

Issuing Authority: QC Administrator	 <b>NWP</b> INDUSTRIES LP	Document Template 2013 Quality Control
Date of Issue: January 23, 2014 Rev Status: 1.0		FORM-QC & Instrumentation Documentation Manual Page 1 of 1

## ***QC & Instrumentation Documentation Manual***

### **4" Dual Meter/Pump Package; Sour Service**

**Prepared for: Encana**

**PO# PO82552**

**Job Order # 10936-001**

**Unit Serial # NWP-10936-001**

Issuing Authority: QA/QC Manager		Document Template Quality Control
Date of Issue: May 18, 2016 Rev Status: 3.0		FORM- Quality Control and Operations Documentation List

Page 1 of 2

## Standard Document Index

<b>Project:</b>	Metering Skid Package
<b>Customer:</b>	
<b>Customer PO:</b>	
<b>NWP JO# :</b>	

### Completed Package Documentation

Final Release Certificate .....

Shipping Manifest (Shipped Loose Item List) .....

Travel Sheets .....

Pressure Piping Construction and Test Data Report (AB-83) .....

Hydro Test Affidavit.....

Paint / Coating Reports .....

Electrical Documentation .....

ITP's (If Required) .....

Heater Permit & Report .....

PDL (BOM) .....

AS BUILT P&ID .....

AS Built General Arrangement Drawing.....

Function Test Map .....

Material Test Reports .....

### Welded Piping Documentation

Travel Sheet .....

Hydrostatic Test Affidavit .....

Post Weld heat Treatment Chart and Requirements .....

NDE Reports .....

AS Built Drawings .....

Material Test Reports .....

### Skid/Structural Documentation

Travel Sheet .....

NDE (If applicable) .....

AS Built Drawings .....

### Instrumentation and Other QC Documentation

Meter Run Documentation .....

Any other certificates that are sent with the instruments for this unit will be included in the manual .....

### Instrumentation Operations and Maintenance Manual

Any documentation available for instrumentation as per PDL (BOM) will be included .....

Instrument Warranty Information if any is included on the manufactures information .....

Issuing Authority: QA/QC Manager		Document Template Quality Control
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**Quality Control Manual is supplied as Follows**

- 1 USB Manual Shipped with Unit .....
- 1 Electronic Manual Emailed to Customer .....

# Complete Package Documentation

Issuing Authority: QA/QC Manager



Quality Control

Date of Issue: June 9, 2015

FORM-FINAL INSPECTION RELEASE  
CERTIFICATE

Rev 1.0

Page 1 of 1

### FINAL INSPECTION RELEASE CERTIFICATE

CUSTOMER: Encana

PRODUCT: 4" Dual Metering/Pump Package;  
Sour Service

WO #: 10936-001

DATE:

#### FINAL INSPECTION DOCUMENTATION

REVIEWED BY: *[Signature]*

ACCEPTED:

REJECTED:

STANDARD DOCUMENTATION REQUIREMENTS: (SEE DOCUMENTS REQUIREMENT LIST)

ADDITIONAL DOCUMENT REQUIREMENTS: (TO BE RECORDED HERE IF APPLICABLE I.E DOCUMENTS PACKAGE REQUIRED BY CUSTOMER ETC.)

Q.C FILE CLOSURE BY: *[Signature]*

DATE:

JAN 29 2020

#### LOOSE COMPONENTS REQUIRED / PREPARED

SHIPPING MANIFEST REVIEWED FOR SHIPLOOSE ITEMS:

YES

Initial *[Signature]*

NO

Initial \_\_\_\_\_

#### PREPARATION FOR SHIPMENTS / STORAGE

PREPARATION NEEDED / COMPLETED:

BOLTS/STUDS/TORQUED: Yes

Initial *[Signature]*

No

Initial \_\_\_\_\_

PRESERVATION REQUIREMENTS COMPLETE: Yes

Initial *[Signature]*

No

Initial \_\_\_\_\_

PIPING, VESSELS, TANK INTERNALS VERIFIED CLEAN: Yes

Initial *[Signature]*

No

Initial \_\_\_\_\_

S/N # NWP-10936-001

#### SHIPPING INSTRUCTIONS

CUSTOMER PDL REVIEWED: YES

Initial \_\_\_\_\_

NO

Initial \_\_\_\_\_

SHIPPING MANIFEST REVIEWED FOR SHIPPING INSTRUCTIONS:

YES

Initial \_\_\_\_\_

NO

Initial \_\_\_\_\_

RELEASED TO INVENTORY:

DATE:

RELEASED TO CUSTOMER:

*Jeremy Atkinson*

DATE:

Jan. 17/2020

### SHIPPING MANIFEST

Work Order # <u>10936-001</u>	Serial Number: _____
Description of Product: <u>4" Dual metering package</u>	Customer: <u>Encana Corporation</u>
Project Coordinator: <u>Carter Freschette</u>	Date: <u>JAN 08 2020</u>

QTY:	UNIT	ITEM DESCRIPTION	LOCATION
1 ✓	EA	Man door canopy c/w teck screws	
4 ✓	EA	Louver hoods	Crates
3 ✓	EA	2' sight glasses	Crates
8 ✓	EA	<i>Ass. Tubing vents</i>	Unit
1 ✓	EA	3" vent	
2 ✓	EA	Meter run handles & templates	
1 ✓	EA	Downspout	
4 ✓	EA	Batteries	

Total Qty of Items to be Shipped: \_\_\_\_\_

Locations:  
 W (Warehouse)  
 Y (Yard)  
 A (A-Fab)  
 U (Unit)

Is a third party release certificate required	Yes _____	No _____
All parts are boxed/on pallets	Yes _____	No _____
There is no visible Damage	Yes _____	No _____
All openings are plugged	Yes _____	No _____
Building/Enclosure Sealed	Yes _____	No _____

Manufacturing Release: C. Nelson  
 QC Release: \_\_\_\_\_  
 Warehouse Acceptance: [Signature]



**Optic  
QA Inc.**

5205 – 49 Avenue  
Beaumont, AB  
T4X 1E4  
Phone: (780) 929-8819  
[www.opticqa.com](http://www.opticqa.com)

## INSPECTION RELEASE

<b>CLIENT</b>	Encana C/O OEL Projects	<b>PROJECT</b>	Duvernay	<b>CLIENT DISTRIBUTION</b>	TBD	
<b>P.O. TO VENDOR</b>	P082552	<b>DESCRIPTION</b>	1 Dual Metering Skid (Sour Service) w/o Fuel Gas	<b>PO COMPLETION DATE</b>	Jan 2, 2020	
<b>VENDOR</b>	NWP Industries	<b>INSPECTION ADDRESS</b>	4017 60 Ave., PO Box 6280, Innisfail, AB	<b>VENDOR SCHEDULED COMPLETION DATE</b>	Jan 2, 2020	
<b>VENDOR CONTACT</b>	Jeremy Atkinson	<b>CONTACT PH, Email</b>	403-227-8331 <a href="mailto:Jeremy.atkinson@nwp.ca">Jeremy.atkinson@nwp.ca</a>			
<b>VENDOR REFERENCE</b>	10936-001				<b>ESTIMATED PROGRESS</b>	100%


INSPECTOR	OPTIC QA JOB#	REPORT NO.	RELEASE NO.	RELEASE DATE
Ian Verville	19313	2	1	Jan 2, 2020

Item No.	Description
1	4" Dual Metering / Pump Packages Sour w/o Fuel Gas Scrubber

Vendor Rep. Signature Jeremy Atkinson Date Jan. 2 / 2020

Inspectors Signature Ian Verville Date Jan 2 / 2020


**Optic QA Inc.      INSPECTION RELEASE**

Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: March 29, 2018 Rev Status: 8		FORM- Package/Product Assembly Travel Sheet

Page 1 of 2


Package / Product Assembly Travel Sheet		Approved By:				
		Date:		OCT 27 2019		
WO # 10936-001	Description: 4" Dual Metering/Pump Package; Sour Service					
Drawing # 10936-001-P-000 R.O, 10936-001-G-000 R.O, W40638-B-01 R.O, W40638-B-02 R.O, 10936-PDL R.O						
PRE HYDROSTATIC TEST:	REQ.	HOLD	EMPLOYEE INT.	DATE	QC INIT.	DATE
Thorough review of PDL and work instructions.	√	√	AL	Dec 11/19	JA	Oct. 23/19
All piping and sub-assemblies level, plumb, and square.	√		AL	Dec 11/19	JA	JAN 17 2020
All structural stands and supports level, plumb, and square. Welding complete with all exposed edges deburred with radius. (GWeld)	√				JA	
Threaded piping assembled as per NWP procedure: <i>Operational Procedure for Threaded Piping Assemblies.</i>	√		AL	Dec 11/19	JA	
Ensure all tubing connections are tight, and have been initialled as per NWP procedure. (Instrumentation): <i>Operational Procedure for the Installation and Verification of Tubing Connections Procedure.</i>	√		DC	Dec 11/19	JA	
Studs torqued as per NWP procedure and documented: <i>Torque / Bolting Procedure.</i>	√		AL	Dec 11/19	JA	JAN 17 2020
If applicable verify with photos that vessel internal is clean and free of debris. (QC)	√				NA	
Gasket surfaces on internal attachments free of runs. No excessive coating in bolt holes.			AL	Dec 11/19	NA	
All studs tight, centered in flanged bolt-ups, and identified as per NWP Procedure: <i>Operational Procedure for Package/Product Assembly</i>	√		AL	Dec 11/19	JA	JAN 17 2020
All unions tight and initialed off	√		AL	Dec 11/19	JA	JAN 17 2020
Function test valves for ease of operation and ability to open and close without restriction	√		AL	Dec 11/19	JA	JAN 17 2020
Lock or plug all valves that are being tested against as per NWP procedure: <i>Operational Procedure for Evaluating Valves and Subsequent Safeguards Prior to Hydrostatic Testing</i>	√				N/A	
Conduct P & ID check prior to flooding.	√	√	AL	Dec 11/19	JA	Dec. 11/19
Verify off-skid projections to +/- 3/8", submit to QC for stamping 'AS BUILT'	√		AL	Dec 11/19	JA	Dec. 31/19
Record Freezing point of Propylene Glycol - <u>50</u> °C					JA	Dec. 12/19
Test area secured with erection of barrier.	√		AL	Dec 12/19	N/A	
Secure affidavit and select correct gauges. (1.5 - 4 times test pressure)	√	√			JA	Dec. 12/19
Threaded consumables counted and recorded for all Jobs identified as 'XXXXX-001'.	√		AL	Dec 12/19	N/A	
Assembly Supervisor/Lead Hand/final visual inspection.	√				N/A	
Work area cleaned up and Package / Product ready for Masking and Sandblasting.	√		AL	Dec 12/19	N/A	

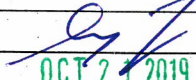


Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: March 29, 2018 Rev Status: 8		FORM- Package/Product Assembly Travel Sheet
		Page 2 of 2

POST HYDROSTATIC TEST:	REQ.	HOLD	EMPLOYEE INT.	DATE	QC INIT.	DATE
All piping and sub-assemblies level, plum and square.			AL	Dec 12/19	JA	JAN 17 2020
Hydrostatic test complete as per NWP procedure with affidavit and gauges returned to QC: <i>See Section 16 of QC Manual.</i>	√		AL	Dec 12/19	JA	Dec. 12/19
Slowly and safely de-pressurize system.	√		AL	Dec 12/19	N/A	
De-water and blow down system as per NWP procedure for Draining Water From Hydro Tested Vessel Packages.	√	√	AL	Dec 12/19	N/A	
Verify removal of all low drain plugs.	√		AL	Dec 12/19	JA	JAN 17 2020
Ensure all water is removed from the tested system.	√		AL	Dec 12/19	JA	JAN 17 2020
Hydrostatic test fittings removed and returned to storage.	√		AL	Dec 12/19	N/A	
Conduct pigging of coil and completion of report as needed.					NA	
All mounted equipment properly secured to package.	√				JA	JAN 17 2020
Confirm ladder bolts tight and thief hatch installation as needed. (Utility)					NA	
U-bolts tightened and visually identified.	√		AL	Dec 12/19	JA	JAN 17 2020
Verify re-installation and tightness of high point vents and low drain plugs after adding RV antifreeze by circling and initialing each point on the P&ID drawing.	√	√	AL	Dec 12/19	NA	
Install all PSV's and discharge piping if applicable. Have QC take pictures prior to packages for ship loose.	√	√			NA	
<b>PRESSURE VESSEL INTERNALS</b>						
Verify that all removable internals have gaskets installed, bolts are correct size, sealing washer installed and bolts torqued per IFC Drawings.	√	√			NA	
Verify with photos that vessel internal is clean and free of debris.					NA	





Comments:

Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: July 26, 2018 Rev Status: 4		FORM- Paint / Blast Final Inspection Checklist
		Page 1 of 1

<b>Sandblasting / Painting / Coating Travel Sheet</b>	Approved By: 
	Date: <b>OCT 27 2019</b>

WO #: 10936-001	Description: 4" Dual Metering/Pump Package; Sour Service
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Drawing #: 10936-001-P-000 R.0, 10936-001-G-000 R.0, W40638-B-01 R.0, W40638-B-02 R.0, 10936-PDL R.0


PRE-BLAST:	REQ.	HOLD	EMPLOYEE INT.	DATE	QC INIT.	DATE
Thorough review of PDL	√	√				<b>JAN 17 2020</b>
All sensitive instruments, valve handles, tags, etc. adequately masked	√				N/A	
All flange faces covered and protected	√				N/A	
Open ends capped / plugged or masked	√				N/A	
Removal of excessive grease and oils if required	√				N/A	
Blast integrity recorded on Paint/Coating Report	√				N/A	
POST BLAST:						
All residual sand blown down and removed	√				N/A	
Review paint colours and painting requirements	√				N/A	
Potential moisture/rusting areas caulked	√				N/A	
Bottom of pipe(s) to support(s) striped (Assembly)	√				N/A	
Difficult and/or restricted areas striped	√				N/A	
Column caps installed as required	√				N/A	
Environmental conditions recorded on Paint/Coating Report	√				N/A	
Visual inspection to verify full coverage, absence of runs and dry spray	√				N/A	
DFT's recorded on Paint/Coating Report	√				N/A	
Required foam insulation thickness on underside of skid measured and recorded on Foam Application Report	√			<b>DEC 17 2019</b>		<b>JAN 17 2020</b>
Required foam insulation thickness on tank measured and recorded on Foam Application Report					N/A	
Visual inspection of elastomer coating for full coverage and recorded on Foam Application Report					N/A	
Ensure all masking material has been removed.	√				N/A	
Work area cleaned up and product ready for Building/Cladding if applicable	√			<b>DEC 17 2019</b>	N/A	


Comments:

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









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Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: April 12, 2017 Rev Status: 2		FORM- Buildings Final Inspection Checklist
		Page 1 of 1


<b>Building / Cladding / Insulating Travel Sheet</b>	Approved By: 
	Date: <b>OCT 21 2019</b>

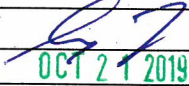


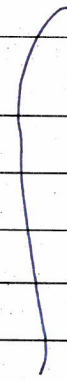
















WO # 10936-001	Description: 4" Dual Metering/Pump Package; Sour Service
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Drawing # 10936-001-P-000 R.0, 10936-001-G-000 R.0, W40638-B-01 R.0, W40638-B-02 R.0, 10936-PDL R.0


Buildings:	REQ.	HOLD	EMPLOYEE INT.	DATE	QC INIT.	DATE
Thorough review of PDL and Building Material Over Counter Pick sheet	✓	✓		Dec. 19/19		JAN 17 2020
Skid leveled and adequately supported	✓	✓			N/A	
Perimeter C channel properly attached	✓	✓			N/A	
Verify panels to be installed level, plumb, square and of same colour/shade/finish	✓	✓				JAN 17 2020
Inspect panels for no gap, and corner/roof connections are tight	✓	✓				
Lifting Lugs – Verify no lifting sling interference with building components	✓	✓				
Correct installation of windows, drain at bottom, and functional ease of operation	✓	✓				
Building louvers and patches are square, tidy and sealed.	✓	✓				
Doors installed level and plumb with all hardware, and functional ease of operation	✓	✓				
Visual inspection of ice rakes if required	✓	✓				
All building envelope breaches are caulked inside and out	✓	✓				JAN 17 2020
Building Material Over Counter Pick complete and submitted to Warehouse	✓		N/A		N/A	
<b>Cladding:</b>						
Thorough review of PDL and Building Material Over Counter Pick sheet	N/A	N/A			N/A	
Skid leveled and adequately supported	N/A				N/A	
Cladding installed and sealed correctly	N/A				N/A	
Banding is orderly, tight, and cut close to clamps	N/A				N/A	
Visual inspection of expansion tank if required	N/A				N/A	
Building Material Over Counter Pick complete and submitted to Warehouse	N/A				N/A	
Work area cleaned up and product ready for E & I if applicable	N/A				N/A	

Comments:

Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: April 12, 2017 Rev Status: 2		FORM- Instrumentation Final Inspection Checklist
		Page 1 of 1

Instrumentation Travel Sheet		Approved By:					
		Date:		 OCT 21 2019			
WO # 10936-001	Description: 4" Dual Metering/Pump Package; Sour Service						
Drawing # 10936-001-P-000 R.0, 10936-001-G-000 R.0, W40638-B-01 R.0, W40638-B-02 R.0, 10936-PDL R.0							
Instrumentation:	REQ.	HOLD	EMPLOYEE INT.	DATE	QC INIT.	DATE	
Thorough review of PDL, P & ID, and work instructions.	√	√				JAN 17 2020	
Verify tubing weights and grades as per NWP procedure.	√						
Confirm all instruments match NWP PDL description to include make, model, serial number, range, set pressure, etc.	√						
Review of Client specifications if applicable.							
All instruments installed as per NWP procedure and industry recognized practices.	√						
All tubing lines installed level, plumb, and square and supported per NWP procedure.	√						
Verify instruments and tubing does not obstruct lifting slings if used on lifting lugs.							
Verify instruments and tubing do not obstruct operation of valves, equipment, and process piping.	√						
All tubing lines and connections are free of scratches and not collapsed.	√						JAN 17 2020
Test area secured with erection of barrier.	√				N/A		
Secure affidavit and correct gauges. (1.5 – 4 times test pressure)	√						Jan. 2/20
Function/Pneumatic/Hydrostatic test complete as per NWP QC Manual and procedures.	√	√				Jan. 2/20	
Test affidavits and gauges returned to QC.	√					Jan. 2/20	
Reinstallation of instrument tubing after testing as per NWP procedure.	√					JAN 17 2020	
All vents terminated 1m minimum from any building openings as per NWP procedure.	√						
All vents are 1.5 meters minimum from any electrical boxes as per NWP procedure.	√						
All tubing lines exiting building bent down at 45° and sealed as per NWP procedure.	√						
All building envelope penetrations caulked neat and tidy, both inside and out.	√					JAN 17 2020	
Work area cleaned up, Instrumentation complete.	√				N/A		

Comments:


Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: March 29, 2018 Rev Status: 5		FORM- Instrumentation Final Inspection Checklist

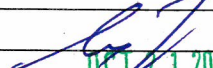
























Page 1 of 1


<b>Electrical Travel Sheet</b>		Approved By: 		
		Date: <b>OCT 21 2019</b>		
WO # 10936-001	Description: 4" Dual Metering/Pump Package; Sour Service			
Drawing # 10936-001-P-000 R.0, 10936-001-G-000 R.0, W40638-B-01 R.0, W40638-B-02 R.0, 10936-PDL R.0				
Electrical:	REQ.	HOLD	EMPLOYEE INT.	DATE
Thorough review of PDL, P & ID, and work instructions	√	√		
Confirm all electrical components match NWP PDL description to include make, model, serial number, etc.	√			
Review of Client specifications if applicable				
All electrical components installed as per NWP procedure and Canadian Electrical Code	√			
All conduit lines sized according to service, application, and Canadian Electrical Code	√			
All conduit lines installed level, plumb, square, and supported per NWP procedure and Canadian Electrical Code.	√			
Verify electrical components do not obstruct lifting slings, if used on lifting lugs.	√			
Verify electrical components do not obstruct operation of valves, equipment, and process piping	√			
Secure test affidavit and required meter and perform Loop Check test	√			
Secure test affidavit and required meter and perform Megger Check test	√			
Return of affidavits to QC	√			
Re-terminate electrical components as per NWP procedure	√			
Confirm covers replaced on fittings after test	√			
Ensure all labels are heat shrunk	√			
All seals tagged and identified as 'NOT PACKED & POURED'	√			
Lamacoids installed as required	√			
All junction boxes clean and free of debris	√			
All teck connections checked for tightness & initialed.	√			
Package is properly grounded and/or bonded. Metal shavings removed off skid.	√			
FAT Test if applicable	√			
All building envelope penetrations caulked neat and tidy, both inside and out	√			
Work area cleaned up, Electrical complete	√			















*\* Not in scope.*

E & I Supervisor (or delegate)	Final Review: _____	Date: _____
QC Final Review	QC Inspector: _____	Date: _____

Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: April 12, 2017 Rev Status: 1		FORM- Utility / Finished Product Final Inspection Checklist
		Page 1 of 2

Utility / Finished Package / Product Travel Sheet		Approved By:				
		Date:		 <span style="color: green;">OCT 27 2019</span>		
WO # 10936-001	Description: 4" Dual Metering/Pump Package; Sour Service					
Drawing # 10936-001-P-000 R.0, 10936-001-G-000 R.0, W40638-B-01 R.0, W40638-B-02 R.0, 10936-PDL R.0						
	REQ	HOLD	EMPLOYEE INT.	DATE	QC INIT.	DATE
Thorough review of PDL and work instructions	√	√		JAN 08 2020		JAN 17 2020
NWP decal on door, square, level and tidy	√			JAN 08 2020		JAN 17 2020
All instruments installed and tubing complete as per both P & ID and NWP procedure	√					JAN 17 2020
All electrical installations complete as per both P & ID and NWP procedure	√				NA	
Test area secured with erection of barrier	√				N/A	
Function/Pneumatic/Hydrostatic test complete as per NWP QC Manual and procedures	√	√				Jan. 2/20
Affidavits and gauges returned to QC	√					Jan. 2/20
Reinstall instrument tubing as per NWP procedure	√					JAN 17 2020
Re-terminate electrical as per NWP procedure	√					JAN 17 2020
Verify removal of all low plug drains	√			JAN 08 2020		JAN 17 2020
If applicable, tank installation of internals complete with photos for verification	√		N/A		NA	
If applicable, verify all change orders complete and signed off	√			JAN 08 2020		JAN 17 2020
All openings either plugged or capped	√					
All flanges on outside of building covered as per Customer's specification	√					
All tubing lines exiting building bent down at 45° and sealed off with electrical tape	√					
Threaded or Welded vents pointing down complete with screens.	√					
Drains clean and either plugged or capped	√			JAN 08 2020		JAN 17 2020
If product/package internally coated, all removable attachments installed	√		N/A		NA	
Tank is clean and free of debris with condition of tank recorded on photos before installation of manway cover	√		N/A		NA	
Touch up paint as required	√		N/A		NA	
Floors clean and painted if required	√			JAN 08 2020	NA	

Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: April 12, 2017 Rev Status: 1		FORM- Utility / Finished Product Final Inspection Checklist
		Page 2 of 2

	REQ	HOLD	EMPLOYEE INT.	DATE	QC INIT.	DATE
Windows clean and locked for shipping	√			JAN 08 2020		JAN 17 2020
Ship loose PSV's secured in the upright position	√		N/A		N/A	
Ship loose items preserved in a neat and orderly fashion complete with an itemized list	√			JAN 08 2020		JAN 17 2020
All ship loose items painted and accounted for to include ladders, platforms, stacks, etc.	√					
Shipping Manifest endorsed by members of Manufacturing, Quality Control, and Warehouse	√	√				
Photos taken and ownership transferred to the Warehouse	√					
Package / product ready to ship	√					
Work instructions retrieved and returned to Document Control	√			JAN 08 2020		JAN 17 2020

Comments:



# 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 LP Owner's Job No: 10936-001  
(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: Feb 12, 2021

2. Constructed For: OEL Projects Ltd.  
(Name of primary contractor if different from above)  
2711 - 39 Ave NE Calgary, Alberta, Canada, T1Y 4T8  
(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 Centre Street SE Calgary AB T2P 2S5  
(Name and address)  
15-03-61-24 W5M  
(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 0.5m<sup>3</sup>)

5. Design Responsibility: Owner ; Contractor

6. WP No.: WP-1604.2 ; Company: NWP Industries LP Owner's WP No. (If used): WP-NA  
(Alberta Registration No.) (Alberta Registration No.)  
 Spec No(s). used: NWP-3, 4, 15 ; Owner's Spec No(s). (If used): NA

7. 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	Design Temp. °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. °F	NDE
10936-001-B-2100 Rev 0 PG-4"-C-80A-200, 201, 202	Hydrocarbons	1480	100 / -20 100 / -49	2220	Propylene glycol & water	SA-106-B SA-333-GR6 SA-213 316L	1/8	1/2" 0.049 WT 1" XXH 4" SCH80	SA-105N SA-350-LF2-CL1 CL600	1150 / 50	100% RT 100% MT FW 10% HT 100% VT
10936-001-B-2200 Rev 0 PG-4"-C-80A-203, 204, 205	Hydrocarbons	1480	100 / -20 100 / -49	2220	Propylene glycol & water	SA-106-B SA-333-GR6 SA-213 316L	1/8	1/2" 0.049 WT 1" XXH 4" SCH80	SA-105N SA-350-LF2-CL1 CL600	1150 / 50	100% RT 100% MT FW 10% HT 100% VT
10936-001-B-2300 Rev 0 PG-4"-C-80A-206	Hydrocarbons	1480	100 / -20 100 / -49	2220	Propylene glycol & water	SA-106-B SA-333-GR6	1/8	4" SCH80	SA-105N SA-350-LF2-CL1 CL600	1150 / 50	100% RT 10% HT 100% VT
10936-001-B-2400 Rev 0 PG-8"-C-80A-207	Hydrocarbons	1480	100 / -20 100 / -49	2220	Propylene glycol & water	SA-106-B SA-333-GR6	1/8	8" SCH80	SA-105N SA-350-LF2-CL1 CL600	1150 / 50	100% RT 10% HT 100% VT



10936-001-P-000 Rev 0 PG-1"-W-160A-208, 209	Hydrocarbons	1480	100 / -20	2220	Propylene glycol & water	SA-106-B	1/16	1" SCH160	SA-105N CL600	NA / NA	100% VT
10936-001-P-000 Rev 0 D-1"-C-80A-500	Hydrocarbons	285	100 / -20	2220	Propylene glycol & water	SA-106-B SA-333-GR6 SA-213 316L	1/16	1/2" 0.049 WT 1" SCH80	SA-105N CL600	NA / NA	100% VT
10936-001-P-000 Rev 0 FG-1"-W-80A-705	Hydrocarbons	250	100 / -20 100 / -49	275	Air	SA-106-B SA-333-GR6 SA-213 316L	1/16	3/8" 0.035 WT 1" SCH80	NA	NA / NA	100% VT
10936-001-P-000 Rev 0 BH-111 BH-112	Hydrocarbons	250	100 / -20 100 / -49	275	Air	SA-213 316L	0	1/2" 0.049 WT	NA	NA / NA	100% VT
10936-001-P-000 Rev 0 P-111 P-112	Chemical	1440	100 / -20 100 / -49	2220	Propylene glycol & water	SA-213 316L	0	1/2" 0.049 WT	NA	NA / NA	100% VT
10936-001-P-000 Rev 0 P-113	Chemical	3626	100 / -20 100 / -49	5439	Automatic transmission fluid	SA-213 316L	0	3/8" 0.065 WT	NA	NA / NA	100% VT

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. 10936-001 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: Jan 2, 2020      NWP Industries LP  
Contractor

Jeremy Atkinson  
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: Jan 2, 2020      Date: \_\_\_\_\_

Ian Verville      \_\_\_\_\_  
Owner's Inspector Name (please print)      ABSA Safety Codes Officer (please print)  
(BOILER EXTERNAL PIPING ONLY)

Ian Verville      \_\_\_\_\_  
Owner's Inspector Signature:      ABSA Safety Codes Officer's Signature

Current version of this Form may be obtained from [www.absa.ca](http://www.absa.ca)

## EXHIBIT 16.2 HYDROSTATIC TEST AFFIDAVIT

Customer: <u>Encana Corporation</u>	JO# 10936-001
Project: <u>Dual metering / pump package function test</u>	Project#
Test Pressure: <u>275 PSI AIR, 2220 PSI HYDRO, 5439 PSI HYDRO</u>	Hold Time: <u>15 minutes</u>
Code Requirements: <u>ASME B31.3 NFS 2016 edition</u>	
All Personnel Advised of Test <input checked="" type="checkbox"/> All Signs & Flagging Posted <input checked="" type="checkbox"/>	
Prior to Filling - Fitting/Hoses & Component Meet Required Test Pressure, Pressure Test Examination Guide Completed	
Initials: <u>NM</u> Supervisor: <u>DK</u> Tester: <u>Nathan</u>	Date: <u>02/01/2020</u>

**Product Description:**

- |  |
|--|
| 1. FG-1"-W-80A-705, BH-111, BH-112, ALL ASSOCIATED INSTRUMENT TUBING = 275 PSI AIR |
| 2. P-111, P-112 PUMP DISCHARGES, FE-1111, FE-1121 TUBING DRAINS = 2220 PSI HYDRO   |
| 3. P-113 PUMP DISCHARGE = 5439 PSI HYDRO   |
|  |

50% Test Pressure Leak/Systems Check Completed

- |                   |
|-------------------|
| 1. 50% = 138 PSI  |
| 2. 50% = 1110 PSI |
| 3. 50% = 2720 PSI |

Test Temperature: \_\_\_\_\_ °F

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

\*See NWP Procedure for Draining Water from Hydro Tested Vessel Package\*

Start Time: <u>10:00 am</u>	Finish Time: <u>1:00 pm</u>
--------------------------------	--------------------------------

Test Gauge Identification #	Pressure Range	Calibration Date
NWPG- 600 - <u>7</u>	0-600 PSI	<u>July. 30 / 2020</u>
NWPG- 600 - <u>8</u>	0-600 PSI	<u>July. 30 / 2020</u>
NWPG- 5000 - <u>35</u>	0-5000 PSI	<u>Nov. 21 / 2020</u>
NWPG- 5000 - <u>40</u>	0-5000 PSI	<u>July. 16 / 2020</u>
NWPG- 10000 - <u>18</u>	0-10000 PSI	<u>Jan. 24 / 2020</u>
NWPG- 10000 - <u>19</u>	0-10000 PSI	<u>March. 21 / 2020</u>
NWPG-	PSI	
NWPG-	PSI	

Test By: <u>Nathan Marretta</u>	Date: 02/01/2020
NWP Representative: <u>Jeremy Allison</u>	Date: 02/01/2020
Customer Representative: <u>Ian Venville</u>	Date: 02/01/2020



**INSPECTION & TEST PLAN (I.T.P.) - LEVEL 3**

Commodity: Process Piping/Tubing Reference: Dual Metering/Pump Pkg. P.O.#: PO82552 Date: Sept. 30, 2019  
 EPCM Contact N/A Vendor: NWP Industries LP Vendor Contact Sean Konkin Prepared By: Sean Konkin  
 Project Name: Duvernay Wellsites Project #: NWP W.O.: 10936 AFE 20201088.8750.468 Rev: 0

IP - Inspection Point DR - Document Review A - Audit H - Hold A/R - As Required n/a - Not Applicable  
 Piping Code: ASME B31.3 Service (sweet, sour, cold): Sour Description (size): 2", 3", 4", 10" Radiography Required: 100%

Inspection Item	Inspection Requirement	Activity	Acceptance Criteria	Vendor's Duties			
				Meets Acceptance Criteria Yes/No/NA	Date	Vendor Inspector Signature	Owners Inspector Signature
Prefabrication Meeting	H, DR	Participate in Pre-fabrication Meeting	Prefab. agenda and issue minutes to all parties	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19
Review Spool ISO's Prior to "IFC"	A	Review piping drawings	Customer Requirements ECA-C-PVF-R-003 (2.4)	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19
Receipt of Approved Drawings	A	Submit to client for approval	Client approved IFC drawings	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19
Welding Procedure Review (ECAWPS)	DR/H	Review wgs, Weld Procedures and complete ECAWPS	Client signed ECAWPS ASME SEC IX (QW-200) ECA-C-WELD-R-001 (7.1)	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19
Welder Qualification	DR	Review Welder Qualification pertinent to the project	ASME Section IX and jurisdictional requirements ECA-C-WELD-R-001 (5.0)	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19
Job Commencement	A, DR	Note the start date of fabrication	Ensure vendor working with approved drawings and latest revision of SARP's and relevant codes	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19
Materials Received	A, DR	Review status of material with the vendor	Accepted once material is in house and conforms to the Bill of Materials ECA-C-PVF-R-003 (2.5)	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19
Material Identity, Heat Numbers	A, DR	Review procedure for material identity and audit materials for project	Vendor Quality Control manual procedure and ASME Section VIII UG-77 ECA-C-PVF-R-003 (2.5)	Y	DEC 02 2019	BW	Sean Konkin Dec 12/19

		Vendor's Duties					
Inspection Item	Inspection Requirement	Activity	Acceptance Criteria	Meets Acceptance Criteria Yes/No/NA	Date	Vendor Inspector Signature	Owners Inspector Signature
Pipe Check	IP	Review for grade, size, schedule and visible damage	Approved drawings and applicable ASTM Standard ECA-C-PVF-C-R-003 (3.0)	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
Fitting Check	IP	Check fitting and flanges for grade, size, schedule and visible damage	Approved drawings and applicable ASTM Standard	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
Layout Check	IP	Review configuration of pipe arrangement	Approved drawings	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
Internal Check	IP	Review inside of piping as visibly accessible including any internals	ASME B31.3 Para. 341.1 and Table 341.3.2A	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
Dimensional Check	IP	Review dimensions on Piping (ie: nozzles, attachments, etc.)	Approved drawings ECA-C-PVF-C-R-003 (3.14)	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
Orientation Check	IP	Review orientation of piping attachments and nozzles	Approved drawings	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
Support Check: (saddles, etc.)	IP	Review supports for dimensional accuracy	Approved Drawings	-	-	-	[Signature] Dec 12/19
Visual Weld Check	IP	Visually check all welds including attachment welds	ASME B31.3 para. 341.4.1 and Table 341.3.2A ECA-C-WELD-R-001 (7.5)	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
Stress Relief	A, DR	Review procedure for PWHT, calibration records and PWHT charts	ASME B31.3 Section 331	Yes	Dec 12 2020	[Signature]	[Signature] Dec 12/19
Radiography Procedures	IP, DR	Review radiography procedures, personnel qualifications, radiographs and reader sheets	ASME B31.3 Section 344.5 and Table 341.3.2A ECA-C-PVF-R-003 (6.0)	Yes	Dec 12 2020	[Signature]	[Signature] Dec 12/19
Other N.D.E. and Procedures (describe)	IP, DR	Review requirements for additional N.D.E. including procedures, qualification and results (hardness)	Encana Specifications ECA-C-PVF-R-004 (Appendix B)	Yes	Dec 12 2020	[Signature]	[Signature] Dec 12/19

		Vendor's Duties					
Inspection Item	Inspection Requirement	Activity	Acceptance Criteria	Meets Acceptance Criteria Yes/No/NA	Date	Vendor Inspector Signature	Owners Inspector Signature
Hydrostatic Test Encana Inspector to Witness	IP, DR, H	Review hydrostatic test procedure and hydrostatic test	ASME B31.3 Section 345 AB 518, AB 522 ECA-C-PVF-R-003 (7.0)	Yes	Dec 12 2019	[Signature]	[Signature] Dec 12/19
Pneumatic Test	IP, DR, H	Review Pneumatic test procedure and test	ASME B31.3, AB 518, AB 522	Yes	Jan 2 2020	[Signature]	[Signature] Jan 2/2020
Destructive Testing (if required)	n/a	Review requirements for destructive testing including procedures, qualifications and results	ASME Section II A	NA	-	-	N/A
Internal Cleaning	IP	Review cleaning and preparation of piping prior to shipment	Internal Shop Procedure	Yes	JAN 17 2020	[Signature]	
Sandblasting, Prime, Paint	A	Review the sandblast, prime and painting	Approved drawings ECA-C-COAT-R-001 ECA-C-COAT-R-002	NA	-	-	-
Mill Test Reports	A, DR	Review mill test reports to ASME Section IIa	ASME Section IIa and ASTM (specific grades) ECA-C-PVF-R-003 (2.5)	Y	DEC 02 2019	[Signature]	[Signature] Dec 12/19
ABSA/BCSA Requirements for piping (when required with intervening vessels)	IP, DR, H	Review fabrication, hydrotest and vendor activities to OGC/ABSA requirements for piping	Approved by Jurisdictional Authority or Owners inspector to proper revision	NA	-	-	N/A
Piping Controls and Safety Device Requirements	IP, DR, A	Verify PSV Capacity and Operation of Controls	ASME CSD -1, UL, FM, CSA	NA	-	-	N/A
Manufacturer's Construction Data Report	A, DR	Review manufacturer's Construction Data Report (mandatory for Alberta)	Client review and sign manufacturers Construction Data Report AB-83 or BCSA-1329	Yes	Jan 2 2020	[Signature]	[Signature] Jan 2/2020
CRN Drawing	n/a	Review CRN drawing and if applicable the manufacturer's specification sheet	Approved by jurisdictional authority to proper revision	NA	-	-	N/A
Final Documentation Review	DR	Review the requested documentation	Owner's inspector's ITP	Yes	JAN 17 2020	[Signature]	[Signature] Jan 17/2020
Release	A, DR, H	Final review of equipment and documentation	P.O. and contract requirements ECA-C-PVF-R-003 (10.0)	Yes	JAN 17 2020	[Signature]	[Signature] Jan 17/2020

*[Signature]*  
**APPROVED**  
 By Rod Skinner at 4:22 pm, Oct 02, 2019



**INSPECTION & TEST PLAN (I.T.P.) - LEVEL 3**

Commodity: Skid Structural Steel Reference: Dual Metering Pkg.; Sour. P.O.#: PO82552 Date: Sept. 30, 2019  
 EPCM Contact N/A Vendor: NWP Industries LP Vendor Contact Sean Konklin Prepared By: Sean Konklin  
 Project Name: Duvernay Wellsites Project #: NWP W.O. 10936 AFE 20201088.8750.468 Rev: 0

IP - Inspection Point DR - Document Review A - Audit H - Hold A/R - As Required n/a - Not Applicable  
 Description : Skid Steel Drawing Number: Drawing Number:

					Vendor's Duties		
Inspection Item	Inspection Requirement	Activity	Acceptance Criteria	Meets Acceptance Criteria Yes/No/NA	Date	Vendor Inspector Signature	Owners Inspector Signature
Drawings Received		Record Date	Approved Drawings ECA-C-PVF-R-003 (2.4)	Y	DEC 02 2019	BW	Sean Konklin Dec 12/19
Welding Procedure Review	A	Review Procedures	CSA W-59 minimum ECA-C-WELD-R-001 (7.1)(13.4.3)	Y	DEC 02 2019	BW	Sean Konklin Dec 12/19
Shop Survey (if required)	A, DR	Review shop for capacity to handle project.	Adequate cranes, welding equipment, qualified welders, Q.C. personnel, etc	-	-	-	N/A
Welder Qualification	DR	Review welder qualifications.	CSA W-59, Alberta Journeyman/Apprentice Level	Y	DEC 02 2019	BW	Sean Konklin Dec 12/19
Materials Received	A	Review material received for availability for fabrication.	CSA W59/47.1 Customer Specifications ECA-C-PVF-R-003 (2.5)	Y	DEC 02 2019	BW	Sean Konklin Dec 12/19
Job Commencement	A	Record date of start of fabrication	Approved Schedule ECA-C-WELD-R-001 (6.0)	Y	DEC 02 2019	BW	Sean Konklin Dec 12/19
Material Identity, Heat Numbers	A, DR	Review procedure for material identity and audit materials for project	Vendor Quality Control manual procedure ECA-C-PVF-R-003 (2.5)	Y	DEC 02 2019	BW	Sean Konklin Dec 12/19

Inspection Item	Inspection Requirement	Activity	Acceptance Criteria	Vendor's Duties				Owners Inspector Signature
				Meets Acceptance Criteria Yes/No/NA	Date	Vendor Inspector Signature		
Layout	A	Review layout of skid steel	Approved drawings	Y	DEC 02 2019	BW	EW Dec 12/19	
Dimensional Check	IP	Review dimensions on structure ( attachments, etc.)	Approved drawings ECA-C-PVF-C-R-003 (3.14)	Y	DEC 02 2019	BW	EW Dec 12/19	
Orientation Check	IP	Review orientation of material, attachments and holes	Approved drawings	Y	DEC 02 2019	BW	EW Dec 12/19	
Support Check	IP	Review supports for dimensional accuracy	Approved drawings		DEC 02 2019	BW	EW Dec 12/19	
Weld Check	IP,H	Review skid upside down for weld quality on members and floor plate if applicable. Review installation of grating as required.	CSA W59 and approved drawing weld details CSA W59 (7.3.3) ECA-C-WELD-R-001 (5.0)(13.7)(13.8)	Y	DEC 02 2019	BW	EW Dec 12/19	
Sandblasting, Prime, Paint	A	Review the sandblast, prime and painting	Approved drawings ECA-C-COAT-R-001	NA	—	—	N/A	
Release	A, DR, H	Final review of equipment and documentation	P.O. and contract requirements ECA-C-PVF-R-003 (10.0)	Yes	Dec-12 2019	—	EW Jan 2/2020	

**APPROVED**  
By Rod Skinner at 4:21 pm, Oct 02, 2019





DEC 23 2019



IJD Inspections Ltd.
E4, 5560 45 Street, Red Deer, AB T4N 1L1
P. 877.617.8776 F. 866.801.7639
www.ijd.ca
permits@ijd.ca

PERMIT # IN19-233G

GAS PERMIT APPLICATION FORM

Permit Applicant: [ ] Owner [ ] Contractor Application Date (mm/dd/yyyy):
New Home Warranty No.(if applicable): Estimated Project Completion Date (mm/dd/yyyy):

Owner Name: NWP Industries LP. Mailing Address: 4017 60th Ave, Box 6280
City: Innisfail Province: AB Postal Code: T4G-1S9 Phone: 403-227-4100
Cell: Email: holly.mayhew@nwp.ca & jeremy.atkinson@nwp.ca Fax: 403-227-4102

Contractor Name: NWP Industries LP Mailing Address: 4017 60th Ave, Box 6280
City: Innisfail Province: AB Postal Code: T4G-1S9 Phone: 403-227-4100
Cell: Email: Fax:

Project Location- Municipality: Innisfail Subdivision/Hamlet:
Street/Rural Address: 4017 60th Ave Unit: Lot: 11 Block: 69 Plan: 7921753
Legal Subdivision: Part of: Section: Township: Range: West of: M
Directions:
Description of Work: Catalytic Infrared Heater, NWP Job number: 10936-001

[ ] Work has not started [ ] Work is in progress [x] Work is complete

Table with 4 columns: TYPE OF PROJECT, TYPE OF WORK, NUMBER OF OUTLETS, INSTALLATION. Includes checkboxes for Residential, Commercial, Industrial, New construction, Renovation, Addition, etc. and fields for Furnaces, Water Heaters, Fireplaces, etc.

Permit Applicant Declaration: The permit applicant certifies that this installation will be completed in accordance with the Alberta Safety Codes Act and Regulations and work will commence within 90 days. The permit applicant/owner acknowledges that as per Section 12(2) of the Alberta Safety Codes Act, IJD Inspections Ltd. is not liable for any decision related to the system of inspections, examinations, evaluations and investigations including but not limited to a decision relating to their frequency and the manner in which they are carried out. F.O.I.P. Notification: Personal information is collected under the authority of Section 33(c) of the Alberta Freedom of Information and Protection of Privacy Act and will be protected under Part 2 of that Act and section 63 of the Safety Codes Act. It will be used for processing permit applications, issuing permits, safety codes compliance monitoring and verification. This permit expires in 1 (one) year from date of issuance unless an extension is requested in writing prior to expiration and granted by the Safety Codes Officer or Jurisdiction having Authority.

Signature of Journeyman: Kevin Fischer (print) OR x Homeowner's Signature (homeowner permit only) Homeowner Declaration: By signing this I hereby certify that I own/will own and occupy this dwelling.
Journeyman's Certification No.: 58193A

Permit Fees
Permit Fee: \$ 105.00 SCC Levy: \$ 4.50 Total Cost: \$ 109.50
SCC levy 4% of the permit fee with minimum of \$4.50 and a maximum of \$560.00
Purchase Order No.: 747198
[ ] Cash [ ] Debit [ ] Cheque [ ] Credit Card: INVOICED Expiry

Permit Validation Section: (to be completed by the Permit Issuer)
Special Conditions:
Other Permits Required (under separate application): [ ] Building [ ] Electrical [ ] Plumbing [ ] PSDS
Permit Issuer's Name: N. ENGLER Permit Issuer's Signature: [Signature]
Designation No.: P9615 Permit Issue Date (mm/dd/yyyy): DEC 23 2019

## INNISFAIL

4943 53 ST  
INNISFAIL, Alberta  
T4G 1A1  
Ph: (403)227-3376  
Fax: (403)227-4045  
Toll Free:



## GAS PERMIT

Permit Number: IN19-233G  
File Number: 180IJD-19-G0134  
Permit Issued: Dec 23, 2019

	<u>Applicant</u>	<u>Contractor</u>	<u>Owner</u>
Name:	NWP INDUSTRIES LP	NWP INDUSTRIES LP	NWP INDUSTRIES LP
Address:	4017 60 AVE BOX 6280 INNISFAIL, ALBERTA T4G 1S9	4017 60 AVE BOX 6280 INNISFAIL ALBERTA T4G 1S9	4017 60 AVE BOX 6280 INNISFAIL, ALBERTA T4G 1S9
Phone:	(403)227-4100	(403)227-4100	(403)227-4100
Cell:	(403)304-9945	(403)304-9945	(403)304-9945
Fax:	(403)227-4102	(403)227-4102	(403)227-4102
Email:	holly.mayhew@nwp.ca;jeremy.atkinson@nwp.ca	holly.mayhew@nwp.ca;jeremy.atkinson@nwp.ca	holly.mayhew@nwp.ca;jeremy.atkinson@nwp.ca

### Project Location:

4017 60 AVE  
INNISFAIL  
L:11 B:69 P:7921753

### Description of Work

Description of Work: CATALYTIC INFRARED HEATER-NWP JOB #10936-001, Total # of Outlets: 2, Person Performing Work: Contractor

### General Permit Conditions:

**This permit expires 18 months from the date of issuance** unless an extension is requested in writing prior to expiration and granted by the Safety Codes Officer or Jurisdiction having Authority.

**As the permit applicant, it is your responsibility to call for inspections at the appointed time.  
If you are unsure of when an inspection needs to take place, please contact us at 1-877-617-8776.**



**Nicole Engler**

Digitally signed by: Nicole Engler  
Nicole Engler  
SCO Number: 229204  
DOP Number: P00009615

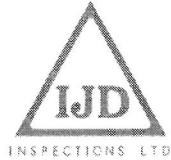
Issued By:

**IJD Inspections Ltd.**

E4, 5560-45 Street  
Red Deer, Alberta  
T4N 1L1  
Ph: (403)346-6533  
Fax: 1-866-801-7639  
Toll Free: (877)617-8776

*The personal information provided as part of this application is collected under section 43 of the Safety Codes Act and sections 303 and 295 of the Municipal Government Act and in accordance with section 32(c) of the Freedom of Information and Protection of Privacy Act. The information is required and will be used for issuing permits, safety codes compliance verification and monitoring and property assessment purposes. The name of the permit holder and the nature of the permit is available to the public upon request.*

IJD Inspections Ltd.  
 E4, 5560 Red Deer, AB T4N 1L1  
 Tel: 1.877.617.8776  
 Fax: 1.866.801.7639  
 permits@ijd.ca



**Gas Site Inspection Report**

**PERMIT #** IN19-233G  
**eSITE #** 180IJD-19-G0134

**Applicant:**

Name: NWP INDUSTRIES LP  
 Address: 4017 60 AVE BOX 6280  
 INNISFAIL, ALBERTA  
 T4G 1S9  
 Email: holly.mayhew@nwp.ca;jeremy.atkinson@nwp.ca  
 Phone: (403)227-4100  
 Fax: (403)227-4102

**Owner:**

Name: NWP INDUSTRIES LP  
 Address: 4017 60 AVE BOX 6280  
 INNISFAIL, ALBERTA  
 T4G 1S9  
 Email: holly.mayhew@nwp.ca;jeremy.atkinson@nwp.ca  
 Phone: (403)227-4100  
 Fax: (403)227-4102

**Project Location:**

**INNISFAIL**  
 Civic or Rural Address:  
**4017 60 AVE**  
 LSD:  
 Lot/Block/Plan:**L:11 B:69 P:7921753**

Description of Work: **CATALYTIC INFRARED HEATER-NWP JOB #10936-001**

ROUGH-IN     FINAL     OTHER

Observations/Code Violations	Code Version	Section
Catadyne heaters. Piping- stainless steel-ok. Venting-type C-ok.  LPG-ok		

Jerry Bond

D2391/92.

Jan 8, 2020.

S.C.O Name (Print)

Designation #

S.C.O. Signature

Date

- The work is progressing; OK to proceed.
- The work complies with the intent of the Safety Codes Act and applicable regulations.
- Unable To Enter. Please contact our office as a site inspection is due.
- The above noted code violations must be completed and/or corrected to comply with the S.C.A.
- No further site inspections are required.
- Permit has expired.
- Rough-In not applicable to scope of work

**VERIFICATION OF COMPLIANCE IS REQUIRED (To be completed by the person responsible for the work).** Please sign below when corrected and/or completed and return to IJD Inspections as soon as possible. Failure to comply with the *Safety Codes Act* can result in fines.

Name (Print)	Title (Owner, Contractor, etc.)	X Signature	Date
--------------	---------------------------------	----------------	------

**Acceptance of Verification of Compliance (To be completed by the SCO)**     Written     Verbal     SCO Site Inspection     Picture/Video

SCO Name (Print)	Designation #	SCO Signature	Date
------------------	---------------	---------------	------

*IJD Inspections Ltd. is not liable for any decision related to the system of inspections, examinations, evaluations and investigations including but not limited to a decision relating to their frequency and the manner in which they are carried out. If you have any questions regarding this report please contact IJD Inspections Ltd.*

ORIGINAL



4017 - 60th AVE Box 6280, Innisfail AB. T4G 1S9 Phone (403) 227 4100 Fax (403) 227 4102

**Project Data List Rev 1**  
**Work Orders: 10936-001**  
**P&ID: 10936-001-P-000 Rev 0**

October 23rd, 2019

**Project Coordinator : Carter Freschette**

**Sales Rep : Brent Warner**

**Quote Reference: 3299 Rev 2**

**Client: Encana Corp**  
**C/o OEL Projects**  
2711 - 39 Avenue NE  
Calgary, Alberta  
T1Y 4T8

**Commercial Contact: Diana Moreno**  
Email: Diana.Moreno@encana.com  
Phone: 403-645-4303

**Customer P.O.: PO82552**

**Technical Contact: Alexander Stang**  
Email: Alexander.Stang@encana.com  
Phone: 403-645-2129

**Technical Contact: Blair Dunne**  
Email: blair.dunne@oelprojects.com  
Phone: 403-298-9792

**Inspection Contact: TBD**  
Email: TBD  
Phone: TBD

ORIGINAL

## Dual Metering Package

**GENERAL DESCRIPTION**

Quantity	Description
1	<p>4" Dual Metering / Pump Package, Sour Service, without Fuel Gas</p> <ul style="list-style-type: none"> <li>• (2) 4" ANSI 600# RF Senior Meter Runs</li> <li>• (3) Injection Pumps</li> <li>• (2) 1000 gallon double wall plastic chemical tanks, mounted on skid extension.</li> <li>• 300 gallon single wall utility tank, steel</li> <li>• Skidded with Building</li> <li>• FCA: Innisfail, Alberta</li> <li>• Delivery: See Delivery Section 12.0</li> <li>• Encana MSSA # 101012</li> <li>• Vendor # 216051.</li> </ul>

**1.0 PIPING**

- Instrument Vent Header – 1" NPT Sch 80, SA-106-B, 3000# fittings
- (2) Inlets, 4" ANSI 600# RF, Sch 80, weld piping to common 8" Header. C/w (2) 2" ANSI 600# RF Sch 160 connections for PSL
- (2) 1" NPT, 6000# TOLs connections for manual blowdown
- (2) Bypass, 4" ANSI 600# RF, Sch 80, weld piping to common 4" Header.
- Main Header – 8" ANSI 600# RF Welded piping, blind both ends
- Test Header – 4" ANSI 600# RF Welded piping, blind both ends
- I/G – 1" NPT Skid edge connection, 1" NPT thread piping thereafter.
- Fuel Gas Inlet (Heaters) – ½" 316 SS Tubing
- Sample – (2) – 1/2" Tubing to Operator Height.
- Venting Instruments vented to common header exiting building.
- Pump and solenoid vented separately to eave height
- Portion of pipe and flange outside building to be "low temp" material

**2.0 INSTRUMENTATION**

Tag #	Quantity	Description
BH 111/112	(2)	<p><b>Building Heater</b> – CCI Thermal Tech Catadyne 24" x 24" Building Heater 12 Volt DC Start Propane Gas supply C/w (XV 1112/1121) Safety shut off, (PCV 1113/1125) 912 Regulator, (PCV1112/1126) Maxitrol Regulator (TCV 1112/1121) Thermostat. Grill Guard, Vent Hood Installed as per Canadian Electrical Code Class 1, Div. 1 Specifications Gas Permit per B149 <b>NOTE STARTER CABLES WIRED TO SKID EDGE BY NWP – BOTH WIRED TO DOOR SIDE OF BUILDING</b></p>
EY 1112/1122/ 1132	(3)	<p><b>Solenoid Valve</b> – ASCO Model EF8314G301-24 3-Way, 1/4" NPT SST Body 24VDC Coil, 1.4 Watts 130 psig Maximum Operating Pressure Differential CSA Approved Explosion Class 1 Div 1</p>

ORIGINAL

- FE 1111/21 (2) Meter Run – Canalta**  
 460RFDC80SSAW00WFTT2\_QBA9-FF-BBC-N-HMPX  
**DUAL CHAMBER** W/ RUN, 4" 600, SCH80, 3PC  
 NACE(SS Trim), Grease Seat, 600 WxF, Teletaps  
 AGA 2000 Ed., A216WCB, DUAL  
 O-PLT 4"x1/8" 2.000" 316SS  
 Teflon - Snap Style, 00Ed.  
 Pipe: Cold Finish, A106B / A105N, OAL: 91"  
 AGA 2000  
 Upstream: 600RF, Downstream: 600RF  
 Contour Flow Cond.: RF, 0.75 Beta  
 Outlets: 0.75"TOL, 0.75"TOL, 1"TOL.  
 Treatments: Weld X-RAY, MPI, Hardness, PWHT  
 Canalta Standard Paint  
 Includes Hydro Test, MTR's, Canalta Inspection
- RG 1112/1122/ 1132 (3) Rate Gauge – Plainsman**  
 Model P5700 Rate / Indicator Gauge  
 1/2" NPT, 52" OAL, 48" Visible
- LG 9101/9111 9131 (3) Level Gauge – Plainsman**  
 Model P5700 Rate / Indicator Gauge  
 1/2" NPT, 52" OAL, 48" Visible
- MVT/TE/TW 1111/21 (2) Multi Variable Sensor – Control Micro Systems**  
 Model TBUT4102M2Y101U-00A  
 Differential Pressure Span: **10-840 in H2O**  
 Absolute Pressure Span: **30-1500 PSI**  
 Digital Modbus Protocol  
 316 SS process cover and sensor material  
 1/4" NPT process connector type  
 Digital Indicator w/push buttons and ex-proof window  
 Explosion Proof CSA approved Class1, Div1, Group B-D  
 Fully compatible with ScadaPack and RealFlo.  
**RTD - Aircom**  
 RTD, 24 3 wire VDC, 1/2" NPT connection  
 2.5" U Length stainless steel thermowell, 3/4"  
 MNPT x 1/2" FNPT
- RTD – AIRCOM**  
**RT7-2ALT-NU-3.5-A-S-3-LT-4.5-14**  
 RTD Assembly w/o Thermowell, 2ALT JB, 3.5" NU,  
 100ohmPt, 3 Wire, Low Temp, 4.5" L, 1/4" OD  
**S24-3/4-316-3**  
 Tapered Thermowell, 0.260" Bore, 3/4" NPT, 316SS,  
 3"U Length
- S 910 (1) Utility Tank – Westeel**  
 300 gallon **single wall**  
 Horizontal design  
 Weld on Saddles, Two Lift Lug  
 3" NPT Drain c/w 3" SS Camlokfitting, 3" NPT Vent,  
 2" NPT INLET/HLSD (FUTURE) 1/2" NPT LG CONNECTION

ORIGINAL

- PSLL 1111/21 (2) Pressure Switch – Argus**  
 Model AEF-1.0  
 Set @ 345 kPag  
 Classification: CSA Class I, Div. 1 & 2, Group D Hazardous Locations  
 Dead Band: Fixed  
 Electrical Connection: 1/2" NPT Female Thread  
 Electrical Rating:  
 1/2 Amp @ 125 VDC 1/4 Amp @ 250 VDC  
 5 Amps @ 125, 250, or 480 VAC (50/60 Hz)
- Enclosure: Type 4  
 Pressure Sensing Element: Diaphragm  
 Setting: External  
 Set Point Repeatability: ± 1% of Adjustable Range  
 Std. Process Connection 2" NPT Male Thread
- P 111/112 (2) Chemical Injection Pump - Bruin**  
 Model **BR5103LP-9111**  
 3/8" N-Seal Injection Head  
 Max Discharge 3000 PSI
- P 113 (1) Chemical Injection Pump – Bruin**  
 Model **BR5113LP-2511**  
 3/8" Injection Head  
 Buna Hard Packing  
 Max Discharge 6000 PSI
- PCV 1121/1122(3) /1123 Regulator – Fisher 67CFR c/w PI**  
 1/4" FNPT Tapped-Bonnet  
 Maximum Inlet Pressure 250 PSi  
 Outlet Pressure Range 0-60 PSi  
 c/w pressure gauge  
 Adjustable spring range, 5 micron filter  
 Adjustable screw with closing cap  
 Temperature Range: -20 to 180 Deg F
- PSV 1112/1122 (2) Relief Valve – Nupro**  
 Model SS-4R3A5-BU, 1/4" x 1/4" NPT  
 set @ **9930 kPa (Note: 6000 psi is max set pressure available)**  
 Buna seals, suitable for H2S Scavenger service
- PSV-1132 (1) Relief Valve – Nupro**  
 Model SS-4R3A5-BU, 1/4" x 1/4" NPT  
 set @ **25,000 kPa (Note: 6000 psi is max set pressure available)**  
 Buna seals, suitable for Wax Dispersant service
- PI 1111/21 (2) Pressure Gauge – WIKA**  
 Model 233.54 Lower Bottom Mount  
 4" Face, 1/2" NPT Connection  
 0-1500 PSI, 316SS
- PI 1126 (1) Pressure Gauge – WIKA**  
 Model 233.54 Lower Bottom Mount  
 4" Face, 1/2" NPT Connection  
 0-300 PSI, 316SS

ORIGINAL

- SP1111/21 (2) **Sample Probe** – Welker  
Model SP-2A  
3/4" NPT  
c/w 1/4" Needle Valve
- RO 1111 (1) **Restriction Orifice**  
1" CL 600 CAT 520  
1/8" orifice, 316 SST
- S 911/913 (2) **Storage Tank** – Marmit Plastics  
Model CHEM1000S  
1000 Imperial Gallon Double Wall Chemical Tank With 4' stand  
12" Cap, 1/2" Stainless  
Steel Fitting, Gor-Tex Gasket  
Polyurethane plastic construction  
Tank: 116" L x 74" W x 71" H (672LB)  
Stand: 72-1/4" L x 87-1/2" W x 48" H (551LB)  
Top Fill Assembly: 1.5" Poly Ball Valve,  
2" SS Camlock fitting/Dust Plug,  
Hose Clamp Assembly With  
Mounting Bracket and Screws  
1.5"D x 12' long chemical compatible hose  
with stainless steel fittings, XLPE lining, protective cover.  
Top portion has been upgraded to vent cap w/screen  
Mounted on extended skid

**Top Fill Assembly Ground Adapter included, See Marmit Plastics Drwg #  
TOPFILL\_GROUND\_WIRE REV A PG 1 & 2 for installation  
ELECTRICAL CONTRACTOR TO INSTALL**

### 3.0 MANUAL VALVES

- BF406N (4) Ball Valve, Grove, B4, 4" ANSI 600# RF, Full Port, **Double Isolation & Bleed**,  
Model 2302332-04-06-11, lever operated, Trunnion NACE
- BF025 (3) Ball Valve, Nutron, 1/4" NPT, 3000#, FP, CS Body, Std Trim, Model T3-F02S30BZ
- BF050 (24) Ball Valve, Nutron, 1/2" NPT, 3000#, FP, CS Body, Std Trim, Model T3-F05S30BZ
- BF050Z (2) Nutron Ball Valve, 1/2" 3000# FP NPT Carbon Steel Body NACE Trim,  
Fire Safe – Spring Closed Model: BA-T3F05S30SZ-C
- BF050N (4) Ball Valve, Nutron, 1/2" NPT, 3000#, FP, CS Body, NACE, Model T3-F05S30SZ
- BR206 (2) Frontier Isolation / Test Ball Valve, 2" ANSI 600# RF x 2" NPT  
c/w 2 x 1/2" NPT ports, A350-LF2 Body with A351-CF8M Ball, 17-4 PH SS Stem,  
Model I320Q06L-2020. NACE
- BR100N (2) Ball Valve, Nutron, 1" NPT, 3000#, RP, CS Body, NACE, Model T3-R10S30SZ
- BR100 (1) Ball Valve, Nutron, 1" NPT, 3000#, RP, CS Body, Std Trim, Model T3-R10S30BZ
- BR200 (1) Ball Valve, Nutron, 2" NPT, 2000#, RP, CS Body, Std Trim, Model T3-R20S20BZ
- CS406N (2) Swing Check Valve, Wheatley, 4" ANSI 600# RF, NACE, Model 9D-510-045144-  
166
- CS100 (1) Swing Check Valve, Wheatley, 1" NPT, RP, CS Body, NACE Trim, 2160 psi,  
Model 9D-822-013216-166
- YS050 (3) Y Strainer, Alberta Strainers 1/2" 3000#, Model YS 3000 NACE  
1/32" Perf Strainer, ASTM A105N Body, 1/2" Drain Connection



ORIGINAL

MF1111-1121	(2)	Manifold, Schneider Electric Five Valve Manifold, 316 SS body, hard seat Model SCL-5VMAN-0.5XFLG NACE, Flange x 1/2" NPT, MAWP 6000 PSI @ 100F
CS050	(2)	Inline Check Valve, Swagelok, 1/2" NPT, 316 SS Model SS-CHF8-1
NM050	(2)	Needle Valve, 1/2" 6000 M X F STRAIGHT SS BODY, Huber Magnum Model MF-50-SS
NF050	(2)	Needle Valve, 1/2" 6000 F X F STRAIGHT SS BODY, Huber Magnum Model FF-50-SS
SW050	(5)	Swagelok SS-8P6T ball valves
BF0501	(2)	1/2-inch NPT <b>FP</b> , 6000#, <b>Nutron</b> Ball Valves, A105 Body, Std Trim, locking handle, Model: T3-F05S60BZ
CB0501	(1)	<b>Plainsman</b> Inline Check Valve 1/2" NPT, 6000#, F x F, SS Body, Model SB-50-6000

**Note:** Valves may be substituted with equivalent brands based on valve availability, TBC with client prior to change

#### 4.0 PACKAGE MATERIALS

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##### Weld Piping

<b>Pipe:</b>	SA 106-B /SA-333Gr 6 SMLS
<b>Flanges:</b>	SA105-N/SA-350-LF2 CL1
<b>Weld Fittings:</b>	SA 234-WPB/SA-420-WPL6
<b>Threadolets</b>	SA-105-N/SA-350-LF2 CL1

##### Bolt-Up

<b>Gaskets:</b>	1/8-inch RF, CGI - 316 SS Inner, FlxCrB Filler, CS Outer
<b>Bolting:</b>	SA-193-B7M, SA-194-2HM

##### Threaded Piping

<b>Threaded Pipe:</b>	SA-106-B/SA-333Gr 6 SMLS
<b>Threaded Fittings:</b>	SA-105-N/SA-350-LF2 CL1

<b>Tubing:</b>	ASTM A269 / ASME SA213 316 SS – 0.035" / 0.049", 0.065"
<b>Fittings:</b>	316 SS - Swagelok
<b>Ferrules:</b>	316 SS

#### 5.0 TESTING / POST WELD HEAT TREAT (PWHT)

---

<b>Hydro-Testing:</b>	Pressure Piping:	As per B31.3
	Instrumentation:	Subjected to an operational test to ensure proper functioning (excluding electrical)
	Instrument Supply Lines:	As per ABSA AB-522
	Process Tubing Lines:	As per B31.3
<b>Radiography:</b>	Welded Piping:	All NDE on Pressure Piping as per ASME B31.3 N.F.S Table 341.3.2
	Weld Piping:	100% Radiography
	Socketweld Piping:	N/A

ORIGINAL

<b>PWHT:</b>	Threaded Piping:	None
<b>Ultrasonic Test:</b>	Buttweld Weld Piping:	Yes
<b>Hardness Test:</b>		None
<b>MPI Inspections:</b>	Max 225 BHN on 10% of piping buttwelds	
	Skid Lift Lugs:	100%
	TOLs, WOLs:	100%

**6.0 SKID / BUILDING**

SK-100

**Skid**

14' W x 15'-6" L

Main skid members 8" Wide Flange Beam

6" @ 8.2# Channel Iron cross members

¼" Checker plate floor, 2" drip lip

Six Lift Points

14'-6" extension for mounting (2) 1000 gallon tanks

3" THK urethane spray foam insulation on skid under side

Q-100

**Self Frame Building – Shed Style Roof 1:12 Slope**

14' W x 15'-6" L x 8'H low side eave

22 gauge pre-painted walls, roof and trim (Tan &amp; Metro Brown)

R12 fibre glass batt insulation in the walls and R36 fibre

glass batt insulation in the roof c/w a 6-mil vapor barrier

24 gauge white fluted aluminum interior liner

Regular fasteners

1 - 3' x 7' single steel man doors (18 ga frame, 20 ga door, R4 insulated) c/w locking panic hardware, hydraulic door closures, 24" x 24" IWG windows, aluminum thresholds, check chains, weather-stripping and canopy

1 – 40" x 40" double glazed sliding window c/w half screen and latch

4 – 12" x 12" operable louvers c/w screen and manual wing nut control and storm hoods

P. Eng stamped building drawings only (AB Registered)

Supply ice rakes at lower eaves

Supply eaves-trough c/w (2) downspouts

**7.0 PAINT**

- Not Included in Scope of Work

**8.0 ELECTRICAL**

Materials and Labour to wire two 12 VDC heaters to edge of the skid as per Class 1 Div 1. CEC specifications.

**RTU SUPPLIED BY ENCANA, INSTALLED BY NWP.  
ALL WIRING BY OTHERS.**

ORIGINAL

**9.0 PROGRESS PAYMENTS**

---

The following Progress Payment Schedule shall apply to this order:

- 15% invoiced upon submittal of approval drawings.
- 40% invoiced upon receipt of major materials.
- 40% invoiced upon completion and readiness to ship.
- 5% invoiced upon submittal of final documentation.

**10.0 DOCUMENTATION**

---

- One Equipment Manual and QC manual on Flash Drive are included – to Encana Calgary
- One Equipment Manual and QC manual on Flash Drive are included – shipped with unit
- Hard copies are available at \$500 per copy
- Hard Copy Mud Book
- P&ID, skid and general arrangement drawings (with one revision) are included. Extra charges apply for additional changes and revisions at \$100.00 per hour.
- **Documents will be provided in accordance to Encana supplied VDDR**
- P.Eng Stamped Building Drawing included.

**11.0 ADDITIONAL NOTES**

---

- Packages will be dismantled only to the extent required for shipping.
- All specifications provided to us are reviewed, 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.
- All instrument Documentation and Data Sheets provided from our vendors shall be included in the Document Manual.
- Standard QC documentation to be provided.
- Any P.Eng stamped drawings such as Skid or P & ID which may be required shall be an additional charge and have not been allowed for.
- Structural steel skid welded in accordance with CSA W59.
- No recommended Spare Parts are required at this time.
- Cancellation Terms:
  - i. 10% after award of PO
  - ii. Cost incurred to date plus 20% of total PO Value after work has commenced.
- Drawing Schedule:
  - IFA P&ID within 2 weeks of PO (returned in one week)
  - IFC P&ID 1 week after code 2
  - GA Drawing 2 weeks thereafter

**12.0 DELIVERY SCHEDULE**

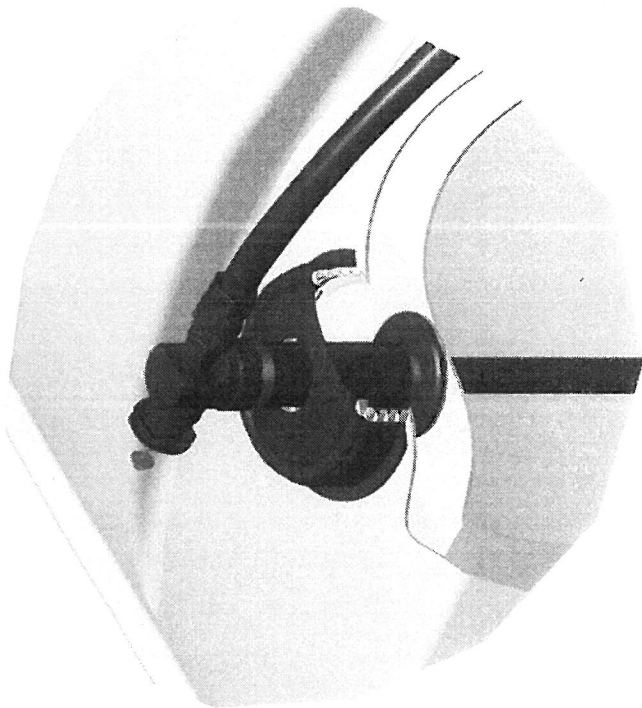
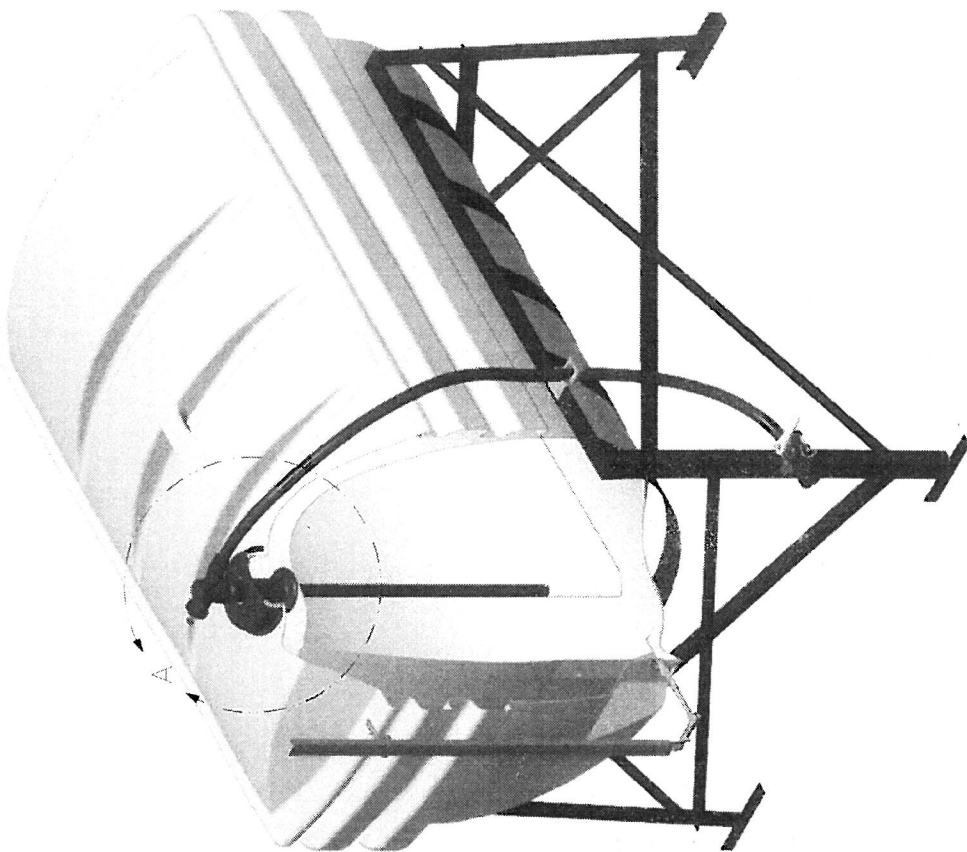
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- Target due dates are set as follows:
  - 10936-001 / December 20th, 2019 / 15-03-61-24 W5M

**13.0 SHIP LOOSE MATERIALS**

---

- Dismantle the package to the extent for shipping
- **S-911 & S-913 Top fill Assembly Ground Adapter (Only if Electrical Wiring is not complete by contractor in NWP yard)**



DETAIL A  
SCALE 7/164

**FOR INFORMATION ONLY**

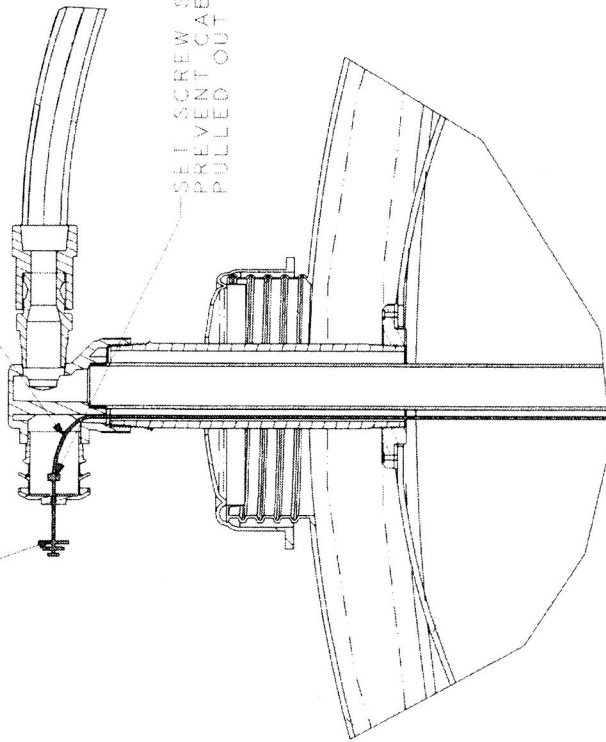
CF OCT 23 2019

ECN	REV	DESCRIPTION	DATE	APPROVED
	A	REPLACE CABLE SWEDGE WITH SHAFI COLLAR	18/OCT/19	
REVISIONS				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			TOLERANCES ON	
			X.XX ± 0.01	
			X.X ± 0.02	
			X ± 0.03	
			ANGLES ± 0.5°	
			DIMENSIONS ± .100	
SIGNATURE		DATE		TITLE
[Signature]		18/08/19		OPTIONAL TOP FILL ADAPTOR
CAP MODEL		TOP FILL ADAPTOR ASM		GROUND WIRE
SHEET		1		OF 2
DRAWING NO.		SIZE		SCALE
18700		A		1/4" = 1'-0"
DWG. NO.		PROJECTION		TOP FILL-GROUND WIRE
18700		A		

MARMIT PLASTICS INC.

