSN	Viton
■ 4	Ball	2000 3000, 4000 & 6000	ASTM A351 Gr. CF8M ASTM A564 17-4PH	ASTM A351 Gr. CF8M ASTM A564 17-4PH
■● 5	Seats	2000 3000, 4000 & 6000	Teflon PEEK	Teflon PEEK
■● 6	Body O-Rings	All	Viton	Viton
■● 8	Thrust Washer	2000 3000, 4000 & 6000	Teflon PEEK	Teflon PEEK
■● 9	Packing	All	Teflon	Teflon (Graphite - 3000 thru 6000)
10	Packing Follower	All	Carbon Steel, Plated	Stainless Steel
11	Belleville Washer	All	Carbon Steel	Stainless Steel
12	Gland Flange **	All	Carbon Steel, Plated	Carbon Steel, Plated
13	Cap Screws	All	Carbon Steel	Stainless Steel
14	Handle	All	Carbon Steel	Carbon Steel
15	Handle Nut	All	Carbon Steel, Plated	Carbon Steel, Plated

ITEM	PART	WORKING PRESSURE	SOUR & LOW TEMP -50°F (-46°C)	STAINLESS STEEL -50°F (-46°C)
1	Body	All	ASTM A350 LF2	ASTM A479 TYPE 316
2a	End Caps - SW	All	ASTM A350 LF2	ASTM A479 TYPE 316 L
2b	End Cap - NPT	All	ASTM A350 LF2	ASTM A479 TYPE 316
■ 3	Stem	All	ASTM A564 17-4PH	ASTM A564 17-4PH with Nitriding
■● 3a*	Stem O-Ring	All	Viton	HSN
■ 4	Ball	2000 3000, 4000 & 6000	ASTM A351 Gr. CF8M ASTM A564 17-4PH	ASTM A351 Gr. CF8M ASTM A564 17-4PH
■● 5	Seats	2000 3000, 4000 & 6000	Teflon PEEK	Teflon PEEK
■● 6	Body O-Rings	All	Viton	Teflon
■● 8	Thrust Washer	2000 3000, 4000 & 6000	Teflon PEEK	Teflon PEEK
■● 9	Packing	All	Teflon (Graphite - 3000 thru 6000)	Teflon (Graphite - 3000 thru 6000)
10	Packing Follower	All	Stainless Steel	Stainless Steel
11	Belleville Washer	All	Stainless Steel	Stainless Steel
12	Gland Flange **	All	Carbon Steel, Plated	Carbon Steel, Plated
13	Cap Screws	All	Stainless Steel	Stainless Steel
14	Handle	All	Carbon Steel	Carbon Steel
15	Handle Nut	All	Carbon Steel, Plated	Carbon Steel, Plated

- Major repair kit.
- Minor repair kit.

* Item 3a is only available on sizes 1 1/2 in. full port through 3 in. reduced port (40 mm through 80 mm) valves.

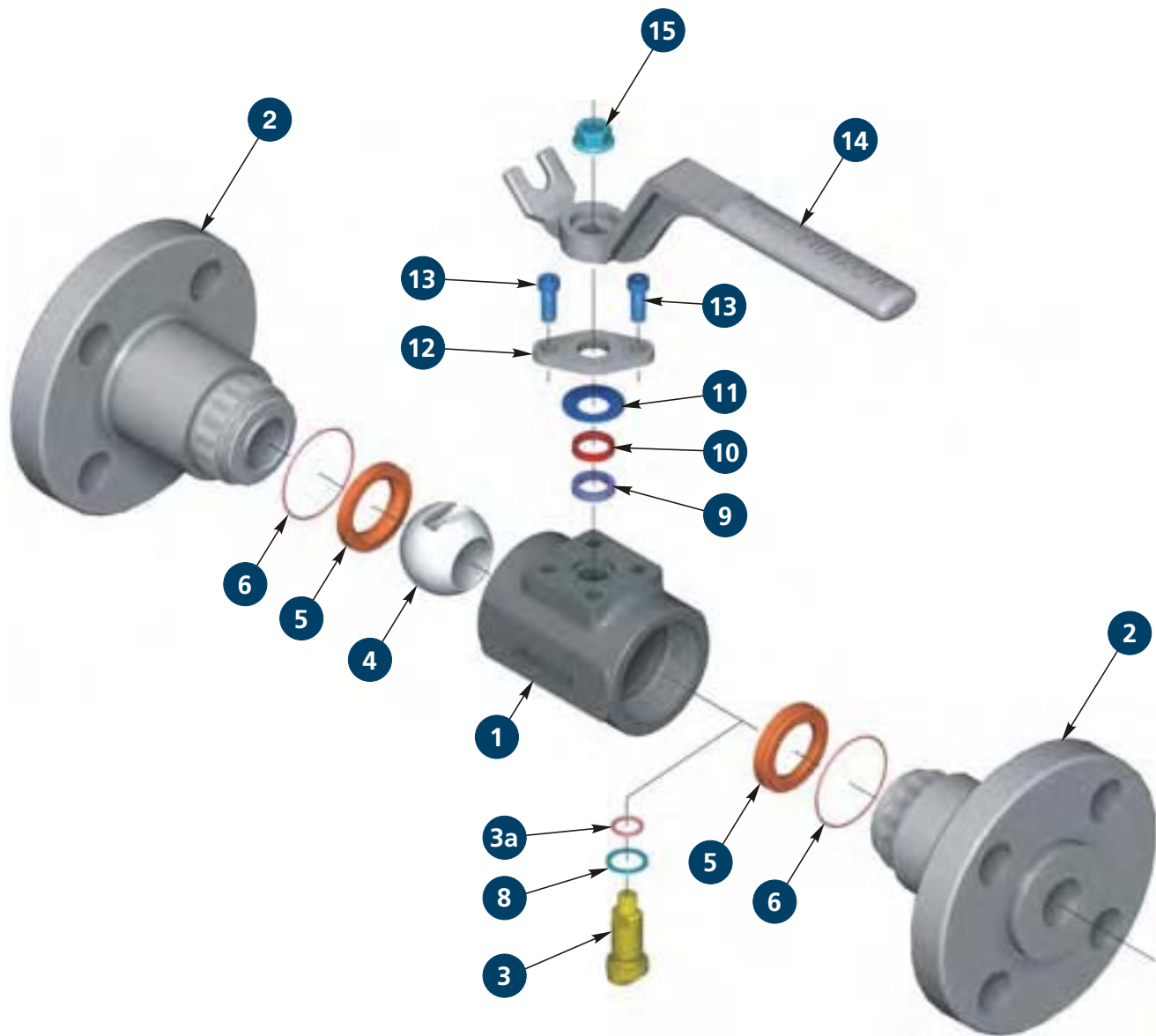
** Locking device is standard on 1/4 in. full port through 2 in. reduced port (8 mm through 50 mm) valves.

Note: Fire safe trim offered as standard whenever possible.

Consult Cooper Cameron Valves - NUTRON Sales Department for fire safe trim.

FLOATING BALL VALVES

THREADED END CONNECTIONS



MATERIALS LIST - FLANGED END CONNECTIONS

ASME CLASS 150 THROUGH 2500 (PN 20 THROUGH 420)

ITEM	PART	ASME CLASS	STANDARD -20°F (-29°F)	SOUR -20°F (-29°C)
1	Body	All	ASTM A105	ASTM A105
2	End Caps	All	ASTM A105	ASTM A105
■ 3	Stem	150, 300, 600 & 900 1500 & 2500	ASTM A108, Plated ASTM A564 17-4PH	ASTM A564 17-4PH ASTM A564 17-4PH
■● 3a*	Stem O-Ring	All	Nitrile	Viton
■ 4	Ball	150 thru 1500 2500	Carbon Steel, Chrome Plated ASTM A564 17-4PH	ASTM A351 Gr. CF8M ASTM A564 17-4PH
■● 5	Seats	150 thru 1500 2500 1/4 in. (8 mm) thru 1 1/4 in. (32 mm) 150 thru 600	Delrin PEEK Teflon	Delrin PEEK Teflon
■● 6	Body O-Rings	All	Nitrile	Viton
■● 8	Thrust Washer	150 thru 1500 2500 1/4 in. (8 mm) thru 1 1/4 in. (32 mm) 150 thru 600	Delrin PEEK Teflon	Delrin PEEK Teflon
■● 9	Packing	All	Teflon	Teflon
10	Packing Follower	All	Carbon Steel, Plated	Stainless Steel
11	Belleville Washer	All	Carbon Steel	Stainless Steel
12	Gland Flange	All	Carbon Steel, Plated	Carbon Steel, Plated
13	Cap Screws	All	Carbon Steel	Stainless Steel
14	Handle	All	Carbon Steel	Carbon Steel
15	Handle Nut	All	Carbon Steel, Plated	Carbon Steel, Plated

ITEM	PART	ASME CLASS	SOUR & LOW TEMP -50°F (-46°C)	STAINLESS STEEL -50°F (-46°C)
1	Body	All	ASTM A350 LF2	ASTM A479 TYPE 316
2	End Caps	All	ASTM A350 LF2	ASTM A479 TYPE 316
■ 3	Stem	All	ASTM A564 17-4PH	ASTM A564 17-4PH with Nitriding
■● 3a*	Stem O-Ring	All	Viton	HSN
■ 4	Ball	150, 300 & 600 900 & 1500 2500	ASTM A351 Gr. CF8M ASTM A351 Gr. CF8M ASTM A564 17-4PH	ASTM A351 Gr. CF8M ASTM A564 17-4PH ASTM A564 17-4PH
■● 5	Seats	150, 300 & 600 900 & 1500 2500 1/4 in. (8 mm) thru 1 1/4 in. (32 mm) 150 thru 600	Delrin Delrin PEEK Teflon	Teflon PEEK PEEK N/A
■● 6	Body O-Rings	All	Viton	Teflon
■● 8	Thrust Washer	150, 300 & 600 900 & 1500 2500	Delrin Delrin PEEK	Teflon PEEK PEEK
■● 9	Packing	All	Teflon (Graphite - 2500 psi)	Teflon (Graphite - 1500 & 2500 psi)
10	Packing Follower	All	Stainless Steel	Stainless Steel
11	Belleville Washer	All	Stainless Steel	Stainless Steel
12	Gland Flange	All	Carbon Steel, Plated	Carbon Steel, Plated
13	Cap Screws	All	Stainless Steel	Stainless Steel
14	Handle	All	Carbon Steel	Carbon Steel
15	Handle Nut	All	Carbon Steel, Plated	Carbon Steel, Plated

- Major repair kit.
- Minor repair kit.

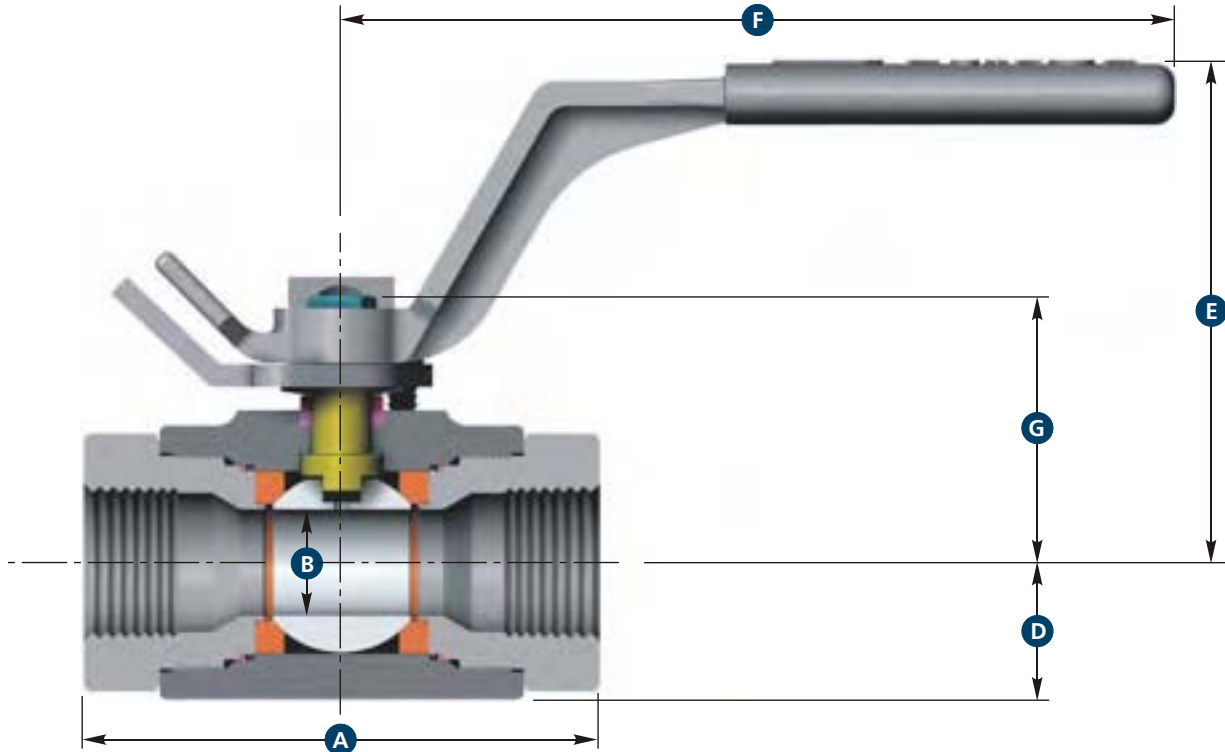
* Item 3a is only available on sizes 1 1/2 in. full port through 3 in. reduced port (40 mm through 80 mm) valves.

Note: Fire safe trim offered as standard whenever possible.

Consult Cooper Cameron Valves - NUTRON Sales Department for fire safe trim.

FLOATING BALL VALVES

FULL PORT - THREADED



DIMENSIONS

SIZE in. (mm)	WOG	A	B	D	E	F	G	C _v	WEIGHT lb. (kg)
1/4 (8)	2000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.5 (1.1)
	3000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.5 (1.1)
	4000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.5 (1.1)
	6000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.5 (1.1)
3/8 (10)	2000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.4 (1.0)
	3000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.4 (1.0)
	4000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.4 (1.0)
	6000	3.88 (98)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	9	2.4 (1.0)
1/2 (15)	2000	3.88 (98)*	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	26	2.2 (0.9)
	3000	3.88 (98)*	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	26	2.2 (0.9)
	4000	3.88 (98)*	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	26	2.2 (0.9)
	6000	4.38 (111)	0.50 (13)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	26	2.2 (0.9)
3/4 (20)	2000	4.25 (108)	0.88 (22)	1.12 (29)	4.40 (112)	6.75 (172)	2.16 (55)	50	4.8 (2.1)
	3000	4.25 (108)	0.88 (22)	1.12 (29)	4.40 (112)	6.75 (172)	2.16 (55)	50	4.8 (2.1)
	4000	4.25 (108)	0.88 (22)	1.12 (29)	4.40 (112)	6.75 (172)	2.16 (55)	50	4.8 (2.1)
	6000	4.25 (108)	0.88 (22)	1.50 (38)	4.40 (112)	6.75 (172)	2.16 (55)	50	6.5 (2.9)
1 1/2 (40)	2000	6.25 (159)	1.50 (38)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	260	18.0 (8.1)
	3000	6.25 (159)	1.50 (38)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	260	18.0 (8.1)
	4000	6.25 (159)	1.50 (38)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	260	18.0 (8.1)
	6000	6.25 (159)	1.50 (38)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	260	18.0 (8.1)
2 (50)	2000	6.25 (159)	2.00 (51)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	480	30.0 (13.6)
	3000	6.25 (159)	2.00 (51)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	480	30.0 (13.6)
	4000	6.25 (159)	2.00 (51)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	480	30.0 (13.6)
	6000	6.25 (159)	2.00 (51)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	480	30.0 (13.6)
3 (80)	1000	9.70 (246)	3.00 (76)	3.50 (89)	8.26 (210)	23.88 (607)	5.37 (137)	1300	67.0 (30.4)
	2000	9.70 (246)	3.00 (76)	3.50 (89)	8.26 (210)	23.88 (607)	5.37 (137)	1300	67.0 (30.4)

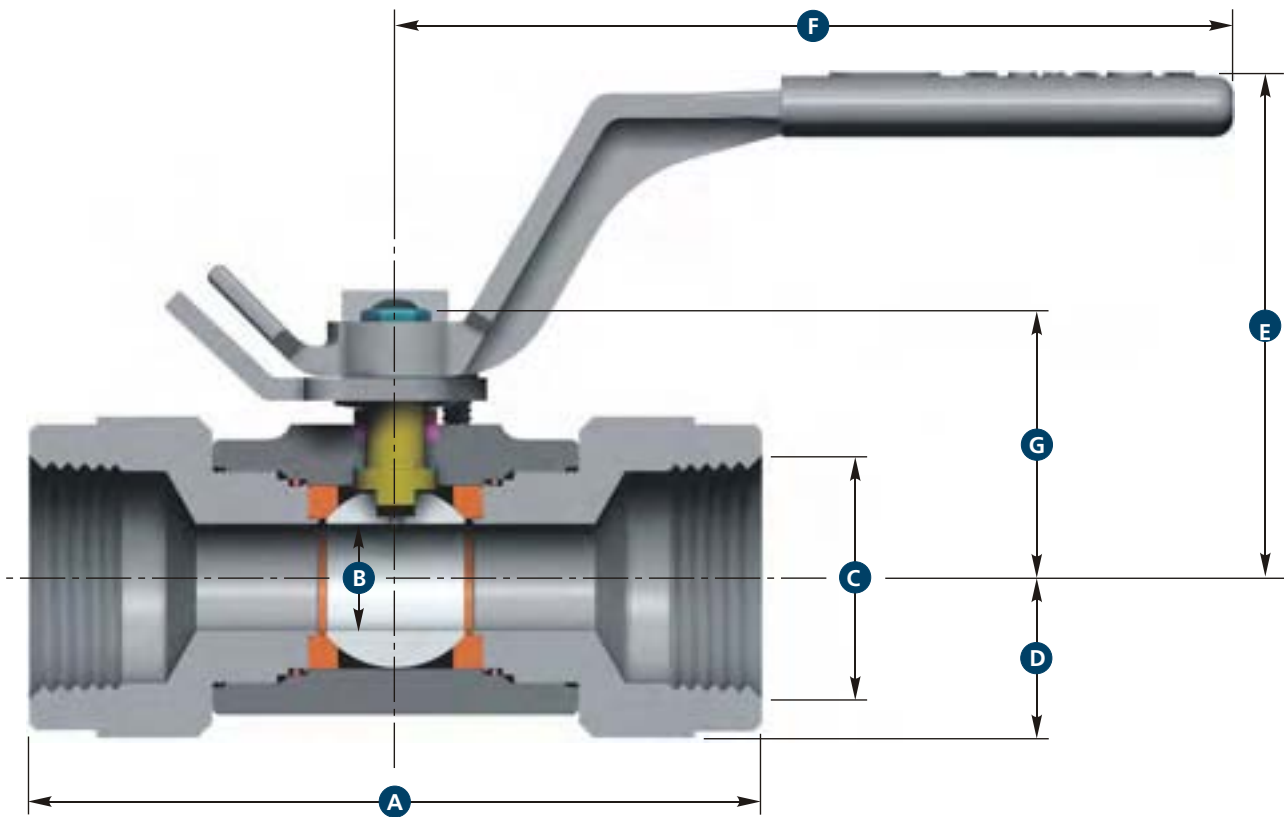
* 4.38 in. (111 mm) for Stainless Steel valves.

NOTE: "A" dimension to be within ± 0.062 in. (1.5 mm).

NUTRON

FLOATING BALL VALVES

REDUCED PORT - THREADED



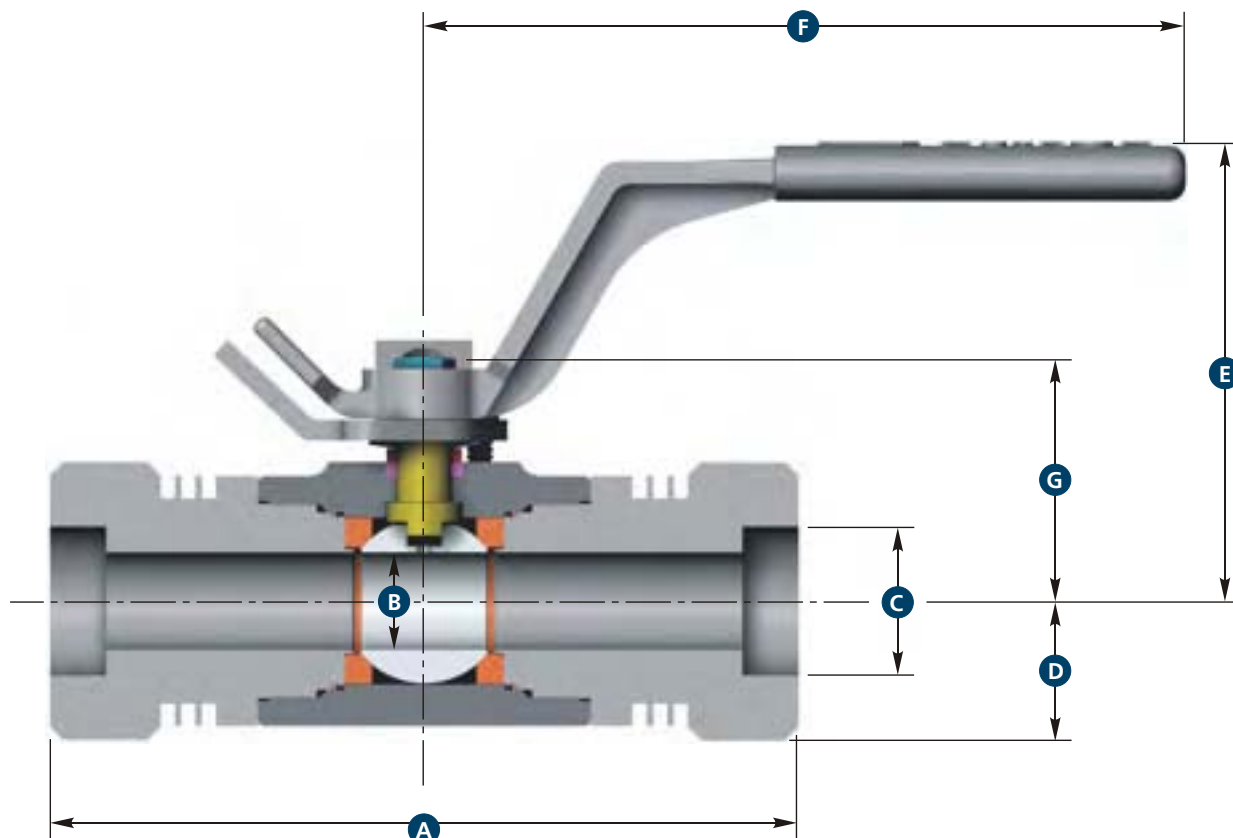
DIMENSIONS

SIZE in. (mm)	WOG	A	B	C	D	E	F	G	C _v	WEIGHT lb. (kg)
3/4 (20)	2000	4.38 (111)	0.50 (13)	0.75 (19)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	14	2.5 (1.1)
	3000	4.38 (111)	0.50 (13)	0.75 (19)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	14	2.5 (1.1)
	4000	4.38 (111)	0.50 (13)	0.75 (19)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	14	2.5 (1.1)
	6000	4.38 (111)	0.50 (13)	0.75 (19)	0.82 (21)	3.29 (83)	4.82 (122)	1.73 (44)	14	2.5 (1.1)
1 (25)	2000	4.25 (108)	0.88 (22)	1.00 (25)	1.12 (28)	4.40 (112)	6.75 (172)	2.16 (55)	35	4.5 (2.0)
	3000	4.25 (108)	0.88 (22)	1.00 (25)	1.12 (28)	4.40 (112)	6.75 (172)	2.16 (55)	35	4.5 (2.0)
	4000	4.25 (108)	0.88 (22)	1.00 (25)	1.12 (28)	4.40 (112)	6.75 (172)	2.16 (55)	35	4.5 (2.0)
	6000	5.25 (133)	0.88 (22)	1.00 (25)	1.50 (38)	4.40 (112)	6.75 (172)	2.16 (55)	35	7.5 (3.4)
1 1/4 (32)	2000	6.00 (152)	0.88 (22)	1.25 (32)	1.30 (33)	4.40 (112)	6.75 (172)	2.16 (55)	35	8.0 (3.6)
	3000	6.00 (152)	0.88 (22)	1.25 (32)	1.30 (33)	4.40 (112)	6.75 (172)	2.16 (55)	35	8.0 (3.6)
2 (50)	2000	6.25 (159)	1.50 (38)	2.00 (51)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	100	17.5 (7.9)
	3000	6.25 (159)	1.50 (38)	2.00 (51)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	100	17.5 (7.9)
	4000	6.25 (159)	1.50 (38)	2.00 (51)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	100	17.5 (7.9)
	6000	7.25 (184)	1.50 (38)	2.00 (51)	1.98 (50)	5.62 (143)	11.00 (279)	3.52 (89)	100	21.0 (9.5)
3 (80)	2000	10.0 (254)	2.00 (51)	3.00 (76)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	420	39.0 (17.6)
	3000	10.0 (254)	2.00 (51)	3.00 (76)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	420	39.0 (17.6)
	4000	10.0 (254)	2.00 (51)	3.00 (76)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	420	39.0 (17.6)
	6000	10.0 (254)	2.00 (51)	3.00 (76)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	420	48.0 (21.8)
4 (100)	1000	9.5 (241)	3.00 (76)	4.00 (102)	3.50 (89)	8.26 (210)	23.88 (607)	5.37 (137)	770	80.0 (36.3)

NOTE: " A " dimension to be within ± 0.062 in. (1.5 mm).

FLOATING BALL VALVES

FULL PORT - SOCKET WELD and THREADED x SOCKET WELD



DIMENSIONS

SIZE in. (mm)	WOG	A		B	C			D	E	F	G	C _v	WEIGHT lb. (kg)	
		FNPT x SW	SW		FNPT x SW	SW							FNPT x SW	SW
1/2 (15)	2000	4.44 (113)*	5.00 (127)	0.50 (13)	0.50 (13)	0.86 (22)	0.94 (24)	3.29 (83)	4.82 (122)	4.82 (122)	1.73 (44)	26	3.5 (1.5)	4.8 (2.1)
	3000	4.44 (113)*	5.00 (127)	0.50 (13)	0.50 (13)	0.86 (22)	0.94 (24)	3.29 (83)	4.82 (122)	4.82 (122)	1.73 (44)	26	3.5 (1.5)	4.8 (2.1)
	4000	4.44 (113)*	5.00 (127)	0.50 (13)	0.50 (13)	0.86 (22)	0.94 (24)	3.29 (83)	4.82 (122)	4.82 (122)	1.73 (44)	26	3.5 (1.5)	4.8 (2.1)
	6000	4.69 (119)	5.00 (127)	0.50 (13)	0.50 (13)	0.86 (22)	0.94 (24)	3.29 (83)	4.82 (122)	4.82 (122)	1.73 (44)	26	3.5 (1.5)	4.8 (2.1)
3/4 (20)	2000	5.50 (140)	6.75 (172)	0.88 (22)	0.75 (19)	1.07 (27)	1.25 (32)	4.40 (112)	6.75 (172)	6.75 (172)	2.16 (55)	50	5.7 (2.5)	6.4 (2.9)
	3000	5.50 (140)	6.75 (172)	0.88 (22)	0.75 (19)	1.07 (27)	1.25 (32)	4.40 (112)	6.75 (172)	6.75 (172)	2.16 (55)	50	5.7 (2.5)	6.4 (2.9)
	4000	5.50 (140)	6.75 (172)	0.88 (22)	0.75 (19)	1.07 (27)	1.25 (32)	4.40 (112)	6.75 (172)	6.75 (172)	2.16 (55)	50	5.7 (2.5)	6.4 (2.9)
	6000	5.50 (140)	6.75 (172)	0.88 (22)	0.75 (19)	1.07 (27)	1.50 (38)	4.40 (112)	6.75 (172)	6.75 (172)	2.16 (55)	50	8.6 (3.9)	9.2 (4.1)
1 1/2 (40)	2000	7.40 (188)	8.54 (217)	1.50 (38)	1.50 (38)	1.92 (49)	2.50 (64)	5.62 (143)	11.00 (279)	11.00 (279)	3.52 (89)	260	21.9 (9.9)	25.7 (11.6)
	3000	7.40 (188)	8.54 (217)	1.50 (38)	1.50 (38)	1.92 (49)	2.50 (64)	5.62 (143)	11.00 (279)	11.00 (279)	3.52 (89)	260	21.9 (9.9)	25.7 (11.6)
	4000	7.40 (188)	8.54 (217)	1.50 (38)	1.50 (38)	1.92 (49)	2.50 (64)	5.62 (143)	11.00 (279)	11.00 (279)	3.52 (89)	260	21.9 (9.9)	25.7 (11.6)
	6000	7.40 (188)	8.54 (217)	1.50 (38)	1.50 (38)	1.92 (49)	2.50 (64)	5.62 (143)	11.00 (279)	11.00 (279)	3.52 (89)	260	21.9 (9.9)	25.7 (11.6)
2 (50)	2000	9.50 (241)	12.75 (324)	2.00 (51)	2.00 (51)	2.41 (61)	2.53 (64)	6.96 (177)	11.88 (302)	11.88 (302)	4.83 (123)	480	38.3 (17)	46.5 (21.0)
	3000	9.50 (241)	12.75 (324)	2.00 (51)	2.00 (51)	2.41 (61)	2.53 (64)	6.96 (177)	11.88 (302)	11.88 (302)	4.83 (123)	480	38.3 (17)	46.5 (21.0)
	4000	9.50 (241)	12.75 (324)	2.00 (51)	2.00 (51)	2.41 (61)	2.53 (64)	6.96 (177)	11.88 (302)	11.88 (302)	4.83 (123)	480	38.3 (17)	46.5 (21.0)
	6000	9.50 (241)	12.75 (324)	2.00 (51)	2.00 (51)	2.41 (61)	2.53 (64)	6.96 (177)	11.88 (302)	11.88 (302)	4.83 (123)	480	38.3 (17)	46.5 (21.0)

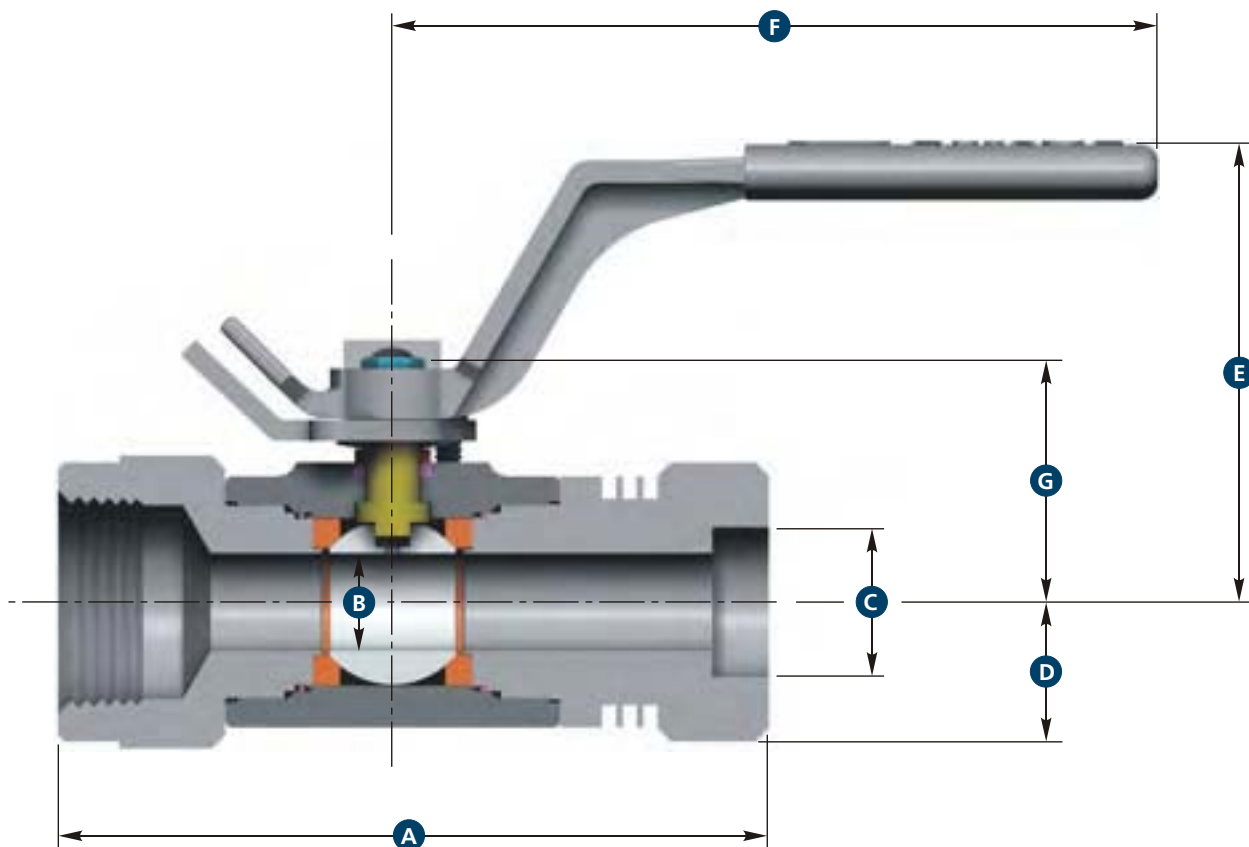
* 4.69 in. (119.1 mm) for Stainless Steel valves.

NOTE: " A " dimension to be within ± 0.062 in. (1.5 mm).

NUTRON

FLOATING BALL VALVES

REDUCED PORT - SOCKET WELD and THREADED x SOCKET WELD



DIMENSIONS

SIZE in. (mm)	WOG	A		B	C		D	E	F	G	C _v	WEIGHT lb. (kg)	
		FNPT x SW	SW		FNPT x SW	SW						FNPT x SW	SW
3/4 (20)	2000	5.56 (141)	6.75 (172)	0.50 (13)	0.75 (19)	1.07 (27)	1.19 (30)	3.29 (83)	4.82 (122)	1.73 (44)	14	3.5 (1.5)	4.4 (1.9)
	3000	5.56 (141)	6.75 (172)	0.50 (13)	0.75 (19)	1.07 (27)	1.19 (30)	3.29 (83)	4.82 (122)	1.73 (44)	14	3.5 (1.5)	4.4 (1.9)
	4000	5.56 (141)	6.75 (172)	0.50 (13)	0.75 (19)	1.07 (27)	1.19 (30)	3.29 (83)	4.82 (122)	1.73 (44)	14	3.5 (1.5)	4.4 (1.9)
	6000	5.56 (141)	6.75 (172)	0.50 (13)	0.75 (19)	1.07 (27)	1.19 (30)	3.29 (83)	4.82 (122)	1.73 (44)	14	3.5 (1.5)	4.4 (1.9)
1 (25)	2000	5.50 (140)*	6.75 (172)	0.88 (22)	1.00 (25)	1.34 (34)	1.25 (32)	4.40 (112)	6.75 (172)	2.16 (55)	35	5.4 (2.4)	6.2 (2.8)
	3000	5.50 (140)*	6.75 (172)	0.88 (22)	1.00 (25)	1.34 (34)	1.25 (32)	4.40 (112)	6.75 (172)	2.16 (55)	35	5.4 (2.4)	6.2 (2.8)
	4000	5.50 (140)*	6.75 (172)	0.88 (22)	1.00 (25)	1.34 (34)	1.25 (32)	4.40 (112)	6.75 (172)	2.16 (55)	35	5.4 (2.4)	6.2 (2.8)
	6000	6.00 (152)	6.75 (172)	0.88 (22)	1.00 (25)	1.34 (34)	1.50 (38)	4.40 (112)	6.75 (172)	2.16 (55)	35	8.3 (3.7)	9.0 (4.0)
2 (50)	2000	7.40 (188)	8.55 (217)	1.50 (38)	2.00 (51)	2.42 (62)	2.50 (64)	5.62 (143)	11.00 (280)	3.52 (90)	100	22.5 (10.2)	26.0 (11.7)
	3000	7.40 (188)	8.55 (217)	1.50 (38)	2.00 (51)	2.42 (62)	2.50 (64)	5.62 (143)	11.00 (280)	3.52 (90)	100	22.5 (10.2)	26.0 (11.7)
	4000	7.40 (188)	8.55 (217)	1.50 (38)	2.00 (51)	2.42 (62)	2.50 (64)	5.62 (143)	11.00 (280)	3.52 (90)	100	22.5 (10.2)	26.0 (11.7)
	6000	7.90 (201)	8.55 (217)	1.50 (38)	2.00 (51)	2.42 (62)	2.50 (64)	5.62 (143)	11.00 (280)	3.52 (90)	100	22.5 (10.2)	26.0 (11.7)
3 (80)	2000	11.38 (289)	12.75 (324)	2.00 (51)	3.00 (76)	3.55 (90)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	420	49.0 (22.2)	60.0 (27.2)
	3000	11.38 (289)	12.75 (324)	2.00 (51)	3.00 (76)	3.55 (90)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	420	49.0 (22.2)	60.0 (27.2)
	4000	11.38 (289)	12.75 (324)	2.00 (51)	3.00 (76)	3.55 (90)	2.53 (64)	6.96 (177)	11.88 (302)	4.83 (123)	420	49.0 (22.2)	60.0 (27.2)

* 6.00 in. (152 mm) for Stainless Steel valves.

NOTE: "A" dimension to be within ± 0.062 in. (1.5 mm).

NUTRON

TC1836
08/04 NP-3M

FLOATING BALL VALVES

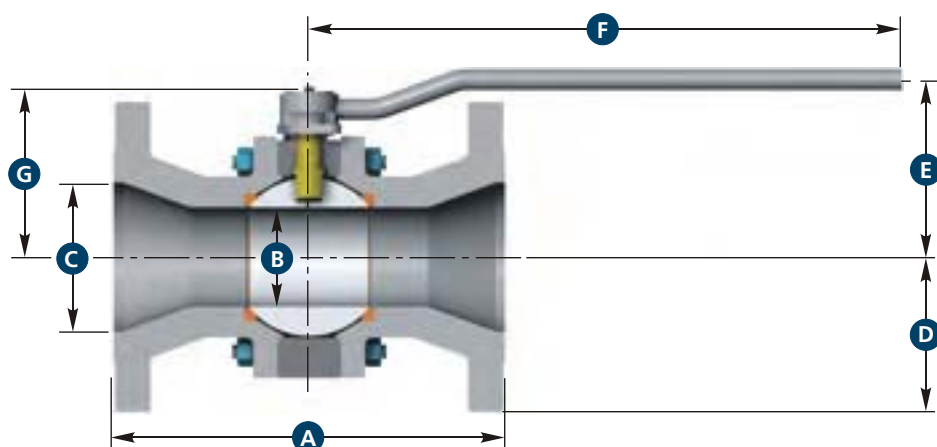
FLANGED

FULL PORT

4 in. (100 mm)

REDUCED PORT

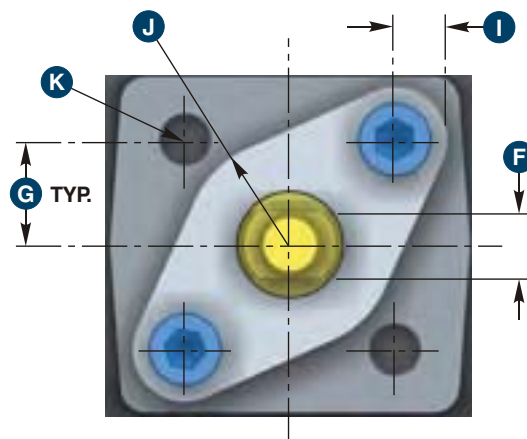
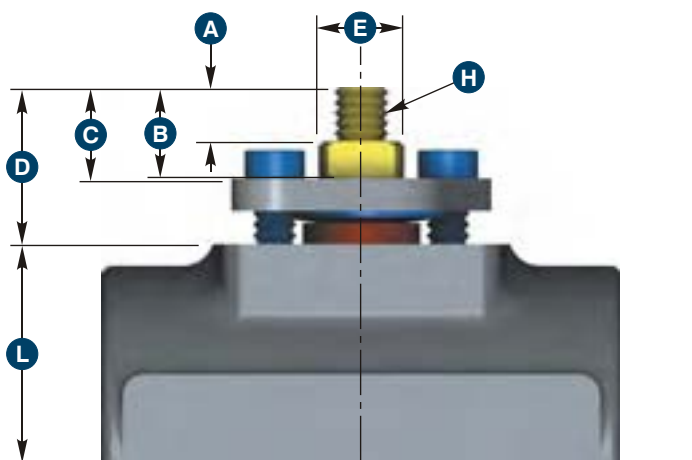
6 in. (150 mm)



DIMENSIONS

SIZE in. (mm)	ASME CLASS (PN)	A	B	C	D	E	F	G	C _v	WEIGHT lb. (kg)
4 FP (100 FP)	150 (20)	9.00 (229)	4.00 (102)	4.00 (102)	4.88 (124)	7.60 (193)	24.00 (610)	6.65 (169)	2300	101 (45.8)
	300 (50)	12.00 (305)	4.00 (102)	4.00 (102)	5.00 (127)	7.60 (193)	24.00 (610)	6.65 (169)	2300	143 (64.8)
6 RP (150 RP)	150 (20)	10.50 (267)	4.00 (102)	6.00 (152)	5.50 (140)	7.60 (193)	24.00 (610)	6.65 (169)	1800	128 (58.0)
	300 (50)	15.88 (403)	4.00 (102)	6.00 (152)	6.25 (160)	7.60 (193)	24.00 (610)	6.65 (169)	1800	143 (64.8)

ACTUATOR MOUNTING DIMENSIONS



DIMENSIONS

SIZE in. (mm)	A	B	C	D	E	F	G	H	I	J	K	L
1/4 FP (8 FP)	0.300 (7.6)	0.440 (11.1)	0.500 (12.7)	0.725 (18.4)	0.464 (11.8)	0.253 (6.4)	0.468 (11.9)	0.250-20 UNC (6.35-20 UNC)	0.23 (5.8)	0.50 (12.7)	#10-32 UNF-2B x 0.31 DP. (#10-32 UNF-2B x 7.9 DP.)	1.002 (25.5)
3/8 FP (10 FP)	0.300 (7.6)	0.440 (11.1)	0.500 (12.7)	0.725 (18.4)	0.464 (11.8)	0.253 (6.4)	0.468 (11.9)	0.250-20 UNC (6.35-20 UNC)	0.23 (5.8)	0.50 (12.7)	#10-32 UNF-2B x 0.31 DP. (#10-32 UNF-2B x 7.9 DP.)	1.002 (25.5)
1/2 FP / 3/4 RP (15 FP / 20 RP)	0.300 (7.6)	0.440 (11.1)	0.500 (12.7)	0.725 (18.4)	0.464 (11.8)	0.253 (6.4)	0.468 (11.9)	0.250-20 UNC (6.35-20 UNC)	0.23 (5.8)	0.50 (12.7)	#10-32 UNF-2B x 0.31 DP. (#10-32 UNF-2B x 7.9 DP.)	1.002 (25.5)
3/4 FP / 1 RP (20 FP / 25 RP)	0.312 (7.9)	0.515 (13.1)	0.560 (14.2)	0.905 (23.0)	0.496 (12.6)	0.314 (7.9)	0.498 (12.6)	0.312-18 UNC (7.92-18 UNC)	0.25 (6.4)	0.50 (12.7)	0.25-28 UNF-2B x 0.30 DP. (6.35-28 UNF-2B x 7.6 DP.)	1.250 (31.8)
* 1 1/2 FP / 2 RP (*40 FP / 50 RP)	0.475 (12.1)	0.826 (21.0)	0.900 (22.9)	1.270 (32.3)	0.811 (20.6)	0.441 (11.2)	0.737 (18.7)	0.438-14 UNC (11.1-14 UNC)	0.40 (10.2)	0.75 (19.1)	0.312-24 UNF-2B x 0.437 DP. (7.92-24 UNF-2B x 11.1 DP.)	2.250 (57.2)
** 2 FP / 3 RP (**50 FP / 80 RP)	0.690 (17.5)	1.180 (30.0)	1.225 (31.1)	1.821 (46.3)	1.000 (25.4)	0.628 (16.0)	0.875 (22.2)	0.625-11 UNC (15.9-11 UNC)	0.41 (10.4)	1.00 (25.4)	0.375-24 UNF-2B x 0.50 DP. (9.53-24 UNF-2B x 12.7 DP.)	3.000 (76.2)
*** 3 FP / 4 RP (***80 FP / 100 RP)	0.690 (17.5)	1.180 (30.0)	1.225 (31.1)	1.821 (46.3)	1.000 (25.4)	0.628 (16.0)	0.875 (22.2)	0.625-11 UNC (15.9-11 UNC)	0.41 (10.4)	1.00 (25.4)	0.375-24 UNF-2B x 0.50 DP. (9.53-24 UNF-2B x 12.7 DP.)	3.500 (88.9)

* Applies to B3 1 1/2 in. (40 mm) full port & 2 in. (50 mm) reduced port ASME Class 600, 900 & 1500 valves.

** Applies to B3 2 in. (50 mm) full port & 3 in. (80 mm) reduced port ASME Class 600, 900 & 1500 valves.

*** Applies to B3 3 in. (80 mm) full port & 4 in. (100 mm) reduced port ASME Class 150 & 300 valves.

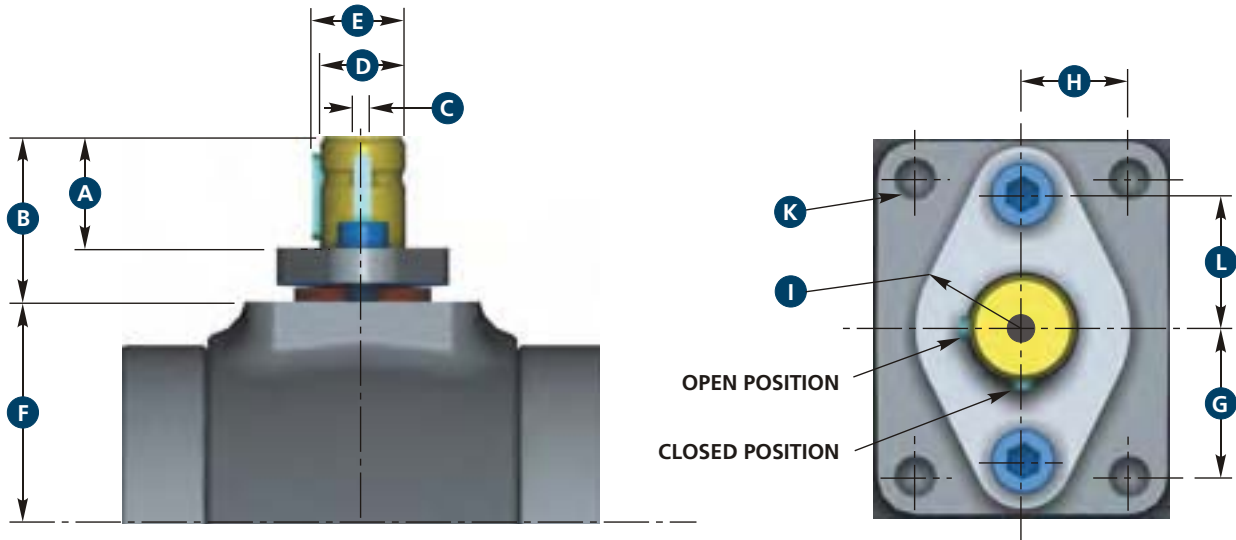
NUTRON

TC1836
08/04 NP-3M

ACTUATOR MOUNTING DIMENSIONS*

3 in. (80 mm) FULL PORT

4 in. (100 mm) REDUCED PORT

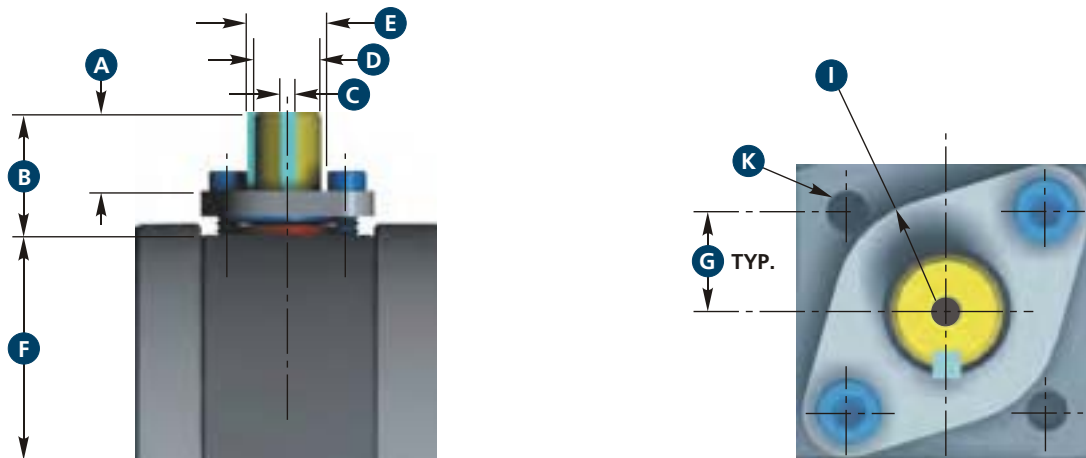


DIMENSIONS

SIZE in. (mm)	A	B	C	D	E	F	G	H	I	K	L
3 FP / 4 RP (80 FP / 100 RP)	1.64 (41.7)	2.395 (60.8)	0.25 (6.4)	1.248 (31.7)	1.362 (34.6)	4.875 (123.8)	1.75 (44.4)	1.25 (31.8)	1.25R (31.8R)	0.5-13UNC-2B x 0.62 DP. (12.7-13UNC-2B x 15.7 DP.)	1.566 (39.8)
(ASME 600-1500, WOG 2000-4000)											

4 in. (100 mm) FULL PORT

6 in. (150 mm) REDUCED PORT



DIMENSIONS

SIZE in. (mm)	A	B	C	D	E	F	G	K	I
4 FP / 6 RP (100 FP / 150 RP)	1.255 (31.9)	1.85 (47.0)	0.25 (6.4)	1.00 (25.4)	1.11 (28.2)	4.688 (119.1)	0.877 (22.3)	0.375-24UNF-2B x 0.5 DEEP (9.5-24UNF-2B x 12.7 DEEP)	1.00 (25.4)
(ASME 150 / 300)									

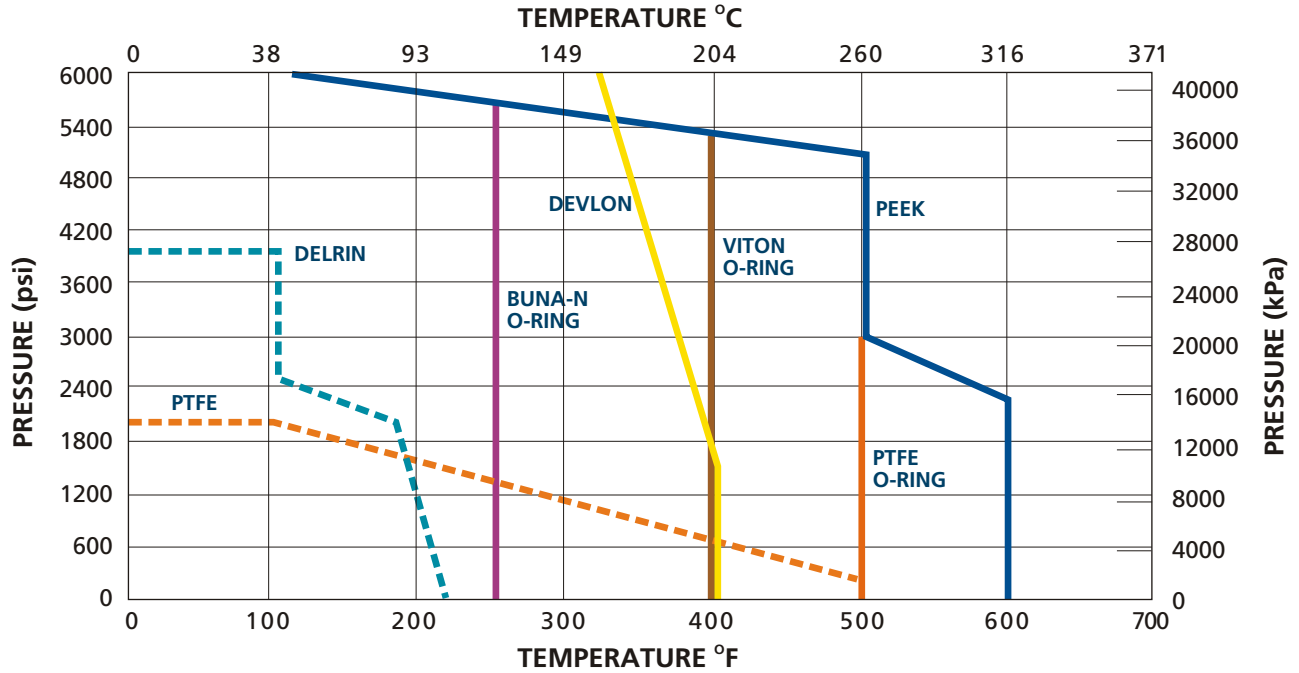
* For B3 1 1/2 in., 2 in., 3 in. & 4 in. (40 mm, 50 mm, 80 mm & 100 mm) valves, see footnote on page 25.

NUTRON

TC1836
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FLOATING BALL VALVES

PRESSURE/TEMPERATURE RATINGS (SEATS AND SEALS)*



* Consult ASME B16.34 for Body and Adapter Material Pressure/Temperature Ratings.

BREAKAWAY TORQUE DATA

Torque=inch-pounds

Bore Size in. (DN)	ASME CLASS (PN)	Pressure (psi)	0	150	300	1000	600	2000	900	3000	1500	4000	5000	2500
				(20)	(50)		(100)		(150)		(250)			(420)
		Seat Material		285	740		1480		2220		3705			6000
1/2 (15)		Peek	72	84	96	108	120	132	144	156	180	192	216	240
		Devlon	72	84	96	108	120	132	144	156	180	192	216	240
		Delrin	60	72	84	96	108	120	132	144	168	180	-	-
		Teflon	60	72	84	96	108	120	-	-	-	-	-	-
7/8 (22)		Peek	276	276	276	276	276	300	324	360	420	444	540	660
		Devlon	96	108	120	132	144	156	168	180	192	204	240	300
		Delrin	96	108	120	132	144	156	168	180	192	204	-	-
		Teflon	96	108	120	132	144	156	-	-	-	-	-	-
1 1/2 (40)		Peek	600	648	696	744	792	840	864	936	1020	1080	1200	1500
		Devlon	360	420	480	576	660	720	792	900	960	1020	1080	1260
		Delrin	336	396	480	576	660	720	792	900	960	1020	-	-
		Teflon	336	360	396	420	456	504	-	-	-	-	-	-
2 (50)		Peek	840	1080	1440	1680	1920	2100	2280	2700	3120	3300	3600	4200
		Devlon	600	720	900	1080	1200	1500	1680	1920	2160	2400	2400	2880
		Delrin	600	720	900	1080	1320	1560	1740	2040	2280	2520	-	-
		Teflon	600	636	816	936	1128	1344	-	-	-	-	-	-
3 (80)		Peek	960	1440	2760	3840	4800	5760	6480	7200	8400	9000	-	-
		Devlon	720	1200	1920	2400	2880	3360	3600	4080	4800	5760	-	-
		Delrin	840	1380	2280	2640	3000	3600	3900	4200	4800	5760	-	-
		Teflon	720	1320	1920	2400	2880	3600	-	-	-	-	-	-
4 (100)		Peek	1440	2400	3840	-	-	-	-	-	-	-	-	-
		Devlon	1200	2040	3120	-	-	-	-	-	-	-	-	-
		Teflon	1080	1944	2820	-	-	-	-	-	-	-	-	-

Torque values shown are to be used as a guide for actuator selection. All above torque values are based upon clean liquid service. Additional factors such as media characteristics, number of cycles and temperature may require an additional safety factor. Please contact the actuator supplier/manufacturer for these factors.

NUTRON

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NUTRON T3 & B3 FLOATING BALL VALVES

TERMS AND CONDITIONS

1. CONTRACT ACCEPTANCE:

Any written or oral purchase order received from Buyer by Cooper Cameron Corporation, Cameron Division and Cooper Cameron Valves ("Seller") shall be construed as a written acceptance of Seller's offer to sell and shall be filled in accordance with the terms and conditions of sale set forth herein. SELLER'S ACCEPTANCE OF THIS ORDER IS EXPRESSLY CONDITIONED ON BUYER'S ASSENT TO THE TERMS CONTAINED HEREIN. The terms and conditions of Seller's proposal (if any) and acknowledgement shall prevail over any conflicting or different terms in Buyer's order unless Buyer notifies Seller in writing of its objections thereto within fifteen (15) days from receipt of Seller's acknowledgement. Buyer's standard terms of purchase will not be considered a counteroffer to Seller's terms and conditions of sale. The failure of Seller to object to any provision in conflict herewith whether contained on Buyer's purchase order or otherwise shall not be construed as a waiver of the provisions hereof nor as an acceptance thereof.

2. QUOTATIONS AND PRICES:

All quotations are made for prompt acceptance and any terms quoted therein are subject to change without notice after thirty (30) days from the date quoted unless specifically stated otherwise on the quotation. Any product, service capability or manufacturing capability which may be available at the time a quotation is made is subject to prior sale. Prices quoted are valid for thirty (30) days unless specifically stated otherwise on the quotation and are subject to change without notice. The price in effect at the time of shipment including any escalation formula will apply, unless a valid quotation or written agreement to the contrary exists between Buyer and Seller. All prices shown are in U.S. dollars and are F.O.B. Seller's shipping point. Any documentation pertaining to traceability requirements for raw materials or products or documentation required for any routine or special processes must be identified by the Buyer at the time of quotation (if any) or at the time of order placement.

3. TAXES:

Any tax or other charge imposed by law on the sale or production of goods or the performance of services shall be paid by the Buyer, unless the law specifically provides that such payment must be made by Seller, in which case Buyer shall reimburse Seller for such payment as part of the purchase price. Custom duties, consular fees, insurance charges and other comparable charges will be borne by Buyer.

4. SHIPPING SCHEDULE AND DELIVERY:

Shipment schedules are given as accurately as conditions permit and every effort will be made to make shipments as scheduled. Seller will not be responsible for deviations in meeting shipping schedules nor for any losses or damages to Buyer (or any third party) occasioned by deviations in the shipping schedule, whether due to Acts of God, orders bearing priority ratings established pursuant to law, differences with workmen, local labor shortages, fire, flood, shortages or failure

of raw materials, supplies, fuel, power or transportation, breakdown of equipment or any other causes beyond Seller's reasonable control, whether of similar or dissimilar nature than those enumerated. Seller shall have additional time within which to perform as may be reasonably necessary under the circumstances and shall have the right to apportion its production among its customers in such a manner as it may consider to be equitable.

Seller reserves the right to furnish commercially equivalent or better substitutes for materials or to subcontract the Buyer's order or portions thereof as Seller deems necessary. In no event shall Seller be liable for any consequential damages for labor resulting from failure or delay in shipment. If Buyer requires drawings, procedures, standards or similar material for approval, shipping schedules will be calculated from the time such approvals are received by Seller, since shipping schedules are based on Seller having all required information and a firm order from Buyer which is enterable into production. Any hold points, witness points or the need for inspection by Buyer's representatives must be identified by Buyer at the time of quotation (if any) and/or order placement in order that the effect on the prices or shipping schedules (if any) can be taken into account. Additional inspection or testing required by Buyer which affects normal production sequence will be considered as extending the shipping dates accordingly.

5. MINIMUM BILLING:

Seller reserves the right to impose a minimum billing charge on all sales, change orders or order supplements.

6. TERMS OF PAYMENT:

Terms of payment for all materials and service are 30 days from invoice date, at net price, provided satisfactory credit has been established. All unpaid invoices are subject to the maximum legal interest rate per annum commencing with the due date.

7. CANCELLATIONS AND RETURNS:

Purchase orders once placed by Buyer and accepted by Seller can be canceled only with Seller's written consent and upon terms which will save Seller from loss. No products may be returned for credit or adjustment without written permission from Seller's office authorized to issue such permission.

8. WARRANTIES:

All products of Seller's manufacture are warranted against defects of material and workmanship for a period of twelve (12) months from the date of installation or eighteen (18) months from date of shipment, whichever period first expires, when such products are used in the service and within the pressure range for which they were manufactured. In the case of products or parts not wholly of Seller's manufacture, Seller's liability shall be limited to the extent of its recovery from the manufacturer of such products or parts under its liability to Seller.

Any repair work performed by Seller is warranted for one year from completion of such repairs and applies only to work performed.

If, within these specified periods, Seller receives notice from Buyer of any alleged defect in or nonconformance of any product or repair and if, in the Seller's sole judgment, the product or repair does not conform or is found to be defective in material or workmanship, then, Buyer shall, at Seller's request, return the part or product F.O.B. to Seller's designated plant or service location. Seller has no liability for removal or reinstallation of products or equipment from below the surface of the water. Seller, at its option and expense, shall repair or replace the defective part or product, or repay to Buyer the full price paid by Buyer for such defective part, repair or product. Any repayment of purchase price shall be without interest.

Seller's warranty liability, including defects caused by Seller's negligence, shall be limited to such repair, replacement or refund, and shall not include claims for labor costs, expenses of Buyer resulting from such defects, recovery under general tort law or strict liability or for damages resulting from delays, loss of use, or other direct, indirect, incidental or consequential damages of any kind. Seller will not be responsible for failures of products which have been in any way tampered with or altered by anyone other than an authorized representative of Seller, failures due to lack of compliance with recommended maintenance procedures or products which have been repaired or altered in such a way (in Seller's judgment) as to affect the products adversely. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, STATUTORY OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE WHICH EXCEED THE FOREGOING WARRANTY.

9. NUCLEAR SALES:

The products sold hereunder are not designed or manufactured for use in or with any atomic installation or activity. If the Buyer or ultimate user of these products intends to use them in such an installation or activity, Seller's Nuclear Terms of Sale shall be part of and control this contract. Seller will furnish Buyer with a copy of its Nuclear Terms of Sale upon request.

10. PATENT INFRINGEMENT:

Seller warrants that the use or sale of material or apparatus sold or rented by it to Buyer hereunder will not infringe United States' patents of others covering such material or apparatus by itself, and hereby agrees to indemnify Buyer against judgment for damages for such infringement of any such patent, provided that Buyer shall, upon receipt of any claim for infringement of any such patent or threat of suit for such infringement or upon the filing of any suit for infringement, whichever comes first, promptly notify Seller in writing and afford Seller full opportunity, at its option and its own expense, to answer such claim or threat of suit, assume the control of the defense of said suit, and settle or compromise same in any way Seller sees fit. Other than court-awarded judgments as aforesaid Seller shall not be liable

for any delays, loss of use or for other direct, indirect, incidental or consequential damages incurred by reason of any such judgment. Seller does not warrant that such material or apparatus (a) will not infringe any such patent when not manufactured by or for Seller or when specially made in whole or in part to the Buyer's design specification and such infringement arises from the inclusion of such specified design or (b), if used or sold in combination with other material or apparatus, or if used in the practice of a process, will not, as a result of such combination or use, infringe any patent covering such combination or process; and Seller shall not be liable for and does not indemnify Buyer for damages or losses of any nature whatsoever resulting from actual or alleged patent infringement arising pursuant to (a) or (b) above.

11. SELLER'S RIGHT TO MANUFACTURE:

Seller in its sole discretion shall have the right to manufacture the products provided hereunder as far in advance of its estimated shipping schedule as it deems appropriate. Seller expressly reserves the right to change or modify the design and construction of any product in due course of Seller's manufacturing procedure without incurring any obligation or liability to furnish or install such changes, modifications or improvements to products previously or subsequently sold.

12. ENGINEERING AND SERVICE:

Upon request, Seller will provide engineering and/or technical information regarding its products and their uses and if feasible, will provide personnel to assist Buyer in effecting field installations and/or field service. Any such information, service or assistance so provided, whether with or without charge, shall be advisory only. In that regard, neither Seller nor Buyer assumes any liability for the acts or omissions of the other party except as may be provided in these terms.

13. LABOR STANDARDS:

Seller hereby certifies that these products were produced in accordance with all applicable requirements of Section 6, 7 and 12 of the Fair Labor Standards Act as amended and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

14. INSPECTION:

Unless otherwise agreed in writing, final inspection and acceptance of products must be made at Seller's plant or other shipping or receiving point designated by Seller and shall be conclusive except as regards latent defects. Buyer's representatives may inspect at the Seller's plant or shipping point during working hours prior to shipment in such manner as will not interfere with operations.

15. DELIVERY AND ACCEPTANCE:

Delivery shall be in accordance with the requirements in the Purchase Contract, provided, in the event Buyer is unable to accept delivery upon completion of the manufacture of the Goods in accordance with such requirements,

Buyer agrees that (i) title and risk of ownership shall pass to Buyer on date of Seller's invoice and (ii) Buyer will make payments within thirty days after date of such invoice. Seller shall retain custodial risk of loss until delivery is made in accordance with such requirements.

16. TRANSPORTATION CHARGES, ALLOWANCES, CLAIMS:

All prices are F.O.B. Seller's plant or other designated shipping point.

No freight is allowed unless stated in Seller's quotation (if any) or in a written contract which may exist between Seller and Buyer at the time of shipment. If Seller's quotation or a written contract states that all or a portion of freight is allowed, all prices are F.O.B. Seller's plant or other designated shipping point, with most economical surface transportation allowed. If the quoted or contractual price includes transportation, Seller reserves the right to designate the common carrier and to ship in the manner it deems most economical. Added costs due to special routing requested by the Buyer are chargeable to the Buyer. Under no circumstances is any freight allowance which is absorbed by Seller to be deducted from the selling price. If the quoted price or contract includes transportation, no deduction will be made in lieu thereof whether Buyer accepts shipment at plant, warehouse, freight station, or otherwise supplies its own transportation. When sales are made from the Seller's warehouse, Seller reserves the right to charge either actual or pro-rated freight from Seller's principle point of manufacture to Seller's warehouse. Buyer assumes risk of loss upon delivery to the carrier, regardless of who pays shipping costs.

Seller endeavors to pack or prepare all shipments so that they will not break, rust or deteriorate in transit, but does not guarantee against such damage. Unless requested in writing by the Buyer, no shipments are insured by Seller against damage or loss in transit. Seller will place insurance as nearly as possible in accordance with Buyer's written instructions but in such case Seller acts only as agent between the insurance company and the Buyer and assumes no liability whatsoever.

Any claims for shipping loss, breakage or damage (obvious or concealed) are Buyer's responsibility and should be made to the carrier. All claims regarding shortages must be made within thirty (30) days from receipt of shipment and must be accompanied by the packing list(s) covering the shipment.

17. CONSULAR INVOICES:

Consular fees for legalizing invoices, stamping bills of lading, or other documents required by the laws of any country or destination are not included in quotations or selling prices. If instructed in writing, Seller will make arrangements for consular documents and declarations as agent of the Buyer, but Seller assumes no liability whatsoever as a result of making such arrangements. Seller assumes no responsibility for any fines or other charges imposed due to errors or incorrect declarations.

18. INDEMNIFICATION AND LIMITATION OF LIABILITY:

A. INDEMNIFICATION:

Seller agrees to indemnify Buyer and hold Buyer harmless against any claims, demands or causes of action for property damage or personal injury (including death) caused by the negligent act or omission of any employee, agent or subcontractor of Seller and not contributed to by the negligence of Buyer, its employees, its agents or any third party. Seller shall not be responsible for the acts and workmanship of employees, agents, contractors or subcontractors of Buyer or any third party, nor for failure or malfunction of any tools, materials, equipment, products, supplies, facilities or devices not manufactured and supplied by Seller. Buyer agrees to hold Seller harmless from any and all losses, claims, or damages arising from subsurface damage, surface damage caused by subsurface damage, loss of hydrocarbons and from pollution, regardless of whether such damages, losses or claims were caused by the negligence or sole negligence of Seller, it being the intent of the parties that this indemnity shall apply to property of Buyer or to that of any third party.

B. LIMITATION OF LIABILITY:

UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES, INCLUDING, BUT NOT LIMITED TO LOSS OF ANTICIPATED PROFITS, LOSS OF USE OF EQUIPMENT OR OF ANY INSTALLATION, SYSTEM OR FACILITY INTO WHICH SELLER'S EQUIPMENT MAY BE LOCATED OR AT WHICH SELLER, ITS AGENT OR SUBCONTRACTOR MAY BE PERFORMING WORK. Seller's total responsibility for any claims, damages, losses or liabilities arising out of or related to its performance of this contract or the products or services covered hereunder shall not exceed the purchase price.

19. MODIFICATION, RESCISSION & WAIVER:

The terms herein may not be modified or rescinded nor any of its provisions waived unless such modification, rescission or waiver is in writing and signed by an authorized employee of Seller at its office in Houston, Texas.

Failure of Seller to insist in anyone or more instances upon the performance of any of the terms and conditions of the contract or the failure of Seller to exercise any of its rights hereunder shall not be construed as a waiver or relinquishment of any such term, condition, or right hereunder and shall not affect Seller's right to insist upon strict performance and compliance with regard to any unexecuted portions of this contract or future performance of these terms and conditions.

All orders must be accepted by an authorized employee of Seller. The rights and duties of the parties and construction and effect of all provisions hereof shall be governed by and construed according to the internal laws of the State of Texas. Any disputes which arise under this agreement shall be venued in the District Court of Harris County, Texas or in the Southern District of Texas.

FLOATING BALL VALVES

TRADE MARK INFORMATION

References in this catalog to registered trademarks or product designations, which are owned by Cooper Cameron Corporation are as follows:

Cameron®
Demco®
DynaCentric®
DynaSeal®
Foster®
NAVCO®
Nutron®
Orbit®
Pow-R-Seal®
Saf-T-Seal®
Thornhill Craver™
TruSeal®
Unibolt™
W-K-M®

References in this catalog to registered trademarks or product designations, which are not owned by Cooper Cameron Corporation are as follows:

Trademark	Owner
Inconel	INCO Nickel Sales, Inc.
Monel	INCO Alloys International
Viton	E.I. DuPont De Nemours & Company
Impreglon	S.R. Metal Protection Ltd.
Devlon	Devol Engineering Limited
Teflon	E.I. DuPont De Nemours & Company

NUTRON T3 & B3 FLOATING BALL VALVES

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Netherlands
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Poland
Qatar
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VALVES**

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STAINLESS STEEL BALL VALVES

Two-Piece Full Bore

CAT. NO. 2500

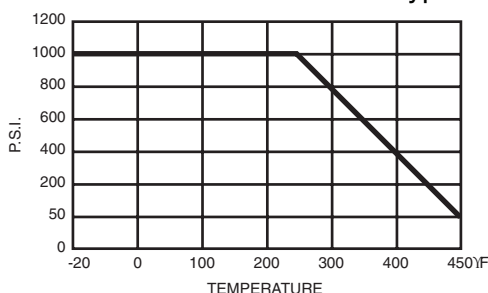


CAT. NO. 2500
Full Bore $\frac{1}{4}$ " - 3"

- For chemical and industrial applications
- Adjustable stem packing
- Design for easy actuator mounting
- Blow-out-proof stem design
- Body and end caps quality investment casting
- Padlocking Devices
- SUITABLE FOR ACTUATION
- **CSA 3.16 Certified** (minus 40°C) for Natural and Propane Gas. (Sizes $\frac{1}{4}$ " - 2")

SPECIFICATIONS

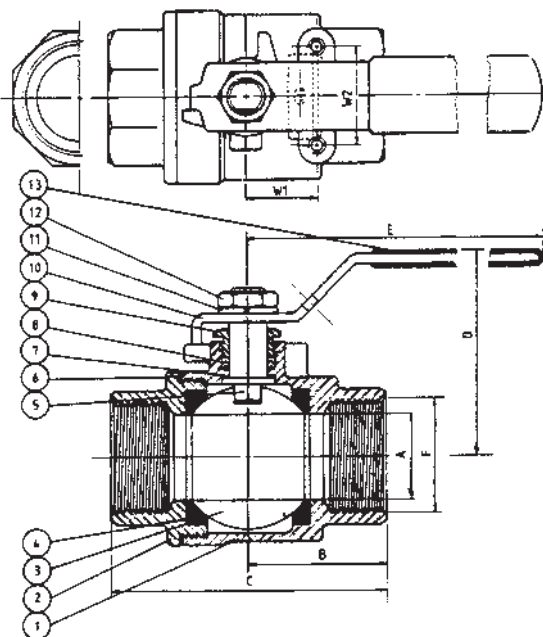
- Pressure Rating: 2000 psi WOG $\frac{1}{4}$ " to 1"
1500 psi WOG $1\frac{1}{4}$ " to 2"
1000 psi WOG $2\frac{1}{2}$ " to 3"
- End Types: NPT



Material List

No.	Part Name	Specification	QTY.
1	Body	ASTM-A351-GRADE-CF8M	1
2	End Cap	ASTM-A351-GRADE-CF8M	1
3	Ball	ASTM-A351-GRADE-CF8M	1
4	Seat	TFM1600 * or RPTFE	2
5	Stem	SS316	1
6	Joint Gasket	TEFLON	1
7	Thrust Washer	REINFORCED TFE *	1
8	Stem Packing	TEFLON	1 Set
9	Packing Gland	SS304	1
10	Handle	SS304	1
11	Stem Washer	SS304	1
12	Stem Nut	SS304	1
13	Plastic Cover	PLASTIC	1
	Locking Device	SS304	

* TFM 1600 on sizes $\frac{1}{4}$ " - 2"



DIMENSIONS (mm)

Size	A	B	C	D	E	W1	W2	F	C _v Factor
$\frac{1}{4}$ "	11.6	27.5	55	50	96	12.7	28.5	$\frac{1}{4}$ " NPT	6
$\frac{3}{8}$ "	12.7	27.5	55	50	96	12.7	28.5	$\frac{1}{4}$ " NPT	7
$\frac{1}{2}$ "	15	32.5	65	53	96	12.7	28.5	$\frac{1}{2}$ " NPT	10
$\frac{3}{4}$ "	20	38.5	77	64	125	22.4	35	$\frac{3}{4}$ " NPT	25
1"	25	44	88	66	125	22.4	35	1 NPT	35
$1\frac{1}{4}$ "	32	51	102	79	170	25.4	38.1	$1\frac{1}{4}$ " NPT	46
$1\frac{1}{2}$ "	38	55	110	83	170	25.4	38.1	$1\frac{1}{2}$ " NPT	80
2"	50	63	126	94	170	25.4	38.1	2 NPT	110
$2\frac{1}{2}$ "	65	81.5	161.5	130	250	N/A	58	$2\frac{1}{2}$ " NPT	310
3"	80	89	178	148	250	N/A	70	3 NPT	360

* **Note:** Due to continuous development of our range of valves, we reserve the right to alter the dimensions and information contained in all our literature as required.



ACTION:

Direct action; Pilot Output Pressure (Yellow) increases with temperature rise. As long as the temperature is above the set point, the output will remain at supply pressure. If the pilot flame goes out, the pressure decreases and drops to zero.

APPLICATION:

Used as a Pilot safety shutdown or as a high stack temperature shutdown.

TEMPERATURE RANGE:

-30°F minimum to 2100°F maximum.
-34°C minimum to 1149°C maximum.

OPERATION:

This Thermostat consists of a STAINLESS TUBE for monitoring the pilot flame, which is connected by a Low Expansion Alloy Rod to a BELLOWS ASSEMBLY. The changes in the length of the STAINLESS TUBE operate a PILOT PLUG seat. The PILOT PLUG consists of two stainless balls rigidly connected together. The seat at BALL 1 is the Output Pressure vent (Yellow to Atmosphere). The seat at BALL 2 is the Supply Pressure inlet (Violet to Yellow).

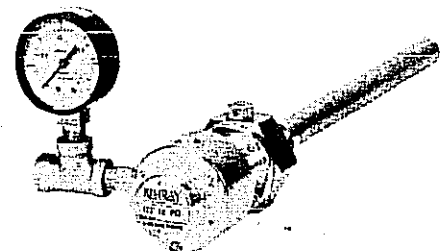
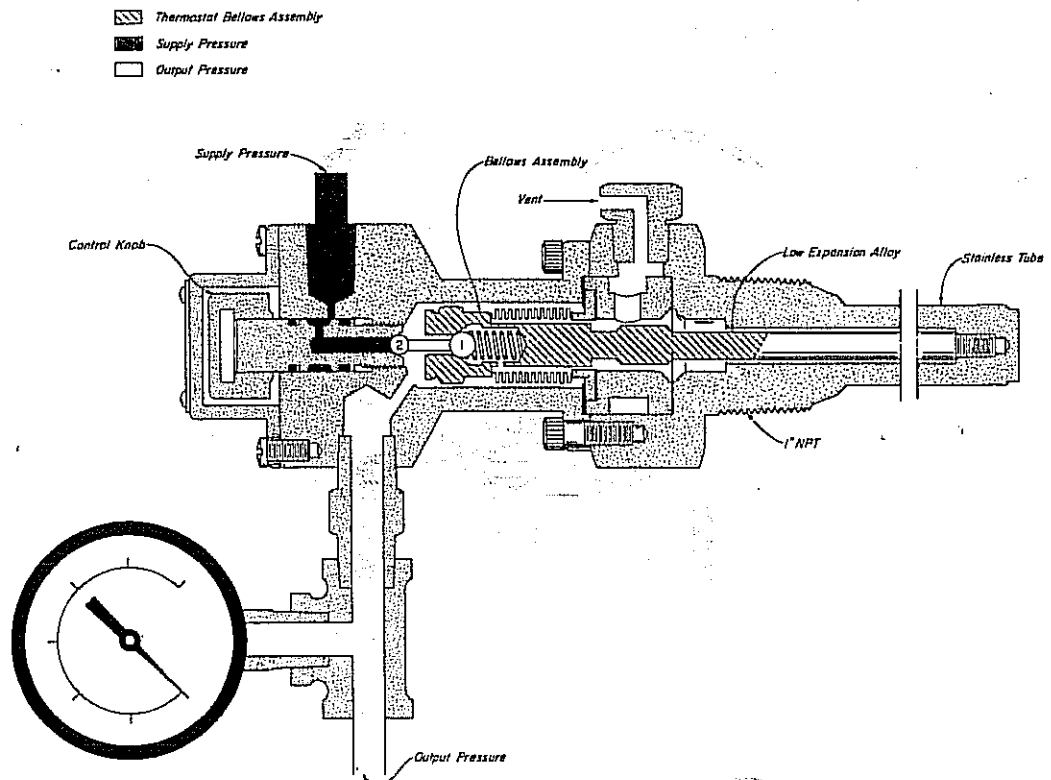
Assume the set point on the HT 12PG is above the temperature of the system. The vent at BALL 1 is open and the inlet at BALL 2 is closed. Output Pressure (Yellow) is at 0 psig or vented.

As the temperature rises in the system, the STAINLESS TUBE or outer tube increases in length to move the Thermostat Bellows Assembly in a direction to first close the seat at BALL 1 (Yellow to Atmosphere) and open the seat at BALL 2 (Violet to Yellow). This causes the Output Pressure (Yellow) to increase and hold a safety valve open.

If the temperature decreases (pilot flame goes out), the action reverses and Output Pressure (Yellow) goes to zero. This allows a safety valve to close, removing the gas supply for the burner and pilot light system.

SUPPLY PRESSURE:

5 psig minimum to 30 psig maximum.



KENCO ENGINEERING COMPANY

P.O. BOX 470426, TULSA, OK 74147-0426

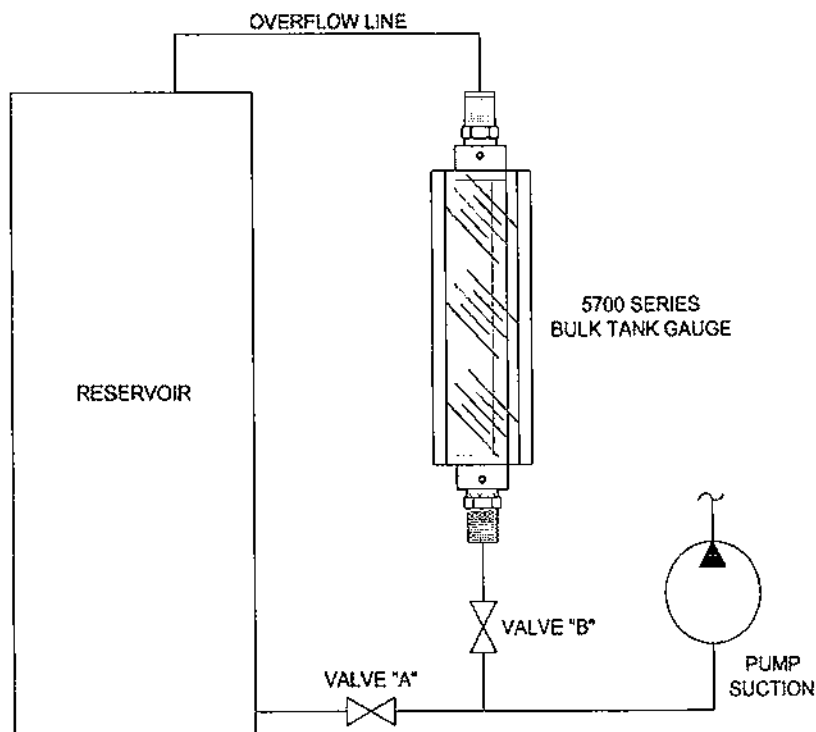
PHONE: (918) 663-4406 FAX: (918) 663-4480

<http://www.kenco-eng.com> e-mail: info@kenco-eng.com

MODEL 5700 BULK TANK GAUGE INSTALLATION AND OPERATING INSTRUCTIONS

Mount the 5700 bulk tank gauge in the outlet between the storage tank and the suction side of a chemical pump (if applicable). When making up gauge to process lines, tighten connections by placing the wrench on the hex of the nipple at the end of the gauge. Do not tighten connections by twisting gauge frame. If the top of the gauge is below the maximum possible liquid level or if there is a possibility of pressure or vacuum in the storage tank (other than atmospheric pressure), the vent connection on top of the 5700 should be connected to the upper part of the storage tank. A valve should be installed between the storage tank and the 5700.

To check the pump feed rate, close the valve between the storage tank and the 5700. Observe the change in fluid height in the 5700 after 1 minute. Multiply the number of divisions observed by the rate per division to obtain the pumping rate. Adjust pump and check rate again if necessary.