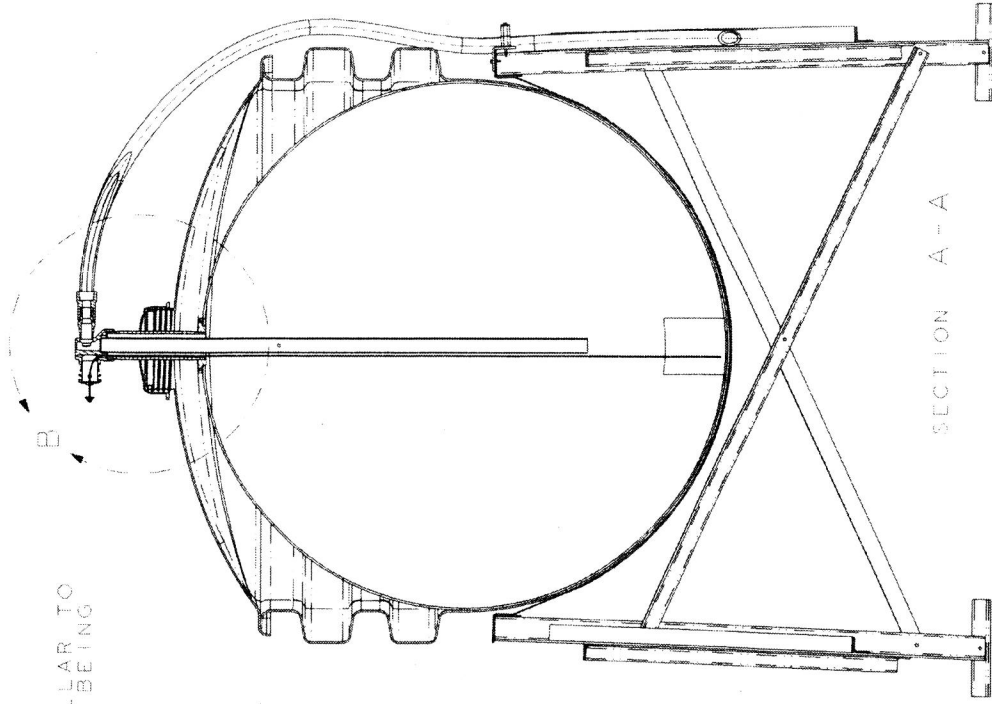
TO SITE GROUND  
MIN 6"

MINIMUM OF 9' OF 3/16" DIAMETER  
(APPROXIMATELY #5 AWG)  
STAINLESS STEEL CABLE INSIDE TANK



SET SCREW SHAFT COLLAR TO  
PREVENT CABLE FROM BEING  
PULLED OUT

DETAIL B  
SCALE 9/64



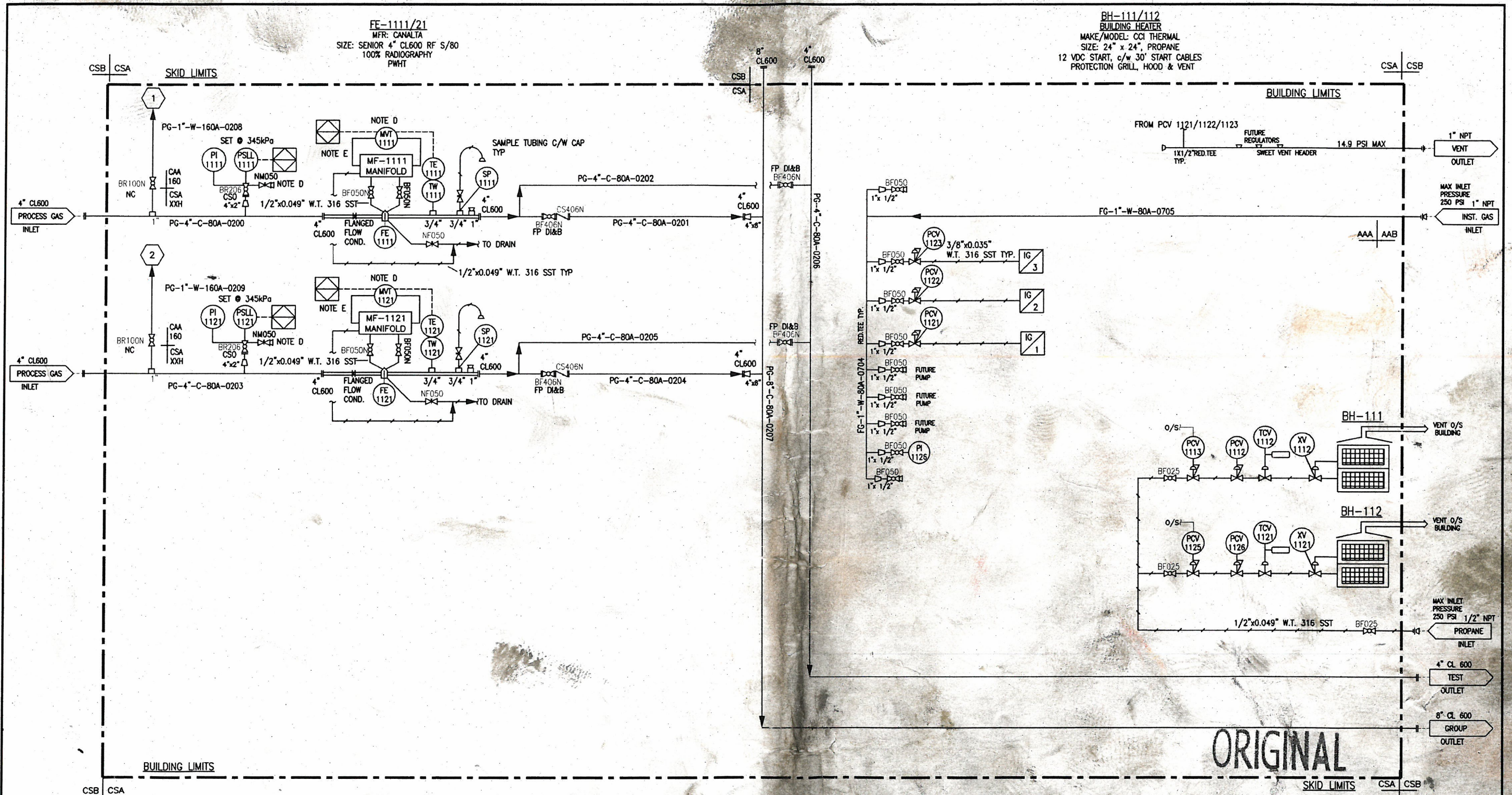
SECTION A-A

**FOR INFORMATION  
ONLY**

10 OCT 23 2019

MARMIT PLASTICS INC.

SHEET	2 of 2	SIZE	A	SCALE	A	DWG. NO.	TOPCIII	GROUND WIRE	REV.	A
-------	--------	------	---	-------	---	----------	---------	-------------	------	---



**ORIGINAL**

NWP UNIT	LSD
10936-001	15-03-61-24 W5M

REV	DATE	BY	CHK	APP	DESCRIPTION
0	SEPT 24/19	CF	D	CF	ISSUED FOR CONSTRUCTION
A	SEPT 16/19	CF			ISSUED FOR APPROVAL

DRAWING REVISIONS

**ISSUED FOR CONSTRUCTION**

SIGNED: *[Signature]*  
 DATE: Oct 21, 2019  
 P.O.: 10936-001  
 S/N: NWP-10936-001



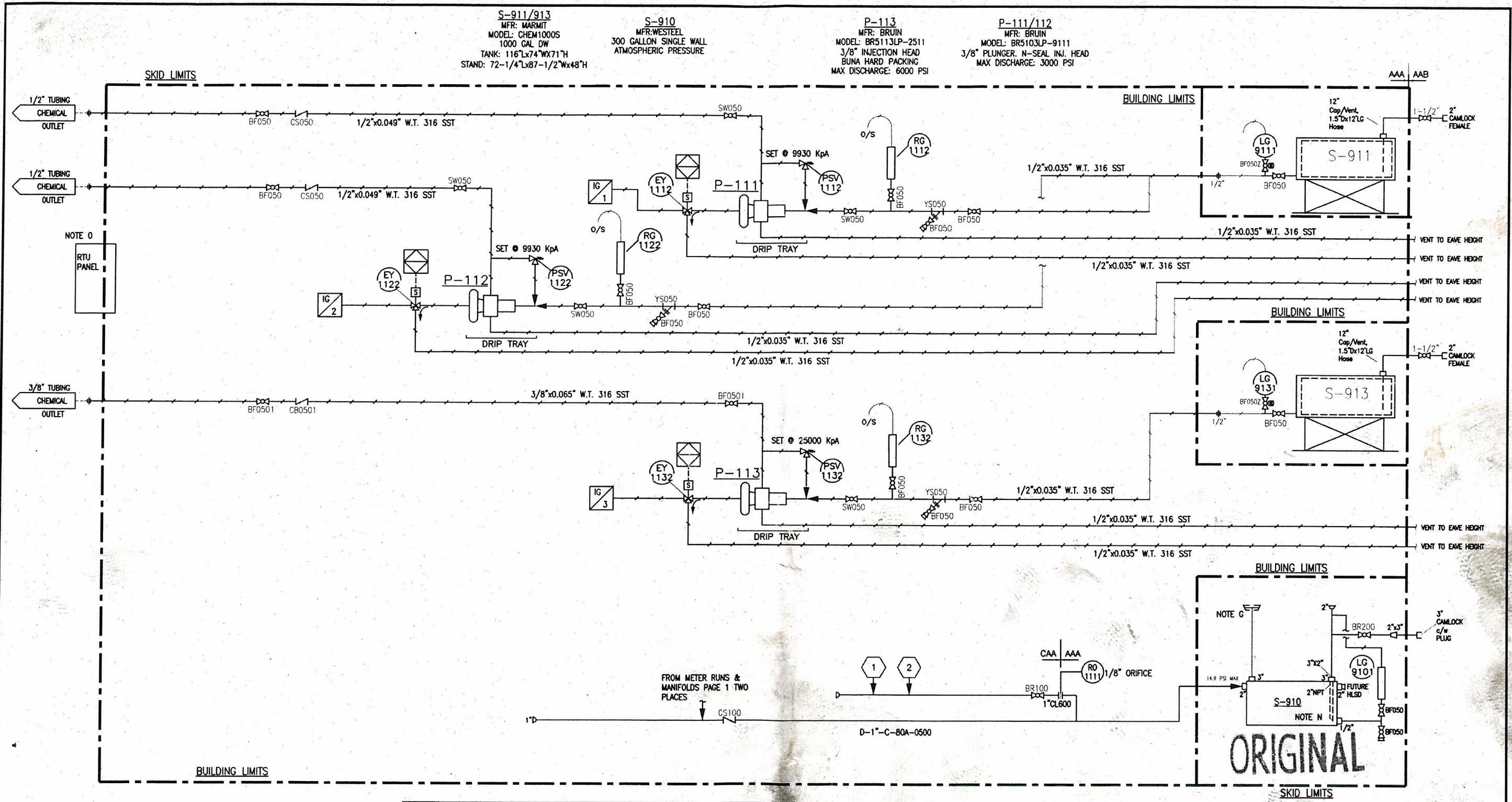
P.O. BOX 6280, INNISFAIL, AB T4G 1S9  
 PH: (403) 227-4100 FAX: (403) 227-4102

SCALE: N.T.S.  
 WEIGHT: (APPROX. LBS.)

ENCANA CORP  
 4" DUAL METER/PUMP PKG. SOUR  
 W/O FUEL GAS SCRUBBER

PIPING AND INSTRUMENTATION DIAGRAM

DWN: CF	CHK: S	APP: CF
DATE: SEPT 16/19	DATE: SEP 25 2019	DATE: SEP 25 2019
SHEET: 1 OF 3	DWG: 10936-001-P-000	REV: 0



REV	DATE	BY	CHK	APP	DESCRIPTION
0	SEPT 24/19	CF			ISSUED FOR CONSTRUCTION
A	SEPT 16/19	CF			ISSUED FOR APPROVAL

DRAWING REVISIONS

**ISSUED FOR CONSTRUCTION**

SIGNED: *[Signature]*

DATE: **Oct 21, 2019**

W.O.: **10936-001**

S/N: **NWP-10936-001**

ALL DIMENSIONS IN INCHES

**NWP INDUSTRIES LP**

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

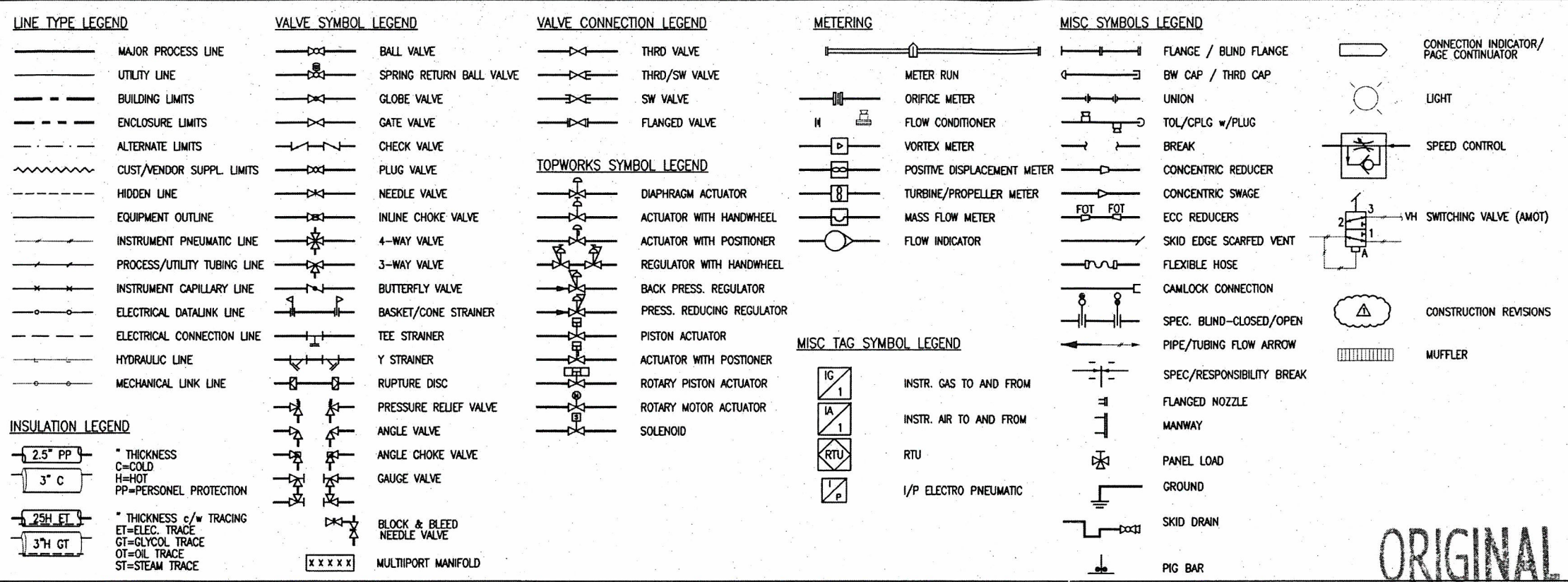
SCALE:

WEIGHT: (APPROX. LBS)

ENCANA CORP  
4" DUAL METER/PUMP PKG. SOUR  
W/O FUEL GAS SCRUBBER

PIPING AND INSTRUMENTATION DIAGRAM

DWN: CF	CHK: <i>[Signature]</i>	APP: <i>[Signature]</i>
DATE: SEPT 16/19	DATE: <b>SEP 25 2019</b>	DATE: <b>SEP 25 2019</b>
SHEET: 2 OF 3	DWG: 10936-001-P-000	REV: 0



**GENERAL NOTES**

- SHOP INSTALL ADDITIONAL PIPE SUPPORTS WHERE REQ'D.
- SHIP LOOSE ITEMS TO BE BOXED AND SEALED PRIOR TO SHIPMENT.
- PLUG AND PROTECT ALL OUTLETS PRIOR TO SHIPMENT.
- ROUTE PIPING TO ENSURE NO LIQUID TRAPS.
- ALL PIPING MATERIAL TO BE STANDARD TEMP U.N.O.
- HYDROTEST PROCESS PIPING TO 1.5 x M.A.W.P.
- ALL PIPING AND PROCESS TUBING LINES TO BE TESTED PER ASME B31.3 NFS
- INSTRUMENT SUPPLY LINES TO BE TESTED PER ABSA AB-522 DIRECTIVE
- SHOP TO ADD UNIONS AS REQUIRED
- SOME FLANGES MAY NOT BE SHOWN ON P&ID

**CUSTOMER NOTES**

- 316SS SEAMLESS TUBING AND 316SS FITTINGS.
- ALL OUTSIDE VENTS TO BE AWAY FROM PERSONNEL
- DELETED
- SWAGelok CALIBRATION FITTINGS AND PLUGS REQUIRED
- 3:1 SLOPE REQUIRED
- PIPE TO EAVE HEIGHT WITH SCARFED TEE C/W BIRD SCREEN RODS. SHOP TO SUPPORT VENT TO BUILDING WALL
- AAA CA 1/16"(1.6MM)
- AAB CA 1/16"(1.6MM)
- CAA CA 1/16"(1.6MM)
- CAB CA 1/16"(1.6MM)
- CSA CA 1/8"(3.2MM)
- CSB CA 1/8"(3.2MM)
- N. 2" PIPE TO BE 2" OFF BOTTOM OF TANK
- SUPPLIED BY CLIENT. INSTALLED BY NWP. WIRED BY CONTRACTOR.

ORIGINAL

REV A

ABBREVIATIONS		
ASSY - ASSEMBLY	HPV - HIGH POINT VENT	MISC. - MISCELLANEOUS
ATM - ATMOSPHERE	HS - HYDRAULIC SUPPLY	PD - POSITIVE DISPLACEMENT
BBL - BARREL	HT - HEAT TRACE	P/I - PNEUMATIC TO CURRENT
BD - BLOWDOWN	IA - INSTRUMENT AIR	P/L - PIPELINE
BTU - BRITISH THERMAL UNITS	ID - INSIDE DIAMETER	PLC - PROGRAMMABLE LOGIC CONTR.
CC - CORROSION COUPON	IG - INSTRUMENT GAS	PO - PUMP OUT
CP - CORROSION PROBE	INJ. PT - INJECTION POINT	RF - RAISED FACE
CSC - CAR SEAL CLOSED	I/P - CURRENT TO PNEUMATIC	RO - RESTRICTION ORIFICE
CSD - CAR SEAL OPEN	I/S - INSIDE	RP - REDUCED PORT
c/w - COMPLETE WITH	L/L - LOW LIQUID LEVEL	RTJ - RING TYPE JOINT
DB&B - DOUBLE BLOCK & BLEED	LPD - LOW POINT DRAIN	RTU - REMOTE TRANSMITTING UNIT
ESD - EMERGENCY SHUTDOWN	LSD - LEGAL SUBMISSION	SP - SAMPLE POINT
ET - ELECTRICAL TRACE	MAMP - MAX. ALLOW. WORK PRES.	s/c - SHOP COAT
FC - FAIL CLOSE	MDMT - MIN. DESIGN METAL TEMP.	SG - SPECIFIC GRAVITY
FFSD - FAIL CLOSE	MCC - MOTOR CONTROL CENTER	SS - STAINLESS STEEL
FO - FAIL OPEN	MISC. - MISCELLANEOUS	S/S - SEAM TO SEAM
FRD - FLOAT RELEASE DEVICE	NC - NORMALLY CLOSED	TK - TANK
FP - FULL PORT	NLL - NORMAL LIQUID LEVEL	T/T - TANGENT TO TANGENT
GO - GEAR OPERATED	NO - NORMALLY OPEN	UNO - UNLESS NOTED OTHERWISE
GT - GLYCOL TRACE	NIS - NOT TO SCALE	VH - VENT HEADER
HC - HOSE CONNECTION	OD - OUTSIDE DIAMETER	ZC - POSITION/LIMIT SWITCH CLOSE
HLL - HIGH LIQUID LEVEL	O/S - OUTSIDE	ZSO - POSITION/LIMIT SWITCH OPEN

INSTRUMENTATION IDENTIFICATION AS PER ANSI/ISA-5.1-2009

LETTER	FIRST LETTERS		SUCCEEDING LETTERS		
	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	MEASURED/INITIATING VARIABLE	VARIABLE MODIFIER	READOUT/PASSIVE FUNCTION	OUTPUT/ACTIVE FUNCTION	FUNCTION MODIFIER
A	ANALYSIS		ALARM		
B	BURNER COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENCE, DIFFERENTIAL			DEVIATION
E	VOLTAGE		SENSOR, PRIMARY ELEMENT		
F	FLOW, FLOW RATE	RATIO			
G	USER'S CHOICE		GLASS, GAUGE, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT		INDICATE		
J	POWER		SCAN		
K	TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE				MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		RUN
S	SPEED, FREQUENCY	SAFETY		SWITCH	STOP
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL, PROBE		
X	UNCLASSIFIED	X-AXIS	ACCESSORY DEVICES, UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE, PRESENCE	Y-AXIS		AUXILIARY DEVICES	
Z	POSITION, DIMENSION	Z-AXIS, SAFETY INSTRUMENTED SYSTEM		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

REV A.1

VALVE TAGGING

XX XXX XX

BALL VALVE (FULL PORT) - BF	025 - 1/4"	G - GAS SERVICE
BALL VALVE (REG. PORT) - BR	038 - 3/8"	H - HIGH PRESSURE
BUTTERFLY VALVE - BU	050 - 1/2"	L - LOW TEMP.
CHECK VALVE (BALL) - CB	075 - 3/4"	N - NACE
CHECK VALVE (PISTON) - CP	100 - 1"	Z - BOM CLARIFIER (1,2,...)
CHECK VALVE (SWING) - CS	200 - 2"	
CHECK VALVE (WAFFER) - CW	201 - 2" 150 ANSI	
GATE VALVE - GA	303 - 3" 300 ANSI	
GLOBE VALVE - GL	406 - 4" 600 ANSI	
STRAINER (BASKET) - SB	609 - 6" 900 ANSI	
STRAINER (Y) - ST	815 - 8" 1500 ANSI	
STRAINER (Y) - SY	1025 - 10" 2500 ANSI	
SWAGELOK - SW		
NEEDLE VALVE (FEMALE x FEMALE) - NF		
NEEDLE VALVE (MALE x FEMALE) - NM		
MANIFOLD - MF		

REV A.1

LINE TAGGING

XX-X"-X-XXXX-XXX

DRAIN - D	150 ANSI - A	0100-0199 EMULSION
EMULSION - E	300 ANSI - B	0200-0299 PROCESS GAS
FUEL GAS - FG	600 ANSI - C	0300-0399 HYDROCARBON
GLYCOL - G	900 ANSI - D	0400-0499 WATER
HYDROCARBON - HC	1500 ANSI - E	0500-0599 DRAIN
INSTRUMENT AIR/GAS - IA/IG	2500 ANSI - F	0600-0699 PROCESS FLUID
PROCESS GAS - PG	3000 THRD/SW - W	0700-0799 FUEL GAS
PRESSURE RELIEF - PR	6000 THRD/SW - X	0800-0899 PRESSURE RELIEF
WATER - W		0900-0999 OTHER
VENT (ATMOS) - V		1000-1099 VENT (NO TESTING)

PIPE SCHEDULE

A - 316 SS TUBING w/ 316 SS FITTINGS  
B - 316 SS TUBING w/ CS FITTINGS  
C - NOT APPLICABLE

REV A

TAG LEGEND

	LOCALLY MOUNTED	PRIMARY LOC. OR PANEL NORMALLY ACCESS. TO OPER.	AUXILIARY LOC. OR PANEL NORMALLY ACCESS. TO OPER.	PRIMARY LOC. OR PANEL MOUNTED ON BACK OF PANEL	AUXILIARY LOC. OR PANEL MOUNTED ON BACK OF PANEL
DISCRETE	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)
SHARED DISPLAY, SHARED CONTROL DISTRIBUTION, CONTROL VIDEO DISPLAY	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)
COMPUTER FUNCTION, SOFTWARE FUNCTION	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)
PROGRAMMABLE LOGIC CONTROL	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)

REV	DATE	BY	CHK	APP	DESCRIPTION
0	SEPT 24/19	CF			ISSUED FOR CONSTRUCTION
A	SEPT 16/19	CF			ISSUED FOR APPROVAL

DRAWING REVISIONS

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*

DATE: Oct 24, 2019

W.O.: 10936-001

S/N: NWP-10936-001

ALL DIMENSIONS IN INCHES

**NWP INDUSTRIES LP**

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

SCALE: N.T.S.

WEIGHT: APPROX. LBS:

ENCANA CORP

4" DUAL METER/PUMP PKG. SOUR W/O FUEL GAS SCRUBBER

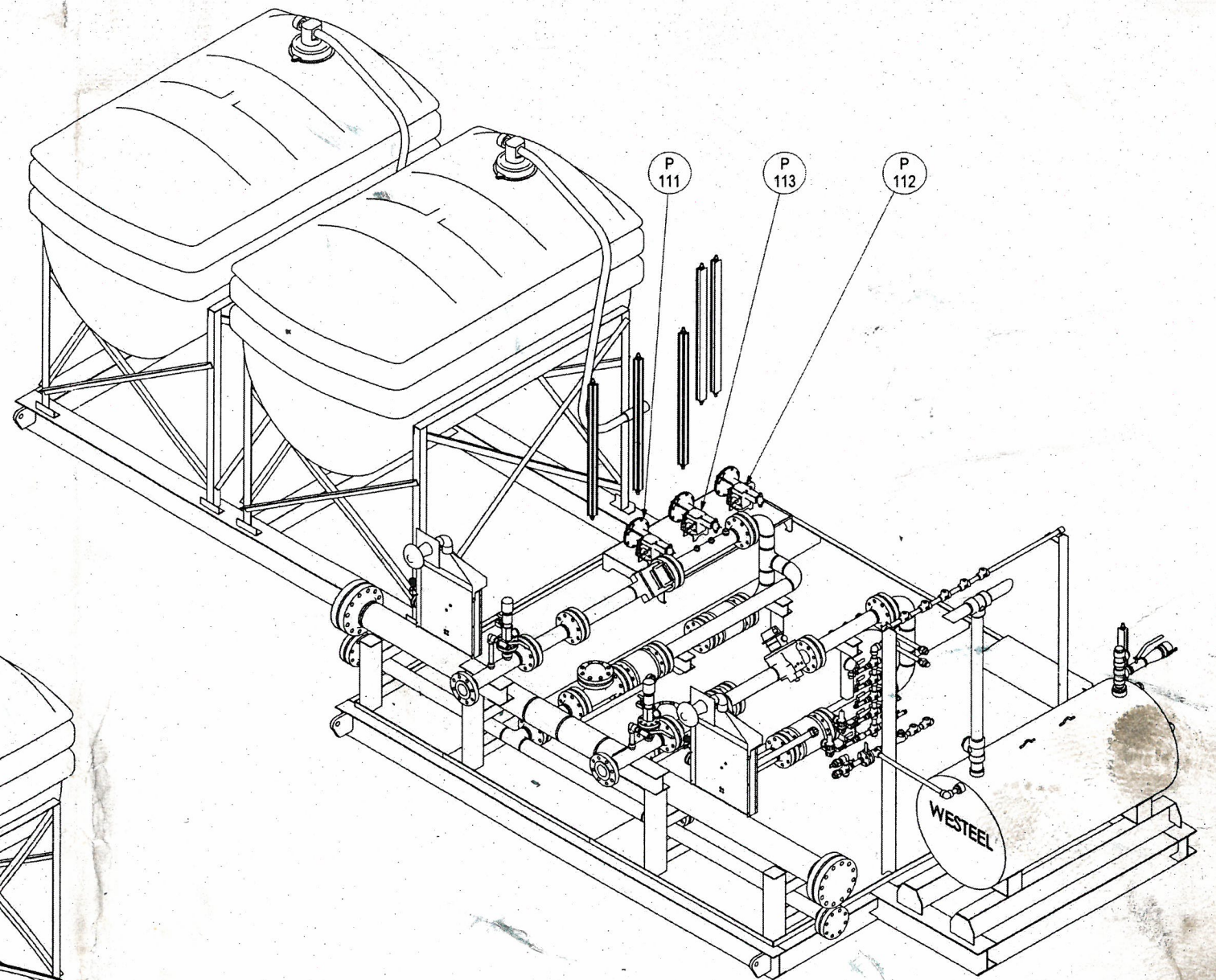
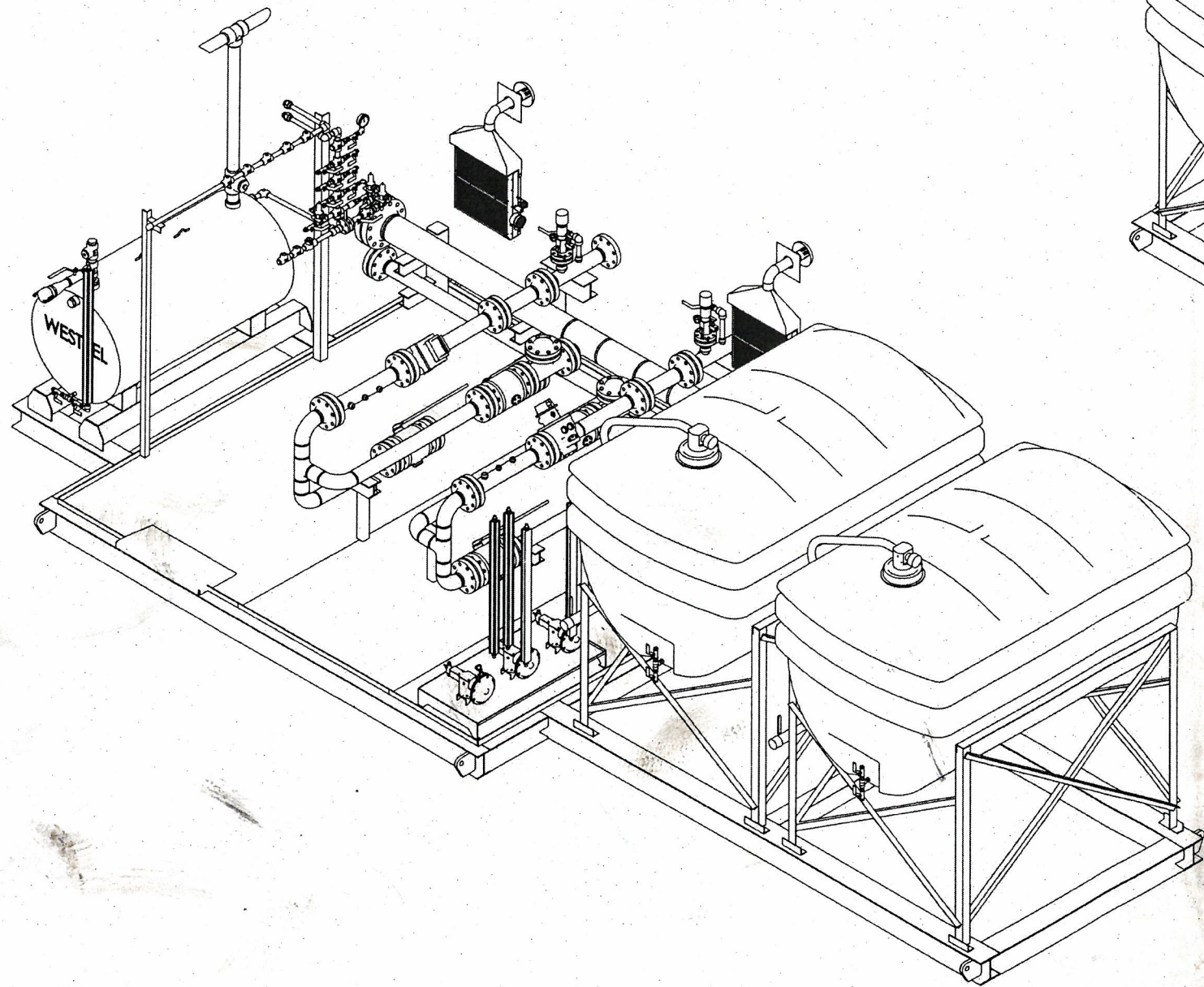
PIPING AND INSTRUMENTATION DIAGRAM

DWN: CF CHK: D APP: CF

DATE: SEPT 16/19 DATE: SEP 25 2019 DATE: SEP 25 2019

SHEET: 3 OF 3 DWG: 10936-001-P-000 REV: 0





**ORIGINAL**

SHIPPING DATA	
APPROX. OVERALL HEIGHT:	131 1/8"
APPROX. OVERALL LENGTH:	410"
APPROX. OVERALL WIDTH:	186 3/4"
APPROX. PACKAGE WEIGHT:	20,500 LBS.
APPROX. EMPTY TANKS WEIGHT:	1,820 LBS.
APPROX. PIPING WEIGHT:	6,400 LBS.

REV.	DATE	BY:	CHK:	APP:	DESCRIPTION
0	SEP 26/19	CSD	D	CF	ISSUED FOR CONSTRUCTION
A	SEP 25/19	CSD	-	-	ISSUED FOR APPROVAL

DRAWING REVISIONS

**ISSUED FOR CONSTRUCTION**

SIGNED: *[Signature]*

DATE: **Oct 21, 2019**

W.O.: **10936-001**

S/N: **NWP-10936-001**

ALL DIMENSIONS IN INCHES

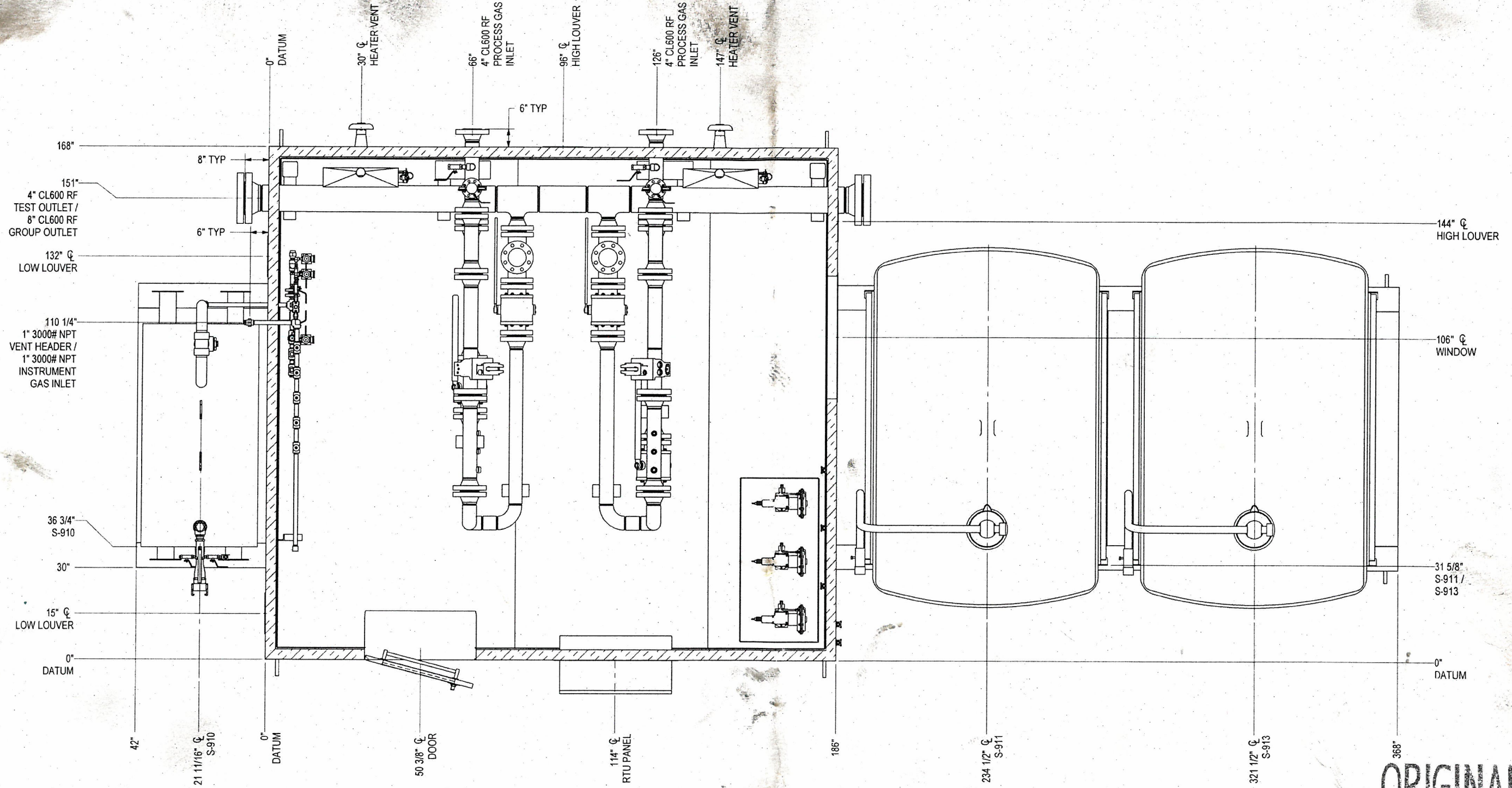
**NWP**  
INDUSTRIES LP

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

PROJECTION:

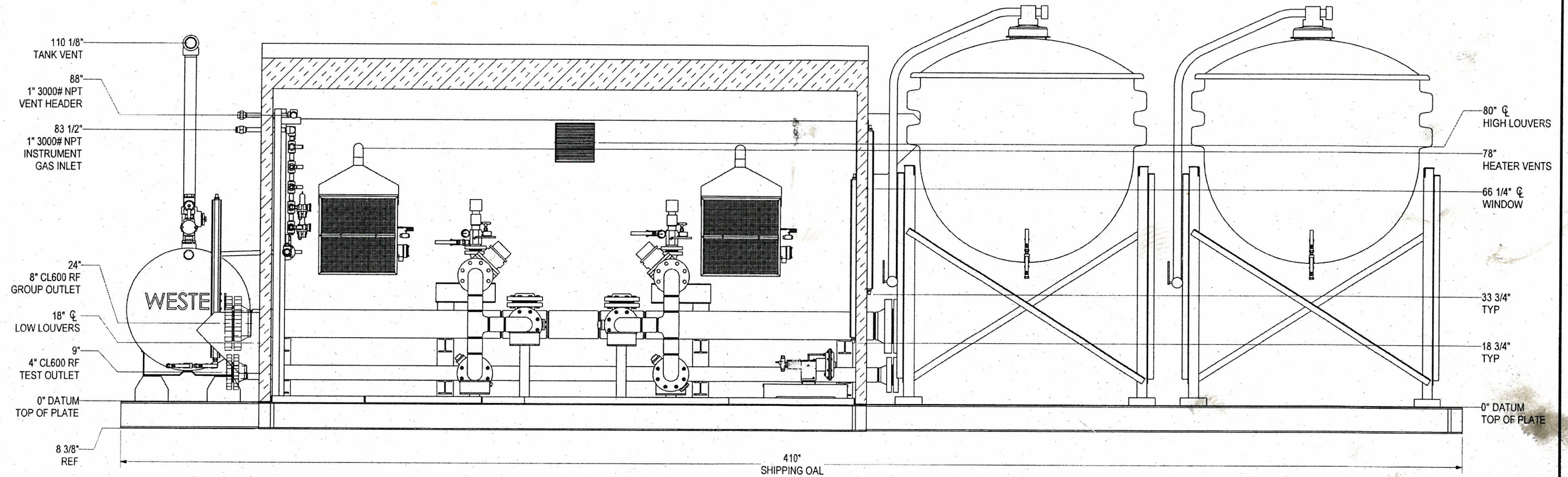
SCALE: AS NOTED

ENCANA CORPORATION 4' DUAL METER/PUMP PACKAGE SOUR W/O FUEL GAS SCRUBBER			
GENERAL ARRANGEMENT - ISOMETRIC VIEWS			
DWN: CSD	CHK: D	APP: CF	REV: 0
DATE: SEP 25/19	DATE: SEP 30 2019	DATE: SEP 30 2019	
SHEET: 1 OF 6	DWG: 10936-001-G-000		



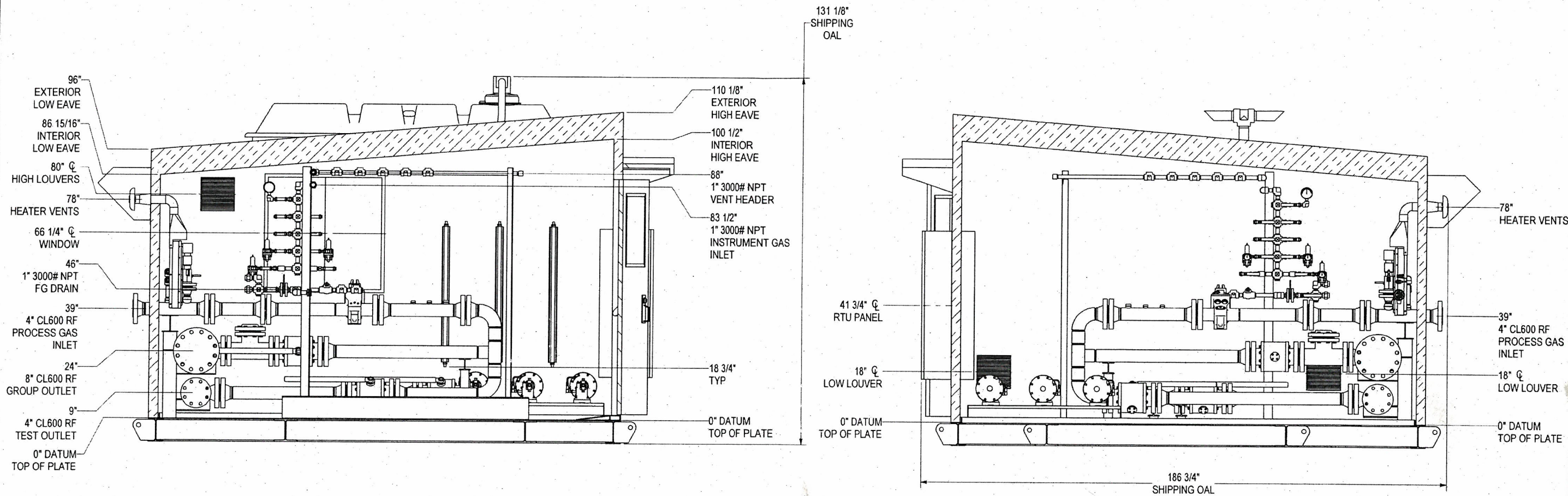
**ORIGINAL**

				<b>ISSUED FOR CONSTRUCTION</b> SIGNED: <i>[Signature]</i> DATE: <b>Oct 21, 2019</b> W.O.: <b>10936-001</b> S/N: <b>NWP-10936-001</b>		 <b>NWP INDUSTRIES LP</b> P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102		ENCANA CORPORATION 4" DUAL METER/PUMP PACKAGE SOUR W/O FUEL GAS SCRUBBER GENERAL ARRANGEMENT - PLAN VIEW			
								DWN: CSD    CHK: <i>[Signature]</i> APP: <i>[Signature]</i> DATE: SEP 25/19    DATE: <b>SEP 30 2019</b> DATE: <b>SEP 30 2019</b>			
DRAWING REVISIONS				ALL DIMENSIONS IN INCHES		PROJECTION:		SCALE: AS NOTED		SHEET: <b>2 OF 6</b> DWG: <b>10936-001-G-000</b> REV: <b>0</b>	
REV.	DATE	BY:	CHK:	APP:	DESCRIPTION						
0	SEP 26/19	CSD	<i>[Signature]</i>	<i>[Signature]</i>	ISSUED FOR CONSTRUCTION						
A	SEP 25/19	CSD	-	-	ISSUED FOR APPROVAL						



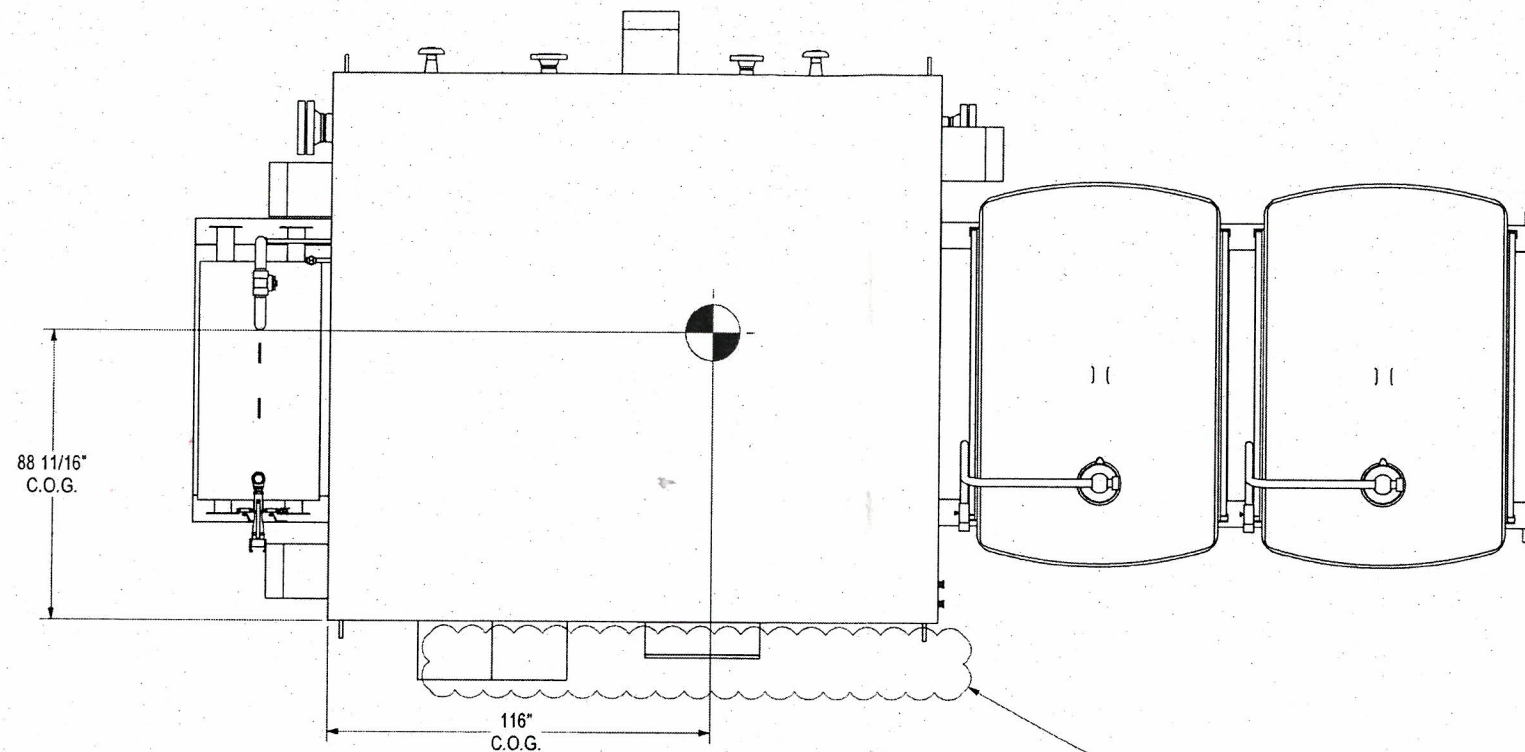
**ORIGINAL**

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					REV.	DATE	BY:	CHK:	APP:	DESCRIPTION																			
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DRAWING REVISIONS						ALL DIMENSIONS IN INCHES		<p>PROJECTION: </p> <p>SCALE: AS NOTED</p>		<p>DWN: CSD    CHK: <i>D</i>    APP: <i>CF</i></p> <p>DATE: SEP 25/19    DATE: <b>SEP 30 2019</b>    DATE: <b>SEP 30 2019</b></p> <p>SHEET: <b>3 OF 6</b>    DWG: <b>10936-001-G-000</b>    REV: <b>0</b></p>																			

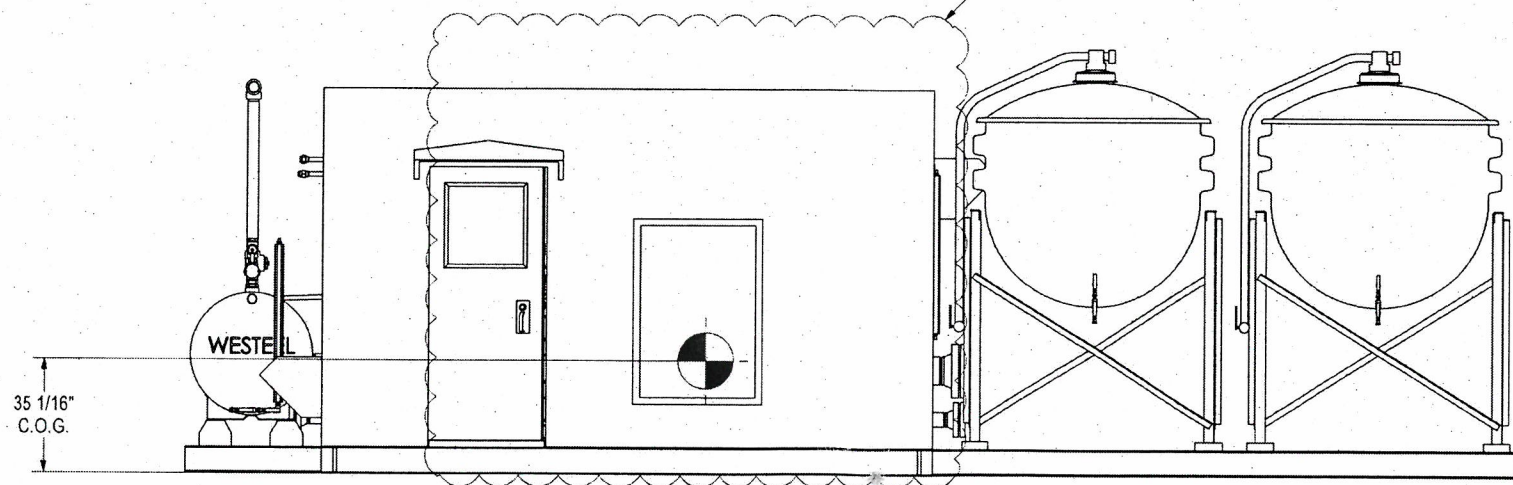


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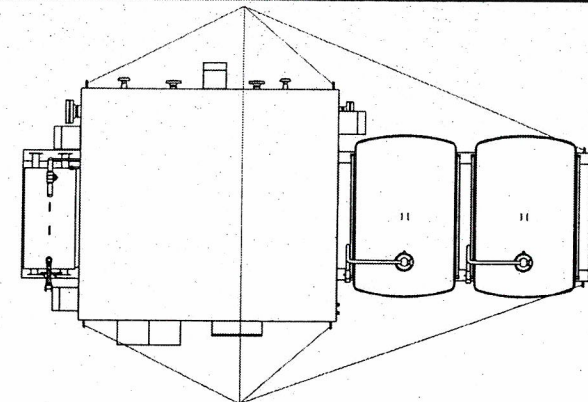


1.5 METER CLEARANCE AROUND RTU  
 NO BUILDING PENETRATION  
 NO BUILDING VENT / LOUVERS  
 NO PROCESS OR TUBING VENTS  
 NO WINDOWS

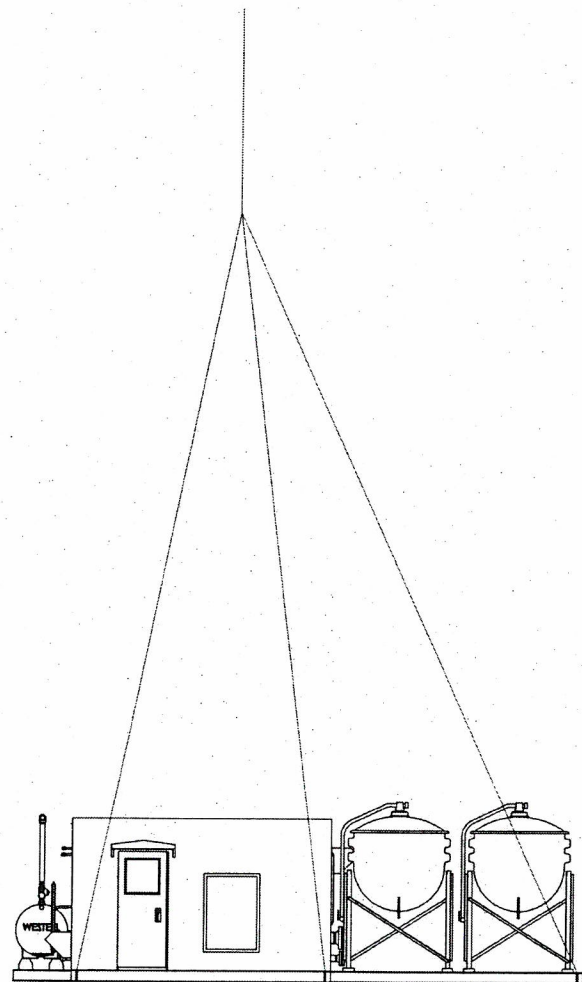


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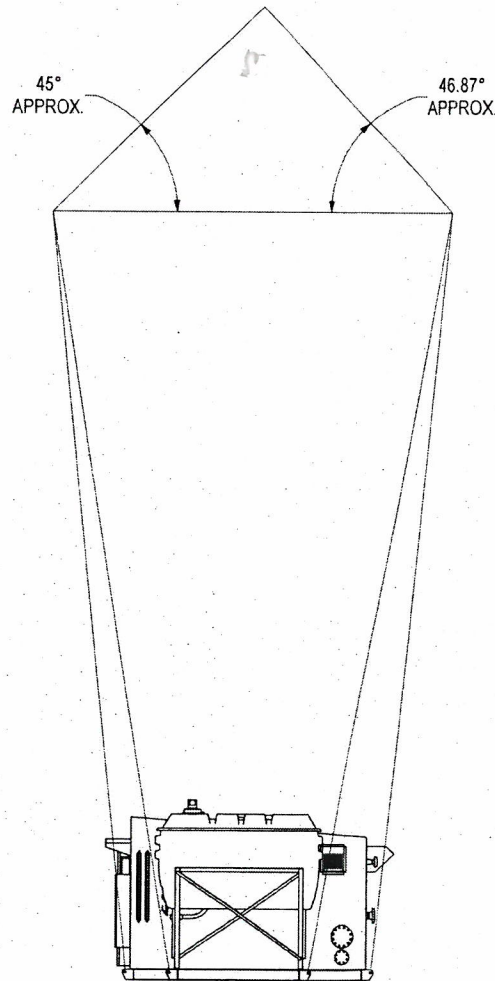
				<b>ISSUED FOR CONSTRUCTION</b> SIGNED: <i>[Signature]</i> DATE: <b>Oct 21, 2019</b> W.O.: <b>10936-001</b> S/N: <b>NWP-10936-001</b>		 <b>NWP INDUSTRIES LP</b> P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102		ENCANA CORPORATION 4" DUAL METER/PUMP PACKAGE SOUR W/O FUEL GAS SCRUBBER PACKAGE CENTER OF GRAVITY																			
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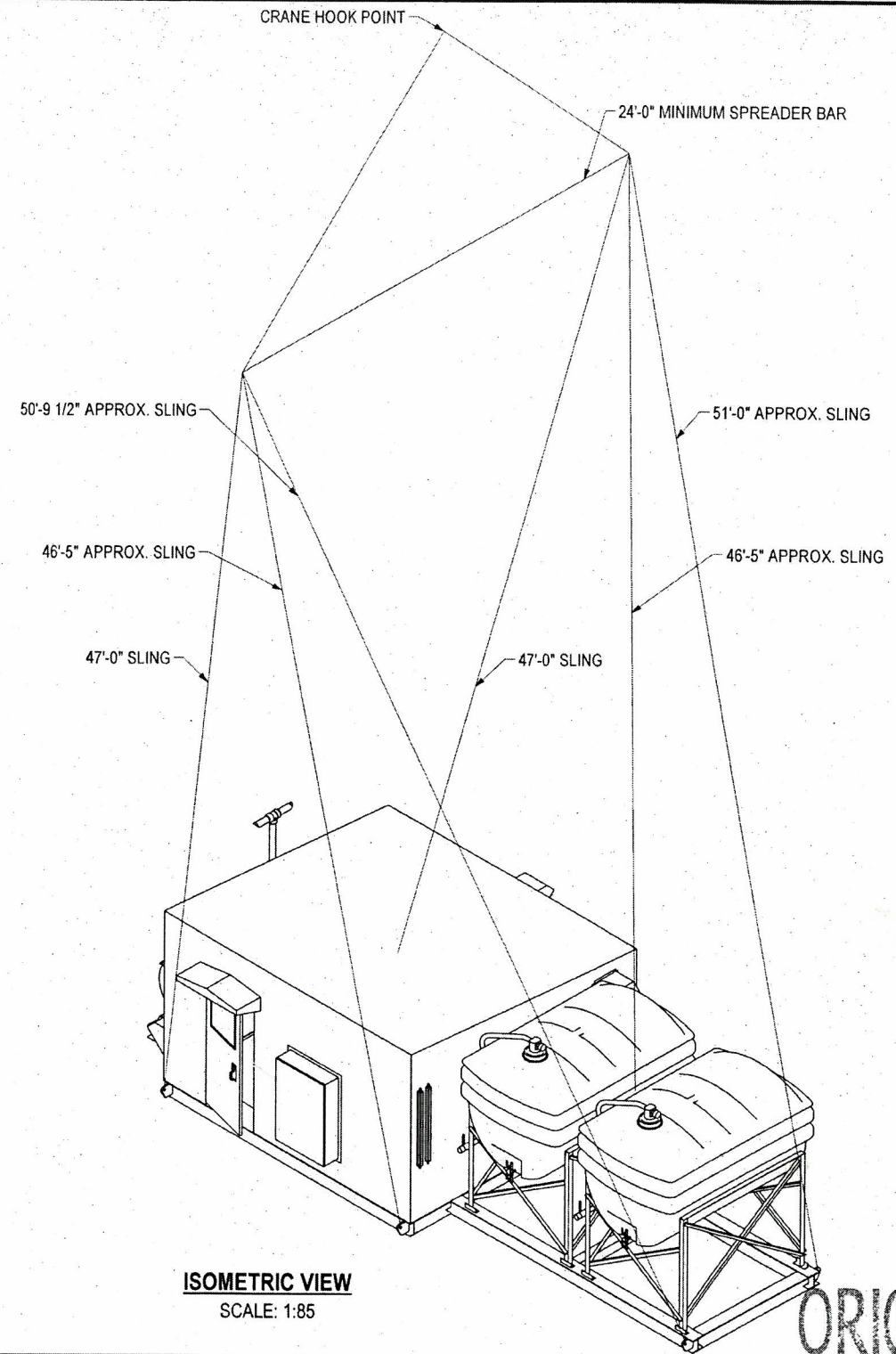
**PLAN VIEW**  
SCALE: 1:130



**FRONT VIEW**  
SCALE: 1:130



**RIGHT VIEW**  
SCALE: 1:130



**ISOMETRIC VIEW**  
SCALE: 1:85

**ORIGINAL**

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DRAWING REVISIONS

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 DATE: **Oct 21, 2019**  
 W.O.: **10936-001**  
 S/N: **NWP-10936-001**  
 ALL DIMENSIONS IN INCHES

**NWP**  
INDUSTRIES LP

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

PROJECTION: SCALE: AS NOTED  
 WEIGHT: (APPROX. LBS.)

ENCANA CORPORATION  
 4" DUAL METER/PUMP PACKAGE SOUR  
 W/O FUEL GAS SCRUBBER

RIGGING LAYOUT

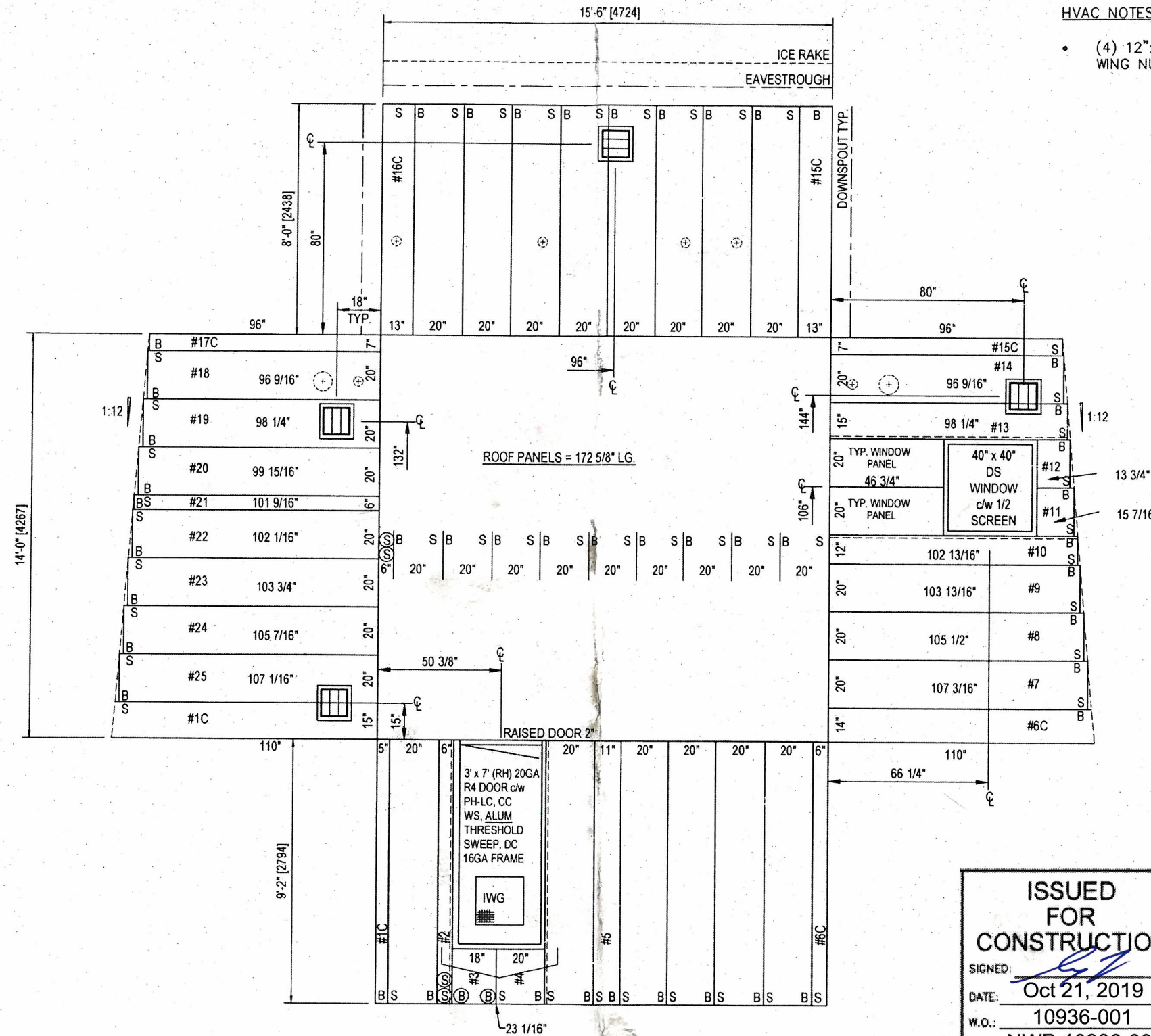
DWN: CSD	CHK: <i>D</i>	APP: <i>CF</i>
DATE: SEP 25/19	DATE: <b>SEP 30 2019</b>	DATE: <b>SEP 30 2019</b>
SHEET: 6 OF 6	DWG: 10936-001-G-000	REV: 0

**BUILDING NOTES:**

1. EXTERIOR WALLS: 22GA TAN (QC8315)
2. EXTERIOR ROOF: 22GA TAN (QC8315)
3. EXTERIOR TRIM: 22GA METRO BROWN (QC8228)
4. MAN DOOR(S) COLOUR: METRO BROWN (QC8228)
5. DOOR CANOPY COLOUR: METRO BROWN (QC8228)
6. ROLL-UP DOOR(S) COLOUR: NA
7. INTERIOR LINER: 24GA WHITE FLUTED ALUM. LINER
8. WALL INSULATION: R12 FIBERGLASS BATT INS.
9. ROOF INSULATION: R36 FIBERGLASS BATT INS.
10. VAPOUR BARRIER: 6 MIL
11. SURFACE AREA: 729 SQ. FT.
12. APPROX. SHIP WEIGHT: 3,075 LBS (BLDG ONLY)
13. REGULAR FASTENERS

**HVAC NOTES:**

- (4) 12"x12" OPERABLE LOVERS c/w SCREEN, MANUAL WING NUT CONTROL AND STORM HOODS



**WALL AND ROOF DESIGN:**  
 - WALL: 3 WP  
 - ROOF: 3RP C/W 26 GA 13" CLIP  
**SCHEDULE OF FASTENERS:**  
 - BASE CHANNEL ANCHORING: (1) #14 x 1 1/2" SCREW OR WELDED WASHER 1 PER PANEL MIN.  
 - WALL PANEL TO BASE CHANNEL: (4) #10 x 3/4" w/ WASHER  
 - WALL PANEL RIB TO BASE CHANNEL & TOP CHANNEL: (1) #8 x 1/2"  
 - WALL PANEL TO TOP CHANNEL: (4) #8 x 1/2"  
 - ROOF PANEL TO DRIP CHANNEL: (4) #10 x 3/4" w/ WASHER  
 - ROOF PANEL TO RIDGE: (4) #10 x 3/4"  
 - DRIP CHANNEL TO TOP CHANNEL: (1) #8 x 1/2" EVERY 12" STAGGERED  
 - ICE RAKES: (1) #14 x 1 1/2" PER PANEL RIB  
**STITCH SCREWS:**  
 - WALL PANELS: (1) #8 x 1/2" EVERY 36"  
 - ROOF PANELS: (1) #10 x 3/4" EVERY 36" TOP & SIDE OF RIB

DOOR LEGEND	
DS = DOUBLE GLAZED	CC = CHECK CHAIN
IWG = INDUSTRIAL WIRE GLASS	WS = WEATHERSTRIPPING
RH = RIGHT HAND SWING	DC = HYDRAULIC CLOSURE
LH = LEFT HAND SWING	SG = INTERIOR SLIDE GATE
PH = PANIC HARDWARE	GA = GAUGE
LC = LOCK CYLINDER	INS = INSULATED
R-12 = CORE INSULATION (R-12)	LS = LOCK SET

**ISSUED FOR CONSTRUCTION**  
 SIGNED: *[Signature]*  
 DATE: Oct 21, 2019  
 W.O.: 10936-001  
 S/N: NWP-10936-001

**SITE LOADS FOR AB P. ENG STAMP:**  
 LSD: 15-03-61-24 W5M NEAR FOX CREEK, AB  
 1/50 SNOW = 2.20 kPa  
 1/50 WIND = 0.39 kPa  
 CEILING COLLATERAL LOAD (MECHANICAL, ELECTRICAL, ETC.) = 0.15 kPa  
 BUILDING IS DESIGNED TO COMPLY WITH THE A.B.C 2014 AS PER THE WIND AND SNOW LOAD SPECIFIED ON THE DRAWING. OWNER SHALL CONTACT WARWICK INDUSTRIES IF ACTUAL BUILDING LOCATION AND REQUIRED DESIGN LOADS DIFFER FROM THOSE SHOWN, IN ORDER TO VALIDATE THE SUITABILITY OF DESIGN FOR THE INTENDED LOCATION.