Product Information

Filters for Compressed Air

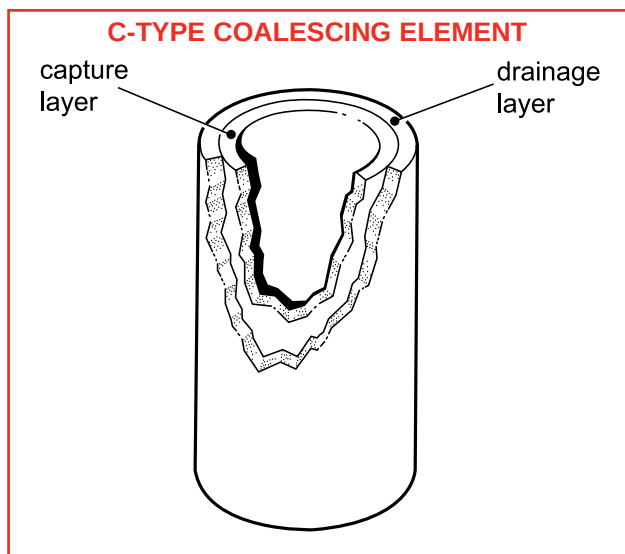
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Email: **info@headlinefilters.com**
Website: **www.headlinefilters.com**

COALESCING FILTRATION – HOW IT WORKS

Compressed air, even from a new installation, is a heavily contaminated product. Dirt is ingested through the compressor inlet, oil is carried over from the piston, and water condenses out at the higher air pressure. The demand for more sophisticated and more reliable pneumatic systems can only be met by ultra-clean compressed air.

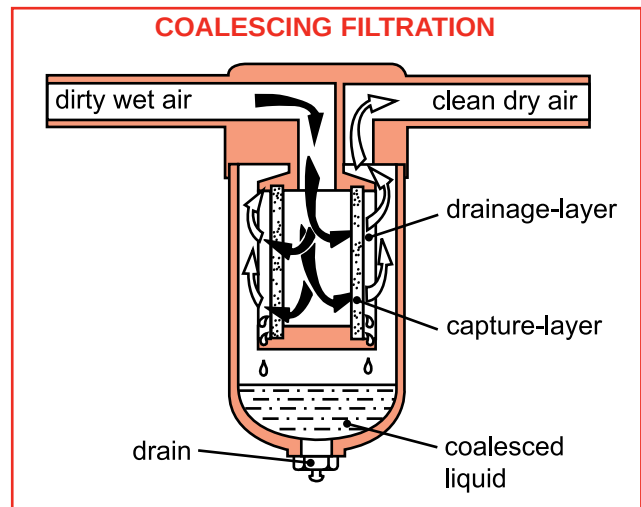
Ultra-clean compressed air is most conveniently produced in the production plant by the installation of a well-designed Coalescing Filtration System. This system will remove essentially all solid and liquid contamination, with minimum maintenance and low operating costs. Headline Coalescing Filters remove up to 99.99% of solid and liquid particulate down to 0.1 micron, producing truly clean compressed air.



Extensive housing range

At the heart of the Headline Coalescing Filter is the completely disposable C-type coalescing element. Made entirely from borosilicate glass microfibre and fluorocarbon binder, it is compatible with all compressor lubricants and will operate at temperatures up to 150°C.

The C-type element has a two layer structure, an inner particulate capture-layer and an outer drainage-layer. Liquid droplets remain mobile once captured and travel through the fine-pored capture-layer, along the intersecting microfibres, growing in size as they progress. These coalesced droplets are

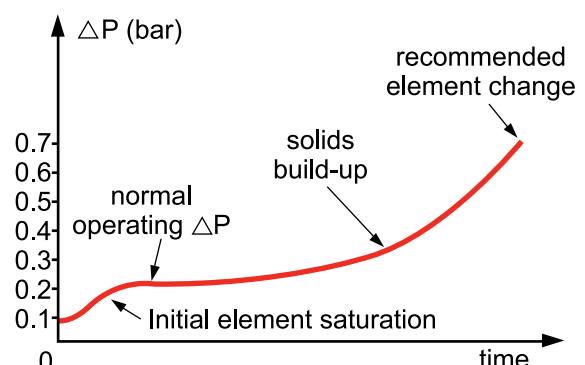


transferred to the larger-pored drainage layer, from where they drain by gravity into the filter bowl. Liquid collected in the filter bowl can be removed by a manual or fully automatic drain.

Headline C-type elements are completely self-supporting and are sealed into the filter housing simply by tightening a retaining nut. No end caps, gasketing materials or support cores are required. At element change only the filter material itself is discarded, and this complete disposability keeps replacement element costs down.

Headline Coalescing Filters are designed to have an initial dry pressure drop of less than 0.15 bar. Thereafter the pressure drop will increase very slowly as solid particles are captured and retained in the capture-layer of the element. Headline recommends changing the filter element when the pressure drop reaches 0.7 bar. The optional differential pressure indicator will give a visual warning of the need to change the filter element.

TYPICAL PRESSURE DROP vs TIME CURVE FOR COALESCING FILTERS



HEADLINE BENEFITS

- COMPLETE REMOVAL OF OIL, WATER AND SOLIDS
- HIGH FLOW RATES, LOW PRESSURE DROPS
- LOW COST, COMPLETELY DISPOSABLE MICROFIBRE FILTER ELEMENTS
- COMPATIBLE WITH ALL COMPRESSOR LUBRICANTS
- WIDE VARIETY OF HOUSING SIZES & OPTIONS AVAILABLE
- CHOICE OF MANUAL OR FULLY AUTOMATIC DRAINS

HOW TO SELECT THE CORRECT GRADE OF FILTER ELEMENT

GRADE 70C – COALESCER

has an efficiency rating of **95% against 0.1 micron** particles and aerosols and should be specified for all general purpose applications requiring clean compressed air e.g. protection of valves, cylinders, air tools, air motors and pumps etc.

GRADE 50C – COALESCER

has an efficiency rating of **99.99% against 0.1 micron** particles and aerosols and should be specified for the most demanding applications requiring the highest quality of air cleanliness e.g. air bearings, spray coating, instrumentation, laser systems, food contact etc. For best performance a grade 70C coalescer should be used as a prefilter to the grade 50C.

GRADE CC – VAPOUR ADSORPTION

Coalescing filters can only remove the oil and water present in compressed air lines as liquid aerosols. They cannot remove the small fraction of oil present as a true vapour or water vapour. Headline manufacture a range of vapour adsorption filter cartridges which will remove such gaseous contamination when used in conjunction with coalescing filters. These grade CC cartridges fit the complete range of Headline Compressed Air Housings and are described in detail on page 14. Please remember grade CC Vapour Adsorption Cartridges must always be protected by a grade 50C coalescing prefilter.

HOW TO ORDER

FILTER HOUSINGS – Please specify model no., port size and element grade required e.g. 360A-50C-1/4". Each housing comes complete with filter element fitted ready for installation.

ACCESSORIES – For your convenience please order accessory items at the time of ordering the filter housing.
Please check the exact order codes in the tables on pages 4 – 14.

REPLACEMENT – ELEMENTS – Coalescing elements are sold in packs of 3 or 10. Please refer to tables on pages 4 – 13 for the exact order codes. Please specify the grade required.

HOW TO SELECT THE CORRECT FILTER HOUSING

First select the correct grade of element using the guidelines above. Next estimate the maximum air flow and line pressure expected at the filter. Now turn to page 16 of this bulletin and select which housings have the necessary flow capacity for the grade of element chosen. Then refer to the specification tables on pages 4 – 11 to select the housing which has the necessary pressure and temperature capability, and the required drain option.

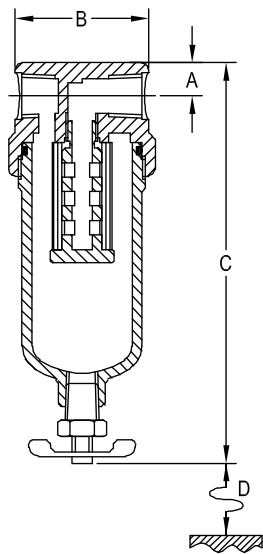
LARGER HOUSINGS

Details of larger Headline Filters are available on request.

INSTALLATION GUIDE

- Never install a filter with ports smaller than the existing air line size.
- Always install the filter as close as possible to the equipment being protected.
- Never exceed the maximum rated flow of the filter, or its efficiency will be jeopardized.
- Never install polycarbonate bowls where synthetic lubricants or solvents may contact them.
- Always use a grade 70C prefilter before a grade 50C final filter.
- Always protect grade CC vapour adsorption cartridges with a grade 50C coalescer.

High Efficiency Coalescing Filters



310



315



310A



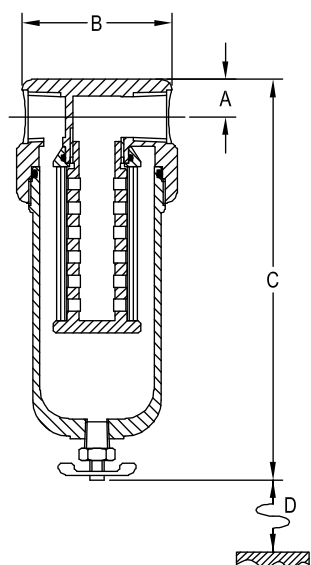
315A

Principal Specifications

Housing Model	310	315	310A	315A
Port Size - NPT	1/8"	1/4"	1/8"	1/4"
Drain Type	Manual	Manual	Manual	Manual
Maximum Pressure - Bar	10	10	16	16
Maximum Temperature - °C	50	50	120	120
Materials of Construction (2)				
Head	Al	Al	Al	Al
Bowl	Pc	Pc	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions				
A - mm	10	10	10	10
B - mm	40	40	40	40
C - mm	106	106	118	118
D - mm	38	38	38	38
Volume - cc	35	35	45	45
Weight - kg	0.11	0.11	0.16	0.16
Accessories				
Standard Gasket Set	GN315	GN315	GN315	GN315
Viton Gasket Set	GV315	GV315	GV315	GV315
Mounting Bracket	MB315	MB315	MB315	MB315
Bowl Guard	BG315	BG315	N/A	N/A
Filter Element Codes (1)				
Disposable Element	12-32-xx	12-32-xx	12-32-xx	12-32-xx

Notes (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.

High Efficiency Coalescing Filters



360



360F



360A



360AFI

Principal Specifications

Housing Model	360	360F	360I	360FI	360A	360AF	360AI	360AFI
Port Size - NPT	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
B - mm	62	62	62	62	62	62	62	62
C - mm	162	175	202	215	164	175	204	215
D - mm	72	72	72	72	72	72	72	72
Volume - cc	150	130	150	130	165	145	165	145
Weight - kg	0.385	0.385	0.385	0.385	0.50	0.50	0.50	0.50
Accessories								
Standard Gasket Set	GN360	GN360	GN360	GN360	GN360	GN360	GN360	GN360
Viton Gasket Set	GV360	GV360	GV360	GV360	GV360	GV360	GV360	GV360
Mounting Bracket	MB360	MB360	MB360I	MB360I	MB360	MB360	MB360I	MB360I
Bowl Guard	BG360	-	BG360	-	-	-	-	-
Filter Element Codes (1)								
Disposable Element	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx

- Notes (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 (3) Auto float drains require minimum 1 bar pressure to function correctly.

High Efficiency Coalescing Filters

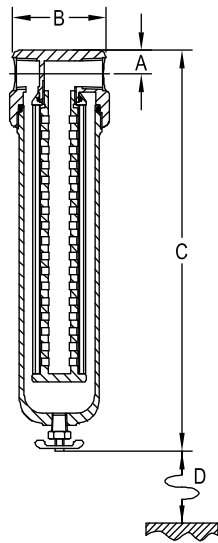


Principal Specifications

Housing Model	365	365F	365I	365FI	365A	365AF	365AI	365AFI
Port Size - NPT	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
B - mm	62	62	62	62	62	62	62	62
C - mm	162	175	202	215	164	175	204	215
D - mm	72	72	72	72	72	72	72	72
Volume - cc	150	130	150	130	165	145	165	145
Weight - kg	0.385	0.385	0.385	0.385	0.50	0.50	0.50	0.50
Accessories								
Standard Gasket Set	GN360	GN360	GN360	GN360	GN360	GN360	GN360	GN360
Viton Gasket Set	GV360	GV360	GV360	GV360	GV360	GV360	GV360	GV360
Mounting Bracket	MB360	MB360	MB360I	MB360I	MB360	MB360	MB360I	MB360I
Bowl Guard	BG360	-	BG360	-	-	-	-	-
Filter Element Codes (1)								
Disposable Element	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx

Notes (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 (3) Auto float drains require minimum 1 bar pressure to function correctly.

High Efficiency Coalescing Filters



370



370F



370FI



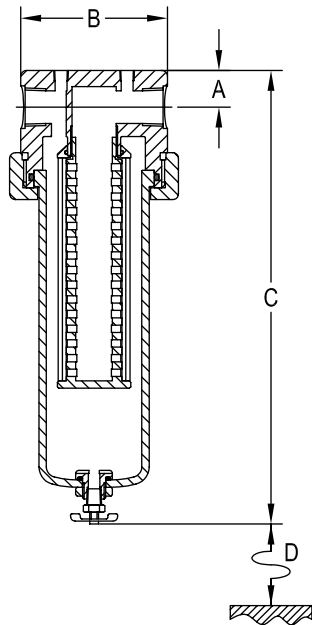
370AFI

Principal Specifications

Housing Model	370	370F	370I	370FI	370A	370AF	370AI	370AFI
Port Size - NPT	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
B - mm	62	62	62	62	62	62	62	62
C - mm	265	265	305	305	265	265	305	305
D - mm	190	140	190	140	190	140	190	140
Volume - cc	300	280	300	280	315	295	315	295
Weight - kg	0.465	0.465	0.465	0.465	0.64	0.64	0.64	0.64
Accessories								
Standard Gasket Set	GN360	GN360	GN360	GN360	GN360	GN360	GN360	GN360
Viton Gasket Set	GV360	GV360	GV360	GV360	GV360	GV360	GV360	GV360
Mounting Bracket	MB360	MB360	MB360I	MB360I	MB360	MB360	MB360I	MB360I
Bowl Guard	BG370	BG370	BG370	BG370	-	-	-	-
Filter Element Codes (1)								
Disposable Element	25-178-xx	25-127-xx	25-178-xx	25-127-xx	25-178-xx	25-127-xx	25-178-xx	25-127-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

High Efficiency Coalescing Filters



380



380F



380A



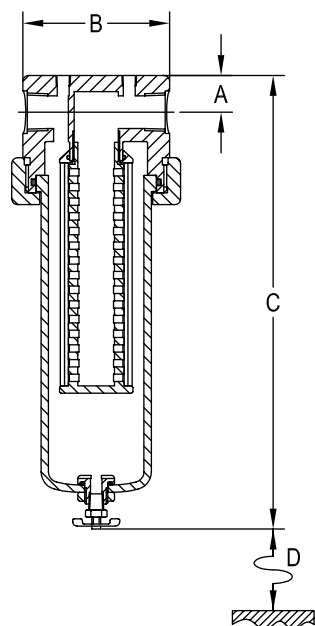
380AI

Principal Specifications

Housing Model	380	380F	380I	380FI	380A	380AF	380AI	380AFI
Port Size - NPT	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	25	25	25	25	25	25	25	25
B - mm	100	100	100	100	100	100	100	100
C - mm	305	305	382	382	305	305	382	382
D - mm	152	152	152	152	152	152	152	152
Volume - cc	675	655	675	655	675	655	675	655
Weight - kg	1.60	1.60	1.74	1.74	2.08	2.08	2.22	2.22
Accessories								
Standard Gasket Set	GN380	GN380	GN380	GN380	GN380	GN380	GN380	GN380
Viton Gasket Set	GV380	GV380	GV380	GV380	GV380	GV380	GV380	GV380
Mounting Bracket	MB380	MB380	MB380I	MB380I	MB380	MB380	MB380I	MB380I
Filter Element Codes (1)								
Disposable Element	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

High Efficiency Coalescing Filters



383



383F



383I



383A

Principal Specifications

Housing Model	383	383F	383I	383FI	383A	383AF	383AI	383AFI
Port Size - NPT	1"	1"	1"	1"	1"	1"	1"	1"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	25	25	25	25	25	25	25	25
B - mm	100	100	100	100	100	100	100	100
C - mm	305	305	382	382	305	305	382	382
D - mm	152	152	152	152	152	152	152	152
Volume - cc	675	655	675	655	675	655	675	655
Weight - kg	1.60	1.60	1.74	1.74	2.08	2.08	2.22	2.22
Accessories								
Standard Gasket Set	GN380	GN380	GN380	GN380	GN380	GN380	GN380	GN380
Viton Gasket Set	GV380	GV380	GV380	GV380	GV380	GV380	GV380	GV380
Mounting Bracket	MB380	MB380	MB380I	MB380I	MB380	MB380	MB380I	MB380I
Filter Element Codes (1)								
Disposable Element	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

High Efficiency Coalescing Filters

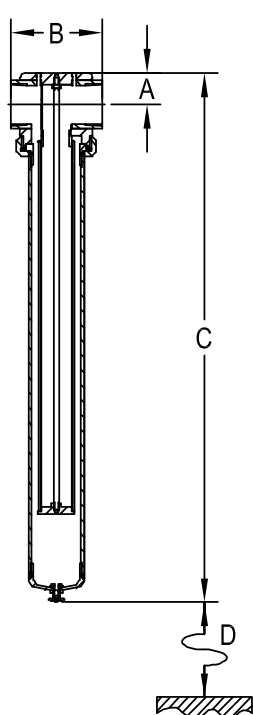


Principal Specifications

Housing Model	385A	385AF	385AI	385AFI	390A	390AF	390AI	390AFI
Port Size - NPT	1 1/2"	1 1/2"	1 1/2"	1 1/2"	2"	2"	2"	2"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	16	16	16	16	16	16	16	16
Maximum Temperature - °C	120	120	120	120	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	SS/Al	SS/Al	SS/Al	SS/Al	SS/Al	SS/Al	SS/Al	SS/Al
Bowl	Al	Al	Al	Al	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	47	47	47	47	47	47	47	47
B - mm	140	140	140	140	140	140	140	140
C - mm	415	415	492	492	655	655	732	732
D - mm	234	234	234	234	480	480	480	480
Volume - cc	2100	2080	2100	2080	3500	3480	3500	3480
Weight - kg	5.3	5.3	5.3	5.3	6.7	6.7	6.7	6.7
Accessories								
Standard Gasket Set	GN385	GN385	GN385	GN385	GN385	GN385	GN385	GN385
Viton Gasket Set	GV385	GV385	GV385	GV385	GV385	GV385	GV385	GV385
Mounting Bracket	MB385	MB385	MB385	MB385	MB385	MB385	MB385	MB385
Filter Element Codes (1)								
Disposable Element	51-230-xx	51-230-xx	51-230-xx	51-230-xx	51-476-xx	51-476-xx	51-476-xx	51-476-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

High Efficiency Coalescing Filters

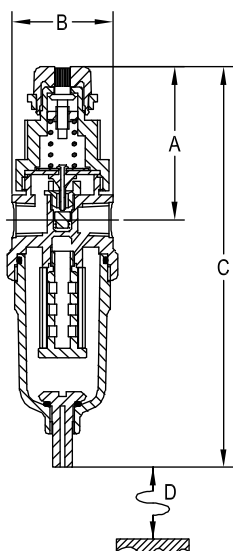


Principal Specifications

Housing Model	395A	395AF	395AI	395AFI
Port Size - NPT	3"	3"	3"	3"
Drain Type (3)	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	16	16	16	16
Maximum Temperature - °C	120	120	120	120
Materials of Construction (2)				
Head	Al	Al	Al	Al
Bowl	Al	Al	Al	Al
Internals	Al/SS	Al/SS	Al/SS	Al/SS
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions				
A - mm	65	65	65	65
B - mm	190	190	190	190
C - mm	1075	1151	1075	1151
D - mm	770	770	770	770
Volume - cc	7055	7035	7055	7035
Weight - kg	10.9	10.9	10.9	10.9
Accessories				
Standard Gasket Set	GN395	GN395	GN395	GN395
Viton Gasket Set	GV395	GV395	GV395	GV395
Mounting Bracket	MB395	MB395	MB395	MB395
Filter Element Codes (1)				
Disposable Element	63-762-xx	63-762-xx	63-762-xx	63-762-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

Coalescing Filter Regulators



FR310



FR315A



FR360A

Principal Specifications

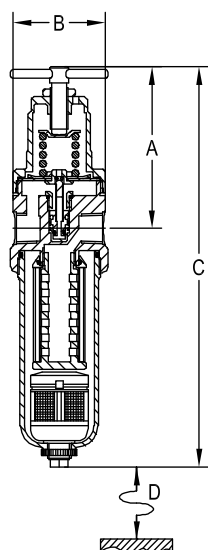
Housing Model (1)	FR310	FR315	FR310A	FR315A	FR360	FR360F	FR360A	FR360AF
Port Size - NPT	1/8"	1/4"	1/8"	1/4"	1/4"	1/4"	1/4"	1/4"
Gauge Port - NPT	1/8"	1/8"	1/8"	1/8"	1/4"	1/4"	1/4"	1/4"
Drain Type (4)	Manual	Manual	Manual	Manual	Manual	Automatic	Manual	Automatic
Maximum Inlet Pressure - Bar	10	10	16	16	10	10	16	16
Maximum Temperature - °C	50	50	100	100	50	50	100	100
Materials of Construction (3)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Al	Al	Pc	Pc	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	61	61	61	61	115	115	115	115
B - mm	40	40	40	40	68	68	68	68
C - mm	160	160	170	170	270	290	280	290
D - mm	38	38	38	38	72	72	72	72
Weight - kg	0.220	0.220	0.260	0.260	1.00	1.00	1.10	1.10
Accessories								
Gasket Set	GNFR315	GNFR315	GNFR315	GNFR315	GNFR360	GNFR360	GNFR360	GNFR360
Mounting Bracket	MBFR315	MBFR315	MBFR315	MBFR315	MBFR360	MBFR360	MBFR360	MBFR360
Filter Element Codes (2)								
Disposable Element	12-32-xx	12-32-xx	12-32-xx	12-32-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx

- Notes
- (1) Add regulated range suffix, 30, 60, 100, e.g. FR315-100-50C
 - (2) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (3) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (4) Auto float drains require minimum 1 bar pressure to function correctly.

Regulated Range

0 - 2 Bar -	Suffix 30
0.5 - 4 Bar -	Suffix 60
0.7 - 7 Bar -	Suffix 100

Coalescing Filter Regulators



FR365F



FR365A



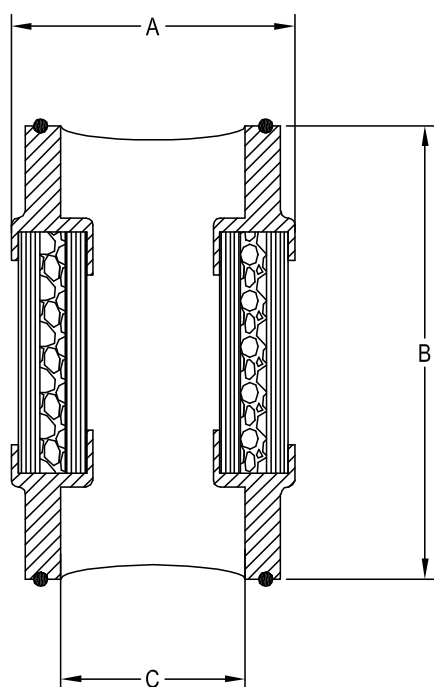
FR370A

Principal Specifications

Housing Model	FR365	FR365F	FR365A	FR365AF	FR370	FR370F	FR370A	FR370AF
Port Size - NPT	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Gauge Port - NPT	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Inlet Pressure - Bar	10	10	16	16	10	10	16	16
Maximum Temperature - °C	50	50	100	100	50	50	100	100
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Al	Al	Pc	Pc	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	115	115	115	115	115	115	115	115
B - mm	68	68	68	68	68	68	68	68
C - mm	270	290	280	290	380	380	380	380
D - mm	72	72	72	72	184	140	184	140
Weight - kg	1.00	1.00	1.10	1.10	1.05	1.05	1.20	1.20
Accessories								
Gasket Set	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360
Mounting Bracket	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360
Filter Element Codes (1)								
Disposable Element	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-178-xx	25-127-xx	25-178-xx	25-127-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

Vapour Adsorption Cartridges



12-32-xxTP



25-64.xx



25-178-xx

Headline vapour adsorption cartridges are designed to fit all standard size filter housings to provide vapour adsorption over the full range of line pressures.

Flow rates are the same as for grade 50 elements in the same size bodies. However, with adsorption more important considerations will be the volume of adsorbent and the contact time.

Principal Specifications

Cartridge Type (1)	12-32-CC (2)	12-57-CC (3)	25-64-CC (4)	25-178-CC (4)	51-230-CC	51-476-CC
Maximum Temperature - °C	50	50	50	50	50	50
Principal Dimensions						
A - mm	24	24	40	40	65.5	65.5
B - mm	32	57	64	178	230	476
C - mm	12.5	12.5	26	26	52	52
Volume - cc	6	9	20	90	175	415

- Notes
- (1) Replace 'xx' with grade required, CC, 4A, 13X, SG, MB, PP.
 - (2) Add suffix 'TP' for use with 700 series plastic and 300 series aluminium housings, e.g. 12-32-CCTP.
 - (3) Add suffix 'TS' for use with 110 and 120 series stainless steel housings, e.g. 12-57-SGTS.
 - (4) Add suffix 'TP' for use with 700 series plastic and 300 series aluminium housings, e.g. 25-64-MBTP, 25-178-CCTP.

ACCESSORIES

MOUNTING BRACKETS

Filter Mounting Brackets are available for most Headline Filters. The model no. for each housing is given in the tables on pages 4-13.



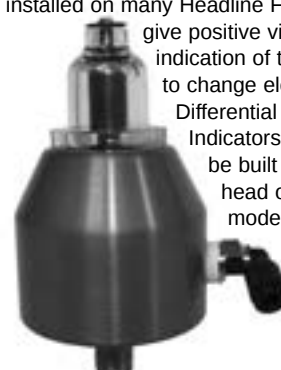
BOWL GUARDS

Available for most filters with polycarbonate plastic bowls to protect against impact damage. Headline recommends that, in the interest of safety, bowl guards always be installed.



DIFFERENTIAL PRESSURE INDICATORS

Differential Pressure Indicators can be installed on many Headline Filters to give positive visual indication of the need to change elements. Differential Pressure Indicators can also be built into the head on many models.



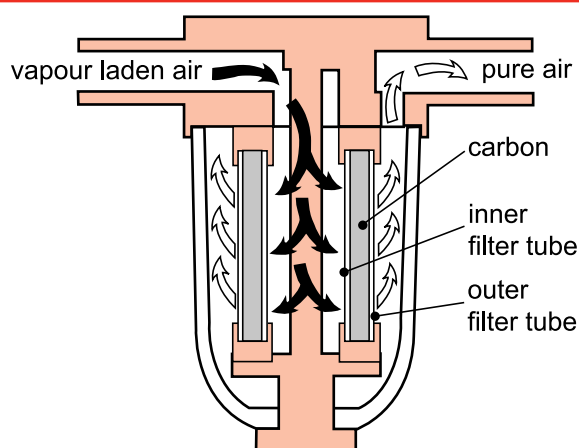
REMOVE LAST TRACES OF OIL VAPOUR AND ODOUR FROM COMPRESSED AIR

Headline grade CC vapour Adsorption Cartridges fit the standard range of compressed air housings and are designed to remove the last traces of oil vapour and odour from compressed air. The cartridge consists of a cylinder of activated carbon cloth sandwiched between two filter tubes providing the most effective known adsorption of organic vapours. Carbon cloth is up to 20 times more efficient in the removal of organic vapours than granulated carbon, giving Headline cartridges exceptional flow and life characteristics.

ADSORPTION CHARACTERISTICS

EXCELLENT ADSORPTION	-	HYDROCARBONS C ₄ & LARGER FREONS OIL VAPOUR ALCOHOLS ALDEHYDES & KETONES AROMATIC HYDROCARBONS
LITTLE ADSORPTION	-	METHANE CARBON MONOXIDE CARBON DIOXIDE ACETYLENE AMMONIA AMINES HYDROCARBONS C ₃ & LOWER

GRADE CC ADSORPTION CARTRIDGES



GRADE CC ADSORPTION CARTRIDGE HOW IT WORKS

RECOMMENDED PREFILTER/ADSORBER COMBINATIONS

Line Size	Maximum flow rate at 7 bar	Prefilter Housing (use 50C element)	Adsorber Housing and cartridge code
1/4"	10 Nm ³ /hr	315, 315A	315, 315A + 12-32-CC
1/2"	29 Nm ³ /hr	360F, 360AF	360, 360A + 25-64-CC
1/2"	76 Nm ³ /hr	370F, 370AF	370A + 25-178-CC
3/4", 1"	154 Nm ³ /hr	380AF	380A + 38-152-CC
1 1/2"	241 Nm ³ /hr	385AF	385 + 51-230-CC
2"	482 Nm ³ /hr	390AF	390A + 51-476-CC
3"	1089 Nm ³ /hr	395AF	395A + 63-762-CC

AIR FLOW RATES in Nm³/hr at 0.15 bar Pressure Drop

HOUSING MODEL	LINE SIZE	ELEMENT GRADE	AIR LINE PRESSURE (bar)								
			1	2	3	4	5	6	7	10	16
315, 315A	1/8" or 1/4"	70C	15	21	28	37	44	50	58	79	122
		50C	4	6	9	11	13	15	17	24	37
		CC	2	4	5	6	7	8	10	13	21
360, 360I 360FI 360A, 360AF	1/4" or 1/2"	70C	31	48	62	77	94	109	125	172	266
		50C	12	19	24	29	37	42	48	66	103
		CC	7	11	14	18	21	25	29	39	62
370, 370I 370FI 370A, 370AF	1/2"	70C	73	107	144	180	218	252	288	395	611
		50C	29	43	58	72	87	101	115	158	244
		CC	19	29	38	48	57	67	76	106	163
380A, 380AF	3/4" or 1"	70C	191	286	380	478	574	672	764	1058	1628
		50C	50	71	96	120	144	168	193	264	407
		CC	40	57	76	96	115	134	154	212	327
385A, 385AF	1 1/2"	70C	383	571	760	957	1148	1344	1541	2115	3275
		50C	83	126	166	210	251	294	335	465	717
		CC	59	90	120	149	179	210	241	331	513
390A, 390AF	2"	70C	676	1012	1340	1674	2018	2352	2693	3694	5717
		50C	168	252	334	423	505	588	677	924	1434
		CC	119	181	240	300	357	420	482	663	1027
395A, 395AF	3"	70C	1350	2025	2700	3375	4050	4725	5400	7425	11475
		50C	390	585	780	975	1170	1365	1530	2145	3315
		CC	276	420	560	691	827	975	1089	1539	2374

- Notes
- (1) Airline pressures above 10 bar apply only to housings with aluminium bowls.
 - (2) Housings with polycarbonate bowls are limited to 10 bar.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.



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Product Information

Filters for Compressed Air

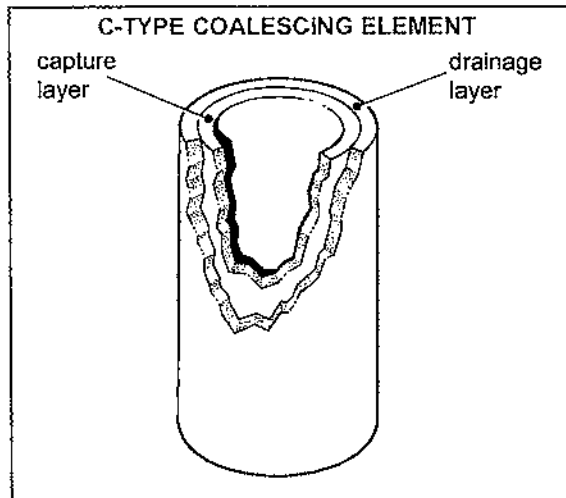
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COALESCING FILTRATION – HOW IT WORKS

Compressed air, even from a new installation, is a heavily contaminated product. Dirt is ingested through the compressor inlet, oil is carried over from the piston, and water condenses out at the higher air pressure. The demand for more sophisticated and more reliable pneumatic systems can only be met by ultra-clean compressed air.

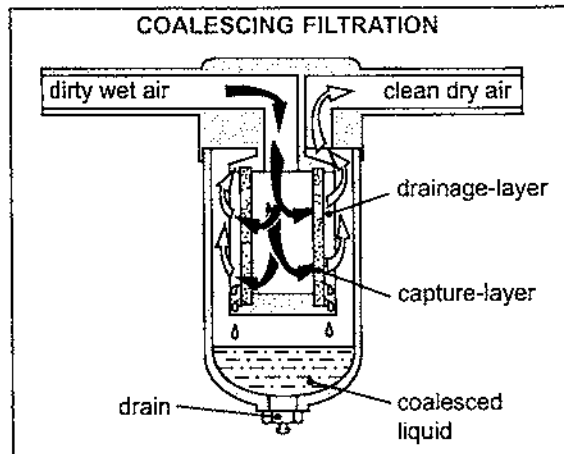
Ultra-clean compressed air is most conveniently produced in the production plant by the installation of a well-designed Coalescing Filtration System. This system will remove essentially all solid and liquid contamination, with minimum maintenance and low operating costs. Headline Coalescing Filters remove up to 99.99% of solid and liquid particulate down to 0.1 micron, producing truly clean compressed air.



Extensive housing range

At the heart of the Headline Coalescing Filter is the completely disposable C-type coalescing element. Made entirely from borosilicate glass microfibre and fluorocarbon binder, it is compatible with all compressor lubricants and will operate at temperatures up to 150°C.

The C-type element has a two layer structure, an inner particulate capture-layer and an outer drainage-layer. Liquid droplets remain mobile once captured and travel through the fine-pored capture-layer, along the intersecting microfibres, growing in size as they progress. These coalesced droplets are

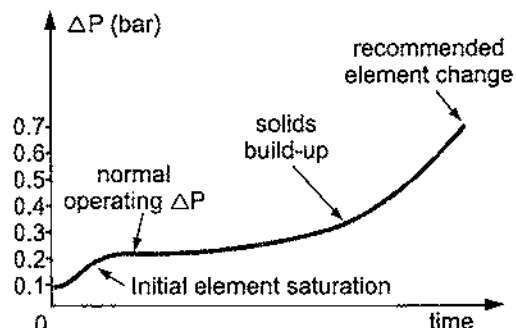


transferred to the larger-pored drainage layer, from where they drain by gravity into the filter bowl. Liquid collected in the filter bowl can be removed by a manual or fully automatic drain.

Headline C-type elements are completely self-supporting and are sealed into the filter housing simply by tightening a retaining nut. No end caps, gasketing materials or support cores are required. At element change only the filter material itself is discarded, and this complete disposability keeps replacement element costs down.

Headline Coalescing Filters are designed to have an initial dry pressure drop of less than 0.15 bar. Thereafter the pressure drop will increase very slowly as solid particles are captured and retained in the capture-layer of the element. Headline recommends changing the filter element when the pressure drop reaches 0.7 bar. The optional differential pressure indicator will give a visual warning of the need to change the filter element.

TYPICAL PRESSURE DROP vs TIME CURVE FOR COALESCING FILTERS



HEADLINE BENEFITS

- COMPLETE REMOVAL OF OIL, WATER AND SOLIDS
- HIGH FLOW RATES, LOW PRESSURE DROPS
- LOW COST, COMPLETELY DISPOSABLE MICROFIBRE FILTER ELEMENTS
- COMPATIBLE WITH ALL COMPRESSOR LUBRICANTS
- WIDE VARIETY OF HOUSING SIZES & OPTIONS AVAILABLE
- CHOICE OF MANUAL OR FULLY AUTOMATIC DRAINS

HOW TO SELECT THE CORRECT GRADE OF FILTER ELEMENT

GRADE 70C – COALESCER

has an efficiency rating of **95% against 0.1 micron** particles and aerosols and should be specified for all general purpose applications requiring clean compressed air e.g. protection of valves, cylinders, air tools, air motors and pumps etc.

GRADE 50C – COALESCER

has an efficiency rating of **99.99% against 0.1 micron** particles and aerosols and should be specified for the most demanding applications requiring the highest quality of air cleanliness e.g. air bearings, spray coating, instrumentation, laser systems, food contact etc. For best performance a grade 70C coalescer should be used as a prefilter to the grade 50C.

GRADE CC – VAPOUR ADSORPTION

Coalescing filters can only remove the oil and water present in compressed air lines as liquid aerosols. They cannot remove the small fraction of oil present as a true vapour or water vapour. Headline manufacture a range of vapour adsorption filter cartridges which will remove such gaseous contamination when used in conjunction with coalescing filters. These grade CC cartridges fit the complete range of Headline Compressed Air Housings and are described in detail on page 14. Please remember grade CC Vapour Adsorption Cartridges must always be protected by a grade 50C coalescing prefilter.

HOW TO ORDER

FILTER HOUSINGS – Please specify model no., port size and element grade required e.g. 360A-50C-1/4". Each housing comes complete with filter element fitted ready for installation.

ACCESSORIES – For your convenience please order accessory items at the time of ordering the filter housing. Please check the exact order codes in the tables on pages 4 – 14.

REPLACEMENT – ELEMENTS Coalescing elements are sold in packs of 3 or 10. Please refer to tables on pages 4 – 13 for the exact order codes. Please specify the grade required.

HOW TO SELECT THE CORRECT FILTER HOUSING

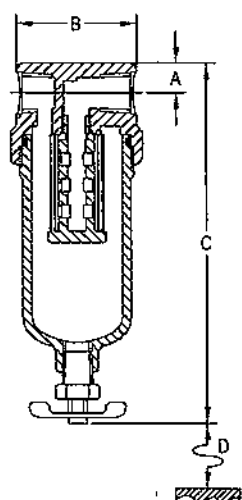
First select the correct grade of element using the guidelines above. Next estimate the maximum air flow and line pressure expected at the filter. Now turn to page 16 of this bulletin and select which housings have the necessary flow capacity for the grade of element chosen. Then refer to the specification tables on pages 4 – 11 to select the housing which has the necessary pressure and temperature capability, and the required drain option.

LARGER HOUSINGS

Details of larger Headline Filters are available on request.

INSTALLATION GUIDE

- Never install a filter with ports smaller than the existing air line size.
- Always install the filter as close as possible to the equipment being protected.
- Never exceed the maximum rated flow of the filter, or its efficiency will be jeopardized.
- Never install polycarbonate bowls where synthetic lubricants or solvents may contact them.
- Always use a grade 70C prefilter before a grade 50C final filter.
- Always protect grade CC vapour adsorption cartridges with a grade 50C coalescer.



310



315



310A

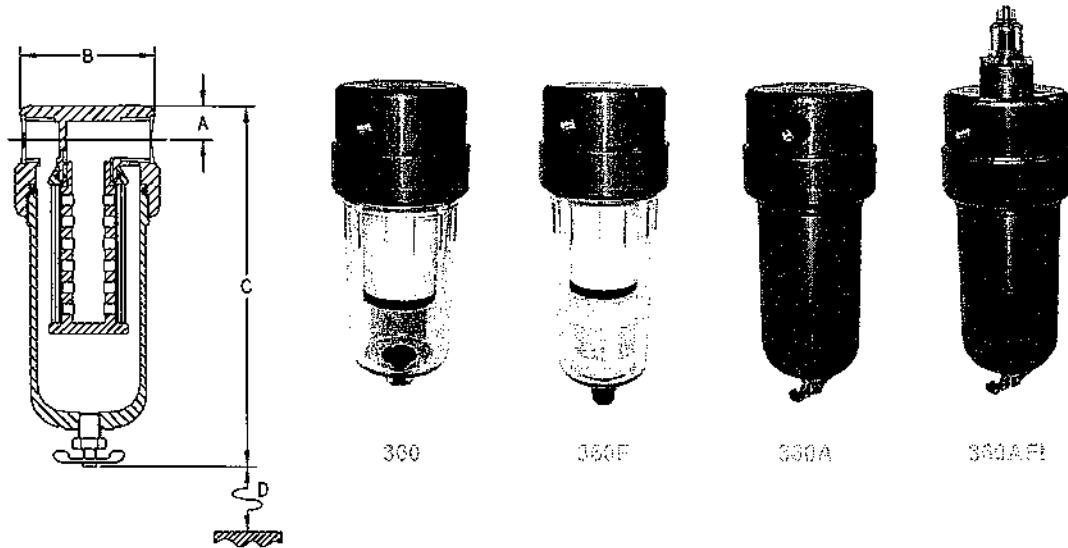


315A

Principal Specifications

Housing Model	310	315	310A	315A
Port Size - NPT	1/8"	1/4"	1/8"	1/4"
Drain Type	Manual	Manual	Manual	Manual
Maximum Pressure - Bar	10	10	16	16
Maximum Temperature - °C	50	50	120	120
Materials of Construction (2)				
Head	Al	Al	Al	Al
Bowl	Pc	Pc	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions				
A - mm	10	10	10	10
B - mm	40	40	40	40
C - mm	106	106	118	118
D - mm	38	38	38	38
Volume - cc	35	35	45	45
Weight - kg	0.11	0.11	0.16	0.16
Accessories				
Standard Gasket Set	GN315	GN315	GN315	GN315
Viton Gasket Set	GV315	GV315	GV315	GV315
Mounting Bracket	MB315	MB315	MB315	MB315
Bowl Guard	BG315	BG315	N/A	N/A
Filter Element Codes (1)				
Disposable Element	12-32-xx	12-32-xx	12-32-xx	12-32-xx

Notes (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.