NO.	DATE	REVISION	DRN	CHK	ENG	APR
A	2019/10/15	FOR APPROVAL	AG	JSG		DC
O	2019/10/17	IFC	AG	JSG	EW	DC

**GENERAL NOTES**

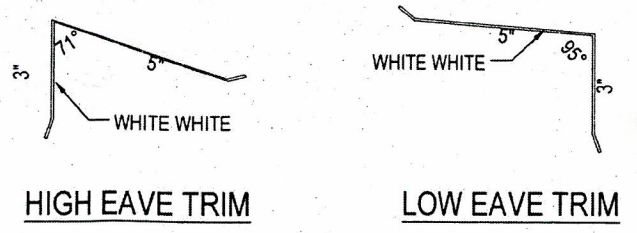
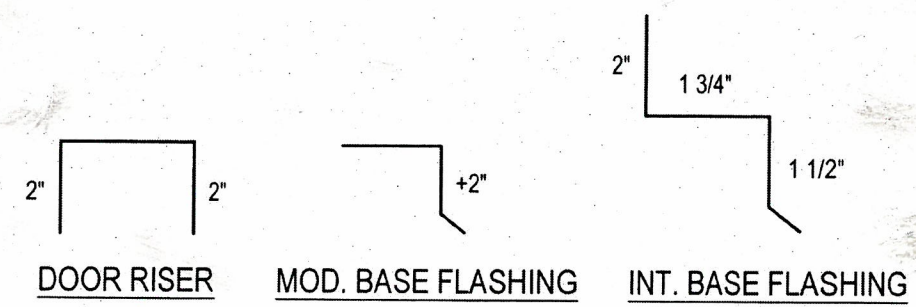
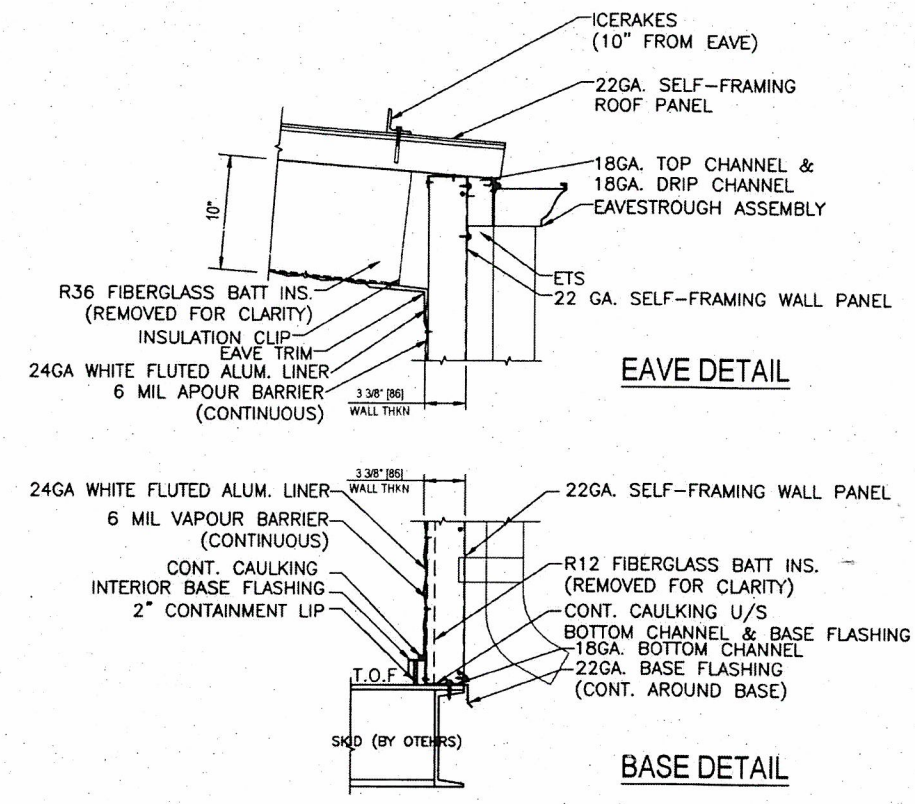
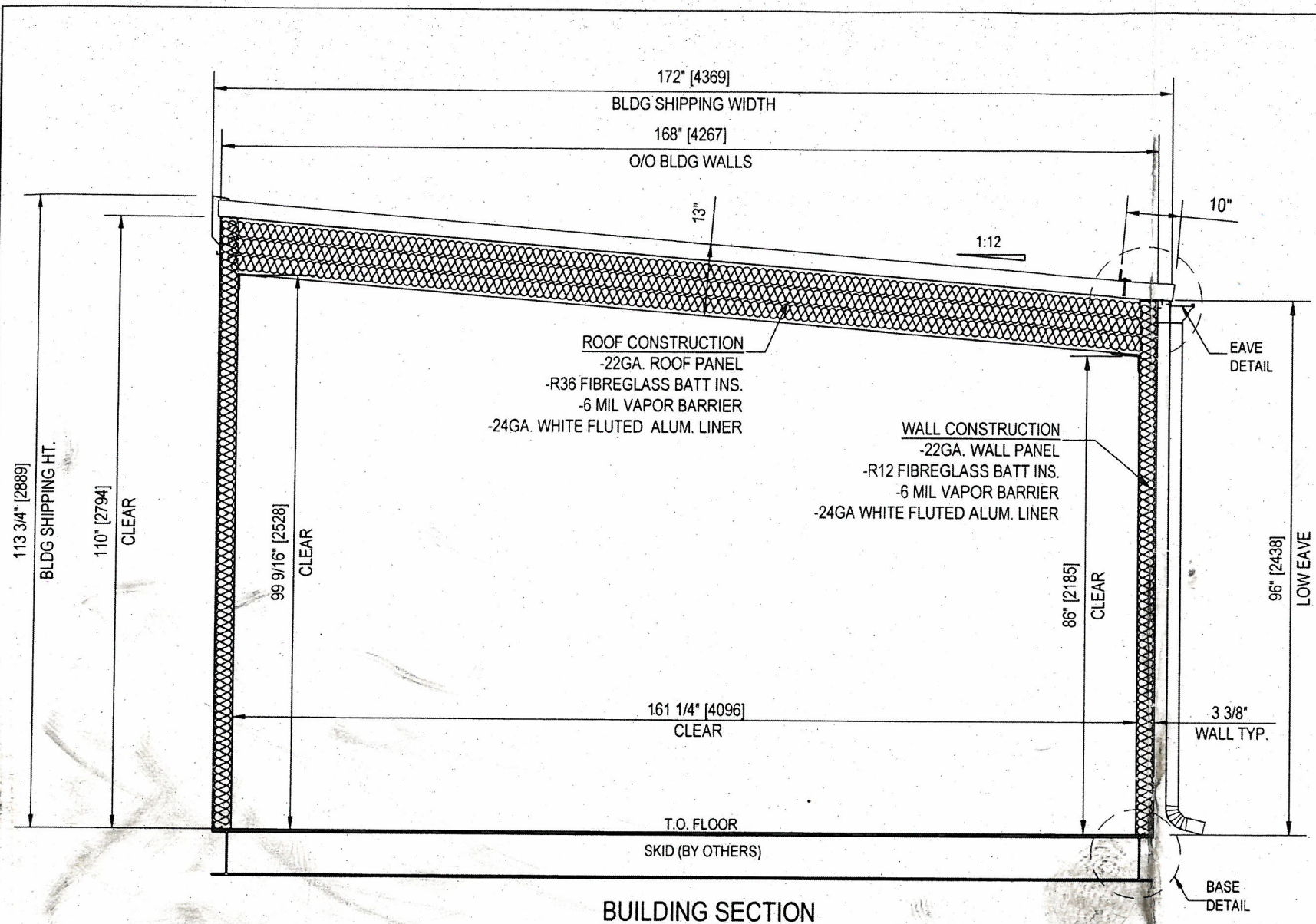
1. ALL WALL PANELS ARE TO BE TYPICAL 6/8 (BIGSMALL) PANELS UNLESS NOTED OTHERWISE
2. ALL DIMENSIONS ARE IN IMPERIAL. FOR SHOP USE, METRIC DIMENSIONS ARE REFERENCE ONLY
3. ALL DIMENSIONS TO WINDOWS AND DOORS ARE TO ROUGH OPENINGS
4. DO NOT SCALE DRAWING
5. CONFIRM LOCATIONS OF ANY FANS AND LOUVERS PRIOR TO INSTALLATION
6. CENTRE BUILDING ON SKID
7. BUILDING INSTALLATION AND ASSEMBLY SHALL BE AS PER PTW STRUCTURAL SOLUTIONS LTD. SELF-FRAME INSTALLATION MANUAL AND DETAILS. WHERE THERE ARE CONFLICTS INFORMATION ON DRAWINGS SHALL BE TAKEN AS CORRECT
8. "POST CONSTRUCTION DRAWINGS" ARE GENERATED FROM CONSTRUCTION CHANGE INFORMATION FORWARDED TO PTW STRUCTURAL SOLUTIONS LTD. BY THE OWNERS FIELD SUPERVISORS AND/OR Hired CONTRACTORS. ANY CHANGES NOT DOCUMENTED WILL NOT APPEAR ON THE DRAWINGS AND THEREFORE THE DRAWING MAY NOT BE AN ACCURATE REPRESENTATION OF THE CONSTRUCTED FACILITY.
9. PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION AND/OR EXCAVATION IT SHALL BE THE RESPONSIBILITY OF THE OWNERS REPRESENTATIVE TO VERIFY THE LOCATION AND STATUS OF ANY PIPING, ELECTRICAL EQUIPMENT OR BUILDINGS
10. ANY REVISIONS MADE TO EXISTING EQUIPMENT, ELECTRICAL OR INSTRUMENTATION ON A FACILITY NOT DESIGNED BY PTW STRUCTURAL SOLUTIONS LTD. IS ONLY SHOWN AS REPRESENTATION OF WHAT EXISTS AND MUST BE VERIFIED BY THE OWNER

PTWENERGY.COM

**PTW**  
STRUCTURAL SOLUTIONS

ENGINEERING RECORD		
	BY	DATE
DRAWN	AG	2019/10/17
CHECKED	JSG	2019/10/17
DESIGNED	EW	2019/10/17
REVIEWED	DC	2019/10/17
QUOTE No.	Quote# 19-53288	
CONTRACT No.	PO# 746378	
PROJECT No.	W40638	

NWP INDUSTRIES	
ENCANA BLDG.	
BLDG. PANEL LAYOUT	
DRAWING NUMBER	REV
W40638-B-01	0



**ISSUED FOR CONSTRUCTION**

SIGNED: *[Signature]*

DATE: Oct 21, 2019

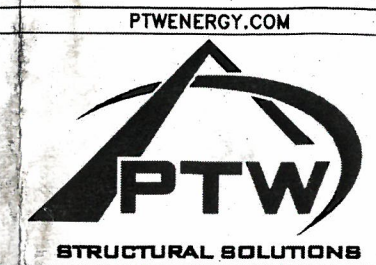
W.O.: 10936-001

S/N: NWP-10936-001

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NWP INDUSTRIES	
ENCANA BLDG.	
BLDG. SECTION & DETAILS	
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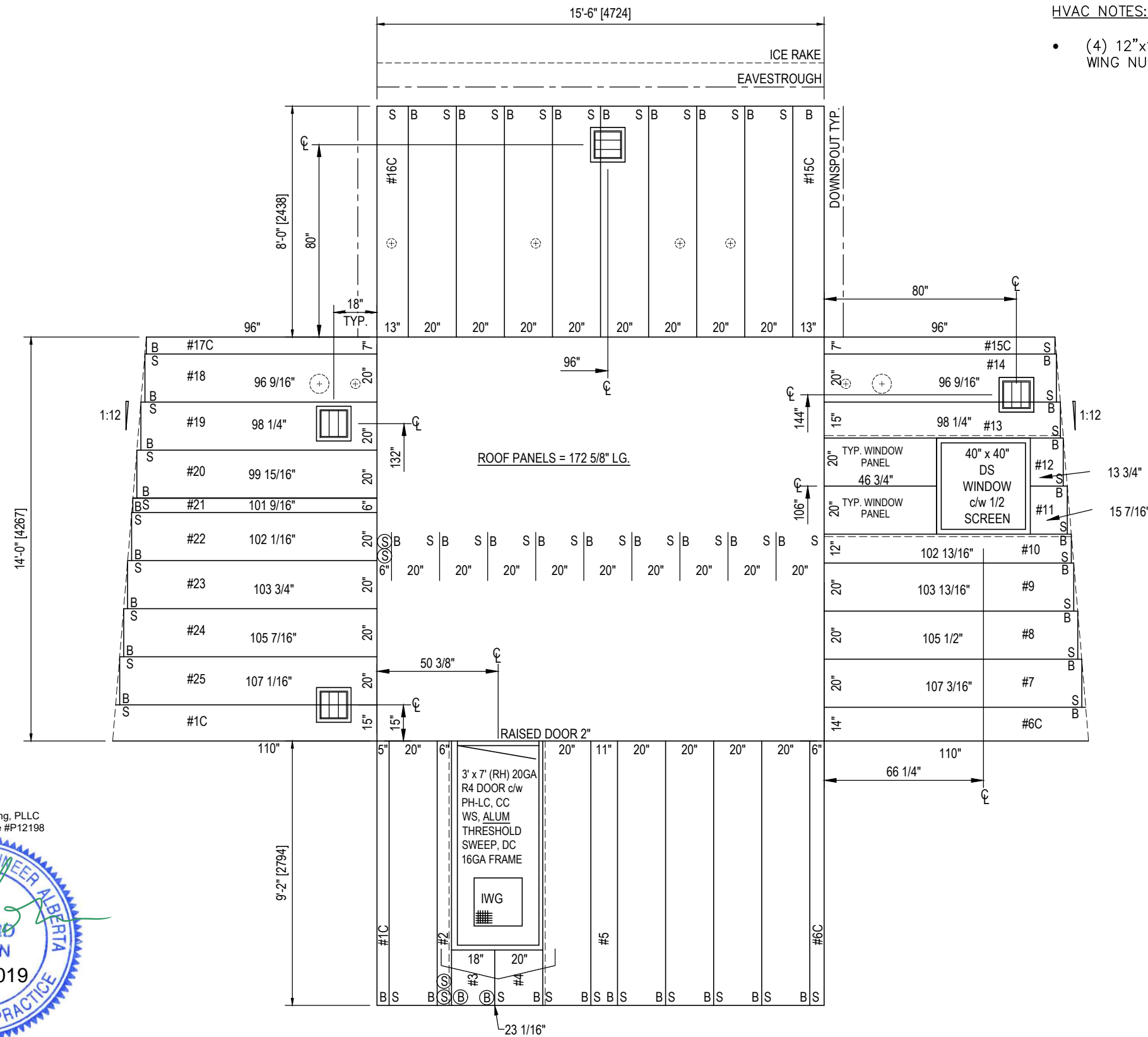


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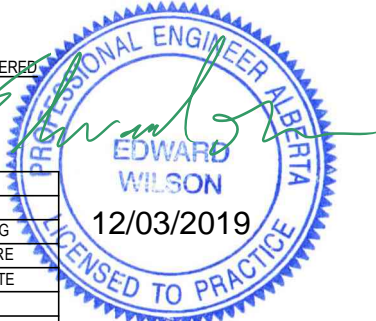
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- (4) 12"x12" OPERABLE LOVERS c/w SCREEN, MANUAL WING NUT CONTROL AND STORM HOODS



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Wilson Engineering, PLLC  
 Permit to Practice #P12198



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  2. ALL DIMENSIONS ARE IN IMPERIAL FOR SHOP USE. METRIC DIMENSIONS ARE REFERENCE ONLY
  3. ALL DIMENSIONS TO WINDOWS AND DOORS ARE TO ROUGH OPENINGS
  4. DO NOT SCALE DRAWING
  5. CONFIRM LOCATIONS OF ANY FANS AND LOUVERS PRIOR TO INSTALLATION
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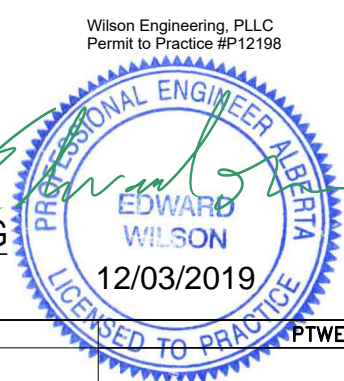
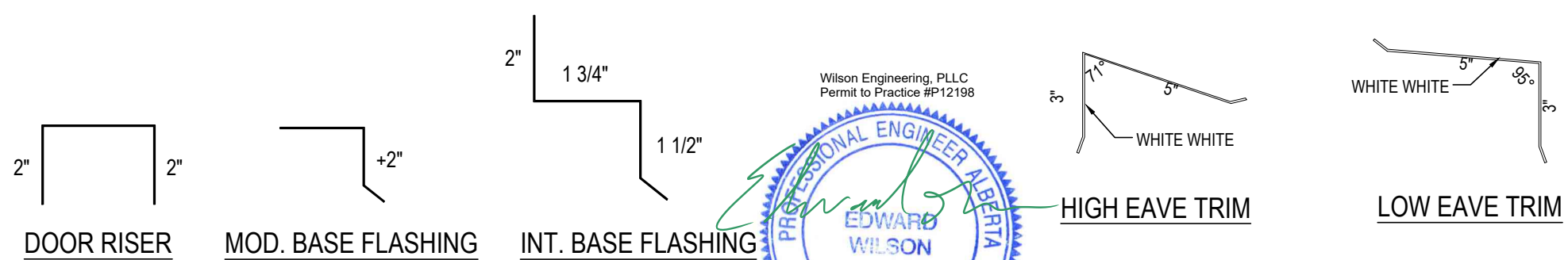
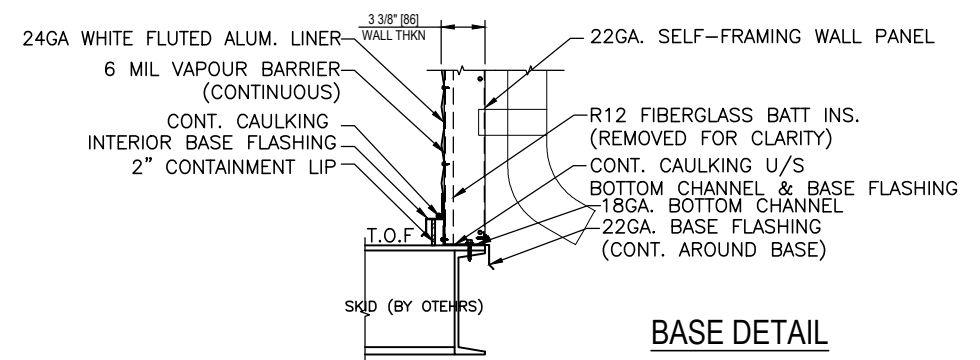
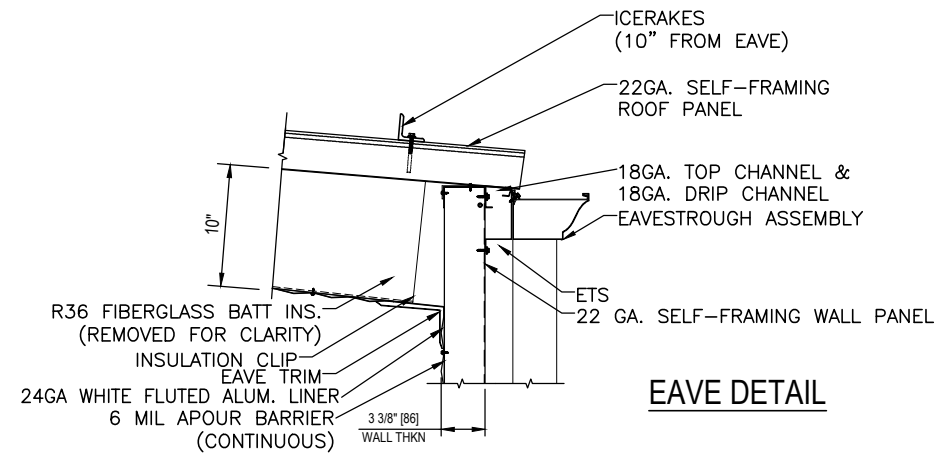
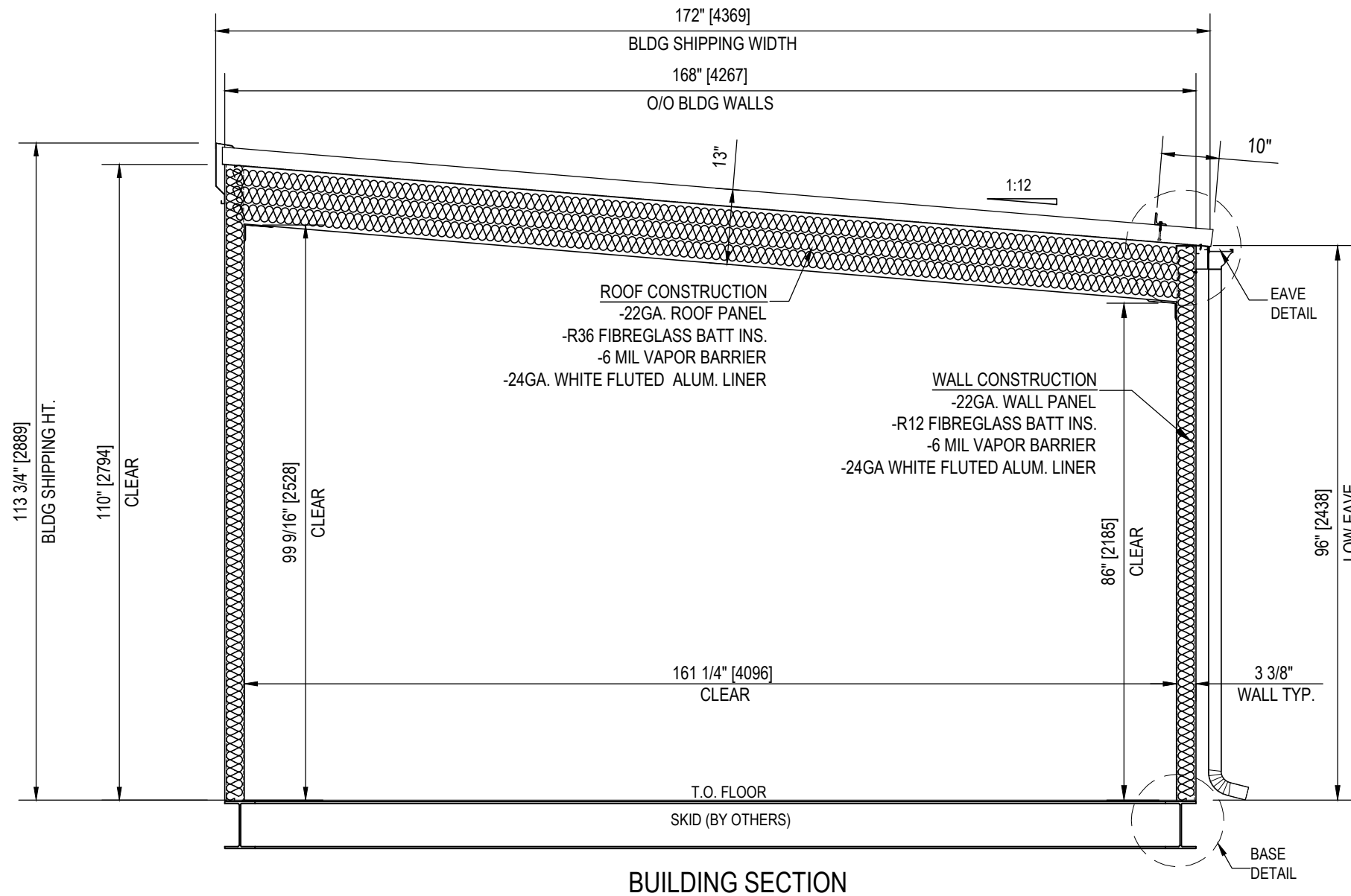
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STRUCTURAL SOLUTIONS

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PROJECT No.	W40638	

**SITE LOADS FOR AB P. ENG STAMP:**  
 LSD: 15-03-61-24 W5M NEAR FOX CREEK, AB  
 1/50 SNOW = 2.20 kPa  
 1/50 WIND = 0.39 kPa  
 CEILING COLLATERAL LOAD (MECHANICAL, ELECTRICAL, ETC.) = 0.15 kPa  
 BUILDING IS DESIGNED TO COMPLY WITH THE A.B.C 2014 AS PER THE WIND AND SNOW LOAD SPECIFIED ON THE DRAWING. OWNER SHALL CONTACT WARWICK INDUSTRIES IF ACTUAL BUILDING LOCATION AND REQUIRED DESIGN LOADS DIFFER FROM THOSE SHOWN, IN ORDER TO VALIDATE THE SUITABILITY OF DESIGN FOR THE INTENDED LOCATION.



NWP INDUSTRIES	
ENCANA BLDG.	
BLDG. PANEL LAYOUT	
DRAWING NUMBER	REV
W40638-B-01	0



NO.	DATE	REVISION	DRN	CHK	ENG	APR
A	2019/10/15	FOR APPROVAL	AG	JSG	EW	DC
O	2019/10/17	IFC	AG	JSG	EW	DC

**GENERAL NOTES**

- ALL WALL PANELS ARE TO BE TYPICAL B/S (BIG/SMALL) PANELS UNLESS NOTED OTHERWISE.
- ALL DIMENSIONS ARE IN IMPERIAL FOR SHOP USE. METRIC DIMENSIONS ARE REFERENCE ONLY
- ALL DIMENSIONS TO WINDOWS AND DOORS ARE TO ROUGH OPENINGS
- DO NOT SCALE DRAWING
- CONFIRM LOCATIONS OF ANY FANS AND LOUVERS PRIOR TO INSTALLATION
- CENTRE BUILDING ON SKID
- BUILDING INSTALLATION AND ASSEMBLY SHALL BE AS PER PTW STRUCTURAL SOLUTIONS LTD. SELF-FRAME INSTALLATION MANUAL AND DETAILS. WHERE THERE ARE CONFLICTS INFORMATION ON DRAWINGS SHALL BE TAKEN AS CORRECT
- "POST CONSTRUCTION DRAWINGS" ARE GENERATED FROM CONSTRUCTION CHANGE INFORMATION FORWARDED TO PTW STRUCTURAL SOLUTIONS LTD. BY THE OWNERS FIELD SUPERVISORS AND OR HIRED CONTRACTORS. ANY CHANGES NOT DOCUMENTED WILL NOT APPEAR ON THE DRAWINGS AND THEREFORE THE DRAWING MAY NOT BE AN ACCURATE REPRESENTATION OF THE CONSTRUCTED FACILITY.
- PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION AND OR EXCAVATION IT SHALL BE THE RESPONSIBILITY OF THE OWNERS REPRESENTATIVE TO VERIFY THE LOCATION AND STATUS OF ANY PIPING, ELECTRICAL, EQUIPMENT OR BUILDINGS
- ANY REVISIONS MADE TO EXISTING EQUIPMENT, ELECTRICAL OR INSTRUMENTATION ON A FACILITY NOT DESIGNED BY PTW STRUCTURAL SOLUTIONS LTD. IS ONLY SHOWN AS REPRESENTATION OF WHAT EXISTS AND MUST BE VERIFIED BY THE OWNER.

PTWENERGY.COM

ENGINEERING RECORD		
	BY	DATE
DRAWN	AG	2019/10/17
CHECKED	JSG	2019/10/17
DESIGNED	EW	2019/10/17
REVIEWED	DC	2019/10/17
QUOTE No.	Quote# 19-53288	
CONTRACT No.	PO# 746378	
PROJECT No.	W40638	

NWP INDUSTRIES	
ENCANA BLDG.	
BLDG. SECTION & DETAILS	
DRAWING NUMBER	REV
W40638-B-02	0



CLIENT:	NWP Industries			
PROJECT:	Encana Building			
JOB NO:	W40638	DESIGN CODE:		
MADE BY:	REVIEWED BY:	DATE:	REV.	SHEET
AG	EW	3-Dec-19	0	

CSA A660 DESIGN AND CONFORMANCE

**PTW Structural Solutions Ltd.  
Self Frame Shed Building Design**

Encana Building  
NWP Industries  
W40638

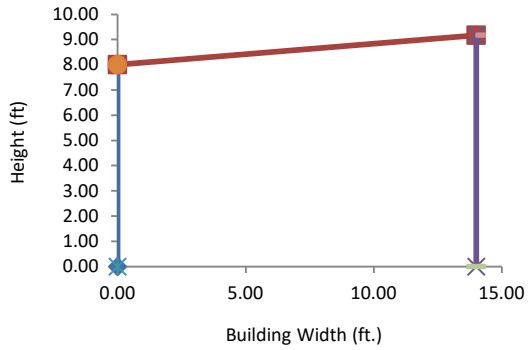


Reference: **Encana Building**  
 Job/Quote No.: **W40638**  
 Client: **NWP Industries**  
 Date: **3-Dec-19**  
 Originated by: **AG**  
 Checked by: **EW**  
 Province: **Alberta**

Site/Location: **Fox Creek**

Importance Category: **Normal**

Input Data:  
 Roof Dead Load: **7.0** psf  
 Building Width: **14** ft.  
 Low Eave Height: **8** ft.  
 Building Length: **17.5** ft.  
 Roof Slope: **1 :12**



Exposure Condition (O/R): **Open terrain**  
 Building Category: **1**

Bldg Site Class: **D**

Wall Panels: **No Reinf (R12)**

Type of Structure: **Other cold-formed SFRS**

Roof Panels: **3RP-13 (R36)**

**REPORT SUMMARY**

**Roof Panels Bending**       $\Phi M_n = 4.116$  ft-k       $M_u = 2.742$  ft-k      Ratio **0.67**  
OK

**Wall Panels Axial Compression & Bending**  
 $\Phi P_n = 14.94$  Kips       $P_u = 0.469$  Kips  
 $\Phi M_n = 1.322$  ft-k       $M_u = 0.323$  ft-k      Ratio **0.25**  
OK

**Deflections:**

	<b>Walls</b>		<b>Roof</b>
Service Load Deflection:	0.049 in.	Service Load Deflection:	0.167 in.
Allow. Deflection h/180:	0.533 in.	Allow. Deflection L/240:	0.700 in.
Deflection Ratio h/Δ:	2261.4 <span style="color: red;">OK</span>	Deflection Ratio L/Δ:	1008.0 <span style="color: red;">OK</span>

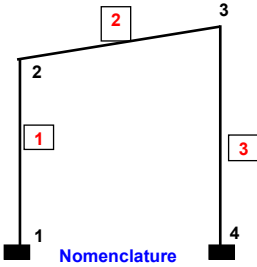
**Fastener Schedule:**

Schedule of Fasteners

	Fastener	Spacing	Screw/Panel
Base Channel Anchoring:	#14 x 1-1/2	20 in.	1
Wall Panel to Base Channel:	#8x1/2"		4
Roof Panel to drip Channel:	#10x3/4"		4
Drip Channel to Top channel:	#8x1/2"	12in	
Stitch Screws			
Wall Panels:	#8x1/2"	36in	
Roof Panels:	#10x3/4"	36in	

Reference: **Encana Building**  
 Job No.: **W40638**  
 Client: **NWP Industries**

Date: **3-Dec-19**  
 Originated by: **AG**  
 Checked by: **EW**



**Nomenclature**

**Seismic Design Parameters**

**Equivalent Static Force Procedure 4.1.8.11**

Sa(0.2): **0.135**  
 Sa(0.5): **0.089**  
 Sa(1.0): **0.051**  
 Sa(2.0): **0.025**

Occupancy Importance Factor Ie: **1.00**

**Seismic:**

Force Modification Factor Rd: **1.00**  
 Force Modification Factor Ro: **1.00**  
 Higher Mode Factor Mv: **1.00**  
 Base overturning Reduction J: **1.00**

Site Soil Classification: **D**

Type of Structure:  
 4.1.8.11(3) Building Period Ta: **0.122 sec**  
 S(T): **0.135 sec.**

Building reference Ht: **8.29 ft**

**Snow Loads**

Ground Snow Load 1/50: **2.2 Kpa**  
 Associated rain Load 1/50: **0.1 Kpa**

Importance Factor Is: **1.00**  
 Wind Exposure Factor Cw: **1.00**

**Roof configuration:**

Slippery roof (y/n): **y**

Shape Factor Ca: **1.0**

Slope factor Cs: **1.0**

Basic roof snow load factor Cb: **0.8**

Characteristic Length lc: **16.80 ft**

Roof Slope  $\alpha$ : **4.76 degrees**

Snow Load S: **1.860 Kpa**

**Wind Load**

Wind Load 1/50: **0.39 Kpa**

Wind Load 1/10: **0.30 Kpa**

Importance factor Iw: **1.00**

One Day rain, 1/50: **80 mm**

Exposure Factor Ce: **0.90**

End Zone Z: **1.4 ft**

End Zone Y: **19.69 ft**

Member	E (Ksi)	A(in <sup>2</sup> )	I (in <sup>4</sup> )	L (ft.)	$\lambda_x$	$\lambda_y$
1	29000	0.82379	1.103	8.00	0.000	1.000
2	29000	1.1191	13.692	7.02	0.997	0.083
3	29000	0.82379	1.103	9.17	0.000	-1.000

Joint	x (ft)	y(ft)
1	0.00	0.00
2	0.00	8.00
	7.00	8.58
3	14.00	9.17
4	14.00	0.00

**Design Loads:**

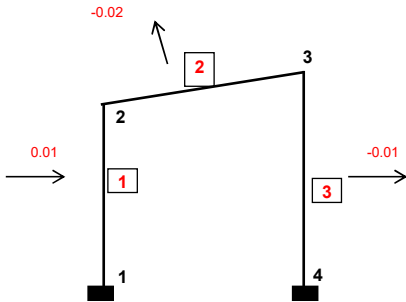
**Wind Factored Loads (1.4)**

Member #1: **0.012 Kip/ft**  
 Member #2: **-0.021 Kip/ft**  
 Member #3: **-0.008 Kip/ft**

**Snow Loads (1.5)**

Factored Snow Load: **0.058 Kip/ft**  
 Factored Total Load: **0.067 Kip/ft**

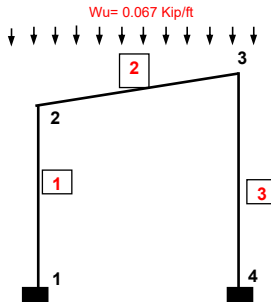
Factored reaction at Panel: **0.469 Kip/ft**



**Nomenclature**

**C. Support Reactions (1.4WL)**

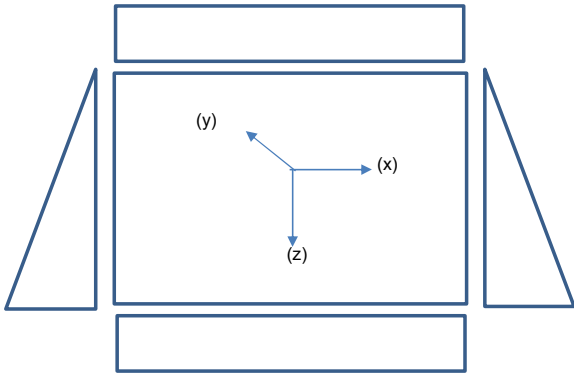
Joint No.	Rx (K/pnl)	Ry (K/pnl)
1	<b>0.033</b>	<b>-0.060</b>
4	<b>0.054</b>	<b>0.060</b>



**Nomenclature**

**C. Support Reactions (1.25DL+1.5Snow)**

Joint No.	Ry (K/ft)
1	<b>0.469</b>
4	<b>0.469</b>



**End Wall Base Reactions:**

Dead (y)	35 lb/ft	0.51 kN/m
Snow (y)	65 lb/ft	0.95 kN/m
Wind (x)	95 lb/ft	1.39 kN/m
Wind (z)	80 lb/ft	1.17 kN/m
Wind (y)	40 lb/ft	0.58 kN/m
Seismic (x)	25 lb/ft	0.36 kN/m
Seismic (z)	25 lb/ft	0.36 kN/m
Seismic (y)	15 lb/ft	0.22 kN/m

**Side Wall Base Reactions:**

Dead (y)	80 lb/ft	1.17 kN/m
Snow (y)	270 lb/ft	3.94 kN/m
Wind (x)	40 lb/ft	0.58 kN/m
Wind (z)	75 lb/ft	1.09 kN/m
Wind (y)	105 lb/ft	1.53 kN/m
Seismic (x)	20 lb/ft	0.29 kN/m
Seismic (z)	20 lb/ft	0.29 kN/m
Seismic (y)	5 lb/ft	0.07 kN/m

**Seismic Base Shear**

4.1.8.11(2)  $V=S(T_a)*M_v*IE*W/(R_d*Ro)$       0.765366 kips      765.3664 lbs

W= 5.669381 kips

Roof area	245 ft <sup>2</sup>
End wall area	128.33 ft <sup>2</sup>
Side wall area	160.4167 ft <sup>2</sup>
25% snow load	2379.381 lbs

**Unfactored Wind Base Shear**

2.293169 kips	End zone area	160.4167 ft <sup>2</sup>	<b>Windward Side</b>	<b>Leeward Side</b>
	Interior zone area	0 ft <sup>2</sup>	1.3523818 kips	0.940787 kips
<b>Wind Governs</b>	Wind on end wall	1.345326 kips		

**Diaphragm and chord force calculations**

Building plan dimensions =	14 ft	X	17.5 ft
Factored wind load at eave line	86.937 lb/ft		54.095272 lb/ft      32.84203 lb/ft
Moment at roof diaphragm	3.328069 k-ft		
Chord force at sidewalls	0.237719 kips	13.58395 lb/ft	
Max shear in diaphragm	54.33581 lb/ft		
Shear in plane of side walls	19.21894 lb/ft		

**Wind loads parallel to wall panel**

Load at end wall panels	90.74081 lbs
shear between panels	54.33581 lbs/ft

**Certificate of Design and Manufacturing Conformance with NBC, 2015**

*This Certificate is to affirm that all components of the steel building system described below, to be supplied by the named Manufacturer certified in accordance with CSA A660, have been or will be designed and fabricated in accordance with the following Standards to carry the loads and load combinations specified.*

**1. DESCRIPTION**

Manufacturer's Name and Address	PTW Structural Solutions Ltd.,285188 Frontier Rd,Rocky View County,AB,T1X0V9
Manufacturer's Certificate No. under CSA A660	WARW10
Customer Order Number	W40638
Building Type and Size	Gable, 14 ft x 18 ft x 9.17 ft
Intended Use and Occupancy	Encana Building
Importance Category (NBC, Sentence 4.1.2.1.(3))	Normal
Site Location	Fox Creek, Alberta
Applicable Building Code	Alberta Building Code 2019
Builder's Name and Address	PTW Structural Solutions Ltd.,285188 Frontier Rd,Rocky View County,AB,T1X0V9
Owner's Name and Address	

**2. DESIGN STANDARDS**

**Engineer's Initials\***

National Building Code of Canada, 2015 Part 4; Structural Design	EW
CAN / CSA-S16-14, Limit States Design of Steel Structures	
CAN / CSA-S136-16, North American Specification for the Design of Cold-Formed Steel Structural Members	
Other Alberta Building Code 2019	

**3. MANUFACTURING STANDARDS**

EW

- (a) Fabrication has been or will be in accordance with CAN / CSA-S16 and CAN / CSA-S136, as applicable.
- (b) Welding has been or will be performed in accordance with CSA W59 and CAN / CSA-S136, as applicable.
- (c) The Manufacturer has been certified in accordance with CSA W47.1, for Division 1 or 2, and /or CSA W55.3, if applicable
- (d) Welders have been qualified in accordance with CSA W47.1.

**4. PURLIN STABILITY**

n/a

Purlin braces are provided in accordance with CAN / CSA-S136, Clause D3 and Appendix B, Clause D3.2.3. In particular, for a standing seam roof supported on movable clips, braces providing lateral support to both top and bottom purlin flange have been or will be provided. The number of rows is determined by analysis but in no case is less than 1 for spans up to 7 m inclusive or less than 2 for

**5. LOADS**

EW

**(a) Snow and Rain**

1-in-50 year ground snow	2.2 (kPa)
1-in-50 year associated rain	0.1 (kPa)
Wind exposure factor, Cw,	1.00
Importance factor, Is,	1.00
Roof snow load, S,	1.86 (kPa)
Drift load considered (NBC Sub-section 4.1.6.2.8) refer to drawing of specific building	
Specific rain load (NBC,	80 (mm)

(Continued)



\*Initial each true statement. Mark N/A if

Engineer's Initials\*

**(b) Full and Partial Snow**

n/a

- (i) Applied on any one and any two adjacent spans of continuous purlins.
- (ii) Applied on any one and any two adjacent spans of modular rigid frames with continuous roof beams.
- (iii) Applied as described for the building geometry in NBC, Part 4, and in the User's Guide NBC 2005 Structural Commentaries 9Part 4), Commentary G: Snow Loads –

**(c) Wind Load**

EW

1-in-50 year reference velocity 0.39 (kPa)  
 Importance factor, Iw 1.00

**(d) Wind Load Application**

EW

- (i) Applied as per NBC, Part 4, Sub-section 4.1.7
- (ii) Pressure coefficients as per User's Guide – NBC 2015 Structural Commentaries (Part 4), Commentary I; Wind Loads, Figures 13 through I12
- (iii) Building internal pressure 1.0 per User's Guide – NBC 2010 Structural Commentaries (Part 4), Commentary I; Wind Loads

**(e) Crane Loads (where**

n/a

Type \_\_\_\_\_ (top running)(under-running)(jib)  
 Capacity \_\_\_\_\_ (tonnes)  
 Wheel base \_\_\_\_\_ (m)  
 Maximum static, vertical wheel load \_\_\_\_\_ (kN)  
 Vertical impact factor \_\_\_\_\_ %  
 Lateral factor \_\_\_\_\_ % Lateral wheel load \_\_\_\_\_ (kN)  
 Longitudinal factor \_\_\_\_\_ % Maximum longitudinal load \_\_\_\_\_ (kN/side)

**(f) Mezzanine Level Load** \_\_\_\_\_ (kPa)

n/a

**(g) Seismic Load :**

EW

Applied as per NBC, Part 4, Sub-section  
 S<sub>a</sub>(0.2) 0.135 S<sub>a</sub>(0.5) 0.089 S<sub>a</sub>(1.0) 0.051 S<sub>a</sub>(2.0) 0.025  
 F<sub>a</sub> \_\_\_\_\_ F<sub>v</sub> \_\_\_\_\_ I<sub>E</sub> \_\_\_\_\_ 1.00

**(h) Other Live Loads**

n/a

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

(Continued)

*\*Initial each true statement. Mark N/A if*

**Engineer's Initials\***

**(i) Dead Loads**

EW

Dead load of building components is incorporated in the design

Collateral load (mechanical, electrical, ceiling, sprinklers, 0.15 (kPa)

Mezzanine n/a (kPa)

Other (specify) n/a ( )

**(j) Load Combinations**

EW

Applied in accordance with NBC, Part 4, Section 4.1

**6. GENERAL REVIEW DURING**

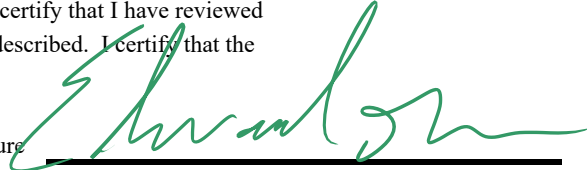
The Manufacturer does not provide general review during construction for regulatory purposes.

*\*Initials each true statement. Mark N/A if statement does not apply.*

**7. CERTIFICATION BY ENGINEER**

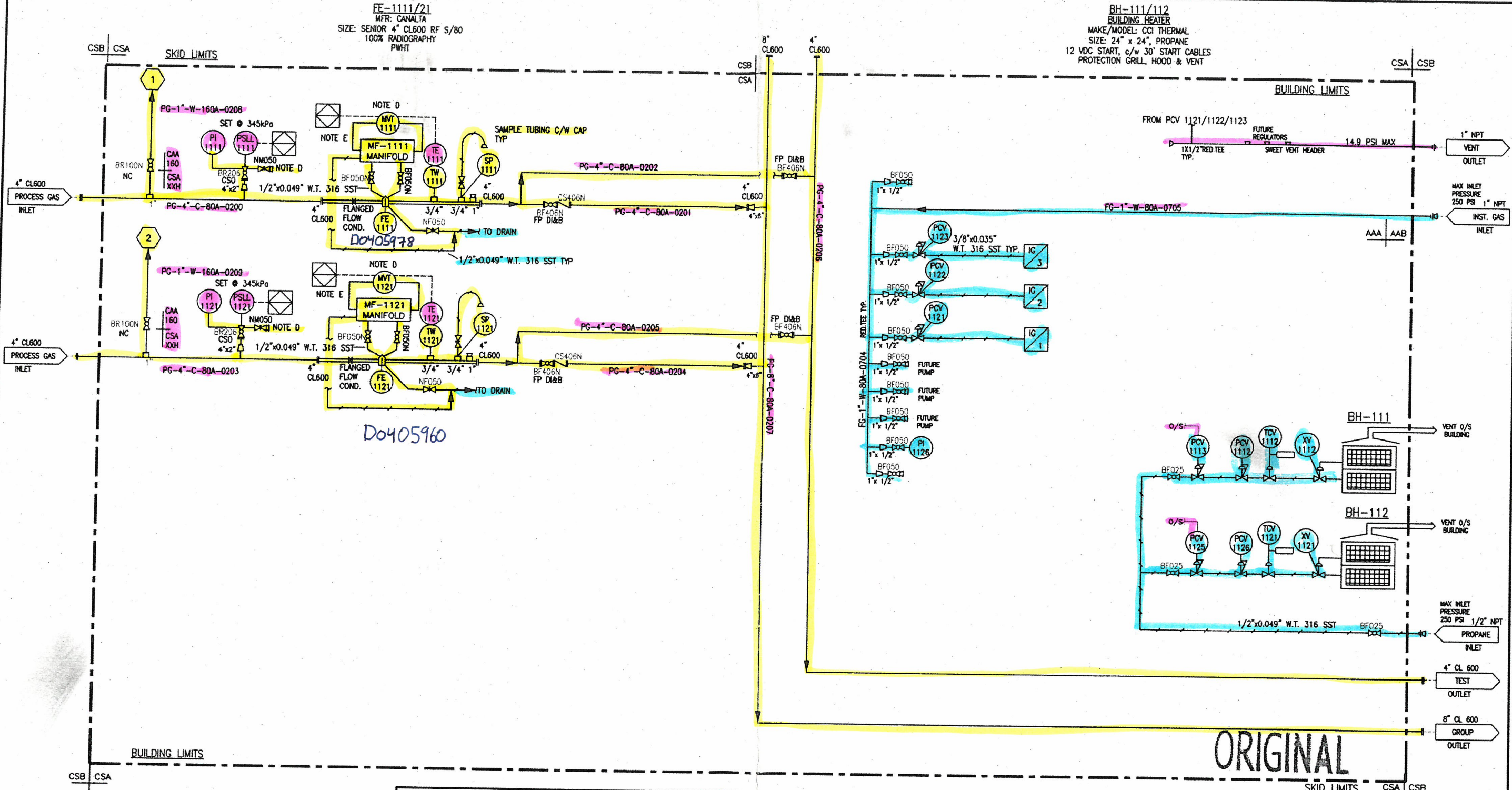
I, Edward Wilson a Professional Engineer registered or licensed to practice in  
The Province or Territory of Alberta, hereby certify that I have reviewed  
the design, and manufacturing process for the steel building system described. I certify that the  
foregoing statements initialed by me, are true.

Name Edward O. Wilson  
Title Professional Engineer  
Affiliation Wilson Engineering, PLLC Permit to Practice #P12198

Signature   
Date December 3, 2019

Professional Seal





D0405960

ORIGINAL

NWP UNIT	LSO
10936-001	15-03-61-24 W5M

REV	DATE	BY	CHK	APP	DESCRIPTION
0	SEPT 24/19	CF	D	CF	ISSUED FOR CONSTRUCTION
A	SEPT 16/19	CF			ISSUED FOR APPROVAL

DRAWING REVISIONS

ISSUED FOR CONSTRUCTION

SIGNED: *[Signature]*  
 DATE: Oct 21, 2019  
 W.O.: 10936-001  
 S/N: NWP-10936-001



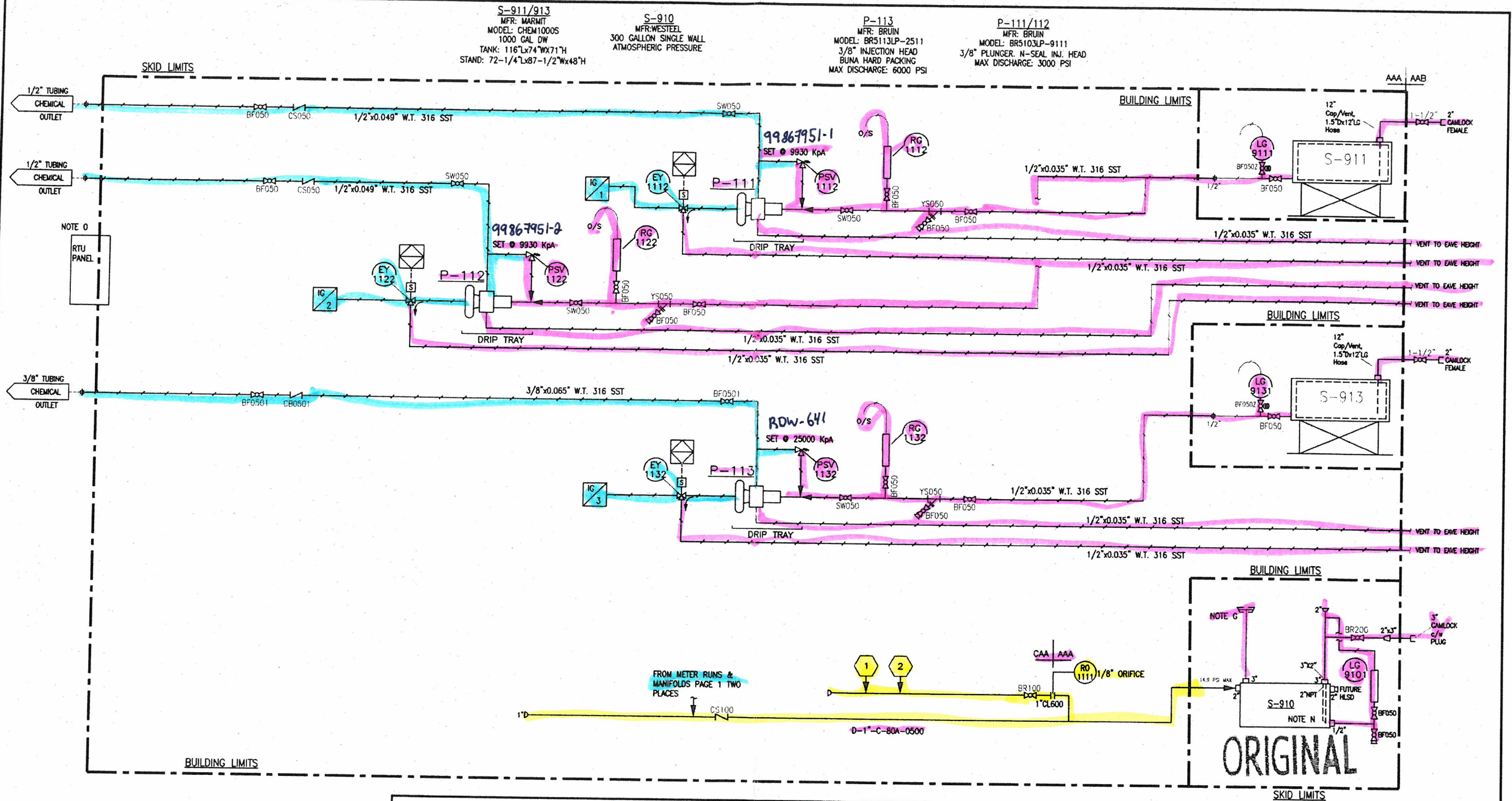
P.O. BOX 6280, INNISFAIR, AB T4G 1S9  
 PH: (403) 227-4100 FAX: (403) 227-4102

SCALE: N.T.S.  
 WEIGHT: (APPROX LBS)

ENCANA CORP  
 4" DUAL METER/PUMP PKG. SOUR  
 W/O FUEL GAS SCRUBBER

PIPING AND INSTRUMENTATION DIAGRAM

DWN: CF	CHK: <i>[Signature]</i>	APP: CF
DATE: SEPT 16/19	DATE: SEP 25 2019	DATE: SEP 25 2019
SHEET: 1 OF 3	DWG: 10936-001-P-000	REV: 0



S-911/913  
MFR: MARMIT  
MODEL: CHEM1000S  
1000 GAL DW  
TANK: 116"Lx74"Wx71"H  
STAND: 72-1/4"Lx87-1/2"Wx48"H

S-910  
MFR: WESTEEL  
300 GALLON SINGLE WALL  
ATMOSPHERIC PRESSURE

P-113  
MFR: BRUIN  
MODEL: BR5113LP-2511  
3/8" INJECTION HEAD  
BUNA HARD PACKING  
MAX DISCHARGE: 6000 PSI

P-111/112  
MFR: BRUIN  
MODEL: BR5103LP-9111  
3/8" PLUNGER, N-SEAL INJ. HEAD  
MAX DISCHARGE: 3000 PSI

REV	DATE	BY	CHK	APP	DESCRIPTION
0	SEPT 24/19	CF	D	CF	ISSUED FOR CONSTRUCTION
A	SEPT 16/19	CF			ISSUED FOR APPROVAL

DRAWING REVISIONS

**ISSUED FOR CONSTRUCTION**

SIGNED: \_\_\_\_\_

DATE: Oct 21, 2019

W.O.: 10936-001

S/N: NWP-10936-001

ALL DIMENSIONS IN INCHES

**NWP INDUSTRIES LP**

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

SCALE: \_\_\_\_\_  
WEIGHT: (APPROX. LBS) \_\_\_\_\_

ENCANA CORP  
4" DUAL METER/PUMP PKG. SOUR  
W/O FUEL GAS SCRUBBER

PIPING AND INSTRUMENTATION DIAGRAM

DWN: CF	CHK: D	APP: CF
DATE: SEPT 16/19	DRAWN: SEPT 25 2019	DATE: SEPT 25 2019
SHEET: 2 OF 3	DWG: 10936-001-P-000	REV: 0

**LINE TYPE LEGEND**

	MAJOR PROCESS LINE
	UTILITY LINE
	BUILDING LIMITS
	ENCLOSURE LIMITS
	ALTERNATE LIMITS
	CUST/VENDOR SUPPL. LIMITS
	HIDDEN LINE
	EQUIPMENT OUTLINE
	INSTRUMENT PNEUMATIC LINE
	PROCESS/UTILITY TUBING LINE
	INSTRUMENT CAPILLARY LINE
	ELECTRICAL DATALINK LINE
	ELECTRICAL CONNECTION LINE
	HYDRAULIC LINE
	MECHANICAL LINK LINE

**INSULATION LEGEND**

	* THICKNESS C=COLD H=HOT PP=PERSONEL PROTECTION
	* THICKNESS c/w TRACING ET=ELEC. TRACE GT=GLYCOL TRACE OT=OIL TRACE ST=STEAM TRACE

**VALVE SYMBOL LEGEND**

	BALL VALVE
	SPRING RETURN BALL VALVE
	GLOBE VALVE
	GATE VALVE
	CHECK VALVE
	PLUG VALVE
	NEEDLE VALVE
	INLINE CHOKE VALVE
	4-WAY VALVE
	3-WAY VALVE
	BUTTERFLY VALVE
	BASKET/CONE STRAINER
	TEE STRAINER
	Y STRAINER
	RUPTURE DISC
	PRESSURE RELIEF VALVE
	ANGLE VALVE
	ANGLE CHOKE VALVE
	GAUGE VALVE
	BLOCK & BLEED NEEDLE VALVE
	MULTIPORT MANIFOLD

**VALVE CONNECTION LEGEND**

	THRD VALVE
	THRD/SW VALVE
	SW VALVE
	FLANGED VALVE

**TOPWORKS SYMBOL LEGEND**

	DIAPHRAGM ACTUATOR
	ACTUATOR WITH HANDWHEEL
	ACTUATOR WITH POSITIONER
	REGULATOR WITH HANDWHEEL
	BACK PRESS. REGULATOR
	PRESS. REDUCING REGULATOR
	PISTON ACTUATOR
	ACTUATOR WITH POSITIONER
	ROTARY PISTON ACTUATOR
	ROTARY MOTOR ACTUATOR
	SOLENOID

**METERING**

	METER RUN
	ORIFICE METER
	FLOW CONDITIONER
	VORTEX METER
	POSITIVE DISPLACEMENT METER
	TURBINE/PROPELLER METER
	MASS FLOW METER
	FLOW INDICATOR

**MISC TAG SYMBOL LEGEND**

	INSTR. GAS TO AND FROM
	INSTR. AIR TO AND FROM
	RTU
	I/P ELECTRO PNEUMATIC

**MISC SYMBOLS LEGEND**

	FLANGE / BLIND FLANGE
	BW CAP / THRD CAP
	UNION
	TOL/CPLG w/PLUG
	BREAK
	CONCENTRIC REDUCER
	CONCENTRIC SWAGE
	ECC REDUCERS
	SKID EDGE SCARFED VENT
	FLEXIBLE HOSE
	CAMLOCK CONNECTION
	SPEC. BLIND-CLOSED/OPEN
	PIPE/TUBING FLOW ARROW
	SPEC/RESPONSIBILITY BREAK
	FLANGED NOZZLE
	MANWAY
	PANEL LOAD
	GROUND
	SKID DRAIN
	PIC BAR

	CONNECTION INDICATOR / PAGE CONTINUATOR
	LIGHT
	SPEED CONTROL
	SWITCHING VALVE (AMOT)
	CONSTRUCTION REVISIONS
	MUFFLER

**GENERAL NOTES**

- SHOP INSTALL ADDITIONAL PIPE SUPPORTS WHERE REQ'D.
- SHIP LOOSE ITEMS TO BE BOXED AND SEALED PRIOR TO SHIPMENT.
- PLUG AND PROTECT ALL OUTLETS PRIOR TO SHIPMENT.
- ROUTE PIPING TO ENSURE NO LIQUID TRAPS.
- ALL PIPING MATERIAL TO BE STANDARD TEMP U.N.O.
- HYDROTEST PROCESS PIPING TO 1.5 x M.A.W.P.
- ALL PIPING AND PROCESS TUBING LINES TO BE TESTED PER ASME B31.3 NFS
- INSTRUMENT SUPPLY LINES TO BE TESTED PER ABSA AB-522 DIRECTIVE
- SHOP TO ADD UNIONS AS REQUIRED
- SOME FLANGES MAY NOT BE SHOWN ON P&ID

**CUSTOMER NOTES**

- 316SS SEAMLESS TUBING AND 316SS FITTINGS.
- ALL OUTSIDE VENTS TO BE AWAY FROM PERSONNEL
- DELETED
- SWAGelok CALIBRATION FITTINGS AND PLUGS REQUIRED
- 3:1 SLOPE REQUIRED
- PIPE TO EAVE HEIGHT WITH SCARFED TEE C/W BIRD SCREEN ROOS. SHOP TO SUPPORT VENT TO BUILDING WALL
- AAA CA 1/16"(1.6MM)
- AAB CA 1/16"(1.6MM)
- CAA CA 1/16"(1.6MM)
- CAB CA 1/16"(1.6MM)
- CSA CA 1/8"(3.2MM)
- CSB CA 1/8"(3.2MM)
- 2" PIPE TO BE 2" OFF BOTTOM OF TANK
- SUPPLIED BY CLIENT. INSTALLED BY NWP. WIRED BY CONTRACTOR.

ORIGINAL

REV A	ABBREVIATIONS		
ASSY - ASSEMBLY	HPV - HIGH POINT VENT	MISC. - MISCELLANEOUS	
ATM - ATMOSPHERE	HS - HYDRAULIC SUPPLY	PD - POSITIVE DISPLACEMENT	
BDL - BARREL	HT - HEAT TRACE	P/I - PNEUMATIC TO CURRENT	
BD - BLOWDOWN	IA - INSTRUMENT AIR	P/L - PIPELINE	
BTU - BRITISH THERMAL UNITS	ID - INSIDE DIAMETER	PLC - PROGRAMMABLE LOGIC CONTR.	
CC - CORROSION COUPON	IG - INSTRUMENT GAS	PO - PUMP OUT	
CP - CORROSION PROBE	INJ. PT - INJECTION POINT	RF - RAISED FACE	
CSC - CAR SEAL CLOSED	I/P - CURRENT TO PNEUMATIC	RO - RESTRICTION ORIFICE	
CSD - CAR SEAL OPEN	I/S - INSIDE	RP - REDUCED PORT	
c/w - COMPLETE WITH	LLL - LOW LIQUID LEVEL	RTU - RING TYPE JOINT	
DB&B - DOUBLE BLOCK & BLEED	LPD - LOW POINT DRAIN	RTU - REMOTE TRANSMITTING UNIT	
ESD - EMERGENCY SHUTDOWN	LSD - LEGAL SUBDIVISION	SP - SAMPLE POINT	
ET - ELECTRICAL TRACE	MAMP - MAX. ALLOW. WORK PRES.	s/c - SHOP COAT	
FC - FAIL CLOSE	MDMT - MIN. DESIGN METAL TEMP.	SG - SPECIFIC GRAVITY	
FFSD - FAIL CLOSE	MCC - MOTOR CONTROL CENTER	SS - STAINLESS STEEL	
FO - FAIL OPEN	MISC. - MISCELLANEOUS	S/S - SEAM TO SEAM	
FRD - FLOAT RELEASE DEVICE	NC - NORMALLY CLOSED	TK - TANK	
FP - FULL PORT	NLL - NORMAL LIQUID LEVEL	T/T - TANGENT TO TANGENT	
GO - GEAR OPERATED	NO - NORMALLY OPEN	UNO - UNLESS NOTED OTHERWISE	
GT - GLYCOL TRACE	NTS - NOT TO SCALE	VH - VENT HEADER	
HC - HOSE CONNECTION	OD - OUTSIDE DIAMETER	ZSC - POSITION/LIMIT SWITCH CLOSE	
HLL - HIGH LIQUID LEVEL	O/S - OUTSIDE	ZSO - POSITION/LIMIT SWITCH OPEN	

INSTRUMENTATION IDENTIFICATION AS PER ANSI/ISA-5.1-2009					
LETTER	FIRST LETTERS		SUCCEEDING LETTERS		
	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	MEASURED/INITIATING VARIABLE	VARIABLE MODIFIER	READOUT/PASSIVE FUNCTION	OUTPUT/ACTIVE FUNCTION	FUNCTION MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			USER'S CHOICE	USER'S CHOICE
D	USER'S CHOICE	DIFFERENCE, DIFFERENTIAL		CONTROL	CLOSE
E	VOLTAGE		SENSOR, PRIMARY ELEMENT		DEVIATION
F	FLOW, FLOW RATE	RATIO			
G	USER'S CHOICE		GLASS, GAUGE, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT				
J	POWER		INDICATE		
K	TIME, SCHEDULE	TIME RATE OF CHANGE	SCAN		
L	LEVEL		LIGHT	CONTROL STATION	
M	USER'S CHOICE				LOW
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	MIDDLE, INTERMEDIATE
O	USER'S CHOICE		ORIFICE, RESTRICTION		USER'S CHOICE
P	PRESSURE		POINT (TEST CONNECTION)		OPEN
Q	QUANTITY	INTEGRATE, TOTALIZE	INTEGRATE, TOTALIZE		
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	RUN
T	TEMPERATURE			TRANSMIT	STOP
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	
V	VIBRATION, MECHANICAL ANALYSIS		WELL, PROBE	VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE				
X	UNCLASSIFIED	X-AXIS	ACCESSORY DEVICES, UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE, PRESENCE	Y-AXIS		AUXILIARY DEVICES	
Z	POSITION, DIMENSION	Z-AXIS, SAFETY INSTRUMENTED SYSTEM		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

REV A.1	VALVE TAGGING	
	<p>BALL VALVE (FULL PORT) - BF</p> <p>BALL VALVE (REG. PORT) - BR</p> <p>BUTTERFLY VALVE - BU</p> <p>CHECK VALVE (BALL) - CB</p> <p>CHECK VALVE (PISTON) - CP</p> <p>CHECK VALVE (SWING) - CS</p> <p>CHECK VALVE (WAFER) - CW</p> <p>GATE VALVE - GA</p> <p>GLOBE VALVE - GL</p> <p>STRAINER (BASKET) - SB</p> <p>STRAINER (Y) - ST</p> <p>STRAINER (Y) - SY</p> <p>SWAGelok - SW</p> <p>NEEDLE VALVE (FEMALE x FEMALE) - NF</p> <p>NEEDLE VALVE (MALE x FEMALE) - NM</p> <p>MANIFOLD - MF</p>	<p>XX XXX XX</p> <p>025 - 1/4"</p> <p>038 - 3/8"</p> <p>050 - 1/2"</p> <p>075 - 3/4"</p> <p>100 - 1"</p> <p>200 - 2"</p> <p>201 - 2" 150 ANSI</p> <p>303 - 3" 300 ANSI</p> <p>406 - 4" 600 ANSI</p> <p>609 - 6" 900 ANSI</p> <p>815 - 8" 1500 ANSI</p> <p>1025 - 10" 2500 ANSI</p> <p>G - GAS SERVICE</p> <p>H - HIGH PRESSURE</p> <p>L - LOW TEMP.</p> <p>N - NACE</p> <p>Z - BOW CLARIFIER (1,2,...)</p>
	LINE TAGGING	
	<p>DRAIN - D</p> <p>EMULSION - E</p> <p>FUEL GAS - FG</p> <p>GLYCOL - G</p> <p>HYDROCARBON - HC</p> <p>INSTRUMENT AIR/GAS - IA/IG</p> <p>PROCESS GAS - PG</p> <p>PRESSURE RELIEF - PR</p> <p>WATER - W</p> <p>VENT (ATMOS) - V</p>	<p>0100-0199 EMULSION</p> <p>0200-0299 PROCESS GAS</p> <p>0300-0399 HYDROCARBON</p> <p>0400-0499 WATER</p> <p>0500-0599 DRAIN</p> <p>0600-0699 PROCESS FLUID</p> <p>0700-0799 FUEL GAS</p> <p>0800-0899 PRESSURE RELIEF</p> <p>0900-0999 OTHER</p> <p>1000-1099 VENT (NO TESTING)</p> <p>NOMINAL PIPE SIZE</p> <p>150 ANSI - A</p> <p>300 ANSI - B</p> <p>600 ANSI - C</p> <p>900 ANSI - D</p> <p>1500 ANSI - E</p> <p>2500 ANSI - F</p> <p>2000# THRD/SW - T</p> <p>3000# THRD/SW - W</p> <p>6000# THRD/SW - X</p> <p>PIPE SCHEDULE</p> <p>A - 316 SS TUBING w/ 316 SS FITTINGS</p> <p>B - 316 SS TUBING w/ CS FITTINGS</p> <p>C - NOT APPLICABLE</p>

REV A	TAG LEGEND				
	LOCALLY MOUNTED	PRIMARY LOC. OR PANEL NORMALLY ACCESS. TO OPER.	AUXILIARY LOC. OR PANEL NORMALLY ACCESS. TO OPER.	PRIMARY LOC. OR PANEL MOUNTED ON BACK OF PANEL	AUXILIARY LOC. OR PANEL MOUNTED ON BACK OF PANEL
DISCRETE					
SHARED DISPLAY, SHARED CONTROL DISTRIBUTION, CONTROL VIDEO DISPLAY					
COMPUTER FUNCTION, SOFTWARE FUNCTION					
PROGRAMMABLE LOGIC CONTROL					

REV	DATE	BY	CHK	APP	DESCRIPTION
0	SEPT 24/19	CF	D	CF	ISSUED FOR CONSTRUCTION
A	SEPT 16/19	CF			ISSUED FOR APPROVAL

**ISSUED FOR CONSTRUCTION**

SIGNED:

DATE: Oct 24, 2019

W.O.: 10936-001

S/N: NWP-10936-001

ALL DIMENSIONS IN INCHES

**NWP INDUSTRIES LP**

P.O. BOX 6280, INNISFAIL, AB T4G 1S9

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

SCALE: N.T.S

WEIGHT: APPROX. LBS

ENCANA CORP

4" DUAL METER/PUMP PKG. SOUR

W/O FUEL GAS SCRUBBER

PIPING AND INSTRUMENTATION DIAGRAM

DWN: CF CHK: D APP: CF

DATE: SEPT 16/19 DATE: SEPT 25 2019 DATE: SEP 25 2019

SHEET: 3 OF 3 DWG: 10936-001-P-000 REV: 0

**MTR'S**  
**(Material Test**  
**Reports)**

1/2" xxs SA333 4T 015010337  
 CE=.29 VT.279 Low

PO 746642  
**CONFORMS WITH ASME  
 SEC. II PART A 2019  
 EDITION FEB 4 / 20 JF.**

ES

PG 1 of 3

**HENGYANG VALIN  
 STEEL TUBE CO.,LTD**

**MILL TEST REPORT**

Add: 10 Dalixincun, Hengyang City, Hunan, P.R. China P.C.:421001  
 Tel and Fax: +86 734 8873739  
 E-mail: hseec@hysteeltube.com

(ACCORDING TO EN10204 3.1B)

CUSTOMER	TRANS AM			CERTIFICATE NO.	YCHYST2015036-01				
CONTRACT NO.	2111001647-2	P.O.NO.	PO.CI-15-328-B (LOT B)	L/C NO.	5FAHDS-00329	DATE:	2015-7-2	PAGE:	1/3
PRODUCT	SEAMLESS CARBON STEEL PIPE FOR OIL AND GAS USE			DELIVERY CONDITION	N(CD)				
SPECIFICATION	ASTM A333-6-2013, ASME SA333-6-2013, API 5L BN PSL-2 45TH EDITION, NACE MR-0175-2011/ISO 15156-2(REGION 3)-2009 /MR-0103-2012/SS (CSA Z245.1 GRADE 241 CATEGORY II-2014)			HEAT TREATMENT	>850°C				
GRADE	Gr6/Gr241, BN			DIMENSIONS	1/2"*0.294"*20FT				
TOTAL BUNDLES:	TOTAL PIECES:		TOTAL LENGTH:		ft	TOTAL WEIGHT:			mt

NO.	BATCH No.	HEAT No.	BUNDLES	PIECES	LENGTH	WEIGHT	TENSILE TEST ASTM A370						FLATTENING TEST
					ft	mt	SAMPLE TYPE/ ORIENTATION / SIZE(mm/GAUGE LENGTH(mm):FL50						
					WI	TS(PSI)	YS(PSI)	RT0.5	EL(%)	R.A. (%)	YS/TS		
1	WL1505-044	015010337					67425	44950	32.5		0.67	ACCEPTABLE	

NO.	IMPACT TEST								NON METALIC INCLUSION	GRAIN SIZE	HARDNESS TEST	
	NOTCH TYPE/ORIENTATION/TEMPERATURE(°C)/SIZE (mm) :										NACE MR0175/ISO 15156-2(REGION 3)/MR0103	
	AK1 (J)	Av.(J)	% SHEAR AREA	LE	AK2 (J)	Av.(J)	% SHEAR AREA	LE			HV10	
1	/				/					/147 /		

NOTES:  
 W1--THEORETICAL WEIGHT      SAMPLE ORIENTATION : L--LONGITUDINAL T--TRANSVERSE      N--NORMALIZING      HE--HOT EXPANDED  
 W2--ACTUAL WEIGHT      SAMPLE TYPE: S--STRIP C-- CLUBBED F--FULL-SECTION      A--ANNEALING      HR--HOT ROLLED  
 NR--NORMALIZING ROLLED      Q&T--QUENCHING AND TEMPERING      Av.--AVERAGE      N&T--NORMALIZING AND TEMPERING  
 AK1--ABSORB ENERGY FOR THE FIRST SET      AK2--ABSORB ENERGY FOR THE SECOND SET      LE--SIDE EXPANSION



NWP INDUSTRIES PO# 746642 Item# 5  
 Heat Number: 015010337  
 Trans Am Piping Products Ltd. - 3 Rev'd By: SB  
 Shipment/Seq #: S 15 . 1873

1/2" XXH SEAMLESS CS PIPE  
 A333 GR 6 PE - SRL

HENGYANG VALIN  
STEEL TUBE CO.,LTD

MILL TEST REPORT

Add: 10 Dalixincun, Hengyang City, Hunan, P.R.China P.C.:421001

Tel and Fax: +86 734 8873739

E-mail: hsiec@hysteeltube.com

(ACCORDING TO EN10204 3.1B)

CUSTOMER	TRANS AM			CERTIFICATE NO.	YCHYST2015036-01		
CONTRACT NO.	2111001647-2	P.O.NO.	PO.CI-15-328-B (LOT B)	L/C NO.: 5FAHD5-00329	DATE:	2015-7-2	PAGE: 2/3
PRODUCT	SEAMLESS CARBON STEEL PIPE FOR OIL AND GAS USE.			DELIVERY CONDITION	N(CD)		
SPECIFICATION	ASTM A333-6-2013, ASME SA333-6-2013, API 5L BN PSL-2 45TH EDITION, NACE MR-0175-2011/ISO 15156-2(REGION 3)-2009 /MR-0103-2012/SS (CSA Z245.1 GRADE 241 CATEGORY II-2014)			HEAT TREATMENT	>850℃		
GRADE	Gr6/Gr241, BN			DIMENSIONS	1/2"*0.294"*20FT		
TOTAL BUNDLES:	TOTAL PIECES:		TOTAL LENGTH:	ft	TOTAL WEIGHT: mt		

NO	HEAT No. BATCH No.	Type	CHEMICAL COMPOSITION (%)																					SUM1	SUM2	SUM3	R1	R2	R3			
			C	Si	Mn	Cr	Mo	W	Cu	Ni	P	Al	Sn	As	Pb	Sb	Nb	Ti	Zr	N	Bi	S	V							B	Ca	CE
			*100						*1000						*10000						*100	*1000										
	015010337	H	11	25	105	20	7	10	20	8	31					15	30					20	20	3	29	59	17	47			9.5	
1	WL1505-044	P	12	25	107	20	8	10	18	7	30					16	28					18	18	3	31	58	17.8	45.8			8.9	
	WL1505-044	P	12	24	105	20	7	10	20	8	31					16	28					18	16	2	30	59	17.6	45.6			8.8	

NON-DESTRUCTIVE TEST				PE				
POSITION	PIPE BODY	PIPE END	END SURFACE(GROOVE)					
NDT Type(Level)	UT/L2	UT/L2		ACCEPTABLE				
LAMINAR				VISUAL & DIMENSION				
TEST RESULT	ACCEPTABLE	ACCEPTABLE	N/A	ACCEPTABLE				
RESIDUAL MAGNETISM	≤20GS		ACCEPTABLE				COATING	
UT THICKNESS MEASUREMENT				N/A				
HYDROSTATIC TEST	Min(psi/s)	2470/6	ACCEPTABLE				ACCEPTABLE	

NOTES: H-HEAT ANALYSIS P-PRODUCT ANALYSIS CE-EQUIVALENT CARBON R-RATIO R1=Ca /S R2=Al/N R3=Mn /C  
 CEIIW=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15 CEPCM=C+Si/30+(Mn+Cr+Cu)/20+Ni/60+Mo/15+V/10+5\*B SUM1=Cr+Cu+Mo+Ni+V SUM2=Nb+V SUM3=Nb+V+Ti  
 ET-ISO10893-2-2011, UT-ISO10893-10-2011, MPI-ISO10893-5-2011, EMI-ISO10893-3-2011, WT-ISO10893-12-2011, LaminationT-ISO-10893-8-2011  
 L4/L3/L2--ACCEPT LEVEL L4/L3/L2,NOTCH DEPTH IS 12.5%/10%/5% THE SPECIFIED WALL THICKNESS.





**HENGYANG VALIN  
STEEL TUBE CO.,LTD**


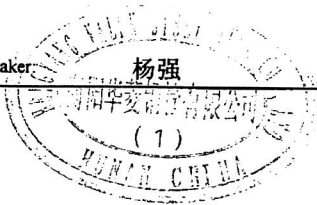
**MILL TEST REPORT**

Add: 10 Dalixincun, Hengyang  
City, Hunan, P.R.China P.C. 421001  
Tel and Fax: +86 734 8873739  
E-mail: [hsiec@hysteeltube.com](mailto:hsiec@hysteeltube.com)

(ACCORDING TO EN10204 3.1B)

CUSTOMER	TRANS AM			CERTIFICATE NO.	YCHYST2015036-01	
CONTRACT NO.	2111001647-2	P. O. NO.	PO.CI-15-328-B (LOT B)	L/C NO.: 5FAHD5-00329	DATE:	2015-7-2
PRODUCT	SEAMLESS CARBON STEEL PIPE FOR OIL AND GAS USE.			DELIVERY CONDITION	N(CD)	
SPECIFICATION	ASTM A333-6-2013, ASME SA333-6-2013, API 5L BN PSL-2 45TH EDITION, NACE MR-0175-2011/ISO 15156- 2(REGION 3)-2009 /MR-0103-2012/SS (CSA Z245.1 GRADE 241 CATEGORY II-2014)		HEAT TREATMENT	> 850°C		
GRADE	Gr6/Gr241, BN			DIMENSIONS	1/2"*0.294"*20FT	
TOTAL BUNDLES:	TOTAL PIECES:		TOTAL LENGTH:		ft	TOTAL WEIGHT : mt
		REMARK : 1.Origin: made in china;2.All elements to be listed; 3.Pipe produced from "fully killed" steel. 4.Silicon and calcium treated for inclusion morphology control in steel melting. 5.Billet produced by: HENGYANG VALIN STEEL TUBE Co.,Ltd				

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<p>We hereby certify that material herein described has been manufactured in accordance with the standards and specifications required in your order and satisfies the corresponding requirements.</p> <p>This certificate is issued by a computerized system and it is valid with electronic signature. In case the owner of the 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.</p> <p>Any alteration and/or falsification will be subject to the law.</p> <p>If you need to assure the authenticity of this certificate ,please do not hesitate to contact Hengyang Valin Steel Tube CO.,LTD, E-mail: <a href="mailto:hsiec@hysteeltube.com">hsiec@hysteeltube.com</a></p> <p>CUSTOMER THIRD PARTY</p>	<p>Quality Manager: </p> <p>Certificate-maker: </p>
---	---

<b>Material:</b> 2302332-04-06-01	<b>Material Rev :</b> 06	<b>Serial number :</b> 121253220005	<b>Customer Verification</b> Customer: Rep: Date: 30 OCT 2018
<b>Description:</b> B4C 4"x4" 600 RF Oring LF2 DPE BARE	<b>Batch ID :</b>		
<b>(Identification):</b>			
<b>Sales Order (Ext ID):</b> 4710300562	<b>Production Order(Desc):</b> 121253220		
<b>IBASE NUMBER:</b> 35981649	<b>Record Compiled By-</b> 193791		

ID#	Material/Description	I-Base	Serial Number	Rev Level	Qty.	Batch / Information
1	2301862-04-06-01 TRUN 04 150-600 B4C .025 NI LF2			04	1.000	18-201995 180718-B1D1
2	2301863-04-15-01 GLAND PLATE 04 150-1500 B4C LF2			03	1.000	18-201995 180830-B1D1
3	2301864-04-15-01 STEM 04 900/1500 B4C LVR 4130 0.025 ENP			04	1.000	V11702046 HT1808005
4	2301865-04-09-01 SEAT RING INNER 04 150-900 B4C DPE LF2			02	2.000	D72-6005V D18012201
5	2301865-04-15-02 SEAT RING OUTER 04 150-1500 B4C DPE LF2			03	2.000	D72-6005V D18012201
6	2301866-04-06-01 BODY 04 150-600 B4C LF2			03	1.000	D82-1959V HT1831093
7	2301867-04-06-01 CLOSURE RF 04 600 B4C DPE LF2			03	2.000	D82-1959V HT1831093
8	9D-292-04025-500C1 BALL 4 150/600 NI/LF2			04	1.000	D72-3411 HT1807012



A Schlumberger Company

Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaoxin District, Weifang City  
Shandong Province, P. R. China, Postcode 261091  
Tel/Fax: +86-536-208-0601

# TEST CERTIFICATE FOR GROVE B4C PRODUCT IN ACCORDANCE WITH EN 10204 3.1

Customer Name: CAMERON CANADA CORP.  
CC STO number: 4710300562  
Sales Order reference number: N/A  
Work order number: 121253220  
Valve Part Number: 2302332-04-06-01  
Valve Serial Number: 121253220005

All valves have been inspected and hydrostatically tested to comply with the specifications and corresponding test parameters indicated below and are certified as satisfactory.

This certification complies with EN 10204 para. 3.1. It was prepared by QA department personnel from tests conducted by a testing department whose supervisor is administratively independent from the Production Manager.

Hydrostatic shell & seat tests and air seat tests conducted in accordance with API 6D

Valve size: 4"x4"	ANSI pressure class: 600
Material specification: ASTM A350 LF2	CWP rating: 1480 psig / 10.21 Mpa
<b>Hydrostatic Shell &amp; Seat Test</b>	
Shell test pressure: 2220 psig / ##### Mpa	Shell test duration: 2 minutes
Seat 'A' test pressure: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Seat 'B' test pressure: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Double Isolation & Bleed (DIB-1) test press.: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Shell Test Pressure After Relief Valve Fixing: 1628 psig / ##### Mpa	Shell test duration: 2 minutes
<b>Air Seat Test</b>	
Air seat 'A' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Air seat 'B' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes

Note: Pressure Listed above is minimum required. Maximum pressure is not allowed to exceed 1.1 times listed above  
Actuator Type: - Actuator Brand: - Actuator Figure No.: -  
Paint specification: Valve - Yes - Standard (1-Coat), Actuator - Not Applicable  
**Additional certification supplied with this order**  
Mill Test Reports for Body, Closure, Top Cover, Seat, Ball & Stem  
Certificate of Compliance per EN 10204 3.1  
**Comments**

Hydraulic Test Inspector:

Name: Zhang Qing Peng Signature: Zhang QP Date: 2018.10.26

QA/QC Approval:

Name: Song Kuijuan Signature: Song KJ Date: 2018.10.26

Third Party Witness

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: Schlumberger-Private

Date: C:\M\OE\A244-035B.R\Rev07

06/09/2017

Name:

Signature:

Date:

Conforms with ASME  
Sec. II, Part A 2017 Edition  
OCT 0 8 2019

苏州恩威尔机械有限公司 Suzhou Enwi Machinery CO.,LTD		INSPECTION CERTIFICATE QUALITY CONTROL DEPARTMENT 检验证明书(质量控制部)		Company's QMS certified body: ISO9001 No.公司质量管理体系证书号: CNB3312375-UK No.01	
Purchaser 买方: Shandong Cameron Petroleum Equipment Pre Ltd 山东卡麦龙石油机械有限公司		Cert. No. 证书号:20181008001	Date 日期:2018/10/8	Certificate type 证书类型: EN 10204 <input type="checkbox"/> 2.2 <input checked="" type="checkbox"/> 3.1 <input type="checkbox"/> 3.2	
		Purchase Order No. 订单号:4511991768	Our Job No. 工单号:	Melting practice 熔炼方法 <input checked="" type="checkbox"/> EBT+LF+VD+模铸 <input type="checkbox"/> DEF.VD	

CHEMICAL ANALYSIS 化学分析		Heat No. 炉号: D82-1959V H.T Lot 热处理批次号: HT1831093		Raw Material Supplier 原材料供应商: XINYU XINLIANG SPECIAL STEEL CO.,LTD.												
Material 材料规范: ASTM A350 LF2																
MS-021239-02-04	C	Mn	Si	NI	Cr	S	P	AI	Cu	Mo	TI	Sn	V	Nb	N	H
Rev.01	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm
MIN	/	0.60	0.15	/	/	/	/	/	/	/	/	/	/	/	/	/
MAX	0.23	1.35	0.30	0.40	0.30	0.02	0.025	/	0.40	0.12	/	/	0.03	0.02	/	/
Heat Analysis 浇包分析:	0.19	0.98	0.25	0.016	0.06	0.006	0.019		0.004	0.002			0.001	0.008		
Product Analysis 产品分析:	0.186	0.96	0.22	0.02	0.037	0.005	0.012		0.008	0.002			0.001	0.001		
碳当量 C.E. (Long) = 0.356						C+Mn=0.039						Cu+Ni+C+Mn+V=0.066				

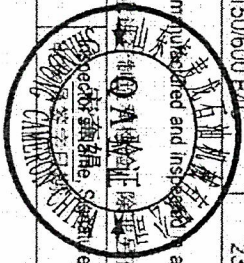
HEAT TREATMENT 热处理		Temperature (°C) 温度	Time (Hour) 时间	Cooling Method 冷却方法
Type 类型	Quench	900 °C	3.0 H	Water Cooling
	Temper	620 °C	3.5 H	Air Cooling

MECHANICAL TEST 机械性能测试		From QTC 试样: <input checked="" type="checkbox"/>		From Piece 本体: <input type="checkbox"/>	
UTSob	YSob	EL85	ROAup	IMPACT TEST 冲击测试	
抗拉强度 (Mpa)	屈服强度 (Mpa)	伸长率 (%)	收缩率 (%)	Dir. 方向	Type 类型
Min 485	275	22	30	L	V
Max 855	/	/	/		
UTSob	YSob	EL85	ROAup	IMPACT TEST 冲击测试	
抗拉强度 (Mpa)	屈服强度 (Mpa)	伸长率 (%)	收缩率 (%)	Dir. 方向	Type 类型
527	384	34	74	L	V
Test Piece No. 试样号	Gauge length 标距(mm)	Diameter 直径 (mm)	length of reduced section 缩减(mm)	Temp °C 温度	Temp °C 温度
18070231-2	50	12.50	55	48 °C	20 °C

Analysis for Plating 镀层分析		Thickness 厚度	Heat Treatment Temperature 热处理温度	Heat Treatment time 热处理时间
Actual 实测				
PO Item No. 订单行号	Your Item No. 你们的行号	Description 描述	Part Number 零件号	Quantity 数量
00030	E06005-30	BODY 04 150/600 B4C	2301866-04-06-01 REV.03	28

Remarks 备注:  
We hereby certified that the items described herein have been manufactured and inspected in accordance with the specifications and requirements called for against the above order unless otherwise stated.  
在此声明我们以上订单所描述的产品均按照规范和要求进行生产和检验,如有说明,请参照说明。

Surveyor's Name, Signature & Date  
检查员签字日期: *Inspector* 2018.10.8



Conforms with ASME  
 Sec. II, Part A 2017 Edition  
 OCT 08 2019

**INSPECTION CERTIFICATE**

QUALITY CONTROL DEPARTMENT  
 检验证明书 (质量控制部)

Company's OMS certified body—ISO9001  
 No.02018001 质量体系认证证书: No.02018001-AO-RSG-CHINA/Rev.1

JIANGSU YINGLIU MACHINE  
 MANUFACTURING CO., LTD.  
 江苏应流机械制造有限公司

Purchaser: 买方  
 Shandong Cameron Petroleum Equipment  
 Pe Ltd  
 山东卡麦石油设备有限公司

Cert. No. 证书号: 18072002  
 Date 日期: 2018.07.20  
 Purchase Order No. 4512020847  
 Our Job No. YC218271

Certificate type 证书类型: EN 10204 C2.1 3.1  
 Marking practice 标识方法: M.E.R. D.R.V.D.

**CHEMICAL ANALYSIS 化学分析**

Material 材料规格:	ASTM A550 LF2		Deal No./#号:		18-201995		HITel 热处理批次号:		180718-B101		Raw Material Supplier 原材料供应商:		CHANG QIANG			
	C	Mn	Si	Ni	Cr	S	P	Al	Ca	Mg	TI	Sn	V	Nb	N	H
MS-021239-02204 REV.01	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm
Min	0.60	0.15														
Max	0.23	1.35	0.30	0.40	0.30	0.02	0.025		0.40	0.12			0.03	0.02		
Heat Analysis 热分析	0.20	0.91	0.23	0.03	0.03	0.006	0.023		0.05							
Product Analysis 产品分析	0.210	0.944	0.204	0.0199	0.0499	0.0021	0.0226		0.0405	0.0012			0.0011	0.0016		
碳当量C.E. (Long)					0.385		C+Mn		0.051		C+Ni+C+Mn+V		0.114			

**HEAT TREATMENT 热处理**

Type 类型	Temperature (°C) 温度	Time (Hour) 时间	Cooling Method 冷却方法
Quenching	890	1.75h	Water cooled
Tempering	600	2.25h	Air cooled

**MECHANICAL TEST 机械性能测试**

MS-021239-02204 REV.01	UTS a b 抗拉强度 (MPa)		Yield 屈服强度 (MPa)		EL 5.5 伸长率 (%)		ROA 4 收缩率 (%)		IMPACT TEST 冲击测试		HARDNESS (HB) 硬度		
	(MPa)	(MPa)	(MPa)	(MPa)	(%)	(%)	(%)	(%)	Type 类型	Temp °C 温度	Average 平均值	Min 最小	Max 最大
Mile	485	485	275	22	30				Dir. 方向 <td>Temp °C 温度 <td></td> <td></td> <td></td> </td>	Temp °C 温度 <td></td> <td></td> <td></td>			
Mile	655								longitudinal	-46°C	27/27	143	197
ACTUAL	520								longitudinal				
Test Piece No. 试棒号	5-240#	Change length 长度 (mm)	50.00	Diameter 直径 (mm)	12.50	Length of reduction 缩减 (mm)	60	Temp 温度 (°C)					

**Analysis for Pitting 蚀层分析**

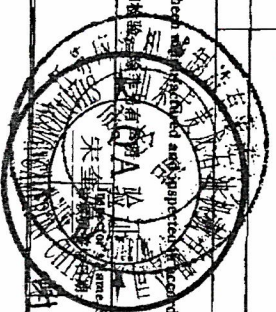
Pitting specification 电蚀规范	This class 厚度 (in)		Heat Treatment Temperature 热处理温度 (°C)		Heat Treatment Time 热处理时间 (h)	
	Standard 标准	0.001+0.0005 /-0				
X-31000-01 REV.A4	Actual 实际	0.001				

PO Item No. 订单行号	Your Item No. 你们的行号	Description 描述	Part Number 零件号	Quantity 数量
10		TRUN 04 150-600 B4C .025 NI LF2	2301842-04-05-01	75
20		TRUN 03 150-600 B4C .025 NI LF2	2301842-03-05-01	20

**Remarks 备注:**

We hereby certified that the items described herein have been inspected and approved in accordance with the specifications and requirements called for against the above order unless otherwise stated.  
 在此声明我们以上订单所描述的产品均按照规范和要求进行制造和检验

Inspector's Name, Signature & Date  
 检验员名字日期: 靳金凤 2018.08.31



Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 08 2019

苏州工业园区托普来表面技术有限公司  
SIP Toplate Surface Technologies co.,Ltd

报告编号: TP-1808310003  
REPORT: P-1808310003

产品检验合格证

Declaration of Conformity according to EN 10204 2.1

产品名称 Production name	板制	
订单编号 Po.No.	4512020367/20	4512020367/10
零件编号 Part No.	2301862-01-06-01	301862-04-06-01
规格 Type	3" LF2 4" LF2	
数量 Quantity	20pcs 75pcs	
出厂批号 Batch No.	VM 180831	
试片号码 Piece No.	TP-180831	
涂层种类 Plate Type	镍磷合金 Ni-P Alloy	

检测 报告

TEST REPORT

According to ASTM B733-04

内容 Inspection Item	检测数据 Tests Data
外观 Surface Visual	漆黄色 Golden Light
厚度 Thickness	0.001inch
孔隙率试验及试片 Porosity Test (barroxyd)	孔隙率为 0 Hole Rating=0
试片 180° 弯折试验 Test Piece Bending Test 180°	合格 Pass
热处理参数及硬度 Heat Treatment Parameters and Hardness	温度: / Temp: / 时间: / Time: / 产品在油硬度 HV= / Surface Hardness: HV= /
合金成分 Alloy Component	Ni= 89.5 % P= 10.5 %
检验员: Inspector:	黄保签字 Approved:
控制结果: 合格 Result: Pass	出厂日期: Date: 2018.8.21

兹证明材料已按标准和顾客要求进行制造、抽样、检验、和实验。结果材料与采购合同符合要求。

We hereby certify that material was manufactured, sampled tested and inspected in accordance with the material specification and customer po. Requirements, and was found to meet the requirements.



Shandong Cameron Petroleum Equipment Pte Ltd  
Baigong East Street 880#, Gaoxin District,  
Weifang City Shandong Province  
P. R. China, Postcode 261061  
Tel./Fax +86-536-208-0601

## LETTER OF COMPLIANCE

For:

### GROVE BRAND TRUNNION VALVES

### Model B4, B5-Sour Low Temperature Service

Cameron Valves & Measurement hereby certifies that the design, manufacture, sampling, testing and quality control inspection of the GROVE brand CSA Z245.15 ball valves for Sour Low Temperature Service meet the requirements of CSA Z245.15-13 Sour Service, V&M Engineering Standards, and customer purchase order requirements. As part of compliance to these specifications, the valves are marked in accordance with MSS SP-25. The valves are also marked "SOUR" as required by CSA Z245.15-13 marking requirements for Sour Service and are suitable for use in CSA Z662 Pipeline systems.

The materials of construction for these valves conform to the metallurgical requirements of NACE MR0175/ISO1516:2009 (Parts 1 & 2 for Carbon & Alloy Steels in SSC Region 3 Sour Service and Parts 1 & 3 for CRA's as specified in CSA Z245.15-13 Chapter 13). According to NACE MR0175-2009/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 Z245.15-13 for Category II M45C Service.

The ASTM A320 Grade L7M studs and cap screws and ASTM Grade A194 7ML nuts used in the products specified above have been Quality Control inspected and meet the requirements of the applicable ASTM specifications-as is already implied fully by the statements above regarding both CSA and NACE standards compliance.

Approved by: \_\_\_\_\_

王振龙

Wang Zhenlong  
Quality manager



**From:**  
Schlumberger Canada Limited  
3707-97 Street  
Edmonton, Alberta,  
Canada T6E 6J2  
Phone 780.468.2732  
Fax 780.450.1359  
www.cameron.slb.com

**To:**  
MRC CANADA ULC

**Date:** Sep 26, 2019

**Subject:**

**Serial Number:** 121253220-005,006,007

**Part Number:** 2302332-04-06-11

**Description:** B4C 4"x4" 600 RF Oring LF2 DPE WO

**Sales Order:** 3735342-000010

**Purchase Order:** C7405629083J0

**Comments:**  
DT# 88387486





Shandong Cameron Petroleum Equipment Pte Ltd  
Beijing East Street 880#, Gaoxin District, Weifang City  
Shandong Province, P. R. China, Postcode 261061  
Tel/Fax: +86-536-208-0601

## CERTIFICATION OF COMPLIANCE

### API 6D 24TH EDITION/API 607 & NACE MR-0175

Customer Name: CAMERON CANADA CORP.  
CC STO Number: 4710300562  
Sales Order Reference Number: N/A  
Work order number: 121253220

We hereby certify that the materials for component parts and the manufacture of said valves are in compliance with Cameron valves specifications and drawings and meet all requirements of the above referenced customer order. We further certify that the above listed valve(s) are in full conformance with American Petroleum Institute (API) 6D 24th Edition and all addenda (as of this date hereby certified), have been API monogrammed and has/have successfully passed all applicable test in accordance with requirements thereof, including additional customer requirements agreed upon in the above indicated order.

Cameron certifies the subject product in compliance with pre-qualified materials of NACE MR0175/ISO15156. This certification does not imply or warrant the application of the product in compliance with NACE MR0175/ISO15156 service conditions in which the customer/user installs the product.

ID	Serial Number	Valve Part Number	Valve Size	Pressure Class	End Conn.	Trim
1	121253220001	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
2	121253220002	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
* 3	<del>121253220003</del>	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
4	121253220004	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
5	121253220005	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
6	121253220006	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
7	121253220007	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
** 8	121253220008	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2

WO# 121289395 used to modify Ser#s 001,002,004-008 to new PT# 2302332-04-06-11

\* WO# 200078574

\*\* WO# 121390677 used to modify Ser# 008 to new PT# 2302332-04-06-62

王振龙

Signature: \_\_\_\_\_

Name: Wang Zhenlong

Date: 2018.10.31



EC Declaration of Conformity  
Pressure Equipment Directive 97/23/EC

Doc.No.: CVM-QF-A344-093

Revision: 06

Customer Name :

CAMERON CANADA CORP.

PO number: 4710300562

Sales Order Number: N/A

Product Category III Conformity  
Assessment Module H

Notified Body

Manufacture

Authorized Representative

Lloyd's Register Verification  
LTD 71 Frenchurch Street  
London EC3M 4BS UK  
Identification No.0038  
Certification No.  
0038/PED/MUM/071004/1

Shangdong Cameron Petroleum  
Equipment PTE Ltd. No.880, Beigong  
East Street, Gaoxin District, Weifang City,  
Shandong Province, P.R. China,261061  
Tel:86-536-2080601 Tax:86-  
536-2080617

Cameron Italy S.r.l.  
Via Italo Betto, 11  
I-27058 Voghera - Pavia

We hereby declare that product(s) described below are in conformance with the pressure Equipment Directive

2014/68/EU

Product Model Number	Qty	Serial Number	Technical File No.	Rev.
Grove B4	1	121253220001	B4 Technical file	1
Grove B4	1	121253220002	B4 Technical file	1
Grove B4	1	121253220003	B4 Technical file	1
Grove B4	1	121253220004	B4 Technical file	1
Grove B4	1	121253220005	B4 Technical file	1
Grove B4	1	121253220006	B4 Technical file	1
Grove B4	1	121253220007	B4 Technical file	1
Grove B4	1	121253220008	B4 Technical file	1

Other EC Directives:

Ref. Design Standards: Asme Section VIII Div I, Section II Part D:API 6D, Pipeline Valves

Asme16.34, Valve-Flanged, Threaded, Welding Ends.

QA Representative: Wang Zhenlong

Title: QA Manager

Signature:

Date: 2018.10.31



EC Declaration of Conformity  
ATEX 94/9/EC Directive

Doc. No. CVM-QF-A344-109

Revision: 04

Product Category  
11.2.G

Customer Name :

CAMERON CANADA CORP.

PO number: 4710300562

Sales Order Number: N/A

Manufacturer

Authorized Representative

Shandong Cameron Petroleum Equip. Co. Pte Ltd

South of Beigong East St.

West of Huixian Rd.

Gaoxin Dist. Weifang City

Shandong Prov., P.R., China 261061

Tele: 86 536 2080601

Fax: 86 536 2080617

Cameron Italy S.r.l.  
Via Italo Betto, 11  
I-27058 Voghera - Pavia

We hereby declare that the product(s) described below are in conformance with the

ATEX 94/9/EC Directive.

Product Model Number	Qty.	Serial Number	Technical File No.	Rev.
GROVE B4	1	121253220001	B4 ATEX Technical File	0
GROVE B4	1	121253220002	B4 ATEX Technical File	0
GROVE B4	1	121253220003	B4 ATEX Technical File	0
GROVE B4	1	121253220004	B4 ATEX Technical File	0
GROVE B4	1	121253220005	B4 ATEX Technical File	0
GROVE B4	1	121253220006	B4 ATEX Technical File	0
GROVE B4	1	121253220007	B4 ATEX Technical File	0
GROVE B4	1	121253220008	B4 ATEX Technical File	0

Other EC Directives: Pressure Equipment Directive 2014/68/EU

Ref. Design Standards: ASME Section VIII Div 1, Section II Part D; API 6D, Pipeline Valves  
ASME B16.34, Valve - Flanged, Threaded, Welding Ends

Authorised Representative: Wang Zhenlong Title: QA Manager

Signature: 王振龙 Date: 2018.10.31

<b>Material:</b> 2302332-04-06-01	<b>Material Rev :</b> 06	<b>Serial number :</b> 121253220006	<b>Customer Verification</b>
<b>Description:</b> B4C 4"x4" 600 RF Oring LF2 DPE BARE		<b>Batch ID :</b>	<b>Customer:</b>
<b>(Identification):</b>			<b>Rep:</b>
<b>Sales Order (Ext ID):</b> 4710300562	<b>Production Order(Desc):</b> 121253220		<b>Date:</b> 30 OCT 2018
<b>IBASE NUMBER:</b> 35981762	<b>Record Compiled By-</b> 193791		

ID#	Material/Description	I-Base	Serial Number	Rev Level	Qty.	Batch / Information
1	2301862-04-06-01 TRUN 04 150-600 B4C .025 NI LF2			04	1.000	18-201995 180718-B1D1
2	2301863-04-15-01 GLAND PLATE 04 150-1500 B4C LF2			03	1.000	18-201995 180830-B1D1
3	2301864-04-15-01 STEM 04 900/1500 B4C LVR 4130 0.025 ENP			04	1.000	V11702046 HT1808005
4	2301865-04-09-01 SEAT RING INNER 04 150-900 B4C DPE LF2			02	2.000	D72-6005V D18012201
5	2301865-04-15-02 SEAT RING OUTER 04 150-1500 B4C DPE LF2			03	2.000	D72-6005V D18012201
6	2301866-04-06-01 BODY 04 150-600 B4C LF2			03	1.000	D82-1959V HT1831093
7	2301867-04-06-01 CLOSURE RF 04 600 B4C DPE LF2			03	2.000	D82-1959V HT1831093
8	9D-292-04025-500C1 BALL 4 150/600 NI/LF2			04	1.000	D72-3411 HT1807012



A Schlumberger Company

Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaoxin District, Weifang City  
Shandong Province, P.R. China, Postcode 261061  
Tel/Fax: +86-536-208-0601

# TEST CERTIFICATE FOR GROVE BAC PRODUCT IN ACCORDANCE WITH EN 10204 3.1

Customer Name: CAMERON CANADA CORP.  
CC STO number: 4710300562  
Sales Order reference number: N/A  
Work order number: 121253220  
Valve Part Number: 2302332-04-06-01  
Valve Serial Number: 121253220006

All valves have been inspected and hydrostatically tested to comply with the specifications and corresponding test parameters indicated below and are certified as satisfactory.

This certification complies with EN 10204 para. 3.1. It was prepared by QA department personnel from tests conducted by a testing department whose supervisor is administratively independent from the Production Manager.

Hydrostatic shell & seat tests and air seat tests conducted in accordance with API 6D

Valve size: 4"x4"	ANSI pressure class: 600
Material specification: ASTM A350 LF2	CWP rating: 1480 psig / 10.21 Mpa
<b>Hydrostatic Shell &amp; Seat Test</b>	
Shell test pressure: 2220 psig / ##### Mpa	Shell test duration: 2 minutes
Seat 'A' test pressure: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Seat 'B' test pressure: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Double Isolation & Bleed (DIB-1) test press.: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Shell Test Pressure After Relief Valve Fixing: 1628 psig / ##### Mpa	Shell test duration: 2 minutes
<b>Air Seat Test</b>	
Air seat 'A' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Air seat 'B' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes

Note: Pressure Listed above is minimum required. Maximum pressure is not allowed to exceed 1.1 times listed above

Actuator Type: - Actuator Brand: -

Paint specification: Valve - Standard (1-Coat), Actuator - Not Applicable

Additional certification supplied with this order

Mill Test Reports for Body, Closure, Top Cover, Seat, Ball & Stem

Certificate of Compliance per EN 10204 3.1

Comments

Actuator Figure No.: -

Hydraulic Test Inspector:

Name: Sheng Qing Jiang

Signature: [Signature]

Date: 2018.10.26

QA/QC Approval:

Name: Song Kuijuan

Signature: [Signature]

Date: 2018.10.26

Third Party Witness

Name: \_\_\_\_\_

Signature: [Signature]

Date: CAM-QE-A244-035E1 Rev07

06/08/2017

Conforms with ASME  
Sec. II, Part A 2017 Edition  
OCT 0 8 2019

**INSPECTION CERTIFICATE**  
QUALITY CONTROL DEPARTMENT

检验证明书(质量证明书)

Company's QMS certified body

ISO9001 No 公司质量管理体系证书号:

CNB3J12375-UK No.01

Cert. No. 证书号: 20181008001

Date 日期: 2018/10/8

苏州恩威尔机械有限公司  
Suzhou Enwill Machinery CO.,LTD

Purchaser 买方:  
Shandong Cameron Petroleum Equipment Pte Ltd  
山东卡麦龙石油机械有限公司

Certificate type 证书类型: EN 10204

Purchase Order No. 订单号: 4511991768

2.2  3.1  3.2

Our Job No. 工单号:

Melting practice 熔炼方法  
 EBT+LF+VD+精炼  DE.F.V.D

**CHEMICAL ANALYSIS 化学分析**

Material 材料规范: ASTM A350 LF2	Heat No. 炉号: D82-1959V	Raw Material Supplier 原材料供应商: XINYU XINLIANG SPECIAL STEEL CO.,LTD.														
MS-021239-02-04 Rev.01	H.T.Lot 热处理批次号: HT1831093															
MIN	C % 0.60	Mn % 0.15	Si % 0.16	Ni % 0.40	Cr % 0.30	S % 0.02	P % 0.025	Al % 0.40	Cu % 0.12	Mo % 0.03	Ti % 0.03	Sr % 0.02	V % 0.03	Nb % 0.02	Ni % 0.03	H % 0.03
MAX	0.23	1.35	0.30	0.40	0.30	0.02	0.025	0.40	0.12	0.03	0.03	0.02	0.03	0.02	0.03	0.03
Steel Analysis 浇包分析	0.19	0.98	0.25	0.016	0.06	0.006	0.019	0.004	0.002	0.001	0.001	0.008				
Product Analysis 产品分析	0.186	0.96	0.22	0.02	0.037	0.005	0.012	0.006	0.002	0.001	0.001	0.001				
碳当量 C.E. (Long) = 0.356		C+Mn=0.039														

**HEAT TREATMENT 热处理**

Type 类型	Temperature (°C) 温度	Time (Hour) 时间	Cooling Method 冷却方法
Quench	900 °C	3.0 H	Water Cooling
Temper	620 °C	3.5 H	Air Cooling

**MECHANICAL TEST 机械性能测试**

UTSob 抗拉强度 (Mpa)	YSos 屈服强度 (Mpa)	EL65 伸长率 (%)	ROAU 收缩率 (%)	From QTC 试样: <input checked="" type="checkbox"/>	IMPACT TEST 冲击测试	From Piece 本件: <input type="checkbox"/>			
Min 485	275	22	30		Dir. 方向 L	Temp °C 温度 48°C	Avg/Min 平均/最小 27/27 J	Min 最小 143	Max 最大 197
Max 655	/	/	/		Dir. 方向 L	Temp °C 温度 48°C			

**ACTUAL 实测**

UTSob 抗拉强度 (Mpa)	YSos 屈服强度 (Mpa)	EL65 伸长率 (%)	ROAU 收缩率 (%)	Dir. 方向 L	Type 类型 V	Temp °C 温度 46 °C	IMPACT TEST 冲击测试	Joules 焦耳 188	Temp 温度(°C) 196	HARDNESS (HB) 硬度 165 166 168
527	384	34	74							
Test Piece No. 试样号	Gauge length 标距(mm)	Diameter 直径 (mm)	length of reduced section 缩减(mm)							
18070231-2	50	12.50	55							

**Analysis for Plating 镀层分析**

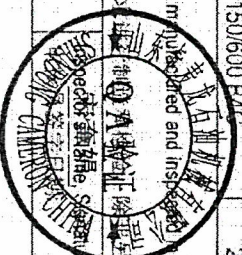
Actual 实测	Thickness 厚度	Heat Treatment Temperature 热处理温度	Heat Treatment time 热处理时间
/	/	/	/

PO Item No. 订单行号	Your Item No. 你们的行号	Description 描述	Part Number 零件号	Quantity 数量
00030	E06005-30	BODY 04 150/600 P4G	2301866-04-06-01 REV.03	28

**Remarks 备注:**

We hereby certified that the items described herein have been manufactured and inspected in accordance with the specifications and requirements called for against the above order unless otherwise stated.  
在此声明我们以上订单所描述的产品均按照规格和要求进行说明。

Inspector's Name, Signature & Date  
检查员签字日期:



Inspector's Name, Signature & Date  
检查员签字日期: 2018.10.8

Conforms with ASME  
Sec. II, Part A 2017 Edition  
OCT 08 2019

INSPECTION CERTIFICATE

JIANGSU YINGLIU MACHINE  
MANUFACTURING CO., LTD.  
江苏应流机械制造有限公司

QUALITY CONTROL DEPARTMENT  
检验证明书 (质量控制部)

Company's OMS certified body—ISO9001  
N公司质量管理体系认证号: N020333 3000A-Q-REC/CHAD/001

Purchaser: 买方

Cert. No. 证书号: 18072002  
Date 日期: 2018. 07. 20

Certificate type 证书类型: EN 10204 C2.1  
3.2  
Meeting practice 检验方法: E.F. D.E.V.D.

Shandong Cameron Petroleum Equipment  
Pte Ltd  
山东卡麦龙石油机械有限公司

Purchase Order No. 订单号: 4512020567  
Our Job No. 工单号: YC2718271

Certificate type 证书类型: EN 10204 C2.1  
3.2  
Meeting practice 检验方法: E.F. D.E.V.D.

CHEMICAL ANALYSIS 化学分析

Material 材料规格:	ASTM A350 LF2		Desl No.炉号:		18-201995		Heat 热处理:		180718-8101		Raw Material Supplier 原材料供应商:		CHANG QIANG			
	C	Mn	Si	Ni	Cr	S	P	Al	Ca	NiO	TI	Sn	V	Nb	N	H
MS-021239-02-04 REV.01	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm
Mn	0.60	0.15														
Max	0.23	1.35	0.30	0.40	0.30	0.02	0.025		0.40	0.12		0.03	0.02			
Heat Analysis 热分析	0.20	0.91	0.23	0.03	0.03	0.006	0.023		0.05							
Product Analysis 产品分析	0.210	0.966	0.204	0.0199	0.0499	0.0021	0.0226		0.0405	0.0012		0.0071	0.0016			
碳当量C.E. (Loag)			0.386		Cr+NiO		0.051		Cr+NiC+Mn+V		0.0071		0.0016		0.114	

HEAT TREATMENT 热处理

Type 类型	Temperature (°C) 温度	Time (Hour) 时间	Cooling Method 冷却方法
Quenching	890	1.75h	Water cooled
Tempering	600	2.25h	Air cooled

MECHANICAL TEST 机械性能测试

MS-011239-02-04 REV.01	UTS a b 抗拉强度 (Mpa)		Yield 屈服强度 (Mpa)		EL 6.5 伸长率 (%)		ROA 4 收缩率 (%)		DIPACT TEST 冲击测试		HARDNESS (HB) 硬度			
	Mile	485	485	275	22	30	30	30	Dir. 方向	Type 类型	Temp. °C 温度	AvenMin 平均值/最小	Min 最小	Max 最大
ACTUAL	520	345	33	79	longitudinal	V	-46°C	140	125	125	154/156/152	143	197	
Test Piece No. 试样号	5-2-40#		Gauge length 标距 (mm)		50.00		Diameter 直径 (mm)		12.50		Length of redaction 退磁 (mm)		60	

Analysis for Piling 硬度分析

Piling specification 电镀锌规范	Standard 标准	Thickness 厚度 (mm)	Heat Treatment Temperature 热处理温度 (°C)
X-31300-01 REV.04	0.001±0.0005	±0	
Actual 实际	0.001		

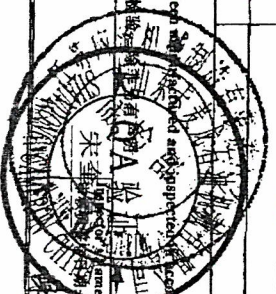
PO Item No. 订单号	Your Item No. 你们的行号	Description 描述	Part Number 零件号	Quantity 数量
10		TRUN 04 180-600 B4C . 025 NI LF2	2301862-04-06-01	75
20		TRUN 03 150-600 B4C . 025 NI LF2	2301862-03-06-01	20

Remarks 备注:

We hereby certified that the items described herein have been inspected and approved in accordance with the specifications and requirements called for against the above order unless otherwise stated.

在此声明我们对以上订单所描述的产品均按照规范和要求进行制造和检验。

Inspector's Name, Signature & Date  
检验员签字日期: 戴金凤 2018. 08. 31



Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 0 8 2019

苏州工业园区托普来表面技术有限公司  
SIP Toplate Surface Technologies co.,Ltd

报告编号: TP-1808310003  
REPORT:TP-1808310003

产品检验合格证

Declaration of Conformity according to EN 10204 2.1

产品名称 Production name	板制		
订单编号 Po.No.	4512020367/20	4512020367/10	
零件编号 Part No.	2301862-03-06-01	301862-04-06-01	
规格 Type	3" LF2 4" LF2		
数量 Quantity	20pcs 75pcs		
出厂批号 Batch No.	VM 180831		
试片号码 Piece No.	TP 180831		
涂层种类 Plate Type	镍磷合金 Ni-PAlloy		

检测 报告

TEST REPORT

According to ASTM B733-04

内容 Inspection Item	检测数据 Test Data
外观 Surface Visual	金黄色 Golden Light
厚度 Thickness	0.001/inch
孔隙率试验及试剂 Porosity Test (ferroxyl)	孔隙率为 0 Hole Rating=0
试片 180° 弯曲试验 Test Piece Bending Test:180°	合格 Pass
热处理参数及硬度 Heat Treatment Parameters and Hardness	温度: / Temp: / 时间: / Time: / 产品表面硬度 HV= / Surface Hardness:HV= /
合金成分 Alloy Component	Ni= 89.5 % P= 10.5 %
检验员: Inspector: 李平	质保签字 Approved: 赵慧慧
检测结果: 合格 Result: Pass	出厂日期: 2018.8.21

经证明材料已按标准和顾客要求进行制造、抽样、检验、和实验。结果材料与采购合同符合要求。

We hereby certify that material was manufactured, sampled tested and inspected in accordance with the material specification and customer pa. Requirements, and was found to meet the requirements.





Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaoxin District,  
Weifang City Shandong Province  
P. R. China, Postcode 261061  
Tel./Fax +86-536-208-0601

## LETTER OF COMPLIANCE

For:

### GROVE BRAND TRUNNION VALVES

#### Model B4, B5-Sour Low Temperature Service

Cameron Valves & Measurement hereby certifies that the design, manufacture, sampling, testing and quality control inspection of the GROVE brand CSA Z245.15 ball valves for Sour Low Temperature Service meet the requirements of CSA Z245.15-13 Sour Service, V&M Engineering Standards, and customer purchase order requirements. As part of compliance to these specifications, the valves are marked in accordance with MSS SP-25. The valves are also marked "SOUR" as required by CSA Z245.15-13 marking requirements for Sour Service and are suitable for use in CSA Z662 Pipeline systems.

The materials of construction for these valves conform to the metallurgical requirements of NACE MR0175/ISO1516:2009 (Parts 1 & 2 for Carbon & Alloy Steels in SSC Region 3 Sour Service and Parts 1 & 3 for CRA's as specified in CSA Z245.15-13 Chapter 13). According to NACE MR0175-2009/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 Z245.15-13 for Category II M45C Service.

The ASTM A320 Grade L7M studs and cap screws and ASTM Grade A194 7ML nuts used in the products specified above have been Quality Control Inspected and meet the requirements of the applicable ASTM specifications-as is already implied fully by the statements above regarding both CSA and NACE standards compliance.

Approved by: \_\_\_\_\_

王振龙

Wang Zhenlong  
Quality manager



**From:**

Schlumberger Canada Limited

3707-97 Street

Edmonton, Alberta,

Canada T6E 6J2

Phone 780.468.2732

Fax 780.450.1359

www.cameron.slb.com

**To:**

MRC CANADA ULC

<b>Date:</b>	Sep 26, 2019
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**Subject:**

<b>Serial Number:</b>	121253220-005,006,007
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<b>Part Number:</b>	2302332-04-06-11
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<b>Description:</b>	B4C 4"x4" 600 RF Oring LF2 DPE WO
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<b>Sales Order:</b>	3735342-000010
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<b>Purchase Order:</b>	C7405629083J0
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<b>Comments:</b>	DT# 88387486
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Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaoxin District, Weifang City  
Shandong Province, P. R. China, Postcode 261061  
Tel/Fax: +86-536-208-0601

## CERTIFICATION OF COMPLIANCE

### API 6D 24TH EDITION/API 607 & NACE MR-0175

Customer Name: CAMERON CANADA CORP.  
CC STO Number: 4710300562  
Sales Order Reference Number: N/A  
Work order number: 121253220

We hereby certify that the materials for component parts and the manufacture of said valves are in compliance with Cameron valves specifications and drawings and meet all requirements of the above referenced customer order. We further certify that the above listed valve(s) are in full conformance with American Petroleum Institute (API) 6D 24th Edition and all addenda (as of this date hereby certified), have been API monogrammed and has/have successfully passed all applicable test in accordance with requirements thereof, including additional customer requirements agreed upon in the above indicated order. Cameron certifies the subject product in compliance with pre-qualified materials of NACE MR0175/ISO15156. This certification does not imply or warrant the application of the product in compliance with NACE MR0175/ISO15156 service conditions in which the customer/user installs the product.

ID	Serial Number	Valve Part Number	Valve Size	Pressure Class	End Conn.	Trim
1	121253220001	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
2	121253220002	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
*	121253220003	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
4	121253220004	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
5	121253220005	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
6	121253220006	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
7	121253220007	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
**	8	121253220008	4"x4"	600	RF x RF	ASTM A350 LF2

WO# 121289395 used to modify Ser#s 001,002,004-008 to new PT# 2302332-04-06-11  
\* WO# 200078574  
\*\* WO# 121390677 used to modify Ser# 008 to new PT# 2302332-04-06-62

王振龙

Signature: \_\_\_\_\_

Name: Wang Zhenlong

Date: 2018.10.31



EC Declaration of Conformity  
Pressure Equipment Directive 97/23/EC

Doc.No.: CVM-QF-A344-093

Revision: 06

Customer Name :

CAMERON CANADA CORP.

PO number: 4710300562

Sales Order Number: N/A

Product Category III Conformity  
Assessment Module H

Notified Body

Manufacture

Authorized Representative

Lloyd's Register Verification  
LTD 71 Frenchurch Street  
London EC3M 4BS UK  
Identification No.0038  
Certification No.  
0038/PED/MUM/0710044/1

Shangdong Cameron Petroleum  
Equipment PTE Ltd. No.880, Beigong  
East Street, Gaoxin District, Weifang City,  
Shandong Province, P.R. China,261061  
Tel:86-536-2080601 Tax:86-  
536-2080617

Cameron Italy S.r.l.  
Via Italo Betto, 11  
I-27058 Voghera - Pavia

We hereby declare that product(s) described below are in conformance with the pressure Equipment Directive

2014/68/EU

Product Model Number	Qty	Serial Number	Technical File No.	Rev.
Grove B4	1	121253220001	B4 Technical file	1
Grove B4	1	121253220002	B4 Technical file	1
Grove B4	1	121253220003	B4 Technical file	1
Grove B4	1	121253220004	B4 Technical file	1
Grove B4	1	121253220005	B4 Technical file	1
Grove B4	1	121253220006	B4 Technical file	1
Grove B4	1	121253220007	B4 Technical file	1
Grove B4	1	121253220008	B4 Technical file	1

Other EC Directives:

Ref. Design Standards: Asme Section VIII Div I, Section II Part D:API 6D, Pipeline Valves

Asme16.34, Valve-Flanged, Threaded, Welding Ends.

QA Representative: Wang Zhenlong

Title: QA Manager

Signature:

Date: 2018.10.31



**EC Declaration of Conformity**

**ATEX 94/9/EC Directive**

Doc. No. **CVM-QF-A344-109**

Revision: **04**

Product Category

II.2.G

Customer Name :

**CAMERON CANADA CORP.**

PO number: **4710300562**

Sales Order Number: **N/A**

Manufacturer

Authorized Representative

**Shandong Cameron Petroleum Equip. Co. Pte Ltd**

South of Beigong East St.

West of Huixian Rd.

Gaoxin Dist. Welfang City

Shandong Prov., P.R., China 261061

Tele: 86 536 2080601

Fax: 86 536 2080617

**Cameron Italy S.r.l.**  
Via Italo Betto, 11  
I-27058 Voghera - Pavia

We hereby declare that the product(s) described below are in conformance with the

**ATEX 94/9/EC Directive.**

Product Model Number	Qty.	Serial Number	Technical File No.	Rev.
GROVE B4	1	121253220001	B4 ATEX Technical File	0
GROVE B4	1	121253220002	B4 ATEX Technical File	0
GROVE B4	1	121253220003	B4 ATEX Technical File	0
GROVE B4	1	121253220004	B4 ATEX Technical File	0
GROVE B4	1	121253220005	B4 ATEX Technical File	0
GROVE B4	1	121253220006	B4 ATEX Technical File	0
GROVE B4	1	121253220007	B4 ATEX Technical File	0
GROVE B4	1	121253220008	B4 ATEX Technical File	0

Other EC Directives: Pressure Equipment Directive 2014/68/EU

Ref. Design Standards: ASME Section VIII Div 1, Section II Part D; API 6D, Pipeline Valves  
ASME B16.34, Valve - Flanged, Threaded, Welding Ends

Authorised Representative: Wang Zhenlong Title: QA Manager

Signature: 王振龙 Date: 2018.10.31

<b>Material:</b> 2302332-04-06-01	<b>Material Rev :</b> 06	<b>Serial number :</b> 121253220007	<b>Customer Verification</b> Customer: Rep: Date: 30 OCT 2018
<b>Description:</b> B4C 4"x4" 600 RF Oring LF2 DPE BARE	<b>Batch ID :</b>		
<b>(Identification):</b>			
<b>Sales Order (Ext ID):</b> 4710300562	<b>Production Order(Desc):</b> 121253220		
<b>IBASE NUMBER:</b> 35981785	<b>Record Compiled By-</b> 193791		

ID#	Material/Description	I-Base	Serial Number	Rev Level	Qty.	Batch / Information
1	2301862-04-06-01 TRUN 04 150-600 B4C .025 NI LF2			04	1.000	18-201995 180718-B1D1
2	2301863-04-15-01 GLAND PLATE 04 150-1500 B4C LF2			03	1.000	18-201995 180830-B1D1
3	2301864-04-15-01 STEM 04 900/1500 B4C LVR 4130 0.025 ENP			04	1.000	V11702046 HT1808005
4	2301865-04-09-01 SEAT RING INNER 04 150-900 B4C DPE LF2			02	2.000	D72-6005V D18012201
5	2301865-04-15-02 SEAT RING OUTER 04 150-1500 B4C DPE LF2			03	2.000	D72-6005V D18012201
6	2301866-04-06-01 BODY 04 150-600 B4C LF2			03	1.000	D82-1959V HT1831093
7	2301867-04-06-01 CLOSURE RF 04 600 B4C DPE LF2			03	2.000	D82-1959V HT1831093
8	9D-292-04025-500C1 BALL 4 150/600 NI/LF2			04	1.000	D72-3411 HT1807012



A Schlumberger Company

Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaoxin District, Weifang City  
Shandong Province, P.R. China, Postcode 261061  
Tel/Fax: +86-536-208-0901

# TEST CERTIFICATE FOR GROVE B4C PRODUCT IN ACCORDANCE WITH EN 10204 3.1

Customer Name: CAMERON CANADA CORP.  
CC STO number: 4710300562  
Sales Order reference number: N/A  
Work order number: 121253220  
Valve Part Number: 2302332-04-06-01  
Valve Serial Number: 121253220007

All valves have been inspected and hydrostatically tested to comply with the specifications and corresponding test parameters indicated below and are certified as satisfactory.

This certification complies with EN 10204 para. 3.1. It was prepared by QA department personnel from tests conducted by a testing department whose supervisor is administratively independent from the Production Manager.

Hydrostatic shell & seat tests and air seat tests conducted in accordance with API 6D

Valve size: 4"x4"	ANSI pressure class: 600
Material specification: ASTM A350 LF2	CWP rating: 1480 psig / 10.21 Mpa
<b>Hydrostatic Shell &amp; Seat Test</b>	
Shell test pressure: 2220 psig / ##### Mpa	Shell test duration: 2 minutes
Seat 'A' test pressure: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Seat 'B' test pressure: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Double Isolation & Bleed (DIB-1) test press.: 1628 psig / ##### Mpa	Seat test duration: 2 minutes
Shell Test Pressure After Relief Valve Fixing: 1628 psig / ##### Mpa	Shell test duration: 2 minutes
<b>Air Seat Test</b>	
Air seat 'A' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Air seat 'B' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes

Note: Pressure Listed above is minimum required. Maximum pressure is not allowed to exceed 1.1 times listed above

Actuator Type: -

Actuator Brand: -

Actuator Figure No.: -

Paint specification: Valve - Yes - Standard (1-Coat), Actuator - Not Applicable

**Additional certification supplied with this order**

Mill Test Reports for Body, Closure, Top Cover, Seat, Ball & Stem

Certificate of Compliance per EN 10204 3.1

Comments

Hydraulic Test Inspector:

Name: Zhang gang sheng

Signature: Zhang Taisi

Date: 2018.10.26

QA/QC Approval:

Name: Song Kuijuan

Signature: Yigong

Date: 2018.10.26

Third Party Witness

Name: \_\_\_\_\_

Signature: Schlumberger-Private

Date: CVM-QE-A344-035B Rev07

06/08/2017

Conforms with ASME  
Sec. II, Part A 2017 Edition  
OCT 0 8 2019

<b>苏州恩威尔机械有限公司</b> Suzhou Enwill Machinery CO.,LTD		<b>INSPECTION CERTIFICATE</b> QUALITY CONTROL DEPARTMENT 检验证明书(质量控制部)		Company's QMS certified body: ISO9001 No 公司质量管理体系证书号: CNB312375-UK No.01	
Purchaser 买方: Shandong Cameron Petroleum Equipment Pie Ltd 山东卡麦龙石油机械有限公司	Cert. No. 证书号:20181008001	Date 日期:2018/10/8	Purchase Order No. 订单号:4511991768	Certificate type 证书类型: EN 10204 <input type="checkbox"/> 2.2 <input checked="" type="checkbox"/> 3.1 <input type="checkbox"/> 3.2	Our Job No. 工单号: <input checked="" type="checkbox"/> EBT+LF+VD+煅铸 <input type="checkbox"/> E.F.V.D

<b>CHEMICAL ANALYSIS 化学分析</b>		Heat No. 炉号: D82-1959V H.T Lot 热处理批次号: HT1831093										Raw Material Supplier 原材料供应商: XINYU XINLIANG SPECIAL STEEL CO.,LTD.																			
Material 材料规范: ASTM A350 LF2																															
MS-021239-02-04 Rev 01	C	Mn	Si	Ni	Cr	S	P	Al	Cu	Mo	Ti	Sr	V	Nb	Ni	H	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm
MIN	/	0.60	0.15	/	/	/	/	/	/	/	/	/	/	/	/	/															
MAX	0.23	1.35	0.30	0.40	0.30	0.02	0.025	/	0.40	0.12	/	/	0.03	0.02	/	/															
Heat Analysis 渣包分析	0.19	0.98	0.25	0.016	0.06	0.006	0.019		0.004	0.002			0.001	0.006																	
Product Analysis 产品分析	0.186	0.96	0.22	0.02	0.037	0.005	0.012		0.006	0.002			0.001	0.001																	
碳当量 C.E. (Long) = 0.356	C+Mn=0.039										Cu+Ni+Cr+Mo+V=0.066																				

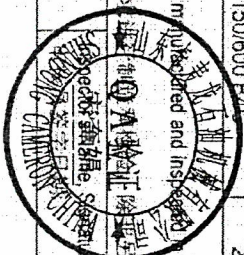
<b>HEAT TREATMENT 热处理</b>		Temperature (°C) 温度	Time (Hour) 时间	Cooling Method 冷却方法
Type 类型	Quench	900 °C	3.0 H	Water Cooling
	Temper	620 °C	3.5 H	Air Cooling

<b>MECHANICAL TEST 机械性能测试</b>										<b>IMPACT TEST 冲击测试</b>																							
UTSob					YSos					EL65					ROAUp					From QTC 试样: <input checked="" type="checkbox"/>					From Piece 本体: <input type="checkbox"/>								
抗拉强度 (Mpa)		屈服强度 (Mpa)		伸长率 (%)		收缩率 (%)		Dir. 方向		Type 类型		Temp °C 温度		Ave/Min 平均/最小		Min 最小		Max 最大		Dir. 方向		Temp °C 温度		Temp °C 温度		Temp °C 温度		Temp °C 温度		Temp °C 温度		Temp °C 温度	
527		384		34		74		L		V		46 °C		202   188   196		165   166   168		L															

<b>Analysis for Plating 镀层分析</b>		Thickness 厚度	Heat Treatment Temperature 热处理温度	Heat Treatment time 热处理时间
Actual 实际	PO Item No. 订单行号	Your Item No. 你们的行号	Description 描述	Part Number 零件号
	00030	E06005-30	BODY 04 150/600 BAC	2301866-04-06-01 REV.03
Quantity 数量		28		

Remarks 备注:  
We hereby certified that the items described herein have been manufactured and inspected in accordance with the specifications and requirements called for against the above order unless otherwise stated  
在此声明我们以上订单所描述的产成品均按照规格和要求制造和检验符合说明。

Inspector's Name, Signature & Date  
检查员签字日期: 2018.10.8





Conforms with ASME  
 Sec. II, Part A 2017 Edition  
 OCT 08 2019

INSPECTION CERTIFICATE

JIANGSU YINGLIU MACHINE  
 MANUFACTURING CO., LTD.  
 江苏应流机械股份有限公司

QUALITY CONTROL DEPARTMENT  
 检验证明书 (质量控制部)

Company's OMS certified body: ISO9001  
 No. 公司质量管理体系证书号: NQ203332008AQ-RQC-BAAR001

Purchaser: 买方  
 Shandong Cameron Petroleum Equipment  
 山东卡麦龙石油机械有限公司

Cert. No. 证书号  
 18072002  
 Date 日期  
 2018. 07. 20

Certificate type 证书类型: EN 10204 C2.1  
 3.2  
 Marking practice 标识方法: E.P. R.R.V.D.

CHEMICAL ANALYSIS 化学分析

Material 材料规范:	ASTM A560 LF2	Heat No. 炉号:	HITel 热处理批次号:											Raw Material Supplier 原材料供应商:	CHANG QIANG						
			18-201995	C	Mn	Si	Ni	Cr	S	P	Al	Ca	Mg			Ti	5a	V	Nb	N	H
MS-02139-02-04 REV.01	C	Mn	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	
Min			0.60	0.15																	
Max			1.35	0.30	0.40	0.30	0.02	0.025		0.40	0.12										
Heat Analysis 热分析	0.20	0.91	0.23	0.03	0.03	0.006	0.023		0.05												
Product Analysis 产品分析	0.210	0.966	0.204	0.0199	0.0499	0.0021	0.0226		0.0405	0.0012											
碳当量 C.E. (Ceq)			0.386						Cr+Ni	0.051											
									Cr+Ni+Cr+Mo+V	0.0071	0.0016										0.114

HEAT TREATMENT 热处理

Type 类型	Temperature (°C) 温度	Time (Hour) 时间	Cooling Method 冷却方法
Quenching	890	1.75h	Water cooled
Tempering	600	2.25h	Air cooled

MECHANICAL TEST 机械性能测试

MS-01239-02-04 REV.01	UTS o/b 抗拉强度 (Mpa)	Yield 屈服强度 (Mpa)	EL 6.5 伸长率 (%)	ROA ↓ 收缩率 (%)	Dir. 方向	IMPACT TEST 冲击测试		HARDNESS (HB) 硬度			
						Type 类型	Temp. °C 温度				
Min	485	275	22	30	longitudinal	V	-46°C	217/27	Min 最小 Max 最大		
Max	655								143 197		
ACTUAL	520	365	33	79	longitudinal	V	-46°C	140 125 125	154/156/152		
Test Piece No. 试样号	5-240#	Gauge length 标距 (mm)	50.00	Diameter 直径 (mm)	12.50	Length of reduction 缩减长度 (mm)	60	Temp 温度 (°C)	20	Direction 方向	切

Analysis for Piling 硬度分析

Piling specification 电液标准	Standard 标准	Thickness 厚度 (mm)	Heat Treatment Temperature 热处理温度 (°C)	
X-31200-01 REV.04	0.001+0.0005	-0		
Actual 实际	0.001			
PO Item No. 订单行号	Your Item No. 你们的行号	Description 描述	Part Number 零件号	Quantity 数量
10		TRIM 04 150-600 B4C .025 NI LF2	2301842-04-06-01	1.75
20		TRIM 03 150-600 B4C .025 NI LF2	2301842-03-06-01	20

Remarks 备注:

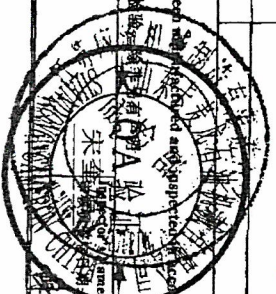
We hereby certified that the items described herein have been inspected and reported in accordance with the specifications and requirements called for against the above order unless otherwise stated.  
 在此声明我们对以上订单所描述的产品均按照规范和要求进行制造和检验。

Inspector's Name, Signature & Date

靳金凤 2018. 08. 31

Inspector's Name, Signature & Date

靳金凤 2018. 08. 31



Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 0 8 2019

苏州工业园区托普来表面技术有限公司  
SIP Toplate Surface Technologies co.,Ltd

报告编号: TP-1808310003  
REPORT:TP-1808310003

产品检验合格证

Declaration of Conformity according to EN 10204 2.1

产品名称 Production name	板翅
订单编号 Po.No.	4512020367/20 4512020367/10
零件编号 Part No.	2301862-03-06-01 301862-04-06-01
规格 Type	3° LF2 4° LF2
数量 Quantity	20pcs 75pcs
出厂批号 Batch No.	VM180831
试片号码 Piece No.	TP180831
涂层种类 Plate Type	镍磷合金 Ni-PAlloy

检测报告

TEST REPORT

According to ASTM B733-04

内容 Inspection Item	检测数据 Test Data
外观 Surface Visual	金黄色 Golden Light
厚度 Thickness	0.001inch
孔隙率试验及试剂 Porosity Test (ferroxyl)	孔隙率为 0 Hole Rating=0
试片 180° 弯曲试验 Test Piece Bending Test:180°	合格 Pass
热处理参数及硬度 Heat Treatment Parameters and Hardness	温度: / Temp: / 时间: / Time: / 产品表面硬度 HV= / Surface Hardness HV= /
合金成分 Alloy Component	Ni= 89.5 % P= 10.5 %
检验员: Inspector: 李平	质检签字: 赵慧慧
检测结果: 合格	出厂日期: 2018.8.21
Result: Pass	Date: 2018.8.21

兹证明材料已按照标准和顾客要求进行制造、抽样、检验、和实验。结果材料与采购合同符合要求。

We hereby certify that material was manufactured, sampled tested and inspected in accordance with the material specification and customer po. Requirements, and was found to meet the requirements.



Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaixin District,  
Weifang City Shandong Province  
P. R, China, Postcode 261061  
Tel./Fax +86-536-208-0601

## LETTER OF COMPLIANCE

For:

### GROVE BRAND TRUNNION VALVES

#### Model B4, B5-Sour Low Temperature Service

Cameron Valves & Measurement hereby certifies that the design, manufacture, sampling, testing and quality control inspection of the GROVE brand CSA Z245.15 ball valves for Sour Low Temperature Service meet the requirements of CSA Z245.15-13 Sour Service, V&M Engineering Standards, and customer purchase order requirements. As part of compliance to these specifications, the valves are marked in accordance with MSS SP-25. The valves are also marked "SOUR" as required by CSA Z245.15-13 marking requirements for Sour Service and are suitable for use in CSA Z662 Pipeline systems.

The materials of construction for these valves conform to the metallurgical requirements of NACE MR0175/ISO1516:2009 (Parts 1 & 2 for Carbon & Alloy Steels in SSC Region 3 Sour Service and Parts 1 & 3 for CRA's as specified in CSA Z245.15-13 Chapter 13). According to NACE MR0175-2009/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 Z245.15-13 for Category II M45C Service.

The ASTM A320 Grade L7M studs and cap screws and ASTM Grade A194 7ML nuts used in the products specified above have been Quality Control Inspected and meet the requirements of the applicable ASTM specifications--as is already implied fully by the statements above regarding both CSA and NACE standards compliance.

Approved by: \_\_\_\_\_

王振龙

Wang Zhenlong  
Quality manager



**From:**  
Schlumberger Canada Limited  
3707-97 Street  
Edmonton, Alberta,  
Canada T6E 6J2  
Phone 780.468.2732  
Fax 780.450.1359  
www.cameron.slb.com

**To:**  
MRC CANADA ULC

<b>Date:</b>	Sep 26, 2019
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**Subject:**

<b>Serial Number:</b>	121253220-005,006,007
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<b>Part Number:</b>	2302332-04-06-11
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<b>Description:</b>	B4C 4"x4" 600 RF Oring LF2 DPE WO
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<b>Sales Order:</b>	3735342-000010
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<b>Purchase Order:</b>	C7405629083J0
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<b>Comments:</b> DT# 88387486
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Shandong Cameron Petroleum Equipment Pte Ltd  
Beijing East Street 880#, Gaoxin District, Weifang City  
Shandong Province, P. R. China, Postcode 261061  
Tel/Fax: +86-536-208-0601

## CERTIFICATION OF COMPLIANCE

### API 6D 24TH EDITION/API 607 & NACE MR-0175

Customer Name: CAMERON CANADA CORP.  
CC STO Number: 4710300562  
Sales Order Reference Number: N/A  
Work order number: 121253220

We hereby certify that the materials for component parts and the manufacture of said valves are in compliance with Cameron valves specifications and drawings and meet all requirements of the above referenced customer order. We further certify that the above listed valve(s) are in full conformance with American Petroleum Institute (API) 6D 24th Edition and all addenda (as of this date hereby certified), have been API monogrammed and has/have successfully passed all applicable test in accordance with requirements thereof, including additional customer requirements agreed upon in the above indicated order.

Cameron certifies the subject product in compliance with pre-qualified materials of NACE MR0175/ISO15156. This certification does not imply or warrant the application of the product in compliance with NACE MR0175/ISO15156 service conditions in which the customer/user installs the product.

ID	Serial Number	Valve Part Number	Valve Size	Pressure Class	End Conn.	Trim
1	121253220001	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
2	121253220002	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
* 3	<del>121253220003</del>	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
4	121253220004	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
5	121253220005	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
6	121253220006	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
7	121253220007	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
** 8	121253220008	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2

WO# 121289395 used to modify Ser#s 001,002,004-008 to new PT# 2302332-04-06-11

\* WO# 200078574

\*\* WO# 121390677 used to modify Ser# 008 to new PT# 2302332-04-06-62

王振龙

Signature: \_\_\_\_\_

Name: Wang, Zhenlong

Date: 2018.10.31



EC Declaration of Conformity  
Pressure Equipment Directive 97/23/EC

Doc.No.: CVM-QF-A344-093

Revision: 06

Product Category III Conformity  
Assessment Module H

Customer Name :

CAMERON CANADA CORP.

PO number: 4710300562

Sales Order Number: N/A

Notified Body

Manufacture

Authorized Representative

Lloyd's Register Verification  
LTD 71 Frenchurch Street  
London EC3M 4BS UK  
Identification No.0038  
Certification No.  
0038/PED/MUM/071004/1

Shandong Cameron Petroleum  
Equipment PTE Ltd. No.880, Beigong  
East Street, Gaoxin District, Weifang City,  
Shandong Province, P.R. China,261061  
Tel:86-536-2080601 Tax:86-  
536-2080617

Cameron Italy S.r.l.  
Via Italo Betto, 11  
I-27058 Voghera - Pavia

We hereby declare that product(s) described below are in conformance with the pressure Equipment Directive

2014/68/EU

Product Model Number	Qty	Serial Number	Technical File No.	Rev.
Grove B4	1	121253220001	B4 Technical file	1
Grove B4	1	121253220002	B4 Technical file	1
Grove B4	1	121253220003	B4 Technical file	1
Grove B4	1	121253220004	B4 Technical file	1
Grove B4	1	121253220005	B4 Technical file	1
Grove B4	1	121253220006	B4 Technical file	1
Grove B4	1	121253220007	B4 Technical file	1
Grove B4	1	121253220008	B4 Technical file	1

Other EC Directives:

Ref. Design Standards: Asme Section VIII Div I, Section II Part D:API 6D, Pipeline Valves

Asme16.34, Valve-Flanged, Threaded, Welding Ends.

QA Representative: Wang Zhenlong

Title: QA Manager

Signature:

Date: 2018.10.31



EC Declaration of Conformity  
ATEX 94/9/EC Directive

Doc. No. CVM-QF-A344-109

Revision: 04

Product Category  
II.2.G

Customer Name :

CAMERON CANADA CORP.

PO number: 4710300562

Sales Order Number: N/A

Manufacturer

Authorized Representative

Shandong Cameron Petroleum Equip. Co. Pte Ltd

South of Beigong East St.

West of Huixian Rd.

Gaoxin Dist. Weifang City

Shandong Prov., P.R., China 261061

Tele: 86 536 2080601

Fax: 86 536 2080617

Cameron Italy S.r.l.  
Via Italo Betto, 11  
I-27058 Voghera - Pavia

We hereby declare that the product(s) described below are in conformance with the

ATEX 94/9/EC Directive.

Product Model Number	Qty.	Serial Number	Technical File No.	Rev.
GROVE B4	1	1212533220001	B4 ATEX Technical File	0
GROVE B4	1	1212533220002	B4 ATEX Technical File	0
GROVE B4	1	1212533220003	B4 ATEX Technical File	0
GROVE B4	1	1212533220004	B4 ATEX Technical File	0
GROVE B4	1	1212533220005	B4 ATEX Technical File	0
GROVE B4	1	1212533220006	B4 ATEX Technical File	0
GROVE B4	1	1212533220007	B4 ATEX Technical File	0
GROVE B4	1	1212533220008	B4 ATEX Technical File	0

Other EC Directives: Pressure Equipment Directive 2014/68/EU

Ref. Design Standards: ASME Section VIII Div 1, Section II Part D; API 6D, Pipeline Valves  
ASME B16.34, Valve - Flanged, Threaded, Welding Ends

Authorised Representative: Wang Zhenlong Title: QA Manager

Signature: 王振龙 Date: 2018.10.31

<b>Material:</b> 2302332-04-06-01	<b>Material Rev :</b> 06	<b>Serial number :</b> 121253221002	<b>Customer Verification</b> Customer: Rep: Date: 29 OCT 2018
<b>Description:</b> B4C 4"x4" 600 RF Oring LF2 DPE BARE	<b>Batch ID :</b>		
<b>(Identification):</b>			
<b>Sales Order (Ext ID):</b> 4710300562	<b>Production Order(Desc):</b> 121253221		
<b>IBASE NUMBER:</b> 35959608	<b>Record Compiled By-</b> 193791		

ID#	Material/Description	I-Base	Serial Number	Rev Level	Qty.	Batch / Information
1	2301862-04-06-01 TRUN 04 150-600 B4C .025 NI LF2			04	1.000	18-201995 180718-B1D1
2	2301863-04-15-01 GLAND PLATE 04 150-1500 B4C LF2			03	1.000	18-201995 180830-B1D1
3	2301864-04-15-01 STEM 04 900/1500 B4C LVR 4130 0.025 ENP			04	1.000	V11702046 HT1808005
4	2301865-04-09-01 SEAT RING INNER 04 150-900 B4C DPE LF2			02	2.000	D72-6005V D18012201
5	2301865-04-15-02 SEAT RING OUTER 04 150-1500 B4C DPE LF2			03	2.000	D72-6005V D18012201
6	2301866-04-06-01 BODY 04 150-600 B4C LF2			03	1.000	D82-1959V HT1831093
7	2301867-04-06-01 CLOSURE RF 04 600 B4C DPE LF2			03	2.000	D82-1959V HT1831093
8	9D-292-04025-500C1 BALL 4 150/600 NI/LF2			04	1.000	18-202585 18072601





Shandong Cameron Petroleum Equipment Pte Ltd  
 Beigong East Street 880#, Gaoxin District, Weifang City  
 Shandong Province, P.R. China, Postcode 261061  
 Tel/Fax: +86-536-208-0601

# TEST CERTIFICATE FOR GROVE B4C PRODUCT IN ACCORDANCE WITH EN 10204 3.1

Customer Name: CAMERON CANADA CORP.  
 CC STO number: 4710300562  
 Sales Order reference number: N/A  
 Work order number: 121253221  
 Valve Part Number: 2302332-04-06-01  
 Valve Serial Number: 121253221002

All valves have been inspected and hydrostatically tested to comply with the specifications and corresponding test parameters indicated below and are certified as satisfactory  
 This certification complies with EN 10204 para. 3.1. It was prepared by QA department personnel from tests conducted by a testing department whose supervisor is administratively independent from the Production Manager.  
 Hydrostatic shell & seat tests and air seat tests conducted in accordance with API 6D

Valve size: 4"x4"	ANSI pressure class: 600
Material specification: ASTM A350 LF2	CWP rating: 1480 psig / 10.21 Mpa
<b>Hydrostatic Shell &amp; Seat Test</b>	
Shell test pressure: 2220 psig / #### Mpa	Shell test duration: 2 minutes
Seat 'A' test pressure: 1628 psig / #### Mpa	Seat test duration: 2 minutes
Seat 'B' test pressure: 1628 psig / #### Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 1628 psig / #### Mpa	Seat test duration: 2 minutes
Double Isolation & Bleed (DIB-1) test press.: 1628 psig / #### Mpa	Seat test duration: 2 minutes
Shell Test Pressure After Relief Valve Fixing: 1628 psig / #### Mpa	Shell test duration: 2 minutes
<b>Air Seat Test</b>	
Air seat 'A' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Air seat 'B' test pressure: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes
Double Block & Bleed (DBB) test press.: 80 psig / 0.55 Mpa	Seat test duration: 2 minutes

Note: Pressure Listed above is minimum required. Maximum pressure is not allowed to exceed 1.1 times listed above  
 Actuator Type: - Actuator Brand: -  
 Paint specification: Valve - Standard (1-Coat), Actuator - Not Applicable  
**Additional certification supplied with this order**

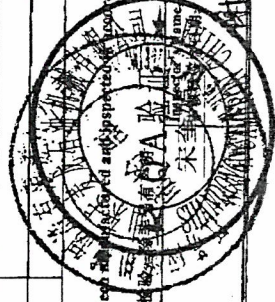
Mill Test Reports for Body, Closure, Top Cover, Seat, Ball & Stem  
 Certificate of Compliance per EN 10204 3.1

**Comments**

Hydraulic Test Inspector: \_\_\_\_\_ Signature: 张庆江 Date: 2018.10.26  
 Name: Shengqing Jiang  
 QA/QC Approval: \_\_\_\_\_ Signature: Wang Date: 2018.10.26  
 Name: Song Kuijuan  
 Third Party Witness \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name: \_\_\_\_\_ Signature: Private Date: CAM-QE-A344-035B-REV07

OCT 08 2019

JIANGSU YINLIU MACHINE MANUFACTURING CO., LTD. 江苏盈流机械制造有限公司		INSPECTION CERTIFICATE QUALITY CONTROL DEPARTMENT 检验证明书 (质量控制部)				Company's OMS certified body—ISO9001 本公司质量管理体系认证证书—ISO9001			
Purchaser: 买方 Shandong Cameron Petroleum Equipment 山东卡麦龙石油机械有限公司		Cert. No. 证书号 18072002		Date 日期 2018.07.20		Certificate type 证书类型 EN 10204 Q2.2. 3.1		Mfg. practices 制造方法 EN 10204 Q2.2. 3.2	
Purchase Order No. 订单号 4512020847		Our Job No. 工单号 YC27LB271		EN 10204 Q2.2. 3.1		EN 10204 Q2.2. 3.2		Mfg. practices 制造方法 EN 10204 Q2.2. 3.1	
CHEMICAL ANALYSIS 化学成分									
Material 材料牌号 ASTM A350 LF2		Heat No. 炉号 18-201995		H.T. Lot 热处理批号 180718-B101		Raw Material Supplier 原料供应商 CHANG QIANG			
C %		Si %		Mn %		P %		S %	
0.23		0.30		0.40		0.02		0.025	
Heat Analysis 热分析		0.20		0.03		0.006		0.023	
Product Analysis 产品分析		0.210		0.0199		0.0499		0.0021	
Cr+Mo		0.385		0.051		0.0012		0.0021	
Ni+Cu		0.0016		0.0016		0.0016		0.0016	
HEAT TREATMENT 热处理									
Type 类型		Temperature (°C) 温度		Time (Hour) 时间		Cooling Method 冷却方法			
Quenching		890		1.75h		Water cooled			
Tempering		600		2.25h		Air cooled			
MECHANICAL TEST 机械性能测试									
From QTC 试样: 圆									
UTS o b 抗拉强度 (Mpa)		Yield 屈服强度 (Mpa)		EL 65 伸长率 (%)		ROA 收缩率 (%)		IMPACT TEST 冲击测试	
485		276		22		30		Type 类型: V	
655		365		33		79		Temp °C 温度: -46°C	
UTS o b 抗拉强度 (Mpa)		Yield 屈服强度 (Mpa)		EL 65 伸长率 (%)		ROA 收缩率 (%)		IMPACT TEST 冲击测试	
820		365		33		79		Type 类型: V	
Temp °C 温度: -46°C		Dir. 方向: longitudinal		Temp °C 温度: -46°C		Dir. 方向: longitudinal		Temp °C 温度: -46°C	
HARDNESS (HB) 硬度		HARDNESS (HB) 硬度		HARDNESS (HB) 硬度		HARDNESS (HB) 硬度		HARDNESS (HB) 硬度	
143		143		143		143		143	
197		197		197		197		197	
Analysis for Plating 镀层分析									
Test Piece No. 试样号		Gauge length 标距 (mm)		Diameter 直径 (mm)		Length of red neck section 红颈段长度 (mm)		Temp 温度 (°C)	
5-240#		50.00		12.50		60		20	
Plating specification 电镀规范		Thickness 厚度 (in)		Heat Treatment Temperature 热处理温度 (°C)		Heat Treatment time 热处理时间 (h)			
X-31300-01 REV.04		0.001-0.0005 /-0		0.001		20			
Standard 标准		Actual 实际		Your Item No. 您的行号		Part Number 零件号		Quantity 数量	
0.001-0.0005 /-0		0.001		TRUN 04 150-600 B4C .025 NI LF2		2301862-04-06-01		175	
0.001		0.001		TRUN 03 150-600 B4C .025 NI LF2		2301862-03-06-01		20	
Remarks 备注: We hereby certified that the items described herein have been inspected and approved in accordance with the specifications and requirements called for against the above order unless otherwise stated. 在此声明我们以上订单所描述的产品均按照规范和要求进行制造和检验。									
Inspector's Name, Signature & Date 检查员签字日期: 戴金凤 2018.08.31									



戴金凤 2018.08.31

苏州工业园区托普来表面技术有限公司  
SIP Toplate Surface Technologies co.,Ltd

报告编号: TP-1808310003  
REPORT:TP-1808310003

产品检验合格证

Declaration of Conformity according to EN 10204 2.1

产品名称 Production name	板轴		
订单编号 Po.No.	4512020367-20	4512020367-10	
部件编号 Part No.	2301862-03-06-01 301862-04-06-01		
规格 Type	3" LF2 4" LF2		
数量 Quantity	20pcs 75pcs		
出厂批号 Batch No.	VM 180831		
试片号码 Piece No.	TP 180831		
涂层种类 Plate Type	镍磷合金 Ni-PAlloy		

检测报告

TEST REPORT

According to ASTM B733-04

内容 Inspection Item	检测数据 Tests Data
外观 Surface Visual	色泽 Color Golden Light
厚度 Thickness	0.001inch
孔隙率试验及试剂 Porosity Test (ferroxyl)	孔隙率为 0 Hole Rating=0
试片 180° 弯曲试验 Test Piece Bending Test 180°	合格 Pass
热处理参数及硬度 Heat Treatment Parameters and Hardness	温度: / Time: / 产品表面硬度:HV= / Surface Hardness:HV=
合金成分 Alloy Component	Ni= 89.5 % P= 10.5 %
检验员: 李平	质保签字: 赵慧恩
检验结果: 合格	Approved: 赵慧恩
Result: Pass	出厂日期: 2018.8.24 Date

兹证明材料已按标准和顾客要求进行了制造、抽样、检验、和试验。经来料材料与采购合同符合要求。  
We hereby certify that material was manufactured, sampled tested and inspected in accordance with the material specification and customer po. Requirements, and was found to meet the requirements.