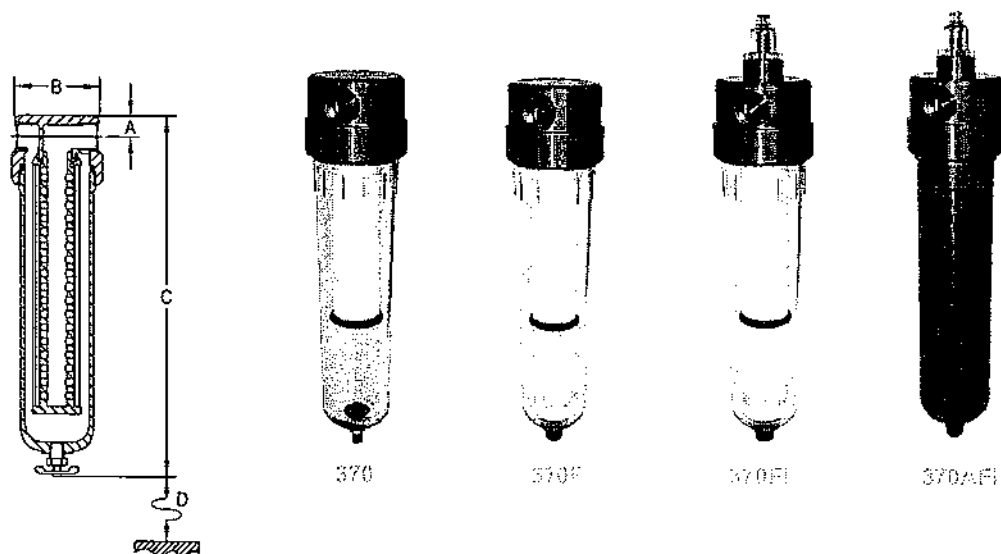


Principal Specifications

Housing Model	360	360F	360I	360FI	360A	360AF	360AI	360AFI
Port Size - NPT	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
B - mm	62	62	62	62	62	62	62	62
C - mm	162	175	202	215	164	175	204	215
D - mm	72	72	72	72	72	72	72	72
Volume - cc	150	130	150	130	165	145	165	145
Weight - kg	0.385	0.385	0.385	0.385	0.50	0.50	0.50	0.50
Accessories								
Standard Gasket Set	GN360	GN360	GN360	GN360	GN360	GN360	GN360	GN360
Viton Gasket Set	GV360	GV360	GV360	GV360	GV360	GV360	GV360	GV360
Mounting Bracket	MB360	MB360	MB360I	MB360I	MB360	MB360	MB360I	MB360I
Bowl Guard	BG360	-	BG360	-	-	-	-	-
Filter Element Codes (1)								
Disposable Element	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

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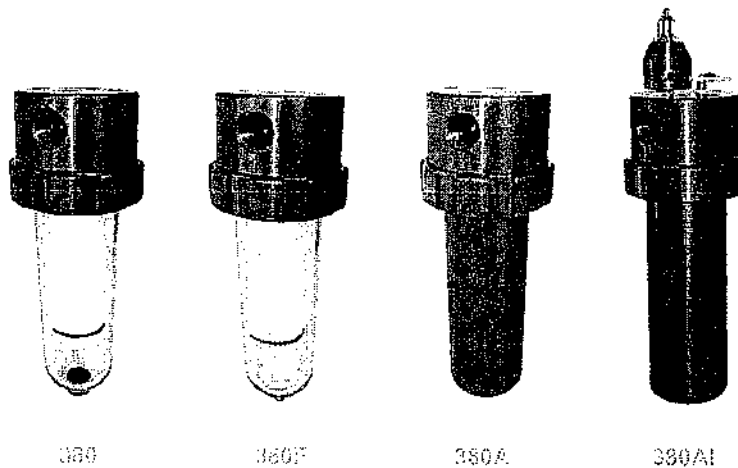
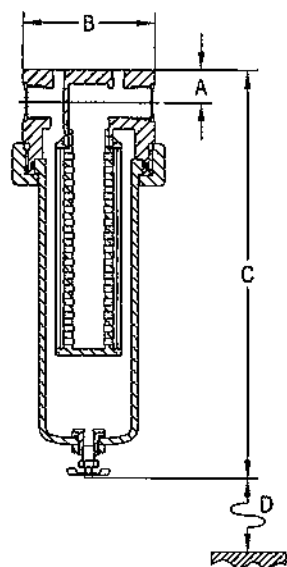


Principal Specifications

Housing Model	370	370F	370FI	370FI	370A	370AF	370AI	370AFI
Port Size - NPT	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
B - mm	62	62	62	62	62	62	62	62
C - mm	265	265	305	305	265	265	305	305
D - mm	190	140	190	140	190	140	190	140
Volume - cc	300	280	300	280	315	295	315	295
Weight - kg	0.465	0.465	0.465	0.465	0.64	0.64	0.64	0.64
Accessories								
Standard Gasket Set	GN360	GN360	GN360	GN360	GN360	GN360	GN360	GN360
Viton Gasket Set	GV360	GV360	GV360	GV360	GV360	GV360	GV360	GV360
Mounting Bracket	MB360	MB360	MB360I	MB360I	MB360	MB360	MB360I	MB360I
Bowl Guard	BG370	BG370	BG370	BG370	-	-	-	-
Filter Element Codes (1)								
Disposable Element	25-178-xx	25-127-xx	25-178-xx	25-127-xx	25-178-xx	25-127-xx	25-178-xx	25-127-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

380 Series Filter Housing

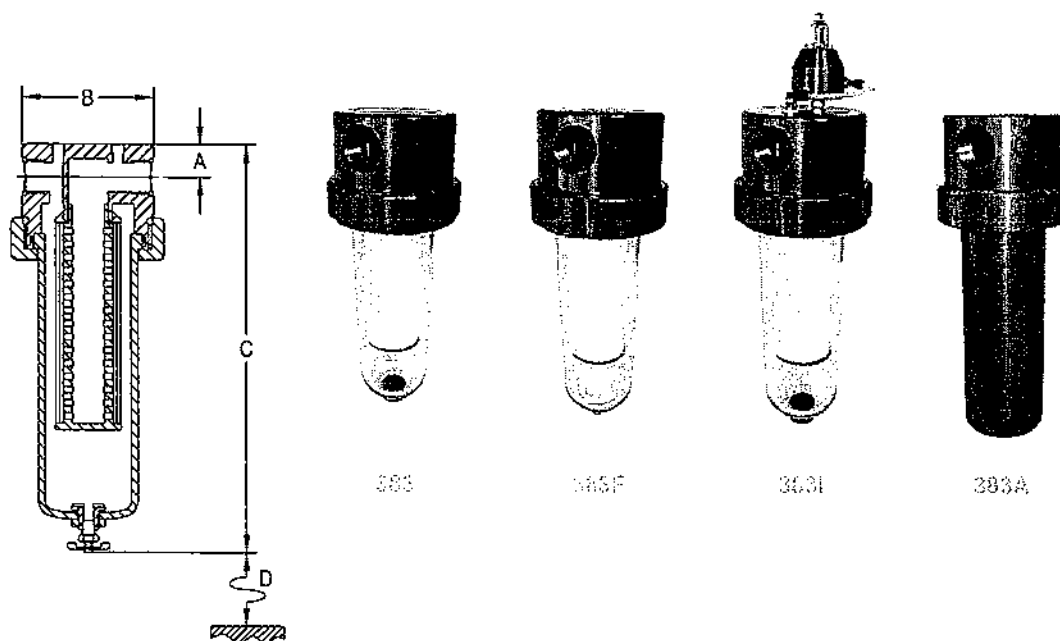


Principal Specifications

Housing Model	380	380F	380I	380FI	380A	380AF	380AI	380AFI
Port Size - NPT	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	25	25	25	25	25	25	25	25
B - mm	100	100	100	100	100	100	100	100
C - mm	305	305	382	382	305	305	382	382
D - mm	152	152	152	152	152	152	152	152
Volume - cc	675	655	675	655	675	655	675	655
Weight - kg	1.60	1.60	1.74	1.74	2.08	2.08	2.22	2.22
Accessories								
Standard Gasket Set	GN380	GN380	GN380	GN380	GN380	GN380	GN380	GN380
Viton Gasket Set	GV380	GV380	GV380	GV380	GV380	GV380	GV380	GV380
Mounting Bracket	MB380	MB380	MB380I	MB380I	MB380	MB380	MB380I	MB380I
Filter Element Codes (1)								
Disposable Element	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

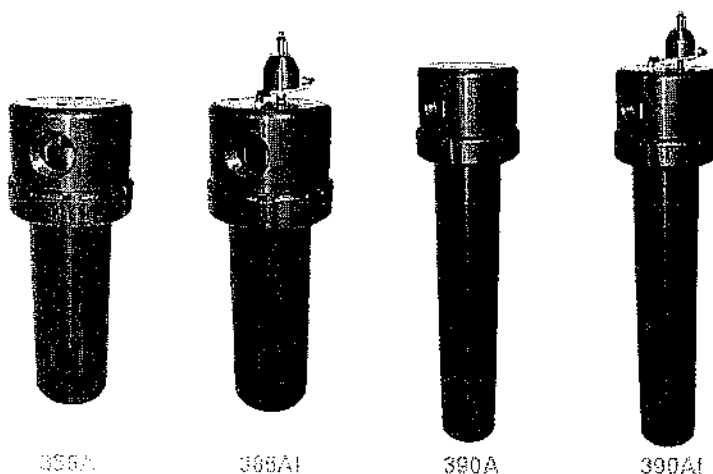
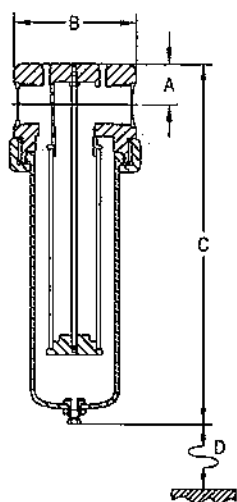
38 Series Filter Housing - Drainable



Principal Specifications

Housing Model	383	383F	383I	383FI	383A	383AF	383AI	383AFI
Port Size - NPT	1"	1"	1"	1"	1"	1"	1"	1"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	10	10	10	10	16	16	16	16
Maximum Temperature - °C	50	50	50	50	120	120	120	120
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Pc	Pc	Al	Al	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	25	25	25	25	25	25	25	25
B - mm	100	100	100	100	100	100	100	100
C - mm	305	305	382	382	305	305	382	382
D - mm	152	152	152	152	152	152	152	152
Volume - cc	675	655	675	655	675	655	675	655
Weight - kg	1.60	1.60	1.74	1.74	2.08	2.08	2.22	2.22
Accessories								
Standard Gasket Set	GN380	GN380	GN380	GN380	GN380	GN380	GN380	GN380
Viton Gasket Set	GV380	GV380	GV380	GV380	GV380	GV380	GV380	GV380
Mounting Bracket	MB380	MB380	MB380I	MB380I	MB380	MB380	MB380I	MB380I
Filter Element Codes (1)								
Disposable Element	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx	38-152-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

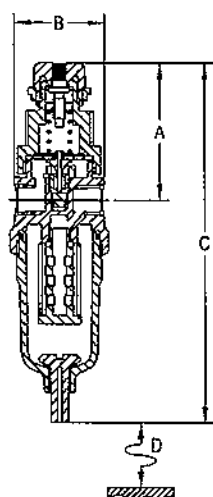


Principal Specifications

Housing Model	385A	385AF	385AI	385AFI	390A	390AF	390AI	390AFI
Port Size - NPT	1 1/2"	1 1/2"	1 1/2"	1 1/2"	2"	2"	2"	2"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Pressure - Bar	16	16	16	16	16	16	16	16
Maximum Temperature - °C	120	120	120	120	120	120	120	120
Materials of Construction (2)								
Head	AI	AI	AI	AI	AI	AI	AI	AI
Internals	SS/AI	SS/AI	SS/AI	SS/AI	SS/AI	SS/AI	SS/AI	SS/AI
Bowl	AI	AI	AI	AI	AI	AI	AI	AI
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	47	47	47	47	47	47	47	47
B - mm	140	140	140	140	140	140	140	140
C - mm	415	415	492	492	655	655	732	732
D - mm	234	234	234	234	480	480	480	480
Volume - cc	2100	2080	2100	2080	3500	3480	3500	3480
Weight - kg	5.3	5.3	5.3	5.3	6.7	6.7	6.7	6.7
Accessories								
Standard Gasket Set	GN385	GN385	GN385	GN385	GN385	GN385	GN385	GN385
Viton Gasket Set	GV385	GV385	GV385	GV385	GV385	GV385	GV385	GV385
Mounting Bracket	MB385	MB385	MB385	MB385	MB385	MB385	MB385	MB385
Filter Element Codes (1)								
Disposable Element	51-230-xx	51-230-xx	51-230-xx	51-230-xx	51-476-xx	51-476-xx	51-476-xx	51-476-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: AI=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

#



FR310



FR315A



FR360A

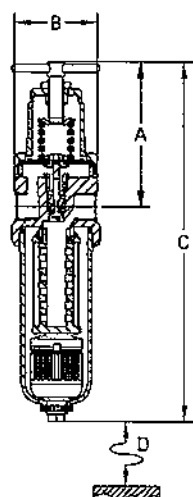
Principal Specifications

Housing Model (1)	FR310	FR315	FR310A	FR315A	FR360	FR360F	FR360A	FR360AF
Port Size - NPT	1/8"	1/4"	1/8"	1/4"	1/4"	1/4"	1/4"	1/4"
Gauge Port - NPT	1/8"	1/8"	1/8"	1/8"	1/4"	1/4"	1/4"	1/4"
Drain Type (4)	Manual	Manual	Manual	Manual	Manual	Automatic	Manual	Automatic
Maximum Inlet Pressure - Bar	10	10	16	16	10	10	16	16
Maximum Temperature - °C	50	50	100	100	50	50	100	100
Materials of Construction (3)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Al	Al	Pc	Pc	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	61	61	61	61	115	115	115	115
B - mm	40	40	40	40	68	68	68	68
C - mm	160	160	170	170	270	290	280	290
D - mm	38	38	38	38	72	72	72	72
Weight - kg	0.220	0.220	0.260	0.260	1.00	1.00	1.10	1.10
Accessories								
Gasket Set	GNFR315	GNFR315	GNFR315	GNFR315	GNFR360	GNFR360	GNFR360	GNFR360
Mounting Bracket	MBFR315	MBFR315	MBFR315	MBFR315	MBFR360	MBFR360	MBFR360	MBFR360
Filter Element Codes (2)								
Disposable Element	12-32-xx	12-32-xx	12-32-xx	12-32-xx	25-64-xx	25-64-xx	25-64-xx	25-64-xx

- Notes (1) Add regulated range suffix, 30, 60, 100, e.g. FR315-100-50C
(2) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
(3) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
(4) Auto float drains require minimum 1 bar pressure to function correctly.

Regulated Range

0 - 2 Bar -	Suffix 30
0.5 - 4 Bar -	Suffix 60
0.7 - 7 Bar -	Suffix 100



FR365F



FR365A



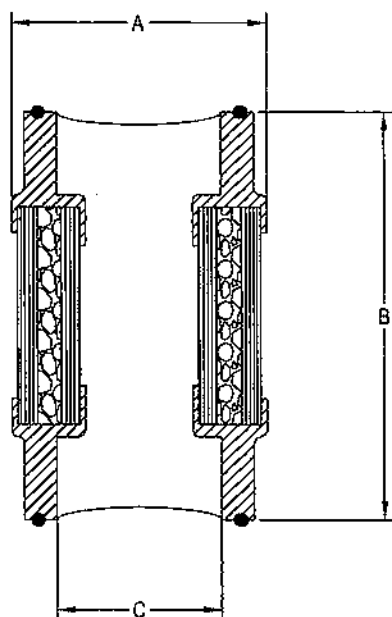
FR370A

Principal Specifications

Housing Model	FR365	FR365F	FR365A	FR365AF	FR370	FR370F	FR370A	FR370AF
Port Size - NPT	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Gauge Port - NPT	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"
Drain Type (3)	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic
Maximum Inlet Pressure - Bar	10	10	16	16	10	10	16	16
Maximum Temperature - °C	50	50	100	100	50	50	100	100
Materials of Construction (2)								
Head	Al	Al	Al	Al	Al	Al	Al	Al
Internals	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon
Bowl	Pc	Pc	Al	Al	Pc	Pc	Al	Al
Gaskets	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile	Nitrile
Principal Dimensions								
A - mm	115	115	115	115	115	115	115	115
B - mm	68	68	68	68	68	68	68	68
C - mm	270	290	280	290	380	380	380	380
D - mm	72	72	72	72	184	140	184	140
Weight - kg	1.00	1.00	1.10	1.10	1.05	1.05	1.20	1.20
Accessories								
Gasket Set	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360	GNFR360
Mounting Bracket	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360	MBFR360
Filter Element Codes (1)								
Disposable Element	25-64-xx	25-64-xx	25-64-xx	25-64-xx	25-178-xx	25-127-xx	25-178-xx	25-127-xx

- Notes
- (1) Replace 'xx' with grade required, 50C, 70C or CC. CC cartridges are not used in housings with automatic drains.
 - (2) Material abbreviations: Al=Anodised aluminium, Pc=Polycarbonate, SS=Stainless Steel.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

Headline Vapour Adsorption Cartridges



12-32-xxTP



25-64-xx



25-178-xx

Headline vapour adsorption cartridges are designed to fit all standard size filter housings to provide vapour adsorption over the full range of line pressures.

Flow rates are the same as for grade 50 elements in the same size bodies. However, with adsorption more important considerations will be the volume of adsorbent and the contact time.

Principal Specifications

Cartridge Type (1)	12-32-CC (2)	12-57-CC (3)	25-64-CC (4)	25-178-CC (4)	51-230-CC	51-476-CC
Maximum Temperature - °C	50	50	50	50	50	50
Principal Dimensions						
A - mm	24	24	40	40	65.5	65.5
B - mm	32	57	64	178	230	476
C - mm	12.5	12.5	26	26	52	52
Volume - cc	6	9	20	90	175	416

- Notes
- (1) Replace 'xx' with grade required, CC, 4A, 13X, SG, MB, PP.
 - (2) Add suffix 'TP' for use with 700 series plastic and 300 series aluminium housings, e.g. 12-32-CCTP.
 - (3) Add suffix 'TS' for use with 110 and 120 series stainless steel housings, e.g. 12-57-SGTS.
 - (4) Add suffix 'TP' for use with 700 series plastic and 300 series aluminium housings, e.g. 25-64-MBTP, 25-178-CCTP.

ACCESSORIES

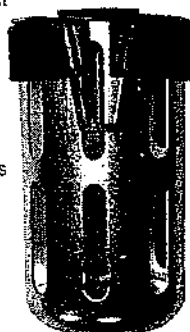
MOUNTING BRACKETS

Filter Mounting Brackets are available for most Headline Filters. The model no. for each housing is given in the tables on pages 4-13.



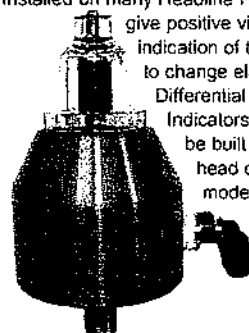
BOWL GUARDS

Available for most filters with polycarbonate plastic bowls to protect against impact damage. Headline recommends that, in the interest of safety, bowl guards always be installed.



DIFFERENTIAL PRESSURE INDICATORS

Differential Pressure Indicators can be installed on many Headline Filters to give positive visual indication of the need to change elements. Differential Pressure Indicators can also be built into the head on many models.



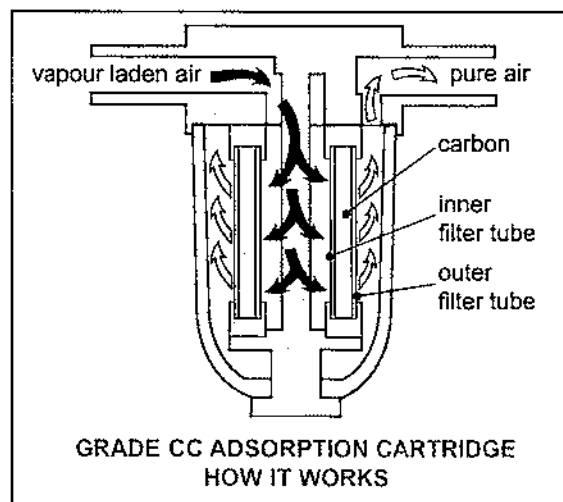
REMOVE LAST TRACES OF OIL VAPOUR AND ODOUR FROM COMPRESSED AIR

Headline grade CC vapour Adsorption Cartridges fit the standard range of compressed air housings and are designed to remove the last traces of oil vapour and odour from compressed air. The cartridge consists of a cylinder of activated carbon cloth sandwiched between two filter tubes providing the most effective known adsorption of organic vapours. Carbon cloth is up to 20 times more efficient in the removal of organic vapours than granulated carbon, giving Headline cartridges exceptional flow and life characteristics.



ADSORPTION CHARACTERISTICS

EXCELLENT ADSORPTION	- HYDROCARBONS C ₄ & LARGER FREONS OIL VAPOUR ALCOHOLS ALDEHYDES & KETONES AROMATIC HYDROCARBONS
LITTLE ADSORPTION	- METHANE CARBON MONOXIDE CARBON DIOXIDE ACETYLENE AMMONIA AMINES HYDROCARBONS C ₃ & LOWER



RECOMMENDED PREFILTER/ADSORBER COMBINATIONS

Line Size	Maximum flow rate at 7 bar	Prefilter Housing (use 50C element)	Adsorber Housing and cartridge code
1/4"	10 Nm ³ /hr	315, 315A	315, 315A + 12-32-CC
1/2"	29 Nm ³ /hr	360F, 360AF	360, 360A + 25-64-CC
1/2"	76 Nm ³ /hr	370F, 370AF	370A + 25-178-CC
3/4", 1"	154 Nm ³ /hr	380AF	380A + 38-152-CC
1 1/2"	241 Nm ³ /hr	385AF	385 + 51-230-CC
2"	482 Nm ³ /hr	390AF	390A + 51-476-CC
3"	1089 Nm ³ /hr	395AF	395A + 63-762-CC

AIR FLOW RATES in Nm³/hr at 0.15 bar Pressure Drop

HOUSING MODEL	LINE SIZE	ELEMENT GRADE	AIR LINE PRESSURE (bar)								
			1	2	3	4	5	6	7	10	16
315, 315A	1/8" or 1/4"	70C	15	21	28	37	44	50	58	79	122
		50C	4	6	9	11	13	15	17	24	37
		CC	2	4	5	6	7	8	10	13	21
360, 360I 360FI 360A, 360AF	1/4" or 1/2"	70C	31	48	62	77	94	109	125	172	266
		50C	12	19	24	29	37	42	48	66	103
		CC	7	11	14	18	21	25	29	39	62
370, 370I 370FI 370A, 370AF	1/2"	70C	73	107	144	180	218	252	288	395	611
		50C	29	43	58	72	87	101	115	158	244
		CC	19	29	38	48	57	67	76	106	163
380A, 380AF	3/4" or 1"	70C	191	286	380	478	574	672	764	1058	1628
		50C	50	71	96	120	144	168	193	264	407
		CC	40	57	76	96	115	134	154	212	327
385A, 385AF	1 1/2"	70C	383	571	760	957	1148	1344	1541	2115	3275
		50C	83	126	166	210	251	294	335	465	717
		CC	59	90	120	149	179	210	241	331	513
390A, 390AF	2"	70C	676	1012	1340	1674	2018	2352	2693	3694	5717
		50C	168	252	334	423	505	588	677	924	1434
		CC	119	181	240	300	357	420	482	663	1027
395A, 395AF	3"	70C	1350	2025	2700	3375	4050	4725	5400	7425	11475
		50C	390	585	780	975	1170	1365	1530	2145	3315
		CC	276	420	560	691	827	975	1089	1539	2374

- Notes
- (1) Airline pressures above 10 bar apply only to housings with aluminium bowls.
 - (2) Housings with polycarbonate bowls are limited to 10 bar.
 - (3) Auto float drains require minimum 1 bar pressure to function correctly.

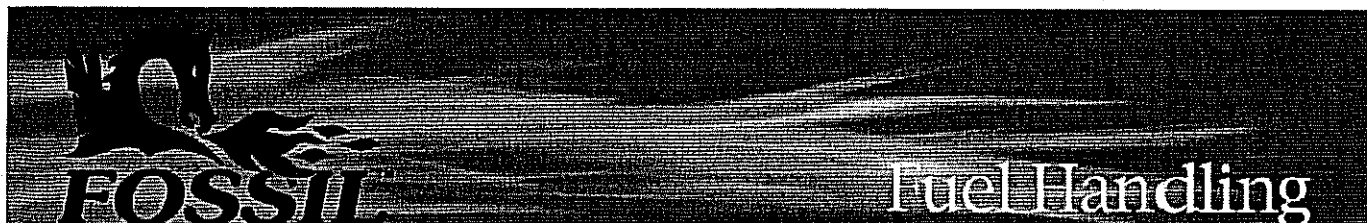


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Valves

Fossil Power Systems Inc. (FPS) is pleased to announce the release of our new line of automatic and manual valves, offering unsurpassed quality components. Our valves are available in a variety of configurations for a variety of applications, including but not limited to oil, gas, steam, and water

SPECIFICATIONS

Max. Operating Pressure: 200 psig (1380 kPa).

Max. Ambient Operating Temperature: 60° c (140°F)

Min. Ambient Operating Temperature: -45°C (-49°F)

Mounting: Multi-position

Flow: Bi-directional

NOTE: Other parameters are available – consult factory

CERTIFICATIONS AND APPROVALS

FPS automatic GAS valves have the following certifications:

- CSA 6.5-2000/ANSI Z21.21 – Automatic Valves for Gas Applications
- CGA 3.9-M94 – Automatic Safety Shut-off Gas Valves
- CSA – Commercial / Industrial (C/I)

FPS Manual Gas Valves have the following certification:

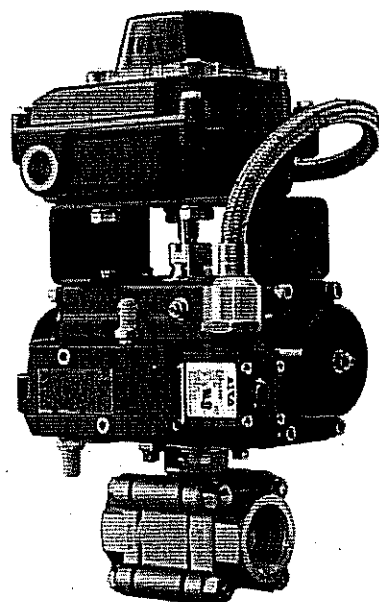
- CSA Interim Requirement No. 60 Lever Operated Gas Shut-off

Available for all Valves:

- FM Class 7400 – Liquid and Gas Safety Shut-off Valves
- API 607 4th Edition Fire safe

VALVE COMPONENT AND FEATURES

- Stainless steel ball, body, stem and hardware



Download a PDF version of full specifications and options for this product:

- [Automatic / Manual Valves](#)



- Highly visible beacon-style, direct mount, limit switch
- Pneumatic rack & pinion actuator
- Solenoids in various voltages, including but not limited to, "low power" 24VDC.
- Available in either "fail-closed" or "fail-open" configurations
- Available in either explosion-proof or water-tight configurations

AVAILABILITY

- Sizes ½" to 2" with threaded/socket-weld connections
- Sizes ½" to 6" with ANSI B16.5 150# or 300# flanges
- Sizes 3/8" and ½" in tandem configuration
- Other sizes available upon request

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BOILER CONTROL, COMBUSTION MANAGEMENT & HARDWARE FOR THE STEAM POWER INDUSTRY

VALVES

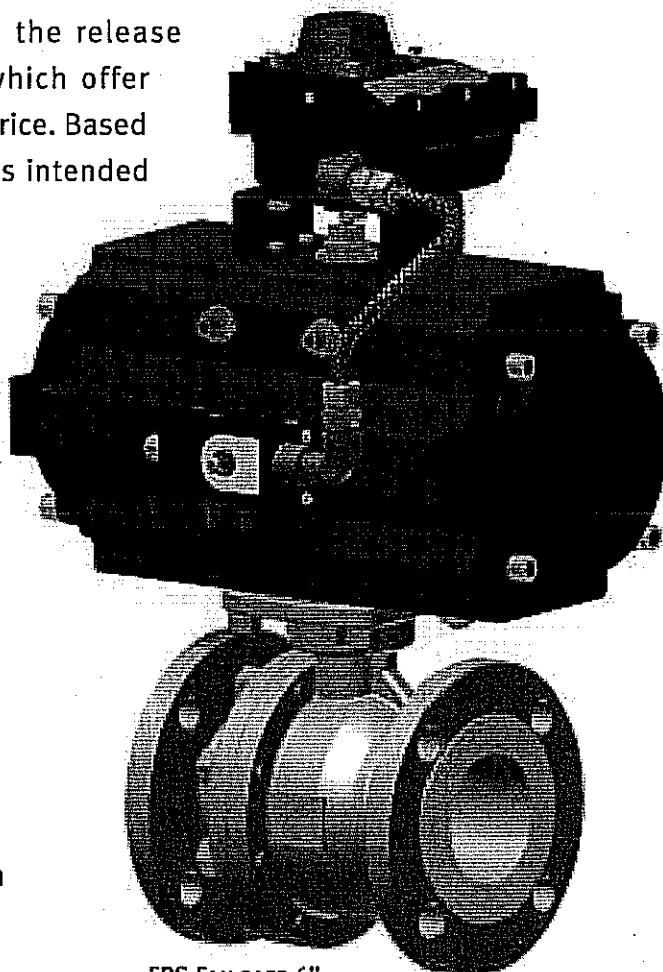
Automatic/Manual Valves

CSA/FM/API APPROVED

Fossil Power Systems Inc. is pleased to announce the release of our new line of manual and automatic valves which offer unsurpassed quality and components at an affordable price. Based on our past customer experience, this line of valves is intended to be available for quick delivery.

AVAILABLE MODELS

- Sizes 1/2"–2" with NPT or Socket Weld connections
- Sizes 1/2"–6" with ANSI B16.5 150# or 300# flanged connections
- Explosion-proof limit switch and solenoid coil for hazardous locations
- Water-tight limit switch and solenoid coil for wet locations
- Optional low power solenoid coil specifically for solar powered gas field applications
- Available in either a "Fail Closed" or "Fail Open" configuration upon the loss of either the power or air supplies
- CF8M valve bodies



FPS FAILSAFE 6"
150# FLANGE VALVE

Controlling
the **power**
of steam

KEY FEATURES OF FPS AUTOMATIC VALVES

GENERAL

- Highly visible beacon type open/closed indicator for ease of viewing at a distance and in dark environments
- Direct valve to actuator mounting via ISO 5211 Standard, eliminating the need for brackets and couplers which could become bent or broken
- Direct connection of the limit switch shaft to the actuator pinion

VALVE

- Three piece valve body design on threaded and socket weld connections allows the center section to be removed for easy replacement of the ball, seats and seals without disturbing pipe connections
- Ball valve seals in both directions ensuring successful pre-start leak testing
- The valve stem is tensioned using Belleville washers to allow for automatic compensation of normal seal wear and temperature fluctuations
- 316 SS ball, stem and hardware

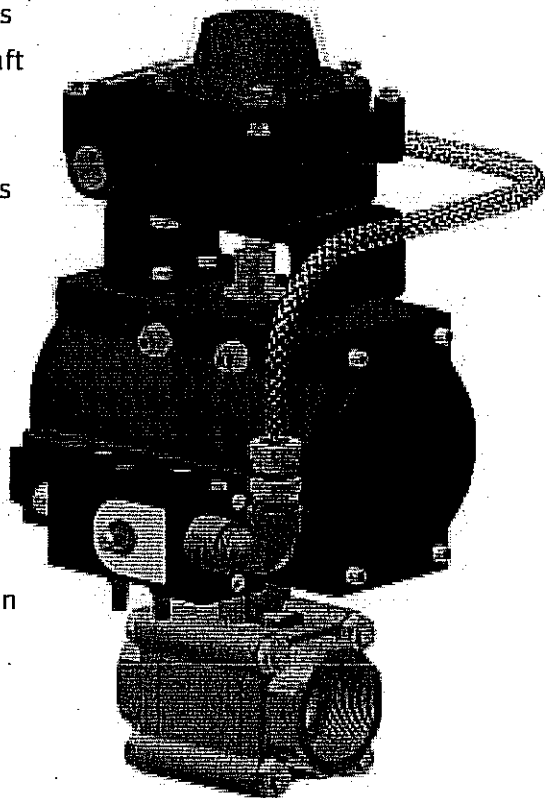
ACTUATOR

The pneumatic rack and pinion actuator consists of:

- Precision anodized and fluoropolymer impregnated aluminum alloy body
- Die cast aluminum alloy end caps
- Die cast aluminum alloy pistons
- One piece aluminum alloy shaft and pinion
- Nitrile seals
- Nylatron piston bearings
- Carbon steel springs on spring return model
- Stainless steel fasteners

SOLENOID

- Anodized aluminum bodies and direct actuator mounting via the accepted NAMUR standard mounting patterns
- Various voltages available for seamless system integration
- Available in 12 VDC, 24VDC, 120VAC, 240VAC
- Available in explosion-proof or watertight models
- Available in Low Power Option (24VDC only)



FPS FAILSAFE 1" NPT VALVE

SPECIFICATIONS

SPRING RETURN OR DOUBLE ACTING VALVE OPERATING SPECIFICATIONS

- Max. Operating Pressure:
Consult factory
- Max. Ambient Operating Temperature: Consult factory
- Min. Ambient Operating Temperature: -45°C (-49°F)
- Mounting: Multi-position
- Flow: Bi-directional
- Materials: CF8M Valve Body;
316 S/S Ball;
Stem and Hardware
- Actuator: Spring Return
or Double Acting

SPECIFICATIONS

CSA AUTOMATIC GAS VALVE OPERATING SPECIFICATIONS

- Max. Operating Pressure:
1380kPa (200 psig)
- Max. Ambient Operating Temperature: 50°C (122°F)
- Min. Ambient Operating Temperature: -45°C (-49°F)
- Mounting: Multi-position
- Flow: Bi-directional
- Materials: CF8M Valve Body;
316 S/S Ball;
Stem and Hardware
- Actuator: Spring Return

AVAILABLE CERTIFICATIONS

- CSA 6.5-2000/ANSI
Z21.21 – Automatic Valves for
Gas Appliances
- CGA 3.9-M94 – Automatic Safety
Shut-off Gas Valves
- CSA – Commercial/Industrial (C/I)
- CSA Interim Requirement No. 60
Lever Operated Gas Shut-off
- API 607 4th Edition Firesafe
on all valves.
- FM Class 7400 - Liquid and Gas
Safety Shutoff Valves
(Sept. 2004)

SPECIFICATIONS

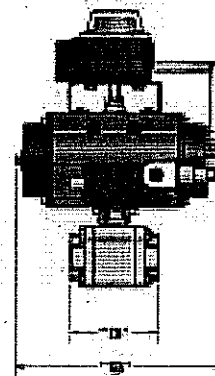
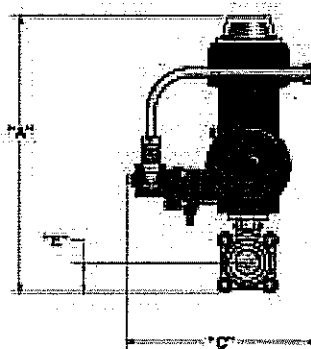
FM AUTOMATIC LIQUID & GAS VALVE OPERATING SPECIFICATIONS

- Max. Operating Pressure:
1380kPa (200 psig)
- Max. Ambient Operating
Temperature: 60°C (140°F)
- Min. Ambient Operating
Temperature: -10°C (14°F)
- Mounting: Multi-position
- Flow: Bi-directional
- Materials: CF8M Valve Body;
316 S/S Ball;
Stem and Hardware
- Actuator: Spring Return

AUTOMATIC VALVES THREADED - SPRING-RETURN/EXPLOSION-PROOF

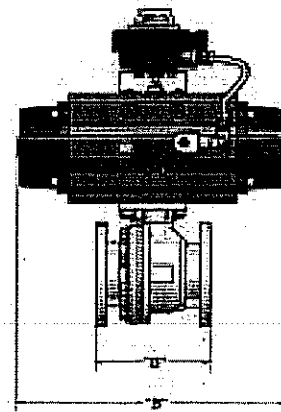
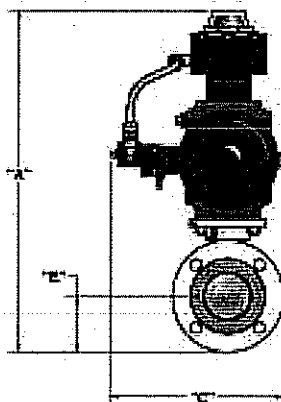
Size	CV	"A" In (mm)	"B" In (mm)	"C" In (mm)	"D" In (mm)	"E" In (mm)	Weight lbs (kg)
1/4"	8	12.1 (308.2)	7.7 (194.6)	10.6 (270)	3 (75)	1 (25.6)	11.9 (5.4)
3/8"	8	12.1 (308.2)	7.7 (194.6)	10.6 (270)	3 (75)	1 (25.6)	11.9 (5.4)
1/2"	8	12.1 (308.2)	7.7 (194.6)	10.6 (270)	2.9 (72.5)	1 (25.6)	11.9 (5.4)
3/4"	15	12.5 (317.6)	7.7 (194.6)	10.6 (270)	3.4 (85.4)	1.2 (30.7)	13 (5.9)
1"	34	13.8 (352)	8.1 (205.6)	10.6 (270)	4.1 (105.3)	1.3 (33.8)	16.7 (7.6)
1-1/4"	56	14 (355.4)	8.1 (205.6)	10.6 (270)	4.4 (111)	1.5 (38.6)	18.2 (8.3)
1-1/2"	85	15.9 (404.3)	9.8 (250)	10.6 (270)	5 (127.3)	1.7 (43.3)	26.1 (11.8)
2"	125	17 (431.1)	9.8 (250)	10.6 (270)	5.7 (145)	2.4 (61.4)	29.3 (13.3)

*For other dimensions consult factory
**Dimensions are approximate



AUTOMATIC VALVES FLANGED - ANSI 150#, SPRING RETURN, EXPLOSION-PROOF

Size	CV	"A" In (mm)	"B" In (mm)	"C" In (mm)	"D" In (mm)	"E" In (mm)	Weight lbs (kg)
1/2"	28	13.8 (350.2)	8.1 (205.6)	10.6 (270)	4.3 (108.3)	1.8 (44.5)	13 (5.9)
3/4"	50	14.2 (359.5)	8.1 (205.6)	10.6 (270)	4.6 (117.3)	1.9 (49.3)	13.9 (6.3)
1"	95	14.6 (371.8)	8.1 (205.6)	10.6 (270)	5 (127.1)	2.1 (54)	15.7 (7.1)
1-1/2"	260	17.1 (434.6)	8.1 (205.6)	10.6 (270)	6.5 (165.1)	2.5 (63.5)	27.8 (12.6)
2"	485	17.9 (454.8)	9.8 (250)	10.9 (277.5)	7 (178.3)	3 (76.2)	33.7 (15.3)
2-1/2"	800	19.9 (506.9)	9.8 (250)	10.9 (277.5)	7.5 (190)	3.5 (88.9)	55.1 (25)
3"	1250	20.9 (529.8)	14 (355)	12.7 (322.2)	8 (203.5)	3.8 (95.3)	65.5 (29.7)
4"	2250	22.6 (573.3)	14 (355)	13.5 (341.8)	9 (228.6)	4.5 (114.3)	90.8 (41.2)
6"	5400	28.2 (716.7)	16.6 (422)	14.8 (375.2)	15.5 (393.7)	5.5 (139.7)	203.7 (92.4)



MANUAL VALVES

- Fossil Power Systems Inc. (FPS) offers a series of CSA approved manual valves in sizes 1/2" to 2" with NPT or Socket Weld connections
- Sizes 1/2" to 6" are available with 150# or 300# flanged connections
- CF8M valve bodies
- Locking handle is standard

KEY FEATURES OF FPS MANUAL VALVE

GENERAL

- Three-piece swing-out valve body on threaded and socket weld connections allows the center section to be removed for easy in-line maintenance
- Insulated locking handle indicates the position of the ball
- Ball valve seals in both directions ensuring successful pre-start leak testing
- Multi-position mounting

CSA MANUAL GAS VALVE SPECIFICATIONS

- Max. Operating Pressure: 1380kPA (200psig)
- Max. Ambient Operating Temperature: 65°C (149°F)
- Min. Ambient Operating Temperature: -40°C (-40°F)
- Mounting: Multi-position
- Flow: Bi-directional
- Materials: CF8M Valve Body; 316SS Stem, Seat and Hardware

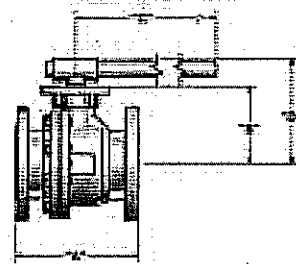
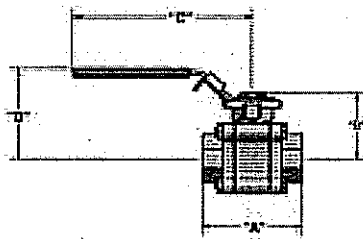
MANUAL VALVES THREADED/SOCKET WELD

Size	Cv	"A" In (mm)	"B" In (mm)	"C" In (mm)	"D" In (mm)	Weight lbs (kg)
1/4"	8	3 (75)	1.9 (49)	5.5 (139)	3 (77)	1.96 (.89)
3/8"	8	3 (75)	1.9 (49)	5.5 (139)	3 (77)	1.94 (.88)
1/2"	8	2.9 (72.5)	1.9 (49)	5.5 (139)	3 (77)	1.83 (.83)
3/4"	15	3.4 (85.4)	2.2 (55.4)	5.5 (139)	3.2 (82)	1.85 (.84)
1"	34	4.1 (105.3)	2.7 (69.7)	6.5 (165)	3.9 (98.5)	3.30 (1.50)
1-1/4"	56	4.4 (111)	2.9 (73)	6.5 (165)	4 (102)	4.78 (2.17)
1-1/2"	85	5 (127.3)	3.6 (92.4)	8.5 (215)	5 (128)	9.41 (4.27)
2"	125	5.7 (145)	4 (101.1)	8.5 (215)	5.4 (137)	11.68 (5.30)

*Dimensions are approximate

MANUAL VALVES ANSI FLANGED 150#

Size	Cv	"A" In (mm)	"B" In (mm)	"C" In (mm)	"D" In (mm)	Weight - 150lbs lbs (kg)
1/2"	28	4.3 (108.3)	1.8 (46.7)	6.5 (165)	3.3 (82.7)	4 (1.81)
3/4"	50	4.6 (117.3)	2 (51.2)	6.5 (165)	3.3 (82.7)	4.8 (2.19)
1"	95	5 (127.1)	2.3 (58.8)	6.5 (165)	3.8 (96.8)	6.4 (2.91)
1-1/2"	260	6.5 (165.1)	3.5 (89.1)	10.3 (262)	5.8 (147.1)	14.1 (6.4)
2"	485	7 (178.3)	3.8 (96.6)	10.3 (262)	6.1 (154.6)	20.2 (9.19)
2-1/2"	800	7.5 (190)	4.6 (116)	10.3 (262)	6.9 (174)	31.5 (14.3)
3"	1250	8 (203.5)	5.2 (132.5)	14.4 (365)	7.1 (178.7)	43 (19.5)
4"	2250	9 (228.6)	6.3 (160.7)	14.4 (365)	8 (203.2)	68.4 (31)
6"	5400	15.5 (393.7)	8.3 (210.2)	29.5 (750)	10.9 (276.7)	165.4 (75)



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AN ISO REGISTERED COMPANY

627 Series Self-Operated Pressure Reducing Regulators

FISHER®

July 1989

Form 5252

Introduction

Scope of Manual

This manual provides instructions for the installation, adjustment, maintenance, and parts ordering for the 627 Series regulators. These regulators usually are shipped separate for line installation, although sometimes they are shipped installed on other equipment. Refer to the instruction manual for the other equipment for installation and operating instructions.