OCT 08 2019

INSPECTION CERTIFICATE		QUALITY CONTROL DEPARTMENT		Company's QMS certified body—													
检验证明书 (质量证明书)		ISO9001 No. 公司质量管理体系证书号:		CNBJ312375-UK No.01													
Cert. No. 证书号: 20181008001		Date 日期: 2018/10/8		Certificate type 证书类型: EN 10204													
Purchase Order No. 订单号: 4511991768		Our Job No. 工单号:		Melting practice 熔炼方法													
Shandong Cameron Petroleum Equipment Pte Ltd 山东卡麦龙石油机械有限公司				☑ EBT+LF+VD+模铸 □ E.F.V.D													
<b>CHEMICAL ANALYSIS 化学分析</b>																	
Material 材料规范: ASTM A350 LF2		Heat No. 炉号: D82-1959V		Raw Material Supplier 原材料供应商: XINYU XINLIANG SPECIAL STEEL CO., LTD.													
MS-021239-02-04		H.T. Lot 热处理批次号: HT1831093															
Rev 01	C %	Mn %	Si %	Ni %	Cr %	S %	P %	Al %	Cu %	Mo %	Ti %	Sn %	V %	Nb %	N %	H %	
MIN	/	0.60	0.15	/	/	/	/	/	/	/	/	/	/	/	/	/	/
MAX	0.23	1.35	0.30	0.40	0.30	0.02	0.025	/	0.40	0.12	/	/	0.03	0.02	/	/	/
Heat Analysis 浇包分析	0.19	0.98	0.25	0.016	0.06	0.006	0.019		0.004	0.002			0.001	0.006			
Product Analysis 产品分析	0.185	0.96	0.22	0.02	0.037	0.005	0.012		0.005	0.002			0.001	0.001			
碳当量 C.E. (Long) = 0.356		Cr+Mo=0.039		Cu+Ni+Cr+Mo+V=0.066													
<b>HEAT TREATMENT 热处理</b>																	
Type 类型	Temperature (°C) 温度	Time (Hour) 时间	Cooling Method 冷却方法														
Quench	900 °C	3.0 H	Water Cooling														
Temper	620 °C	3.5 H	Air Cooling														
<b>MECHANICAL TEST 机械性能测试</b>																	
From QTC 试棒: ☑						From Piece 本体: □											
UTS <sub>cb</sub> 抗拉强度 (Mpa)		YS <sub>0.2s</sub> 屈服强度 (Mpa)		ROA <sub>ψ</sub> 收缩率 (%)		IMPACT TEST 冲击测试		Temp °C 温度		Avr/Min 平均/最小		HARDNESS (HB) 硬度		Min 最小		Max 最大	
485	275	22	/	30	/	Dir. 方向	Type 类型	Temp °C 温度	-46 °C	27J / 27J	143	197					
655	/	/	/	/	/	L	V	-46 °C									
UTS <sub>0.2b</sub> 抗拉强度 (Mpa)		YS <sub>0.2s</sub> 屈服强度 (Mpa)		ROA <sub>ψ</sub> 收缩率 (%)		IMPACT TEST 冲击测试		Temp °C 温度		Joules 焦耳		HARDNESS (HB) 硬度		165		166	
527	384	34	74	74	74	Dir. 方向	Type 类型	Temp °C 温度	-48 °C	202	188	196	Direction 方向		L		
Test Piece No. 试样号		Gauge length 标距(mm)		Diameter 直径 (mm)		length of reduced section 缩颈(mm)		Temp 温度(°C)									
18070231-2		50		12.50		55		20 °C									
<b>Analysis for Plating 镀层分析</b>																	
Actual 实测		Thickness 厚度		Heat Treatment Temperature 热处理温度		Heat Treatment time 热处理时间											
PO Item No. 订单行号		Your Item No. 你们的行号		Description 描述		Part Number 零件号		Quantity 数量									
00030		E06005-30		BODY 04 150/600 R4C		2301866-04-06-01 REV.03		28									
Remarks 备注:						We hereby certified that the items described herein have been manufactured and inspected in accordance with the specifications and requirements called for against the above order unless otherwise stated.						在此声明我们以上订单所描述的产品均按照规范和要点对应的进行了说明。					
Surveyor's Name, Signature & Date 检查员签字日期: <i>Frank Ditz</i> 2018.10.8						Inspector's Name, Signature & Date 检验员签字日期: <i>for</i> 2018.10.8											

OCT 08 2019

<b>INSPECTION CERTIFICATE</b> QUALITY CONTROL DEPARTMENT 检验证明书(质量控制部)		Company's QMS certified body— ISO9001 No 公司质量管理体系证书号: CNBJ312375-UK No.01															
Cert. No. 证书号:20180809003	Date 日期:2018/8/9	Purchase Order No. 订单号:451991768															
Purchaser 买方: Shandong Cameron Petroleum Equipment Pte Ltd 山东卡麦龙石油机械有限公司		Melting practice 熔炼方法 <input checked="" type="checkbox"/> EB+LF+VD+模铸 <input type="checkbox"/> E.F.V.D															
<b>CHEMICAL ANALYSIS 化学分析</b>																	
Material 材料规范: ASTM A350 LF2	Heat No. 炉号: D82-1959V H.T.Lot 热处理批次号: HT1831093	Raw Material Supplier 原材料供应商: XINYU XINLIANG SPECIAL STEEL CO.,LTD.															
MS-021230-04-04 REV.01	C % 0.23	Mn % 0.60	Si % 0.15	Ni % /	Cr % /	S % /	P % 0.025	Al % /	Cu % /	Mo % /	Ti % /	Sn % /	V % /	Nb % /	N % /	H ppm /	
MAX Heat Analysis 浇包分析	C % 0.19	Mn % 0.98	Si % 0.25	Ni % 0.016	Cr % 0.06	S % 0.006	P % 0.019	Al % /	Cu % 0.40	Mo % 0.12	Ti % /	Sn % /	V % 0.03	Nb % 0.02	N % /	H ppm /	
Product Analysis 产品分析	C % 0.186	Mn % 0.96	Si % 0.22	Ni % 0.02	Cr % 0.037	S % 0.005	P % 0.012	Al % /	Cu % 0.006	Mo % 0.002	Ti % /	Sn % /	V % 0.001	Nb % 0.001	N % 0.006	H ppm /	
碳当量 C.E.(Long) = 0.367				Cr+Mo=0.039				Cu+Ni+Cr+Mo+V= 0.066									
<b>HEAT TREATMENT 热处理</b>																	
Type 类型		Temperature (°C) 温度		Time (hour) 时间		Cooling Method 冷却方法											
Quench		900 °C		3.0 H		Water Cooling											
Temper		620 °C		3.5 H		Air Cooling											
<b>MECHANICAL TEST 机械性能测试</b>				From QTC 试样: <input checked="" type="checkbox"/>				From Piece 本体: <input type="checkbox"/>									
UTSob 抗拉强度 (Mpa)	YSas 屈服强度	EL65 伸长率	ROAp 收缩率	IMPACT TEST 冲击测试				HARDNESS (HB) 硬度									
	(Mpa)	(%)	(%)	Dir 方向	Type 类型	Temp °C 温度	Avr/Min 平均/最小	Min 最小	Max 最大	Dir 方向	Temp °C 温度	Direction 方向	Min 最小	Max 最大	Dir 方向	Temp °C 温度	Direction 方向
Min 485	/	22	30	L	V	-46°C	27J/27J	143	197	L	20 °C	L	165	166	166	166	168
Max 655	/	/	/	L	V	-46°C	202	188	196	L	20 °C	L	155	166	166	166	168
ACTUAL 实测		UTSob 抗拉强度 (Mpa)	YSas 屈服强度	EL65 伸长率	ROAp 收缩率	IMPACT TEST 冲击测试				HARDNESS (HB) 硬度							
527	384	34	74	L	V	-46°C	202	188	196	L	20 °C	L	155	166	166	168	168
Test Piece No. 试样号		Gauge length 标距(mm)		Diameter 直径 (mm)		length of reduced section 缩颈(mm)		Temp 温度(°C)		Direction 方向							
180721-2		50		12.50		55		20 °C		L							
<b>Analysis for Plating 镀层分析</b>																	
Actual 实测		Thickness 厚度		Heat Treatment Temperature 热处理温度		Heat Treatment Time 热处理时间											
PO Item No. 订单行号		Your Item No. 你们的行号		Description 描述				Part Number 部件号		Quantity 数量							
00040		E06005-40		CLOSURE RF 04 600 B4CDE				2301867-04-06-01 REV.03		32							
Remarks 备注:				We hereby certified that the items described herein have been manufactured and inspected in accordance with the specifications and requirements called for against the above order unless otherwise stated. 在此声明我们以上订单所描述的产品均按照规范和要求进行生产和检验,如有说明。				Surveyor's Name, Signature & Date 检查员签字日期:				Signature & Date 签字日期:					
检查员签字日期: 2018.8.9				检查员签字日期: 2018.8.9				检查员签字日期: 2018.8.9				检查员签字日期: 2018.8.9					



Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaoxin District,  
Weifang City Shandong Province  
P.R. China, Postcode 261061  
Tel./Fax +86-536-208-0601

## LETTER OF COMPLIANCE

For:

### GROVE BRAND TRUNNION VALVES

#### Model B4, B5-Sour Low Temperature Service

Cameron Valves & Measurement hereby certifies that the design, manufacture, sampling, testing and quality control inspection of the GROVE brand CSA Z245.15 ball valves for Sour Low Temperature Service meet the requirements of CSA Z245.15-13 Sour Service, V&M Engineering Standards, and customer purchase order requirements. As part of compliance to these specifications, the valves are marked in accordance with MSS SP-25. The valves are also marked "SOUR" as required by CSA Z245.15-13 marking requirements for Sour Service and are suitable for use in CSA Z662 Pipeline systems.

The materials of construction for these valves conform to the metallurgical requirements of NACE MR0175/ISO1516:2009 (Parts 1 & 2 for Carbon & Alloy Steels in SSC Region 3 Sour Service and Parts 1 & 3 for CRA's as specified in CSA Z245.15-13 Chapter 13). According to NACE MR0175-2009/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 Z245.15-13 for Category II M45C Service.

The ASTM A320 Grade L7M studs and cap screws and ASTM Grade A194 7ML nuts used in the products specified above have been Quality Control inspected and meet the requirements of the applicable ASTM specifications-as is already implied fully by the statements above regarding both CSA and NACE standards compliance.

Approved by: \_\_\_\_\_

王振龙

Wang Zhenlong  
Quality manager



**From:** Schlumberger Canada Limited  
3707-97 Street  
Edmonton, Alberta,  
Canada T6E 6J2  
Phone 780.468.2732  
Fax 780.450.1359  
www.cameron.slb.com

**To:** MRC CANADA ULC

<b>Date:</b>	Sep 26, 2019
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**Subject:**

<b>Serial Number:</b>	121253221-002
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<b>Part Number:</b>	2302332-04-06-11
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<b>Description:</b>	B4C 4"x4" 600 RF Oring LF2 DPE WO
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<b>Sales Order:</b>	3735342-000010
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<b>Purchase Order:</b>	C7405629083J0
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<b>Comments:</b> DT# 88387486
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Shandong Cameron Petroleum Equipment Pte Ltd  
Beigong East Street 880#, Gaoxin District, Weifang City  
Shandong Province, P.R. China, Postcode 261061  
Tel/Fax: +86-536-208-0601

## CERTIFICATION OF COMPLIANCE API 6D 24TH EDITION/API 607 & NACE MR-0175

Customer Name: CAMERON CANADA CORP.  
CC STO Number: 4710300562  
Sales Order Reference Number: N/A  
Work order number: 121253221

We hereby certify that the materials for component parts and the manufacture of said valves are in compliance with Cameron valves specifications and drawings and meet all requirements of the above referenced customer order. We further certify that the above listed valve(s) are in full conformance with American Petroleum Institute (API) 6D 24th Edition and all addenda (as of this date hereby certified), have been API monogrammed and has/have successfully passed all applicable test in accordance with requirements thereof, including additional customer requirements agreed upon in the above indicated order. Cameron certifies the subject product in compliance with pre-qualified materials of NACE MR0175/ISO15156. This certification does not imply or warrant the application of the product in compliance with NACE MR0175/ISO15156 service conditions in which the customer/user installs the product.

ID	Serial Number	Valve Part Number	Valve Size	Pressure Class	End Conn.	Trim
** 1	121253221001	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
** 2	121253221002	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
* 3	121253221003	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
* 4	121253221004	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2
* 5	121253221005	2302332-04-06-01	4"x4"	600	RF x RF	ASTM A350 LF2

\* WO# 121288470 used to modify valve Ser# 003,004,005 to new PT# 2302332-04-06-11  
\*\* WO# 121289395 used to modify valve Ser# 001,002 to new PT# 2302332-04-06-11


Signature: \_\_\_\_\_

王振龙

Name: Wang, Zhenlong \_\_\_\_\_

Date: 2018.10.31 \_\_\_\_\_



 <b>CAMERON</b> A Schlumberger Company	EC Declaration of Conformity Pressure Equipment Directive 97/23/EC	Doc.No.: CVM-QF-A344-093 Revision: 06
	Product Category III Conformity Assessment Module H	Customer Name : CAMERON CANADA CORP. PO number: 4710300562 Sales Order Number: N/A
Notified Body Lloyd's Register Verification LTD 71 Frenchurch Street London EC3M 4BS UK Identification No.0038 Certification No. 0038/PED/MUM/0710044/1	Manufacture Shangdong Cameron Petroleum Equipment PTE Ltd. No.880, Beigong East Street, Gaoxin District. Weifang City, Shandong Province, P.R. China,261061 Tel:86-536-2080601 Fax:86- 536-2080617	Authorized Representative Cameron Italy S.r.l. Via Italo Betto, 11 I-27058 Voghera - Pavia

We hereby declare that product(s) described below are in conformance with the pressure Equipment Directive 2014/68/EU

Product Model Number	Qty	Serial Number	Technical File No.	Rev.
Grove B4	1	121253221001	B4 Technical file	1
Grove B4	1	121253221002	B4 Technical file	1
Grove B4	1	121253221003	B4 Technical file	1
Grove B4	1	121253221004	B4 Technical file	1
Grove B4	1	121253221005	B4 Technical file	1

Other EC Directives:

Ref. Design Standards: Asme Section VIII Div I , Section II Part D:API 6D, Pipeline Valves  
Asme16.34, Valve-Flanged, Threaded, Welding Ends.

QA Representative: Wang Zhenlong Title: QA Manager  
 Signature: 王振龙 Date: 2018.10.31



EC Declaration of Conformity  
ATEX 94/9/EC Directive

Doc. No. CVM-QF-A344-109  
Revision: 04

Product Category  
II.2.G

Customer Name :

CAMERON CANADA CORP.

PO number: 4710300562

Sales Order Number: N/A

Manufacturer

Authorized Representative

Shandong Cameron Petroleum Equip. Co. Pte Ltd

South of Beigong East St.  
West of Huixian Rd.  
Gaoxin Dist. Weifang City  
Shandong Prov., P.R., China 261061  
Tele: 86 536 2080601  
Fax: 86 536 2080617


Cameron Italy S.r.l.  
Via Italo Betto, 11  
I-27058 Voghera - Pavia

We hereby declare that the product(s) described below are in conformance with the  
ATEX 94/9/EC Directive.

Product Model Number	Qty.	Serial Number	Technical File No.	Rev.
GROVE B4	1	121253221001	B4 ATEX Technical File	0
GROVE B4	1	121253221002	B4 ATEX Technical File	0
GROVE B4	1	121253221003	B4 ATEX Technical File	0
GROVE B4	1	121253221004	B4 ATEX Technical File	0
GROVE B4	1	121253221005	B4 ATEX Technical File	0

Other EC Directives: Pressure Equipment Directive 2014/68/EU

Ref. Design Standards: ASME Section VIII Div 1, Section II Part D; API 6D, Pipeline Valves  
ASME B16.34, Valve - Flanged, Threaded, Welding Ends

Authorised Representative: Wang Zhenlong  
 Title: QA Manager

Signature: \_\_\_\_\_ Date: 2018.10.31

# HAITIMA CORPORATION ✓

## MATERIAL TEST CERTIFICATE

Page: 2

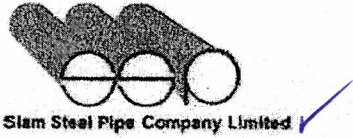
Date: May. 06, 2017

<b>Customer: PRIMROSE ALLOYS, INC. ✓</b>																	
Contract No.			Invoice No.			Material			according to								
#732482			HAT170409			A105N			ASTM A105								
Article: Hot Forged Flange/geschmiedeter Flansch						Specification: ASME B16.5											
State of delivery: HOT FORGED						Melting process/Erschmelzungsart: E						normalized at 910°C±10°C					
Marking: HTM Standard, CLASS, TYPE, SIZE, Material, Heat-No.																	
Stamp of Manufacturer: HTM																	
<b>Content of the Delivery:</b>																	
NO.	Pieces/stueckzahl	Description/Bezeichnung				Heat No/Schmelze-Nr				Test No/ProbeNr							
6	100	600# TH RF 1" ✓				16204088 ✓				BC17Y03501							
7	150	600# TH RF 2" ✓				16204088				BC17Y03501							
8	15	600# WN RF SCHXXS 1-1/2" ✓				16204088				BC17Y03501							
9	25	600# WN RF SCH160 1" ✓				16204088				BC17Y03501							
10	25	150# WN RF SCH40 2" ✓				16204088				BC17Y03501							
<b>Chemical analysis:</b>																	
NO.	Heat No.	%C	%Si	%Mn	%P	%S	%Cr	%Mo	%Ni	%Ti	%Ta	%N	%Co	%Cu	%Al	%Nb	%V
6-10	16204088	0.18 ✓	0.28 ✓	0.94 ✓	0.015 ✓	0.003 ✓	0.013 ✓	0.002 ✓	0.019 ✓					0.010 ✓			0.001 ✓
<b>Mechanical tests: CE = (0.34) ✓</b>																	
NO.	Test No/ProbeNr	Tensile Test: ASTM A370 L=4d				Charpy-impact Test, ISO-V Specimen				Hardness							
		Yield Strength	Tensile Strength	Elong	Red of Area	Kerbschlagversuch, ISO-V-Probe				Haerte							
		N/mm <sup>2</sup>	N/mm <sup>2</sup>	%	%	J		Σ/N		HB							
6-10	BC17Y03501	385 ✓	555 ✓	39.0 ✓	73.0					143 145 156 ✓							
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS.										INSPECTOR		Q.C. MANAGER					
										<i>Yuan Lu</i>		<i>Kanson Chen</i>					

\* MEETS NACE MR0175 ✓

Conforms with ASME  
 Sec. II, Part A 2017 Edition  
 Jan. 17, 2018 KF

1" SCH 80 SA106B HT 17-290126  
 CE=0.27 VT-192 Low



SIAM STEEL PIPE COMPANY LIMITED

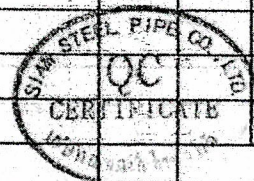
บริษัท สยาม สตีล ไพป์ จำกัด  
 MILL TEST CERTIFICATE

NO:SSP/QR 29-01

ใบรับประกันคุณภาพสินค้า  
 EN10204 3.1

PG 1 of 1

CONTRACT NO.	2017THWM029	PRODUCT	CARBON STEEL SEAMLESS PIPE				SPECIFICATION	ASTM/ASME A/SA106/API 5L	DELIVERY CONDITION		Forming Method	COLD DRAWING						
CUSTOMER	CCD STEEL TRADERS LTD				DATE OF ISSUE	10/07/2017	LICENCE	5L-0971		NO.	2901							
NO.	HEAT NO.	STEEL GRADE	SIZE	QUANTITY	LENGTH (M)	TENSILE TEST			Rys/ts	IMPACT TEST			Hardness					
				PIECES		Y.S Mpa	T.S Mpa	E.L(%)		Or.	SIZE(mm)	AKV(J)	HRC					
1	17-290126	GR.B	1" SCH80	392	2508.8	310	490	32				15						
2	17-290358	GR.B	1" SCH160	183	1171.2	300	495	34				14						
3	17-290473	GR.B	2" SCH80	250	1600	310	485	34				15						
4																		
TOTAL																		
NO.	Analysis	CHEMICAL COMPOSITION (%)										NDT	STRAIGHTNESS	HYDROSTATI C PRESSURE (≥SS)	VISUAL TEST	Bending	DIMENSION & WEIGHT TEST	
		C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V							
1	HEAT	0.19	0.25	0.49	0.013	0.021	0.01	0.03	0.026	0.005	0.004		OK	OK	17.0MPa	OK	OK	OK
2	HEAT	0.2	0.23	0.55	0.018	0.021	0.02	0.03	0.024	0.007	0.004		OK	OK	17.0MPa	OK	OK	OK
3	HEAT	0.2	0.22	0.53	0.019	0.016	0.010	0.021	0.024	0.003	0.005		OK	OK	17.0MPa	OK	OK	OK
4																		



RESULT: ALL TEST RESULTS ABOVE COMPLY WITH THE REQUIREMENTS IN ASME(B36.10M)-2007/ASTM A106B-2015/API 5L GR. B 45 EDITION. HARDNESS ACCORDING TO NACE MR-0175/ISO 15156/0103. THIS IS CERTIFY THAT IN ACCORDANCE WITH THE RELEVANT SPECIFICATION AND CONTRACTS, THE STEEL PIPES WERE TESTED QUALIFIED BY OUR QUALITY CONTROL DEPARTMENT AND ARE IN ACCEPTANCE CONDITIONS. CERTIFY THAT GOODS ARE SUPPLIED AS PER PURCHASE ORDER AND SPECIFICATION REQUIREMENTS. MANUFACTURED FROM FULL KILLED CARBON STEEL. COUNTRY OF ORIGIN: THAILAND.

Address: 210/17 Moo 12, Tungsukla, Sriracha, Chonburi, 20230, Thailand

PO 746380  
 CONFORMS WITH ASME  
 SEC. II PART A 2019  
 EDITION JAN 22/20 JF.

E.S

2" SCH 80 / XH ASTM/ASME A/SA 106B HT. 17-290473  
 2" SCH 80 SA106B HT 17-290473

Po 746909 E.S

CONFORMS WITH ASME  
 SEC. II PARTA 2019  
 EDITION JAN 15/ 20 JF.



Siam Steel Pipe Company Limited ✓

CE = .29

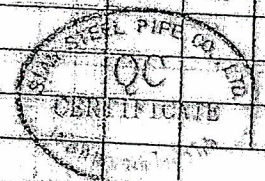
SIAM STEEL PIPE COMPANY LIMITED  
 บริษัท สยาม สตีล ไพป์ จำกัด  
 MILL TEST CERTIFICATE  
 ใบรับประกันคุณภาพสินค้า  
 EN10204 3.1

VT. 208 Low

NO: SSP/QR 29-01

Page 1 of 1

CONTRACT NO.	2017THWM029	PRODUCT	CARBON STEEL SEAMLESS PIPE			SPECIFICATION	ASTM/ASME A/SA 106/API 5L	DELIVERY CONDITION		Forming Method	COLD DRAWING	
CUSTOMER	CCD STEEL TRADERS LTD			DATE OF ISSUE	10/07/2017	LICENCE	5L-0971	NO.	2901			
NO.	HEAT NO.	STEEL GRADE	SIZE	QUANTITY	LENGTH (M)	TENSILE TEST			R <sub>yk</sub> /kN	IMPACT TEST		
				PIECES		Y.S Mpa	T.S Mpa	EL(%)		Or.	SIZE(mm)	AKV(J)
1	17-290126	GR.B	1" SCH80	392	2508.8	310	490	32				15
2	17-290358	GR.B	1" SCH160	183	1171.2	300	495	34				14
3	17-290473	GR.B	2" SCH80	250	1600	310	485	34				15
4												
TOTAL												

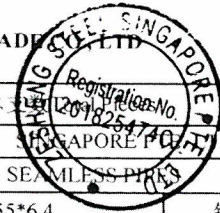


NO.	Analysis	CHEMICAL COMPOSITION (%)											NDT	STRAIGHTNESS	HYDROSTATIC PRESSURE (≥5S)	VISUAL TEST	Bending	DIMENSION & WEIGHT TEST	
		C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V								
1	HEAT	0.19	0.25	0.49	0.013	0.021	0.01	0.03	0.026	0.005	0.004								
2	HEAT	0.2	0.23	0.55	0.018	0.021	0.02	0.03	0.024	0.007	0.004								
3	HEAT	0.2	0.22	0.53	0.019	0.016	0.010	0.021	0.024	0.003	0.005								
4																			

RESULT: ALL TEST RESULTS ABOVE COMPLY WITH THE REQUIREMENTS IN ASME(B36.10M)-2007/ASTM A106B-2015/API 5L GR.B 45 EDITION. HARDNESS ACCORDING TO NACE MR-0175/ISO 15156-01:03. THIS IS CERTIFY THAT IN ACCORDANCE WITH THE RELEVANT SPECIFICATION AND CONTRACTS, THE STEEL PIPES WERE TESTED QUALIFIED BY OUR QUALITY CONTROL DEPARTMENT AND ARE IN ACCEPTANCE CONDITIONS. CERTIFY THAT GOODS ARE SUPPLIED AS PER PURCHASE ORDER AND SPECIFICATION REQUIREMENTS. MANUFACTURED FROM FULL KILLED CARBON STEEL. COUNTRY OF ORIGIN: THAILAND.

Address: 210/17 Moo 12, Tungsukla, Sriracha, Chonburi, 20230, Thailand

靖江市泽盛国际贸易有限公司  
JINGJIANG ZESHENG INTERNATIONAL TRADE CO., LTD.



产品质量证明书  
MILL TEST CERTIFICATE EN10204 3.1

江苏省靖江市滨江国际A座801 PG 1 of 1  
No.801, Tower A, Binjiang Commercial Center Jingjiang,  
Jiangsu Province, China (214500)  
www.jssteelpipe.com  
Tel:86-523-84900018 Fax:86-523-84900018

总捆数Total Bundles		7		总重量(t)Total Weight		11.623		日期Date: 2018-11-08		№: 181108WM020-15															
收货单位 PURCHASER				合同编号 Contract No		2018ZSWM020																			
产品名称 Product		CARBON STEEL SEAMLESS PIPES		技术标准 Spec.		ASME/ASTM SA/A333-2015/API 5L X52 PSL-2 45TH/CSA Z245.1-2014																			
规格Size O.D×W.T×L (m)		1" SCH80 33.4*4.55*6.4		钢级Grade		GR.359		牌号 Steel Type		交货状态 Delivery Status															
										COLD-DRAWING(ANNEAL+NORMALIZED)															
序号 NO.	炉号 Heat No	批号 Batch No	捆数 Bundle	支数 Pcs	重量 (MT) Weight	拉伸试验 Tensile Test						冲击试验 Impact Test			硬度试验 Hardness Value										
						尺寸 Dimension	标距长度 Gauge Length (mm)	屈服强度 Y.S Mpa	抗拉强度 T.S Mpa	伸长率 E.L (%)	截面比 Share Are (%)	尺寸 Dimension (*4)	温度 (°C) Temperature	冲击值(J) Impact Value		硬度值 Hardness Value (HRC)									
1	1894175	1811304	7	561	11.623	*1-A2	50	360/365	525/530	34/36	40/42	D6	-73°C	37/39/42		14.0									
2																									
3																									
4																									
5																									
序号 NO.	类别 Type *5	化学成分(%) Chemical Composition														低倍组织(级) M.S			金相分析 Metallogical Analysis						
		C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V	B	Nb	Ti	CE	一般疏松 Ordinary Porosity	中心疏松 Central Porosity	偏析 Segregation	显微组织*6 Microstructure	夹杂物 Inclusion				带状组织(级) B.S	脱碳层 (mm) D.L
1	C	0.16	0.34	1.24	0.017	0.005	0.04	0.02	0.02	0.001	0.003	0.001	0.002	0.001	###										
2	C																								
3	C																								
4	C																								
5	C																								
压扁 Flattening	冷弯 Cold Bending	扩口 Flaring	超声检验 U.T	涡流检验 E.T	磁粉检验 M.P.I	漏磁检验 L.M.T	通径 N.D	表面&尺寸 S&D	水压 Hydro Test (≥5s)	1	20.7	Mpa													
	OK			OK	OK			OK		2		Mpa													
										3		Mpa													
										4		Mpa													
										5		Mpa													
注释 Notes	*1:纵向条状 Longitudinal Strip: A1-12.7mm, A2-19.05mm A3-25.4mm A4-38.1mm, F-全截面 Full-section *2棒状 Clubbed: B1=12.7mm, B2=8.9mm, B3=8mm, B4=10mm *3:横向条状 Transverse Strip: C1-12.7mm, C2-19.05mm C3-25.4mm C4-38.1mm, *4: D1=10×10×55mm D2=10×7.5×55mm D3=10×6.67×55mm D4=10×5×55mm D5=10×3.33×55mm D6=10×2.5×55mm *5:C-成品成分 Product composition R-熔炼成分 Melting composition *6:F-铁素体 Ferrite B-贝氏体 Bainite P-珠光体 Pearlite S-回火索氏体 Tempered Sorbite M-马氏体 Martensite																								
备注 Remark	1. AT THEORETICAL WEIGHT BASIS; 2. HARDNESS ACCORDING TO NACE MR-0175/ISO 15156/0103; 3. ALL TEST RESULTS ABOVE COMPLY WITH THE STANDARD ASME(B36.10M)-2015/ASTM SA/A333 GR.6-2015/API 5L X52 PSL-2 45TH EDITION/CSA Z245.1 GR. 359 CAT II SS-2014.																								

说明:本质证书以原件为准, 复印无效。  
Remark: No duplicate will be accepted.



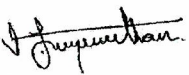
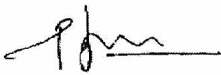
靖江市泽盛国际贸易有限公司  
JINGJIANG ZESHENG INTERNATIONAL TRADE CO., LTD.  
制证人: 高叶  
Certification-maker:

1" SCH 80 SA333 HT 1894175  
CE = .37 VT. 179 Low

PO 744456  
Conforms with ASME  
Sec. II, Part A 2017 Edition  
April 30/19 JF

E.S


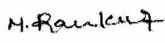
Heat Number: 2211801-004  
MRC Global Part Number: 14C20960, MRC Global Part Description: 4 WHEATLEY 9D-510-045144-166 600# CS SWG CHK VLV RF B:WCC T:SOUR API 6D

	<b>FLOW LINK SYSTEMS PRIVATE LIMITED - MANUFACTURING UNIT – 3</b> Block 2C –GC 400/1C Avanashi Road –Arasur, Coimbatore -641 407			Document Number	FLS-L4-QMSF-QA-014/R3
				Document Level	4
				Issue Date	12-Jan-17
				Sheet	1 OF 1
<b>SWING CHECK VALVE TEST CERTIFICATE</b>					
<b>CUSTOMER</b> SCHLUMBERGER CANADA LIMITED EDMONTON-3707 97 <sup>TH</sup> ST 3707 97 <sup>TH</sup> ST EDMONTON Alberta T6E6J2 CANADA.		TYPE WHEATLEY 510 SOUR	Report Number: <b>11920</b> Date: 21 Feb 2018 Purchase Order Number : 4511733883 Date : 06 Dec 2017		
SIZE - CLASS : 4 FG 5 CL 600 ST CV VALVE SERIAL NO : 2211801004			BILL OF MATERIAL : 9D-510-045144-166 / Rev 9		
Serial Number.	Description	Machined Part Number	Quantity	Heat No.	Material Grade
1.	BODY	5A-6600304040148	1	2025R	ASTM A216 Gr.WCC
2.	BONNET	5A-66204040148	1	1H095	ASTM A216 Gr.WCC
3.	STUD 3/4"-10UNCX 3-1/4"	5A-04049075010325	12	1-FJT-3	ASTM A193 Gr.B7M
4.	NUT HVY HEX 3/4"-10 UNC	5A-0314507510	12	654-1025	ASTM A194 Gr.2HM
5.	CLAPPER	5A-66104041220	1	Y2834	ASTM A351 Gr.CF8M
6.	PIN	5A-66310054075	1	--	ASTM A479 Type 316
7.	PLUG 3/8" NPT	5A-01700603730	2	--	ASTM A105N
8.	PLUG 1/2" NPT	5A-01700605030	2	--	ASTM A105N
9.	O RING,HSN 85D, # 257	5A-014010425780	1	--	HYDROGENATED NITRILE – HNBR
10.	O RING,HSN 85D, # 349	5A-014010434980	1	--	HYDROGENATED NITRILE – HNBR
11.	NAME PLATE	X-388969-01	1	--	STAINLESS STEEL
12.	SHEET METAL SCR	5A-025030202	2	--	CASE HARD STEEL
HYDROSTATIC TESTING					
Serial Number	Details		SHELL	SEAT	REMARKS
1.	Required test pressure		2250 PSIG	1650 PSIG	
2.	Actual test pressure		2300 PSIG	1700 PSIG	
3.	Duration of actual test pressure		2 Min	2 Min	
4.	Leakage		-Nil-	-Nil-	
<b>WE CERTIFY THAT</b> 1. THE MACHINED COMPONENTS AND VALVE DIMENSIONS WERE INSPECTED AND CONFORMS TO APPLICABLE DRAWING REQUIREMENTS. 2. THE BODY, BONNET, CLAPPER, PIN, PLUG AND 'O' RING FOR SEAT ARE ASSEMBLED AND TESTED AS PER BELOW SPECIFICATIONS. a. API 6D - 24TH EDITION b. ASME B16.34 – 2017 c. CSA Z245.15 - 13 d. MSS-SP-25 - 2013 (Markings) 3. THE MATERIALS USED FOR BODY, BONNET, CLAPPER, PIN AND PLUG MEET REQUIREMENTS OF NACE MR 0175 / ISO 15156 - 2015 4. WE ALSO CERTIFY THAT THE VALVE IS FREE OF RADIOACTIVE ELEMENTS OR RADIATION CONTAMINATION.					
THIS VALVE IS MANUFACTURED AS PER API 6D 24th EDITION AT LOCATION - FLOW LINK SYSTEMS PRIVATE LIMITED - MANUFACTURING UNIT - 3 Block 2C –GC 400/1C Avanashi Road –Arasur, Coimbatore -641 407					
Tested by:  C. ARUL JOTHI ASSEMBLY INCHARGE		Checked By:  V.LOGANATHAN Inspection Engineer		For FLOW LINK SYSTEMS (P) LTD.,  P. JUSTIN DAVID AUTHORISED SIGNATORY	

Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 08 2019

FLS-L4-QMSF-QD-009/R1

	<b>FLOW LINK SYSTEMS (P) LTD</b> FOUNDRY UNIT - II 65/2-A,B & C,PUDUPALAYAM B.P.O AVINASHI TK, COIMBATORE - 641 654 INDIA		<b>TEST CERTIFICATE</b> (EN 10204-3.1)		TC NO : 17-1725_059 DATE : 20-Jan-18								
	CUSTOMER <b>Schlumberger Canada Limited</b> 3707 97 TH STREET, EDMONTON- ALBERTA T6E 6J2 CANADA.		SPECIFICATION REFERENCE 1. ASTM A216-16 Gr.WCC 2. NACE MR 0175/ ISO 15156 - 2015 3. MS-021010-01 Rev.10 4. QP-038121-11 Rev.03 & QP-038121-14 Rev.04		HEAT NO. <b>2025R</b> FOUNDRY MARK <b>FLS</b>								
PO NUMBER & DATE 4511733883 Dt: 06.12.17			ORDER ACCEPTANCE NO 17-1725										
<b>CHEMICAL COMPOSITION % wt</b>													
MELTING PRACTICE : Steel melted using Electric Induction furnace, and fully killed using Aluminium.													
<b>SPECIFICATION</b>	<b>C</b>	<b>Si</b>	<b>S</b>	<b>P</b>	<b>Mn</b>	<b>Ni</b>	<b>Cr</b>	<b>Mo</b>	<b>V</b>	<b>Cu</b>	<b>Al</b>	<b>RE</b>	<b>CE</b>
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--
Maximum	0.23	0.60	0.035	0.035	1.28	0.50	0.50	0.20	0.030	0.30	0.06	1.00	0.43
Achieved	0.20	0.44	0.007	0.013	0.97	0.08	0.04	0.005	0.000	0.01	0.04	0.13	0.38
Heat Treatment : NORMALIZING: Temperature raised to 920°C, Soaked for 4 hours and then atmospheric air-cooled													
Visual Inspection - Castings conforms to MSS-SP-55-2011 - Type II to XII (within level 'b')													
<b>MECHANICAL PROPERTIES</b>													
<b>TEST TYPE</b>	Tensile as per ASTM A370-17 / ISO 6892-1-2016				Impact (CVN) ISO 148-2016/ASTM A370-17		BEND TEST		HARDNESS				
<b>SPECIFICATION</b>	<b>YS</b> Rp 0.2% (KSI)	<b>YS</b> Rp 1.0% (KSI)	<b>UTS</b> (KSI)	<b>% Elongation</b> 4d    5d		<b>% RA</b>	<b>Test Temperature</b> (at °C) J		<b>ANGLE</b>	<b>D</b>	<b>(HBW / HRRW)</b>		
							<b>Values</b>	<b>Avg.</b>					
Minimum	40	--	70	22	--	35	--	--	--	--	143		
Maximum	--	--	85	--	--	--	--	--	--	--	237		
Achieved	50.0	--	79.4	34	--	64	--	--	--	--	158		
<b>DETAIL OF CASTINGS</b>													
<b>S.No.</b>	<b>PO S.No.</b>	<b>DESCRIPTION</b>	<b>CAST DRAWING NO / REV</b>	<b>CAST PART NO</b>	<b>POURED QTY</b>	<b>DESP. QTY</b>							
1	10	4" 600 SCV BODY	5A-S17540-1 / 6	5A-83504040148	17	10							
<b>REMARKS:</b> 1. Stated Chemical composition is from heat analysis; and Mechanical properties of test coupon from Cast keel bloc 2. *RE = Ni + Cr + Mo +V +Cu 3. ** CE = $C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$ 4. The above stated KSI values have been calculated based on original tested N/MM <sup>2</sup> values. 5. Stated actual Hardness value is less than 22 HRC.													
<b>CERTIFIED THAT</b> 1. THE ABOVE GIVEN DETAILS ARE CORRECT, FULFILLS THE SPECIFICATION / STANDARDS AND PO. 2. MATERIAL WAS MANUFACTURED, SAMPLED, TESTED, INSPECTED IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AND CERTIFIED AS PER EN 10204 - 3.1. 3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIO ACTIVE ELEMENT OR RADIATION.													
PREPARED BY: <b>R.RAMYA</b>			CHECKED BY:  <b>M.RANJITH KUMAR</b>										

**MTR Cameron Approved**

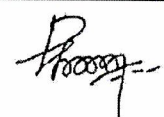
MS: MS-021010-01      Rev:

**Material Grade:** ASTM A216 GR W

**PO# - Item#:** 4511733883 - 10

**Signed:** Amalraj

**Date:** 16-Mar-2018



M.S.DHANABALAN  
 ASSISTANT MANAGER -QUALITY  
 MANUFACTURER'S AUTHORIZED INSPECTOR


Heat Number: 2211801-004  
 MRC Global Part Number: 14C20960, MRC Global Part Description: 4 WHEATLEY 9D-510-045144-166 600# CS SWG CHK VLV RF B:WCC T:SOUR API 6D



Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 08 2019

FLS-L4-QMSF-QD-009/R1

	<b>FLOW LINK SYSTEMS (P) LTD</b> FOUNDRY UNIT-III-SF NO 395/2B2. KEMPANAIKANPALAYAM,ANNUR, COIMBATORE - 641 653, INDIA	<b>TEST CERTIFICATE</b>  (EN 10204-3.1)		TC NO : 176_17-1725-10  DATE : 29-Jan-18										
	CUSTOMER  <b>Schlumberger Canada Limited</b>  3707 97 TH STREET, EDMONTON- ALBERTA T6E 6J2 CANADA.	SPECIFICATION REFERENCE 1. ASTM A216-16 Gr.WCC 2. NACE MR 0175/ ISO 15156 - 2015 3. MS-021010-01 Rev.10 4. QP-038121-11 Rev.03 & QP-038121-14 Rev.04		HEAT NO. <b>1H095</b>  FOUNDRY MARK  FLS										
PO NUMBER & DATE 4511733883 Dt: 06.12.17		ORDER ACCEPTANCE NO 17-1725												
<b>CHEMICAL COMPOSITION % wt</b>														
MELTING PRACTICE : Steel melted using Electric Induction furnace, and fully killed using Aluminium.														
<b>SPECIFICATION</b>	C	SI	S	P	Mn	NI	Cr	Mo	V	Cu	Al	--	*RE	**CE
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Maximum	0.23	0.60	0.035	0.035	1.28	0.50	0.50	0.20	0.030	0.30	0.06	--	1.00	0.43
Achieved	0.20	0.43	0.011	0.021	0.92	0.05	0.01	0.00	0.002	0.01	0.03	--	0.08	0.36
Heat Treatment : NORMALISING: Temperature raised to 920°C, Soaked for 3 hours and then atmospheric air-cooled														
Visual Inspection - Castings conforms to MSS-SP-55-2011 - Type II to XII (within level 'b')														
<b>MECHANICAL PROPERTIES</b>														
<b>TEST TYPE</b>	Tensile as per ASTM A370-17 / ISO 6892-1-2016						Impact (CVN) ISO 148-2016/ASTM A370-17		BEND TEST		HARDNESS			
<b>SPECIFICATION</b>	YS Rp 0.2% (KSI)	YS Rp 1.0% (KSI)	UTS (KSI)	% Elongation 4d 5d		% RA	Test Temperature (at °C) J Values Avg.		ANGLE	D	(HBW / HRBW)			
	Minimum	40	--	70	22	--	35	--	--	--	--	143		
Maximum	--	--	95	--	--	--	--	--	--	--	--	237		
Achieved	44.6	--	74.4	32	--	64	--	--	--	--	--	156		
<b>DETAIL OF CASTINGS</b>														
S.No.	PO S.No.	DESCRIPTION	CAST DRAWING NO / REV	CAST PART NO	POURED QTY	DESP. QTY								
1	10	4" 600 SCV BONNET	5A-S5365-1 / 01	5A-83704040148002	15	10								
<b>REMARKS:</b> 1. Stated Chemical composition is from heat analysis; and Mechanical properties of test coupon from Cast keel block 2. *RE = Ni + Cr + Mo +V +Cu 3. ** CE = C + $\frac{Mn}{6}$ + $\frac{Cr+Mo+V}{5}$ + $\frac{Ni+Cu}{15}$ 4. The above stated KSI values have been calculated based on original tested N/MM² values. 5. Stated actual Hardness value is less than 22 HRC.														
<b>CERTIFIED THAT</b> 1. THE ABOVE GIVEN DETAILS ARE CORRECT, FULFILLS THE SPECIFICATION / STANDARDS AND PO. 2. MATERIAL WAS MANUFACTURED, SAMPLED, TESTED, INSPECTED IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AND CERTIFIED AS PER EN 10204 - 3.1. 3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIO ACTIVE ELEMENT OR RADIATION.														
PREPARED BY: A.Y		CHECKED BY: R.SARAVANA KUMAR LAB INCHARGE												

**MTR Cameron Approved**

MS: MS-021010-01 Rev:

**Material Grade:** ASTM A216 GR V

**PO# - Item#:** 4511733883 - 10

**Signed:** Amalraj



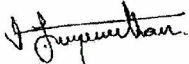
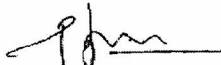
**Date:** 16-Mar-2018

*e. Rajan*

**C. RAJAN**  
 QUALITY ASSURANCE OFFICER  
 MANUFACTURER'S AUTHORIZED INSPECTOR

Heat Number: 2211801-004  
 MRC Global Part Number: 14C20960, MRC Global Part Description: 4 WHEATLEY 9D-510-045144-166 600# CS SWG CHK VLV RF B:WCC T:SOUR API 6D


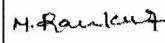
Heat Number: 2211801-005  
MRC Global Part Number: 14C20960, MRC Global Part Description: 4 WHEATLEY 9D-510-045144-166 600# CS SWG CHK VLV RF B:WCC T:SOUR API 6D

	<b>FLOW LINK SYSTEMS PRIVATE LIMITED - MANUFACTURING UNIT – 3</b> Block 2C –GC 400/1C Avanashi Road –Arasur, Coimbatore -641 407			Document Number	FLS-L4-QMSF-QA-014/R3
				Document Level	4
				Issue Date	12-Jan-17
				Sheet	1 OF 1
<b>SWING CHECK VALVE TEST CERTIFICATE</b>					
<b>CUSTOMER</b> SCHLUMBERGER CANADA LIMITED EDMONTON-3707 97 <sup>TH</sup> ST 3707 97 <sup>TH</sup> ST EDMONTON Alberta T6E6J2 CANADA.		TYPE WHEATLEY 510 SOUR	Report Number: <b>11921</b> Date: 21 Feb 2018 Purchase Order Number : 4511733883 Date : 06 Dec 2017		
SIZE - CLASS : 4 FG 5 CL 600 ST CV VALVE SERIAL NO : 2211801005			BILL OF MATERIAL : 9D-510-045144-166 / Rev 9		
Serial Number.	Description	Machined Part Number	Quantity	Heat No.	Material Grade
1.	BODY	5A-6600304040148	1	2025R	ASTM A216 Gr.WCC
2.	BONNET	5A-66204040148	1	1H095	ASTM A216 Gr.WCC
3.	STUD 3/4"-10UNCX 3-1/4"	5A-04049075010325	12	1-FJT-3	ASTM A193 Gr.B7M
4.	NUT HVY HEX 3/4"-10 UNC	5A-0314507510	12	654-1025	ASTM A194 Gr.2HM
5.	CLAPPER	5A-66104041220	1	Y2834	ASTM A351 Gr.CF8M
6.	PIN	5A-66310054075	1	--	ASTM A479 Type 316
7.	PLUG 3/8" NPT	5A-01700603730	2	--	ASTM A105N
8.	PLUG 1/2" NPT	5A-01700605030	2	--	ASTM A105N
9.	O RING,HSN 85D, # 257	5A-014010425780	1	--	HYDROGENATED NITRILE – HNBR
10.	O RING,HSN 85D, # 349	5A-014010434980	1	--	HYDROGENATED NITRILE – HNBR
11.	NAME PLATE	X-388969-01	1	--	STAINLESS STEEL
12.	SHEET METAL SCR	5A-025030202	2	--	CASE HARD STEEL
HYDROSTATIC TESTING					
Serial Number	Details		SHELL	SEAT	REMARKS
1.	Required test pressure		2250 PSIG	1650 PSIG	
2.	Actual test pressure		2300 PSIG	1700 PSIG	
3.	Duration of actual test pressure		2 Min	2 Min	
4.	Leakage		-Nil-	-Nil-	
<b>WE CERTIFY THAT</b> 1. THE MACHINED COMPONENTS AND VALVE DIMENSIONS WERE INSPECTED AND CONFORMS TO APPLICABLE DRAWING REQUIREMENTS. 2. THE BODY, BONNET, CLAPPER, PIN, PLUG AND 'O' RING FOR SEAT ARE ASSEMBLED AND TESTED AS PER BELOW SPECIFICATIONS. a. API 6D - 24TH EDITION b. ASME B16.34 – 2017 c. CSA Z245.15 - 13 d. MSS-SP-25 - 2013 (Markings) 3. THE MATERIALS USED FOR BODY, BONNET, CLAPPER, PIN AND PLUG MEET REQUIREMENTS OF NACE MR 0175 / ISO 15156 - 2015 4. WE ALSO CERTIFY THAT THE VALVE IS FREE OF RADIOACTIVE ELEMENTS OR RADIATION CONTAMINATION. THIS VALVE IS MANUFACTURED AS PER API 6D 24th EDITION AT LOCATION - FLOW LINK SYSTEMS PRIVATE LIMITED - MANUFACTURING UNIT - 3 Block 2C –GC 400/1C Avanashi Road –Arasur, Coimbatore -641 407					
Tested by:  C. ARUL JOTHI ASSEMBLY INCHARGE		Checked By:  V.LOGANATHAN Inspection Engineer		For FLOW LINK SYSTEMS (P) LTD.,  P. JUSTIN DAVID AUTHORISED SIGNATORY	

Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 08 2019

FLS-L4-QMSF-QD-009/R1

	<b>FLOW LINK SYSTEMS (P) LTD</b> FOUNDRY UNIT - II 85 / Z-A,B & C,PUDUPALAYAM B.P.O AVINASHI TK, COIMBATORE - 641 654 INDIA	<b>TEST CERTIFICATE</b> (EN 10204-3.1)	TC NO : 17-1725_059 DATE : 20-Jan-18											
	CUSTOMER <b>Schlumberger Canada Limited</b> 3707 97 TH STREET, EDMONTON- ALBERTA T6E 6J2 CANADA.	SPECIFICATION REFERENCE 1. ASTM A216-16 Gr.WCC 2. NACE MR 0175/ ISO 15156 - 2015 3. MS-021010-01 Rev.10 4. QP-038121-11 Rev.03 & QP-038121-14 Rev.04	HEAT NO. <b>2025R</b>	FOUNDRY MARK <b>FLS</b>										
PO NUMBER & DATE 4511733883 Dt: 06.12.17		ORDER ACCEPTANCE NO 17-1725												
<b>CHEMICAL COMPOSITION % wt</b>														
MELTING PRACTICE : Steel melted using Electric Induction furnace, and fully killed using Aluminium.														
<b>SPECIFICATION</b>	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu	Al	--	*RE	**CE
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Maximum	0.23	0.60	0.035	0.035	1.28	0.50	0.50	0.20	0.030	0.30	0.06	--	1.00	0.43
Achieved	0.20	0.44	0.007	0.013	0.97	0.08	0.04	0.005	0.000	0.01	0.04	--	0.13	0.38
Heat Treatment : NORMALIZING: Temperature raised to 920°C, Soaked for 4 hours and then atmospheric air-cooled														
Visual Inspection - Castings conforms to MSS-SP-55-2011 - Type II to XII (within level 'b')														
<b>MECHANICAL PROPERTIES</b>														
<b>TEST TYPE</b>	Tensile as per ASTM A370-17 / ISO 6892-4-2016						Impact (CVN) ISO 148-2016/ASTM A370-17		BEND TEST		HARDNESS			
<b>SPECIFICATION</b>	YS Rp 0.2% (KSI)	YS Rp 1.0% (KSI)	UTS (KSI)	% Elongation 4d    5d		% RA	Test Temperature (at °C) J		ANGLE	D	(HBW / HRBW)			
	Minimum	40	--	70	22	--	35	--					--	--
Maximum	--	--	95	--	--	--	--	--	--	--	--	237		
Achieved	50.0	--	79.4	34	--	64	--	--	--	--	--	158		
<b>DETAIL OF CASTINGS</b>														
<b>S.No.</b>	<b>PO S.No.</b>	<b>DESCRIPTION</b>	<b>CAST DRAWING NO / REV</b>	<b>CAST PART NO</b>	<b>POURED QTY</b>	<b>DESP. QTY</b>								
1	10	4" 600 SCV BODY	5A-S17540-1 / 6	5A-83504040148	17	10								
<b>REMARKS:</b> 1. Stated Chemical composition is from heat analysis; and Mechanical properties of test coupon from Cast keel bloc 2. *RE = Ni + Cr + Mo +V +Cu 3. ** CE = C + $\frac{Mn}{6}$ + $\frac{Cr+Mo+V}{5}$ + $\frac{Ni+Cu}{15}$ 4. The above stated KSI values have been calculated based on original tested N/MM <sup>2</sup> values. 5. Stated actual Hardness value is less than 22 HRC.														
<b>CERTIFIED THAT</b> 1. THE ABOVE GIVEN DETAILS ARE CORRECT, FULFILLS THE SPECIFICATION / STANDARDS AND PO. 2. MATERIAL WAS MANUFACTURED, SAMPLED, TESTED, INSPECTED IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AND CERTIFIED AS PER EN 10204 - 3.1. 3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIO ACTIVE ELEMENT OR RADIATION.														
PREPARED BY: <b>R.RAMYA</b>			CHECKED BY:  <b>M.RANJITH KUMAR</b>											
M.S.DHANABALAN ASSISTANT MANAGER -QUALITY MANUFACTURER'S AUTHORIZED INSPECTOR														

**MTR Cameron Approved**

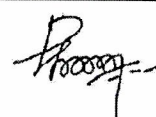
MS: MS-021010-01      Rev:

**Material Grade:** ASTM A216 GR W

**PO# - Item#:** 4511733883 - 10

**Signed:** Amalraj

**Date:** 16-Mar-2018



Heat Number: 2211801-004  
 MRC Global Part Number: 14C20960, MRC Global Part Description: 4 WHEATLEY 9D-510-045144-166 600# CS SWG CHK VLV RF B:WCC T:SOUR API 6D

Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 08 2019

FLS-L4-QMSF-QD-009/R1

	<b>FLOW LINK SYSTEMS (P) LTD</b> FOUNDRY UNIT-III-SF NO 395/2B2. KEMPANAICKANPALAYAM, ANNUR, COIMBATORE - 641 653, INDIA	<b>TEST CERTIFICATE</b>  (EN 10204-3.1)	TC NO : 176_17-1725-10  DATE : 29-Jan-18											
	CUSTOMER  <b>Schlumberger Canada Limited</b> 3707 97 TH STREET, EDMONTON- ALBERTA T6E 6J2 CANADA.	SPECIFICATION REFERENCE 1. ASTM A216-16 Gr.WCC 2. NACE MR 0175/ ISO 15156 - 2015 3. MS-021010-01 Rev.10 4. QP-038121-11 Rev.03 & QP-038121-14 Rev.04	HEAT NO. <b>1H095</b>	FOUNDRY MARK  FLS										
PO NUMBER & DATE 4511733883 Dt: 06.12.17		ORDER ACCEPTANCE NO 17-1725												
<b>CHEMICAL COMPOSITION % wt</b>														
MELTING PRACTICE : Steel melted using Electric Induction furnace, and fully killed using Aluminium.														
<b>SPECIFICATION</b>	C	SI	S	P	Mn	NI	Cr	Mo	V	Cu	Al	--	*RE	**CE
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Maximum	0.23	0.60	0.035	0.035	1.28	0.50	0.50	0.20	0.030	0.30	0.06	--	1.00	0.43
Achieved	0.20	0.43	0.011	0.021	0.92	0.05	0.01	0.00	0.002	0.01	0.03	--	0.08	0.36
Heat Treatment : NORMALISING: Temperature raised to 920°C, Soaked for 3 hours and then atmospheric air-cooled														
Visual Inspection - Castings conforms to MSS-SP-55-2011 - Type II to XII (within level 'b')														
<b>MECHANICAL PROPERTIES</b>														
<b>TEST TYPE</b>	Tensile as per ASTM A370-17 / ISO 6892-1-2016						Impact (CVN) ISO 148-2016/ASTM A370-17		BEND TEST		HARDNESS			
<b>SPECIFICATION</b>	YS Rp 0.2% (KSI)	YS Rp 1.0% (KSI)	UTS (KSI)	% Elongation 4d    5d		% RA	Test Temperature (at °C) J		ANGLE	D	(HBW / HRBW)			
	Minimum	40	--	70	22	--	35	--					--	--
Maximum	--	--	95	--	--	--	--	--	--	--	--	237		
Achieved	44.6	--	74.4	32	--	64	--	--	--	--	--	156		
<b>DETAIL OF CASTINGS</b>														
S.No.	PO S.No.	DESCRIPTION	CAST DRAWING NO / REV	CAST PART NO	POURED QTY	DESP. QTY								
1	10	4" 600 SCV BONNET	5A-S5365-1 / 01	5A-83704040148002	15	10								
REMARKS: 1. Stated Chemical composition is from heat analysis; and Mechanical properties of test coupon from Cast keel block. 2. *RE = Ni + Cr + Mo +V +Cu 3. ** CE = $C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$ 4. The above stated KSI values have been calculated based on original tested N/MM <sup>2</sup> values. 5. Stated actual Hardness value is less than 22 HRC.														
<b>CERTIFIED THAT</b> 1. THE ABOVE GIVEN DETAILS ARE CORRECT, FULFILLS THE SPECIFICATION / STANDARDS AND PO. 2. MATERIAL WAS MANUFACTURED, SAMPLED, TESTED, INSPECTED IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AND CERTIFIED AS PER EN 10204 - 3.1. 3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIO ACTIVE ELEMENT OR RADIATION.														
PREPARED BY: A.Y			CHECKED BY: R.SARAVANA KUMAR LAB INCHARGE											

MTR Cameron Approved

MS: MS-021010-01 Rev.

Material Grade: ASTM A216 GR V

PO# - Item#: 4511733883 - 10

Signed: Amalraj

Date: 16-Mar-2018

C. RAJAN  
 QUALITY ASSURANCE OFFICER  
 MANUFACTURER'S AUTHORIZED INSPECTOR

Heat Number: 2211801-004  
 MRC Global Part Number: 14C20960, MRC Global Part Description: 4 WHEATLEY 9D-510-045144-166 600# CS SWG CHK VLV RF B:WCC T:SOUR API 6D

1" SCH 160 SA106B HT 391506 PO 746736  
 CE=31 VT. 249 Low

CONFORMS WITH ASME  
 SEC. II PART A 2019  
 EDITION JAN 9/20 JF.

E.S  
 PG 1 of 1



MILL TEST CERTIFICATE EN10204 3.1

江苏省江阴市夏港镇澄澄路375号  
 No.375,Zhencheng Rd.Xiagan Town Jiangyin City  
 Jiangsu Province, China (214442)  
 Tel:86-510-66286698 Fax:86-510-66286690

总捆数 Total Bundles		8		总支数 Total Pieces		476		总重量(t) Total Weight		12.578		日期 Date: 2017-10-31		№: 171031 WM053-7											
收货单位 PURCHASER		BHD TUBULAR LTD																							
产品名称 Product		CARBON STEEL SEAMLESS PIPES						技术标准 Spec.		ASTM A/SA106B/C/API 5L X42/CSA Z245.1				合同编号 Contract No		2017ZSWM053									
规格 Size O.D×W.T×L (m)		1" SCH160*6.4M				钢级 Grade		GR.290		牌号 Steel Type		交货状态 Delivery Status		COLD-DRAWING(ANNEAL)											
序号 NO.	炉号 Heat No	批号 Batch No	捆数 Bundle	支数 Pcs	重量 (MT) Weight	拉伸试验 Tensile Test						冲击试验 Impact Test				硬度试验 Hardness Value									
						尺寸 Dimension	标距长度 Gauge Length (mm)	屈服强度 Y.S Mpa	抗拉强度 T.S Mpa	伸长率 E.L (%)	截面比 Share Are(%)	尺寸 Dimension (*4)	温度 (°C) Temperature	冲击值(J) Impact Value		硬度值 Hardness Value (HRC)									
1	391506	1710258	8	476	12.578	*1-A2	50	310/315	485/490	30/32						14.0									
2																									
3																									
4																									
5																									
序号 NO.	类别 Type *5	化学成分(%) Chemical Composition														低倍组织(级) M.S			金相分析 Metallogical Analysis						
		C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V	B	Nb	Ti	CE	一般疏松 Ordinary Porosity	中心疏松 Central Porosity	偏析 Segregation	显微组织*6 Microstructure	夹杂物 Inclusion				带状组织(级) B.S	脱碳层 (mm) D.L
1	C	.200	.220	.570	.016	.017	.030	.010	.015	.009	.001	0.001	.002	.002	0.31					A	B	C	D		
2	C																								
3	C																								
4	C																								
5	C																								
压扁 Flattening	冷弯 Cold Bending	扩口 Flaring	超声检验 U.T	涡流检验 E.T	磁粉检验 M.P.I	漏磁检验 L.M.T	直径 N.D	表面&尺寸 S&D	水压 Hydro Test (≥5s)	1	20.7	Mpa													
OK				OK	OK			OK		2		Mpa													
										3		Mpa													
										4		Mpa													
										5		Mpa													
注释 Notes	*1:纵向条状 Longitudinal Strip: A1-12.7mm, A2-19.05mm A3-25.4mm A4-38.1mm, F-全截面 Full-section *2:棒状 Clubbed: B1=12.7mm, B2=8.9mm, B3=8mm, B4=10mm *3:横向条状 Transverse Strip: C1-12.7mm, C2-19.05mm C3-25.4mm C4-38.1mm. *4: D1=10×10×55mm D2=10×7.5×55mm D3=10×5×55mm D4=10×3.33×55mm *5: C-成品成分 Product composition R-熔炼成分 Melting composition *6: F-铁素体 Ferrite B-贝氏体 Bainite P-珠光体 Pearlite S-回火索氏体 Tempered Sorbite M-马氏体 Martensite																								
备注 Remark	1. AT THEORETICAL WEIGHT BASIS; 2. HARDNESS ACCORDING TO NACE MR-0175/ISO 15156/0103; 3. ALL TEST RESULTS ABOVE COMPLY WITH THE STANDARD ASME (B36.10M)-2007/ASTM A106B/C -2015/API 5L X42 PSL-1 45TH EDITION/CSA Z245.1 GR. 290 CAT I SS.																								

说明: 本质证书以原件为准, 复印无效。  
 Remark: No duplicate will be accepted.

质量管理部负责人  
 Quality Manager: 丁云峰

审核人:  
 Auditor: 丁云峰

制证人: 高叶  
 Certification-maker:

1<sup>st</sup> SCA 80 SA333 WT 3932131  
CE=.38 VT .196 Low

靖江市泽盛国际贸易有限公司  
JINGJIANG ZESHENG INTERNATIONAL TRADE CO., LTD

产品质量证明书  
BEST CERTIFICATE EN10204 3.1

MILL 江苏省靖江市滨江国际A座801  
No.801,Tower A, Binjiang Commercial Center Jiangjiang,  
Jiangsu Province, China (214500) P21 1 of 1  
www.jssteelpipe.com  
Tel:86-523-84900018 Fax:86-523-84900018

总捆数 Total Bundles		24		总支数 Total Pieces		2164		重量 Weight		44.834		日期 Date: 2018-10-20		No: 181020WM024-8											
收货单位 PURCHASER		ZESHENG STEEL SINGAPORE PTE. LTD.																							
产品名称 Product		CARBON STEEL SEAMLESS PIPES																							
规格 Size O.D×W.T×L (m)		1" SCH80 33.4*4.55*6.4		钢级 Grade		GR.359		牌号 Steel Type				交货状态 Delivery Status		COLD-DRAWING (ANNEAL+NORMALIZED)											
序号 NO.	炉号 Heat No	批号 Batch No	捆数 Bundle	支数 Pcs	重量 (MT) Weight	拉伸试验 Tensile Test						冲击试验 Impact Test				硬度试验 Hardness Value									
						尺寸 Dimension	标距长度 Gauge Length (mm)	屈服强度 Y.S Mpa	抗拉强度 T.S Mpa	伸长率 E.L (%)	截面比 Share Are (%)	尺寸 Dimension (*4)	温度 (°C) Temperature	冲击值 (J) Impact Value			硬度值 Hardness Value (HRC)								
1	3932131	1810458	23	2069	42.866	*1-A2	50	375/380	510/520	34/36	80/80	D6	-73°C	42/45/51	14.0										
2	3932131	1810458	1	95	1.968	*1-A2	50	375/380	510/520	34/36	80/80	D6	-73°C	42/45/51	14.0										
3																									
4																									
5																									
序号 NO.	类别 Type *5	化学成分 (%) Chemical Composition														低倍组织 (级) M.S			金相分析 Metallogical Analysis						
		C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V	B	Nb	Ti	CE	一般疏松 Ordinary Porosity	中心疏松 Central Porosity	偏析 Segregation	显微组织 *6 Microstructure	夹杂物 Inclusion				带状组织 (级) B.S	脱碳层 (mm) D.L
1	C	0.16	0.30	1.24	0.013	0.006	0.04	0.01	0.02	0.005	0.003	0.001	0.002	0.001	0.38					A	B	C	D		
2	C	0.16	0.30	1.24	0.013	0.006	0.04	0.01	0.02	0.005	0.003	0.001	0.002	0.001	0.38										
3	C																								
4	C																								
5	C																								
压扁 Flattening	冷弯 Cold Bending	扩口 Flaring	超声检验 U.T	涡流检验	E.T	磁粉检验 M.P.I	漏磁检验 L.M.T	通径 N.D	表面 & 尺寸 S&D	水压 Hydro Test (>=5s)	1	20.7	Mpa												
	OK			OK		OK			OK		2		Mpa												
											3		Mpa												
											4		Mpa												
											5		Mpa												
注释 Notes	*1:纵向条状 Longitudinal Strip: A1-12.7mm, A2-19.05mm A3-25.4mm A4-38.1mm. F-全截面 Full-section *2:棒状 Clubbed: B1=12.7mm, B2=8.9mm, B3=8mm, B4=10mm *3:横向条状 Transverse Strip: C1-12.7mm, C2-19.05mm C3-25.4mm C4-38.1mm. *4: D1=10×10×55mm D2=10×7.5×55mm D3=10×6.67×55mm D4=10×5×55mm D5=10*3.33*55mm D6=10*2.5*55mm *5: C-成品成分 Product composition R-熔炼成分 Melting composition *6: F-铁素体 Ferrite B-贝氏体 Bainite P-珠光体 Pearlite S-回火索氏体 Tempered Sorbite M-马氏体 Martensite																								
备注 Remark	1. AT THEORETICAL WEIGHT BASIS; 2. HARDNESS ACCORDING TO NACE MR-0175/ISO 15156/0103; 3. ALL TEST RESULTS ABOVE COMPLY WITH THE STANDARD ASME (B36.10M)-2015/ASTM SA/A333 GR.6-2015/API 5L X52 PSL-2 45TH EDITION/CSA Z245.1 GR. 359 CAN U.S.S-2014																								

说明: 本质证书以原件为准, 复印无效。  
Remark: No duplicate will be accepted.

JINGJIANG ZESHENG INTERNATIONAL TRADE CO., LTD.

制证人: 高叶  
Certification-maker:

PO 745898  
**CONFORMS WITH ASME  
SEC. II PART A 2019  
EDITION JAN 6 / 20 JF.**

E.S

 I.M.L. - INDUSTRIA MECCANICA FIGURE 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 182 Packing List Nr 346 Invoice Nr 319
--	---

Heat Code	Heat Nr	Quantity	Description
K207	32887	72,00	FITTING HEX.BUSHING M/F 3/8M THRD NPT 3"x1" A105N

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	V	Nb	N	AL	C.E.	PRE
ASTM A105 (LADLE)	0,005	0,004	-	0,026	0,415	-

Test specimen Sect. mm2	Length mm	Shape 1=O - 2=□	Tensile N/mm2	Yield Strength > 0,2% N/mm2	Yield Strength >1% N/mm2	Elongation %	Reduction of area %
122,65	50,00	1	515,0	363,0	-	35,0	60,5

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

Sec

Conforms with ASME  
 Sec. II, Part A 2017  
 April 23, 2018 SH

in, XZ  
 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 
--	----------------------	---

# Welded Piping Documentation



Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: Dec 6, 2017 Rev Status: 11.0		FORM-PRESSURE PIPING EXAMINATION CHECKLIST

Page 1 of 1

## EXHIBIT 21.2 PRESSURE PIPING EXAMINATION CHECKLIST

OCT 01 2019

Drawing No. / Revision No. 10936-001-B-2100 R0, 10936-001-B-2200 R0, 10936-001-B-2300 R0, 10936-001-B-2400 R0,				
WO# 10936-001-B				
NO.	FUNCTION	HOLD	SIGNATURE OR INITIAL & DATE	
			QC INSPECTOR	OWNER'S INSPECTOR
1	DRAWINGS: ABSA registration over 0.5 Cu. M Approved by Owner, Approved for Construction (signed & dated)			
2	Owner's Inspector Notified.		BW Nov 27/19	
3	Registered Welding Procedures Specifications, Q.C Manual and Forms available at site, Job File started.		BW OCT 02 2019	
4	Welders qualified for WPS's and have valid Performance cards. Welders Log completed. WPS reviewed with Welders	✓	BW Nov 27/19	
5	Material Checked against P.O., Drawings, and Specifications. Identification confirmed. Color Coding applied.	✓	BW NOV 27 2019	
6	Sample of each Welder's work examined, including root spacing, alignment, cleaning, joint preparation, preheat and electrode control.		BW DEC 02 2019	
7	Non-destructive Examination completed. Reports and radiographs reviewed, signed by Level II or III, Radiograph I.D. detailed on drawings.	✓	BW DEC 10 2019	
8	Visual Examination of all completed welds, Welder's I.D. Stamped and recorded on drawings.		BW DEC 02 2019	
9	Heat Treatment verified and recorded on drawings.	✓	LR Dec. 9/19	
10	Each system checked against specifications and drawings before test.		✓ DEC 12 2019	
11	All deficiencies recorded and signed off by Q.C.I and Owner's Inspector before test. Pressure test examination guide completed.		✓ DEC 12 2019	
12	Pressure Test checked. Gauge calibration verified, gauge #'s recorded	✓	✓ DEC 12 2019	
13	Systems checked after Test. Deficiencies recorded and corrected.		✓ DEC 12 2019	
14	Construction Data Reports (AB-83) prepared and signed by Q.C.I and Owner's Inspector.		✓ Jan 2/20	
15	Declaration form (AB-28) submitted to ABSA		NA	
16	As built drawings accepted by Owner		NA	

## EXHIBIT 16.2 HYDROSTATIC TEST AFFIDAVIT

Customer: <u>Encana Corporation</u>	JO# 10936-001
Project: <u>Dual metering package</u>	Project#
Test Pressure: <u>2220 PSI</u>	Hold Time: <u>15 minutes</u>
Code Requirements: <u>ASME B31.3 NFS 2016 EDITION</u>	
All Personnel Advised of Test <input checked="" type="checkbox"/> All Signs & Flagging Posted <input checked="" type="checkbox"/>	
Prior to Filling – Fitting/Hoses & Component Meet Required Test Pressure, Pressure Test Examination Guide Completed	
Initials: Supervisor: _____ Tester: <u>AL</u>	Date: <u>12/12/2019</u>

Product Description:

1. PG-4"-C-80A-200, 201, 202, 203, 204, 205, PG-4"-C-80A-206, PG-8"-C-80A-207, PG-1"-W-160A-208, 209, D-1"-C-80A-500, ALL ASSOCIATED PROCESS TUBING = 2220 PSI

50% Test Pressure Leak/Systems Check Completed

1. 50% = 1110 PSI

Test Temperature: \_\_\_\_\_ °F

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

\*See NWP Procedure for Draining Water from Hydro Tested Vessel Package\*

Start Time: <u>7:10 am</u>	Finish Time: <u>8:30am</u>
----------------------------	----------------------------

Test Gauge Identification #	Pressure Range	Calibration Date
NWPG- 5000 -32-	0-5000 PSI	July 16/2020
NWPG- 5000 -23-	0-5000 PSI	July 15 / 2020
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	
NWPG-	PSI	

Test By: <u>Andrew Lundgren</u>	Date: 12/12/2019
NWP Representative: <u>Jeremy Atkinson</u>	Date: 12/12/2019
Customer Representative: <u>Don Smith</u>	Date: 12/12/2019



# EXHIBIT 14.1 HEAT TREATMENT REQUIREMENTS

Serial#

PO# 747022

JOB NO.: 10936-001-B

CUSTOMER: Encana

DATE: Dec 5, 2019

## COMPONENT DESCRIPTION 8 Sools

DWG. NO. AND LINE NO.	DIAMETER	THICKNESS	MATERIAL	LENGTH	WEIGHT
10936-001-B-2100 Rev.0	4"	SCH 80	SA-106-B & SA-333-GR6	various	various
10936-001-B-2200 Rev.0	4"	SCH 80	SA-106-B & SA-333-GR6	various	various
10936-001-B-2300 Rev.0	4"	SCH 80	SA-106-B & SA-333-GR6	various	various
10936-001-B-2400 Rev.0	8"	SCH 80	SA-106-B & SA-333-GR6	various	various

TYPE OF HEAT TREATMENT: PRESSURE VESSEL or Process Piping STRESS RELIEVE P-No.1

### HEATING

Temperature to be raised from 600°F (316°C) to 1150°F (621°C) at maximum rate of 200 °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 ± 25°F for 120 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 600°F (316°C) at a maximum rate of 250 °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, center, and top of the furnace charge in accordance with the ASME code.
- During the heating period, there shall not be greater variation in temperature throughout the portion of the vessel being heater than 250°F (140°C) within any 15 ft. (4.6m) interval of length. An adequate number of thermocouples much be used to ensure this Code requirements is met. This limitation is also applicable to the temperature variations between the different thicknesses of various vessel components.
- During the holding period, there shall not be a greater difference than 150°F (83°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 attached thermocouples an ASME Code Section IX Welding Procedure Specification is required (WSP 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 <sup>2</sup> = W-Sec.]

Q.C. Inspector Signature: *BW*

Date: **DEC 05 2019**

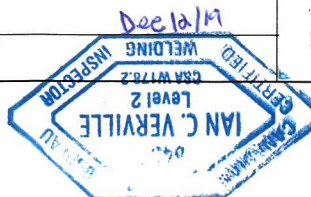
Thermocouple Attachment Method: **CAPACITOR DISCHARGE**

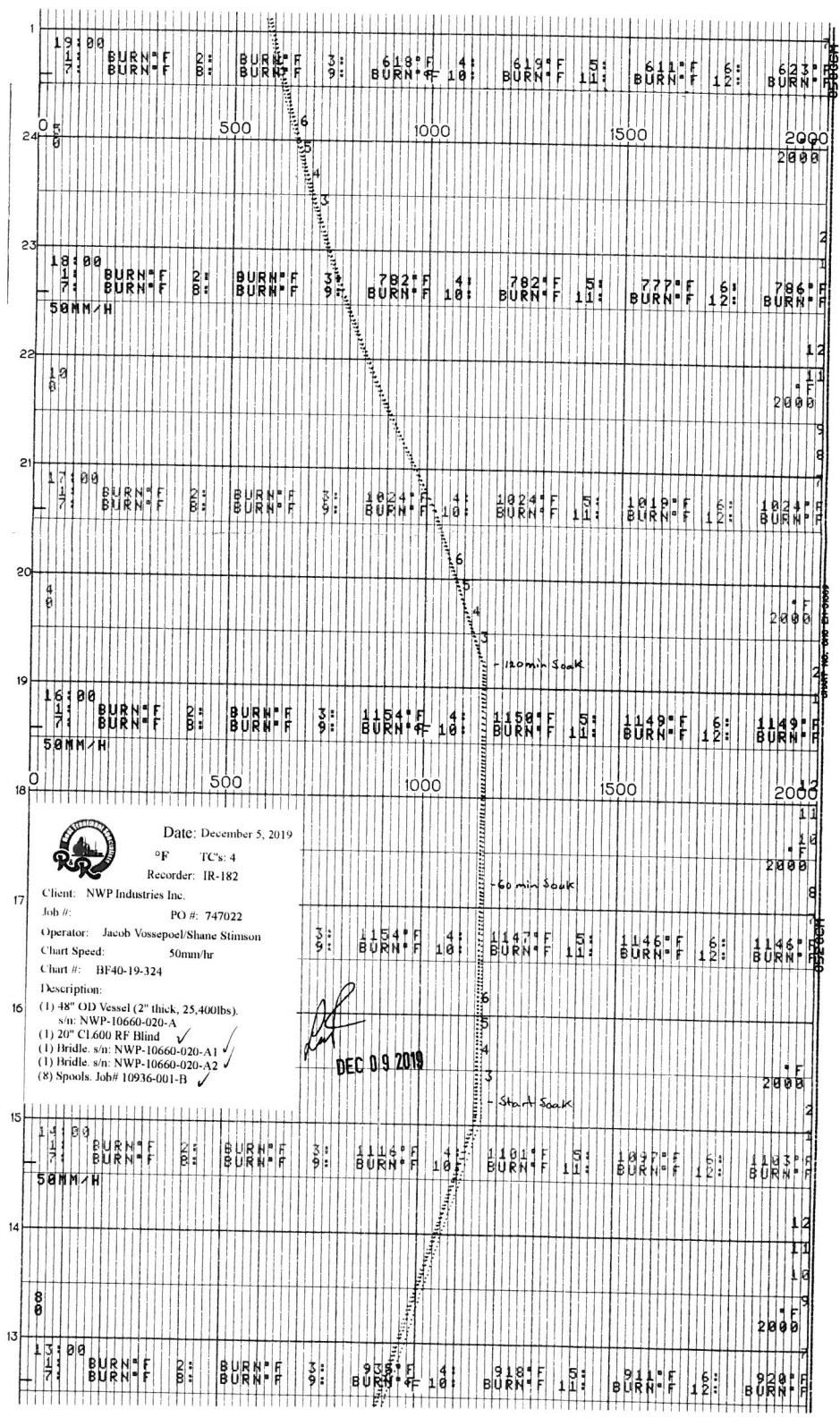
Furnace Heat Number: **B F 4 0 - 1 9 - 3 2 4**

Furnace Operator Signature: \_\_\_\_\_

Form Prepared by: Holly Mayhew

Vessel NWP-10660-020-A TC# 3 top 2"  
from head seam, TC# 6 middle, TC# 4  
bottom 2" from head seam, opposit side.  
TC# 5 on Spool in basket  
December 5, 2019





18.5 0.0

18:00  
50MM/H

18:00

18:00

18:00

18:00

18:00

18:00

18:00

18:00

18:00

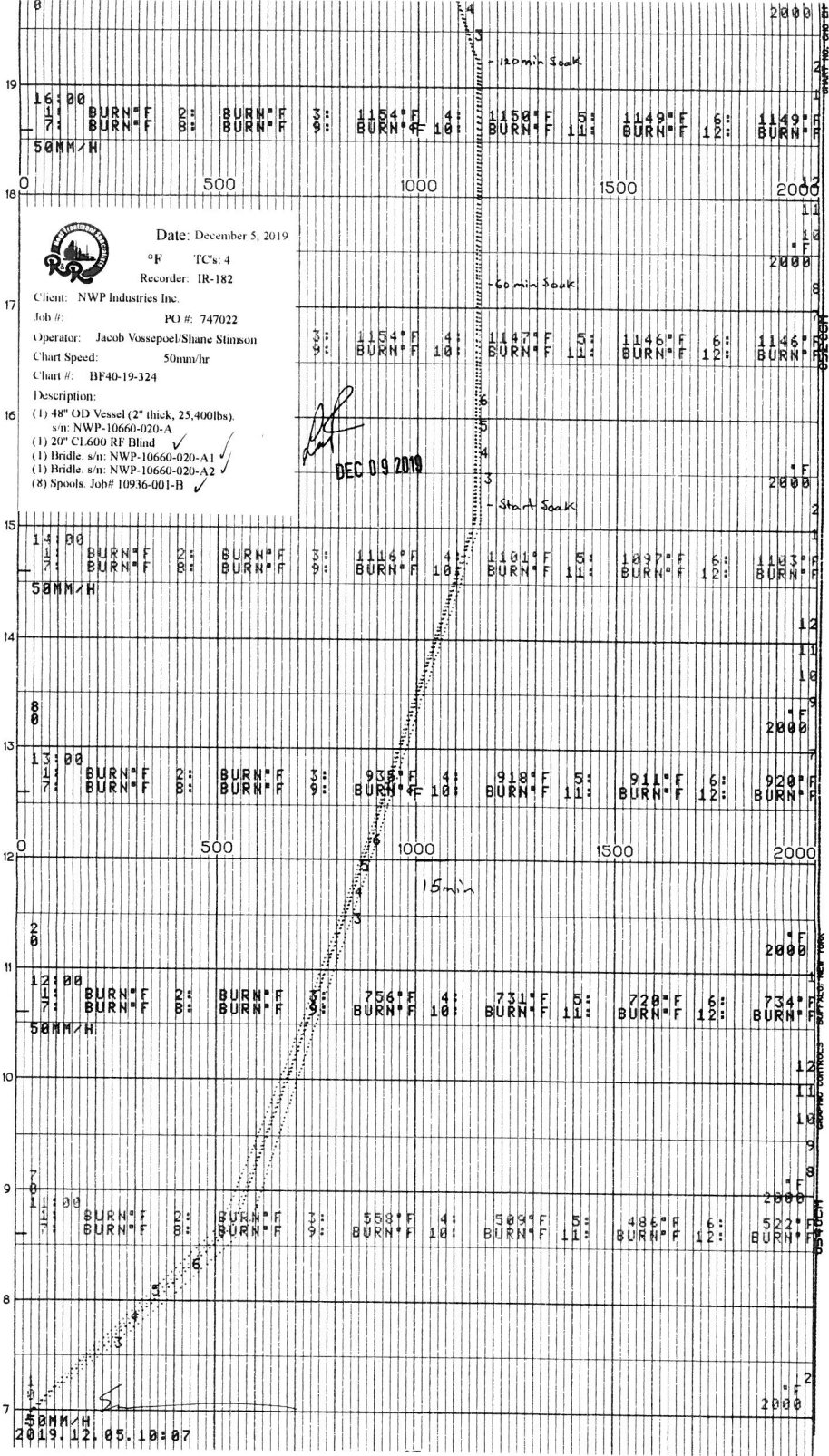
18:00

DEC 09 2019

120 min Soak

60 min Soak

Start Soak



Date: December 5, 2019  
 °F TC's: 4  
 Recorder: IR-182

Client: NWP Industries Inc.  
 Job #: PO #: 747022  
 Operator: Jacob Vossepoel/Shane Stinson  
 Chart Speed: 50mm/hr  
 Chart #: BF40-19-324

- Description:
- (1) 48" OD Vessel (2" thick, 25,400lbs)  
 s/n: NWP-10660-020-A
  - (1) 20" CL600 RF Blind ✓
  - (1) Bridle. s/n: NWP-10660-020-A1 ✓
  - (1) Bridle. s/n: NWP-10660-020-A2 ✓
  - (8) Spools. Job# 10936-001-B ✓

*[Signature]*  
 DEC 09 2019

2019.12.05.10:07



## R & R Stress Relieving Service Ltd.

Nisku: 2103 – 6<sup>th</sup> Street, T9E 7X8 Tel: (780) 955-7559 Fax: (780) 955-2903  
Blackfalds: #15 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:	RR1119
DATE:	November 7, 2019
DATE DUE:	February 7, 2020
INSTRUMENT MFG:	Chino
MODEL NUMBER:	AH-3725 N00
SERIAL NUMBER:	AH-059C172
RECORDER NUMBER:	IR-182

**This instrument has been calibrated to  $\pm 5^{\circ}\text{F}$  and it is within the manufacturers specifications.**

### REFERENCE STANDARDS

Omega CL3512A S/N: 09001089

Certification Date: 01/02/19

**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

OIL AND GAS  $\phi$  PETROCHEMICAL  $\phi$  POWER  $\phi$  PULP AND PAPER  
INNOVATION  $\phi$  QUALITY  $\phi$  EXPERIENCE



**Client:**

**Encana Corporation**

**Report Number:**  
**RT-19-0968**

**Radiographic Testing Report**

**Radiation source:** IR-192  
**Device S/N:** D13263  
**Source S/N:** 90212G  
**Activity(cI):** 65  
**Effective Focal Spot Size(EFSS):** 3.5mm

**Date:** 2-Dec-19  
**Serial #:** NWP-10936-001-B  
**Code:** ASME B31.3 NFS - 2016 Edition / Encana Category VII  
**Project:** Welded Piping for 4" Dual Metering Pkg.  
**Insp Descr.:** Gamma ray on welded pipe interpreted to CSA Z662  
**Location:** Sour Service Client Specification ECA-C-PVF-R-004  
 Innisfail AB

**Inspection Procedure - NDT-RT01**  
**ASME Radiography Procedure**  
**SOD:** minimum source-to-object distance(D)  
**OFD:** maximum object-to-film distance (D in T-274.1)

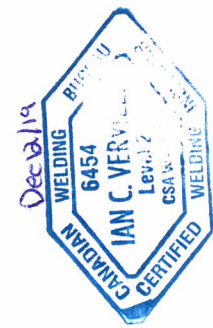
AC-Arc Burn BT-Burn through CK-Crack LC-Low cover EP-Excessive Penetration  
 P-Porosity HB-Hollow Bead EUC-External Undercut IUC-Internal Undercut S-Slag  
 IP-Incomplete Penetration LF-Lack of Fusion CB-Concave Bead GP-Gas Pocket HL- High/Low

Weld I.D.#	Size	Thickness	Welder ID	Material	Film Type	RT Tech.	# of Exp.	IQI	SOD(in)	OFD(in)	Type & location of discontinuity	Accept	Reject
X-1	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	Weld Discontinuity Severity: 1: Slight 2: Moderate 3: Severe(rejectable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-2	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	Film mark @ 11cm, CB (1) @ 34cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-3	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-4	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-5	2"	S160	DD	c.s./P1	Agfa D4/C3	RT1	5	FS ASTM B	1.907"	.468"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-6	4"	S80	DD	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (1) @ 7cm & 22cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-7	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-8	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	CB (2) @ 1cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-9	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	CB (1) @ 9cm, P (1) @ 27cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-10	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-11	4"	S80	DD	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-12	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-13	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-14	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (2) @ 5cm & 28cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-15	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	CB (1) @ 16cm & 27cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-16	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	S (2) @ 5cm, P (1) @ 6cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-17	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	Film mark @ 8cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-18	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-19	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (2) @ 36cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-20	2"	S160	C	c.s./P1	Agfa D4/C3	RT1	5	FS ASTM B	1.907"	.468"		<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Auditor**  
 Richard Humphrey - CGSB/SNT-12122 RT2

**Inspector**  
 NWP QC Representative  
 DEC 03 2019

**Report #:** RT-19-0968  
**Page:** 1 of 3  
**Rev.:** 0





**Client:** Encana Corporation  
**Date:** 2-Dec-19 **JOB:** 10936-001-B  
**Serial #:** NWP-10936-001-B  
**Code:** ASME B31.3 NFS - 2016 Edition / Encana Category VII  
**Project:** Welded Piping for 4" Dual Metering Pkg.  
**Insp Descr:** Gamma ray on welded pipe interpreted to CSA Z662  
 Sour Service Client Specification ECA-C-PVF-R-004  
**Location:** Innisfail AB

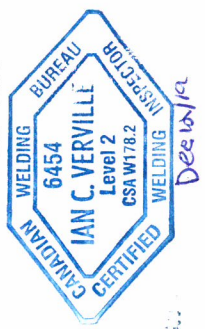
**Report Number:** RT-19-0968  
**Inspection Procedure - NDT-RT01**  
**ASME Radiography Procedure**  
 SOD: minimum source-to-object distance(D)  
 OFD: maximum object-to-film distance (D in T-274.1)

**Radiation source:** IR-192  
 Device S/N: D13263  
 Source S/N: 90212G  
 Activity(ci): 65  
 Effective Focal Spot Size(EFSS): 3.5mm

Weld I.D.#	Size	Thickness	Welder ID	Material	Film Type	RT Tech.	# of Exp.	IQI	SOD(in)	OFD(in)	Type & location of discontinuity	Weld Discontinuity Severity: 1: Slight 2: Moderate 3: Severe(rejectable)	Accept	Reject
X-21	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	Cluster porosity (2) @ .4cm-individual indications below max. diameter per code, CB (1) @ 30cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-22	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	CB (1) @ 8cm & 18cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-23	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (1) @ 15cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-24	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (2) @ 27cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-25	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (1) @ 30cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-26	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"			<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-27	4"	S80	DD	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"			<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-28	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	CB (1) @ 18cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-29	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"			<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-30	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	CB (2) @ 2cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-31	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"			<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-32	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (2) @ 13cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-33	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (1) @ 12cm, HB (2) @ 19cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-34	4"	S80	DD	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	Film mark @ 7cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-35	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"			<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-36	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	Film mark @ 2cm, P (2) @ 12cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-37	4"	S80	DD	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	P (1) @ 16cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-38	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	CB (1) @ 31cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-39	4"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"			<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-40	8"	S80	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	8.000"	.625"	HB (2) @ 17cm & 35cm, P (2) @ 61cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Auditor:** Richard Humphrey - CGSB/SNT-12122 RT2  
**Inspector:** Ian C. Verwill  
**QC Representative:** NWP QC Representative  
**Date:** DEC 03 2019

**Report #:** RT-19-0968  
**Page:** 2 of 3 **Rev.:** 0







**Client:** Encana Corporation  
**Date:** 2-Dec-19 **JOB:** 10936-001-B  
**Serial #:** NWP-10936-001-B  
**Code:** ASME B31.3 NFS - 2016 Edition / Encana Category VII  
**Project:** Welded Piping for 4" Dual Metering Pkg.  
**Insp Descr.:** Gamma ray on welded pipe interpreted to CSA Z662  
 Sour Services Client Specification ECA-C-PVF-R-004  
**Location:** Innisfail AB

**Report Number:** RT-19-0968  
**No of Film in Cassette:** 1  
**Screen Type:** LEAD  
**Front:** 0.010" **Back:** 0.010"  
 AC-Arc Burn BT-Burn through CK-Crack LC-Low cover EP-Excessive Penetration  
 P-Porosity HB-Hollow Bead EUC-External Undercut IUC-Internal Undercut S-Slag  
 IP-Incomplete Penetration LF-Lack of Fusion CB-Concave Bead GP-Gas Pocket HL-High/Low

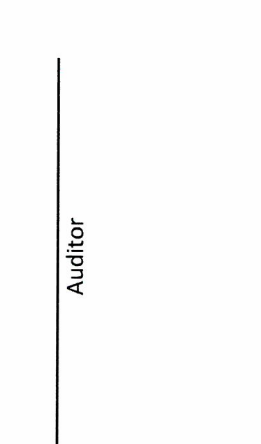
# Radiographic Testing Report

**Inspection Procedure - NDT-RT01**  
**ASME Radiography Procedure**  
 SOD: minimum source-to-object distance(D)  
 OFD: maximum object-to-film distance (D in T-274.1)

Weld I.D.#	Size	Thickness	Welder ID	Material	Film Type	RT Tech.	# of Exp.	IQI	SOD(in)	OFD(in)	Type & location of discontinuity	Weld Discontinuity Severity: 1: Slight 2: Moderate 3: Severe(rejectable)	Accept	Reject
X-41	8"	580	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	8.000"	.625"	P (1) @ 56cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-42	4"	580	DD	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"	S (1) @ 4cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-43	8"	580	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	8.000"	.625"	HB (2) @ 19cm, CB (1) @ 64cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-44	8"	580	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	8.000"	.625"	CB (1) @ 59cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-45	4"	580	DD	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	4.038"	.462"			<input checked="" type="checkbox"/>	<input type="checkbox"/>
X-46	8"	580	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	8.000"	.625"	P (1) @ 5cm, 11cm & 18cm, P (3) @ 35cm to 48cm, P (1) @ 57cm & 59cm		<input type="checkbox"/>	<input checked="" type="checkbox"/>
X-47	8"	580	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	8.000"	.625"	CB (1) @ 58cm		<input checked="" type="checkbox"/>	<input type="checkbox"/>
													<input type="checkbox"/>	<input type="checkbox"/>
													<input type="checkbox"/>	<input type="checkbox"/>
													<input type="checkbox"/>	<input type="checkbox"/>
													<input type="checkbox"/>	<input type="checkbox"/>
													<input type="checkbox"/>	<input type="checkbox"/>
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**Richard Humphrey - CGSB/SNT-12122 RT2**  
 Auditor  
**DEC 03 2019**  
 NWP QC Representative

**Report #:** RT-19-0968  
**Page:** 3 of 3 **Rev.** 0  
**4017 60th Ave, Innisfail, AB T4G 1S9 403-227-4100**  
**Dec 12/19**





**NWP INDUSTRIES LP**

**Client:**

**Encana Corporation**

**Report Number:**  
**RT-19-0978**

**Radiographic Testing Report**

Radiation source: IR-192  
Device S/N: D13263  
Source S/N: 90212G  
Activity(ci): 64  
Effective Focal Spot Size(EFSS): 3.5mm

Date: 4-Dec-19  
Serial #: NWP-10936-001-B  
Code: ASME B31.3 NFS - 2016 Edition / Encana Category VII  
Project: Welded Piping for 4" Dual Metering Pkg.  
Insp Descr.: Gamma ray on welded pipe interpreted to CSA Z662  
Sour Service Client Specification ECA-C-PVF-R-004

No of Film in Cassette: 1  
Screen Type: LEAD  
Front: 0.010" Back: 0.010"

Inspection Procedure - NDT-RT01  
ASME Radiography Procedure

SOD: minimum source-to-object distance(D)  
OFD: maximum object-to-film distance (D in T-274.1)

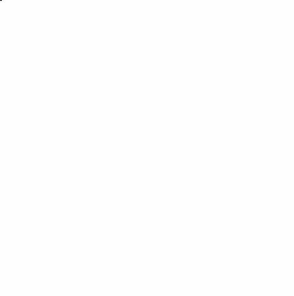
Weld I.D.#	Size	Thickness	Welder ID	Material	Film Type	RT Tech.	# of Exp.	IQI	SOD(in)	OFD(in)	Type & location of discontinuity	Accept	Reject
X-46R	8"	580	C	c.s./P1	Agfa D4/C3	RT1	3	FS ASTM B	8.000"	.625"	Weld Discontinuity Severity: 1: Slight 2: Moderate 3: Severe(rejectable) P (1) @ 4cm, 10cm, 57cm & 59cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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Location:		Insp Descr.:		Project:		Code:		Serial #:		Date:		Client:	

Auditor: \_\_\_\_\_  
Richard Humphrey - CGSB/SNT-1212 RT2  
NWP QC Representative

Signature: \_\_\_\_\_  
Date: DEC 05 2019

NWP Industries  
4017 60th Ave, Innifail, AB T4G 1S9  
Report #: RT-19-0978  
Page: 1 of 1 Rev. 0





# HARDNESS TESTING REPORT

Report #:  
HT-19-0126

<b>NWP Client:</b> Encana Corporation <b>Date:</b> 03-Dec-19 <b>Serial #:</b> NWP 10936-001-B <b>JOB #:</b> 10936-001-B <b>Location:</b> Innisfail, AB <b>Project:</b> Welded Piping for Dual Meter/Pump Pkg. <b>Insp. Description:</b> HT on marked welds.	<b>Client Spec:</b> N/A <b>Insp. Standard:</b> N/A <b>Code:</b> Client Information <b>Procedure:</b> NDT-HT01 <b>Technique:</b> 5 Point Test <b>Surface:</b> Light sanding with 120 grit paper <b>Max Hardness:</b> 187 <b>Hardness Unit:</b> BHN
---	--

**Equipment Used:** alphaDUR mini      **Serial #:** ADm-1370      **Probe #:** 5270      **Load:** 49/N  
**Calibration Block:** BAQ      **Cal Block Serial #:** EP17203496      **Accuracy:** 61.4 HRC +/- 0.5 ASTM

Weld #:	Material	Welder	BASE	HAZ	WELD	HAZ	BASE	Remarks:	Accept	Reject
HT-1	CS/P1	4	138	136	152	150	146		<input checked="" type="checkbox"/>	<input type="checkbox"/>
HT-2	CS/P1	4	138	149	163	156	156		<input checked="" type="checkbox"/>	<input type="checkbox"/>
HT-3	CS/P1	4	133	126	155	133	157		<input checked="" type="checkbox"/>	<input type="checkbox"/>
HT-4	CS/P1	4	131	123	172	133	128		<input checked="" type="checkbox"/>	<input type="checkbox"/>
HT-5	CS/P1	DD	140	127	157	141	140		<input checked="" type="checkbox"/>	<input type="checkbox"/>
									<input type="checkbox"/>	<input type="checkbox"/>
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Auditor \_\_\_\_\_

  
 Sheldon Stotz- CGSB/SNT:4734 / RTII, MTII, PTII, UTI
 

 Date **DEC 10 2019**  
 NWP QC Rep. \_\_\_\_\_





# MAGNETIC PARTICLE INSPECTION REPORT

Report #:  
MT-19-0601

**NWP Client:** Encana Corporation  
**Date:** 03-Dec-19  
**Serial #:** NWP-10936-001-B  
**JOB #:** 10936-001-B  
**Location:** Innisfail, AB  
**Project:** Welded Piping on Dual Meter/Pump  
 Pkg.  
**Insp. Description:** MT on Weldolet & Socket welds.

**Client Spec:** N/A  
**Insp Standard:** ASME Sec. V, Article 7  
**Code:** ASME B31.3 NFS 2016 Edition  
**Procedure:** NDT-MT01  
**Technique:** MT 2 (black on white)  
**Surface:** As-Welded/Bare Metal

**Yoke Type :** Sentinal    **Yoke Model:** MP-A2L    **Yoke S/N:** MP5782    **Daily Lift Test:**  Accept     Reject  
**Light Source:** Yoke LED light + shop lighting    **10 LBS Weight:** S/N:1985    **Power Type:** A/C

Light Meter:		Model:	Cal. Date:	Serial #:
Manufacturer	Designation	Consumable Type	Batch Number	
Magnaflux	WCP-2	White Contrast	19E13K	
Magnaflux	7HF	Magnetic Particle	19C11K	

Weld #:	Material	Welder	Remarks:	Report #	Accept	Reject
MT-1	C.S./P1	C	2" Weldolet		<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-2	C.S./P1	C	1" Socket Weld		<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-3	C.S./P1	C	2" Weldolet		<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-4	C.S./P1	C	1" Socket Weld		<input checked="" type="checkbox"/>	<input type="checkbox"/>
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Auditor

Sheldon Slotz - CGSB/SNT:4734 / RTII, MTII, PTII, UTII

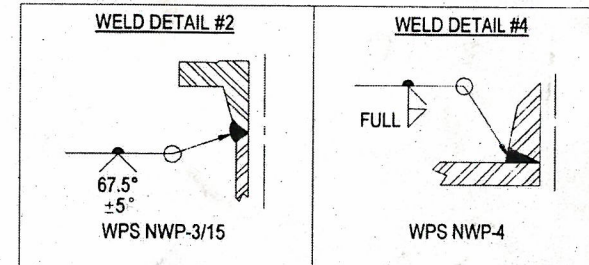
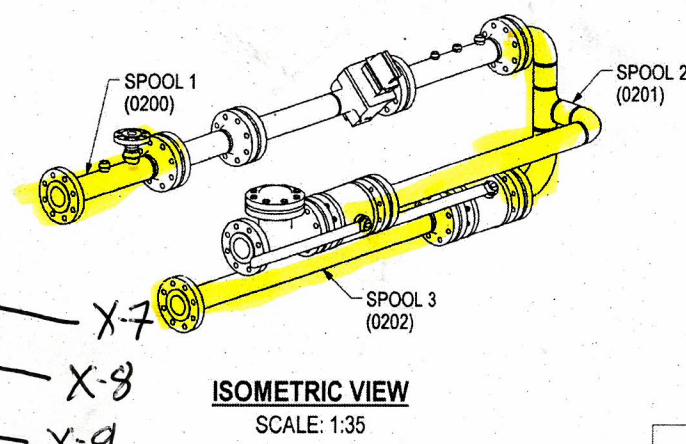
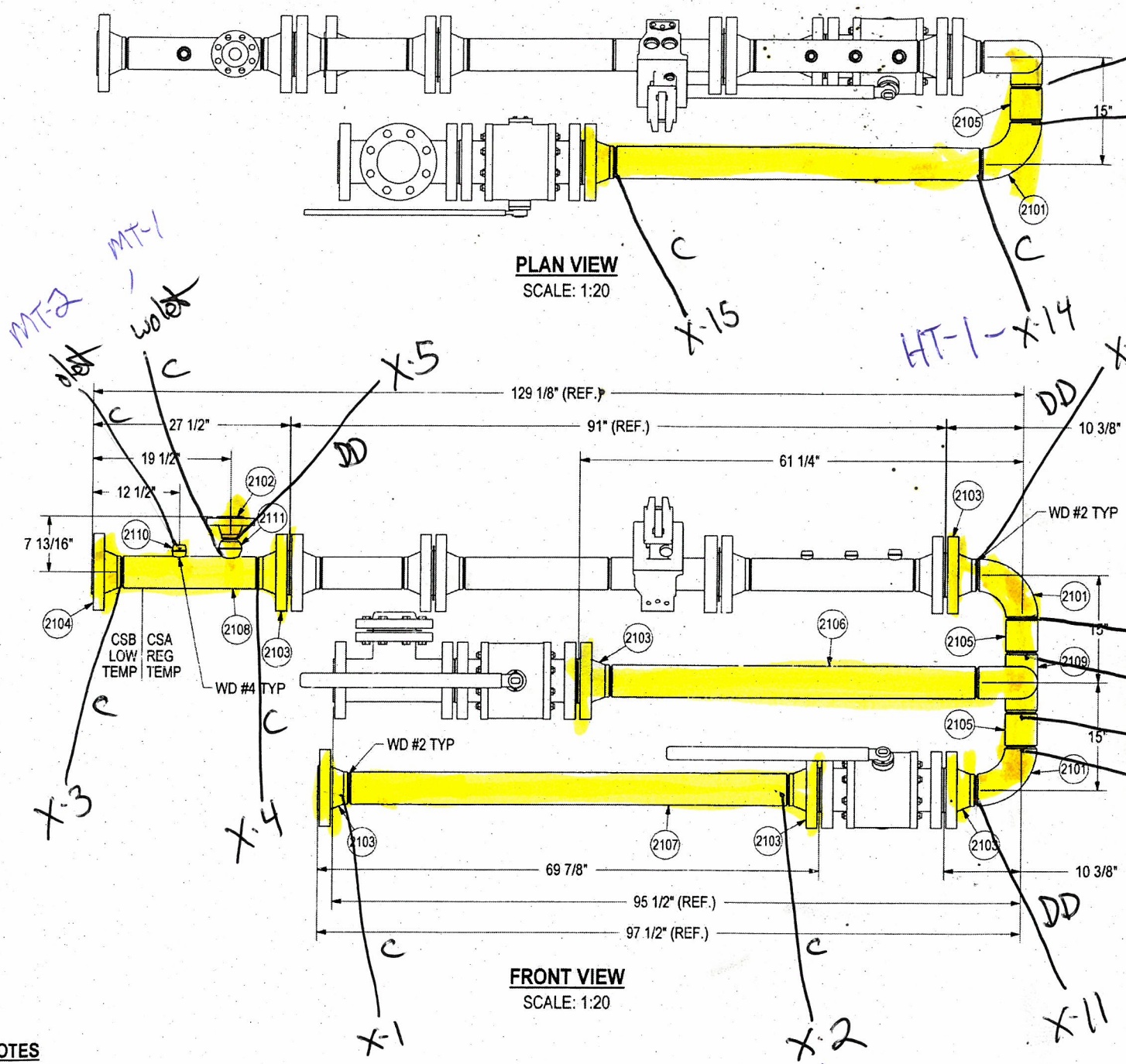
*BW*  
NWP QC Rep.    Date: DEC 10 2019



Report: MT-19-0601  
Page: 1 of 1    Rev. 0

ITEM	PART #	DESCRIPTION	MATERIAL	SIZE	QTY	MTR #
2101	ELBBW90L480B	ELBOW: 4" 90 DEG LR BW SCH 80	SA-234-WPB		3	6203340 629-2
2102	FRFWN2C160A	FLANGE 2" 600 ANSI S/160 RFWN	SA-105N		1	213550
2103	FRFWN4C80A	FLANGE 4" 600 ANSI S/80 RFWN	SA-105N	K5AV8	6	212-260
2104	FRFWN4C80AL	FLANGE 4" 600 ANSI S/80 RFWN	SA-350LF2-CL1		1	19105017 20
2105	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	4 5/8"	3	17-310214
2106	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	50 3/4"	1	17-310214
2107	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	61 1/8"	1	17-310214
2108	PIP480CL	PIPE: 4" NOM SCH 80 BBE	SA-333-GR6 SMLS	18 3/4"	1	AB956
2109	TESBW480B	TEE: 4" SCH 80 BW	SA-234-WPB		1	6203340 39
2110	TOLBW1(3-36)XA	THREADOLET: 1" CL6000 ON 4" RUN	SA-105N		1	50457
2111	WOLBW2(4)160A	WOL: 2" ON 4" RUN SCH 160	SA-105N		1	50301

C = 12  
DD = 3



PIPING DESIGN DATA	
LINE NUMBER:	PG-4"-C-80A-0200/0201/0202
INTERNAL COATING:	NONE
CLIENT SPECIFICATION:	CSA/CSB
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2016 EDITION
DESIGN PRESSURE:	1480 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 °F
MINIMUM DESIGN TEMPERATURE:	-49 °F / -20 °F @ 1480 PSIG
SERVICE:	SOUR HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	2220 PSIG
RADIOGRAPHY:	100% BW (NOTE 6)
MPI:	100% TOL, 100% WOL
HARDNESS TEST:	10% ALL WELDS, 225 HBW MAX (NOTE 6)
POST WELD HEAT TREATMENT:	1150 °F ± 25 °F HOLD FOR 1 HOUR
CORROSION ALLOWANCE:	1/8"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

- NOTES**
- ALL DIMENSIONS SHALL HAVE A TOLERANCE OF ±1/8" UNLESS OTHERWISE SPECIFIED.
  - ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
  - CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED TO MAINTAIN OVERALL DIMENSIONS.
  - 1/8" ROOT GAP ACCOUNTED FOR ON ALL BUTT WELDS.
  - MATERIAL SPECIFICATION MAY BE UPGRADED AS FOLLOWS:  
WELD FITTING: SA-234-WPB TO SA-420-WPL6  
PIPE: SA-106-B TO SA-333-GR6 SMLS  
FORGING: SA-105N TO SA-350-LF2 CLASS 1
  - MATERIALS PER ENCANNA SOUR SERVICE REQUIREMENTS ECA-C-GEN-R-003 LATEST REV. NDE PER ENCANNA PIPING MATERIALS ECA-C-PVF-R-004 LATEST REV.  
HARDNESS TEST A234-WPB - 197 HBW MAX  
HARDNESS TEST A105N - 187 HBW MAX

REV.	DATE	BY:	CHK:	APP:	DESCRIPTION
0	SEP 26/19	CSD	CF	CF	ISSUED FOR CONSTRUCTION

DRAWING REVISIONS

**ISSUED FOR CONSTRUCTION**

SIGNED: *[Signature]*

DATE: Oct 1, 2019

W.O.: 10936-001-B

S/N: \_\_\_\_\_

ALL DIMENSIONS IN INCHES

**ORIGINAL**

**NWP INDUSTRIES LP**

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

PROJECTION:

SCALE: AS NOTED

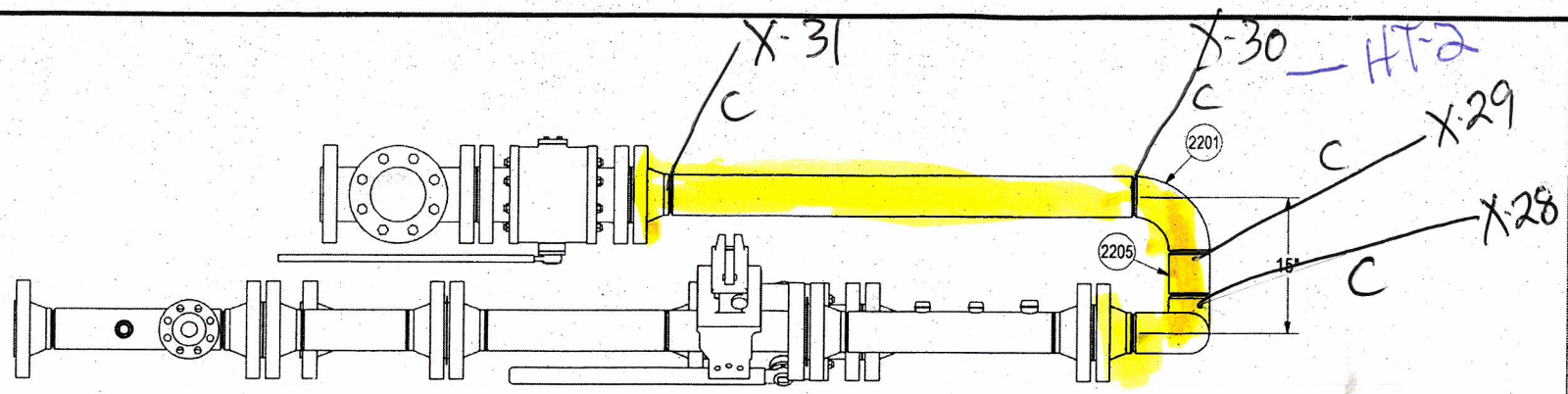
ENCANNA CORPORATION  
4" DUAL METER/PUMP PACKAGE SOUR  
GAS FUEL GAS SCRUBBER  
GAS INLET

WELDED PIPING PROCESS GAS INLET

DWN: CSD    CHK: S    APP: CF

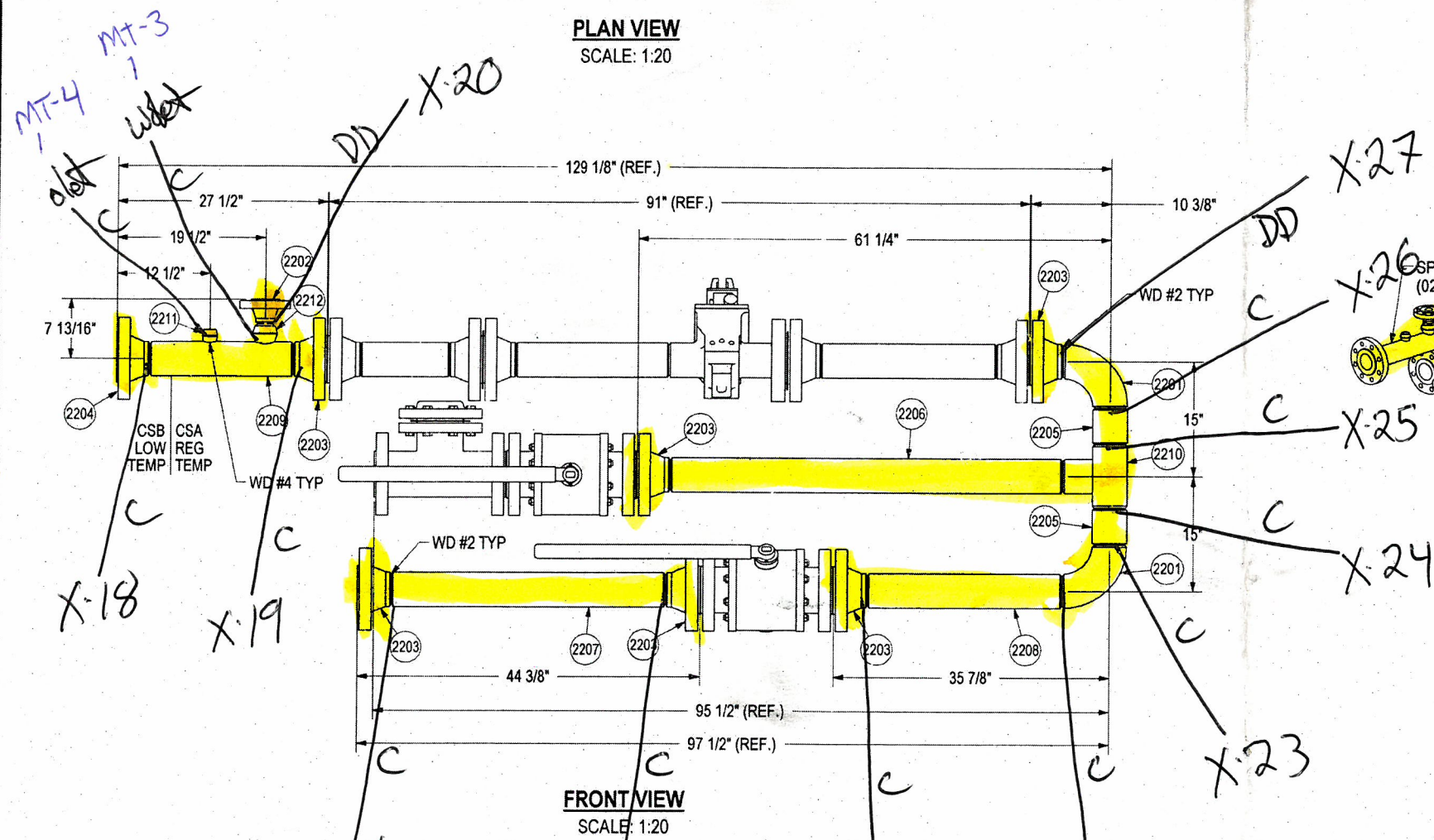
DATE: SEP 26/19    DATE: SEP 30 2019    DATE: SEP 30 2019

SHEET: 1 OF 1    DWG: 10936-001-B-2100    REV: 0

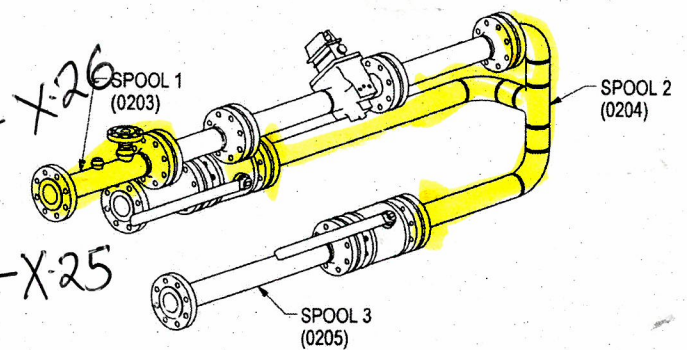


ITEM	PART #	DESCRIPTION	MATERIAL	SIZE	QTY	MTR #
2201	ELBBW90L480B	ELBOW: 4" 90 DEG LR BW SCH 80	SA-234-WPB		3	62000M 069-1
2202	FRFWN2C160A	FLANGE 2" 600 ANSI S/160 RFWN	SA-105N		1	615556
2203	FRFWN4C80A	FLANGE 4" 600 ANSI S/80 RFWN	SA-105N		6	65248
2204	FRFWN4C80AL	FLANGE 4" 600 ANSI S/80 RFWN	SA-350LF2-CL1		1	1970307 20
2205	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	4 5/8"	3	1441582
2206	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	50 3/4"	1	1441582
2207	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	35 5/8"	1	1441582
2208	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	25 3/8"	1	1441582
2209	PIP480CL	PIPE: 4" NOM SCH 80 BBE	SA-333-GR6 SMLS	18 3/4"	1	AB106
2210	TESBW480B	TEE: 4" SCH 80 BW	SA-234-WPB		1	62000M 0 39
2211	TOLBW1(3-36)XA	THREADOLET: 1" CL6000 ON 4" RUN	SA-105N		1	50157
2212	WOLBW2(4)160A	WOL: 2" ON 4" RUN SCH 160	SA-105N		1	50301

**PLAN VIEW**  
SCALE: 1:20

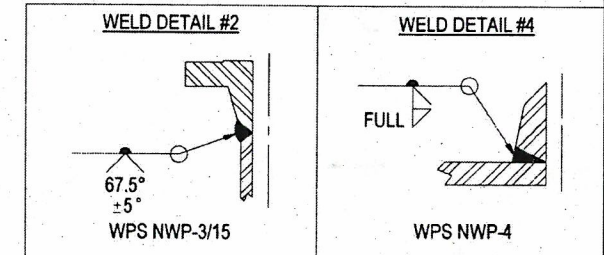


**FRONT VIEW**  
SCALE: 1:20



**ISOMETRIC VIEW**  
SCALE: 1:35

C = 14  
DD = 2



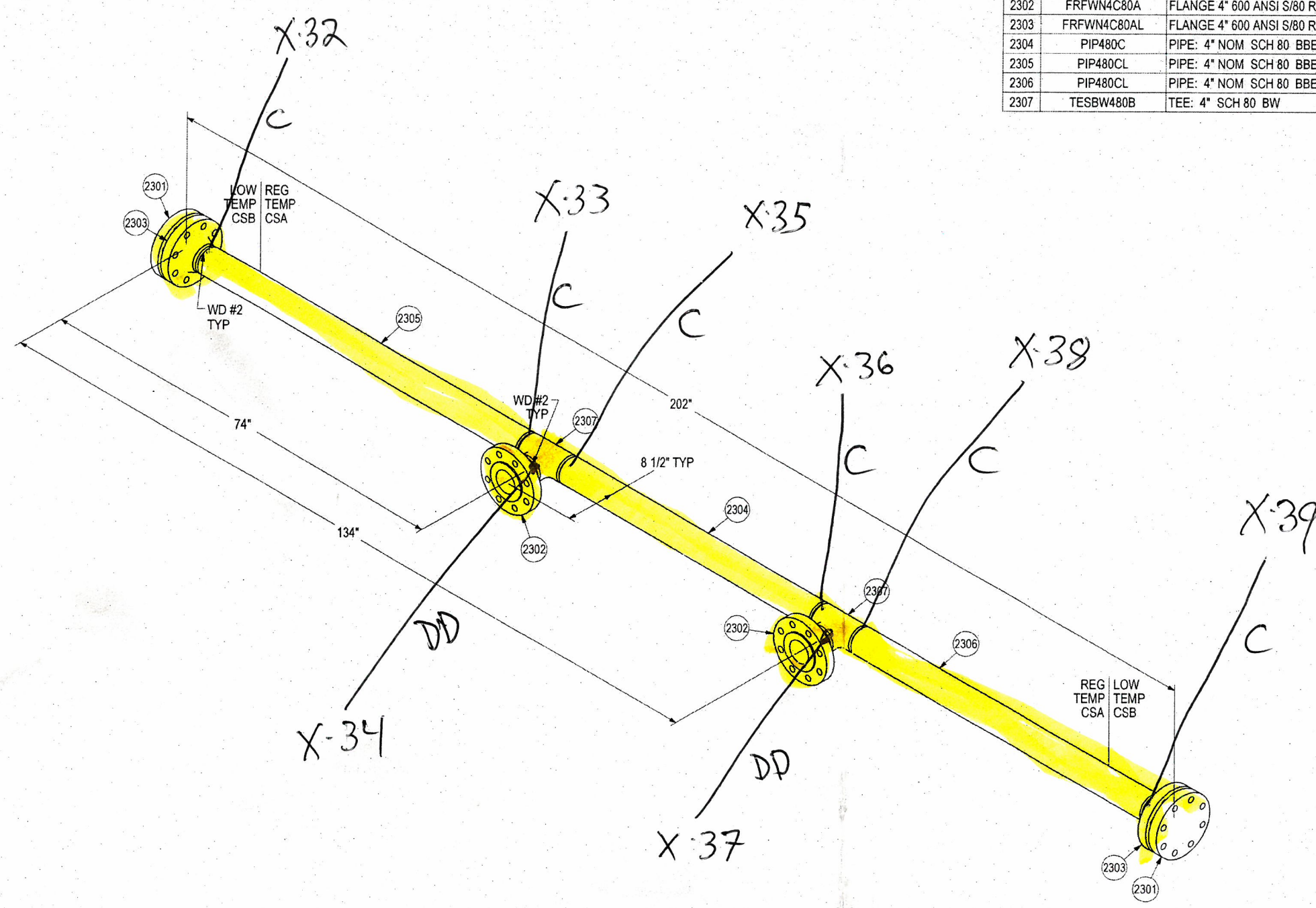
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LINE NUMBER:	PG-4"-C-80A-0203/0204/0205
INTERNAL COATING:	NONE
CLIENT SPECIFICATION:	CSA/CSB
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2016 EDITION
DESIGN PRESSURE:	1480 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 °F
MINIMUM DESIGN TEMPERATURE:	49 °F / -20 °F @ 1480 PSIG
SERVICE:	SOUR HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	2220 PSIG
RADIOGRAPHY:	100% BW (NOTE 6)
MPI:	100% TOL, 100% WOL
HARDNESS TEST:	10% ALL WELDS, 225 HBW MAX (NOTE 6)
POST WELD HEAT TREATMENT:	1150 °F ± 25 °F HOLD FOR 1 HOUR
CORROSION ALLOWANCE:	1/8"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

- NOTES**
- ALL DIMENSIONS SHALL HAVE A TOLERANCE OF ±1/8" UNLESS OTHERWISE SPECIFIED.
  - ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
  - CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED TO MAINTAIN OVERALL DIMENSIONS.
  - 1/8" ROOT GAP ACCOUNTED FOR ON ALL BUTT WELDS.
  - MATERIAL SPECIFICATION MAY BE UPGRADED AS FOLLOWS:  
WELD FITTING: SA-234-WPB TO SA-420-WPL6  
PIPE: SA-106-B TO SA-333-GR6 SMLS  
FORGING: SA-105N TO SA-350-LF2 CLASS 1
  - MATERIALS PER ENCANA SOUR SERVICE REQUIREMENTS ECA-C-GEN-R-003 LATEST REV. NDE PER ENCANA PIPING MATERIALS ECA-C-PVF-R-004 LATEST REV.  
HARDNESS TEST A234-WPB - 197 HBW MAX  
HARDNESS TEST A105N - 187 HBW MAX

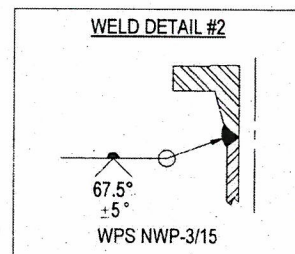
**ORIGINAL**

<p>ISSUED FOR CONSTRUCTION</p> <p>SIGNED: _____</p> <p>DATE: Oct 1, 2019</p> <p>W.O.: 10936-001-B</p> <p>S/N: _____</p>				<p><b>NWP INDUSTRIES LP</b></p> <p>P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102</p>		<p>ENCANA CORPORATION</p> <p>4" DUAL METER/PUMP PACKAGE SOUR C/W FUEL GAS SCRUBBER</p> <p>WELDED PIPING PROCESS GAS INLET</p>	
<p>0 SEP 26/19 CSD [Signature] [Signature] ISSUED FOR CONSTRUCTION</p> <p>REV. DATE BY: CHK: APP: DESCRIPTION</p>				<p>PROJECTION: [Symbol]</p> <p>SCALE: AS NOTED</p>		<p>DWN: CSD CHK: [Signature] APP: [Signature]</p> <p>DATE: SEP 26/19 DATE: SEP 30 2019 DATE: SEP 30 2019</p>	
<p>DRAWING REVISIONS</p>				<p>ALL DIMENSIONS IN INCHES</p>		<p>SHEET: 1 OF 1 DWG: 10936-001-B-2200 REV: 0</p>	

ITEM	PART #	DESCRIPTION	MATERIAL	SIZE	QTY	MTR #
2301	FRFBL4CAL	BLIND 4" 600 ANSI RF	SA-350LF2-CL1		2	
2302	FRFWN4C80A	FLANGE 4" 600 ANSI S/80 RFWN	SA-105N		2	19105017 70
2303	FRFWN4C80AL	FLANGE 4" 600 ANSI S/80 RFWN	SA-350LF2-CL1		2	17-31624
2304	PIP480C	PIPE: 4" NOM SCH 80 BBE	SA-106-B SMLS	51 1/2"	1	AG956
2305	PIP480CL	PIPE: 4" NOM SCH 80 BBE	SA-333-GR6 SMLS	65 3/8"	1	AG956
2306	PIP480CL	PIPE: 4" NOM SCH 80 BBE	SA-333-GR6 SMLS	59 3/8"	1	AG956
2307	TESBW480B	TEE: 4" SCH 80 BW	SA-234-WPB		2	62 B10M 39



C=6  
DD=2



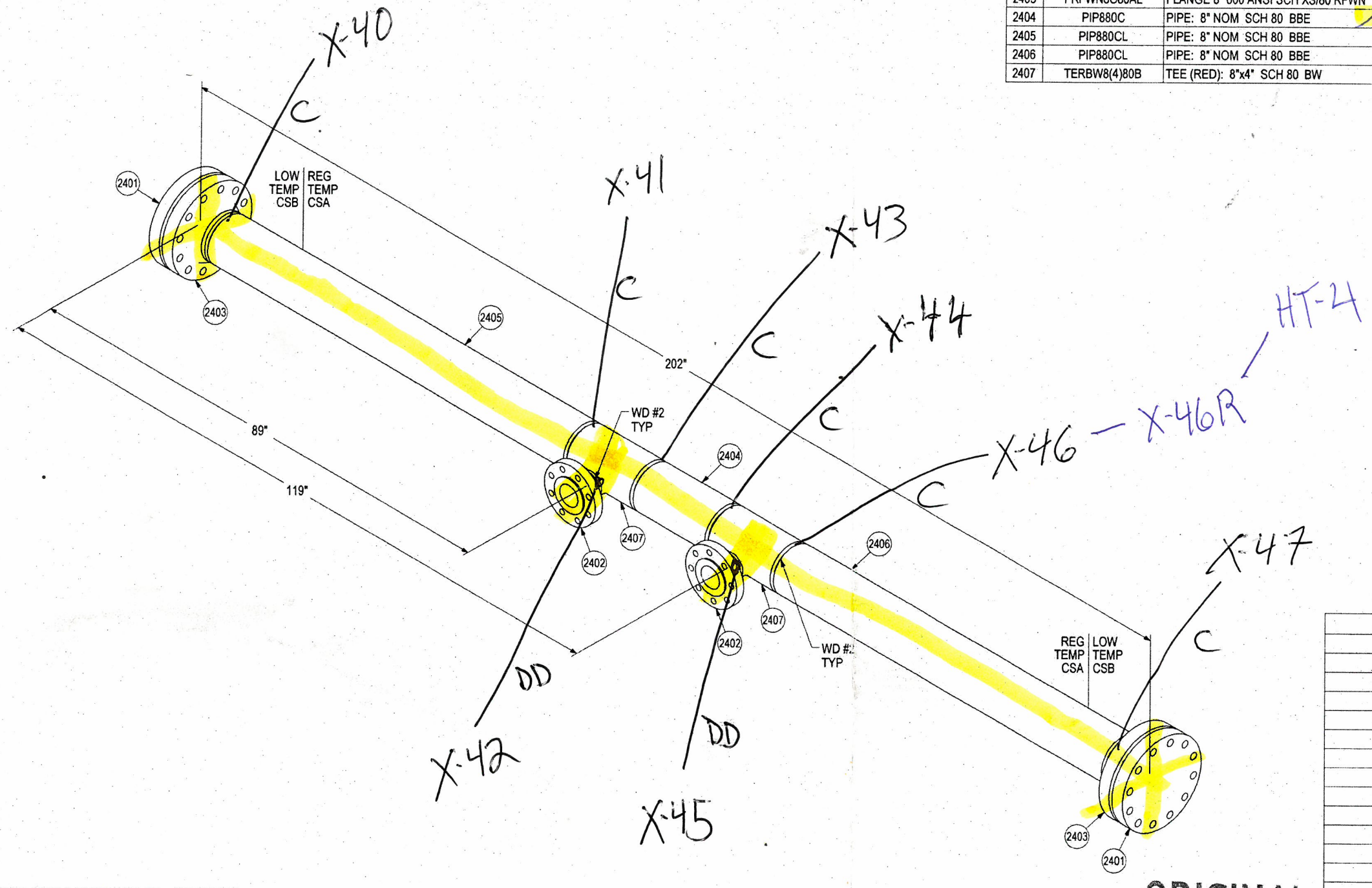
PIPING DESIGN DATA	
LINE NUMBER:	PG-4"-C-80A-0206
INTERNAL COATING:	NONE
CLIENT SPECIFICATION:	CSA/CSB
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2016 EDITION
DESIGN PRESSURE:	1480 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 °F
MINIMUM DESIGN TEMPERATURE:	-49 °F / -20 °F @ 1480 PSIG
SERVICE:	SOUR HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	2220 PSIG
RADIOGRAPHY:	100% BW (NOTE 6)
MPI:	NONE
HARDNESS TEST:	10% ALL WELDS, 225 HBW MAX (NOTE 6)
POST WELD HEAT TREATMENT:	1150 °F ± 25 °F HOLD FOR 1 HOUR
CORROSION ALLOWANCE:	1/8"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

- NOTES**
- ALL DIMENSIONS SHALL HAVE A TOLERANCE OF ± 1/8" UNLESS OTHERWISE SPECIFIED.
  - ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
  - CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED TO MAINTAIN OVERALL DIMENSIONS.
  - 1/8" ROOT GAP ACCOUNTED FOR ON ALL BUTT WELDS.
  - MATERIAL SPECIFICATION MAY BE UPGRADED AS FOLLOWS:  
WELD FITTING: SA-234-WPB TO SA-420-WPL6  
PIPE: SA-106-B TO SA-333-GR6 SMLS  
FORGING: SA-105N TO SA-350-LF2 CLASS 1
  - MATERIALS PER ENCANNA SOUR SERVICE REQUIREMENTS ECA-C-GEN-R-003 LATEST REV. NDE PER ENCANNA PIPING MATERIALS ECA-C-PVF-R-004 LATEST REV.  
HARDNESS TEST A234-WPB - 197 HBW MAX  
HARDNESS TEST A105N - 187 HBW MAX

**ORIGINAL**

<p>ISSUED FOR CONSTRUCTION</p> <p>SIGNED: <i>[Signature]</i></p> <p>DATE: Oct 1, 2019</p> <p>W.O.: 10936-001-B</p> <p>SIN: -----</p>				<p><b>NWP</b></p> <p>INDUSTRIES LP</p> <p>P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102</p>		<p>ENCANA CORPORATION</p> <p>4" DUAL METER/PUMP PACKAGE SOUR CWF FUEL GAS SCRUBBER</p> <p>WELDED PIPING TEST OUTLET</p>	
0	SEP 26/19	CSD	ISSUED FOR CONSTRUCTION	DWN:	CSD	CHK:	APP:
REV.	DATE	BY:	DESCRIPTION	DATE:	SEP 26/19	DATE:	SEP 30 2019
DRAWING REVISIONS				SHEET:	1 OF 1	DWG:	10936-001-B-2300
ALL DIMENSIONS IN INCHES				PROJECTION:	SCALE:	AS NOTED	REV:

ITEM	PART #	DESCRIPTION	MATERIAL	SIZE	QTY	MTR #
2401	FRFBL8CAL	BLIND 8" 600 ANSI RF	SA-350LF2-CL1		2	
2402	FRFWN4C80A	FLANGE 4" 600 ANSI S/80 RFWN	SA-105N		2	15AV8
2403	FRFWN8C80AL	FLANGE 8" 600 ANSI SCH XS/80 RFWN	SA-350LF2-CL1		2	14281 989
2404	PIP880C	PIPE: 8" NOM SCH 80 BBE	SA-106-B SMLS	15 3/4"	1	17-620478
2405	PIP880CL	PIPE: 8" NOM SCH 80 BBE	SA-333-GR6 SMLS	76 1/4"	1	17-620478
2406	PIP880CL	PIPE: 8" NOM SCH 80 BBE	SA-333-GR6 SMLS	70 1/4"	1	17-050478
2407	TERBW8(4)80B	TEE (RED): 8"x4" SCH 80 BW	SA-234-WPB		2	17-050478



PIPING DESIGN DATA	
LINE NUMBER:	PG-8"-C-80A-0207
INTERNAL COATING:	NONE
CLIENT SPECIFICATION:	CSA/CSB
DESIGN AND FABRICATE TO:	ANSI/ASME B31.3 NFS 2016 EDITION
DESIGN PRESSURE:	1480 PSIG
MAXIMUM DESIGN TEMPERATURE:	100 °F
MINIMUM DESIGN TEMPERATURE:	-49 °F / -20 °F @ 1480 PSIG
SERVICE:	SOUR HYDROCARBONS
HYDROSTATIC TEST PRESSURE:	2220 PSIG
RADIOGRAPHY:	100% BW (NOTE 6)
MPI:	NONE
HARDNESS TEST:	10% ALL WELDS, 225 HBW MAX (NOTE 6)
POST WELD HEAT TREATMENT:	1150 °F ± 25 °F HOLD FOR 1 HOUR
CORROSION ALLOWANCE:	1/8"
Q.C. PROGRAM NO.:	AQP-1253
WELDING PROCEDURE REGISTRATION NO.:	WP-1604.2

- NOTES**
- ALL DIMENSIONS SHALL HAVE A TOLERANCE OF  $\pm 1/8"$  UNLESS OTHERWISE SPECIFIED.
  - ALL BOLT HOLES STRADDLE COMMON CENTER LINE.
  - CUT LENGTHS FOR PIPE ARE FOR REFERENCE ONLY. SHOP TO ADJUST PIPE LENGTHS AS REQUIRED TO MAINTAIN OVERALL DIMENSIONS.
  - 1/8" ROOT GAP ACCOUNTED FOR ON ALL BUTT WELDS.
  - MATERIAL SPECIFICATION MAY BE UPGRADED AS FOLLOWS:  
WELD FITTING: SA-234-WPB TO SA-420-WPL6  
PIPE: SA-106-B TO SA-333-GR6 SMLS  
FORGING: SA-105N TO SA-350-LF2 CLASS 1
  - MATERIALS PER ENCANNA SOUR SERVICE REQUIREMENTS ECA-C-GEN-R-003 LATEST REV.  
NDE PER ENCANNA PIPING MATERIALS ECA-C-PVF-R-004 LATEST REV.  
HARDNESS TEST A234-WPB - 197 HBW MAX  
HARDNESS TEST A105N - 187 HBW MAX

<p>ISSUED FOR CONSTRUCTION</p> <p>SIGNED: <i>[Signature]</i></p> <p>DATE: Oct 1, 2019</p> <p>W.O.: 10936-001-B</p> <p>S/N: -----</p>				<p><b>NWP</b></p> <p>INDUSTRIES LP</p> <p>P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102</p>		<p>ENCANNA CORPORATION</p> <p>4" DUAL METER/PUMP PACKAGE SOUR</p> <p>C/W FUEL GAS SCRUBBER</p> <p><i>[Signature]</i></p> <p>WELDED PIPING GROUP OUTLET</p>													
<table border="1"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY:</th> <th>CHK:</th> <th>APP:</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>SEP 26/19</td> <td>CSD</td> <td>D</td> <td>UF</td> <td>ISSUED FOR CONSTRUCTION</td> </tr> </tbody> </table>				REV.	DATE	BY:	CHK:	APP:	DESCRIPTION	0	SEP 26/19	CSD	D	UF	ISSUED FOR CONSTRUCTION	<p>DWN: CSD</p> <p>DATE: SEP 26/19</p>		<p>CHK: <i>[Signature]</i></p> <p>DATE: SEP 30 2019</p>	
REV.	DATE	BY:	CHK:	APP:	DESCRIPTION														
0	SEP 26/19	CSD	D	UF	ISSUED FOR CONSTRUCTION														
<p>DRAWING REVISIONS</p> <p>ALL DIMENSIONS IN INCHES</p>				<p>PROJECTION: </p> <p>SCALE: AS NOTED</p>		<p>SHEET: 1 OF 1</p> <p>DWG: 10936-001-B-2400</p>													



**MTR'S**  
**(Material Test**  
**Reports)**

4" SCH 80 SA106B HT 1441582  
 CE = .35  
 VT. 311 Low

JIANGYIN YUEYUECHAO MANUFACTURE TUBE CO.,LTD ✓

No 18 Qiaohuang Rd, Xiake Town, Jiangyin City, Jiangsu Province, China.

Mill Test Certificate (EN10204-3.1B)

TO: CCD LTD.

SSP PO: I-14287

Page 1 of 1

DESCRIPTION: SEAMLESS STEEL PIPES ACCORDING TO ASTM A106B/ASME SA106B/2013(ADO) API 5LB

S/C NO.: EW-WM1404X-033  
 INVOICE NO.: 14-EW033WM-4

SPEC: ASTM A106B/ASME SA106B/2013(ADO) API 5LB

CERTIFICATE NO.: YYC 033-4

Date: 17/9/2014

ITEM NO.	HEAT NO.	LOT NO.	STEEL GRADE	SIZE (mm)	PIECES	WEIGHT (MT)	CHEMICAL COMPOSITION %									
							C	Si	Mn	P	S	Cr	Ni	Cu	V	Mo
1	1441582		GRB	4" SCH80*38FT	105	27.18	0.17	0.26	0.38	0.025	0.019	0.127	0.048	0.107	0.003	0.009
2	133747		GRB	10" SCH120*38FT	5	7.715	0.18	0.22	0.96	0.011	0.010	0.061	0.042	0.091	0.001	0.019
3	1208-25-486		GRB	3/4" SCH80*21FT	367	5.166	0.19	0.23	0.41	0.030	0.007	0.044	0.006	0.005	0.002	0.004
4	1001R-12		GRB	10" SCH100*38FT	3	3.993	0.20	0.28	0.43	0.016	0.010	0.029	0.004	0.006	0.004	0.001
5	H67327		GRB	1/2" SCH80*21FT	415	4.304	0.19	0.24	0.45	0.015	0.009	0.031	0.015	0.019	0.001	0.001

TOTAL: 895 PCS 31 BUNDLES 48.358 MT

ITEM NO.	MECHANICAL PROPERTIES				TECHNOLOGICAL PROPERTIES		NONDESTRUCTIVE TEST		SURFACE QUALITY		DIMENSION TOLERANCE	
	YIELD STRENGTH (Map)	TENSILE STRENGTH (Map)	HARDNESS (HRC)	ELONGATION %	FLATTENING TEST	BENDING TEST	U.T	ILT (Pa)	IN	OUT	O.D.	W.T.
1	320/315	490/485	14	38.0/37.5	Satisfactory	—	Satisfactory	2760	Satisfactory	Satisfactory	Satisfactory	Satisfactory
2	320/315	505/500	11	34.0/34.5	Satisfactory	—	Satisfactory	2760	Satisfactory	Satisfactory	Satisfactory	Satisfactory
3	365/370	485/490	12	46.0/46.5	Satisfactory	—	Satisfactory	2470	Satisfactory	Satisfactory	Satisfactory	Satisfactory
4	360/310	455/460	13	31.0/30.0	Satisfactory	—	Satisfactory	2760	Satisfactory	Satisfactory	Satisfactory	Satisfactory
5	305/300	465/470	12	32.5/33.0	Satisfactory	—	Satisfactory	2470	Satisfactory	Satisfactory	Satisfactory	Satisfactory

STAMP

Remarks: 1. We hereby certify that our pipe meet the standard of API 5L GR. B-44  
 2. We hereby certify that the properties described herein meet the requirement of the above spec.  
 3. Properties complianca with EN 10204-3.1B  
 4. The hardness described herein compliance with NACE MR-01-75/MR-01-03, ISO 15156-2-2009 (ADO)  
 5. There are no welding repair on pipes.  
 6. we hereby certify that there are no mercury, mercury compounds, mercury bearing instruments and no mercury equipment have been used on our pipes.

QA Office: Pan Ting

Chief Inspection Dept.

CONFORMS WITH ASME  
 SEC. II PART A, 2017 EDITION  
 MAR 6 / 19 JF.

\_\_\_\_\_

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

\_\_\_\_\_

RAT.  
 RAT.-P  
 RAT  
 App.



SIAM STEEL PIPE COMPANY LIMITED

บริษัท สยาม สตีล ไพป์ จำกัด  
MILL TEST CERTIFICATE

ใบรับประกันคุณภาพสินค้า  
EN10204 3.1

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

NO:SSP/QR 17-25

PG: 1 of 1

CONTRACT NO.	2017THWM031	PRODUCT	CARBON STEEL SEAMLESS PIPE			SPECIFICATION	ASME(B36.10M)/ASTM A106B/C/API 5L X42 PSL-I/CSA Z245.1 CAT I	DELIVERY CONDITION		Forming Method		HOT ROLLING									
CUSTOMER	BHD TUBULAR LTD				DATE OF ISSUE	10/09/2017	LICENCE		5L-0971	NO.	8306										
NO.	HEAT NO.	STEEL GRADE	SIZE	QUANTITY	LENGTH (M)	TENSILE TEST			Grain Size	IMPACT TEST			Hardness								
				PIECES		Y.S Mpa	T.S Mpa	EL(%)		Or.	SIZE(mm)	AKV(J)		BHN							
1	17-310161	GR.290	4"SCH40	128	1510.4	370	485	36	7			170									
2	17-310165	GR.290	4"SCH40	252	1537.2	340	470	36	7			160									
3	17-310169	GR.290	4"SCH80	89	1050.2	430	575	36	7			170									
4	17-310214	GR.290	4"SCH80	180	1098	410	560	38	7			160									
TOTAL				649	5195.8																
NO.	Analysis	CHEMICAL COMPOSITION (%)														WDT	STRAIGHTNESS	HYDROSTATIC PRESSURE (≥5S)	VISUAL TEST	Flattening	DIMENSION & WEIGHT TEST
		C	Si	Mn	P	S	Cr	Ni	Cu	Ti	Mo	V	B	Nb	CE						
1	HEAT	0.18	0.24	1.13	0.013	0.006	0.040	0.007	0.010	0.002	0.004	0.004	0.001	0.002	0.383	OK	OK	18.3Mpa	OK	OK	OK
2	HEAT	0.18	0.24	1.05	0.013	0.008	0.010	0.008	0.024	0.002	0.004	0.003	0.001	0.002	0.366	OK	OK	18.3Mpa	OK	OK	OK
3	HEAT	0.16	0.30	1.13	0.016	0.009	0.020	0.008	0.020	0.003	0.005	0.002	0.001	0.002	0.354	OK	OK	20.7Mpa	OK	OK	OK
4	HEAT	0.16	0.28	1.04	0.016	0.007	0.030	0.008	0.024	0.002	0.008	0.001	0.001	0.002	0.342	OK	OK	20.7Mpa	OK	OK	OK

RESULT: ALL TEST RESULTS ABOVE COMPLY WITH THE REQUIREMENTS IN ASME(B36.10M)-07/ASTM A106B/C-15/API 5L X42 PSL-I/CSA Z245.1 GR. 290 CAT I SS-07. HARDNESS ACCORDING TO NACE MR-0175/ISO 15156/103. THIS IS CERTIFY THAT IN ACCORDANCE WITH THE RELEVANT SPECIFICATION AND CONTRACTS. THE STEEL PIPES WERE TESTED QUALIFIED BY OUR QUALITY CONTROL DEPARTMENT AND ARE IN ACCEPTANCE CONDITIONS. CERTIFY THAT GOODS ARE SUPPLIED AS PER PURCHASE ORDER AND SPECIFICATION REQUIREMENTS. MANUFACTURED FROM FULL KILLED CARBON STEEL. COUNTRY OF ORIGIN: THAILAND.

Address:210/17 Moo 12, Tungsukla, Sriracha, Chonburi,20230, Thailand

4" SCH 80 SA106B - HT 17-310214  
CE = .34  
VT .354 Low

PO 739966  
Conforms with ASME  
Sec. II, Part A 2017 Edition  
Mar 17/18 JF

E.S

8" SCH 80 SA333 HT 17-620478  
 CE=.29  
 VT. 475 Low

PO 746737  
 Conforms with ASME  
 Sec. II, Part A 2017 Edition

Nov 7/19 JF



SIAM STEEL PIPE COMPANY LIMITED

บริษัท สยาม สตีล ไพป์ จำกัด  
 MILL TEST CERTIFICATE

NO:SSP/QR 62-02

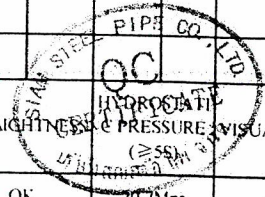
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ใบรับประกันคุณภาพสินค้า  
 EN10204 3.1

Page 1 of 1

CONTRACT NO.	2017THWM062	PRODUCT	CARBON STEEL SEAMLESS PIPE			SPECIFICATION	ASME(B36.10M)/ASTM A333 GR 6/API 5L X52 PLS-2 CSA Z245.1 CAT II	DELIVERY CONDITION	N	Forming Method	HOT ROLLING			
CUSTOMER	CCD STEEL TRADERS LTD					DATE OF ISSUE	15/12/2017	LICENCE	51-0971		NO.	1215-2		
NO.	HEAT NO.		STEEL GRADE	SIZE	QUANTITY	LENGTH (M)	TENSILE TEST			(%Per cent Shear area	IMPACT TEST -45°C			Hardness
	BATCH	PRODUCT					PIECES	Y.S Mpa	T.S Mpa		E.L(%)	Or.	SIZE(mm)	
1	174A099V	17-620356	GR.359	4"SCH80	39	249.6	400	485	38	80/80	T	3.3*10*55	61/62/65	160
2	1745529V	17-620356	GR.359	4"SCH80	52	332.8	400	485	38	80/80	T	3.3*10*55	61/62/65	160
3	1749559V	17-620478	GR.359	8"SCH80	12	142.8	385	500	38	80/85	T	6.67*10*55	63/68/74	160
4														
TOTAL					103	725.2								

NO.	Analysis	CHEMICAL COMPOSITION (%)														NDT	STRAIGHTNESS	PRESSURE	VISUAL TEST	Flattening	DIMENSION & WEIGHT TEST
		C	Si	Mn	P	S	Cr	Ni	Cu	Ti	Mo	V	B	Nb	CE						
1	HEAT	0.12	0.22	1.26	0.01	0.004	0.040	0.030	0.025	0.001	0.008	0.005	0.001	0.002	0.299	OK	OK	20.7Mpa	OK	OK	OK
2	HEAT	0.12	0.22	1.26	0.01	0.004	0.040	0.030	0.025	0.001	0.008	0.005	0.001	0.002	0.299	OK	OK	20.7Mpa	OK	OK	OK
3	HEAT	0.12	0.26	1.28	0.008	0.004	0.030	0.026	0.024	0.001	0.007	0.003	0.001	0.002	0.298	OK	OK	20.7Mpa	OK	OK	OK
4	HEAT																				



RESULT: ALL TEST RESULTS ABOVE COMPLY WITH THE REQUIREMENTS IN ASME(B36.10M)-07/ASTM A333 GR.6/API 5L X52 PLS-2./CSA Z245.1 GR. 359 CAT II SS. HARDNESS ACCORDING TO NACE MR-0175/ISO 15156/0103. THIS IS CERTIFY THAT IN ACCORDANCE WITH THE RELEVANT SPECIFICATION AND CONTRACTS. THE STEEL PIPES WERE TESTED QUALIFIED BY OUR QUALITY CONTROL DEPARTMENT AND ARE IN ACCEPTANCE CONDITIONS. CERTIFY THAT GOODS ARE SUPPLIED AS PER PURCHASE ORDER AND SPECIFICATION REQUIREMENTS. IMPACT TEST TEMPERATURE REDUCTION ACCORDING ASTM A333 STANDARD. 5\*10\*55 AT -56°C, 6.67\*10\*55 AT -50°C, 7.5\*10\*55 AT -48°C. MANUFACTURED FROM FULL KILLED CARBON STEEL. COUNTRY OF ORIGIN: THAILAND.  
 Address:210/17 Moo 12, Tungskula, Sriracha, Chonburi,20230, Thailand

# HAITIMA CORPORATION

## MATERIAL TEST CERTIFICATE

Page: 2

Date: Sep. 28, 2019

<b>Customer: NWP INDUSTRIES LP.</b>																	
Contract No.			Invoice No.					Material				according to					
#743569			HAT190919					A350 LF2 CL1				ASTM A350 / NACE MR 0175 ✓					
Article: Hot Forged Flange/geschmiedeter Flansch										Specification: ASME B16.5 ✓							
State of delivery: Quenched And Temper										Melting process/Erschmelzungsart: E				Q+T			
Marking: HTM Standard, CLASS, TYPE, SIZE, Material, Heat-No.																	
Stamp of Manufacturer: HTM																	
<b>Content of the Delivery:</b>																	
NO.	Pieces/stueckzahl	Description/Bezeichnung						Heat No/Schmelze-Nr				Test No/ProbeNr					
6	50	600# Blind ANSI RF 4"						1910501720				BC19Y01804					
7	20	2500# ANSI SCH XXS RFWN 1-1/2"						1910501720				BC19Y01804					
8	20	300# ANSI SCH80 RFWN 3"						1910501720				BC19Y01804					
9	200	600# ANSI SCH80 RFWN 3"						1910501720				BC19Y01804					
10	300	600# ANSI SCH80 RFWN 4" ✓						1910501720 ✓				BC19Y01804					
<b>Chemical analysis:</b>																	
NO.	Heat No.	%C	%Si	%Mn	%P	%S	%Cr	%Mo	%Ni	%Ti	%Ta	%Nb	%Co	%Cu	%Al	%N	%V
6-10	1910501720	0.17	0.23	1.23	0.016	0.006	0.062	0.001	0.005			0.001		0.025			0.001
<b>Mechanical tests:</b>																	
NO.	Test No/ProbeNr	Tensile Test: ASTM A370 L=4d				Charpy-impact Test, ISO-V Specimen				Hardness							
		Yield Strength N/mm <sup>2</sup>	Tensile Strength N/mm <sup>2</sup>	Elong %	Red of Area %	Kerbschlagversuch, ISO-V-Probe (-46°C)		Σ/N		Haerte HB							
6-10	BC19Y01804	361	552	32.5	73.0	106	124	137	122	148 148 152							
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS.										INSPECTOR				Q.C. MANAGER			
										<i>Yuan Lu</i>				<i>Hanson Chen</i>			

Conforms with ASME  
Sec. II, Part A 2017 Edition

NOV 27 2019

*DA*



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

Sold To: TRANS AM PIPING PRODUCTS LTD  
 9335 ENDEAVOR DRIVE S.E.  
 CALGARY AB T3S 0A1

MTR #: 353,698  
 PO #: CI-18-621

Sales Order #: C001813483 Date: 12/20/2018

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

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

Certified Material Test Report

Heat Code: 50301

Material: A/SA105N 14

Item	Quantity	Description
77	38	6 - 3 X 2 S160 BWP A/SA105N
79	15	6 - 3 X 2 XXS BWP A/SA105N

Chemical Composition

Ladle	B	C	Co	CR	CU	MN	MO	NB
	0.0004	0.2000	0.002	0.04	0.07	1.020	0.007	0.012
	NI	P	S	SI	V			
	0.030	0.005	0.0170	0.250	0.003			

Carbon Equivalency: Ladle 0.39

Product	C	Co	Cr	Cu	Mn	Mo	Nb	Ni
	0.1990	<0.001	0.03	0.07	1.070	0.010	0.014	0.026
	P	S	Si	V				
	0.004	0.0110	0.280	0.002				

Carbon Equivalency: Product 0.39

Product	Tensile PSI	Yield PSI	Elong %	RA %	Hardness
	73,615	50,169	36.50	62.69	137 BHN

MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#C129557/BONNEY FORGE (USA) - LOT#50301

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

1. IN ACCORDANCE WITH ANSI/NACE MR0175/ISO 15156-2015 & ISO 17945/MR0103-2015

Conforms with ASME Sec. II, Part A 2017 Edition

MAR 19 2019

Marie Dehmer  
 Quality Assurance Representative



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

Sold To: TRANS AM PIPING PRODUCTS LTD  
 9335 ENDEAVOR DRIVE S.E.  
 CALGARY AB T3S 0A1

MTR #: 351,635

PO #: CI-18-552

Sales Order #: C001811751

Date: 11/02/2018

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

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

Certified Material Test Report

Heat Code: 50457

Material: A/SA105N 14

Item 14 Description 36 - 3 X 1 6M THP A/SA105N

Chemical Composition

Ladle	C	Co	CR	CU	MN	MO	NB	NI
	0.2000	0.002	0.03	0.03	1.040	0.004	0.012	0.020
P	S	SI	V					
	0.003	0.019	0.230	0.003				
Carbon Equivalency:	Ladle			0.38				

Product	B	C	Co	Cr	Cu	Mn	Mo	Nb
	0.0002	0.1870	<0.001	0.03	0.04	1.090	0.007	0.014
Ni	P	S	SI	V				
	0.016	0.003	0.013	0.251	0.001			
Carbon Equivalency:	Product			0.38				

Product	Tensile PSI	Yield PSI	Elong %	RA %	Hardness
	76,033	51,933	36.80	65.84	144 BHN

MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#D123049/  
 BONNEY FORGE (USA) - LOT#50457

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

1. IN ACCORDANCE WITH ANSI/NACE MR0175/ISO 15156-2015 & ISO 17945/MR0103-2015

Conforms with ASME Sec. II, Part A 2017 Edition

JAN 07 2019

Marie Dehmer  
 Quality Assurance Representative

4" XH BW TEE A234-WPB  
 near Number : 62B10M039  
 Trans Am Piping Products Ltd. Rev'd By: PW  
 Shipment/Seq # : 1249 30

Purchaser : TRANS-AM PIPING PRODUCTS LTD. ✓

# INSPECTION CERTIFICATE



Thai Benkan Co., Ltd.  
 58 Soi Watkrusai, Bangkrui, Prapadaeng,  
 Samutprakan, 10130 Thailand. ✓

E-No. Purchase Order No. Job No.  
 TA-243 CI-18-113

TO EN10204 3.1/ISO 10474 3.1

D M Y Certificate No.  
 12/04/2019 T. 2018180164

No.	MFG. No.	Specification for Material Made from Seamless Pipe		Specification for Inspection	Visual Examination	Dimensional Inspection
		ASTM A234-18/ASME SA234-17 Gr.WPB CSA Z46.17 Gr.241 CAT I NACE MR0175MSO 15168-2:2015 & MR0103-2015 ✓				
Product & Size (T:*)		Quantity	Heat Treatment (Note 1)	Hardness Actual Data	Barren(%)	
1	62B10M039 ✓	T WPB 4 XS ✓		N	HBW : 130 - 131 ✓	0.0001
2	62B10M062	T WPB 4 S160		N	HBW : 120 - 140	0.0000
3	62B10M067	T WPB 4 XXS		N	HBW : 131 - 140	0.0001
4	62B10M037	T WPB 2 XS		N	HBW : 124 - 142	0.0003
5						

Specification	Chemical Composition %												Tension Test #2			HARDNESS MAX			
	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	C.E.	YS	TS	E				
Min.	X100	X100	X100	X1000	X1000	X100	X100	X100	X100	X1000	X1000	X100	MPa.			%			
Max.		10	28										240	415	30	197 HBW : GOOD			
Base Material Heat No.	30		106	50	25	40	40	40	15	80	20	40	655				Ti	Ca	Al
1	J8LA153	20	23	85	15	3	1	2	4	10	0	10	37	283	453	35	0.000	0.0014	0.014
2	J8K8150	19	23	85	15	4	1	2	4	10	0	8	38	309	467	46	0.000	0.0001	0.013
3	J8L4206	19	25	84	14	6	2	2	4	10	0	9	38	307	471	51	0.000	0.0001	0.013
4	181548	17	23	106	10	3	8	3	6	1	1	1	37	320	476	38	0.000	0.0011	0.025
5																			

(Note 1) A : Hot formed with final temperature between 620 °C-980 °C, Cooled in still air N : Normalizing 910 °C x 40 Minutes, Cooled in still air

\* 2 : Gauge length = 60.8 mm. : Longitudinal.