Description

The 627 Series self-operated pressure reducing regulators (figure 1) are for high and low pressure systems. These regulators can be used with natural gas, air, or a variety of other gases. Performance characteristics vary according to construction (see the AVAILABLE CONFIGURATIONS specification in table 1).

Specifications

Table 1 gives some general specifications for the 627 Series regulators. The nameplates (figure 2) gives detailed information for a particular regulator as it comes from the factory.



Figure 1. Typical 627 Series Self-Operated Pressure Reducing Regulator

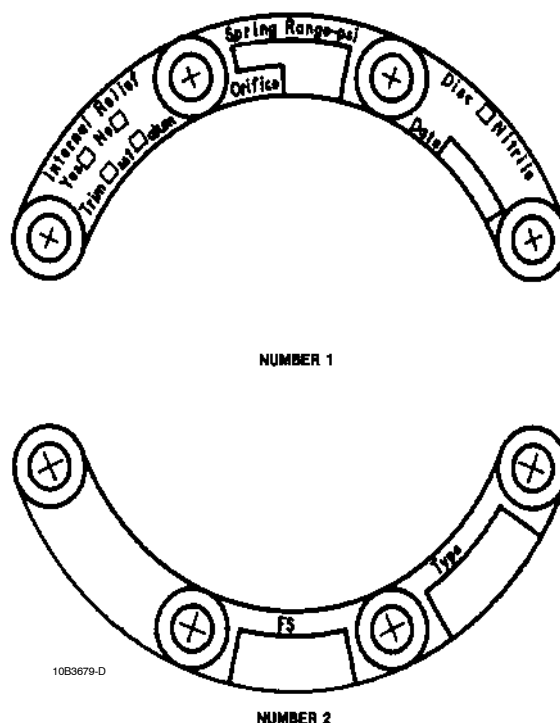


Figure 2. Nameplates

Table 1. Specifications

Available Constructions	Maximum Body Outlet Pressure⁽¹⁾ (Type 627M, 627MR, and 627HM Only)
Type 627: Self-operated pressure reducing regulator equipped with a pitot tube for greater regulated capacities (figure 7)	2000 psig (138 bar) for screwed steel, 1480 psig (102 bar) for RF flanged steel, or 1000 psig (69 bar) for ductile iron. (Type 627 and 627R are limited by maximum diaphragm casing pressure)
Type 627R: Type 627 with internal relief and with an open throat (figure 8)	Port Diameters
Type 627M: Type 627 with a stem seal between the body outlet pressure and diaphragm case. Pressure is measured under the diaphragm through the 1/4-inch NPT downstream control line connection (figure 9)	See table 2
Type 627MR: Type 627M with internal relief (figure 10)	Internal Relief Performance
Type 627H: Type 627 with a diaphragm limiter to deliver a higher outlet pressure (figure 11)	Type 627R: See table 4
Type 627HM: Type 627H with a stem seal between the body outlet pressure and diaphragm case. Pressure is measured under the diaphragm through two 1/4-inch NPT downstream control line connections (figure 12)	Type 627MR: Limited by field-installed control line piping
Body Sizes	Temperature Capabilities⁽¹⁾
3/4, 1, or 2-inch	-20 to 180°F (-29 to 82°C)
End Connection Styles	Pressure Registration
NPT screwed with 3/4, 1, or 2-inch sizes ANSI Class 300 and 600 raised face (RF) flanged with 1 or 2-inch sizes	Type 627, 627H or 627R: Internal Type 627M, 627HM or 627MR: External through 1/4-inch NPT control line connection in the diaphragm casing
Maximum Inlet Pressure⁽¹⁾ (Body Rating)	De-Icer System
2000 psig (138 bar) for screwed steel, 1480 psig (102 bar) for RF flanged steel, or 1000 psig (69 bar) for ductile iron	See figure 3 and Type 627M Regulator De-Icer System Application section
Maximum Valve Disk Inlet Pressure Rating⁽¹⁾	Relief Indicator
2000 psig (138 bar) for nylon disk or 1000 psig (69 bar) for nitrile disk	For 627R and 627MR (see figures 8 & 9)
Maximum Operating Inlet Pressure, Pressure Differential, and Outlet Pressure Ranges⁽¹⁾	Spring Case Vent Connection
See table 2 for pressures by port and spring range	3/4-inch NPT female with removable screened vent assembly
Maximum Spring and Diaphragm Casing Pressure⁽¹⁾	Control Line Connection (Type 627M, 627HM or 627MR Only)
See table 3	1/4-inch NPT female
1. The pressure/temperature limits in this manual and any applicable standard or code limitation should not be exceeded.	Approximate Weight
	With Ductile Iron or Steel Casings: 10 pounds (4.5 kg) With Aluminum Casings: 6.3 pounds (2.8 kg)

Table 2. Maximum Inlet Pressures, Differential Pressures and Outlet Pressure Ranges

TYPE NUMBER	OUTLET PRESSURE RANGE AND CONTROL SPRING (COLOR)	U.S. UNITS			METRIC UNITS		
		Port Dia., Inches	Maximum Inlet Pressure, Psig	Maximum Differential Pressure, Psid	Port Dia., mm	Maximum Inlet Pressure, Bar	Maximum Differential Pressure, Bar
627 and 627M ⁽³⁾	5 ⁽²⁾ to 20 psig (0.34 to 1.4 bar) 10B3076 X012 (yellow)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	1000	1000	3.2	69.0	69.0
		3/16	750	750	4.8	51.7	51.7
		1/4	500	500	6.4	34.5	34.5
		3/8	300	300	9.5	20.7	20.7
		1/2	250	250	12.7	13.8	13.8
	15 to 40 psig (1.0 to 2.8 bar) 10B3077 X012 (green)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	1500 ⁽¹⁾	1500 ⁽¹⁾	3.2	103 ⁽¹⁾	103 ⁽¹⁾
		3/16	1000 ⁽¹⁾	1000	4.8	69.0	69.0
		1/4	750	750	6.4	51.7	51.7
		3/8	500	500	9.5	34.5	34.5
		1/2	300	300	12.7	20.7	20.7
	35 to 80 psig (2.4 to 5.5 bar) 10B3078 X012 (blue)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	2000 ⁽¹⁾	2000 ⁽¹⁾	3.2	138 ⁽¹⁾	138 ⁽¹⁾
		3/16	1750 ⁽¹⁾	1750 ⁽¹⁾	4.8	121 ⁽¹⁾	121 ⁽¹⁾
		1/4	1500 ⁽¹⁾	1500 ⁽¹⁾	6.4	103 ⁽¹⁾	103 ⁽¹⁾
		3/8	1000	1000	9.5	69.0	69.0
		1/2	750	750	12.7	51.7	51.7
	70 to 150 psig (4.8 to 10.3 bar) 10B3079 X012 (red)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	2000 ⁽¹⁾	2000 ⁽¹⁾	3.2	138 ⁽¹⁾	138 ⁽¹⁾
		3/16	2000 ⁽¹⁾	2000 ⁽¹⁾	4.8	138 ⁽¹⁾	138 ⁽¹⁾
		1/4	1750 ⁽¹⁾	1750 ⁽¹⁾	6.4	121 ⁽¹⁾	121 ⁽¹⁾
		3/8	1250 ⁽¹⁾	1250 ⁽¹⁾	9.5	86.2 ⁽¹⁾	86.2 ⁽¹⁾
		1/2	750	750	12.7	51.7	51.7
627R and 627MR	5 ⁽²⁾ to 20 psig (0.34 to 1.4 bar) 10B3076 X012 (yellow)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	1000	1000	3.2	69.0	69.0
		3/16	750	750	4.8	51.7	51.7
		1/4	500	500	6.4	34.5	34.5
		3/8	300	300	9.5	20.7	20.7
		1/2	200	200	12.7	13.8	13.8
	15 to 40 psig (1.0 to 2.8 bar) 10B3077 X012 (green)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	1500 ⁽¹⁾	1500 ⁽¹⁾	3.2	103 ⁽¹⁾	103 ⁽¹⁾
		3/16	1000	1000	4.8	69.0	69.0
		1/4	750	750	6.4	51.7	51.7
		3/8	300	300	9.5	20.7	20.7
		1/2	200	200	12.7	13.8	13.8
	35 to 80 psig (2.4 to 5.5 bar) 10B3078 X012 (blue)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	1750 ⁽¹⁾	1750 ⁽¹⁾	3.2	121 ⁽¹⁾	121 ⁽¹⁾
		3/16	1000	1000	4.8	69.0	69.0
		1/4	750	750	6.4	51.7	51.7
		3/8	300	300	9.5	20.7	20.7
		1/2	200	200	12.7	13.8	13.8
	70 to 150 psig (4.8 to 10.3 bar) 10B3079 X012 (red)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	1000	1000	3.2	69.0	69.0
		3/16	500	500	4.8	34.5	34.5
		1/4	300	300	6.4	20.7	20.7
		3/8	200	200	9.5	13.8	13.8
		1/2	200	200	12.7	13.8	13.8
627H and 627HM ⁽³⁾	140 to 250 psig (9.7 to 17.2 bar) 10B3078 X012 (blue)	3/32	2000 ⁽¹⁾	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	2000 ⁽¹⁾	2000 ⁽¹⁾	3.2	138 ⁽¹⁾	138 ⁽¹⁾
		3/16	1750 ⁽¹⁾	1750 ⁽¹⁾	4.8	121 ⁽¹⁾	121 ⁽¹⁾
		1/4	1500 ⁽¹⁾	1000	6.4	103 ⁽¹⁾	69.0
		3/8	1000	500	9.5	69.0	34.5
		1/2	750	250	12.7	51.7	13.8
	240 to 500 psig (16.5 to 34.5 bar) 10B3079 X012 (red)	3/32	2000	2000 ⁽¹⁾	2.4	138 ⁽¹⁾	138 ⁽¹⁾
		1/8	2000	2000 ⁽¹⁾	3.2	138 ⁽¹⁾	138 ⁽¹⁾
		3/16	1750	1750 ⁽¹⁾	4.8	121 ⁽¹⁾	121 ⁽¹⁾
		1/4	1500	1000	6.4	103 ⁽¹⁾	69.0
		3/8	1000	500	9.5	69.0	34.5
		1/2	750	250	12.7	51.7	13.8

- For inlet pressure in excess of 1000 psig (69 bar), refer to the maximum body and disk pressure ratings in the specification table.
- For pressure settings under 10 psig (0.69 bar), inlet pressure should be limited to approximately 100 psig (6.9 bar) so the set point adjustment can be obtained.

- The unbalance forces change from the wide open monitor mode to an active regulator mode such that the Type 627M or 627HM should have a 3/8-inch (9.5 mm) or larger seat ring when used as a wide open monitor.

Table 3. Maximum Spring and Diaphragm Casing Pressure⁽¹⁾

	SPRING AND DIAPHRAGM CASING STYLE	TYPE 627		TYPE 627R		TYPE 627M		TYPE 627MR		TYPE 627H & 627HM	
		Psig	Bar	Psig	Bar	Psig	Bar	Psig	Bar	Psig	Bar
Maximum pressure to spring and diaphragm casings to prevent leak to atmosphere other than relief action (internal parts damage may occur)	Die Cast Aluminum Ductile Iron Steel	250	17.2	250	17.2	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		250	17.2	250	17.2	250	17.2	250	17.2	N.A.	N.A.
		250	17.2	250	17.2	250	17.2	250	17.2	800	55.2
Maximum pressure to spring and diaphragm casings to prevent burst of casings during abnormal operation (leak to atmosphere and internal parts damage may occur)	Die Cast Aluminum Ductile Iron Steel	375	25.9	375	25.9	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		465	32.0	465	32.0	465	32.0	465	32.0	N.A.	N.A.
		1200	82.7	1200	82.7	1200	82.7	1200	82.7	1200	82.7
Maximum diaphragm casing over-pressure (above set point) to prevent damage to internal parts	All Styles	60	4.1	120	8.3	60	4.1	120	8.3	120	8.3
1. If the spring case is pressurized, a metal adjusting screw cap is required. Contact the Fisher sales office or Fisher sales representative.											

**WARNING**

Personal injury, property damage, equipment damage, or leakage due to escaping gas or bursting of pressure-containing parts may result if this regulator is overpressured or is installed where service conditions could exceed the limits given in tables 1, 2, 3, and 4, or where conditions exceed any ratings of the adjacent piping or piping connections.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation, or standard) to prevent service conditions from exceeding those limits. The Type 627R or 627MR regulator with internal relief will provide downstream overpressure protection within the limits given in tables 1, 2, 3 and 4. If these limits are exceeded additional downstream overpressure protection must be provided by the user.

Additionally, physical damage to the regulator could cause personal injury or property damage due to escaping gas. To avoid such injury or damage, install the regulator in a safe location.

Installation

Regulator operation within ratings does not preclude the possibility of damage from debris in the lines or from external sources. A regulator should be inspected for damage periodically and after any overpressure condition. Key numbers referenced in this section are shown in figures 7 through 12. Ensure that the operating temperature capabilities listed in table 1 are not exceeded.

Like most regulators, 627 Series regulators have outlet pressure ratings that are lower than their inlet pressure ratings. A pressure relieving or pressure limiting device must be provided by the user for the Type 627, 627H, 627M, and 627HM regulators if the inlet pressure can exceed the outlet pressure rating, since these regulators do not have internal relief.

Type 627R regulators provide internal relief which limits the total outlet pressure buildup over setpoint. Use table 4 to determine the total outlet pressure. This internal relief may be adequate for the application, if not, provide additional pressure relief or a pressure limiting device downstream.

Note

If the regulator is shipped mounted on another unit, install that unit according to the appropriate instruction manual.

Perform steps 1 through 6 for all types of regulators:

1. Only personnel qualified through training and experience should install, operate, or maintain this regulator.
2. For a regulator that is shipped separately, make sure that there is no damage to, or foreign material in, the regulator.
3. Ensure that all tubing and piping have been blown free of foreign debris.
4. The regulator may be installed in any position as long as the flow through the body is in the direction indicated by the arrow cast on the body.
5. If continuous operation is required during inspection or maintenance, install a three-valve bypass around the regulator.

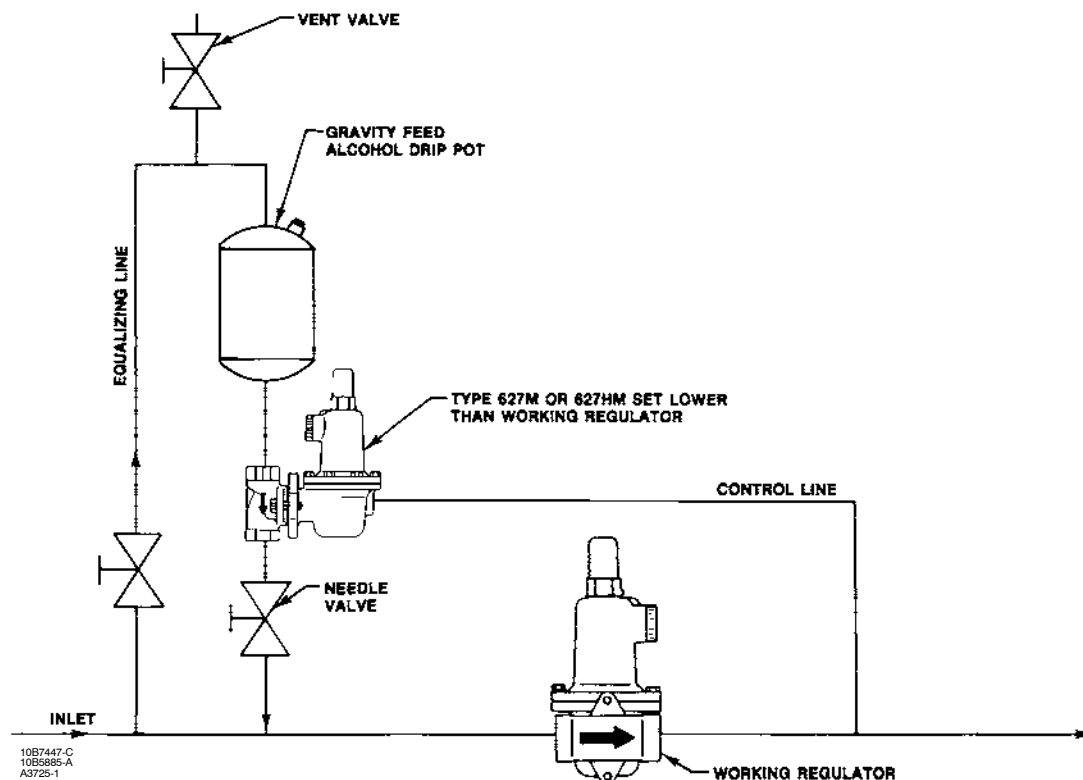


Figure 3. Schematic of De-Icer System

**WARNING**

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gas may accumulate and cause personal injury, death, or property damage due to fire or explosion. Vent a regulator in hazardous gas service to a remote, safe location away from air intakes or any hazardous area. The vent line or stack opening must be protected against condensation or clogging.

6. Position the body (key 1) and/or diaphragm spring case (key 29) so it will not collect moisture or debris into the screened vent. If the regulator requires repositioning, refer to the body area maintenance procedures and/or the diaphragm case area maintenance procedures in the Maintenance section to reposition the screened vent for the application.

Perform steps 7 through 9 for Type 627M, 627HM, and 627MR regulators only:

7. A Type 627M, 627HM, or 627MR regulator requires a downstream control line. Install the control line before putting the regulator into operation.

8. Ensure that the downstream control line piping is at least 3/8-inch or larger outside diameter tubing and connected to a straight section of outlet piping 10 diameters downstream of the regulator.

9. A hand valve should be installed in the control line. This hand valve can be used to throttle down and dampen outlet pulsations in control pressure which may cause instability or cycling of the regulator.

Remote Vent Line Installation

All 627 series regulators have a vent assembly installed in the 3/4-inch NPT spring case vent opening. The vent assembly can be removed to install a remote vent line if necessary. Remote vent lines must have the largest practical diameter. The vent line should be as short as possible with a minimum number of bends or elbows.

Protect the remote vent opening against entrance of rain, snow, or any other foreign material that may plug the vent or vent line and prevent proper operation of the regulator. Periodically check the vent opening to be sure it is not plugged with foreign debris.

Type 627M or 627HM Regulator De-Icer System Application

For the Type 627M or 627HM regulator de-icer system, refer to the application shown in figure 3. With a large pressure drop across the working regulator, ice can form

Table 4. Type 627R Internal Relief Performance⁽¹⁾

OUTLET PRESSURE RANGE AND CONTROL SPRING INFORMATION	OUTLET PRESSURE SETTING, PSIG	MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE, PSIG	MAXIMUM INLET PRESSURE ⁽²⁾ - PSIG						OUTLET PRESSURE SETTING, BAR	MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE, BAR	MAXIMUM INLET PRESSURE ⁽²⁾ - BAR					
			Maximum Inlet Pressure To Keep Maximum Allowable Downstream System Pressure From Being Exceeded								Maximum Inlet Pressure To Keep Maximum Allowable Downstream System Pressure From Being Exceeded					
			Port Diameter - Inches								Port Diameter - mm					
			3/32	1/8	3/16	1/4	3/8	1/2			2.4	3.2	4.8	6.4	9.5	12.7
5 ⁽³⁾ to 20 psig (0.34 to 1.4 bar) 10B3076 X012 (yellow)	10	60	1250	740	320	190	95	75	0.69	4.1	86.2	51.0	22.1	13.1	6.6	5.2
		100	2000	1500	620	390	180	130		6.9	138	103	42.7	26.9	12.4	9.0
		125	2000	1900	830	480	220	160		8.6	138	131	57.2	33.1	15.2	11.0
		175	2000	2000	1100	670	320	220		12.1	138	138	75.8	46.2	22.1	15.2
		200	2000	2000	1300	770	360	260		13.8	138	138	89.6	53.1	24.8	17.9
		250	2000	2000	1600	960	450	320		17.2	138	138	110	66.2	31.0	22.1
	15	60	1000	620	260	170	90	70	1.0	4.1	69.0	42.7	17.9	11.7	6.2	4.8
		100	2000	1400	610	370	170	130		6.9	138	96.5	42.1	25.5	11.7	9.0
		125	2000	1900	810	480	220	160		8.6	138	131	55.8	33.1	15.2	11.0
		175	2000	2000	1100	670	320	220		12.1	138	138	75.8	46.2	22.1	15.2
		200	2000	2000	1300	770	360	260		13.8	138	138	89.6	53.1	24.8	17.9
		250	2000	2000	1600	960	450	320		17.2	138	138	110	66.2	31.0	22.1
	20	60	850	490	210	130	80	65	1.4	4.1	58.6	33.8	14.5	9.0	5.5	4.6
		100	2000	1300	600	360	170	120		6.9	138	89.6	41.4	24.8	11.7	8.3
		125	2000	1800	800	480	220	160		8.6	138	124	55.2	33.1	15.2	11.0
		175	2000	2000	1100	670	320	220		12.1	138	138	75.8	46.2	22.1	15.2
		200	2000	2000	1300	770	360	260		13.8	138	138	89.6	53.1	24.8	17.9
		250	2000	2000	1600	960	450	320		17.2	138	138	110	66.2	31.0	22.1
15 to 40 psig (1.0 to 2.8 bar) 10B3077 X012 (green)	15	60	1000	380	210	130	80	65	1.0	4.1	69.0	26.2	14.5	9.0	5.5	4.5
		100	2000	1300	590	350	170	120		6.9	138	89.6	40.7	24.1	11.7	8.3
		125	2000	1800	800	470	220	160		8.6	138	124	55.2	32.4	15.2	11.0
		175	2000	2000	1100	640	320	220		12.1	138	138	75.8	44.1	22.1	15.2
		200	2000	2000	1300	780	370	260		13.8	138	138	89.6	53.8	25.5	17.9
		250	2000	2000	1600	960	450	320		17.2	138	138	110	66.2	31.0	22.1
	20	60	630	200	150	100	70	65	1.4	4.1	43.4	13.8	10.3	6.9	4.8	4.5
		100	2000	1200	550	330	160	120		6.9	138	82.7	37.9	22.8	11.0	8.3
		125	2000	1700	760	450	210	160		8.6	138	117	52.4	31.0	14.5	11.0
		175	2000	2000	1100	630	320	220		12.1	138	138	75.8	43.4	22.1	15.2
		200	2000	2000	1300	770	360	260		13.8	138	138	89.6	53.1	24.8	17.9
		250	2000	2000	1600	960	460	320		17.2	138	138	110	66.2	31.7	22.1
	30	100	2000	950	450	260	140	110	2.1	6.9	138	65.5	31.0	17.9	9.7	7.6
		125	2000	1500	670	400	190	150		8.6	138	103	46.2	27.6	13.1	10.3
		175	2000	2000	1000	610	300	220		12.1	138	138	69.0	42.0	20.7	15.2
		200	2000	2000	1200	760	360	260		13.8	138	138	82.7	52.4	24.8	17.9
		250	2000	2000	1600	970	460	320		17.2	138	138	110	66.9	31.7	22.1
		100	1500	700	330	200	120	108		2.8	6.9	103	48.3	22.8	13.8	8.3
	125	2000	1300	560	340	180	140	8.6	138		89.6	38.6	23.4	12.4	9.7	
	175	2000	1800	1000	550	290	220	12.1	138		124	69.0	37.9	20.0	15.2	
200	2000	2000	1200	730	350	250	13.8	138	138		82.7	50.3	24.1	17.2		
250	2000	2000	1600	970	460	320	17.2	138	138		110	66.9	31.7	22.1		
100	1500	700	330	200	120	108	6.9	103	48.3		22.8	13.8	8.3	7.4		

- Continued -

within this regulator. The formation of ice decreases the size of the port opening, so the regulator is unable to supply enough flow to satisfy the downstream demand. When the downstream pressure falls below the outlet pressure setting of the Type 627M or 627HM regulator, the disk assembly of the Type 627M or 627HM regulator moves off its seat ring, permitting alcohol to flow into the main gas line. The alcohol carried to the main regulator by the flow stream prevents additional ice from forming on the seat ring. When normal flow resumes, and as pressure in the downstream system is restored, the Type 627M or 627HM regulator shuts off.

Startup and Adjustment

Startup



WARNING

To avoid personal injury or property damage due to explosion or damage to regulator or downstream components during startup, release downstream pressure to prevent an overpressure condition on the diaphragm of the regulator.

Table 4. Type 627R Internal Relief Performance⁽¹⁾ (Continued)

OUTLET PRESSURE RANGE AND CONTROL SPRING INFORMATION	OUTLET PRESSURE SETTING, PSIG	MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE, PSIG	MAXIMUM INLET PRESSURE ⁽²⁾ - PSIG						OUTLET PRESSURE SETTING, BAR	MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE, BAR	MAXIMUM INLET PRESSURE ⁽²⁾ - BAR					
			Maximum Inlet Pressure To Keep Maximum Allowable Downstream System Pressure From Being Exceeded								Maximum Inlet Pressure To Keep Maximum Allowable Downstream System Pressure From Being Exceeded					
			Port Diameter - Inches								Port Diameter - mm					
			3/32	1/8	3/16	1/4	3/8	1/2			2.4	3.2	4.8	6.4	9.5	12.7
35 to 80 psig (2.4 to 5.5 bar) 10B3078 X012 (blue)	40	125	2000	1100	500	300	170	140	2.8	8.6	138	75.8	34.5	20.7	11.7	9.7
		150	2000	1600	750	440	230	180		10.3	138	110	51.7	30.3	15.9	12.4
		175	2000	2000	980	580	290	220		12.1	138	138	67.6	40.0	20.0	15.2
		200	2000	2000	1200	720	340	250		13.8	138	138	82.7	49.6	23.4	17.2
		250	2000	2000	1600	940	450	320		17.2	138	138	110	64.8	31.0	22.1
	50	125	1400	820	400	230	150	140	3.4	8.6	96.5	56.5	27.6	15.9	10.3	9.7
		150	2000	1400	650	370	210	170		10.3	138	96.5	44.8	25.5	14.5	11.7
		175	2000	1900	700	530	270	210		12.1	138	131	48.3	36.5	18.6	14.5
		200	2000	2000	1100	670	330	240		13.8	138	138	75.8	46.2	22.8	16.5
		250	2000	2000	1500	920	430	320		17.2	138	138	103	63.4	29.6	22.1
	60	125	900	450	270	190	140	130	4.1	8.6	62.1	31.0	18.6	13.1	9.7	9.0
		150	1700	1100	540	300	190	160		10.3	117	75.8	37.2	20.7	13.1	11.0
		175	2000	1700	780	470	250	200		12.1	138	117	53.8	32.4	17.2	13.8
		200	2000	2000	1000	610	310	230		13.8	138	138	69.0	42.0	21.4	15.9
		250	2000	2000	1400	880	420	310		17.2	138	138	96.5	60.7	29.0	21.4
	70	150	1200	850	430	250	170	160	4.8	10.3	82.7	58.6	29.6	17.2	11.7	11.0
		175	2000	1400	670	400	230	190		12.1	138	96.5	46.2	27.6	15.9	13.1
		200	2000	2000	920	550	280	230		13.8	138	138	63.4	37.9	19.3	15.9
		250	2000	2000	1300	830	400	310		17.2	138	138	89.6	57.2	27.6	21.4
		80	150	800	500	300	200	160		150	5.5	10.3	55.2	34.5	20.7	13.8
	175		1500	1200	550	330	210	190	12.1	103		82.7	37.9	22.8	14.5	13.1
	200		2000	1700	800	480	270	220	13.8	138		117	55.2	33.1	18.6	15.2
	250		2000	2000	1200	770	390	300	17.2	138		138	82.7	53.1	26.9	20.7
70 to 150 psig (4.8 to 10.3 bar) 10B3079 X012 (red)	70		175	1900	600	400	260	200	175	4.8		12.1	131	41.4	27.6	17.9
		200	2000	1200	630	380	250	210	13.8		138	82.7	43.4	26.2	17.2	14.5
		250	2000	2000	1100	680	360	290	17.2		138	138	75.8	46.9	24.8	20.0
	80	175	1400	250	240	200	190	175	5.5	12.1	96.5	17.2	16.5	13.8	13.1	12.1
		200	2000	960	520	330	240	210		13.8	138	66.2	35.9	22.8	16.5	14.5
		250	2000	2000	1000	620	350	280		17.2	138	138	69.0	42.7	24.1	19.3
	100	200	1500	250	240	230	210	210	6.9	13.8	103	17.2	16.5	15.9	14.5	14.5
		250	2000	1600	770	520	320	270		17.2	138	110	53.1	35.9	22.1	18.6
125	250	2000	1000	500	390	290	260	8.6	17.2	138	69.0	34.5	26.9	20.0	17.9	
150	250	1200	260	260	260	260	260	4.8	17.2	82.7	17.9	17.9	17.9	17.9	17.9	
1. The internal relief performance values were obtained by removing the disk assembly. 2. For inlet pressures in excess of 1000 psig (69 bar), refer to the maximum body and disk pressure ratings in the specification table. 3. For settings under 10 psig (0.69 bar), inlet pressure should be limited to approximately 100 psig (6.9 bar) so the set point adjustment can be obtained. Shaded areas indicate maximum inlet pressures allowed during system malfunction only. Table 1 gives the maximum inlet pressure for normal regulator operation.																

1. The internal relief performance values were obtained by removing the disk assembly.
2. For inlet pressures in excess of 1000 psig (69 bar), refer to the maximum body and disk pressure ratings in the specification table.
3. For settings under 10 psig (0.69 bar), inlet pressure should be limited to approximately

100 psig (6.9 bar) so the set point adjustment can be obtained.
 Shaded areas indicate maximum inlet pressures allowed during system malfunction only. Table 1 gives the maximum inlet pressure for normal regulator operation.

In order to avoid an overpressure condition and possible equipment damage, pressure gauges should always be used to monitor pressures during start-up.

1. Slowly open the upstream shutoff valve.
2. Slowly open the downstream shutoff valve.
3. Check all connections for leaks.
4. Make final control spring adjustments according to the adjustment procedures.

Adjustment

The range of allowable pressure settings is marked on the nameplate (figure 2). If a pressure setting beyond this range is necessary, substitute the appropriate regulator control spring. Change the nameplate to indicate the new pressure range.

Before increasing the setting, refer to tables 2, 3, or 4. Review the pressure limits for the control spring range being used and be certain that the new pressure setting will not result in an overpressure condition.

Table 5. Maximum Torque Values

Key Number ⁽¹⁾	Description	Foot Pounds	Newton Meters
2	Seat ring	25	34
3	Cap screw (w/aluminum diaphragm casing)	16	22
	Cap screw (w/ductile iron or steel diaphragm casing)	25	34
18	Lever, cap screw	7	9
22	Diaphragm connector nut	17	23
26	Guide retainer (For Type 627R and 627MR only)	3	4
37	Spring case cap screw (w/aluminum or ductile iron diaphragm casing)	7	9
	Spring case cap screw (w/steel diaphragm casing)	35	47
46	Diaphragm cap screw (w/Type 627 or 627M)	7	9
	Diaphragm cap screw (w/Type 627H or 627HM)	14	19

1. Refer to figures 7 through 10 for key number locations.

Note

Always use a pressure gauge to monitor pressure when making adjustments.

Refer to figures 7 through 12 for key number locations.

1. Remove the adjusting screw cap (key 36).
2. Loosen the locknut (key 34).
3. Increase the outlet pressure setting by turning the adjusting screw (key 35) clockwise. Decrease the outlet pressure setting by turning the adjusting screw counter-clockwise.
4. When the desired pressure is obtained, hold the adjusting screw (key 35) in place and tighten the locknut (key 34).

Shutdown



WARNING

To avoid personal injury or property damage due to explosion or damage to regulator or downstream components during shutdown, release downstream pressure to prevent an overpressure condition on the diaphragm of the regulator.

1. Close the nearest upstream shutoff valve.
2. Close the nearest downstream shutoff valve.

3. Open the vent valve between the regulator and the downstream shutoff valve nearest to it.

4. For a Type 627, 627H, or 627R regulator, the regulator will open to release pressure between the upstream shutoff valve and the regulator.

5. A Type 627M, 627HM, or 627MR regulator requires venting the control line and downstream pressure from the regulator before maintenance. The pressure between these shutoff valves is released through the open regulator because the disk assembly remains open in response to the decrease in control line pressure.

Maintenance

Unless otherwise specified, the following maintenance procedures apply to all types of regulators. For a summary of maximum torque values required for all types of regulators, refer to table 5.

Due to normal wear, damage from external sources, or debris in the air or gas line, regulator parts such as the disk assembly, seat ring, and diaphragm must be inspected periodically and replaced as necessary to ensure correct performance. The frequency of inspection and replacement depends upon the severity of conditions and the requirements of state and federal laws. Normal wear of the seat ring and disk assembly is accelerated with high pressure drops and with large amounts of impurities in the flow stream. Instructions are given below for replacing the disk assembly, seat ring, diaphragm, and O-rings. These procedures may also be used for disassembly required for inspection and replacement of other parts.

Problem Indication for Type 627R and 627MR Regulators



WARNING

Isolate the regulator from all pressure to avoid personal injury and equipment damage due to explosion or sudden release of process pressure. Cautiously release pressure from the regulator before attempting disassembly.

The vent assembly is equipped with a relief indicator (key 49, figure 4). The cap for the relief indicator snaps over the vent assembly opening. If the relief valve opens wide, exhaust gas pops the cap off the screen vent assembly opening indicating a problem with the regulator. If the cap pops off, refer to the shutdown and to the body area maintenance procedures to inspect the disk assembly and seat ring.

If the disk assembly and seat ring are not damaged, refer to the diaphragm and spring case area maintenance procedures in this section.

The disk assembly and seat ring can be inspected, removed, and replaced without removing the regulator body from the line connections. Refer to the body area maintenance procedures.

Body Area Maintenance Procedures

These procedures are for gaining access to the disk assembly, seat ring, diaphragm casing O-ring and stem assembly. All pressure must be released from the diaphragm casing before the following steps can be performed.

While using the following procedures, refer to figures 7 through 12 for key number locations unless otherwise directed.

Replacing the Disk Assembly or Seat Ring

1. To inspect and replace the disk assembly (key 9) or seat ring (key 2), remove the cap screws (key 3, figure 5), and separate the diaphragm casing (key 5) from the body (key 1).

2. Inspect and, if necessary, remove the seat ring (key 2). If removed, coat the threads of the replacement seat ring with lubricant (key 38) and torque to 25 foot-pounds (34 NSm).

3. Inspect the disk assembly and, if necessary, remove the hair pin clip (key 13) that holds the disk assembly (key 9) in place. If replacing the disk assembly is the only maintenance required, skip to step 16.



Figure 4. Relief Indicator

Replacing the Stem Assembly

If it is necessary to perform maintenance on the stem assembly, continue with steps 4 through 8 and 15 through 19 for Type 627, 627H, and 627R regulators, or steps 9 through 19 for Type 627M, 627HM, and 627MR regulators.

Perform steps 4 through 8 for Type 627, 627H, and 627R Regulators only:

4. For Type 627, 627H, and 627R regulators (figure 5), use steps 5 through 8 to remove and replace the stem assembly.

5. Remove the boost body (key 6), stabilizer (key 7), and stem guide (key 8) from the diaphragm casing (key 5). Unhook and remove the stem (key 10) from the diaphragm casing (key 5).

6. Remove and inspect the diaphragm casing O-ring (key 4, figure 7, 8, or 11) and replace it if necessary.

7. Apply lubricant (key 42) to a replacement diaphragm casing O-ring (key 4, figure 7, 8, or 11) and install it onto the boost body (key 6). Skip to step 14.

8. For the Type 627 or 627H regulators, be sure to insert the pitot tube (tab) into the outlet side of the body (see figure 7 or 11). Skip to step 14.

Perform steps 9 through 19 for Type 627M, 627HM, and 627MR Regulators only:

9. For Type 627M, 627HM, and 627MR regulators (figure 5), use steps 10 through 14 to remove and replace the stem assembly.

10. To remove the blocked throat (key 43), insert a screw driver blade into the groove provided in the throat and pry it out of the diaphragm casing (key 5). Inspect and replace parts as necessary.

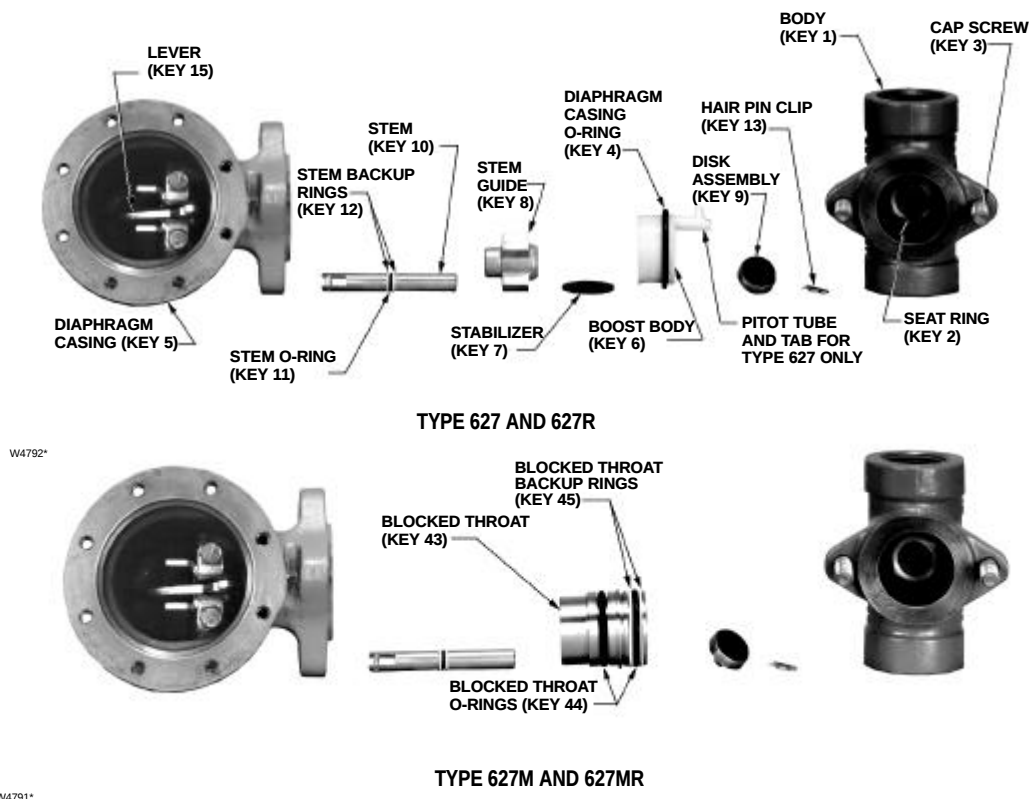


Figure 5. Stem Assemblies

11. Inspect and, if necessary, replace the blocked throat O-rings (key 44, figure 5) and backup rings (key 45, figure 5).