The product was manufactured, sample tested, and inspected as specified in this Standard and the purchase order and was found to have met such requirements.

C.E. =  $C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15$  MAGNETIC PARTICLE EXAMINATION FOR TEE ONLY : GOOD

\* 1 : "T" symbolized wall thickness in mm. \* 2 : YS Yield strength TS = Tensile strength E = Elongation

We hereby certify that the product described herein has been manufactured in accordance with the specifications concerned and also with the purchaser's requirements and that the test results shown herein are correct.

Note for WPB: For each reduction of 0.01 % below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted, up to a maximum of 1.65 %

Form TZ-681/2

Rungnapa Kampanon  
 Quality Assurance Manager  
 Thai Benkan Co., Ltd.

Conforms with ASME  
 Sec. II, Part A 2017 Edition

OCT 2 2 2019



Purchaser : TRANS-AM PIPING PRODUCTS LTD. ✓

# INSPECTION CERTIFICATE



Thai Benkan Co., Ltd. ✓  
58 Soi Watkrumai, Bangkrui, Prapadaeng,  
Samutprakarn, 10130 Thailand.

TO EN10204 3.1/ISO 10474 3.1

E-No. Purchase Order No. Job No.  
TA-288 C1-19-243

D M Y Certificate No.

13/04/2019 T. 2019180168

No.	MFG. No.	Specification for Material Made from Seamless Pipe		Specification for Inspection		Visual Examination	Dimensional Inspection
		ASTM A234-18/ASME SA234-17 Gr.WPB CSA Z46.17 Gr.241 CAT1 NACE MR0176/ISO 15168-2:2015 & MR0103-2015 ✓		ASME B16.9-2018, B16.25-2017		Good	Good
Product & Size (T.*1)		Quantity	Heat Treatment (Note 1)		Hardness Actual Data	Boron(%)	
1	62D00M053	45 EL WPB 6 STD	A		HBW : 120 - 140	0.0001	
2	62D00M076	45 EL WPB 4 XS	A		HBW : 130 - 150	0.0004	
3	62D00M089-1 ✓	90 EL WPB 4 XS ✓	A		HBW : 139 - 144 ✓	0.0004	
4	62D00M048-5	90 EL WPB 6 STD	A		HBW : 120 - 140	0.0005	
5							

Specification	Chemical Composition %												Tension Test *2			HARDNESS MAX			
	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	C.E.	YS	TS	E				
Min.	x100	x100	x100	x1000	x1000	x100	x100	x100	x100	x1000	x1000	x100	MPa.			%			
Max.		10	29										240	416	30	197 HBW : GOOD			
Base Material Heat No.	30		108	50	58	40	40	40	15	80	20	40	665			Ti Ca Al			
1	J9L1035	19	23	83	14	4	1	2	3	9	0	8	35	281	435	34	0.000	0.0010	0.011
2	181544	16	24	105	13	3	7	3	6	1	1	1	36	326	498	45	0.000	0.0011	0.026
3	181575	15	23	72	7	4	8	4	5	2	10	10	31	278	433	42	0.018	0.0011	0.018
4	181573	15	23	71	8	3	7	3	5	2	10	10	29	296	469	33	0.020	0.0011	0.020
5																			

(Note 1) A : Hot formed with final temperature between 620 °C-980 °C, Cooled in still air N : Normalizing 910 °C x 40 Minutes, Cooled in still air  
\* 2 : Gauge length = 60.0 mm. : Length/dia.

The product was manufactured, sample tested, and inspected as specified in this Standard and the purchase order, and was found to have met such requirements.

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

\* 1 : "T" symbolised wall thickness in mm. \* 2 : YS Yield strength TS = Tensile strength E = Elongation

We hereby certify that the product described herein has been manufactured in accordance with the specifications concerned and also with the purchaser's requirements and that the test results shown herein are correct.

Note for WPB: For each reduction of 0.01 % below the specified carbon maximum, an increase of 0.05 % manganese above the specified maximum will be permitted, up to a maximum of 1.65 % Form TZ-6H/2

*Rungnapa Karapathan*

Quality Assurance Manager  
Thai Benkan Co., Ltd.

Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 22 2019

*[Signature]*

NWP INDUSTRIES PO# 746362 Job# CHEM Item# 13 Part# 481602  
 Heat Number: 62D00M069.1  
 Trans Am Piping Products Ltd. Rev'd By: PW  
 Shipment/Seq # : 19 . 1248 37

Heat Number : 62D00M069-2  
 Trans Am Piping Products Ltd. . Rev'd By: PW  
 Shipments / Seq # : 19 . 1281 . 46  
 4" XH LR 90 BW ELBOW A234-WPB

Purchaser : TRANS-AM PIPING PRODUCTS LTD.

# INSPECTION CERTIFICATE

TO EN10204 3.1/ISO 10474 3.1



Thai Benkan Co., Ltd.  
 58 Soi Watkrnai, Bangkru, Prapadaeng,  
 Samutprakarn, 10130 Thailand.

E-No.                      Purchase Order No.                      Job No.  
 TA-288                      C1-19-243

D M Y                      Certificate No.  
 1305/2019                      T. 2018180185

No.	MFG. No.	Specification for Material Made from Seamless Pipe											Specification for Inspection			Visual Examination	Dimensional Inspection
		ASTM A234-18/ASME SA234-17 Gr.WPB CSA Z245.11-17 Gr.241 CAT I NACE MR0175MSO 16198-2:2015 & MR0103-2015											ASME B16.9-2018, B16.25-2017			Good	Good
		Product & Size (T:*1)					Quantity	Heat Treatment (Note 1)			Hardness Actual Data		Boron(%)				
1	62D20M090	RC WPB 3 X 2 1/2 STD						N			HBW : 120 - 140		0.0001				
2	62D00M069	90 EL WPB 4 XS						A			HBW : 130 - 150		0.0001				
3	62D00M089-1	90 EL WPB 4 XS						A			HBW : 130 - 150		0.0004				
4	62D00M069-2	90 EL WPB 4 XS						A			HBW : 130 - 150		0.0004				
5																	

Specification	Chemical Composition %												Tension Test *2			HARDNESS MAX			
	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	C.E.	YS	TS	E				
Min.	X 100	X 100	X 100	X 1000	X 1000	X 100	X 100	X 100	X 100	X 1000	X 1000	X 100	MPa.			%			
Max.		10	29										240	415	30	197 HBW : GOOD			
Base Material Heat No.	30		106	50	58	40	40	40	15	80	20	40	665				Ti	Ca	Al
1	J8K6148	18	18	86	16	5	1	2	6	1	0	0	34	282	478	31	0.000	0.0003	0.013
2	J8K6311	19	21	87	14	6	2	2	6	11	0	9	37	306	471	43	0.000	0.0001	0.014
3	181575	15	23	72	7	4	8	4	5	2	10	10	31	278	433	42	0.016	0.0011	0.016
4	181575	15	23	72	7	4	8	4	5	2	10	10	31	278	433	42	0.016	0.0011	0.016
5																			

(Note 1) A : Hot formed with final temperature between 620 °C-980 °C, Cooled in still air N : Normalizing 910 °C x 40 Minutes, Cooled in still air  
 \* 2 : Gauge length = 50.0 mm. : Longitudinal.

The product was manufactured, sample tested, and inspected as specified in this Standard and the purchase order, and was found to have met such requirements.

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

\* 1 : "T" symbolized wall thickness in mm. \* 2 : YS Yield strength TS = Tensile strength E = Elongation

We hereby certify that the product described herein has been manufactured in accordance with the specifications concerned and also with the purchaser's requirements and that the test results shown herein are correct.

Note for WPB: For each reduction of 0.01 % below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted, up to a maximum of 1.65 %  
 Form TZ-6H/2

Rungnara Kempiranon

**Quality Assurance Manager**  
 Thai Benkan Co., Ltd.

Conforms with ASME  
 Sec. II, Part A 2017 Edition

OCT 22 2019

8 X 4 X H B W R E D T E E A 2 3 4 - W P B

Heat Number: 62D10M062  
Trans Am Piping Products Ltd. Rev'd By: PW  
Shipments/Seq #: 1346

Purchaser: TRANS-AM PIPING PRODUCTS LTD.

# INSPECTION CERTIFICATE

**BENKAN.**

Thai Benkan Co., Ltd.  
58 Soi Watrunai, Bangkru, Prapadaeng,  
Samutprakarn, 10130 Thailand.

TO EN10204 3.1/ISO 10474 3.1

E-No. TA-288 Purchase Order No. C1-19-243 Job No. \_\_\_\_\_

D M Y Certificate No.  
28/05/2019 T- 2019180204

No.	MFG. No.	Specification for Material Made from Seamless Pipe											Specification for Inspection		Visual Examination	Dimensional Inspection
		ASTM A234-16/ASME SA234-17 Gr.WPB CSA Z46.11-17 Gr.241 CAT 1 S5 NACE MR0175/ISO 15183-2:2015 & MRO103-2015											ASME B16.9-2018, B16.25-2017		Good	Good
		Product & Size	(T*1)	Quantity	Heat Treatment (Note 1)		Hardness Actual Data		Boron(%)							
1	62D10M062	T WPB 8 X 4 XS			N		HBW : 120 - 140		0.0004							
2	62D10M062-1	T WPB 8 X 4 XS			N		HBW : 120 - 140		0.0004							
3	62D10M063-1	T WPB 8 X 6 XS			N		HBW : 125 - 140		0.0001							
4	62D10M054-1	T WPB 8 XS			N		HBW : 130 - 145		0.0001							
5	62D10M061-1	T WPB 8 X 3 XS			N		HBW : 120 - 140		0.0005							

Specification	Chemical Composition %												Tension Test #2			HARDNESS MAX			
	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	C.E.	YS	TS	E				
Min.	X100	X100	X100	X1000	X1000	X100	X100	X100	X100	X1000	X1000	X100	MPa.			%			
Max.		10	29										240	415	30	197 HBW : GOOD			
Base Material Heat No.	30		106	50	58	40	40	40	15	80	20	40	655				Ti	Ca	Al
1	190248	16	21	111	12	2	8	4	6	5	1	1	308	469	36	<0.001	0.0001	0.027	
2	190248	16	21	111	12	2	8	4	6	5	1	1	308	469	36	<0.001	0.0001	0.027	
3	J8L5149	19	24	86	16	4	2	3	5	10	0	9	316	464	43	0.000	0.0013	0.014	
4	89755	16	28	86	10	30	10	40	6	2	2	1	314	470	48	0.002	0.0011	0.022	
5	141126	17	26	94	9	3	8	4	5	1	10	10	334	511	40	<0.010	0.0012	0.007	

(Note 1) A : Hot formed with final temperature between 620 °C-980 °C, Cooled in still air N : Normalizing 910 °Cx40 Minutes, Cooled in still air  
\* 2 : Gauge length = 50.0 mm. : Transverse.

The product was manufactured, sample tested, and inspected as specified in this Standard and the purchase order, and was found to have met such requirements.

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

MAGNETIC PARTICLE EXAMINATION FOR TEE ONLY : GOOD

\* 1 : T\* symbolized wall thickness in mm. \* 2 : YS Yield strength TS = Tensile strength E = Elongation

We hereby certify that the product described herein has been manufactured in accordance with the specifications concerned and also with the purchaser's requirements and that the test results shown herein are correct.

Note for WPB: For each reduction of 0.01 % below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted, up to a maximum of 1.65 %  
Form TZ-6H/2

  
Rungnapa Kampranon

Quality Assurance Manager  
Thai Benkan Co., Ltd.

Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 2 2 2019





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.seed.net.tw

**MILL TEST CERTIFICATE**

EN10204-3.1

Customer: **TRANS AM PIPING PRODUCTS LTD.**

Order No.: **7015820(5)-T/A**

Certificate No.: **SE15820E**

Date: **05/22/2019**

Page: **1 OF 3**

PRODUCT		MATERIAL SPECIFICATIONS										DIMENSIONAL SPECIFICATIONS								
FORGED CARBON STEEL FLANGES		ASTM A105-14/ASME SA105-2017										ASME B16.5-13 CSA Z245.12								
Item No.	CODE NO	DESCRIPTION	QUANTITY	CHEMICAL COMPOSITION (%)																
				C	Si	Mn	P	S	Cu	Cr	Ni	Mo	V	Nb	N	Ti	B	CE(*3)		
				Min	0.350	0.350	1.050	0.035	0.040	0.400	0.300	0.400	0.120	0.080	0.020	-	-	-	-	-
				Max	0.201	0.260	1.080	0.015	0.008	0.012	0.069	0.045	0.005	0.029	0.005	0.003	0.003	0.003	3.000	0.405
1	B0382000	600 WNRF STD 4" A105N			0.191	0.280	1.100	0.014	0.012	0.013	0.041	0.051	0.005	0.012	0.005	0.003	0.003	3.000	0.390	
2	B0382000	600 WNRF STD 4" A105N			0.201	0.260	1.080	0.015	0.008	0.012	0.069	0.045	0.005	0.029	0.005	0.003	0.003	3.000	0.390	
3	B0402000	600 WNRF XS 4" A105N			0.196	0.208	1.117	0.011	0.002	0.013	0.017	0.005	0.009	0.002	0.001	0.005	0.002	3.000	0.405	
4	B0405000	600 WNRF XS 8" A105N			0.197	0.230	1.040	0.010	0.008	0.012	0.049	0.005	0.003	0.005	0.005	0.004	0.002	3.000	0.383	
5	B0443000	600 WNRF S160 1 1/2" A105N			0.197	0.230	1.040	0.010	0.008	0.012	0.049	0.005	0.003	0.005	0.005	0.004	0.002	3.000	0.383	
6	B0453000	600 WNRF XXS 1 1/2" A105N			0.197	0.230	1.040	0.010	0.008	0.012	0.049	0.005	0.003	0.005	0.005	0.004	0.002	3.000	0.383	
7	B0454000	600 WNRF XXS 2" A105N			0.200	0.210	1.030	0.013	0.003	0.060	0.120	0.030	0.003	0.001	0.001	0.007	0.002	3.000	0.406	
8	B0460000	600 WNRF S160 (SC) 8" A105N			0.203	0.240	1.040	0.013	0.007	0.010	0.024	0.050	0.005	0.005	0.005	0.002	0.002	3.000	0.387	
9	B0479000	900 WNRF STD 3" A105N			0.222	0.320	1.040	0.012	0.017	0.005	0.016	0.053	0.002	0.006	0.005	0.008	0.001	1.000	0.404	
10	B0487000	900/1500 WNRF XS 1" A105N																		

Item No.	Heat No.	T.S.(*) (MPA)	Y.S.(*) (MPA)	E.L.(*) (%)	Hardness (HB)	R.A.(*) (%)	Impact Test			Material Supplier	HEAT TREATMENT(*2) <input checked="" type="checkbox"/> N
							Temp:	Joule			
		Min	250.0	22.0	187	30.0		1	2	3	REMARKS
		Max	-	-	-	-					
1	812260	514.0	326.0	37.6	150/148	71.0					880°CX4HRS CONFORMS WITH NACE MR0103/ISO17945-1:2015 AND NACE MR0175/ISO15156.2015 CLAUSE 7.2.1.4 REGION 3 AND ANNEX A. CONFORMS WITH Z245.12 CAT I GR248 SOUR SERVICE-17(FOR USE AS WELDING NECK AND BLIND FLANGES ONLY) MN TO C RATIO IS GREATER THAN 3.0" FULLY KILLED IN ELECTRIC FURNACE FINE GRAIN PRACTICE COUNTRY OF ORIGIN: TAIWAN NO WELD REPAIR WAS PERFORMED TEST SPECIMEN SIZE: 12.5 X 12.5MM BORON/10000
2	616019	529.0	370.0	35.8	154/150	68.6					
3	812260	514.0	326.0	37.6	150/148	71.0					
4	E73000	512.0	336.0	36.0	152/150	72.2					
5	511999	510.0	331.0	34.2	152/150	70.4					
6	511999	510.0	331.0	34.2	152/150	70.4					
7	511999	510.0	331.0	34.2	152/150	70.4					
8	Y700383	529.0	362.0	35.6	154/151	71.3					
9	736523	525.0	348.0	36.2	152/150	69.5					
10	931233	515.8	333.4	34.0	153/152	66.0					

\*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 /6) + (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.

Manager of Quality Assurance Dep't

Conforms with ASME  
 Sec. II, Part A 2017 Edition

OCT 01 2019

NWP INDUSTRIES PO# 746257 Item# 6 Part# 496338  
 Heat Number: 812260  
 Trans Am Piping Products Ltd. - Rev'd By: PW  
 Shipment/Seq #: S 19 : 1317

4" CL 600 W/N FLANGE RF XH  
 BORE A/SA105N



SAN ENG STEEL FORGING CO LTD  
 311, Jen Hsin Road, Jen Wu District  
 Kaohsiung, Taiwan, R.O.C.  
 TEL:07-3724248 ; FAX:07-3712923  
 URL: www.saneng.com.tw  
 e-mail: saneng@kts.seed.net.tw

**MILL TEST CERTIFICATE**

EN10204-3.1

Customer: **TRANS AM PIPING PRODUCTS LTD.**

Order No.: 7015342(22)-T/A

Certificate No.: SE15342V

Date: 05/19/2019

Page: 1 OF 1

PRODUCT			MATERIAL SPECIFICATIONS										DIMENSIONAL SPECIFICATIONS						
FORGED CARBON STEEL FLANGES			ASTM A105-14/ASME SA105-2017										ASME B16.5-13 CSA Z245.12						
Item No.	CODE NO	DESCRIPTION	QUANTITY	CHEMICAL COMPOSITION (%)															
				C	Si	Mn	P	S	Cu	Cr	Ni	Mo	V	Nb	N	Ti	B	CE(*)3	
				Min	0.350	0.100	0.800	-	-	-	-	-	-	-	-	-	-	-	-
				Max	0.350	0.350	1.050	0.035	0.040	0.400	0.300	0.400	0.120	0.080	0.020	-	-	-	-
1	B0010000	150 WNRF STD 4" A105N			0.193	0.250	1.070	0.015	0.008	0.011	0.067	0.045	0.005	0.028	0.005	0.003	0.003	3.000	0.396
2	B0010000	150 WNRF STD 4" A105N			0.198	0.280	1.040	0.015	0.008	0.008	0.027	0.045	0.005	0.004	0.005	0.004	0.001	3.000	0.382
3	B0444000	800 WNRF S180 2" A105N			0.204	0.230	1.030	0.014	0.008	0.020	0.070	0.054	0.005	0.016	0.005	0.002	0.002	3.000	0.399
4	B0404000	600 WNRF XS 8" A105N			0.202	0.270	1.060	0.011	0.005	0.009	0.028	0.051	0.005	0.004	0.005	0.004	0.002	3.000	0.390

Item No.	Heat No.	T.S.(*)1 (MPA)	Y.S.(*)1 (MPA)	E.L.(*)1 (%)	Hardness (HB)	R.A.(*)1 (%)	Impact Test Temp: Minimum: Joule			Material Supplier	HEAT TREATMENT(*)2	
							1	2	3		<input type="checkbox"/> N	REMARKS
		Min	485.0	260.0	22.0	-					<input checked="" type="checkbox"/> N	
		Max	-	-	-	187						
1	812257	511.0	321.0	34.6	150/148	70.2				NTMK, RUSSIA		880 CX4HRS CONFORMS WITH NACE MR0103/ISO17945-1:2015 AND NACE MR0175/ISO15156.2015 CLAUSE 7.2.1.4 REGION 3 AND ANNEX A. CONFORMS WITH Z245.12 CAT I GR248 SOUR SERVICE-17(FOR USE AS WELDING NECK AND BLIND FLANGES ONLY) MN TO C RATIO IS GREATER THAN 3.0" FULLY KILLED IN ELECTRIC FURNACE FINE GRAIN PRACTICE COUNTRY OF ORIGIN: TAIWAN NO WELD REPAIR WAS PERFORMED TEST SPECIMEN SIZE: 12.5 X 12.5MM BORON/10000
2	837481	510.0	318.0	37.0	151/149	68.5				NTMK, RUSSIA		
3	815556	512.0	321.0	36.4	150/148	69.5				NTMK, RUSSIA		
4	833335	513.0	327.0	36.2	151/148	71.4				NTMK, RUSSIA		

\*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/8) + (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.



Conforms with ASME  
 Sec. II, Part A 2017 Edition  
 JUL 15 2019

NWP INDUSTRIES PO# 745463 Job# CHEM Item# 2 Part# 835453  
 Heat Number: 815556  
 Trans Am Piping Products Ltd. Rev'd By: PW  
 Shipment / Seq #: 1284 4  
 CL 600 W/N FLANGE RF  
 SCH 160 BORE A/SA105N



**MAHARASHTRA SEAMLESS LIMITED**  
**WORKS (MILL) TEST CERTIFICATE**  
 EN:10204:3.1

QCF.20A

IC No : MSL-7/QC/ 2159/2018 Customer : BHD TUBULAR LTD.  
 Date : 06-MAR-19  
 Specification : API 5L X-52N PSL-2(12) ASTM/ASME A/SA 333 GR.6/1(15) CSA 2245.1 GR.359 CAT-II SS(18)  
 Process/Product: HOT FINISH SEAMLESS Carbon Steel Pipes P.O. No : 117736 Dt. 20-JUN-18  
 W.O. No : 6180031

PG 1 of 1

**DESCRIPTION**

Sl No	Material/Item Code	SIZE (Inch)	Length Range (Feet/Mtr)	Heat No.	No Of PCS	Length (Feet/Mtr)	End Finish	Hydro Test Pressure at 5 Sec	Bend Test	Flattening Test	Flaring Test	Drift Expn. Test	Crushing Test
1		4 1/2 X 0.337	21	A8956	49	1029	BEVEL	3000 PSI	NA	OK	NA	NA	NA
2		4 1/2 X 0.337	21	MA768	11	231	BEVEL	3000 PSI	NA	OK	NA	NA	NA

**PHYSICAL PROPERTIES**

**CHEMICAL COMPOSITION (%)**

Sl No	Heat No	YST (PSi)	UTS (PSi)	E1 (%)	Hardness HRB	Impact Test Charpy V-notch Joule	LA/PA	C	Mn	Si	P	S	Cr	Mo	Ni	V	Cu	Al	Ti	Nb	CE
		76900	110200					.24	1.35	.45	.025	.015	.3	.12	.4	.08	.4		.04	.02	.4
		52200	66700							.1											
	A8956	54090	82941	35.00	77,79	60,70,70	LA	.190	1.250	.310	.016	.004	.003	.002	.005	.002	.005	.032	.004	.001	.400
		53749	82392	34.00	..	Av. 66.6	PA	.184	1.246	.335	.014	.007	.004	.002	.007	.004	.008	.027	.004	.004	.395
							PA	.184	1.241	.352	.018	.006	.004	.002	.006	.004	.011	.029	.004	.003	.396
	MA768	55167	82168	37.80	77,79	32,33,48	LA	.190	1.250	.300	.014	.004	.003	.002	.003	.002	.004	.031	.002	.003	.400
		55019	81925	35.00	..	Av. 37.6	PA	.185	1.220	.315	.014	.004	.014	.002	.005	.003	.007	.033	.004	.001	.393
							PA	.190	1.230	.299	.014	.004	.010	.002	.005	.002	.007	.028	.004	.001	.399

4" Sect 80 SA333 WT A8956  
 CEZ.40 VT.333 Low

PO 746643  
 Conforms with ASME  
 Sec. II, Part A 2017 Edition  
 OCT 30/19 JF E.S

Dimensions : Outside diameter, thickness, weight, length conforms to above specification.  
 Coating : All Pipes are coated with rust preventive from outside surface only.  
 D.P.T. : All Pipes are tested by EMI method conforming to ASTM E570 for longitudinal & transverse defect & WT monitored ultrasonically.  
 Heat Treatment : Normalized  
 Raw material : Full Yield  
 Marking/Stencilling : MAHARASHTRA SEAMLESS LIMITED (B36.10M) ASTM/ASME A/SA 333 GR.6/1, CSA 2245.1 GR.359 CAT-II SS M46C MIN, API 5L GR.X-52N PSL-2 BE SMES OD 4.500 INCH X 0.337 INCH X LENGTH (IN FEET) HFS HEAT NO. ...3000 PSI+NDE+WEIGHT-15.00 PPF+NORM+LT - 46 DEG.C+MADE IN INDIA+BHD TUBULAR LTD  
 Remarks : Norm. at 935 Deg.C with holding time 35 min. ; Material comply with NACE MR-0175/MR-0103, ISO 15156 ; Boron 0.0001%, to 0.0003% ; Sheer area values - 74% to 82% ; Impact at - 56 DEG.C, Specimen size (mm): L10X5X55, Charpy V-Notch LONGITUDINAL

CERTIFY THAT THE MATERIAL CONFORMS TO ABOVE SPECIFICATION.

FOR MAHARASHTRA SEAMLESS LIMITED

R.K. SRIVASTAVA Asst. ENGINEER

Warning: Modification or unauthorized use of this certification is strictly prohibited. Violation calls for criminal prosecution. For authenticity verification, you can contact us at: mslt@mahseam.com  
 V.R.O: Pipe Nagar, Saket, N.A. 17, B.K.G. Road, Dist. Raigad, Maharashtra-402126 Phone: 02194238511, 222010 Fax: 238513 Rev.No: 8, 11.12.2017



4" CL 600 W/N FLANGE RF XH BORE A105N

NWP INDUSTRIES PO# 744782 Item# 1 Part# 496338 Heat Number: K5AV8 Trans Am Piping Products Ltd. - Rev'd By: SB Shipment/Seq #: S 18 - 1936

CLIENTE / Customer / Client  
**TRANS AM PIPING PRODUCTS LTD.**  
 9335 ENDEAVOR DRIVE S.E.  
 CALGARY, ALBERTA T3S 0A1  
 CANADA  
 CAN

**CERTIFICADO DE INSPECCION** UNE EN 10204:06 / 3.1  
**Inspection Certificate - Certificat de Réception** ISO 10474:15 / 3.1

FECHA: 17/12/2018 N.º 199432 HOJA: 1  
 Date: 17/12/2018 No. 199432 Page: 1



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

Packing 144317

Management Systems certified by LRQAE  
 Certified acc. PED 97/23/EC+AD2000-W0  
 PED 14/68/UE  
 by TÜV Rheinland  
 N.º 01 202 E/Q 02 7443

MARCA DEL FABRICANTE  
 Mark of factory  
 Marque du fabricant

DEPARTAMENTO QUALITY ASSURANCE  
 Section  
 Département

PRODUCTO FLANGES SU PEDIDO N.º DE of. de 24/08/2018  
 Article - Produit Requirements - Normes Applicables ASME B16.5-17  
 Your Order No. CI-18-467 EDMONTON  
 Votre Cde. N.º

NORMAS APLICABLES ASME B16.5-17  
 Requirements - Normes Applicables

MATERIAL CORRESPONDIENTE ASME SA105M-17, ASTM A105M-18, EN 10222-2 P280GH-17.  
 Material Correspondent - Qualité

MODO DE FUSION (\*) NACE MR0175/ISO15156-02/03-15 & NACE MR0103/ISO17495-15  
 Steel Making - Elaboration de l'acier Clause 7.2.1.4, Annex A.2 and SSC Region 3.  
 E = Elec. Y = Oxígeno básico CSA-Z245.12-13 GR248 CAT I-SS (WN & BLIND FLANGES ONLY)

PARTIDA Item Poste	CANTIDAD Quantity Quantité	DESCRIPCION Description Description	OBSERVACIONES Remarks Observations (*)	COLADA N. Heat No N.ºCoulée	RESISTENCIA T.Strength Resist Flupr N/mm2	LIMITE ELAST Y.Strength 0.2 % N/mm2	ALARGAM. Elongation Allongement Lo:50mm/4d %	ESTRICCION Red. Area Striction %	RESILIENCIA Impact test Resilience Joules	PROBETA ESPECIMEN CHARPY V 10x10mm		DUREZA Hardness Dureté HBW
										MEDIA Average Moyenne	°C	
8 B0015000		WN 12 150LB STD RF A105N	NE	49HC8	507	311	29,70	58,70				149 150
8 B0015000		WN 12 150LB STD RF A105N	NE	C67A8	521	316	30,40	64,10				140 146
11 B0020000		WN 24 150LB STD/20 RF A105N	NE	K1AV8	500	316	29,40	75,20				140 146
76 B0402000		WN 4 600LB XS/80 RF A105N	NE	C53A8	511	308	29,70	60,20				149 150
76 B0402000		WN 4 600LB XS/80 RF A105N	NE	K5AV8	506	309	29,70	65,10				156 161

COLADA N.º Heat No Ladle: L Product: P		COMPOSICION QUIMICA - STEEL MAKER'S LADLE ANALYSIS - ANALYSE CHIMIQUE														
C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	Nb %	V %	Cu %	Al %	Ti %	B %	CEq %		
49HC8 L	0,180	0,210	1,070	0,011	0,008	0,080	0,090	0,018	0,001	0,001	0,190	0,030	0,003	0,0004	0,40	
C67A8 L	0,170	0,210	1,050	0,011	0,008	0,080	0,080	0,012	0,001	0,001	0,240	0,022	0,003	0,0004	0,38	
K1AV8 L	0,190	0,210	1,090	0,004	0,006	0,096	0,011	0,022	0,003	0,004	0,160	0,027	0,001	0,0005	0,00	
C53A8 L	0,180	0,200	1,070	0,010	0,006	0,110	0,110	0,040	0,001	0,004	0,160	0,023	0,002	0,0003	0,41	
K5AV8 L	0,181	0,246	1,080	0,009	0,004	0,132	0,055	0,023	0,000	0,001	0,061	0,026	0,003	0,0003	0,40	

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

(\*) OBSERVACIONES:  
 Remarks  
 Observations  
 N\_NORMALIZED AT 900 C AND ALLOWED TO COOL IN STILL AIR.

Conforms with ASME  
 Sec. II, Part A 2017 Edition

MAY 23 2019

8" CL 600 W/N FLANGE RF XH  
BORE A/SA350-LF2 CL 1

Heat Number: YU281689  
Trans Am Piping Products Ltd.  
Shipments/Seq #: S 19 : 1558  
Rev'd By: PW



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

**MILL TEST CERTIFICATE**

EN10204-3.1  
Customer: TRANS AM PIPING PRODUCTS LTD.  
Order No.: 70163250-T/A

Certificate No.: SE6325C1  
Date: 08/15/2019  
Page: 1 OF 1

PRODUCT		MATERIAL SPECIFICATIONS										DIMENSIONAL SPECIFICATIONS							
FORGED CARBON STEEL FLANGES		ASTM A-350 LF2-15 CL-1/ASME SA-350 LF2-17 CL-1										ASME B16.5-13 CSA Z245.12							
Item No.	CODE NO	DESCRIPTION	QUANTITY	CHEMICAL COMPOSITION (%)															
				C	Si	Mn	P	S	Cu	Cr	Ni	Mo	V	Nb	N	Ti	B	CE(*)	
1	E0096000	300 WNRF STD 6" LF2		0.208	0.260	1.070	0.012	0.009	0.012	0.008	0.044	0.005	0.029	0.005	0.003	0.003	3.000	0.403	
2	E0116000	300 WNRF XS-4" LF2		0.201	0.240	1.070	0.017	0.009	0.011	0.042	0.052	0.005	0.012	0.005	0.004	0.003	4.000	0.395	
3	E0189000	800 WNRF XS-8" LF2		0.205	0.270	1.050	0.012	0.011	0.010	0.033	0.051	0.008	0.008	0.005	0.004	0.002	3.000	0.393	
4	E0190000	600 WNRF XS 8" LF2		0.182	0.280	1.150	0.007	0.001	0.230	0.110	0.060	0.020	0.008	0.003	0.006	0.002	3.000	0.422	
5	E0222000	2500 WNRTJ S160 2" LF2		0.205	0.280	1.080	0.015	0.008	0.010	0.032	0.048	0.008	0.004	0.005	0.003	0.002	3.000	0.394	

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	812258	516.0	325.0	35.4	151/149	69.3	62.0	39.0	59.0	NTMK, RUSSIA	890 CAHRS BORN/1000 CONFORMS WITH NACE MR0103/ISO 15945-1:2016 AND NACE MR0175/ISO 15156-2015 CLAUSE 7.2.1.4 REGION 3 AND ANNEX A. CONFORMS WITH Z245.12 CAT II GR248 SOUR SERVICE IT. (FOR USE AS WELDING NECK AND BLIND FLANGES ONLY) TEST SPECIMEN SIZE: 10X10X90MM TEST SPECIMEN ORIENTATION: TRANSVERSE MIN TO C RATIO IS GREATER THAN 3.0" FORGING REDUCTION RATIO: 6.5 FULLY KILLED IN ELECTRIC FURNACE FINE GRAIN PRACTICE COUNTRY OF ORIGIN: TAIWAN NO WELD REPAIRS PERFORMED	
2	836839	514.0	366.0	35.8	152/149	70.4	53.0	88.0	92.0	NTMK, RUSSIA		
3	833338	512.0	326.0	37.2	150/149	68.6	71.0	62.0	78.0	NTMK, RUSSIA		
4	YU281689	512.0	348.0	36.0	152/150	73.0	130.0	134.0	66.0	YIEH UNITED, TWN		
5	822569	516.0	340.0	34.0	152/150	68.4	52.0	47.0	57.0	NTMK, RUSSIA		

\*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 / 70) + (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.

Manager of Quality Assurance Dept

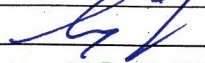


Conforms with ASME  
Sec. II, Part A 2017 Edition

OCT 22 2019



# Skid / Structural Documentation

<b>SKID TRAVEL SHEET</b>	APPROVED BY: 
	DATE: <span style="color: green;">OCT 01 2019</span>

WO # 10936-001-C      Description: 4" Dual Metering/Pump Package; Sour Service

Drawing# 10936-001-C-000 Rev.0, 10936-001-C-100 Rev.0, 10936-001-C-200 Rev.0

	REQ.	HOLD	EMPLOYEE STAMP	DATE	QC INIT.	DATE
Work instructions/drawings Issued for Construction	√				BW	OCT 02 2019
Work instructions/drawings reviewed	√	√			BW	OCT 02 2019
Material and parts verified against B.O.M. and I.F.C. Drawings	√				BW	Dec 02/19
Welding Personnel qualified and assigned	√	√	739 017	Nov 27	BW	Dec 02/19
Verify lift lug layout	√		739	Nov 27	BW	Dec 02/19
Layout / Fit up / Cross Square	√		739/017	Nov 27	BW	Dec 02/19
Skid deck secure and prepped to flip (develop JHA if required)	√		017	Nov 28	-	
Final visual inspection on underside of skid	√		017 235	Dec 2	BW	Dec 02/19
Verify layout, fit-up, and welding of all attachments	√		161/017		-	
All exposed edges de-burred	√		161/017		BW	DEC 02 2019
All sump covers and loose attachments forwarded to Blast/Paint/Coating Personnel	√		161/017		-	
Verify and record maximum skid deflection using formula L/360 <u>.51</u>	√		161/017		BW	DEC 02 2019
Measured deflection <u>.125</u> "	√		161/017		BW	DEC 02 2019
Verify and record all N.D.E. requirements complete	√	√	161/017		BW	DEC 02 2019
Final QC visual inspection complete	√	√	161/017		BW	DEC 02 2019
Work area cleaned up and skid ready Assembly	√		161/017	Dec 02/19		

Comments: Crosssquare Checks Nov 20/19



# MAGNETIC PARTICLE INSPECTION REPORT

Report #: MT-19-0588

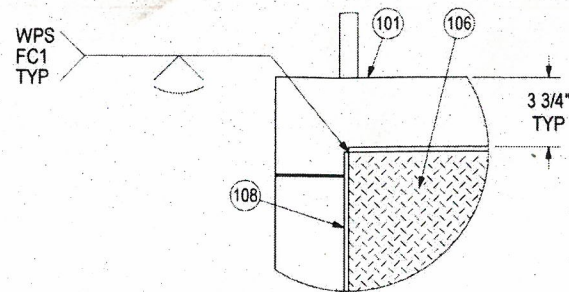
**NWP Client:** Encana Corporation  
**Date:** 02-Dec-19  
**Serial #:** NWP-10936-001-C  
**JOB #:** 10936-001-C  
**Location:** Innisfail, AB  
**Project:** Skid for Sour Dual Meter/Pump Pkg.  
**Insp. Description:** MT Skid Lifting Lugs.

**Client Spec:** N/A  
**Insp Standard:** CSA W59 CL.12 (dynamic)  
**Code:** CSA W59 CL.12 (dynamic)  
**Procedure:** NDT-MT01  
**Technique:** MT 2 (black on white)  
**Surface:** As-Welded/Bare Metal

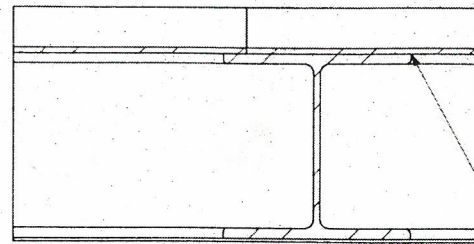
**Yoke Type :** Sentinal **Yoke Model:** MP-A2L **Yoke S/N:** MP5782 **Daily Lift Test:**  Accept  Reject  
**Light Source:** Yoke LED light + shop lighting **10 LBS Weight:** S/N:1985 **Power Type:** A/C

Light Meter:		Model:		Cal. Date:		Serial #:	
Manufacturer	Designation	Consumable Type		Batch Number			
Magnaflux	WCP-2	White Contrast		19E13K			
Magnaflux	7HF	Magnetic Particle		19C11K			

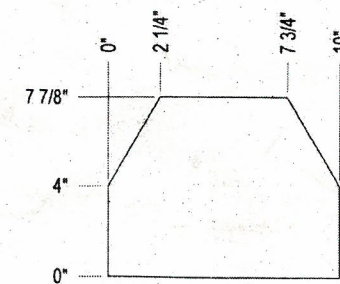
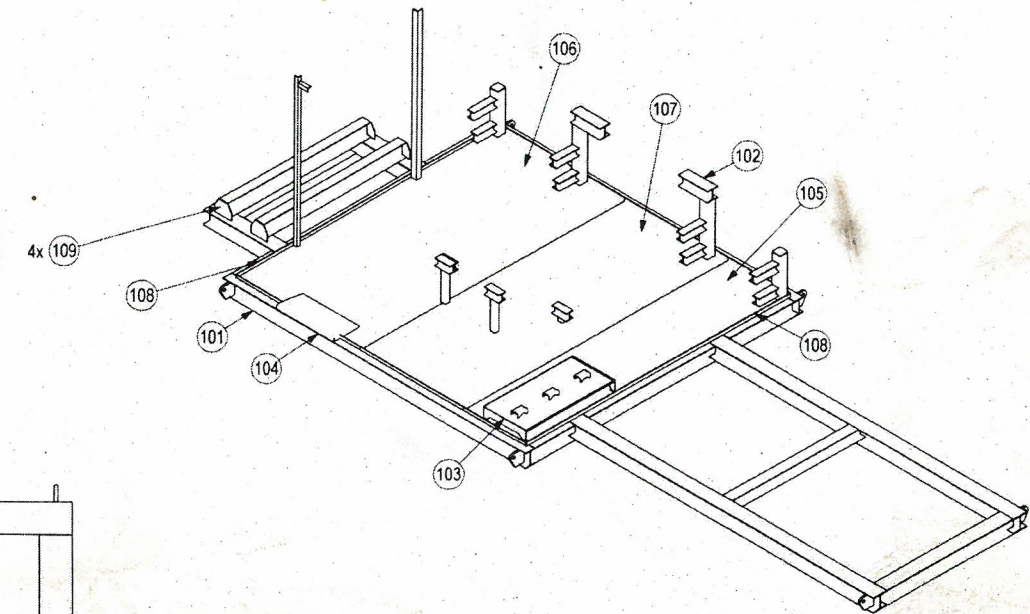
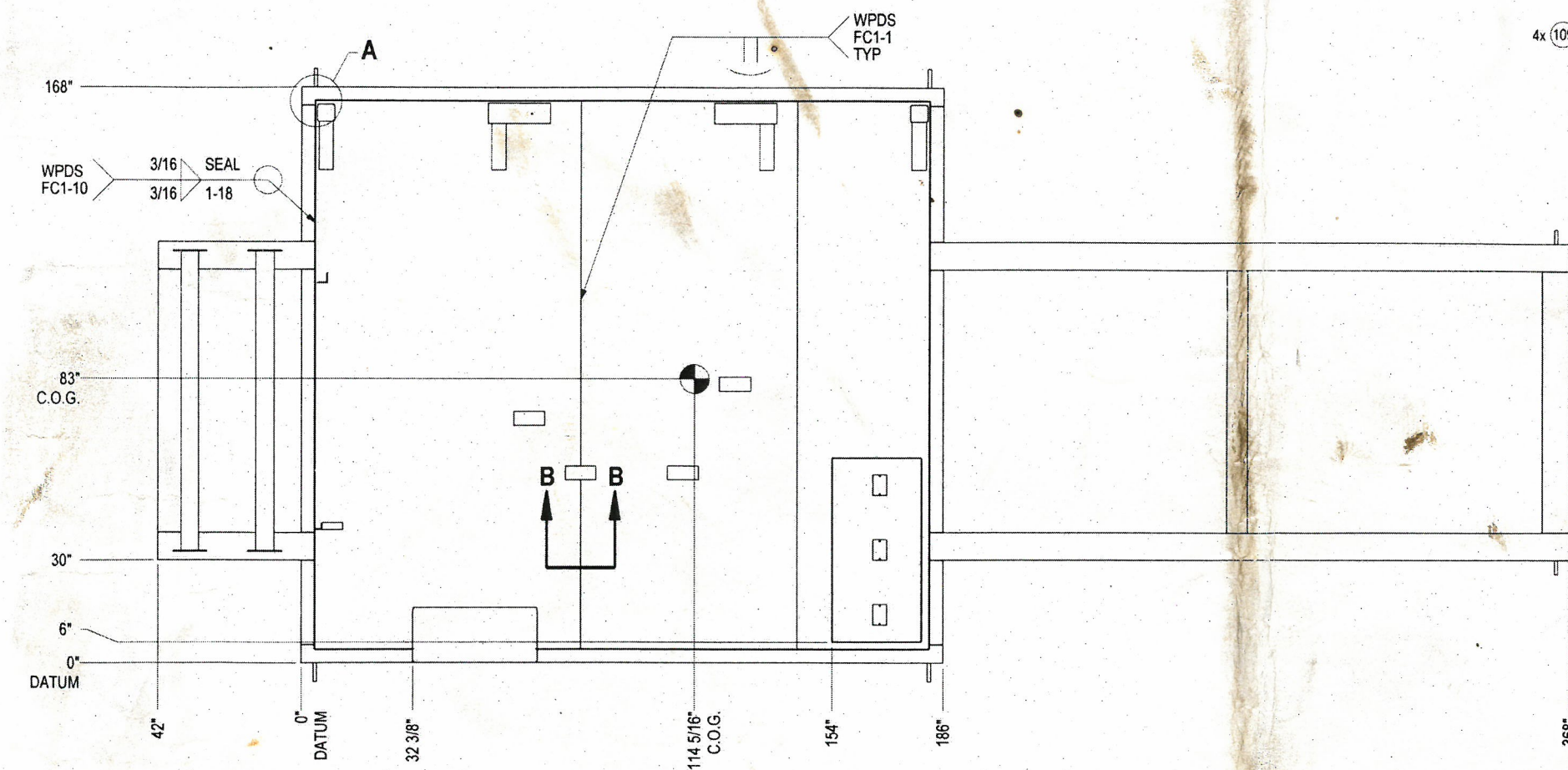
Weld #:	Material	Welder	Remarks:	Accept	Reject
MT-1	C.S./P1	161	MT on Lifting Lug.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-2	C.S./P1	051	MT on Lifting Lug.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-3	C.S./P1	051	MT on Lifting Lug.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-4	C.S./P1	051	MT on Lifting Lug.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-5	C.S./P1	051	MT on Lifting Lug.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
MT-6	C.S./P1	161	MT on Lifting Lug.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
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**DETAIL A**  
SCALE: 1:10



**SECTION B-B**  
SCALE: 1:8



**DETAIL ITEM # 109**  
SCALE: 1:8  
CNC

**ORIGINAL**

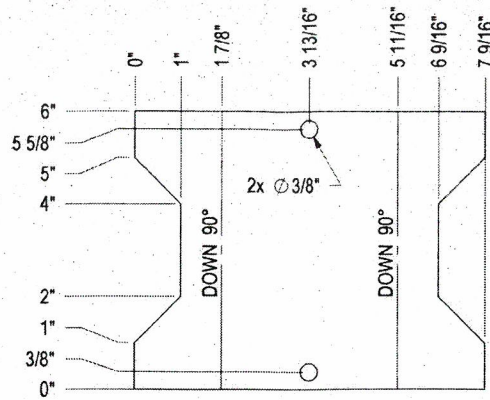
ITEM	PART #	DRAWING #	DESCRIPTION	MATERIAL	SIZE	QTY	MTR #
101		10936-001-C-100	SKID BASE ASSEMBLY			1	
102		10936-001-C-200	PIPE SUPPORT ASSEMBLY			1	
103		SEE SHEET 2	PUMP TRAY ASSEMBLY			1	
104		SK-RAMP-1	SKID DOORWAY RAMP 36\"/>				

**NOTES**

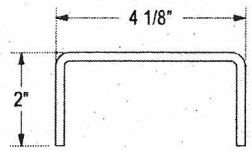
- FABRICATE TO CSA W47.1 AND W59.
- ALL DIMENSIONS ARE REFERENCED FROM DATUM UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS SHALL HAVE A TOLERANCE OF  $\pm 1/8$ \"/>

<p>ISSUED FOR CONSTRUCTION</p> <p>SIGNED: <i>[Signature]</i></p> <p>DATE: Oct 1, 2019</p> <p>W.O.: 10936-001-C</p> <p>S/N: _____</p>				<p><b>NWP</b></p> <p>INDUSTRIES LP</p> <p>P.O. BOX 6280, INNISFAIL, AB T4G 1S9</p> <p>PH: (403) 227-4100 FAX: (403) 227-4102</p>		<p>ENCANA CORPORATION</p> <p>4\"/&gt; </p>			
						<p>SKID ASSEMBLY</p> <p>DWN: CSD    CHK: <i>[Signature]</i>    APP: <i>[Signature]</i></p> <p>DATE: SEP 26/19    DATE: OCT 07 2019    DATE: OCT 01 2019</p> <p>SHEET: 1 OF 3    DWG: 10936-001-C-000    REV: 0</p>			
<p>0    SEP 26/19    CSD    <i>[Signature]</i>    <i>[Signature]</i>    ISSUED FOR CONSTRUCTION</p>				<p>PROJECTION: </p> <p>SCALE: AS NOTED</p> <p>WEIGHT: APPROX. LBS 8,500</p>					
<p>REV.    DATE    BY:    CHK:    APP:    DESCRIPTION</p>				<p>ALL DIMENSIONS IN INCHES</p>					

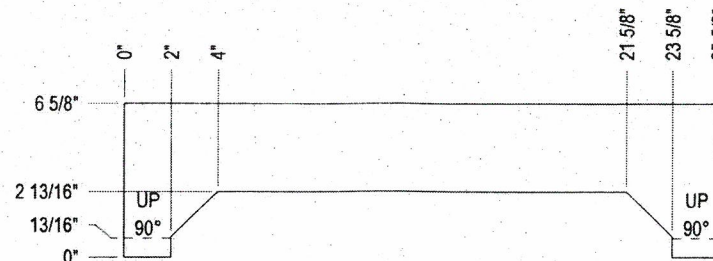
ITEM	PART #	DESCRIPTION	MATERIAL	SIZE	QTY	MTR #
201	PLA.188ST	PUMP BASE PLATE 3/16" THK	SA-36/G40.21-44W	7 9/16" x 6"	3	
202	PLA.188ST	TRAY PLATE 3/16" THK	SA-36/G40.21-44W	53 5/8" x 27 7/16"	1	
203	PLA.188ST	TRAY SIDE PLATE 3/16" THK	SA-36/G40.21-44W	25 5/8" x 6 5/8"	2	



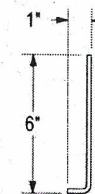
**DETAIL ITEM # 201**  
SCALE: 1:4  
CNC



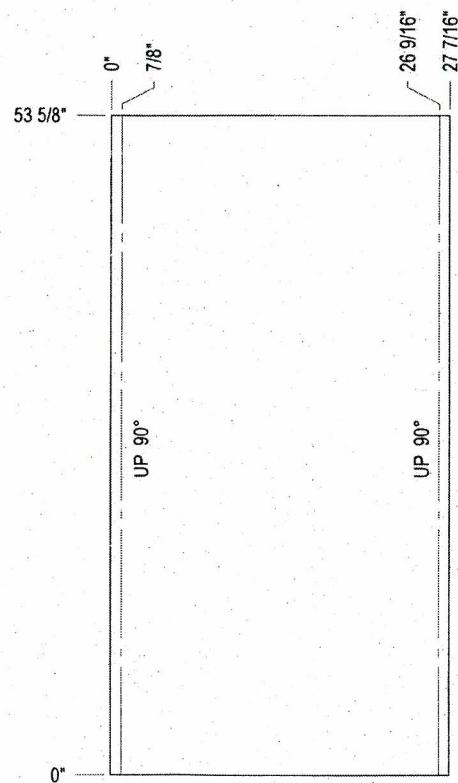
**DETAIL ITEM # 201**  
SCALE: 1:4



**DETAIL ITEM # 203**  
SCALE: 1:8  
CNC



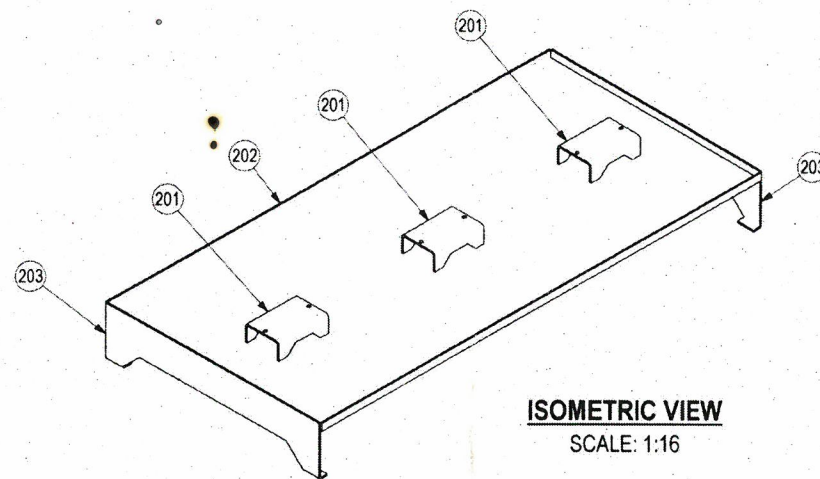
**DETAIL ITEM # 203**  
SCALE: 1:8



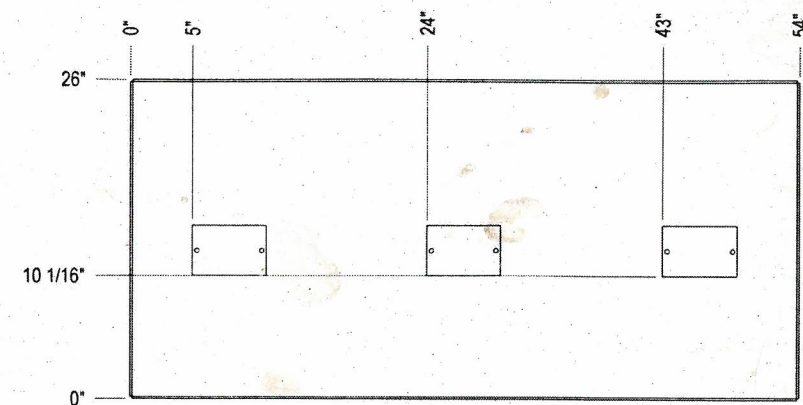
**DETAIL ITEM # 202**  
SCALE: 1:15  
CNC



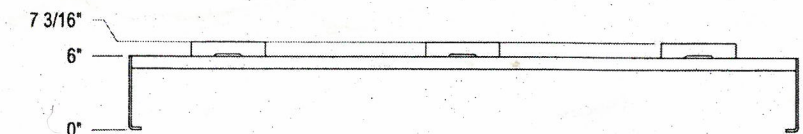
**DETAIL ITEM # 202**  
SCALE: 1:10



**ISOMETRIC VIEW**  
SCALE: 1:16



**PLAN VIEW**  
SCALE: 1:15



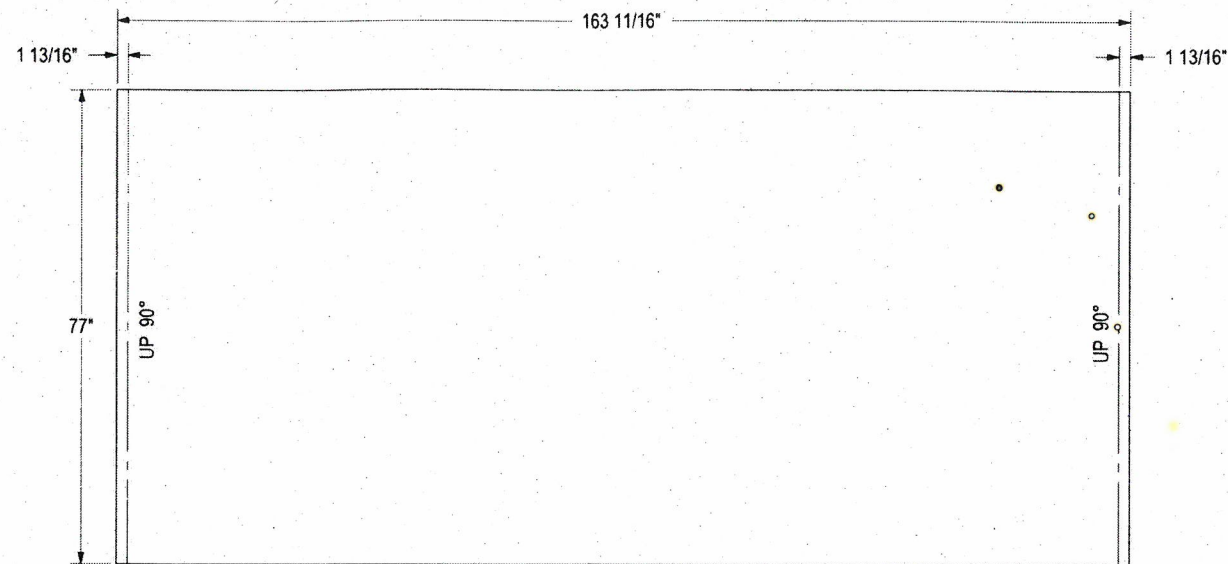
**FRONT VIEW**  
SCALE: 1:15

**NOTES**

- FABRICATE TO CSA W47.1 AND W59.
- ALL DIMENSIONS ARE REFERENCED FROM DATUM UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS SHALL HAVE A TOLERANCE OF ± 1/8" UNLESS OTHERWISE NOTED.
- COPE STRUCTURAL MEMBERS AS REQUIRED.
- DEBURR ALL SHARP EDGES.
- ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.
- WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPDS FC1-10 / WPDS FC1-15.

<table border="1"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY:</th> <th>CHK:</th> <th>APP:</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>SEP 26/19</td> <td>CSD</td> <td>[Signature]</td> <td>[Signature]</td> <td>ISSUED FOR CONSTRUCTION</td> </tr> </tbody> </table>				REV.	DATE	BY:	CHK:	APP:	DESCRIPTION	0	SEP 26/19	CSD	[Signature]	[Signature]	ISSUED FOR CONSTRUCTION	<p><b>ISSUED FOR CONSTRUCTION</b></p> <p>SIGNED: [Signature]</p> <p>DATE: Oct 1, 2019</p> <p>W.O.: 10936-001-C</p> <p>S/N: _____</p>		<p>P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102</p>		<p>ENCANA CORPORATION 4" DUAL METER/PUMP PACKAGE SOUR W/O FUEL GAS SCRUBBER</p> <p>PUMP TRAY ASSEMBLY</p>			
				REV.	DATE	BY:	CHK:	APP:	DESCRIPTION														
0	SEP 26/19	CSD	[Signature]	[Signature]	ISSUED FOR CONSTRUCTION																		
<p>DRAWING REVISIONS</p> <p>ALL DIMENSIONS IN INCHES</p>		<p>PROJECTION: [Symbol]</p> <p>SCALE: AS NOTED</p> <p>WEIGHT: (APPROX. LBS) 110</p>		<p>DWN: CSD</p> <p>CHK: [Signature]</p> <p>APP: [Signature]</p> <p>DATE: SEP 26/19</p> <p>DATE: OCT 01 2019</p> <p>DATE: OCT 01 2019</p>		<p>SHEET: 2 OF 3</p> <p>DWG: 10936-001-C-000</p> <p>REV: 0</p>																	

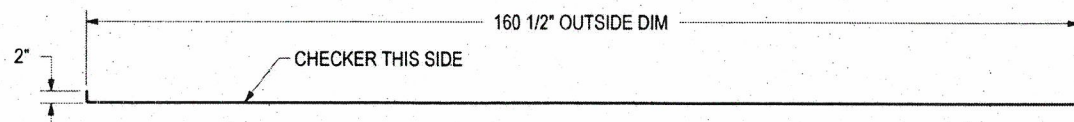
**ORIGINAL**



**DETAIL ITEM # 106**

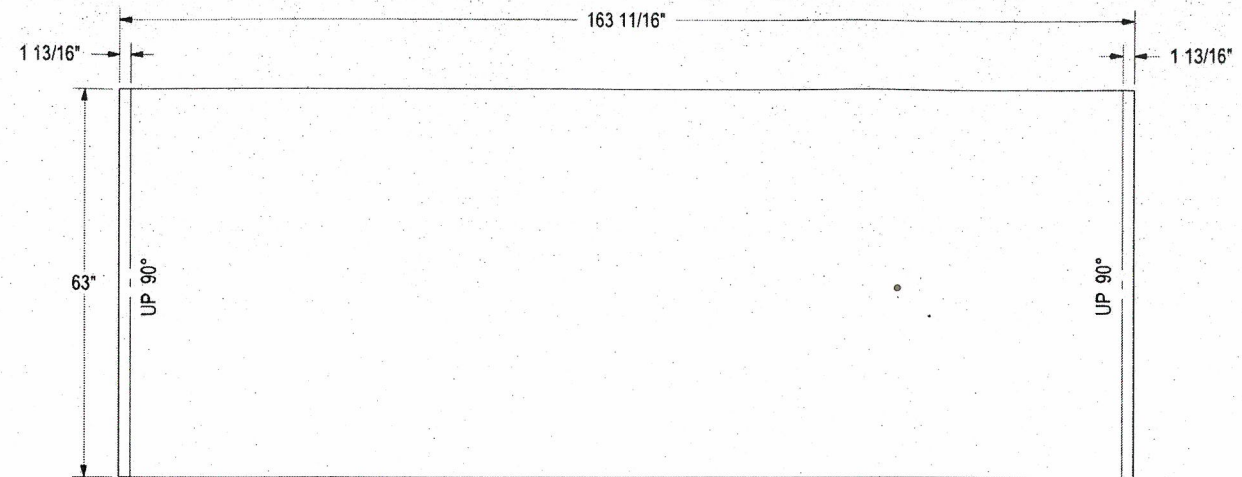
SCALE: 1:30

**CNC**



**DETAIL ITEM # 106**

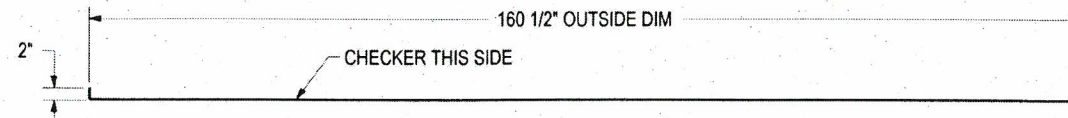
SCALE: 1:30



**DETAIL ITEM # 107**

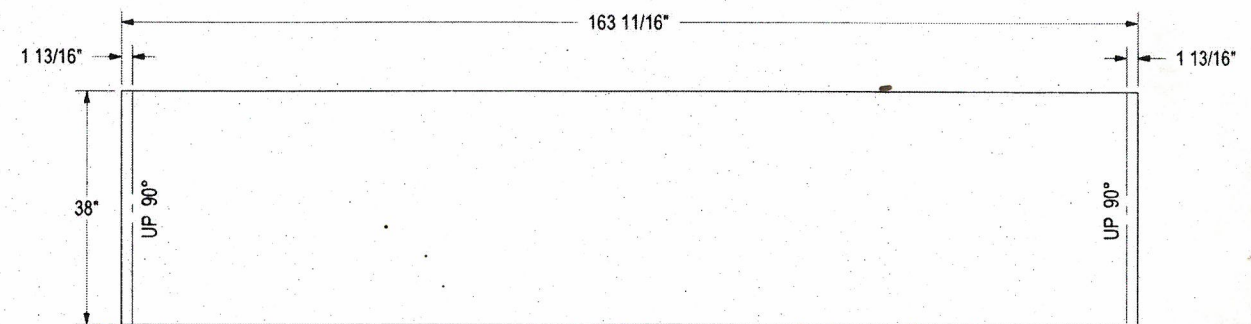
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**CNC**



**DETAIL ITEM # 107**

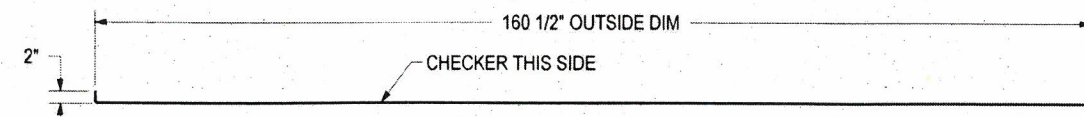
SCALE: 1:30



**DETAIL ITEM # 105**

SCALE: 1:30

**CNC**

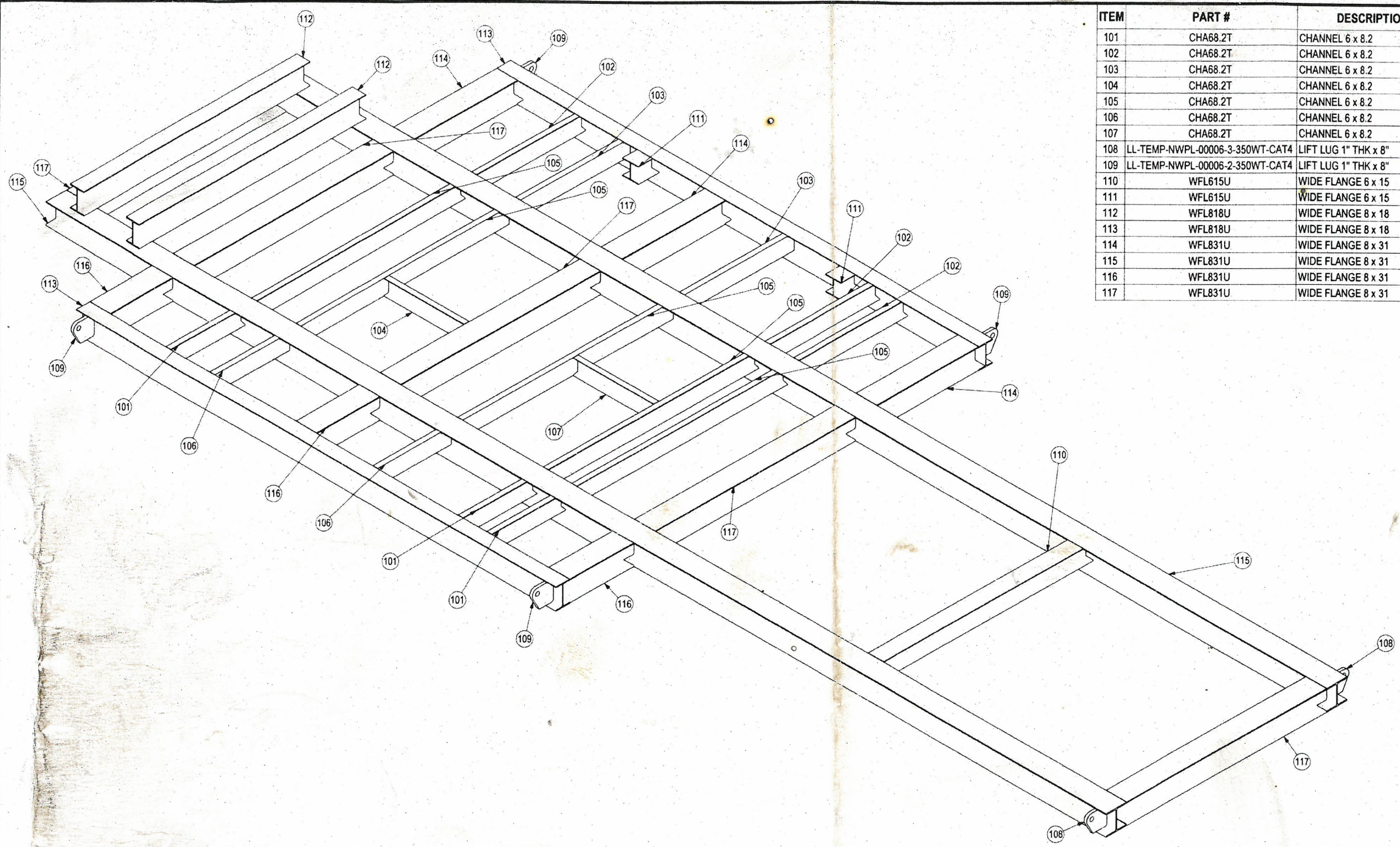


**DETAIL ITEM # 105**

SCALE: 1:30

**ORIGINAL**

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					REV.	DATE	BY:	CHK:	APP:	DESCRIPTION														
0	SEP 26/19	CSD	<i>[initials]</i>	<i>[initials]</i>	ISSUED FOR CONSTRUCTION																			
DRAWING REVISIONS						ALL DIMENSIONS IN INCHES		<p>PROJECTION: </p> <p>SCALE: AS NOTED</p> <p>WEIGHT: (APPROX. LBS)</p>		<p>PART DETAILS</p> <p>DWN: CSD    CHK: <i>[initials]</i>    APP: <i>[initials]</i></p> <p>DATE: SEP 26/19    DATE: OCT 01 2019    DATE: OCT 01 2019</p> <p>SHEET: 3 OF 3    DWG: 10936-001-C-000    REV: 0</p>														

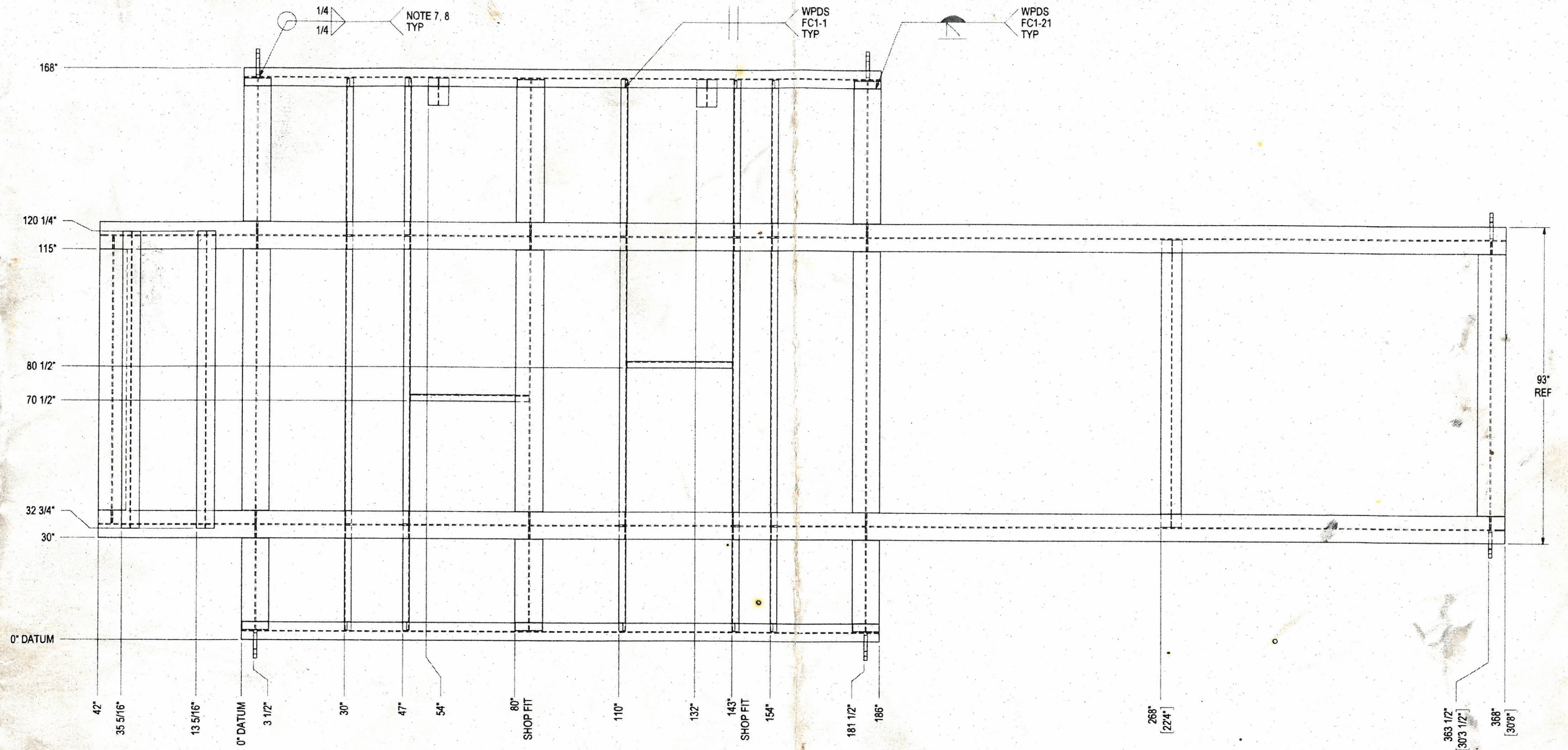


ITEM	PART #	DESCRIPTION	MATERIAL	SIZE	QTY
101	CHA68.2T	CHANNEL 6 x 8.2	G40.21-44W	30 15/16"	3
102	CHA68.2T	CHANNEL 6 x 8.2	G40.21-44W	45 15/16"	3
103	CHA68.2T	CHANNEL 6 x 8.2	G40.21-44W	45 15/16"	2
104	CHA68.2T	CHANNEL 6 x 8.2	G40.21-44W	34 3/4"	1
105	CHA68.2T	CHANNEL 6 x 8.2	G40.21-44W	84 1/2"	5
106	CHA68.2T	CHANNEL 6 x 8.2	G40.21-44W	30 15/16"	2
107	CHA68.2T	CHANNEL 6 x 8.2	G40.21-44W	30 7/8"	1
108	LL-TEMP-NWPL-00006-3-350WT-CAT4	LIFT LUG 1" THK x 8"	G40.21-50WT CAT 4	1"	2
109	LL-TEMP-NWPL-00006-2-350WT-CAT4	LIFT LUG 1" THK x 8"	G40.21-50WT CAT 4	1"	4
110	WFL615U	WIDE FLANGE 6 x 15	G40.21-50W	84 1/2"	1
111	WFL615U	WIDE FLANGE 6 x 15	G40.21-50W	8"	2
112	WFL818U	WIDE FLANGE 8 x 18	G40.21-50W	87 1/2"	2
113	WFL818U	WIDE FLANGE 8 x 18	G40.21-50W	186"	2
114	WFL831U	WIDE FLANGE 8 x 31	G40.21-50W	45 15/16"	3
115	WFL831U	WIDE FLANGE 8 x 31	G40.21-50W	410"	2
116	WFL831U	WIDE FLANGE 8 x 31	G40.21-50W	30 15/16"	3
117	WFL831U	WIDE FLANGE 8 x 31	G40.21-50W	84 1/2"	5

**ORIGINAL**

<table border="1"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY:</th> <th>CHK:</th> <th>APP:</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>SEP 26/19</td> <td>CSD</td> <td>D</td> <td>CF</td> <td>ISSUED FOR CONSTRUCTION</td> </tr> <tr> <td>A</td> <td>SEP 25/19</td> <td>CSD</td> <td>-</td> <td>-</td> <td>ISSUED FOR APPROVAL</td> </tr> </tbody> </table>				REV.	DATE	BY:	CHK:	APP:	DESCRIPTION	0	SEP 26/19	CSD	D	CF	ISSUED FOR CONSTRUCTION	A	SEP 25/19	CSD	-	-	ISSUED FOR APPROVAL	<p><b>ISSUED FOR CONSTRUCTION</b></p> <p>SIGNED: <i>[Signature]</i></p> <p>DATE: <b>Oct 1, 2019</b></p> <p>W.O.: <b>10936-001-C</b></p> <p>S/N: _____</p>		<p><b>NWP INDUSTRIES LP</b></p> <p>P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102</p>		<p>ENCANA CORPORATION 4" DUAL METER/PUMP PACKAGE SOUR W/O FUEL GAS SCRUBBER</p> <p>SKID BASE ASSEMBLY</p>			
				REV.	DATE	BY:	CHK:	APP:	DESCRIPTION																				
0	SEP 26/19	CSD	D	CF	ISSUED FOR CONSTRUCTION																								
A	SEP 25/19	CSD	-	-	ISSUED FOR APPROVAL																								
<p>PROJECTION: </p> <p>SCALE: AS NOTED</p> <p>WEIGHT: APPROX. LBS. 5,600</p>		<p>DWN: CSD    CHK: <i>[Signature]</i>    APP: <i>[Signature]</i></p> <p>DATE: SEP 25/19    DATE: OCT 01 2019    DATE: OCT 01 2019</p>		<p>SHEET: 1 OF 2    DWG: 10936-001-C-100    REV: 0</p>																									

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**ORIGINAL**

**NOTES**

1. FABRICATE TO CSA W47.1 AND W59.
2. ALL DIMENSIONS ARE REFERENCED FROM DATUM UNLESS OTHERWISE NOTED.
3. ALL DIMENSIONS SHALL HAVE A TOLERANCE OF  $\pm 1/8"$  UNLESS OTHERWISE NOTED.
4. COPE STRUCTURAL MEMBERS AS REQUIRED.
5. DEBURR ALL SHARP EDGES.
6. ALL WELDS TO BE  $1/4"$  CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.
7. WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPS FC1.
8. MPI ON LIFT LUGS REQUIRED.