12. Apply lubricant (key 42) to replacement blocked throat O-rings (key 44) and backup rings (key 45).

13. Apply lubricant (key 42) to the replacement stem O-ring (key 11) and stem backup rings (key 12) and install them on the stem (key 10).

14. For assembly, insert the stem (key 10) into the diaphragm casing (key 5) and hook it on the lever (key 15).

15. Insert parts into the diaphragm casing (key 5) that were removed in steps 5 and 6 or step 10 (see figure 5).

16. Install the the disk assembly (key 9), line up the hole in the disk assembly and stem (key 10) and insert the hair pin clip (key 13).

17. Position the diaphragm casing plus attached parts in relation to the body (key 1) so that they are correct for the application.

18. Secure the diaphragm casing to the body with the cap screws (key 3, figure 5). For an aluminum diaphragm casing (key 5), torque the cap screws (key 3) to 16 foot-pounds (22 N $\cdot$ m). For ductile iron or steel diaphragm casings, torque the cap screws (key 3) to 25 foot-pounds (34 N $\cdot$ m).

19. It may be necessary to reposition the diaphragm spring case to prevent rain, ice, and foreign debris from entering the spring case. Refer to the diaphragm and spring case area maintenance procedures, steps 1, 2, and 21 through 25.

Diaphragm and Spring Case Area Maintenance Procedures

These procedures are for gaining access to the control spring, diaphragm assembly, and lever assembly. All spring pressure must be released from the diaphragm casing before these steps can be performed.

While using the following procedures, refer to figures 7 through 12 for key number locations unless otherwise directed.

1. Remove the adjusting screw cap (key 36), loosen the lock nut, and turn the adjusting screw (key 35) counterclockwise until all compression is removed from the control spring (key 32).

2. Remove the spring case cap screws (key 37), the nameplates, and lift off the spring case (key 29). If changing the control spring (key 32) or repositioning the spring case (key 29) is the only maintenance required, install the replacement control spring or rotate the spring case so it is correct for the application. Skip to step 21. For diaphragm area maintenance, continue with step 3.

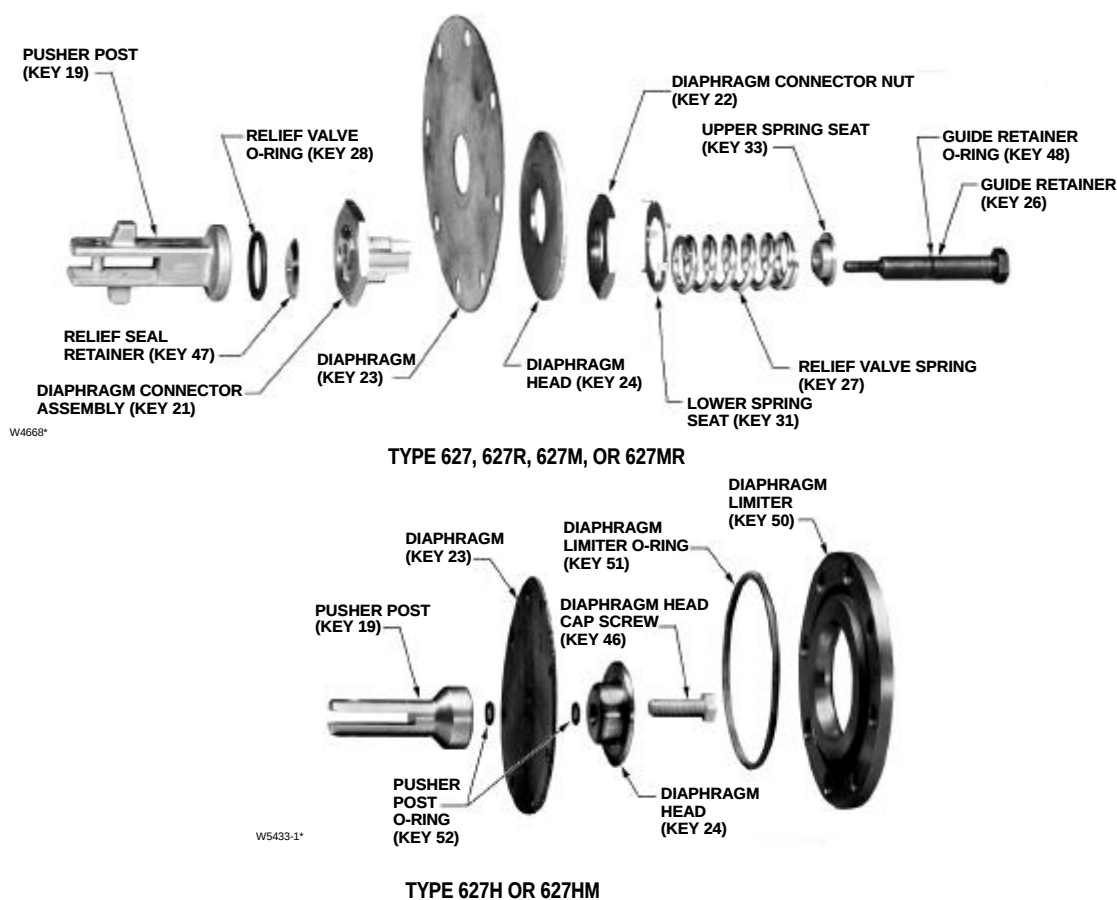


Figure 6. Diaphragm Assembly

3. Remove the diaphragm limiter and O-ring (keys 50 and 51, on the Type 627H or 627HM only). Remove the diaphragm assembly by tilting it so that the pusher post (key 19) slips off the lever (key 15).

4. If it is necessary to replace the lever assembly, remove the lever cap screws (key 18).

5. Install the replacement lever (key 15) into the lever retainer (key 16) by inserting the lever pin (key 17). Secure the lever assembly into the diaphragm casing with the cap screws (key 18) and torque the cap screws to 7 foot-pounds (9 NSm).

If it is necessary to perform maintenance on the diaphragm assembly, continue with steps 6 through 11 and step 20 for Type 627, 627H, 627M, and 627HM regulators, or steps 12 through 19 for Type 627R and 627MR regulators.

Perform steps 6 through 11 for Type 627, 627H, 627M, and 627HM Regulators only:

6. For Type 627, 627H, 627M, and 627HM regulators (figures 5 & 6), use steps 7 through 11 to disassemble and reassemble the diaphragm assembly.

7. Remove the diaphragm head cap screw (key 46), lower spring seat (key 31, Type 627 or 627M only), and diaphragm head (key 24). On the Type 627H or 627HM, remove the diaphragm cap screw O-rings (key 52). Separate the diaphragm (key 23) from the pusher post (key 19).

8. Install the diaphragm (key 23), in reverse order in step 7, on the pusher post (key 19), insert and finger tighten the diaphragm head cap screw (key 46).

9. Hook the pusher post on the lever (key 15), then turn the diaphragm (key 23) to match the holes in the diaphragm with the holes in the spring casing.

10. Unhook the pusher post from the lever and torque the diaphragm head cap screw (key 46) to 7 foot-pounds (9 NSm) for the Type 627 or 627M. On the Type 627H or 627HM torque the diaphragm head cap screw to 14 foot-pounds (18 NSm).

11. Hook the pusher post on the lever (key 15) and check the hole alignment. If necessary, loosen the cap screw (key 46) and reposition the diaphragm (key 23) on the pusher post (key 19). Retorque the screw (see step 10). Skip to step 20.

Perform steps 12 through 19 for Type 627R and 627MR Regulators only:

12. For Type 627R and 627MR regulators (figure 6), use steps 13 through 19 to disassemble and reassemble the diaphragm assembly:

13. Remove the guide retainer (key 26) and separate the diaphragm parts. Refer to figure 6 for the sequence of parts.

14. To remove the diaphragm (key 23), remove the diaphragm connector nut (key 22) and lift off the diaphragm head (key 24) and diaphragm (key 23) from the connector assembly (key 21). Do not attempt to disassemble the connector assembly (key 21).

15. Position the replacement diaphragm (key 23) on the connector assembly (key 21), install the diaphragm head (key 24) and connector nut (key 22), then torque to 17 foot-pounds (32 NSm).

16. If necessary, replace the guide retainer O-ring (key 48) and, set the guide retainer (key 26) aside, ready for assembly.

17. On the pusher post (key 19) install the relief seal O-ring (key 28) and lubricate (key 42). Also, install the relief seal retainer (key 47), diaphragm connector assembly (key 21, with attached parts) relief spring (key 27), upper relief spring seat (key 33), and guide retainer (key 26). Torque the guide retainer (key 26) to 3 foot-pounds (4 NSm).

18. Hook the pusher post (with attached parts) on the lever (key 15) to check the alignment of the holes in the diaphragm with the holes in the spring casing. If the holes do not line up, unhook the pusher post from the lever, hold the pusher post, and rotate the diaphragm to the correct position.

19. Install the lower spring seat (key 31) over the relief spring so it rests flat on the connector nut (key 22).

20. Insert the diaphragm assembly into the diaphragm casing (key 5) and hook the pusher post on the lever (key 15).

21. Install the control spring (key 32) and upper spring seat (key 33), and apply lubricant (key 38) to the upper spring seat (key 33).

22. Install the spring case (key 29) so that the screened vent assembly (key 30) is in the correct position for the application. Place the nameplates (key 39) over the screw holes, insert the spring case cap screws (key 37), and finger tighten.

23. Screw in the adjustment screw to put slack into the diaphragm (key 23).

24. Using a crisscross pattern, finish tightening the spring case cap screws (key 37) to 7 foot-pounds (9 NSm) of torque.

25. If necessary, refer to the installation and/or the startup and adjustment procedures.

26. Install the adjusting screw cap (key 34) after regulator adjustment.

Parts Ordering

When corresponding with your Fisher sales office or sales representative about this regulator, always reference the type number which is found on the nameplate (key 39, figures 7 through 12).

When ordering replacement parts, reference the key number of each needed part as found in the following parts list.

Parts List

Key	Description	Part Number
	Type 627 Parts Kit with aluminum/nitrile trim (includes keys 4, 9, 11, 12, and 23)	R627 X000A12
	Type 627 Parts Kit with stainless steel/nitrile trim (includes keys 4, 9, 11, 12, and 23)	R627 X000S12
	Type 627R Parts Kit with aluminum/nitrile trim (includes keys 4, 9, 11, 12, 23, 28, and 48)	R627R X00A12
	Type 627R Parts Kit with stainless steel/nitrile trim (includes keys 4, 9, 11, 12, 23, 28, and 48)	R627R X00S12
1	Body	
	Ductile iron	
	1000 psig (69 bar) max inlet pressure	
	3/4-inch NPT size	30B3046 X012
	1-inch NPT size	30B3048 X012
	2-inch NPT size	30B3096 X012
	Steel	
	2000 psig (138 bar) max inlet pressure	
	3/4-inch NPT size	30B3050 X012
	1-inch NPT size	30B3051 X012
	2-inch NPT size	30B7452 X012
	Steel, raised face flanged, ANSI Class 600	
	1480 psig (102 bar) max inlet pressure	
	1-inch size	40B6754 X012
	2-inch size	40B6756 X012
2*	Seat ring	
	Aluminum	
	3/32-inch (2.4 mm) port diameter	0R0441 09022
	1/8-inch (3.2 mm) port diameter	1A9367 09012
	3/16-inch (4.8 mm) port diameter	009912 09012
	1/4-inch (6.4 mm) port diameter	0B0420 09012
	3/8-inch (9.5 mm) port diameter	0B0422 09012
	1/2-inch (12.7 mm) port diameter	1A9288 09012

*Recommended spare part.

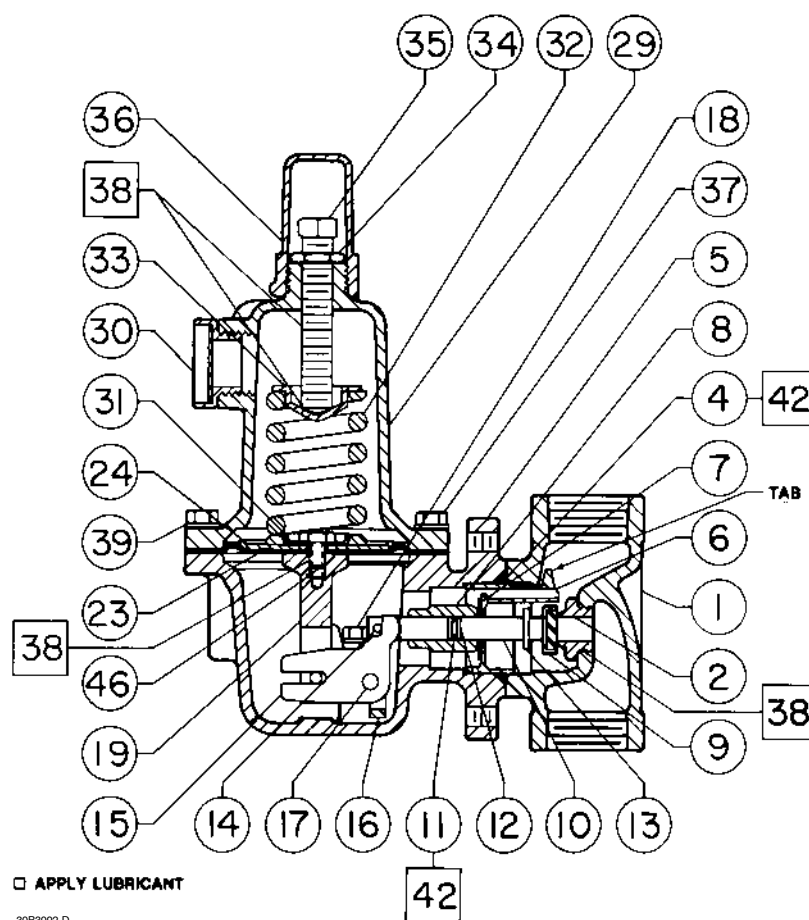


Figure 7. Type 627 Regulator Components

Key	Description	Part Number	Key	Description	Part Number
2*	Seat ring (Cont.) 303 Stainless steel 3/32-inch (2.4 mm) port diameter 1/8-inch (3.2 mm) port diameter 3/16-inch (4.8 mm) port diameter 1/4-inch (6.4 mm) port diameter 3/8-inch (9.5 mm) port diameter 1/2-inch (12.7 mm) port diameter 316 Stainless steel, NACE ⁽¹⁾ construction only 3/32-inch (2.4 mm) port diameter 1/8-inch (3.2 mm) port diameter 3/16-inch (4.8 mm) port diameter 1/4-inch (6.4 mm) port diameter 3/8-inch (9.5 mm) port diameter 1/2-inch (12.7 mm) port diameter	0R0441 35032 1A9367 35032 009912 35032 0B0420 35032 0B0422 35032 1A9288 35032 0R0441 X0012 1A9367 X0022 009912 X0012 0B0420 X0012 0B0422 X0012 1A9288 X0012	5	Diaphragm Case For Type 627 or 627R Aluminum w/o 1/8-inch gauge tap Aluminum with 1/8-inch gauge tap for Type 627 only Ductile iron w/o 1/8-inch gauge tap Ductile iron with 1/8-inch gauge tap for Type 627 only Steel For Type 627M or 627MR Ductile iron Steel For Type 627H Steel For Type 627HM Steel	40B3084 X012 11B5380 X012 30B3053 X012 31B0641 X012 30B3104 X012 39A5987 X012 30B8734 X012 30B3104 X012 30B8734 X012
3	Cap Screw (not shown), (2 req'd) Type 627 and 627R w/aluminum diaphragm case, pl steel All Types w/ductile iron diaphragm case, pl steel or steel diaphragm case, pl steel	18A1087 X012 1C4038 24052 1C4030 24052	6	Boost Body (not for Type 627M, 627HM, or 627MR), Delrin ⁽²⁾ For Type 627 or 627H For Type 627R	30B3056 X012 30B3057 X012
4*	Diaphragm Case O-Ring (Type 627, 627H, or 627R only), nitrile	17A2325 X022	7	Stabilizer (for Type 627, 627H, & 627R only), nitrile	10B3060 X012
			8	Stem Guide (for Type 627, 627H, & 627R only), powdered metal	20B3061 X012

*Recommended spare part.

1. National Association of Corrosion Engineers (NACE) standard MR-01-75.

2. Trademark of E. I. du Pont De Nemours co.

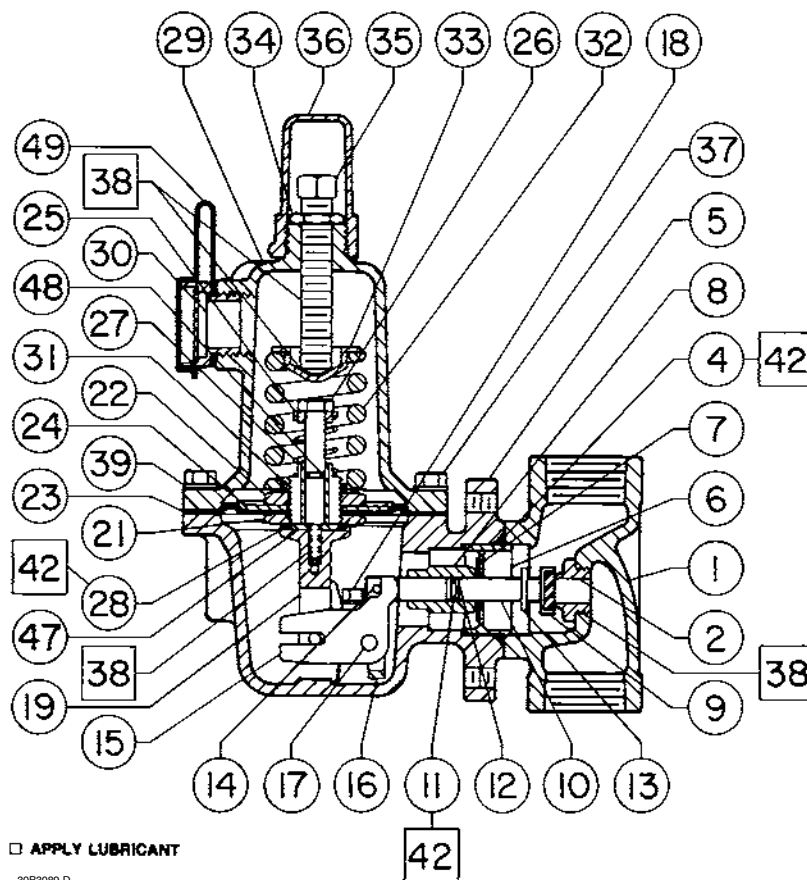


Figure 8. Type 627R Regulator Components

Key	Description	Part Number	Key	Description	Part Number
9*	Disk Assembly (for all port diameters)		19	Pusher Post, aluminum	
	Aluminum holder and nitrile disk	1C4248 X0212		For Type 627 or 627M	10B3098 X012
	303 Stainless steel holder and nitrile disk	1C4248 X0202		For Type 627R or 627MR	10B3098 X022
	Aluminum holder and nylon disk	1C4248 X00A2		For Type 627H or 627HM	
	303 Stainless steel holder and nylon disk	1C4248 X0062		(416 stainless steel)	10B3098 X032
	NACE construction only		21	Diaphragm Connector (for Type 627R	
	Aluminum holder and nitrile disk	1C4248 X0212		or 627MR only), stainless steel	10B6758 X012
	316 Stainless steel holder and nitrile disk	1C4248 X0252	22	Diaphragm Connector Nut (for Type	
	Aluminum holder and nylon disk	1C4248 X00A2		627R or 627MR only), stainless steel	10B7449 X012
	316 Stainless steel holder and nylon disk	1C4248 X0262	23*	Diaphragm, nitrile	
10	Stem			For Type 627 or 627M w/aluminum or	
	303 stainless steel	10B3059 X012		ductile iron diaphragm case	10B3069 X012
	316 stainless steel (NACE)	10B3059 X022		For Type 627 or 627M w/steel	
11*	Stem O-Ring, nitrile	1D6875 06992		diaphragm case	10B8735 X012
12	Stem Backup Ring, TFE (2 req d)	1K7868 06992		For Type 627R or 627MR w/aluminum or	
				ductile iron diaphragm case	10B3068 X012
13	Hair Pin Clip, stainless steel	10B3058 X012		For Type 627R or 627MR w/steel	
14	Drive Pin, zn pl steel	1A9532 28982		diaphragm case	10B8736 X012
15	Lever, zn pl steel	20B3063 X012		For Type 627H or 627HM w/steel	
16	Lever Retainer, zn pl steel	30B3097 X012		diaphragm case (diaphragm is	
				neoprene with nylon fabric)	12B0178 X012
17	Lever Pin		24	Diaphragm Head, zn pl steel	
	Stainless steel	10B3083 X012		For Type 627 or 627M	1D6664 28982
	316 stainless steel (NACE)	10B3083 X022		For Type 627R or 627MR	10B3071 X012
18	Lever Cap Screw (2 req d)			For Type 627H or 627HM	
	Plated steel	10B7454 X012		(416 stainless steel)	12B0175 X012
	316 stainless steel (NACE)	10B7454 X022			

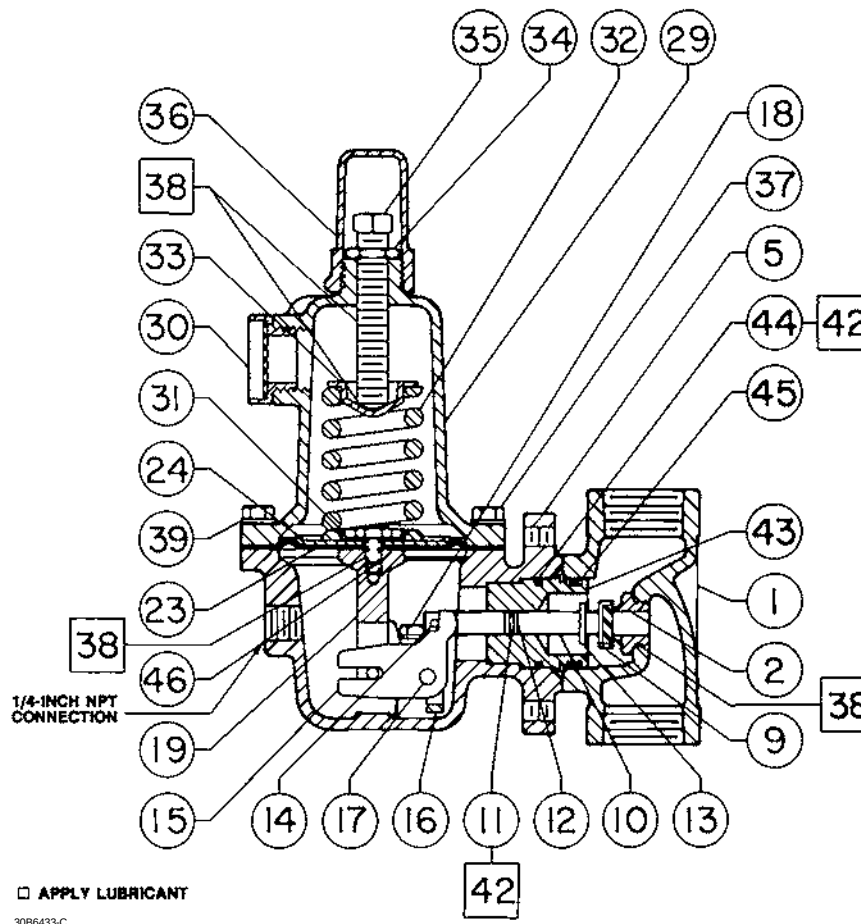


Figure 9. Type 627M Regulator Components

Key	Description	Part Number	Key	Description	Part Number
25	Relief Spring Seat (for Type 627R or 627MR only), steel	10B7446 X012	32	Control Spring, pl steel 5 to 20 psig range (0.34 to 1.4 bar), yellow color code	10B3076 X012
26	Guide Retainer (for Type 627R or 627MR only), stainless steel	10B7450 X012		15 to 40 psig range (1.0 to 2.8 bar), green color code	10B3077 X012
27	Relief Spring (for Type 627R or 627MR only), pl steel	10B6757 X012		35 to 80 psig range (2.4 to 5.5 bar), blue color code	10B3078 X012
28*	Relief Seal O-Ring (for Type 627R or 627MR only), nitrile	1J1085 06992		70 to 150 psig range (4.8 to 10.3 bar), red color code	10B3079 X012
29	Spring Case For Type 627 or 627R Aluminum Ductile iron Steel	40B3086 X012 30B3055 X012 30B3102 X012		140 to 250 psig range (9.6 to 17.2 bar), blue color code, used in a Type 627H or 627HM	10B3078 X012
	For Type 627M or 627MR Ductile iron Steel	30B3055 X012 30B3102 X012		240 to 500 psig range (16.5 to 34.5 bar), red color code, used in a Type 627H or 627HM	10B3079 X012
	For Type 627H or 627HM Steel	30B3102 X012	33	Upper Spring Seat, pl steel	1D6671 25072
30	Screened Vent Assembly, plastic	10B3093 X012	34	Locknut, zn pl steel	1D6677 28982
31	Lower Spring Seat, zn pl steel For Type 627 or 627M For Type 627R or 627MR	1D6666 25072 20B3073 X012	35	Adjusting Screw, pl steel For Type 627 or 627M For Type 627H or 627HM For Type 627R or 627MR	10B3081 X012 10B3081 X012 10B3080 X012
			36	Adjusting Screw Cap, plastic	20B3082 X012

*Recommended spare part.

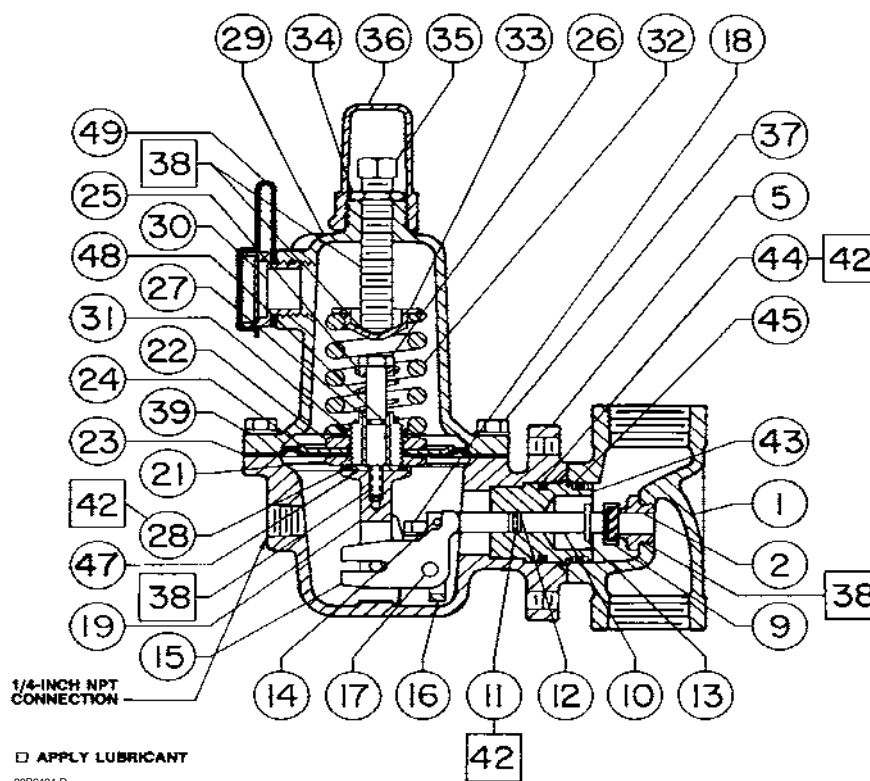


Figure 10. Type 627MR Regulator Components

Key	Description	Part Number	Key	Description	Part Number
37	Spring Case Cap Screw, pl steel (8 req'd) For aluminum or ductile iron diaphragm case For steel diaphragm case Type 627H or 627HM, steel diaphragm case	1A3917 24052 10B8737 X012 1A3464 24052	43	Blocked Throat (for Type 627M, 627HM or 627MR only), stainless steel	10B3085 X012
38*	Lubriplate Mag-1 ⁽³⁾ , Lubricant, 0.9 pound can. Not furnished with regulator	1M1100 X0012	44	Blocked Throat O-Ring (for Type 627M, 627HM, or 627MR only), nitrile (2 req'd)	1E2643 06992
39	Nameplate For aluminum and ductile iron spring cases Aluminum Number 1 Number 2 For Type 627H, 627HM and steel spring cases Stainless steel Number 1 Number 2	10B3679 X032 10B3679 X022 11B6572 X022 11B6572 X032	45	Blocked Throat Backup Ring (for Type 627M, 627HM, or 627MR only), TFE (2 req'd)	10B3106 X012
42*	Dow Corning 33 ⁽⁴⁾ , Lubricant, Not furnished with regulator	T13078 T0012	46	Diaphragm Head Cap Screw, steel For Type 627 or 627M For Type 627H or 627HM	1K9207 24052 1C3791 24052
			47	Relief Seal Retainer (for Type 627R or 627MR only), stainless steel	10B7445 X012
			48*	Guide Retainer O-Ring (for Type 627R or 627MR only), nitrile	1D6825 06992
			49	Relief Indicator (for Type 627R or 627MR only), rubber (not shown)	30B3100 X012
			50	Diaphragm Limiter	22B0176 X012
			51*	Diaphragm Limiter O-Ring	1K8776 06992
			52*	Pusher Post O-Ring (2 Req'd)	1C8538 06992

*Recommended spare part.

3. Trademark of Fiske Brothers Refining Co.

4. Trademark of Tretolite Division of Petrolite Corp.

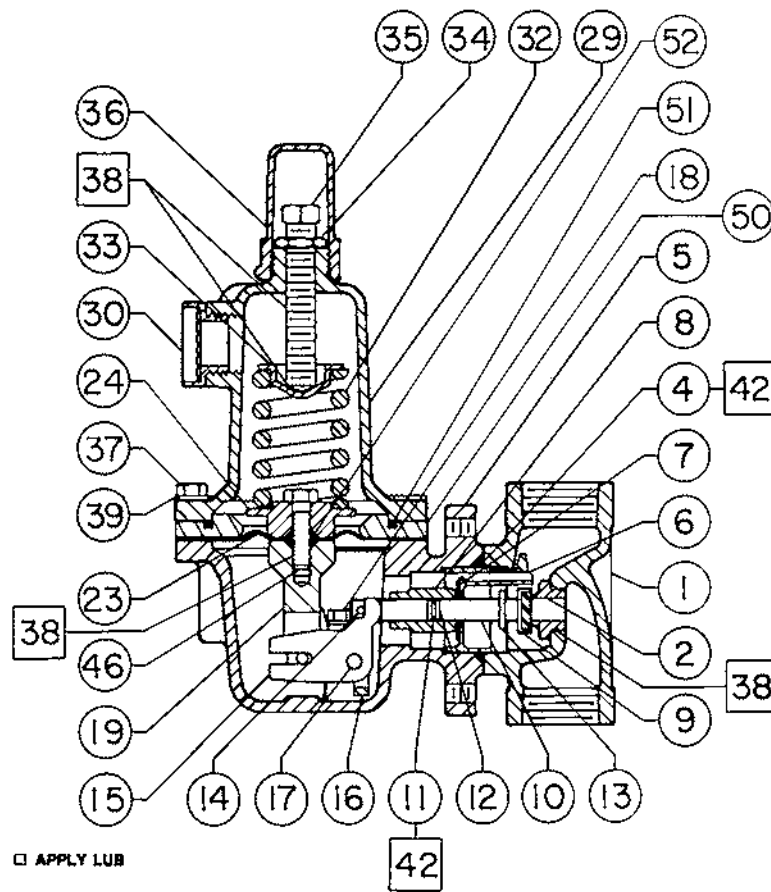


Figure 11. Type 627H Regulator Components

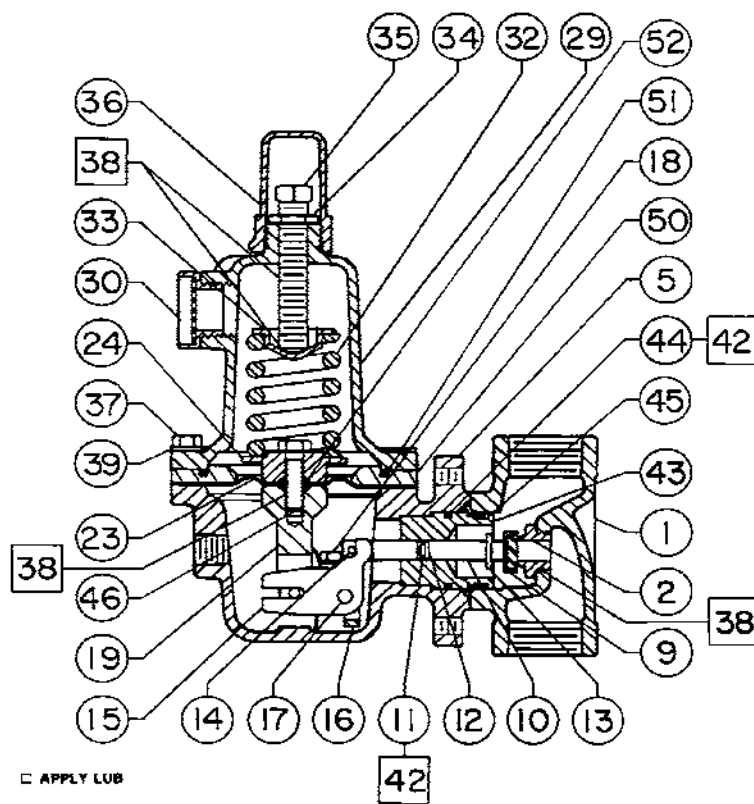


Figure 12. Type 627HM Regulator Components

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67CF Series Filter Regulators

Introduction

Scope of Manual

This manual provides instructions and parts lists for 67CF Series filter regulators. Instructions and parts lists for other equipment mentioned in this instruction manual, as well as for other 67 Series regulators, are found in separate manuals.

Product Description

The 67CF Series direct-operated regulators are equipped with a filter for removing particles from the supply gas. They are typically used to provide constantly controlled, reduced pressures to pneumatic and electropneumatic controllers and other instruments. These are suitable for most air or gas applications. Other applications include providing reduced pressures to air chucks, air jets, and spray guns.

The Type 67CFR regulator has an integral low-capacity internal relief valve. A downstream pressure increase above the outlet pressure setting moves the diaphragm assembly off the soft seat, venting the excess pressure through a hole or vent in the spring case.

Specifications

Some general 67CF Series ratings and other specifications are given on page 2. A label on the spring case gives the control spring range for a given regulator as it comes from the factory.

Installation

Note

If the regulator is shipped mounted on another unit, install that unit according to the appropriate instruction manual.



W7412

Figure 1. Typical Type 67CF Filter Regulator with Optional Gauge



WARNING

Personal injury, property damage, equipment damage, or leakage due to escaping gas or bursting of pressure-containing parts may result if this regulator is over-pressured or is installed where service conditions could exceed the limits given in the specifications, or where conditions exceed any ratings of the adjacent piping or piping connections. To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation, or standard) to prevent service conditions from exceeding those limits.



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Specifications

Body Size, Inlet and Outlets Connection Style

1/4-inch NPT screwed

Maximum Inlet Pressure (Body Rating)⁽¹⁾

250 psig (17,2 bar)

Outlet Pressure Ranges

OUTLET PRESSURE RANGES, PSIG (bar)	CONTROL SPRING DATA		
	Part Number	Color	Wire Diameter, Inch (mm)
0 to 20 (0 to 1,4)	T14130T0012	green stripe	0.135 (3,43)
0 to 35 (0 to 2,4)	T14059T0012	silver	0.156 (3,96)
0 to 60 (0 to 4,1)	T14058T0012	blue stripe	0.170 (4,32)
0 to 125 (0 to 8,6)	T14060T0012	red stripe	0.207 (5,26)

Maximum Emergency Outlet Pressure⁽¹⁾

50 psi (3,4 bar) over outlet pressure setting

Wide-Open Flow Coefficients

Main Valve: C_g : 11.7; C_v : 0.36; C_i : 32.2

Internal Relief Valve: C_g : 1.45; C_v : 0.045; C_i : 32.8

Pressure Registration

Internal

Accuracy

Inlet Sensitivity: Less than 0.2 psig (0,014 bar) change in outlet pressure for every 25 psig (1,72 bar) change in inlet pressure

Repeatability: 0.1 psig (0,0069 bar)⁽²⁾

Air Consumption: testing repeatedly shows no discernible leakage

Regulator Temperature Capabilities

With Nitrile (NBR): -40° to 180°F (-40° to 82°C)

With Fluoroelastomer (FKM):

0° to 300°F (-18° to 149°C)

With Silicone (VMQ)⁽³⁾: -60° to 180°F (-51° to 82°C)

Drain Valve and Spring Case Vent Location

Aligned with inlet, other positions optional

Type 67CFR Internal Relief Performance

Low capacity for minor seat leakage only; other overpressure protection must be provided if inlet pressure can exceed the maximum pressure rating of downstream equipment or exceeds maximum outlet pressure rating of the Type 67CFR

Filter Capabilities

Free Area: 12 times pipe area

Micron Rating:

Cellulose Element: 40 microns

Glass Fiber Element: 10 microns

Stainless Steel Element: 40 microns

Approximate Unit Weight

1 pound (0,5 kg)

Options

- Handwheel adjusting screw
- NACE (MR0175) compliant construction
- Ammonia service construction
- Panel mount (includes spring case with 1/4-inch vent, handwheel, and panel mounting nut)
- Closing cap (available on spring case with 1/4-inch NPT vent)
- Aluminum or stainless steel drain valve
- Fluoroelastomer (FKM) elastomers for high temperatures and/or corrosive chemicals
- Silicone (VMQ) elastomers for cold temperatures
- Triple scale outlet pressure gauge (brass or stainless steel)
- Stainless steel stem on the valve plug
- Fixed bleed restriction mounted in the side outlet
- Tire valve in second outlet
- Pipe plug in second outlet

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.

2. Repeatability is the measure of the regulator's ability to return to setpoint consistently when traveling from steady state to transient to steady state.

3. Silicone is not compatible with hydrocarbon gas.



WARNING

The internal relief valve of the Type 67CFR regulator does not provide full overpressure protection. The internal relief valve is designed for minor seat leakage only. If maximum inlet pressure to the Type 67CFR exceeds maximum pressure ratings of the downstream equipment or exceeds maximum allowable outlet pressure of the Type 67CFR, additional overpressure protection is required.

1. Regulator operation within ratings does not preclude the possibility of damage from debris in the lines or from external sources. Regulators should be inspected for damage periodically and after any overpressure condition.

2. Only personnel qualified through training and experience should install, operate, and maintain a regulator. Make sure that there is no damage to or foreign material in the regulator. Also ensure that all tubing and piping is free of debris.

3. Install the regulator so that flow is from the IN to the OUT connection as marked on the regulator body.

4. For best drainage, orient the drain valve (key 2) to the lowest possible point on the dripwell (key 5). This orientation may be improved by rotating the dripwell with respect to the body (key 1).



WARNING

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gas may accumulate and cause personal injury, death, or property damage due to fire or explosion. Vent a regulator in hazardous gas service to a remote, safe location away from air intakes or any hazardous area. The vent line or stack opening must be protected against condensation or clogging.

5. A clogged spring case vent hole may cause the regulator to function improperly. To keep this vent hole from being plugged (and to keep the spring case from collecting moisture, corrosive chemicals, or other foreign material) orient the vent to the lowest possible point on the spring case or otherwise protect it.

Inspect the vent hole regularly to make sure it is not plugged. Spring case vent hole orientation may be changed by rotating the spring case with respect to the body. A 1/4-inch NPT spring case vent may be remotely vented by installing obstruction-free tubing or piping into the vent. Protect the remote vent by installing a screened vent cap on the remote end of the vent pipe.

6. For use in regulator shutdown, install upstream block and vent valves and downstream block and vent valves (if required), or provide some other suitable means of properly venting the regulator inlet and outlet pressures. Install a pressure gauge to monitor instruments on startup.

7. Apply a good grade of pipe compound to the male pipe threads before making connections, making sure not to get the pipe compound inside the regulator.

8. Install tubing fitting or piping into the 1/4-inch NPT inlet connection on the body (key 1) and into the 1/4-inch NPT body outlet connection.

9. The second 1/4-inch NPT outlet can be used for a gauge or other use. If not used, it must be plugged.

Installing a 67CF Series Regulator in an Existing Installation

When installing a 67CF Series regulator in an existing installation, it may be necessary to use spacers (key 34, figure 6) to adapt the installation. If the mounting bolts are too long, place a spacer on the bolt (see figure 6). To be sure the regulator is secure, the bolts should have at least two full threads of engagement.

Startup and Adjustment

Key numbers are referenced in figure 2.

1. With proper installation completed and downstream equipment properly adjusted, slowly open the upstream and downstream shutoff valve (when used) while using pressure gauges to monitor pressure.



WARNING

To avoid personal injury, property damage, or equipment damage caused by bursting of pressure containing parts or explosion of accumulated gas, never adjust the control spring to produce an outlet pressure higher than the upper limit of the outlet pressure range for that particular spring. If the desired outlet pressure is not within the range of the control spring, install a spring of the proper range according to the diaphragm parts maintenance procedure.

2. If outlet pressure adjustment is necessary, monitor outlet pressure with a gauge during the adjustment procedure. The regulator is adjusted by loosening the locknut (key 19), if used, and turning the adjusting screw or handwheel (key 18) clockwise to increase or counterclockwise to decrease the outlet pressure setting. Retighten the locknut to maintain the adjustment position.

Shutdown

First, close the nearest upstream block valve and then close the nearest downstream block valve (when used). Next, open the downstream vent valve. Since the regulator remains open in response to the

decreasing downstream pressure, pressure between the closed block valves will be released through the open vent valve.

Maintenance

Regulator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement of parts depends on the severity of service conditions and upon applicable codes and government regulations. Open the drain valve (key 2) regularly to empty accumulated liquid from the dripwell (key 5).

Note

If sufficient clearance exists, the body (key 1) may remain mounted on other equipment or in a line or panel during maintenance unless the entire regulator will be replaced.



WARNING

To avoid personal injury, property damage, or equipment damage caused by sudden release of pressure or explosion of accumulated gas, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure from the regulator.

Filter Element and Trim Maintenance

Key numbers are referenced in figures 2 and 3.

1. Remove four dripwell screws (key 3) from the dripwell (key 5) and separate the dripwell and O-ring (key 4) from the body (key 1). The filter retainer (key 9), filter element (key 6), and gasket (key 26) may come off with dripwell. If not, remove these parts.
2. Inspect the removed parts for damage and debris. Replace any damaged parts. If a replacement is not available, the filter element may be cleaned.
3. To remove the valve cartridge assembly, grasp the end of cartridge and pull it straight out of body (key 1). Replace with new cartridge assembly. The cartridge

assembly may be disassembled and parts may be cleaned or replaced. If the soft seat (key 15) was removed, make sure it is properly snapped into place before installing the valve cartridge assembly.

4. Apply lubricant to the O-ring (key 14), then align cartridge key to keyway in body and insert. Reinstall the gasket (key 26), filter (key 6), and filter retainer (key 9). Reinstall the O-ring (key 4), secure the dripwell with screws (key 3), and torque to 24 to 36 inch-pounds (2,7 to 4,1 N·m).

Diaphragm Maintenance

Key numbers are referenced in figure 2.

1. Back out the adjusting screw or handwheel (key 18) until compression is removed from the spring (key 17).
2. Remove the six spring case screws (key 3) to separate the spring case (key 7) from the body (key 1). Remove the upper spring seat (key 20) and spring (key 17).
3. Remove the diaphragm assembly (key 16), inspect the diaphragm, and replace the assembly, if necessary.
4. Place the diaphragm assembly (key 16) on the body (key 1) as shown in figure 4. Push down on the diaphragm assembly to make sure the valve plug (key 11) strokes smoothly and approximately 1/16-inch (2 mm).

Note

In step 5, if installing a control spring of a different range, be sure to delete the spring range originally appearing on the label and indicate the new spring range.

5. Stack the control spring (key 17) and upper spring seat (key 20) onto the diaphragm assembly (key 16).
6. Install the spring case (key 7) on the body (key 1) with the vent oriented to prevent clogging or entrance of moisture. Install the six spring case screws (key 3) using a crisscross pattern and torque to 24 to 36 inch-pounds (3 to 4 N·m).
7. When all maintenance is complete, refer to the Startup and Adjustment section to put the regulator back into operation and adjust the pressure setting. Tighten the locknut (key 19) if used, and install the closing cap if used.

Parts Ordering

When corresponding with the Fisher Sales Office or Sales Representative about this regulator, include the type number and all other pertinent information printed on the label. Specify the eleven-character part number when ordering new parts from the following parts list.

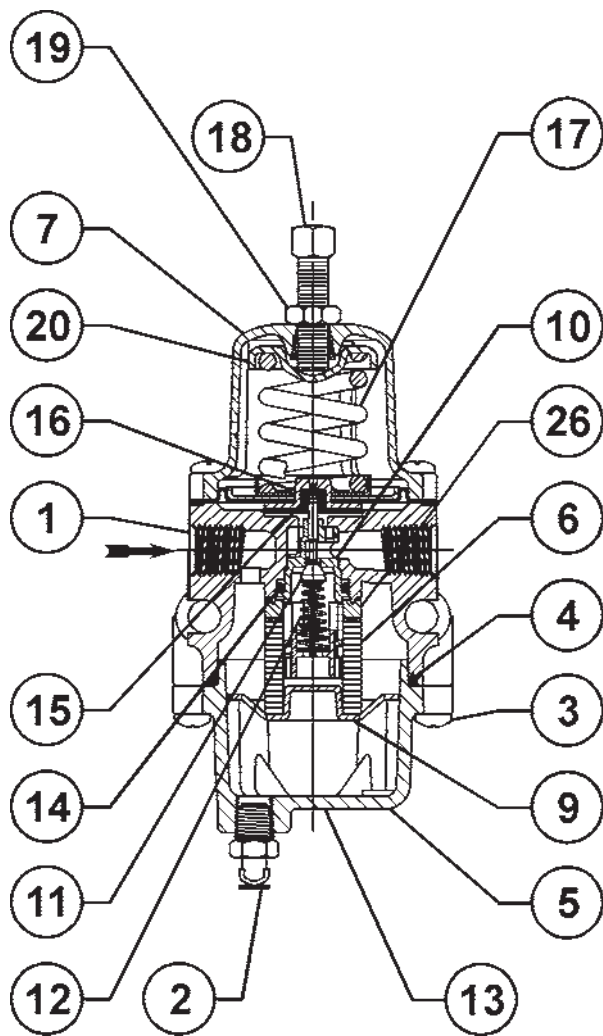
Parts List

Key	Description	Part Number	Key	Description	Part Number
	Parts Kit Includes valve cartridge assembly (contains keys 10, 11, 12, 13, 14, and 15), diaphragm assembly (key 16), filter element (key 6), filter gasket (key 26), and four screws (key 3)		12 ^(1, 2)	Valve Spring Stainless steel Inconel (NACE)	T14105T0012 T14116T0012
	Type 67CF (without relief) Brass stem with nitrile plug Aluminum stem with nitrile plug (NACE)	R67CFX00012 R67CFX00N12	13 ^(1, 2)	Valve Retainer	T14071T0012
	Type 67CFR (with relief) Brass stem with nitrile plug Aluminum stem with nitrile plug (NACE)	R67CFRX0012 R67CFRX0N12	14 ^(1, 2)	O-Ring Nitrile (NBR) Fluoroelastomer (FKM) Silicone (VMQ)	T14063T0012 T14063T0022 T14063T0032
	Valve Cartridge Assembly Only Brass stem With nitrile plug With fluoroelastomer plug Aluminum stem with nitrile plug with nitrile plug (NACE)	T14121T0012 T14121T0022 T14121T0042 T14121T0052	15 ^(1, 2)	Soft Seat Nitrile (NBR) Fluoroelastomer (FKM)	T14055T0012 T14055T0022
1	Body, Aluminum	T80432T0012	16 ⁽¹⁾	Diaphragm Assembly 67CF (without relief) Nitrile (NBR) Fluoroelastomer (FKM) Type 67CFR (with relief) Nitrile (NBR) Fluoroelastomer (FKM) Silicone (VMQ)	T14119T0022 T14119T0042 T14119T0012 T14119T0032 T14119T0052
2	Drain Valve Brass Aluminum Stainless steel	1K418918992 1K4189000B2 AH3946X0012	17	Spring Types 67CF and 67CFR, Plated steel (standard) 0 to 20 psig (0 to 1,4 bar), Green stripe 0 to 35 psig (0 to 2,4 bar), Silver 0 to 60 psig (0 to 4,1 bar), Blue stripe 0 to 125 psig (0 to 8,6 bar), Red stripe Type 67CFR (NACE), Inconel (NACE) 0 to 35 psig (0 to 2,4 bar), Silver stripe 0 to 60 psig (0 to 4,1 bar), Blue 0 to 125 psig (0 to 8,6 bar), Red	T14130T0012 T14059T0012 T14058T0012 T14060T0012 T14113T0012 T14114T0012 T14115T0012
3	Flange Screw Standard spring case and spring case with 1/4-inch NPT vent (10 required) For wire seal Flange Screw (9 required) Flange Screw (1 required)	T13526T0012 T13526T0012 14B3987X012	18	Adjusting Screw For standard spring case Square head (standard) Handwheel Wire seal (not shown)	T14061T0012 T14102T0012 T14104T0012
4 ⁽¹⁾	O-Ring Nitrile (NBR) Fluoroelastomer (FKM) Silicone (VMQ)	T14057T0012 T14057T0022 T14057T0032		For spring case with 1/4-inch NPT vent Square head for closing cap Handwheel	T14101T0012 T14103T0012
5	Dripwell	T21040T0012	19	Locknut	1A946324122
6 ⁽¹⁾	Filter Element Cellulose (40 microns) (standard) Glass fiber (10 microns) Stainless steel (40 microns)	1F257706992 17A1457X012 15A5967X012	20	Upper Spring Seat	1B798525062
7	Spring Case, Aluminum Drilled hole vent (standard) 1/4-inch NPT vent	T14070T0012 T14070T0022	22	Pressure Gauge Brass 0 to 30 psig/0 to 2 bar/0 to 0,2 MPa 0 to 60 psig/0 to 4 bar/0 to 0,4 MPa 0 to 160 psig/0 to 11 bar/0 to 1,1 MPa Stainless Steel 0 to 30 psig/0 to 2 bar/0 to 0,2 MPa 0 to 60 psig/0 to 4 bar/0 to 0,4 MPa 0 to 160 psig/0 to 11 bar/0 to 1,1 MPa	11B8579X022 11B8579X032 11B8579X042 11B9639X012 11B9639X022 11B9639X032
9	Filter Retainer	T14052T0012	23	1/4-Inch Pipe Plug Socket head, steel Hex head, stainless steel	1C333528992 1A767535072
10 ^(1, 2)	Valve Cartridge	T80434T0012	24	Tire Valve	1H447099022
11 ^(1, 2)	Valve Plug Brass stem, nitrile (NBR) plug Aluminum stem, fluoroelastomer (FKM) plug Aluminum stem, nitrile (NBR) plug	T14053T0012 T14053T0022 T14053T0032	26 ⁽¹⁾	Filter Gasket Nitrile (NBR) Fluoroelastomer (FKM)	T14081T0012 T14081T0022
			31	Panel Mounting Nut	10B2657X012
			32	Wire Seal (not shown)	1U7581000A2
			33	Closing Cap	23B9152X012
			34	Spacer	T14123T0012
			35	Mounting adaptor plate for Fisher 2500 Series Controller	T21043T0012

1. Recommended Spare Part

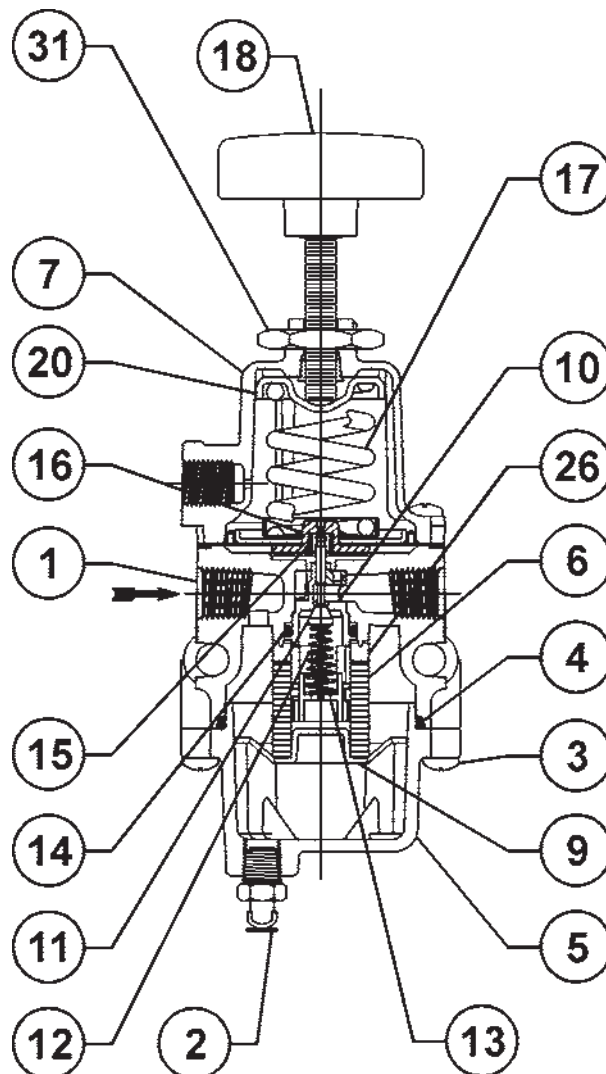
2. Valve cartridge assembly includes keys 10, 11, 12, 13, 14, and 15.

67CF Series



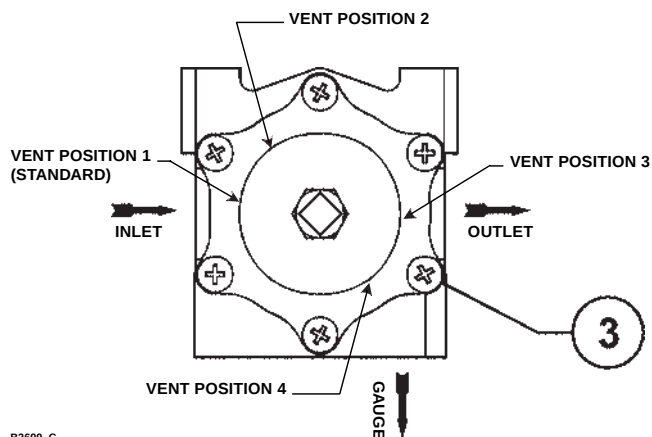
B2693

STANDARD CONSTRUCTION



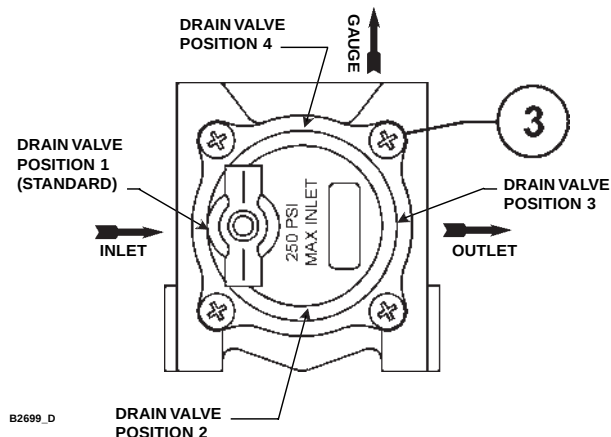
B2696

PANEL MOUNT OPTION
(INCLUDES HANDWHEEL, MOUNTING NUT,
AND 1/4-INCH NPT SPRING CASE VENT)



B2699_C

SPRING CASE VENT POSITIONS



B2699_D

DRAIN VALVE POSITIONS

Figure 2. 67CF Series Assembly Drawings

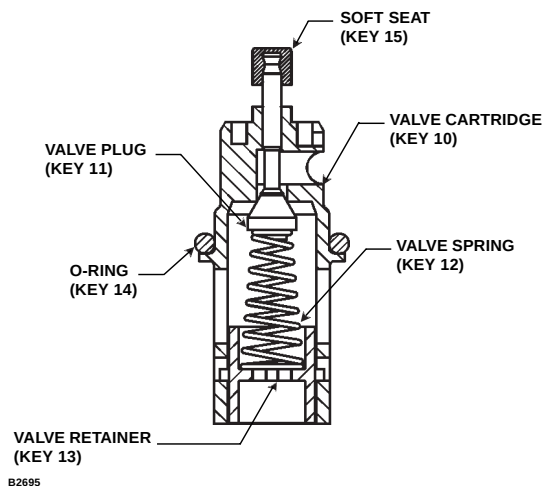


Figure 3. Valve Cartridge Assembly

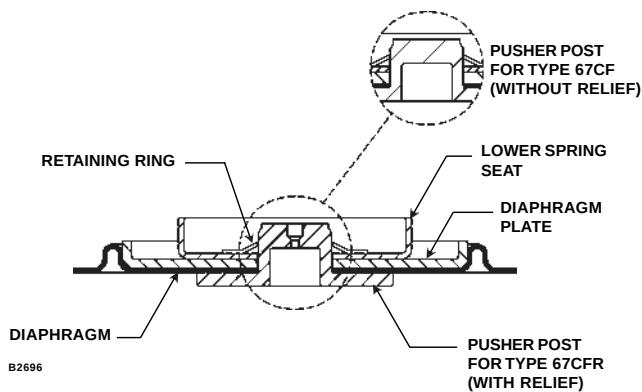


Figure 4. Diaphragm Assembly (Key 16)

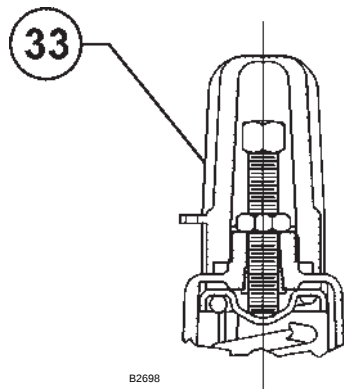


Figure 5. Optional Closing Cap (Only Available with the 1/4-inch Spring Case Vent)

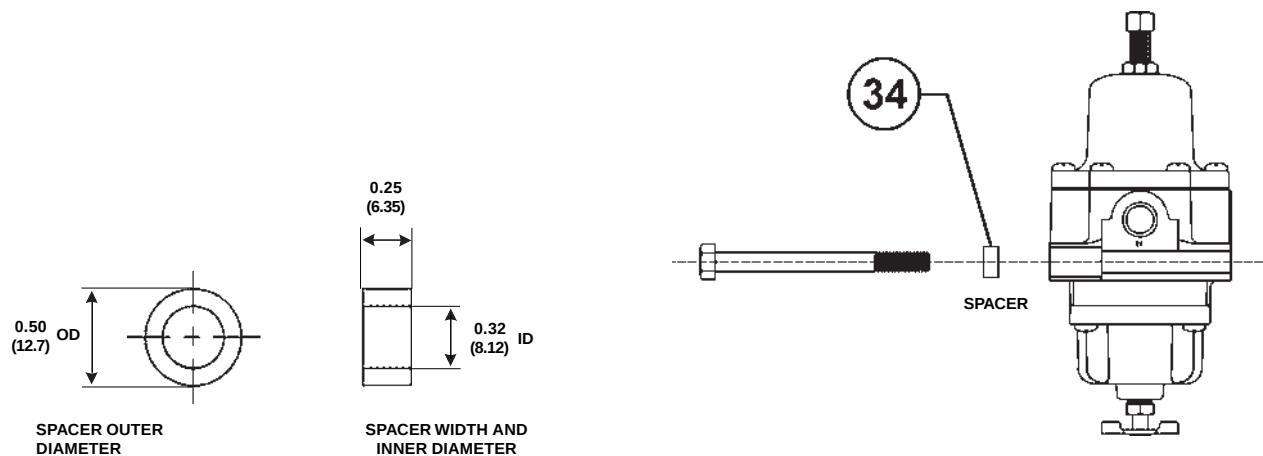


Figure 6. Spacer Diameter and Assembly
(For Installing 67CF Series Regulator in an Existing Installation if the Mounting Bolts are too Long)

67CF Series

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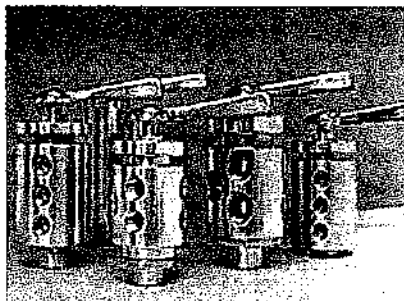


FISHER-ROSEMOUNT™ Managing The Process Better.™

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Toll-free: 800-401-4647
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[All Categories](#) > [Precision Selector Valves](#) > [Multiport Stack Control Valves](#) > [Item # CAL4TSLA3010](#)

Item # CAL4TSLA3010 Multiport Stack Control Valves



[larger image](#)

Multiport Stack Control Valves

Conant Stack Valves offer various combinations of porting arrangements to suit your requirements for more simplified piping configurations. These units are compact, require low torque, and eliminate the need for gear sets and other mechanical arrangements while possessing the capability of handling up to five separate switching arrangements.

Specifications

Valve Type	Stack Selector
Pipe Thread (inches)	1/4
Body Material	Aluminum
Drillings	4-Way
Pressure Range	0-150 PSI
Options	NA
Sleeve Material	Teflon®
Rotor Material	Stainless Steel
Standard Handle	#300 Lever
Handle Rotation (degrees)	90
Dimension A - Body Diameter (inches)	2 1/4
Dimension B - Body Height (inches)	3 7/8
Dimension C (inches)	9/16
Dimension D - Handle Length (inches)	3 1/2

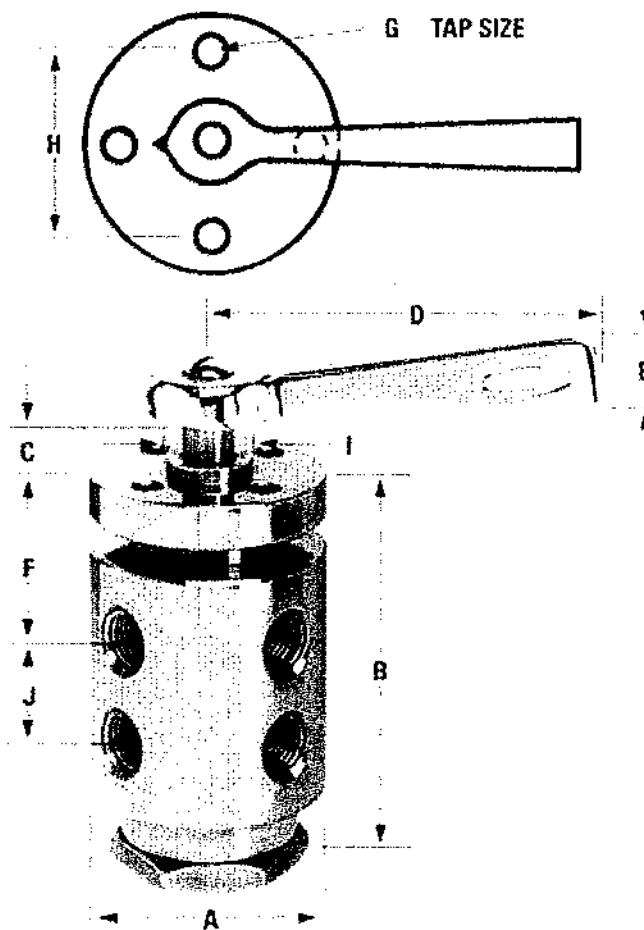
Dimension E - Handle Height (inches)	3/4
Dimension F (inches)	1 1/4
Dimension G - Tap Size	1/4-20TH'D
Dimension H (inches)	1 3/8
Dimension I (inches)	3/4 O.D. x 1/8
Dimension J (inches)	7/8



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Item # CAL4TSLA3010, Multiport Stack Control Valves

Dimensional Drawing

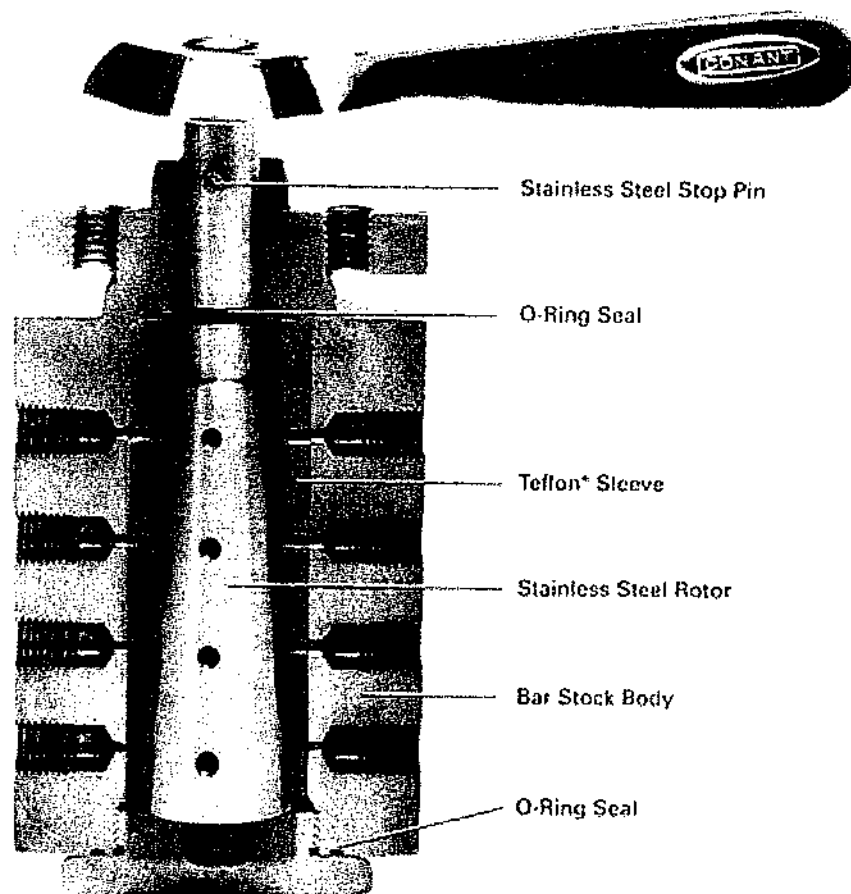


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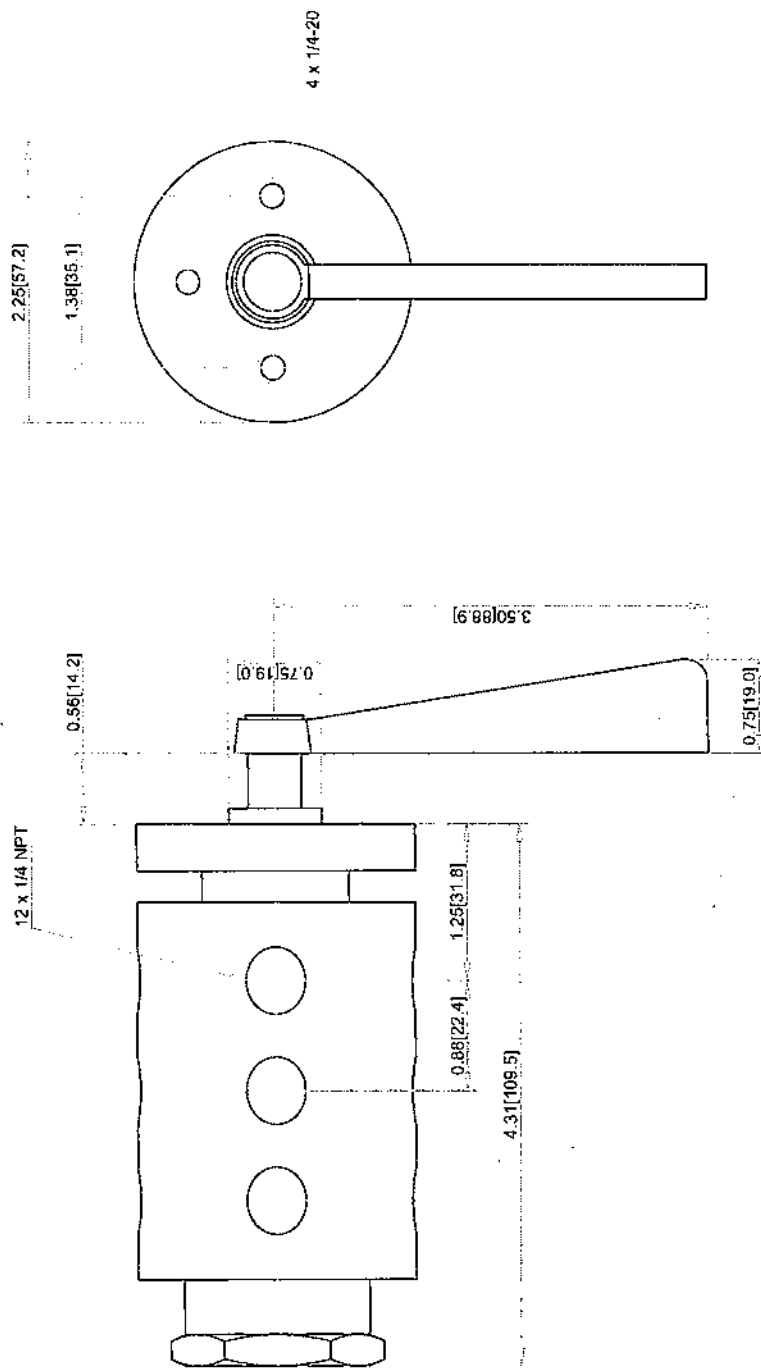
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Item # CAL4TSLA3010, Multiport Stack Control Valves

Cutaway View



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Note:

- Drawings Not To Scale
- Drawings Subject to Change Without Notice
- Dimensions are inches next to [Millimeters]

Option:

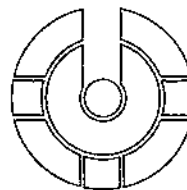
- JIS, DIN & BS Threads
- Sanitary Connections, Tube Connections
- Optional Handles with Locking Devices
- Custom Name Plates and Valve Tags
- Electric & Pneumatic Actuation Packages
- Mufflers
- Custom Port Configurations
- Stem Extensions
- OEM Configurations Upon Request
- Custom Manifold Assemblies

Part No.:

CAL4TSLA3010

Description:

Valve Type	Stack Selector
Pipe Thread (inches)	1/4
Body Material	Aluminum
Rotor Material	Stainless Steel
Sleeve Material	Teflon®
Handle Rotation (Degrees)	90
Drillings	4-Way
Pressure Ratings	0-150 PSI
Standard Handle	#300 Lever
No of Stacks	NA
Options	NA



Conant Controls, Inc.

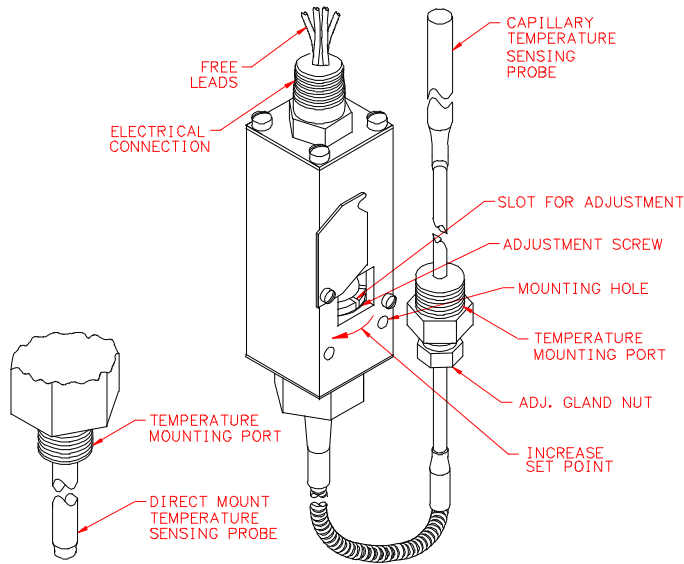
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Email : Sales@ConantControls.com
Web : www.ConantControls.com

CUSTOM CONTROL SENSORS, INC.

6900T & 6900TU INSTALLATION INSTRUCTION



SPECIAL CONDITIONS FOR SAFE USE:

THE INTEGRAL CABLE SHALL BE SUITABLY MECHANICALLY PROTECTED AND TERMINATED IN A SUITABLE JUNCTION OR TERMINAL FACILITY

GENERAL:

- Observe all Warnings and Cautions contained on the attached Warning Sticker, the Warning Declaration and the CCS Catalog.
- Follow all applicable Federal, State Governmental or industry codes and regulations, pertaining to the use of this device.

MOUNTING:

- Units may be directly mounted in any position. On a flat surface using (2) mounting holes provided at the source of the variable pressure sensed.

WARNING:

COOL ALL SENSING AREAS TO A SAFE TEMPERATURE PRIOR TO INSTALLATION OR REMOVAL OF THIS DEVICE. INSURE THAT BOTH TEMPERATURE AND ELECTRICAL CONNECTIONS ARE DEACTIVATED AND LOCKED OFF IN THE UNPRESSURIZED AND OPEN CIRCUIT CONDITION ON ALL ATTACHED CIRCUITS. DO NOT EXCEED NAMEPLATE LISTED PROOF TEMPERATURE OR ELECTRICAL RATINGS.

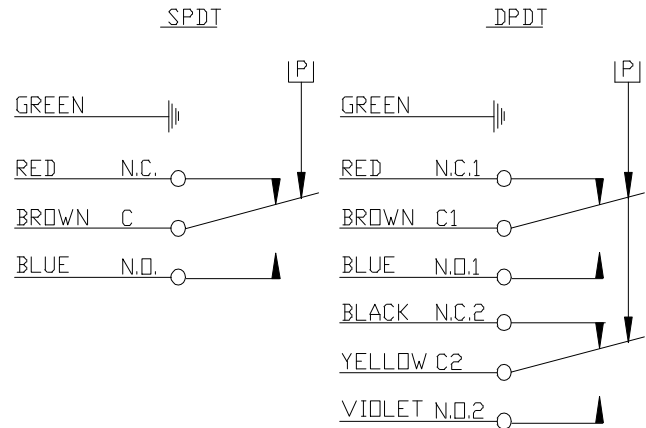
- Units are supplied with male NPT temperature ports suitable for connection to NPT Thermowells or NPT taper threaded pipe. Capillary models are provided with an adjustable gland nut for positioning of the temperature sensing probe.
- If a Thermowell is used pipe sealing compounds are usually not required. Pipe joint sealing compound is preferred over Teflon tape. However, either method of sealing is acceptable with proper care to avoid introducing sealing material into plumbing.

ELECTRICAL CONNECTIONS:

WARNING: DO NOT MAKE ELECTRICAL CONNECTIONS WHILE ELECTRICAL POWER IS ON.

- Electrical conductors are provided within a male conduit connection. Flexible conduit is recommended.

WIRING DIAGRAMS



- When making wire connections disconnect electrical power. Check for multiple circuits.

- Make electrical connections in accordance with the NEC and all other appropriate codes and regulations. Conduit enclosure shall be wrenchtight. Keep as much wire as possible for a service loop to facilitate service, see wiring diagrams.

Adjustment: (Not applicable if units are factory set)
Temperature settings are externally adjustable.

- Loosen access cover. Adjust wheel as illustrated.

- Clockwise to increase settings.
- Counterclockwise to decrease setting:

- If the electrical circuit cannot be used for testing disconnect electrical power and use a suitable circuit tester or light box.

- Immerse only the temperature sensing probe of the switch in a suitably agitated fluid, in an approved temperature calibration bath. Consult the manufacturer of the bath for a suitable fluid for the temperatures to be encountered. Stabilize the bath at the desired set point temperature and adjust the adjustment wheel so that unit just actuates. Verify the set point by decreasing the temperature below the reset point and slowly increasing the temperature through the set point.

- Re-tighten access cover.

- Reconnect electrical circuit.

- Return power to unit.

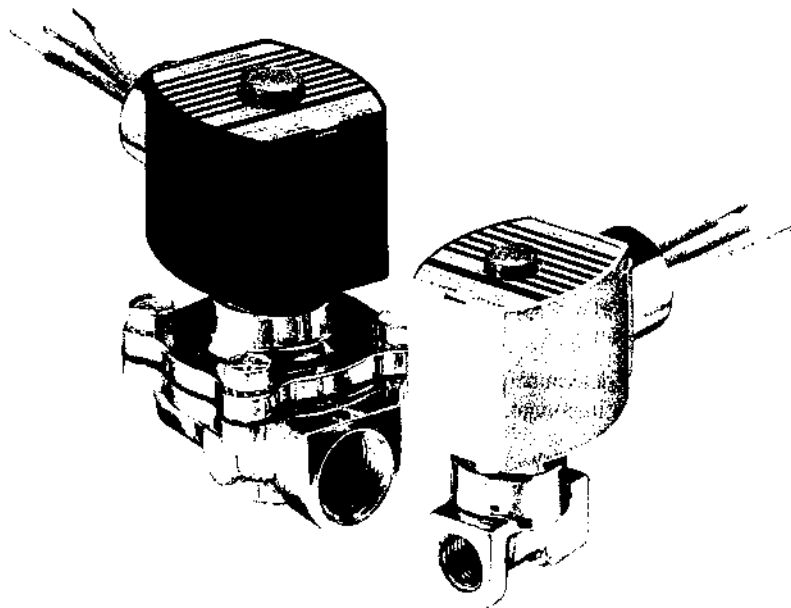
WARNING DECLARATION

If this switch is used to protect equipment or personnel from unsafe pressure or to guard against the hazardous release of contained substances it must be installed and operated in accordance with applicable codes, regulations and standards. This switch must be used in conjunction with system design(s) or procedure(s) necessary to mitigate any hazard resulting from its failure. Conform to installation instructions accompanying this switch. Individuals who ignore this warning may suffer serious or fatal injury and do so at their own risk. Custom Control Sensors is not liable for any misuse, abuse, suitability or adequacy of user's application of the switch. Service by qualified personnel only.

ASCO[®] Red-Hat[®] and Red-Hat II[®]

Solenoid Valves

**SELECTION
INSTALLATION/MAINTENANCE
TROUBLESHOOTING**



ASCO[®]

ASCO Valve Canada

HOW TO SELECT

ASCO® Red-Hat and Red-Hat II Solenoid Valves

ASCO Red-Hat and Red Hat II^① solenoid valves for the control of fluids are available in thousands of varieties, each designed to meet specific requirements. Many features are readily apparent and easily understandable; others are more complex and require special knowledge to select the best valve for your control application.

For example, selecting a valve too large for the application will usually involve needless initial cost; selecting a valve too small will usually lead to poor fluid control for the application.

Valves fall into four basic construction groups:

Two way Valves – have one inlet and one outlet pipe connection and are available for normally closed and normally open operations. Normally closed valves are closed when the valve is de-energized and open when the proper voltage is applied to the coil. Normally open valves are open when de-energized and close when the coil is energized.

Three way Valves – have three pipe connections and two orifices which are alternately open or closed. These valves are available normally closed, normally open, or with universal construction which can be used as normally closed or normally open. Three way valves are generally used as pilots for larger control valves, to actuate single-acting cylinders, or to divert the flow of fluids.

Four way Valves – usually have four pipe connections: one for pressure, one for exhaust, and two to operate double-acting cylinders. They are also used to pilot larger control valves.

Manual Reset Valves – must be opened or closed manually, then revert to their original position when, depending on the construction, they are energized or de-energized. They are used to prevent inadvertent startup of critical systems.

After determining the basic valve type, consideration must be given to pipe size; orifice size, flow rate, pressure rating, medium to be controlled, ambient and fluid temperatures, voltage, type of solenoid enclosure, cycling rate and required life rating.

Although the relative importance of each factor is determined by the application itself, valve size is usually the most important.

Valve Sizing

Valve configuration and orifice size, as well as the viscosity, specific gravity and temperature of the controlled medium have the greatest influence on determining proper valve size.

All variables affecting the selection have been reduced to a single parameter known as the flow coefficient (Cv). ASCO provides graphs for determining Cv values, and displays those Cv values for each valve in its product catalogue. This makes it easier to select the proper valve to meet your particular flow requirements.

Pressure Ratings

Pressure rating is directly related to orifice size. For direct acting valves which operate from zero to maximum pressure, the pressure rating decreases as orifice size increases.

Large valves, and those rated for high pressures, are offered in

pilot-operated versions in which fluid line pressure operates the valve. These valves have a pilot and bleed orifice, and are usually of the diaphragm or piston type. For proper operation, a minimum pressure differential of 2 to 10 psi (depending on construction) is required between the inlet and exhaust ports.

The minimum and maximum pressure ratings for these valves are listed in the ASCO catalogue and are shown on the valve nameplate. Special care must be taken not to excessively oversize an internally piloted valve. Pressure drop or flow through the valve may be insufficient to lift the piston or diaphragm off the orifice, resulting in little or no flow.

In some designs, heavy-duty solenoid coils are used to increase the pressure rating for a given orifice size.

Pressure ratings should be as close as practicable to system pressure.

A valve will not open against pressure significantly higher than the valve's rating. The solenoid's magnetic circuit will not be completed, causing the coil to draw excessive current and burn out.

Conversely, if the system pressure is significantly lower than the valve's rating, the high impact of the solenoid core against the plug nut will cause excessive wear and reduced life.

For best results, select a valve with a pressure rating which is only slightly greater than system pressure.

Medium Compatibility

Valve materials and constructions are compatible with a wide variety of media: air, water, oil, steam, and corrosive and non-corrosive gases and liquids. It is essential that the valve you select be compatible with your controlled medium.

ASCO valve bodies and internal parts are stainless and carbon steel, aluminum, brass, and a wide variety of plastics and elastomers. The ASCO catalogue specifies media compatibility for each valve.

Solenoid Coil Insulation

A coil's worst enemy is heat. Prolonged periods at excessive temperatures lead to thermal degradation of coil insulation. This heat may come from high-temperature fluids passing through the valve, from the electrical energy spent in the coil, or simply from the air around it. The temperature which results from all these sources will determine the required coil insulation class.

Nominal maximum permissible ambient temperatures are based on test conditions used by Underwriter's Laboratories, Inc. to determine safe coil insulation temperatures. Tests are conducted with coils continuously energized and valves at maximum fluid temperatures.

The epoxy-molded coils and solenoids used in ASCO Red-Hat and Red-Hat II valves are resistant to thermal degradation; they dissipate heat more effectively than paper-section coils. They also resist moisture, chemical attack, fungi, and mechanical stress, significantly increasing their life.

① ASCO's new generation of solenoid valves, Red-Hat II, features one-piece epoxy encapsulated solenoids.

Coil Operating Voltage

Standard voltage ratings are 6, 12, 24, 120, 240, and 480 volts AC, and 6, 12, 24, 120 and 240 volts DC.

Red-Hat and Red-Hat II valves operate satisfactorily on voltage reductions as much as 10 - 15% below nominal (depending on construction), and can withstand as much as 10% over voltage for brief periods.

Power Consumption

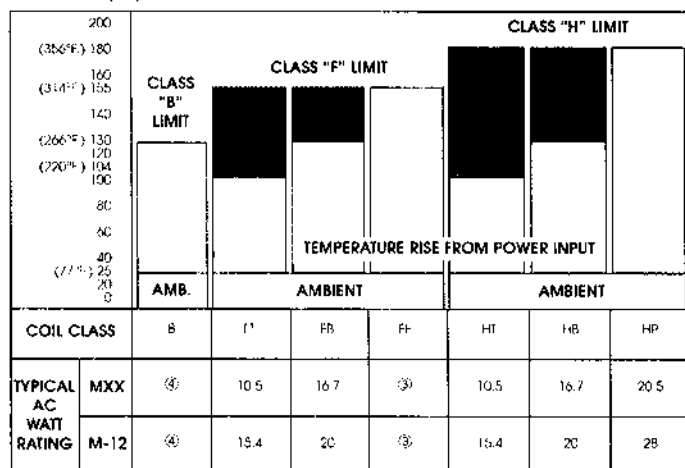
Power consumption can be determined from the ratings shown for each valve series shown in the ASCO catalogue. For AC valves, the watts, volt-ampere "inrush" (the high, momentary surge occurring at coil energization) and volt-ampere "holding" (the continuous draw following inrush) are given.

The current rating for inrush and holding may be determined by

ENCLOSURE TYPE DESIGNATIONS

Enclosure Type	Location	Application Criteria
1	Indoor	General purpose; normal atmospheric conditions
2	Indoor	Drip-proof.
3	Outdoor	Dust-tight, rainproof, and sleet (ice) resistant.
3S	Outdoor	Dust-tight, rainproof, and sleet (ice) proof.
4	Indoor	Watertight and dust-tight.
4X	Indoor	Watertight, dust-tight, and corrosion resistant.
6	Indoor/Outdoor	Submersible, watertight, dust-tight, and sleet (ice) resistant.
7	Indoor	Hazardous locations. Suffix to type (Class I and Group A, B, C or D) complete designation from definitions in National Electrical Code.
9	Indoor	Hazardous locations, combustible dust. Class I and Group E, F or G suffixes from National Electrical Code.

FINAL TEMP. (°C.)



INDUSTRIAL TEMPERATURE LIMITATIONS⁽¹⁾ AND THERMAL CHARACTERISTICS OF ASCO RED-HAT SOLENOIDS AND COILS

The typical watt ratings given show the relationship between different classes of coil insulation and the watt ratings to achieve higher temperature capabilities.

The information contained in these tables applies only to non-explosionproof constructions.⁽²⁾



⁽²⁾ Excess margin for higher fluid or ambient temperature

⁽¹⁾ As measured by the "Resistance Method"

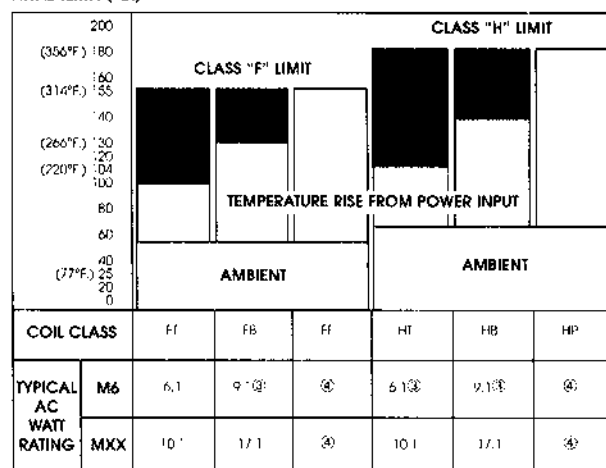
⁽²⁾ Ambient temperatures are directly additive to coil rise - fluid temperature is not

⁽³⁾ Only available in limited watt ratings. Consult ASCO when required.

⁽⁴⁾ Only available in M-5 and MLXX solenoid sizes

⁽⁵⁾ Because of explosionproof codes and surface temperature limitations, the maximum listed ambients for specific valves should not be exceeded. Consult factory concerning explosionproof applications where higher than listed ambients are encountered.

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dividing the volt-ampere rating by the voltage:

$$\frac{\text{Inrush}}{\text{Amps}} = \frac{\text{volt-amp inrush}}{\text{voltage}}$$

$$\frac{\text{Holding}}{\text{Amps}} = \frac{\text{volt-amp holding}}{\text{voltage}}$$

DC valves have no inrush current. The amp rating can be determined by dividing the voltage into the DC watt rating:

$$\frac{\text{Amps}}{\text{Amps}} = \frac{\text{watts (DC)}}{\text{voltage}}$$

Solenoid Enclosures

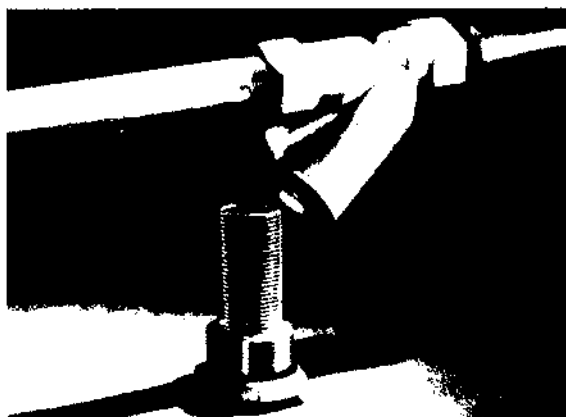
ASCO Red-Hat II solenoid enclosures have one-piece molded epoxy construction with an integral 1/2" N.P.T. conduit hub. The epoxy encapsulation serves as the enclosure. The magnetic frame is molded into the coil.

ASCO Red-Hat solenoid valves have an enclosure which is separate from the coil. The enclosure should be kept in place at all times because, with many types, it provides part of the magnetic circuit. Removal of the enclosure can reduce solenoid efficiency and expose the mechanism to damage.

For optional electrical features such as junction boxes, spade and screw terminal coils, and DIN-type connections, consult ASCO catalogue.

Cycling Rate and Estimated Life

When controlling unlubricated air or dry, inert gas, special construction is usually required to provide long valve life. Selecting the solenoid valve to last as long as the rest of the system or equipment allows the valve to be serviced during normal maintenance downtime. Because foreign matter such as pipe scale can shorten the life of a solenoid valve, a suitable strainer should be installed as close as possible to the valve inlet.



A strainer or filter should always be installed as close as possible to the inlet of a solenoid valve.



Pipe joint compound or Teflon tape should be used on all male fittings, but should not be placed on the first two threads or on female fittings.

HOW TO INSTALL AND MAINTAIN ASCO® Red-Hat and Red-Hat II Solenoid Valves

Proper installation and maintenance procedures go a long way toward prolonging valve life. Read and follow the instruction packed with each ASCO Red-Hat and Red-Hat II valve.

Nameplate data - voltage, pressure, etc. - should be checked to ensure compatibility with system conditions. Check, too, that the type of solenoid enclosure is compatible with your operating environment.

Some Red-Hat and Red-Hat II valves are designed to operate in any mounting position, while others must be oriented in a certain way to operate properly. Whenever possible, however, all valves should be mounted with the solenoid in a vertical and upright position to reduce the possibility of foreign matter accumulating in the core tube area. The first line of defense against this occurrence, however, is the installation of a filter or strainer as close as possible to the valve inlet.

Installation Practices

Teflon tape or pipe joint compound should be used, but only on male pipe threads. To prevent foreign matter from entering the valve, do not apply either sealant to the first two male threads or

to any of the female threads.

Two wrenches should be used to attach the valve to its piping. Use a pipe wrench to turn the pipe into the valve, and a second wrench on the flat of the valve body. To prevent distortion of the valve body, apply the second wrench to the side of the valve into which the pipe is being inserted.

Because the Teflon tape or pipe joint compound reduces friction and makes turning easy, there is a tendency to over torque when installing valves. This poses potential damage to the valve body, especially aluminum or die-cast body valves.

Inlet and outlet piping must be properly supported to prevent strain on the valve body.

Wiring must comply with local codes and the Canadian Electrical Code. Be sure that the solenoid leads cannot be pulled from the coil. If you are not using flexible conduit for transition into the valve, the supply conduit must be properly supported to prevent stress on the solenoid assembly.

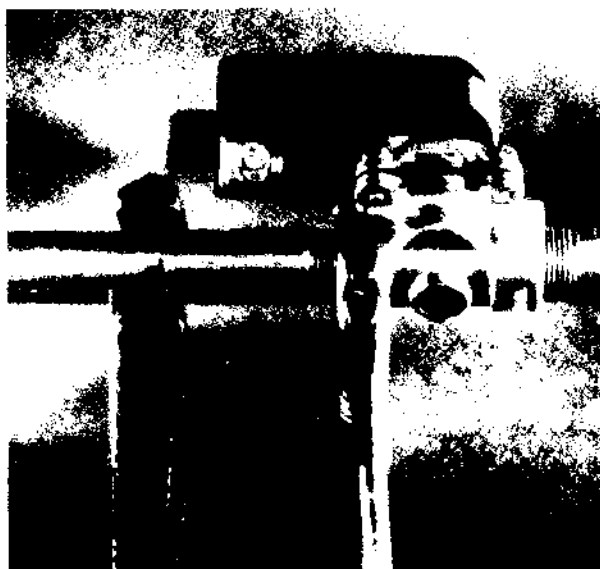
A considerable amount of foreign matter can collect in a system,

especially during new construction. So, always flush the system thoroughly before releasing it for normal operation. Clean the strainers and filters after the line pressure and electric power have been shut off, but be sure to open the strainer service cap slowly to release trapped pressure. A second flush may be necessary.

Maintenance Procedures

Cleaning of filters and strainers should be part of your normal preventive maintenance program, along with cleaning and inspection of the valve. If the valve is not operating properly, and corrective steps are required, confirm that the problem is in the valve and not caused by other conditions in the system.

Foreign matter in the valve, such as pipe joint sealant, corrosion from pipes and process vessels, mineral deposits and other solids, is a major cause of solenoid valve failure. If valve disassembly is required, always follow the instructions supplied with the valve for disassembly, cleaning and reassembly.



Two wrenches should be used when removing or installing a solenoid valve. Stress on the valve body can be prevented by placing the wrench on the same side of the valve as the pipe that is being screwed out of or into the valve.



Dirt on the valve body and on internal parts should be wiped off with a lint-free cloth.

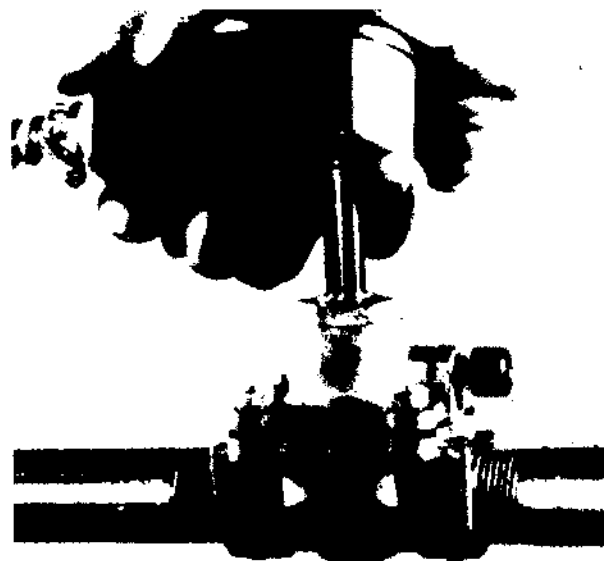
Before disassembling the valve, it's always best to have on hand those parts subject to wear which are most likely to require replacement. ASCO offers rebuild kits containing all the internal parts needed to restore the valve to its like- new condition.

Except on very old valves, you'll find the rebuild kit number listed on the valve nameplate. These kits include comprehensive instructions and an exploded view of the valve. On all valves, but especially Red-Hat II, always be sure to reinstall the nameplate. The nameplate serves as a retainer to hold the solenoid to the valve.

Maintenance Tips

Direct-Acting Valves

Always turn off electrical and fluid supplies before disassembling a valve, and loosen the solenoid base slowly to release any trapped pressure. Remove internal parts and wipe them clean with a lint-free cloth. Examine the valve body for foreign material and



After electric power and fluid line pressure have been shut off, the first step in valve disassembly is to remove the solenoid mechanism.



The solenoid core must move freely in the core tube and should be free from signs of binding and excessive wear.

deposits. Be especially careful not to scratch the valve seat or disc during cleaning.

The movable core and core tube should be examined for signs of binding and wear. If present, all internal parts should be replaced. If there is excessive wear to the valve body (e.g. wire drawing of the seat), the valve should be replaced.

The disc at the end of the movable core or piston should be checked for signs of excessive impacting. If deep impressions are noted, and the system involves liquids, a water hammer condition may exist. To protect the pipes and equipment in the system, install a water hammer cushioner close to the valve

inlet, or replace the valve with an ASCO Slow Closing valve.

After reassembly, check the valve operation by energizing the solenoid coil. A sharp metallic click should be heard if the valve is operating properly.

Pilot-Operated Valves

Cleaning and inspection procedures are essentially the same as for direct-acting valves. However, pilot operated valves also have a diaphragm or piston with bleed holes which must be cleaned. The piston should move freely in its cylinder and the piston rings should rotate freely in the groove.

HOW TO TROUBLESHOOT ASCO® Red-Hat and Red-Hat II Solenoid Valves

Because there are so many potential reasons for solenoid valves to malfunction, they are often thought to be complex, trouble-prone devices. Actually, they are quite simple and very reliable. Many of the problems originate outside the valves themselves, while others are caused by misapplication or improper installation.

Troubleshooting should begin with a check of the voltage and pressure input. The problem may be caused by an inoperative control relay or a fluctuating pressure regulator. If voltage and pressure check out, look to the valve. The main reasons a direct-acting solenoid valve fails to operate include:

- Low or no voltage
- Burned-out solenoid
- Pressure higher than the valve's rating
- Foreign matter in the valve
- Binding core or damaged core tube

To operate properly, a solenoid valve core must move within the core tube and contact the plunger when the coil is energized. You should hear a sharp metallic click at energization. Absence of the click usually indicates an electrical problem. For most valves, voltage applied to the coil must be at least 85% of the nameplate voltage rating.

If the valve coil is receiving the proper voltage, absence of a click may mean that the line pressure is higher than the valve's rating. Check that next.

If line pressure is OK, foreign matter may be preventing the core from moving in the core tube. Core movement can also be restricted if the top of the core has been peened over by millions of operations, if the disc is swollen or cut, or if the core itself has been damaged.

A pilot-operated valve might fail to operate when energized even though a click has been heard. A no-flow condition may be caused by:

- Insufficient pressure drop across the valve
- Ruptured diaphragm or damaged piston ring
- Plugged or restricted pilot orifice

Both pilot-operated and direct-acting valves can fail to operate when de-energized because of:

- Faulty control circuit
- Scale or other foreign matter in the valve

- Binding core or damaged core tube
- Broken spring

Pilot-operated valves may also malfunction when de-energized due to:

- Plugged bleed orifice
- Damaged pilot seat or disc
- Damaged diaphragm or piston
- Insufficient pressure drop across the valve

Excessive solenoid noise (hum or chatter) can be caused by:

- Low voltage
- Faulty relay or improper electrical control signal
- Loose solenoid parts
- Foreign matter on core or plunger face
- Worn core or plunger face
- Damaged spring
- Excessive system pressure

When troubleshooting 4 way valves controlling cylinders, it is important to follow the instructions provided with the valve. Some 4 way valves require an oil-mist lubricator for proper operation.

Pilot-activated 4 way valves normally require full-size piping for pressure inlet and exhaust. In some of these valves, restrictive speed control devices should be installed in the cylinder connections.

Because faulty cylinder operation is often caused by the cylinder itself, it should be checked for:

- Misalignment between the piston rod and connected load
- Lack of lubrication
- Worn and leaking piston cups which allow fluid to exhaust through the valve
- Foreign matter in the speed controls
- System overloading, low line pressure, or undersized hoses or fittings.

If the problem does not appear to be in the cylinder, the valve should be checked.



ASCO offers rebuild kits which contain all components needed to make a valve like new again.

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- Foreign matter in the speed controls
- System overloading, low line pressure, or undersized hoses or fittings.

If the problem does not appear to be in the cylinder, the valve should be checked.

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Probable Solution
Valve will not operate when valve circuit is energized (direct-acting valve)	Low voltage or no voltage to solenoid coil	Check voltage at coil; for most valves, voltage should be at least 85 percent on nameplate rating.
	Burned out coil	See "Coil Failure" below.
	Excessive foreign matter jamming core in core tube	Clean valve; install strainer close to valve inlet.
	Binding core or damaged core tube	Replace parts.
	Excessive fluid pressure	Reduced pressure to valve nameplate pressure rating or install suitable valve.
Valve will not operate when valve circuit is energized (pilot-operated valve)	Same causes and solutions as for direct-acting valve, plus:	
	Low pressure drop across valve	Valve might be oversized; replace valve with one having a smaller orifice. Increase pressure, if possible.
	Ruptured diaphragm or piston ring	Replace damaged parts.
	Plugged or restricted pilot orifice	Clean valve and pilot orifice.
Valve will not close or shift when valve circuit is de-energized (direct-acting valve)	Coil not de-energized	Check electrical control circuit.
	Excessive foreign matter jamming core in core tube	Clean valve; install strainer close to valve inlet.
	Damaged disc or seat causing internal leakage	Replace with new parts.
	Binding core or damaged core tube	
	Damaged spring	Replace with new spring. Never elongate or shorten spring.
Valve will not close or shift when valve circuit is de-energized (pilot-operated valve)	Same causes and solutions as for direct-acting valve, plus:	
	Plugged bleed orifice	Clean orifice.
	Damaged pilot seat or pilot disc	Replace with new parts.
	Damaged diaphragm or piston	
	Damaged pilot spring	Replace with new spring. Never elongate or shorten spring.
	Insufficient pressure drop across the valve	Valve might be oversized; replace valve with one having a smaller orifice. Increase pressure, if possible.
Wire drawing	Dirt or foreign matter is lodged on seat	Replace valve body or install new valve; install suitable strainer close to inlet of valve.
Coil failure *	Overvoltage	Check voltage at coil; voltage must conform to nameplate rating.
	Damaged core or core tube causing inrush current to be drawn continuously	Check for damaged core and core tube, or damaged spring. Check for scale or foreign matter on the core or inside the core tube. Clean thoroughly and replace any damaged parts.
	Excessive foreign matter jamming core in core tube and causing inrush current to be drawn continuously	
	Excessive fluid pressure causing inrush current to be drawn continuously	Reduce pressure or install suitable valve.
	Excessive ambient or fluid temperature	Class A coils are limited to ambient temperatures of 77° F. For temperature up to 167° F, use Class F coils; for temperatures up to 212° F, use Class H.
	Missing solenoid parts	Install missing solenoid housing and other metal parts or properly install incorrectly assembled metal parts. The housing and other metal parts form part of the magnetic circuit and are required to provide the impedance needed to limit current draw.
	Moisture inside solenoid enclosure	Waterproof the entrance conduit to prevent entry of moisture. If valve is mounted outdoors, check to see that enclosure is weatherproof and that gaskets are in good condition; use appropriate sealant where required. If general-purpose enclosure is used in a damp or humid atmosphere, use watertight, molded coils.

* In Red-Hot II Explosionproof solenoids, a binding core, high-input voltage, or excessive ambient or fluid temperature may cause the solenoid's non-resettable thermal fuse to open. If this occurs, the solenoid must be replaced.

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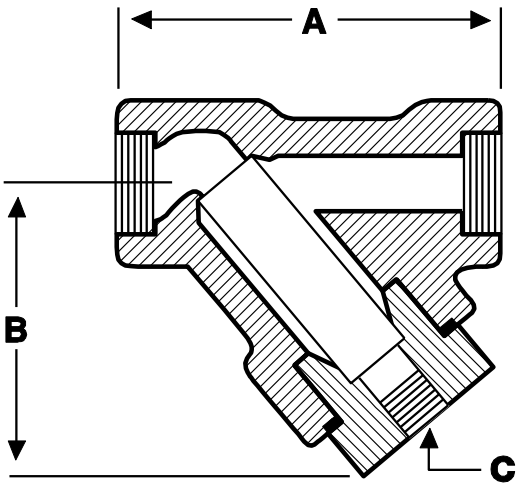
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SS-Printed in Canada

1M-02-99

ALTA	MODEL YS 3000 CLASS 3000 CARBON STEEL SCREWED / SOCKET WELD "Y" STRAINER	DRAWING A 101
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DESCRIPTION	MATERIAL
BODY	ASTM A105 N
CAP	ASTM A105 N
GASKET	SPIRAL WOUND SS
SCREEN	304 SS 1/32 PERF

TEMPERATURE		WORKING PRESSURE	
C	F	kPa	P.S.I.
-29 to 38	-20 to 100	20670	3000

ALL STRAINERS ARE INDIVIDUALLY HYDROSTATICALLY TESTED TO ANSI B16.5

SIZE		DIMENSIONS				NET WEIGHT			
		A		B				C	
mm	in.	mm	in.	mm	in.	mm	in.	Kg.	Lbs
25	1	117	4 5/8	89	3 1/2	15	1/2	1.8	4

FEATURES

- BODY HAS A MACHINED SEAT TO HOLD SCREEN SECURELY.
- CAP HAS A MACHINED SCREEN HOLDER TO ALIGN SCREEN DURING INSTALLATION AND TO RETAIN SEDIMENT WHEN CAP IS REMOVED.
- BODY IS MACHINED TO HOLD CAP GASKET IN A BLOW-OUT PROOF DESIGN.

June 1990

Type 119 Control Valve

Introduction

Scope of Manual

This instruction manual provides installation, spring adjustment, maintenance, and parts information for the Type 119 control valve.

Description

The Type 119 control valve (figure 1) is used for on-off or throttling control of noncorrosive or mildly corrosive liquids and gases. It is designed to meet the low-pressure liquid and gas application requirements in many varied industries.

As loading pressure is applied to the Type 119 control valve diaphragm, the disk holder is pulled off the orifice. As loading pressure is reduced, the opposing spring force moves the disk holder toward the closed position, resulting in spring-close action should a loss of supply pressure occur.

Specifications

Table 1 lists specifications for the Type 119 control valve. Some of the specifications for a given control valve as it originally comes from the factory are stamped on a nameplate (figure 2) located on the spring case flange.

Installation



WARNING

To avoid personal injury or property damage caused by controlled process fluid or bursting of pressure-retaining

1. Before installing the valve, be sure the valve body and associated equipment are free of damage and foreign material.



W3735-1

Figure 1. Type 119 Control Valve

parts, be certain the service conditions do not exceed the limits shown in table 1. The leak-off and spring case vents must be kept open. To avoid danger of fire or explosion from venting of flammable or otherwise hazardous fluid into a closed or poorly vented location, pipe the vents to a well-ventilated location, away from any buildings or windows so as not to create a further hazard.

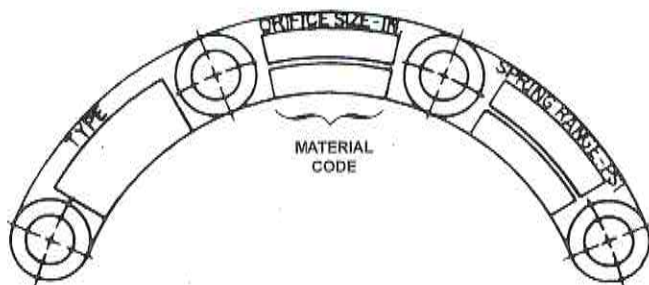
Type 119

Specifications

Table 1. Specifications

Maximum Inlet Pressure⁽¹⁾ 150 psig (10,34 bar)	Material Temperature Capabilities⁽¹⁾ With Nitrile Elastomers: –20 to 170°F (–29 to 77°C) With Fluoroelastomers: 0 to 250°F (–18 to 121°C) Note: Not for use with hot water or ammonia.
Spring Ranges See table 2	Flow Direction Up through the seat ring
Maximum Control Pressure to Diaphragm 150 psig (10,34 bar)	Spring Case Vent and Bonnet Leak-Off Connection 1/4-inch NPT female
Maximum Pressure Drop⁽¹⁾ 150 psi (10,34 bar) for all port diameters	Approximate Weight 6 pounds (2,72 kg)

1. The pressure and temperature limitations in this manual, and any applicable code limitation, should not be exceeded.



1E5427-F

MATERIAL CODE	ORIFICE SEAT DISK MATERIAL
A/N	Aluminum/Nitrile
SST/N	Stainless steel/Nitrile
SST/V	Stainless steel/Fluoroelastomer

Figure 2. Type 119 Nameplate

2. The control valve can be installed in any position, but the normal orientation is with the actuator portion vertical above the body. If installing the control valve at an outside

Table 2. Spring Selection

SPRING RANGE		SPRING PART NUMBER	SPRING COLOR CODE
Psig	bar		
3-15	0,21-1,03	1D892327022	Red
5-20	0,34-1,38	1D751527022	Cadmium
5-35	0,34-2,41	1D665927022	Blue
30-60	2,07-4,14	1D745527142	Green

location, point the spring case and bonnet vents in the downward direction to protect them from moisture or foreign materials.

3. Install the valve using accepted piping practices. Make sure that the valve is oriented so that flow through the body will match the flow direction arrow on the body.

4. If continuous operation is required during maintenance and inspection, install a three-valve bypass around the control valve.

5. Connect the control pressure line to the 1/4-inch NPT connection in the valve body bonnet marked PILOT.

Spring Adjustment

The control valve spring has been selected to meet the pressure condition requirements of the application as specified on the order. This pressure condition is stamped on the actuator nameplate.

The spring has a fixed pressure span over which loading pressure will stroke the valve. Adjustment of the spring compression shifts the span so that more or less loading pressure is required to start travel. Since the span does not change, there will be a corresponding increase or decrease in the pressure requirements at the end of the valve stroke.

If the control valve has been disassembled or pressure conditions have changed, the spring may need adjustment to make the valve travel coincide with the diaphragm pressure range. Make the adjustment in the following manner. Key numbers refer to figure 3.

1. Loosen the locknut (key 13) on the spring case.
2. Turn the adjusting screw (key 12) clockwise to compress the spring (key 16) or counterclockwise to decrease spring compression. Increased spring compression results in increased loading pressure necessary to start travel. Decreased spring compression results in less loading pressure required to start travel.
3. After adjustment, tighten the locknut. Note that the spring can be identified by the color code. Depending on how much conditions are changed, it may be necessary to install a new spring, using appropriate steps in the Maintenance section. After changing the spring, adjust the valve using the above steps in this section, and indicate the new spring range on the nameplate.

Maintenance

Valve parts are subject to normal wear and must be inspected and replaced as necessary. Inspection and maintenance depends on the severity of the service conditions.



WARNING

To avoid personal injury or property damage caused by sudden release of pressure or uncontrolled process fluid, isolate the control valve from the pressure system, and release all pressure from the valve body and actuator before performing maintenance operations.

The following describes the procedure for complete disassembly and assembly of the actuator-valve body combination. When inspection or repairs are required, disassemble only those parts necessary to accomplish the job. Key numbers refer to figure 3.

Disassembly

1. Isolate the control valve from all pressure, and release pressure from the valve body and actuator. Loosen the locknut (key 13), and remove all spring compression from the control valve by turning the adjusting screw (key 12) out of the spring case.
2. Remove the two bonnet cap screws (key 15, not shown) that secure the bonnet to the body, and lift the spring case, bonnet, and trim assembly from the body.
3. Examine the seating edge of the orifice (key 3). If it is nicked or rough, unscrew it from the body with a thinwall 7/8-inch (22,22 mm) socket wrench, and replace it with a new seat ring of the proper size.
4. Remove the bonnet O-ring (key 11), and inspect it for wear damage.

5. Unscrew and remove the spring case cap screws (key 14). Remove the spring case, upper spring seat, and spring (keys 2, 17 and 16). Do not lose the nameplate (key 20) when removing the spring case.

6. Pull the hair pin clip (key 6) from the stem and remove the disk holder assembly (key 4).

7. Pull the diaphragm/stem assembly (key 5) out of the bonnet (key 9), and inspect for damage or deterioration. If necessary, replace the entire diaphragm assembly.

8. Without removing the O-rings and bushing spacers (keys 8 and 7) inspect their inside diameter surfaces for damage or deterioration.

Note

The following step should be performed only when there is an indication of O-ring or bushing spacer failure.

9. Remove the internal retaining rings, stem wipers, O-rings, and bushing spacers (keys 10, 19, 8 and 7). Inspect these parts for wear or deterioration, and replace if necessary.

Assembly

This procedure assumes that the control valve has been completely disassembled. If the control valve has been only partially disassembled, start these instructions at the appropriate step.

1. If the orifice (key 3) was removed during disassembly, lubricate the threads with Never-Seez⁽¹⁾ lubricant (key 21) or equivalent, and screw it into the valve body using a thinwall 7/8-inch (22,22 mm) socket wrench.

2. Lubricate the bushing spacers, O-rings, stem wipers, and internal retaining rings (keys 7, 8, 19 and 10)

with Dow Corning⁽²⁾ No.111 silicon-base lubricant (key 22) or equivalent, and install as shown in figure 3.

3. Carefully slide the diaphragm assembly (key 5) into and through the O-rings and bushing cavity. Turn the diaphragm assembly to line up the diaphragm holes with the bonnet holes.

4. Slide the disk holder assembly (key 4) all the way into the stem. Connect the disk holder assembly with the hair pin clip (key 6).

5. Coat the bonnet O-ring (key 11) with Dow Corning No. 111 lubricant (key 22) or equivalent. Install the O-ring in the recessed notch in the bonnet (key 9).

6. Mount the bonnet (key 9) on the valve body (key 1), insert two cap screws (key 15, not shown), and tighten to 7 foot-pounds (9 N•m).

7. Put the spring (key 16) on the diaphragm assembly (key 5), and place the upper spring seat (key 17) in the end of the spring.

8. Lubricate the point and threads of the adjusting screw (key 12) with Never Seez lubricant (key 21) or equivalent.

9. Position the spring case (key 2) and nameplate (key 20) on the diaphragm assembly (key 5). Insert the cap screws (key 14).

10. Tighten all cap screws until finger tight. Then, following a crisscross pattern, tighten each cap screw.

11. Connect the control piping to the control connection in the bonnet.

12. Adjust the spring by following the procedures in the Spring Adjustment section, and remark the nameplate if necessary.

1. Trademark of Never-Seez Corp.

2. Trademark of Tretolite Div. of Petrolite Corp.

Parts Ordering

When contacting your Fisher sales office or sales representative for technical assistance or ordering replacement parts, include the type number and all other pertinent information stamped on the nameplate attached to the spring case.

When ordering replacement parts, also be sure to include the 11-character part number for each part required from the following parts list.

Parts List

Key	Description	Part Number
-----	-------------	-------------

Note

In this parts list, parts marked NACE are intended for corrosion-resistant service as detailed in the National Association of Corrosion Engineers (NACE) standard MR-01-75.

Part Kits

Kits include keys 4, 5, 6, 8, 10, 11, and 19.

For 1/8 (3,18 mm), 3/16 (4,76 mm), 1/4 (6,35 mm), 5/16 (7,94 mm), & 3/8 inch (9,52 mm) orifices with aluminum disk holder nitrile diaphragm, and nitrile disk & O-rings	R119X000A12
---	-------------

For 1/2 (12,70 mm) & 9/16 inch (14,29 mm) orifices with aluminum disk holder, nitrile diaphragm, and nitrile disk & O-rings	R119X000A22
---	-------------

For 1/8 (3,18 mm), 3/16 (4,76 mm), 1/4 (6,35 mm), 5/16 (7,94 mm), & 3/8 inch (9,52 mm) orifices with stainless steel disk holder, nitrile diaphragm and nitrile disk & O-rings	R119X00SN12
--	-------------

For 1/2 (12,70 mm) & 9/16 inch (14,29 mm) orifices with stainless steel disk holder, nitrile diaphragm and nitrile disk & O-rings	R119X00SN22
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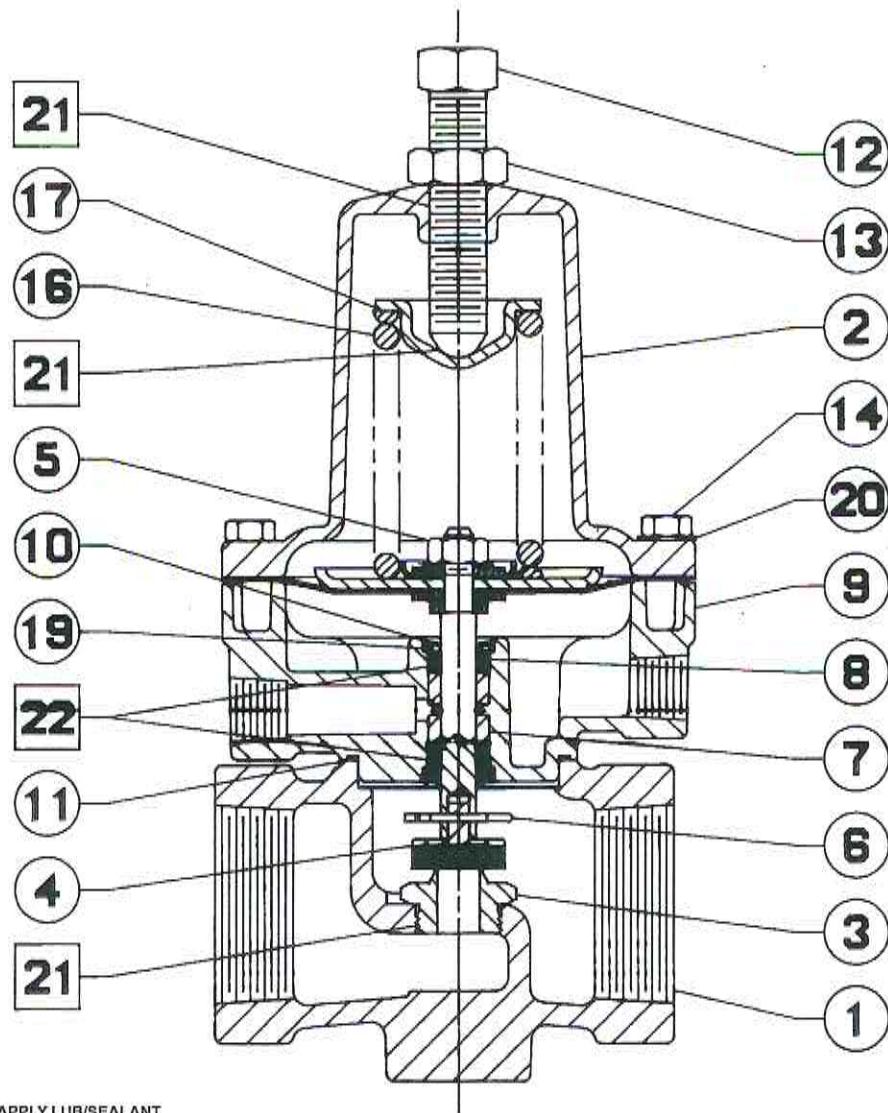
Key	Description	Part Number
	For 1/8 (3,18 mm), 3/16 (4,76 mm), 1/4 (6,35 mm), 5/16 (7,94 mm), & 3/8 inch (9,52 mm) orifices with stainless steel disk holder and fluoroelastomer diaphragm, disk, & O-rings and stainless steel disk holder	R119X00SV12
	For 1/2 (12,70 mm) & 9/16 inch (14,29 mm) orifices w/ stainless steel disk holder and fluoroelastomer diaphragm, disk & O-rings	R119X00SV22
	NACE Construction For 1/8 (3,18 mm), 3/16 (4,76 mm), 1/4 (6,35 mm), 5/16 (7,94 mm), and 3/8 inch (9,52 mm) orifices with aluminum disk holder, fluoroelastomer diaphragm, disk and O-rings	R119XN0SV32
	For 1/2 (12,70 mm) and 9/16 inch (14,29 mm) orifices with aluminum disk holder, fluoroelastomer diaphragm, disk and O-rings	R119XN0SV42
1	Valve Body	
	Cast Iron	
	3/4-inch (DN 20)	1E987119012
	1-inch (DN 25)	1E987319012
	1-1/4-inch (DN 32)	1E987519012
	Steel	
	3/4-inch (DN 20)	1E9871X0012
	1-inch (DN 25)	1E9873X0012
2	Spring Case	
	Aluminum	2P901508012
3*	Orifice	
	Aluminum	
	1/8-inch (3,18 mm) diameter	1A936709012
	3/16-inch (4,76 mm) diameter	00991209012
	1/4-inch (6,35 mm) diameter	0B042009012
	5/16-inch (7,94 mm) diameter	0B042109012
	3/8-inch (9,52 mm) diameter	0B042209012
	1/2-inch (12,70 mm) diameter	1A928809012
	9/16-inch (14,29 mm) diameter	1E985209022

*Recommended spare part.

Type 119

Key	Description	Part Number	Key	Description	Part Number
3*	Orifice (continuation)		8*	O-ring ⁽¹⁾ (2 required)	
	Stainless steel			Nitrile	18A7019X012
	1/8-inch (3,18 mm) diameter	1A936735032		Fluoroelastomer (high-temperature, corrosion)	18A7019X022
	3/16-inch (4,76 mm) diameter	00991235032		Nace MR-01-75, fluoroelastomer	18A7019X022
	1/4-inch (6,35 mm) diameter	0B042035032			
	5/16-inch (7,94 mm) diameter	0B042135032	9	Bonnet, aluminum	48A7025X012
	3/8-inch (9,52 mm) diameter	0B042235032			
	1/2-inch (12,70 mm) diameter	1A928835032	10	Internal Retaining Ring ⁽¹⁾ (2 required)	
	9/16-inch (14,29 mm) diameter	1C425235032		Nitrile & fluoroelastomer	18A7020X022
4*	Disk Holder Assembly ⁽¹⁾			Nace MR-01-75, fluoroelastomer	18A7020X032
	Aluminum/nitrile		11*	Bonnet O-Ring ⁽¹⁾	
	1/2 and 9/16-inch (12,70 and 14,29 mm)	1C4248000B2		Nitrile	1K594906562
	Stainless steel/nitrile			Fluoroelastomer (high-temperature, corrosion) & Nace MR-01-75	13A5559X012
	1/8 (3,18 mm), 3/16 (4,76 mm), 1/4 (6,35 mm), 5/16 (7,94 mm) & 3/8 inch (9,52 mm) orifices	1A8328000A2	12	Adjusting Screw, zinc plated steel	1D995448702
	1/2 (12,70 mm) & 9/16 inch (14,29 mm) orifices	1C4248000A2	13	Locknut, zinc plated steel	1A353724122
	Stainless steel/fluoroelastomer		14	Cap Screw, zinc plated steel (8 required)	1A391724052
	1/8 (3,18 mm), 3/16 (4,76 mm), 1/4 (6,35 mm), 5/16 (7,94 mm) & 3/8 inch (9,52 mm) orifices	1A8328000M2	15	Cap Screw, zinc plated steel (2 required) (not shown)	1B787724052
	1/2 (12,70 mm) & 9/16 inch (14,29 mm) orifices	1C4248X0052	16	Actuator Spring, zinc plated steel	See table 2
	Nace MR-01-75, aluminum/fluoroelastomer		17	Upper Spring Seat, zinc plated steel	1D667125072
	1/8 (3,18 mm), 3/16 (4,76 mm), 1/4 (6,35 mm), 5/16 (7,94 mm) & 3/8 inch (9,52 mm) orifices	1A8328X0122	18	Type Y602-12 Vent (not shown)	27A5516X012
	1/2 (12,70 mm) & 9/16 inch (14,29 mm) orifices	1C4248X0182	19	Stem Wiper ⁽¹⁾ , TFE (2 required)	18A7024X012
5*	Diaphragm/Stem Assembly ⁽¹⁾		20	Nameplate, aluminum	1E542711992
	Aluminum/nitrile	17A8080X032	21	Never-Seez Lubricant, 1 gal (3,78 L) can (not furnished with valve)	1M523906992
	Stainless steel/nitrile	17A8080X022	22	Dow Corning 111 Lubricant, 10 pounds (4,54 kg) can (not furnished with valve)	1M528306992
	Stainless steel/fluoroelastomer	17A8080X012	23	Vent Screen, stainless steel (not shown)	0L078343062
	Nace MR-01-75, Aluminum/fluoroelastomer	19A0348X022	24	Nace Tag	19A6034X012
6	Hair Pin Clip ⁽¹⁾		25	Tag Wire	1U7581X0022
	All except NACE	19A0347X012			
	NACE MR-01-75	19A0347X022			
7	Bushing Spacer, Delrin 500 ⁽²⁾ (2 required)	18A7021X012			

*Recommended spare part.
1. Included in repair kit.
2. Trademark of DuPont Co.



□ APPLY LUB/SEALANT
37A8076-C

Figure 3. Type 119 Control Valve