REV.	DATE	BY:	CHK:	APP:	DESCRIPTION
0	SEP 26/19	CSD	D	CF	ISSUED FOR CONSTRUCTION
A	SEP 25/19	CSD	-	-	ISSUED FOR APPROVAL

DRAWING REVISIONS

**ISSUED FOR CONSTRUCTION**

SIGNED: *[Signature]*

DATE: Oct 1, 2019

W.O.: 10936-001-C

S/N: \_\_\_\_\_

ALL DIMENSIONS IN INCHES



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

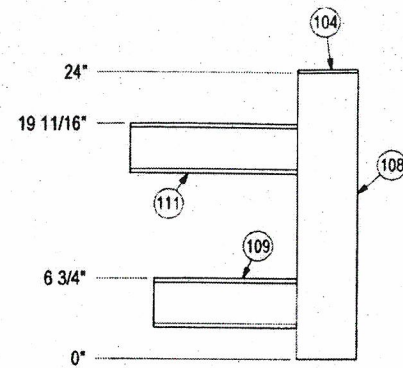
PROJECTION: SCALE: AS NOTED

ENCANA CORPORATION  
4" DUAL METER/PUMP PACKAGE SOUR  
W/O FUEL GAS SCRUBBER

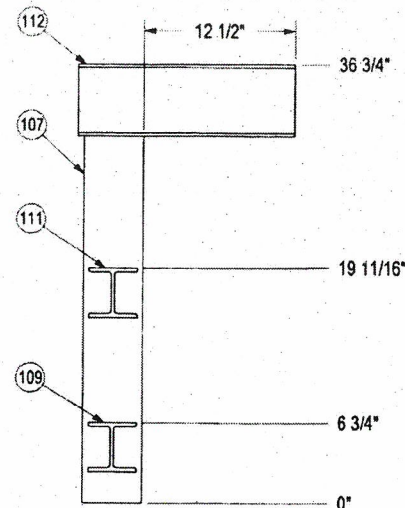
SKID BASE ASSEMBLY

DWN: CSD	CHK: <i>[Signature]</i>	APP: <i>[Signature]</i>
DATE: SEP 25/19	DATE: OCT 01 2019	DATE: OCT 01 2019
SHEET: 2 OF 2	DWG: 10936-001-C-100	REV: 0

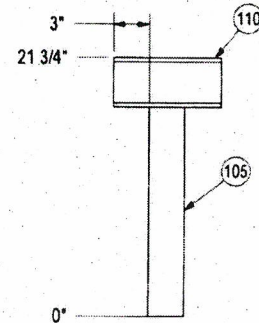




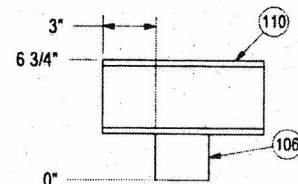
**DETAIL PS-01**  
SCALE: 1:15  
QTY - 2



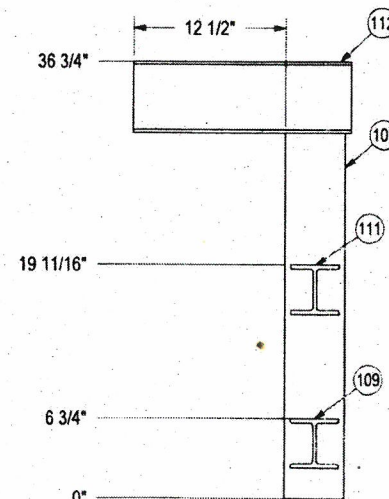
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SCALE: 1:15  
QTY - 1



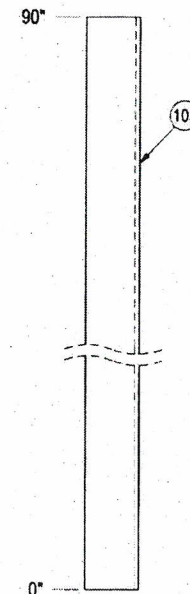
**DETAIL PS-03**  
SCALE: 1:15  
QTY - 2



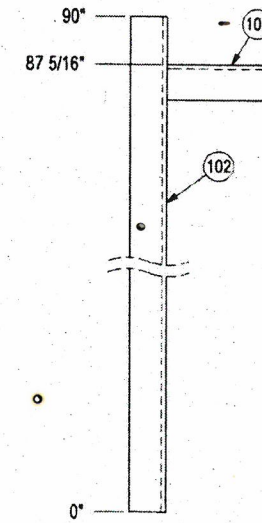
**DETAIL PS-04**  
SCALE: 1:10  
QTY - 2



**DETAIL PS-05**  
SCALE: 1:15  
QTY - 1



**DETAIL PS-06**  
SCALE: 1:10  
QTY - 1



**DETAIL PS-07**  
SCALE: 1:10  
QTY - 1

ITEM	PART #	DESCRIPTION	MATERIAL	SIZE	QTY
101	ANG.25(22)ST	ANGLE 2 x 2 x 1/4	SA-36/G40.21-44W	6"	1
102	ANG.25(22)ST	ANGLE 2 x 2 x 1/4	SA-36/G40.21-44W	90°	1
103	ANG.25(33)ST	ANGLE 3 x 3 x 1/4	SA-36/G40.21-44W	90°	1
104	BUY	HSS CAP 5 x 5 x 0.25	PLASTIC	1/4"	2
105	HSS.25(33)U	HSS 3 x 3 x 0.25	G40.21-50W	17 9/16"	2
106	HSS.25(33)U	HSS 3 x 3 x 0.25	G40.21-50W	2 9/16"	2
107	HSS.25(55)U	HSS 5 x 5 x 0.25	G40.21-50W	30 3/4"	2
108	HSS.25(55)U	HSS 5 x 5 x 0.25	G40.21-50W	24"	2
109	WFL413U	WIDE FLANGE 4 x 13	G40.21-50W	12"	4
110	WFL413U	WIDE FLANGE 4 x 13	G40.21-50W	9"	4
111	WFL413U	WIDE FLANGE 4 x 13	G40.21-50W	14"	4
112	WFL615T	WIDE FLANGE 6 x 15	G40.21-44W	18"	2

**NOTES**

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- ALL DIMENSIONS ARE REFERENCED FROM DATUM UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS SHALL HAVE A TOLERANCE OF  $\pm 1/8$ " UNLESS OTHERWISE NOTED.
- COPE STRUCTURAL MEMBERS AS REQUIRED.
- DEBURR ALL SHARP EDGES.
- ALL WELDS TO BE 1/4" CONTINUOUS FILLET WELDS UNLESS OTHERWISE NOTED.
- WELD PROCESS TO BE MCAW UNLESS OTHERWISE NOTED. WPS FC1.
- ALL ATTACHMENTS TO COLUMN SHALL BE INSTALLED ON CENTERLINE UNLESS OTHERWISE NOTED.

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**ISSUED FOR CONSTRUCTION**

SIGNED: *[Signature]*  
DATE: Oct 1, 2019

W.O.: 10936-001-C

S/N: \_\_\_\_\_  
ALL DIMENSIONS IN INCHES



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

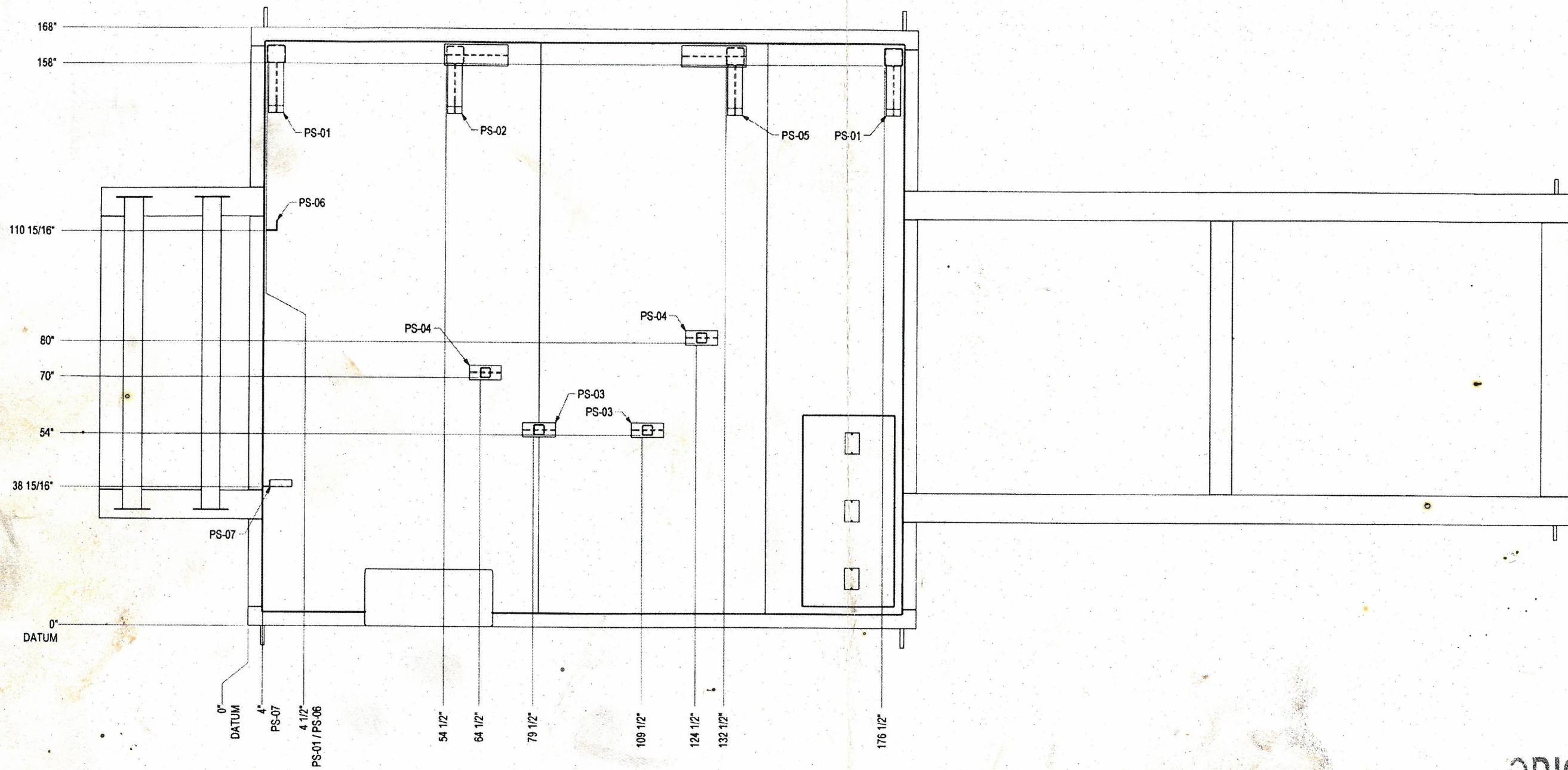
PROJECTION: SCALE: AS NOTED  
WEIGHT: (APPROX. LBS)

ENCANA CORPORATION  
4" DUAL METER/PUMP PACKAGE SOUR  
W/O FUEL GAS SCRUBBER

PIPE SUPPORT ASSEMBLY

DWN: CSD	CHK: <i>[Signature]</i>	APP: <i>[Signature]</i>
DATE: SEP 26/19	DATE: OCT 01 2019	DATE: OCT 01 2019
SHEET: 1 OF 2	DWG: 10936-001-C-200	REV: 0

**ORIGINAL**



**ORIGINAL**

<p style="text-align: center;"><b>ISSUED FOR CONSTRUCTION</b></p> <p>SIGNED: <i>[Signature]</i></p> <p>DATE: <b>Oct 1, 2019</b></p> <p>W.O.: <b>10936-001-C</b></p> <p>S/N: -----</p>					<p style="text-align: center;"><b>NWP</b></p> <p style="text-align: center;">INDUSTRIES LP</p> <p>P.O. BOX 6280, INNISFAIL, AB T4G 1S9 PH: (403) 227-4100 FAX: (403) 227-4102</p>		<p style="text-align: center;">ENCANA CORPORATION</p> <p style="text-align: center;">4" DUAL METER/PUMP PACKAGE SOUR W/O FUEL GAS SCRUBBER</p>															
							<p style="text-align: center;">PIPE SUPPORT ASSEMBLY</p>															
<table border="1"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY:</th> <th>CHK:</th> <th>APP:</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>SEP 26/19</td> <td>CSD</td> <td><i>[Signature]</i></td> <td><i>[Signature]</i></td> <td>ISSUED FOR CONSTRUCTION</td> </tr> </tbody> </table>					REV.	DATE	BY:	CHK:	APP:	DESCRIPTION	0	SEP 26/19	CSD	<i>[Signature]</i>	<i>[Signature]</i>	ISSUED FOR CONSTRUCTION	<p>PROJECTION: </p> <p>SCALE: AS NOTED</p> <p>WEIGHT: (APPROX. LBS)</p>		<p>DWN: CSD</p> <p>DATE: SEP 26/19</p> <p>SHEET: 2 OF 2</p>		<p>CHK: <i>[Signature]</i></p> <p>DATE: OCT 01 2019</p> <p>DWG: 10936-001-C-200</p>	
REV.	DATE	BY:	CHK:	APP:	DESCRIPTION																	
0	SEP 26/19	CSD	<i>[Signature]</i>	<i>[Signature]</i>	ISSUED FOR CONSTRUCTION																	
DRAWING REVISIONS					ALL DIMENSIONS IN INCHES		<p>APP: <i>[Signature]</i></p> <p>DATE: OCT 01 2019</p>		<p>REV: 0</p>													

**Instrumentation &  
Other QC  
Documentation**

	<b>PRE-SET PROPORTIONAL RELIEF VALVE TEST REPORT</b>	Document # SD-631-2
		Revision # 5
Southern Alberta Fluid System Technologies Inc.		Date of Revision: 11/08/2015
Printed copies are uncontrolled		Page 1 of 1
		Document Owner: Dale Clayton

**Product Information**

<b>Customer and PO#</b>	<b>NWP - 746309</b>
Order Number	99867951
Relief Valve Ordering Number	SS-4R3A5-BU
Spring Kit Ordering Number (For R3A and R4 Series)	177-R3A-K1-C
For Setting, Send to	CS
Tag Number	
Serial Number	99867951-1




**Pre-Setting Test Method**

After standard production testing, the valve is set and the set point is verified by pressurizing the inlet of the valve with nitrogen and verifying that the set pressure is within the allowable pressure range. This test is repeated a minimum of two times. The valve is depressurized between each test. The set point is defined as the point at which nitrogen bubbles pass thru the valve at a rate of one bubble per second.

**Pre-Setting Test Conditions**

Nominal Set Pressure	9930	Kpa	Pick from dropdown list in grey cells	
Allowable Set Pressure Range: (± 5%)	9433.50	to	10426.5	Kpa
Allowable Set Pressure Range:(± 21 KPA )	9909	to	9951	Kpa

**Test Results**

Date	01/10/2019	Test Medium	Nitrogen
Set Pressure	9921 KPA	Reseat:	9910 KPA
Temperature	21°C	Test Gauge #	1311933
Tested By (Print Name)	Travis Herron	Signature	
Verified By (Print Name)	Paul Proust	Signature	 


**Note:** User to verify set point prior to installation.

**\*Set Pressure is the upstream pressure at which the first indication of flow occurs. Set pressure of each valve initial relief is repeatable within: ±3.0 psig (or equivalent pressure unit) or ±5% (whichever is greater) of the initial set pressure at 60 to 80°F (15 to 26°C)**

This test was performed to consider a specific set of conditions and should not be considered valid outside these conditions. Neither Swagelok Company nor Cleveland Valve & Fitting makes representation or warranties regarding these selected conditions or the results there from. Production tests cannot duplicate the variety of actual operating conditions. See the applicable product catalogs for technical data.

**SAFE PRODUCT SELECTION:**

When selecting a product, the total system design must be considered to ensure safe, trouble free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

	<b>PRE-SET PROPORTIONAL RELIEF VALVE TEST REPORT</b>	Document # SD-631-2
		Revision # 5
Southern Alberta Fluid System Technologies Inc.		Date of Revision: 11/08/2015
Printed copies are uncontrolled		Page 1 of 1
		Document Owner: Dale Clayton

**Product Information**

<b>Customer and PO#</b>	NWP - 746309
Order Number	99867951
Relief Valve Ordering Number	SS-4R3A5-BU
Spring Kit Ordering Number (For R3A and R4 Series)	177-R3A-K1-C
For Setting, Send to	CS
Tag Number	
Serial Number	99867951-2




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Nominal Set Pressure	9930	Kpa	Pick from dropdown list in grey cells	
Allowable Set Pressure Range: (± 5%)	9433.50	to	10426.5	Kpa
Allowable Set Pressure Range:(± 21 KPA )	9909	to	9951	Kpa

**Test Results**

Date	01/10/2019	Test Medium	Nitrogen
Set Pressure	9949 KPA	Reseat:	9910 KPA
Temperature	21°C	Test Gauge #	1311933
Tested By (Print Name)	Travis Herron	Signature	
Verified By (Print Name)	Paul Proust	Signature	 


**Note:** User to verify set point prior to installation.

**\*Set Pressure is the upstream pressure at which the first indication of flow occurs. Set pressure of each valve initial relief is repeatable within: ±3.0 psig (or equivalent pressure unit) or ±5% (whichever is greater) of the initial set pressure at 60 to 80°F (15 to 26°C)**

This test was performed to consider a specific set of conditions and should not be considered valid outside these conditions. Neither Swagelok Company nor Cleveland Valve & Fitting makes representation or warranties regarding these selected conditions or the results there from. Production tests cannot duplicate the variety of actual operating conditions. See the applicable product catalogs for technical data.

**SAFE PRODUCT SELECTION:**

When selecting a product, the total system design must be considered to ensure safe, trouble free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

	<b>PRE-SET PROPORTIONAL RELIEF VALVE TEST REPORT</b>	Document # SD-631-2
		Revision # 5
Southern Alberta Fluid System Technologies Inc.		Date of Revision: 11/08/2015
Printed copies are uncontrolled		Page 1 of 1
		Document Owner: Dale Clayton

**Product Information**

Customer and PO#	NWP - 746309
Order Number	99867951
Relief Valve Ordering Number	SS-4R3A5-BU
Spring Kit Ordering Number (For R3A and R4 Series)	177-R3A-K1-F
For Setting, Send to	PRONGHORN
Tag Number	99867951
Serial Number	RDW-641


**Pre-Setting Test Method**

After standard production testing, the valve is set and the set point is verified by pressurizing the inlet of the valve with nitrogen and verifying that the set pressure is within the allowable pressure range. This test is repeated a minimum of two times. The valve is depressurized between each test. The set point is defined as the point at which nitrogen bubbles pass thru the valve at a rate of one bubble per second.

**Pre-Setting Test Conditions**

Nominal Set Pressure	25,000	Kpa	Pick from dropdown list in grey cells
Allowable Set Pressure Range: (± 5%)		to	
Allowable Set Pressure Range:(± 3 PSI )		to	

**Test Results**

Date	SEPT. 30/2019	Test Medium	HYD OIL
Set Pressure	25,000 KPA	Reset:	24,942 KPA
Temperature	17°C	Test Gauge #	649770
Tested By (Print Name)	KENDAL MCNEIL	Signature	
Verified By (Print Name)		Signature	

**Note: User to verify set point prior to installation.**

**\*Set Pressure is the upstream pressure at which the first indication of flow occurs. Set pressure of each valve initial relief is repeatable within: ±3.0 psig (or equivalent pressure unit) or ±5% (whichever is greater) of the initial set pressure at 60 to 80°F (15 to 26°C)**

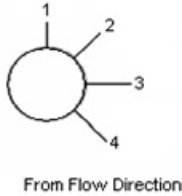
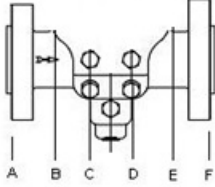
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**SAFE PRODUCT SELECTION:**

When selecting a product, the total system design must be considered to ensure safe, trouble free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Serial No: D0405960 Tag Number: \_\_\_\_\_ Date: 16-Sep-2019 Edition: 00  
 Body Heat Number: 9655 Top Housing Heat Number: 80H1 Overall Length: 13.250 "  
 Line Size: 4 Schedule: 80 ANSI Class: 600 Configuration: W x RF Material: A216WCB/A352LCC

**ORIFICE FITTING INTERNAL DIAMETER (inches)**



**PLEASE NOTE:**

This drawing may not accurately represent the model ordered, it is intended as a reference of the spots checked for bore diameter only. Not all points may be applicable to all models.

Plane	Upstream Points					Downstream Points		
	A	B	C			D	E	F
			0.5D	0.25D	0D			
1	3.825	3.827	3.828	3.828	3.829	3.828	3.827	3.827
2	3.825	3.827	3.828	3.828	3.829	3.829	3.827	3.827
3	3.825	3.827	3.828	3.829	3.830	3.829	3.827	3.827
4	3.825	3.827	3.828	3.828	3.829	3.829	3.827	3.827
Temp (°F)	64	64	64	64	64	64	64	64
Roughness (µin)	80	80	80	80	80	80	80	80
Average of Column C (D <sub>m</sub> ): <b>3.829</b>						Average of Downstream Columns: <b>3.828</b>		
"D <sub>r</sub> " at 68°F: 3.829								

\*\*\* Inspected to AGA Report 3 \*\*\*

**Upstream 0D - 2D**

**Downstream 0D - 2D**

**Roughness**

	Measured	Allowed (± 0.25%)	
Max:	3.830	3.839	<b>PASS</b>
Min:	3.825	3.819	<b>PASS</b>

	Measured	Allowed (± 0.5%)	
Max:	3.829	3.848	<b>PASS</b>
Min:	3.827	3.810	<b>PASS</b>

Min	Max	Measured (Avg. A-D)	
34.0	250.0	80.0	<b>PASS</b>

Inspector: Ricardo

**PRESSURE TAP TESTS (inches)**

Tap Size:  0.125  0.250  0.375  0.500 Instrument Type:  Depth Gauge  Caliper

	Top				Bottom			
	U/S RIGHT	U/S LEFT	D/S RIGHT	D/S LEFT	U/S RIGHT	U/S LEFT	D/S RIGHT	D/S LEFT
Tap Size	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497
Tap Location	0.995	0.990	0.993	0.991	0.994	0.992	0.992	0.991
Pressure Test	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Tap Size is ± 0.016 (0.484 to 0.516): **PASS**

Tap Location within ±0.035: **PASS**

Inspector: RL TA

**ECCENTRICITY (inches)**

	RIGHT	LEFT		TOP	BOTTOM
HORIZONTAL	0.001	0.004	VERTICAL	-0.002	0.003
HORIZONTAL TOLERANCE	0.012		VERTICAL TOLERANCE	0.046	
HORIZONTAL ECCENTRICITY	0.002		VERTICAL ECCENTRICITY	0.003	

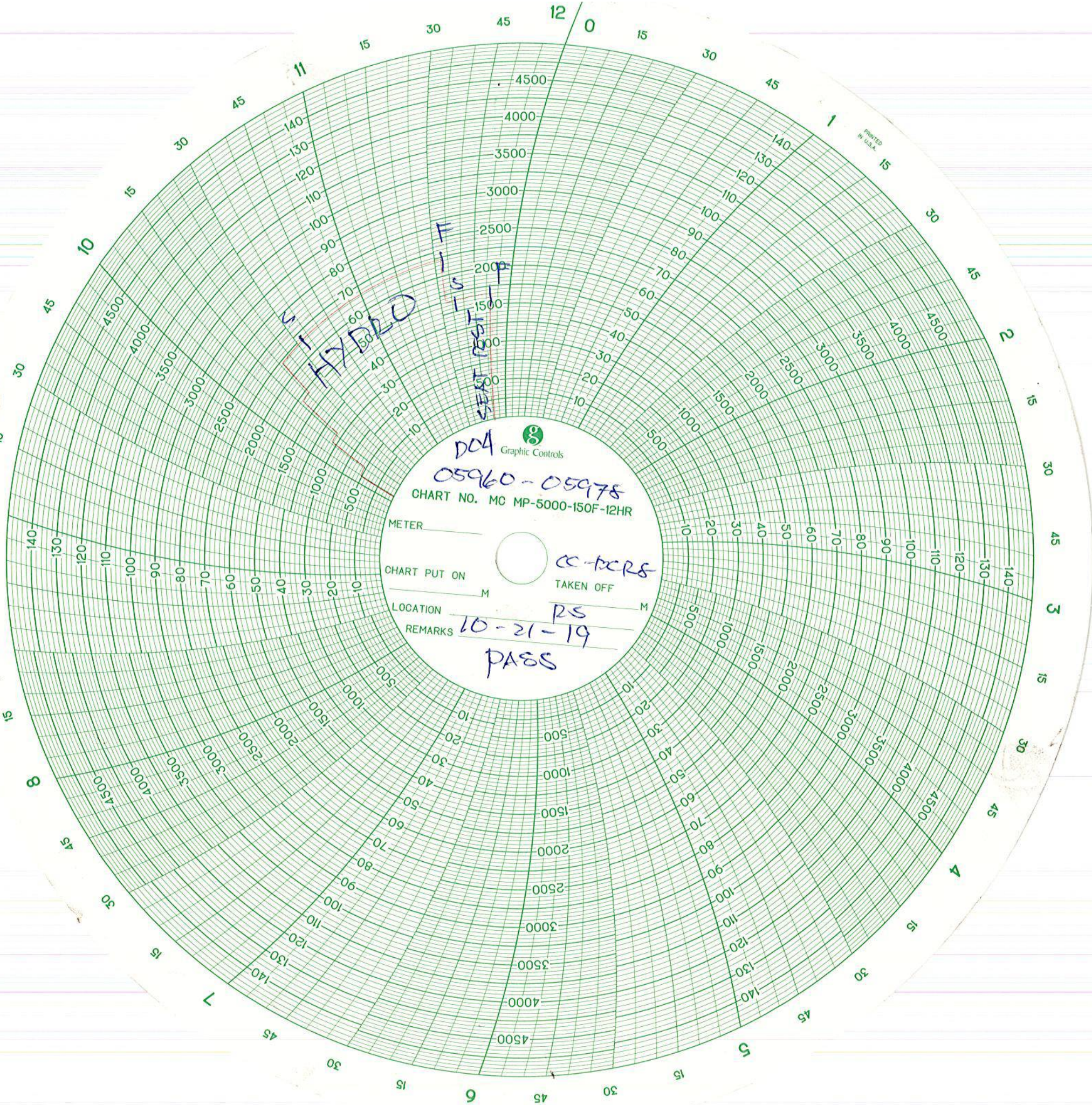
Inspector: JS

**PLATE SEAL GAP (inches)**

Target Seal Gap:  0.562  0.688  0.700  0.813  0.875

	Top	Bottom	Right	Left
Seal Gap Width	0.562	0.562	0.562	0.562

Inspector: TA



PRINTED IN U.S.A.

D04 Graphic Controls

05960-05978

CHART NO. MC MP-5000-150F-12HR

METER \_\_\_\_\_

CHART PUT ON \_\_\_\_\_

CC-PCRS  
TAKEN OFF \_\_\_\_\_

LOCATION \_\_\_\_\_

REMARKS 10-21-19

PASS

HYDRO  
WEST POINT



Serial           D0405960           Top Serial No.:           T0403878            
Chart Recorder #:           CC-BCR8           Gauge Serial #:           PG-5000-12          

**HYDROSTATIC SHELL INTEGRITY TEST REPORT**

TEST PRESSURE (PSI):           2225            
DURATION (MINUTES):           60            
TECHNICIAN:           RS            
WITNESS:           JA            
DATE:           21-Oct-2019          

**Result:**  
 PASS     FAIL

**VALVE SEAT TEST REPORT**

GREASE SEAT     SOFT SEAT

TEST PRESSURE (PSI):           1650            
DURATION (MINUTES):           15            
TECHNICIAN:           RS            
WITNESS:           JA            
DATE:           21-Oct-2019          

EQUALIZER VALVE OPERATIONAL  
 GREASE GUN OPERATIONAL

**Result:**  
 PASS     FAIL

**BLANK PLATE REPORT**

PRESSURE APPLIED:           15PSI            
SEAL MATERIAL:           HNBR            
FLOW CONDITIONER HEAT #:           N/A            
TECHNICIAN:           RS            
WITNESS:           JA            
DATE:           21-Oct-2019          

VACUUM APPLIED TO D/S  
 PRESSURE APPLIED TO D/S

**Result:**  
 PASS     FAIL

Standard Test Parameters:

SC FITTINGS: 30 MINUTE HYDRO AND BLANK PLATE TEST  
DC & DBB FITTINGS: 60 MINUTE HYDRO, SEAT TEST WITH WATER AND BLANK PLATE TEST  
PRESSURE PIPING: 10 MINUTE HYDRO

REVIEW DATASHEET FOR ALTERNATE CUSTOMER SPECIFICATIONS



# Dual Chamber Orifice Fitting Datasheet

6759 - 65th Avenue, Red Deer, Alberta T4P 1X5  
 Ph:(403)342-4494 Fax:(403)346-7110  
 Email: canalta@canaltaflow.com

General	1	Tag No.	
	2	Line No.	
	3	Line Size/Schedule	4" SCH80 (XS) ✓
	4	Inside Diameter	3.826 "
	5	Measurement Standard	AGA2000 Ed. ✓
	6	Quantity	2 ✓
	7	Paint	Canalta Standard Ship Coat
Orifice Plate	1	Orifice Plates	Qty Provided (per): 1 <input checked="" type="checkbox"/> Installed
	2	Material	316 SS
	3	Thickness(Inches)	0.125
	4	Beta(b) = d/D (installed)	0.52
	5	Bore Diameter (d) (Inches)	2.000 ✓
	6	Max.Allowable Beta (b) = d/D	0.75
	7	Max.Allow. Orifice Bore Diam. (d) (Inches)	2.75
	8	Vent   Drain	
	9	Seal Assembly	Teflon - Snap Style, 00Ed. ✓
	10	Plate Holder	Standard, CF8M Stainless
Orifice Fitting	1	Body Material	A216WCB (NACE) ✓
	2	Body Size / Rating	4" 600 ✓
	3	Body Connections	Up:Weld Down:RF Dwl Pin: <input type="checkbox"/>
	4	Seal Gap	.56200
	5	Trim Material	Corrosive 316 SS
	6	Seat Style	Grease
	7	Tap Hole Diameter	0.5
	8	Body Stud Bolt/Nut Special Coating	S: A193 B7M N: A194 2HM ✓ Special Coating: None
	9	Engineering Design Standard	ASME B16.34-2017
	10	Tap Location	1.000" from plate face
	11	Tap Connection Style	1/2" NPT
	12	Sets of Taps	4
	13	Shaft Orientation	Dual ✓
	14	Valve Lockout Mechanism	None ✓
Meter Tube	1	Tube Material	A106B-A333GR6-API5LX42 ✓
	2	Pipe Grade	Cold Drawn
	3	Pipe (Outer) Connection Types	Up:RF Down:RF
	4	Pipe Connection Size / Rating	4" 600
	5	Flange Material	A105N
	6	Stud Bolt / Nut Material	S: A193 B7M N: A194 2HM ✓ Special Coating: None
	7	Gasket	316 Spiral Wound Flex CGI ✓
	8	Pipe Measurement Standard	AGA2000 Catch All
	9	Engineering Design Standard	ASME B31.3-2016
Flow Conditioner	1	Flow Conditioner Type	Contour ✓
	2	Material	AISI 316SS
	3	Spacer	Included: <input type="checkbox"/>
	4	Connection Style	RF Dwl Pin: <input type="checkbox"/>

Customer:	NWP Industries LP
Customer PO#:	
Ref#:	746211 ✓
Sales Quote:	SQ033008 Line: 10000
Sales Order:	Line:
Sales Contact:	Aixandra Veno

Drawing Name:  
 Dimensions (Inches)  
 OAL: 91 ✓ N1: 16 ✓  
 UL1: 20 ✓ N2: 12 ✓  
 UL2: 31 ✓ N3: 8 ✓  
 DL: 40 ✓ N4:  
 FC1: N5:  
 N6:  
 N7:  
 N8:

Overall Length Tolerance +/- 1/4"  
 Weld Bevels: 37.5° +/- 15°

### Non-Destructive Testing

- Fitting Radiography Testing (Critical Locations)
- Fitting Radiography Testing (Weldneck Only)
- Weld Radiography Testing: 100% by shop rate  
ASME B31.3 - Normal ✓
- MPI ✓
- Liquid Penetrant
- Hardness 10% ✓
- PWHT - Minimum: 1 hour(s) ✓
- Ultrasonic
- Ferrite

Seat Test:	1650 PSIG
Hydro Test:	1 Hour(s) @ 2225 PSIG
Corr. Allow.:	1/8
CWP:	1480 PSIG @ -20°F to 100°F

### Weld Procedures

- GMAW, FCAW, or SAW  
(CCL5 may also be used on outlets of large runs)
- CCL-1N Rev 1(RT/LT-FCAW)
- CCL8 (STAINLESS-GMAW(RMD)/FCAW)
- CCL5 (RT/LT-SMAW) ✓
- CCL-10N/11N (RT/LT-MCAW)
- Subcontractor (refer to attachment)

### Branch Connection Details

	N1	N2	N3	N4	N5	N6	N7	N8
Style	TOL	TOL	TOL	—	—	—	—	—
Size (Inches)	3/4 ✓	3/4 ✓	1 ✓	—	—	—	—	—
Schedules	—	—	—	—	—	—	—	—
Rating	6000 ✓	6000 ✓	6000 ✓	—	—	—	—	—
Orientation	0	0	0	—	—	—	—	—
Material	A105N	A105N	A105N	—	—	—	—	—

### Other Applicable Customer Specifications

- All information complies with our registered CRN.

- Built to Encana spec ECA-C-GEN-R-003 ✓
- No Incomplete Penetration, No undercut ✓
- Hardness 225 BHN Max ✓
- Latest NACE Requirements ✓
- PWHT: 1150-1175 F (1 Hour Mn) ✓
- 100% Xray Per Meter ✓
- 100% MPI on TOLs ✓

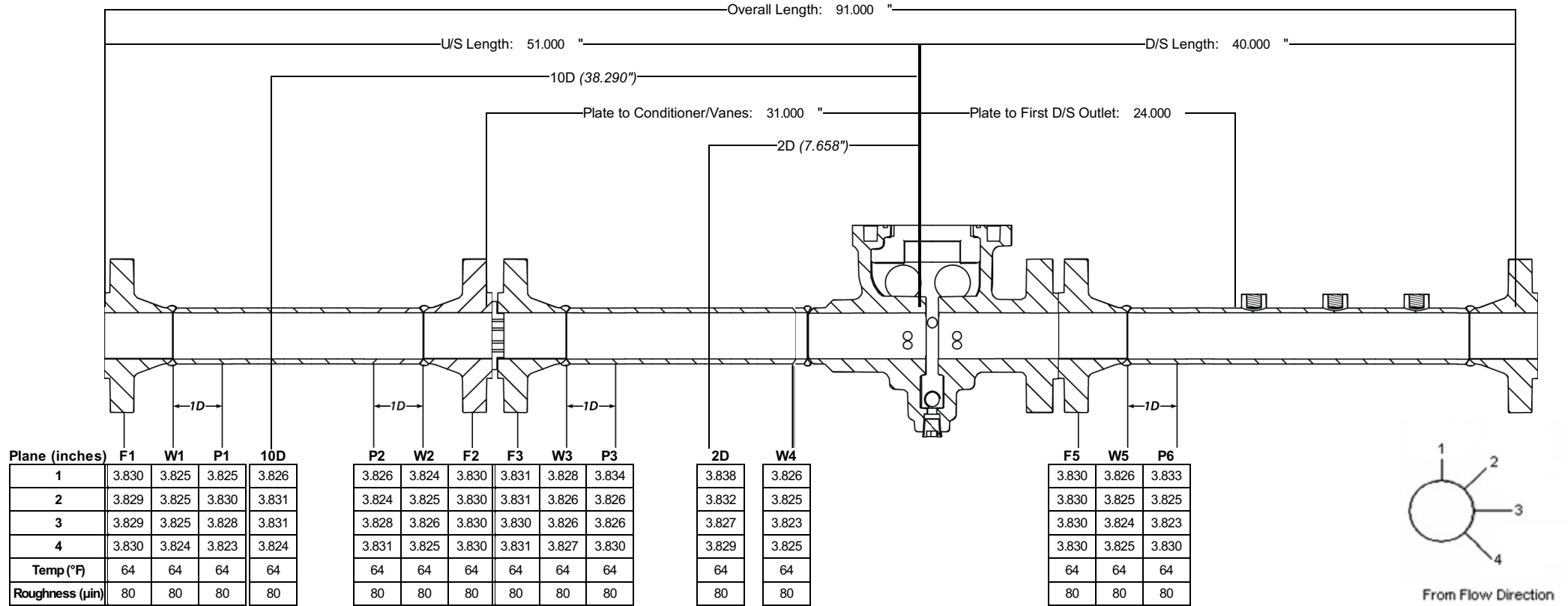
Rev	Description	By	Date
0	Issued for quotation	AV	09.18.19

Customer Approval	
Signature:	
Printed Name:	Carter Freschette

SEP 18 2019

Serial           D0405960          

**PLEASE NOTE:** This drawing may not accurately represent the model ordered; it is intended as a reference of the spots checked for bore diameters only. Not all points may be applicable

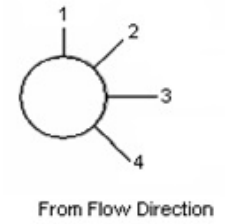


Plane (inches)	F1	W1	P1	10D
1	3.830	3.825	3.825	3.826
2	3.829	3.825	3.830	3.831
3	3.829	3.825	3.828	3.831
4	3.830	3.824	3.823	3.824
Temp (°F)	64	64	64	64
Roughness (µin)	80	80	80	80

P2	W2	F2	F3	W3	P3
3.826	3.824	3.830	3.831	3.828	3.834
3.824	3.825	3.830	3.831	3.826	3.826
3.828	3.826	3.830	3.830	3.826	3.826
3.831	3.825	3.830	3.831	3.827	3.830
64	64	64	64	64	64
80	80	80	80	80	80

2D	W4
3.838	3.826
3.832	3.825
3.827	3.823
3.829	3.825
64	64
80	80

F5	W5	P6
3.830	3.826	3.833
3.830	3.825	3.825
3.830	3.824	3.823
3.830	3.825	3.830
64	64	64
80	80	80



**ROUNDNESS CHECKS (inches)**

From Fitting Inspection Sheet: Dm:           3.829           Largest Value OD - 1D Upstream:           3.830           Smallest Value OD - 1D Upstream:           3.825          

**Upstream**

	Tolerance		Measured		
	%	Value	%	Value	
Max Diff between Values	0.5	0.019	0.392	0.015	<b>PASS</b>

**Upstream OD - 1D**

	Tolerance		Measured		
	%	Value	%	Value	
Minimum	-0.250	3.819	-0.104	3.825	<b>PASS</b>
Maximum	0.250	3.839	0.026	3.83	<b>PASS</b>

**Downstream**

	Tolerance		Measured		
	%	Value	%	Value	
Minimum	-0.500	3.810	-0.157	3.823	<b>PASS</b>
Maximum	0.500	3.848	0.104	3.833	<b>PASS</b>

Pin Type Flow Conditioner Clearance Checked:  Yes  N/A

Inspector:           Ricardo           Date:           18-Oct-2019

Serial No:           T0403878           Heat No:           80H1          

- EQ AND GREASE PORT DRILLED
- EQ PORT: BALL SEAT AND PORT HOLE ARE CENTERED
- TAG HOLES DRILLED CORRECTLY
- SEAL BAR SURFACE PASSES (ROUGHNESS AND NO POROSITIES)
- TOP AND BOTTOM PLATE CARRIER SLOTS ARE BEVELED ON INTERIOR AND EXTERIOR
- SQUARE FLANGE SURFACE IS FLAT
- BOLT UP FLANGE PASSES (ROUGHNESS AND NO POROSITIES)
- ALL THREAD SIZES AND FINISH PASSES
- CLEARANCE ON TOP OF FLANGE FOR NUTS
- PINION SEAL SURFACES PASS (ROUGHNESS AND NO POROSITIES)
- FITTING DEGREASED AND NO SHAVING INSIDE
- WALL THICKNESS PASSES, NO FLAWS ON INTERIOR OR EXTERIOR

T-SLOT WIDTH:           1.792          

FLANGE THICKNESS:           0.814          

Inspector:           DNW           Date:           31-May-2019



**MATERIAL TEST REPORT  
IN ACCORDANCE WITH  
EN 10204 - 3.1**

DATE	2019.07.31
PURCHASE ORDER NO.	
CERTIFICATE NO.	3ZMQ19062802
DATE OF POURING	2019.06.28
VENDOR MARK	C3Z

**COMPANY NAME & ADDRESS:**  
CCI Global - S. Korea  
161 Bodeum-Ro, 16bl-18lot, Geomdan Industrial Park, Oryu, Sugu, Incheon, South Korea  
Telephone +82-32-562-0161

<b>SPECIFICATION REFERENCE:</b>
1. STANDARD: ASTM A216 & A352
GRADE: WCB / LCC
YEAR: 2008
2. NACE MR 0175

SERIAL NO. (If applicable)	DESCRIPTION	DRAWING REV. NO.	PART NO.	QUANTITY
	4" DUAL CHAMBER		460RFDC04	60

**CHEMICAL COMPOSITION %**

ELEMENT	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu	*RE	*CE
<b>Minimum</b>											0.000	0.000
<b>Maximum</b>	0.25	0.60	0.045	0.040	1.20	0.50	0.50	0.20	0.03	0.30	1.530	0.649

HEAT NUMBER	QTY	ACHIEVED											*RE	*CE	
9607	10	0.18	0.31	0.01	0.01	1.05	0.21	0.001	0.006	0.001	0.001			0.219	0.371
9634	10	0.17	0.30	0.01	0.01	1.09	0.19	0.002	0.005	0.001	0.001			0.199	0.366
9642	10	0.19	0.30	0.01	0.02	1.10	0.20	0.007	0.005	0.001	0.001			0.214	0.389
9655	10	0.19	0.31	0.01	0.01	1.06	0.21	0.004	0.001	0.001	0.001			0.217	0.382
9676	10	0.18	0.34	0.01	0.01	1.04	0.21	0.002	0.001	0.001	0.001			0.215	0.368
96L8	10	0.18	0.29	0.01	0.01	1.07	0.20	0.006	0.001	0.001	0.001			0.209	0.373
														0.000	0.000

**HEAT TREATMENT:**  
QUENCHING Temperature raised to 900°C, soaked for 5.8 hours and then water cooled. TEMPERING Temperature raised to 620°C, soaked for 6.6 hours and then air cooled.

**MECHANICAL PROPERTIES**

SPECIFICATION	Y.S. ( MPa )	UTS ( MPa )	% ELONGATION IN 50mm (4d)	% REDUCTION IN AREA	NOTCH TOUGHNESS J (at -46.0 °C)		BEND TEST		HARDNESS ( HB )	PROOF LOAD ( )
					VALUES	AVERAGE	ANGLE	D		
<b>Minimum</b>	275	485	22	35	16	20				
<b>Maximum</b>		655							237	

HEAT NUMBER	QTY	ACHIEVED									HARDNESS	PROOF LOAD
9607	10	336	538	32	61	47.58.63	56			160		
9634	10	335	536	34	60	47.58.71	59			159		
9642	10	334	529	34	59	45.5936	55			157		
9655	10	336	535	33	60	49.65.70	61			163		
9676	10	332	523	33	59	50.62.64	59			164		
96L8	10	334	527	32	61	42.55.70	56			159		

**REMARKS :**  
1. \*RE = Ni + Cr + Mo + V + Cu  
2. \*CE = C + [Mn/6] + [(Cr + Mo + V)/5] + [(Ni + Cu)/15]

**OTHER COMMENTS:**

**CERTIFIED THAT:**  
1. THE ABOVE GIVEN DETAILS ARE CORRECT.  
2. THE MATERIAL CONFORMS TO ABOVE SPECIFICATION.  
3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION.  
THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1

*Umix*

<b>PREPARED BY:</b> 	<b>CHECKED BY:</b> 	<b>AUTHORISED WORK INSPECTOR: QUALITY CONTROL MANAGER / MANUFACTURER'S AUTHORIZED INSPECTOR</b>
-------------------------	------------------------	---



**MATERIAL TEST REPORT  
IN ACCORDANCE WITH  
EN 10204 - 3.1**

DATE	2018.12.18
PURCHASE ORDER NO.	
CERTIFICATE NO.	43ZMQ18110501
DATE OF POURING	2018.11.05
VENDOR MARK	C3Z

**COMPANY NAME & ADDRESS:**  
CCI Global - S. Korea  
161 Bodeum-Ro, 16bl-18lot, Geomdan Industrial Park, Oryu, Sugu, Incheon, South Korea  
Telephone +82-70-4848-4205

**SPECIFICATION REFERENCE:**  
1. STANDARD: ASTM A216 & A352  
GRADE: WCB / LCC  
YEAR: 2008  
2. NACE MR 0175

SERIAL NO. (If applicable)	DESCRIPTION	DRAWING REV. NO.	PART NO.	QUANTITY
	4" TOP HOUSING		460DC14R	140

**CHEMICAL COMPOSITION %**

ELEMENT	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu				*RE	*CE
<b>Minimum</b>														0.000	0.000
<b>Maximum</b>	0.25	0.60	0.045	0.040	1.20	0.50	0.50	0.20	0.03	0.30				1.530	0.649

HEAT NUMBER	QTY	ACHIEVED														
8053	20	0.16	0.31	0.01	0.01	1.03	0.21	0.013	0.008	0.001	0.001				0.233	0.350
80E3	20	0.17	0.39	0.01	0.01	1.13	0.20	0.003	0.008	0.001	0.001				0.213	0.374
80E6	20	0.18	0.37	0.01	0.02	1.09	0.19	0.001	0.008	0.001	0.001				0.201	0.376
80H1	20	0.17	0.37	0.01	0.02	1.15	0.21	0.034	0.008	0.001	0.001				0.254	0.384
80K7	20	0.17	0.31	0.01	0.01	1.08	0.20	0.001	0.007	0.001	0.001				0.210	0.365
80N3	20	0.17	0.34	0.01	0.01	1.11	0.19	0.001	0.006	0.001	0.001				0.199	0.369
80P4	20	0.18	0.31	0.01	0.02	1.11	0.21	0.001	0.008	0.001	0.001				0.221	0.381

**HEAT TREATMENT:**  
QUENCHING Temperature raised to 901°C, soaked for 4.0 hours and then water cooled.    TEMPERING Temperature raised to 626°C, soaked for 4.0 hours and then air cooled.

**MECHANICAL PROPERTIES**

SPECIFICATION	Y.S. ( MPa )	UTS ( MPa )	% ELONGATION IN 50mm (4d)	% REDUCTION IN AREA	NOTCH TOUGHNESS J (at -46.0 °C)		BEND TEST		HARDNESS ( HB )	PROOF LOAD (       )
					VALUES	AVERAGE	ANGLE	D		
<b>Minimum</b>	275	485	22	35	16	20				
<b>Maximum</b>		655							237	


HEAT NUMBER	QTY	ACHIEVED								
8053	20	342	543	34	60	46.54.67	56			162
80E3	20	340	542	34	60	48.56.69	58			165
80E6	20	340	540	34	60	50.58.70	59			167
80H1	20	341	539	34	60	41.56.71	56			166
80K7	20	343	537	34	61	49.55.69	58			164
80N3	20	342	535	35	61	47.56.67	57			162
80P4	20	344	536	35	61	45.57.72	58			160


**REMARKS :**  
1. \*RE = Ni + Cr + Mo + V + Cu  
2. \*CE = C + [Mn/6] + [(Cr + Mo + V)/5] + [(Ni + Cu)/15]

**OTHER COMMENTS:**

**CERTIFIED THAT:**  
1. THE ABOVE GIVEN DETAILS ARE CORRECT.  
2. THE MATERIAL CONFORMS TO ABOVE SPECIFICATION.  
3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION.  
THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1

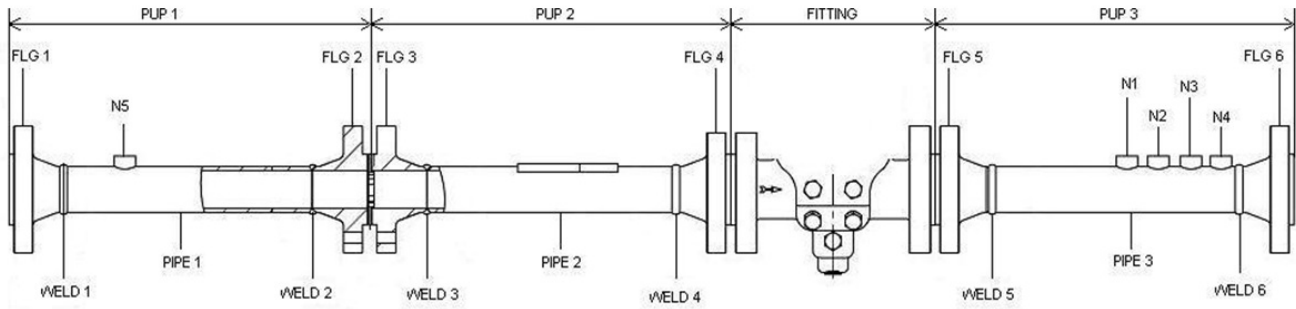
*Umix*

**PREPARED BY:** 

**CHECKED BY:** 

**AUTHORISED WORK INSPECTOR: QUALITY CONTROL MANAGER /  
MANUFACTURER'S AUTHORIZED INSPECTOR**

Serial No: D0405960



**PLEASE NOTE:**  
This drawing may not accurately represent the model ordered, not all points may be applicable.

**HEAT NUMBERS**

**FLANGES**

FLG1: 180577    FLG2: 180577    FLG3: 180577    FLG4: \_\_\_\_\_    FLG5: 180577    FLG6: 180577

**FLANGE TAP CONNECTIONS HEAT NUMBERS**

NIPPLE: \_\_\_\_\_    ELBOW: \_\_\_\_\_    FLANGE: \_\_\_\_\_

**PIPE AND FLOW CONDITIONER**

PIPE 1: D05016    PIPE 2: D05016    PIPE 3: D05016    FC 1: \_\_\_\_\_

**OUTLETS**

N1: 50196    N2: 50196    N3: 50457    N4: \_\_\_\_\_    N5: \_\_\_\_\_    N6: \_\_\_\_\_

**OUTLET NIPPLES**

N1: \_\_\_\_\_    N2: \_\_\_\_\_    N3: \_\_\_\_\_    N4: \_\_\_\_\_    N5: \_\_\_\_\_    N6: \_\_\_\_\_

**OUTLET FLANGES / VALVES**

N1: \_\_\_\_\_    N2: \_\_\_\_\_    N3: \_\_\_\_\_    N4: \_\_\_\_\_    N5: \_\_\_\_\_    N6: \_\_\_\_\_

Inspector: : RENZ BALANOBA    Date: : 09-Oct-2019

**NON-DESTRUCTIVE TESTING**

**RADIOGRAPHIC TESTING NUMBERS (IF APPLICABLE)**

WELD 1: 12    WELD 2: 11    WELD 3: 8    WELD 4: 7    WELD 5: 9    WELD 6: 10  
 N1: \_\_\_\_\_    N2: \_\_\_\_\_    N3: \_\_\_\_\_    N4: \_\_\_\_\_    N5: \_\_\_\_\_    N6: \_\_\_\_\_




**WELDER'S STAMP**

WELD 1: F    WELD 2: F    WELD 3: F    WELD 4: F    WELD 5: F    WELD 6: F  
 N1: F    N2: F    N3: F    N4: \_\_\_\_\_    N5: \_\_\_\_\_    N6: \_\_\_\_\_

**OTHER TESTS APPLIED**

POST WELD HEAT TREAT     MAG PARTICLE     ULTRASONIC  
 LIQUID DYE     10% HARDNESS     100% HARDNESS     OTHER: \_\_\_\_\_

Inspector: : Tyler Hannah    Date: : 10-Oct-2019

		MATERIAL TEST REPORT								Date: :DEC 13, 2018			
		IN ACCORDANCE WITH EN 10204-3.1											
		SPECIFICATION REFERENCE:								PURCHASE ORDER NO.:027160			
		1.Standard:		ASTM A105/A105M									
		Year:		2013						CERTIFICATE NO.: MTRZH18398			
		Grade:								VENDOR MARK: 			
		2.NACE MR 0175						DATE OF POURING: 2018-12-13					
SERIAL NO. (If applicable)	DESCRIPTION							HEAT NUMBER	DRAWING NO./PART NO.		QTY		
1	FLANGE 4" 600LBS RF SCH80 WN A105							180577			600		
CHEMICAL COMPOSITION%													
ELEMENT	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu	Al	*RE	*CE
MIN		0.100			0.600								
MAX	0.350	0.350	0.040	0.035	1.050	0.400	0.300	0.120	0.080	0.400			
HEAT NUMBER	QTY	ACHIEVED											
180577	600	0.190	0.210	0.006	0.013	0.930	0.017	0.019	0.008	0.003	0.016		
HEAT TREATMENT: NORMALIZED AT 900°C FOR 2 HOURS, COOLED IN STILL AIR													
MECHANICAL PROPERTIES													
SPECIFICATION	Y.S. (MPa)	UTS (Mpa)	%ELONG in 50mm (4d)	%RED. IN AREA	Notch Toughness(at -46°C)J		BEND TEST		HARDNESS (HB)	PROOF LOAD			
					Values	Avg.	ANGLE	D					
MIN	250	485	22	30									
MAX									187				
HEAT NUMBER	QTY	ACHIEVED											
180577	600	307	545	32.5	72					159/161/163			
REMARKS:					OTHER COMMENTS:								
1.*RE=Ni+Cr+Mo+V+Cu													
2.*CE=C+【Mn/6】+【(Cr+Mo+V)/5】+【(Ni+Cu)/15】													
CERTIFIED THAT:					Manager-Quality Control Manufacturer's Authorized Inspector  								
1.THE ABOVE GIVEN DETAILS ARE CORRECT													
2.THE MATERIAL CONFORMS TO ABOVE SPECIFICATION													
3.THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION													
THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1													
Prepared by:					Checked by:								
GU					JIANGWEIZENG								





**REVIEWED**  
By Daniel Fielder at 4:14 pm, Jan 11, 2018



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

Page 3 of 3

Sold To:

MTR #: 335,250

PO #: CI-17-737

Sales Order #: C001711221

Date: 11/03/2017

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

**Certified Material Test Report**

Heat Code: 50196

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

Material: A/SA105N 14

Item	Quantity	Description
9		36 - 1 1/2 X 3/4 6M THP A/SA105N
10		FLT X 3/4 6M THP A/SA105N

**Chemical Composition**

Ladle	C	Co	CR	CU	MN	MO	Nb	NI
	0.2000	0.002	0.04	0.03	1.050	0.003	0.014	0.020
	P	S	SI	V				
	0.005	0.019	0.270	0.003				
Carbon Equivalency:	Ladle		0.39					

Product	C	Cr	Cu	Mn	Mo	Ni	P	S
	0.0000	0.00	0.00	0.000	0.000	0.000	0.000	0.000
	Si	V						
	0.000	0.000						

Product	Tensile PSI	Yield PSI	Elong %	RA %	Hardness
	71,610	47,449	36.85	57.04	135 BHN
					135 BHN

MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#D117358/BONNEY FORGE (USA) - LOT#50196

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

1. IN ACCORDANCE WITH ANSI/NACE MR0175 / ISO 15156-2015

Marie Dehmer  
Quality Assurance Representative

**REVIEWED**  
By Virglyn Manriquez at 8:06 am, Dec 17, 2018



Manufacturer of Piping and Pressure Vessel Components

4404 Haygood St - Houston, TX 77022

Phone: 713-695-3633 Fax: 713-695-3528

A Bonney Forge Company

MTR #: 351,635

Date: 11/02/2018

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

**Certified Material Test Report**

Heat Code: 50457

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

Material: A/SA105N 14

Item	Description
14	36 - 3 X 1 6M THP A/SA105N

**Chemical Composition**

Ladle	C	Co	CR	CU	MN	MO	NB	NI
	0.2000	0.002	0.03	0.03	1.040	0.004	0.012	0.020
	P	S	SI	V				
	0.003	0.019	0.230	0.003				
Carbon Equivalency:	Ladle			0.38				

Product	B	C	Co	Cr	Cu	Mn	Mo	Nb
	0.0002	0.1870	<0.001	0.03	0.04	1.090	0.007	0.014
	Ni	P	S	Si	V			
	0.016	0.003	0.013	0.251	0.001			
Carbon Equivalency:	Product			0.38				

	Tensile PSI	Yield PSI	Elong %	RA %	Hardness	
Product	76,033	51,933	36.80	65.84	144 BHN	144 BHN


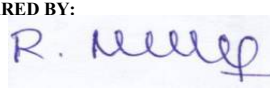
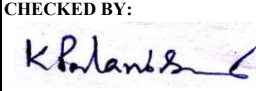
MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#D123049/  
BONNEY FORGE (USA) - LOT#50457

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

I. IN ACCORDANCE WITH ANSI/NACE MR0175/ISO 15156-2015 & ISO 17945/MR0103-2015

Marie Dehmer  
Quality Assurance Representative



SERIAL NO. (If applicable)		DESCRIPTION								DRAWING R	PART NO.				QUANTITY	
		O-PLT 2"X1/8" Various Bores, 316SS								3	260DC13-316-XXXX-125				210	
		O-PLT 3"X1/8" Various Bores, 316SS								3	360DC13-316-XXXX-125				200	
		O-PLT 4"X1/8" Various Bores, 316SS								3	460DC13-316-XXXX-125				247	
		O-PLT 6"X1/8" Various Bores, 316SS								3	660DC13-316-XXXX-125				10	
<b>CHEMICAL COMPOSITION %</b>																
ELEMENT	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu				*RE	*CE	
Minimum						10.00	16.00	2.00						28.00	4.27	
Maximum	0.08	1.00	0.03	0.045	2.00	14.00	18.00	3.00						35.00	5.55	
HEAT NUMBER	QTY	ACHIEVED														
21800126	210	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05						28.53	4.59
21800126	200	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05						28.53	4.59
21800126	247	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05						28.53	4.59
21800126	10	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05						28.53	4.59
															0.00	0.00
															0.00	0.00
															0.00	0.00
HEAT TREATMENT: SOLUTION ANNEALED																
<b>MECHANICAL PROPERTIES</b>																
SPECIFICATION	Y.S. (MPa)	UTS (MPa)	% ELONGATION IN 50mm (4d)	% REDUCTION IN AREA	NOTCH TOUGHNESS J (at °C)		BEND TEST		HARDNESS (BHN)	PROOF LOAD ( )						
					VALUES	AVERAGE	ANGLE	D								
Minimum	205	515	40	50												
Maximum									215							
HEAT NUMBER	QTY	ACHIEVED														
21800126	210	336	601	55						147-150						
21800126	200	336	601	55						147-150						
21800126	247	336	601	55						147-150						
21800126	10	336	601	55						147-150						
REMARKS :					OTHER COMMENTS:											
1. *RE = Ni + Cr + Mo + V + Cu 2. *CE = C + [Mn/6] + [(Cr + Mo + V)/5] + [(Ni + Cu)/15]																
CERTIFIED THAT: 1. THE ABOVE GIVEN DETAILS ARE CORRECT. 2. THE MATERIAL CONFORMS TO ABOVE SPECIFICATION. 3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION. THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1					<p>For ACCURA INDUSTRIES</p> 											
PREPARED BY: 					CHECKED BY: 					AUTHORISED WORK INSPECTOR: QUALITY CONTROL MANAGER / MANUFACTURER'S AUTHORIZED INSPECTOR						



# 泰州市恒达新型复合材料有限公司

JIANGSU STEEL GROUP CO.,LIMITED

编号: JSSG201903017007D

## 质量证明书 (TEST REPORT)

订货单位 CUSTOMER	APS Machining	产品名称 PRODUCT	STAINLESS STEEL ROUND BAR	交货状态	POLISHED
收货单位 PURCHASER	APS Machining	代 号 CUSTOMER'S NO.	HD100289	DELIVER STATE	
技术标准 SPECIFICATION	ASTM A276-06	客户订单编号 CUSTOMER ORDER NO	HD5328		
		签发日期 DATE OF ISSUE	2019.04.17	交货日期 DATE OF DELIVERY	2019.04.17

序 号 NO.	钢 号 TYPE	炉 号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION		化学成分 CHEMICAL COMPOSITION % (熔炼分析 HEAT ANALYSIS)											拉伸试验 TENSILE TEST (G.L=L3)			F.M. (Kg/m)	BEN D TES T	*02 HARD NESS	试样热处 理
			SIZE	Qty(Kgs)	C	Si	Mn	P	S	Ni	Cr	Mo	Ti	N	Cu	屈服 Y.S.	抗拉 T.S.	EL %				
3	316L	JS257	1"	120	0.024	0.75	1.69	0.027	0.001	10.03	16.52	2.01	---	---	---	208	521	35				
4	316L	JS258	2"	202	0.026	0.65	1.81	0.023	0.001	10.17	16.21	2.03	---	---	---	211	535	35				
5	316L	JS259	2.75"	287	0.025	0.65	1.82	0.024	0.001	10.11	16.17	2.05	---	---	---	212	537	35				
6	316L	JS260	4.75"	597	0.027	0.67	1.74	0.027	0.001	10.01	16.23	2.05	---	---	---	212	537	35				
7	316L	JS261	5.0"	1707	0.028	0.66	1.75	0.027	0.001	10.07	16.27	2.07	---	---	---	213	535	35				
8	316L	JS262	6.25"	1222	0.028	0.65	1.72	0.025	0.001	10.12	16.57	2.04	---	---	---	218	545	35				
9	316L	JS263	8.5"	1124	0.029	0.54	1.65	0.021	0.001	10.02	16.78	2.11	---	---	---	218	545	35				
10	316L	JS264	10.75"	1543	0.022	0.68	1.77	0.026	0.001	10.12	16.58	2.01	---	---	---	218	545	35				

判 定 员 :  
SURVEYOR TO 刘鑫  
质检部长: 胡海龙  
QC MANAGER

本产品已按上述要求进行制造和检验,其结果符合要求,特此证明。  
This product has been manufactured and tested accordingly, I hereby certify that



Treatment Type: Meter Tube Date: Oct-07-2019  
 Furnace Record Number: 191007 Operator: Tyler Hannah

**Component Description**

1	BROMLEY RP#23014#1. 260RFSC80. S0233420, S0233461, S0233593, S0233600, S0233607.											
M.T.												
1	Qty	10	Diameter	2.375	Thickness	0.218	Material	A216WCB	Length	48"	Weight	825.Lbs
2	NWP RP#23033#1. 460RFDC80. D0405960, D0405978.											
M.T.												
6	Qty	6	Diameter	4.5	Thickness	0.337	Material	A216WCB	Length	91"	Weight	728.Lbs
3	Qty		Diameter		Thickness		Material		Length		Weight	
4	Qty		Diameter		Thickness		Material		Length		Weight	
5	Qty		Diameter		Thickness		Material		Length		Weight	
6	Qty		Diameter		Thickness		Material		Length		Weight	
7	Qty		Diameter		Thickness		Material		Length		Weight	

**Instruction**

Ramp Up: 600°F ► 1150°F @ Max 600°F/Hr  
 For Meter Tube, above 600°F, heating rate is 1200°F/h divided by the maximum weld thickness and never more than 600°F/h.

Hold For: 30Min @ 1100°F to 1200°F  
 Soak time= 15 Min every 1/4" Unless max thickness is > 2" than Soak Time= 2Hr for the first 2" + 15 Min every extra inch

Ramp Down: 1150°F ► 600°F @ Max 600°F/Hr  
 For Meter Tube, above 600°F, cooling rate is 1200°F/h divided by the maximum weld thickness and never more than 600°F/h.

**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.
- If Capacitor discharge welding is used to attach thermocouples an ASME Section IX welding procedure 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<sup>2</sup> = W-Sec.]

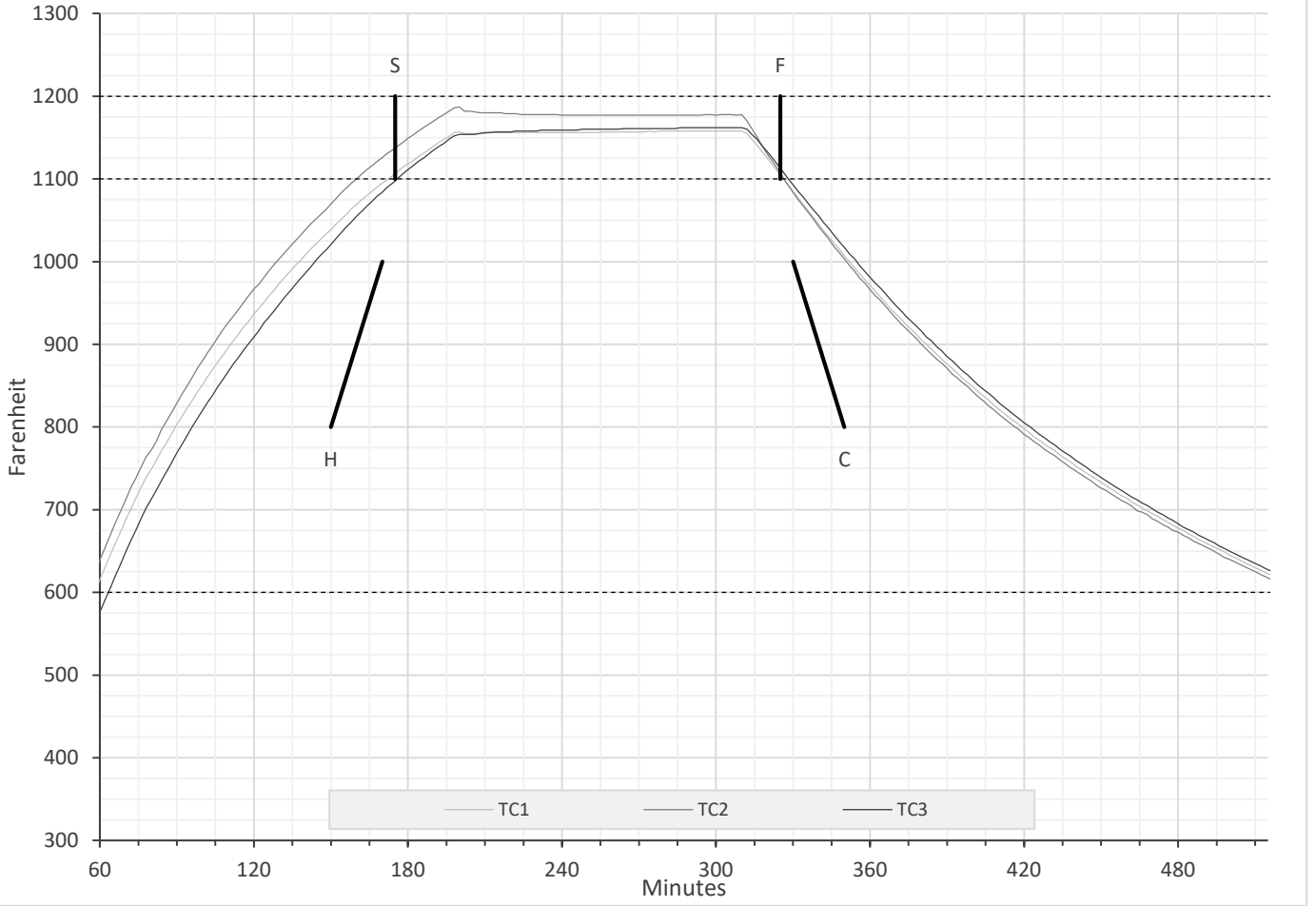
TC Location: Furnace diagonals & center.  
 TC Attachment Methode: Direct Contact

Furnace Operator Signature:  (Tyler Hannah) Date: Oct 09, 2019

Q.C. Inspector Signature: \_\_\_\_\_ (Francis Dumas) Date: Oct 09, 2019



Canalta Heat Treatment Chart | Furnace Record Number: 191007



Holding Time: 150 Minutes


Operator: Tyler Hannah  
Recorder: OMEGA OM-DAQPRO-5300

Date: Oct-07-2019  
Serial No. 7014168

### Content

BROMLEY RP#23014#1. 260RFSC80. S0233420, S0233461, S0233593, S0233600, S0233607.

NWP RP#23033#1. 460RFDC80. D0405960, D0405978.

Furnace Operator Signature:  (Tyler Hannah)

Date: Oct 09, 2019

Q.C. Inspector Signature: \_\_\_\_\_ (Francis Dumas)

Date: Oct 09, 2019



# MAGNETIC PARTICLE EXAMINATION REPORT

CLIENT: CANALTA CONTROLS DATE: 8-Oct-19 PAGE: 1 OF 1  
 INVOICE ADDRESS: Red Deer, AB WORK LOCATION: Red Deer, AB  
 EXAMINATION STANDARD: ASME V Article 7 - 2017 ACCEPTANCE STANDARD: ASME B31.3 - 2016  
 TEAM PROCEDURE: MT.ASME.EDM.1 R3 EXAMINATION OF: NWP INDUSTRIES

**MT - 50191885- 01 JC**

SURFACE CONDITION:  AS GROUND  MACHINED  PAINTED  SAND BLAST  BASE METAL  AS WELDED  
 MATERIAL: P1 THICKNESS: Not Supplied TEMPERATURE: 21 °C

TEAM JOB NO.: 5019 1885  
 BRANCH NO.: 5301  
 PO NO.: 30457  
 RP NO.: 23033 #1

**TEST EQUIPMENT AND MATERIALS:**

EQUIPMENT	MODEL AND SERIAL NO.	MAGNETIZING CURRENT	TEST MEDIUM/CONSUMABLES	MANUFACTURER /BATCH NO./CONCENTRATION
<input checked="" type="checkbox"/> DC YOKE	Electro Spec ESX Ferrous, Serial#7708- 4AMP	<input checked="" type="checkbox"/> AC	<input checked="" type="checkbox"/> WET VISIBLE	Black Particles -- Magnaflux 7HF
<input checked="" type="checkbox"/> DAILY LIFT TEST	10 lbs. SN: A511 Status: Pass	<input type="checkbox"/> DC	<input type="checkbox"/> DRY POWDER	Batch# 03109
<input checked="" type="checkbox"/> WHITE LIGHT	Shop Hi Intensity Fluorescent	<input type="checkbox"/> N/A (Permanent Magnet)	<input checked="" type="checkbox"/> CONTRAST PAINT	White Contrast -- Magnaflux WCP-2
<input checked="" type="checkbox"/> LIGHT INTENSITY	> 100 foot candles	<input checked="" type="checkbox"/> CONTINUOUS	<input checked="" type="checkbox"/> WET FLUORESCENT	Batch# 04093
<input type="checkbox"/> BLACKLIGHT		<input type="checkbox"/> RESIDUAL	<input type="checkbox"/> SETTLEMENT TEST	

BLACK LIGHT INTENSITY BEFORE EXAMINATION:           $\mu\text{w}/\text{CM}^2$  BLACK LIGHT INTENSITY AFTER EXAMINATION:           $\mu\text{w}/\text{CM}^2$  WHITE LIGHT/BACKGROUND: 120 fc

Wet / Black Magnetic Particle Inspection Performed on:  
**02, 1" & 04, 3/4" TOL'S**

MT #	Size #	Control #	Welder	Status
MT-1	1" TOL	<b>D0405960</b>	F	Accept
MT-2	3/4" TOL	v	F	Accept
MT-3	3/4" TOL	v	F	Accept
MT-4	1" TOL	<b>D0405978</b>	F	Accept
MT-5	3/4" TOL	v	F	Accept
MT-6	3/4" TOL	v	F	Accept

All above Listed Welds are in Accordance With The Examination / Acceptance Standards

**TECHNICIANS:**

INTERPRETATION IS IN ACCORDANCE WITH THE ABOVE MENTIONED STANDARDS, TO THE BEST OF MY PROFESSIONAL ABILITY  
 (PRINT): James Coffin CGSB/SNT LEVEL: II REG. NO.: 11281 (SIGN):   
 (PRINT): Craig Olsen CGSB/SNT LEVEL: I REG. NO.: 12504 (SIGN):

THE ABOVE REPRESENTATION IS A PROFESSIONAL OPINION. FINAL INTERPRETATION IS THE RESPONSIBILITY OF THE CLIENT. I HAVE READ AND AM IN FULL AGREEMENT WITH THE CONTENTS OF THIS REPORT.

CLIENT REPRESENTATIVE: (PRINT): *Yusef Hossain* (SIGN):

# HARDNESS TESTING REPORT

2507 - 84 Avenue, Edmonton, Alberta T6P 1K1  
Phone (780) 417-7777 Fax: (780) 417-1185

CLIENT: Canalta Controls DATE: 2019-10-08 PAGE: 1 OF 1  
 INVOICE ADDRESS: Red Deer Shop WORK LOCATION: Red Deer  
 EXAMINATION STANDARD: ASTM A1038 ACCEPTANCE STANDARD: ASTM A1038  
 TEAM PROCEDURE: HT.EDM.2 R7 EXAMINATION OF: NWP INDUSTRIES

**HT - 50191885-02 CO**

TEAM JOB NO.: 5019-1885  
 BRANCH NO.: 5301  
 RP #: 23033 #1  
 PO #: 30457

SURFACE CONDITION:  AS GROUND  MACHINED  PAINTED  SHOT BLASTED  BASE METAL  AS WELDED

**TEST EQUIPMENT AND MATERIALS:**

<b>SCALE</b> <input checked="" type="checkbox"/> BRINELL <input type="checkbox"/> ROCKWELL B <input type="checkbox"/> ROCKWELL C <input type="checkbox"/> VICKERS <input type="checkbox"/> OTHER	INSTRUMENT: <u>Krautkramer</u>	INSTRUMENT CALIBRATION DUE DATE: <u>Mar. 21 2020</u>	COMMENTS:
	MODEL: <u>Mic-10</u>	CALIBRATION BLOCK: <u>SN 156161 - 63.3 HRC</u>	
	SERIAL No.: <u>1-1228</u>	MANUAL / DIGITAL READINGS: <u>DIGITAL</u>	

TEST No.	SPOOL/LINE No.	WELD No.	DIAMETER	THICKNESS	WELDER(S)	BAR	PM (P)	HAZ (P)	WELD	HAZ (F)	PM (F)	ACC.	REJ.
HT -1	D0405960	X - 9	4"	8.56mm	F	n/a	171	174	189	184	191	Accept	
HT -2	D0405678	X - 3	4"	8.56mm	F	n/a	168	176	182	168	175	Accept	

**TECHNICIANS** A044 HTE R1  
 INTERPRETATION IS IN ACCORDANCE WITH THE ABOVE MENTIONED STANDARDS, TO THE BEST OF MY PROFESSIONAL ABILITY  
 (PRINT): Craig Olsen CGSB/SNT LEVEL: I REG. NO.: 12504 (SIGN): [Signature]  
 (PRINT): James Coffin CGSB/SNT LEVEL: II REG. NO.: 11281 (SIGN): [Signature]  
 THE ABOVE REPRESENTATION IS A PROFESSIONAL OPINION, FINAL INTERPRETATION IS THE RESPONSIBILITY OF THE CLIENT. I HAVE READ AND AM IN FULL AGREEMENT WITH THE CONTENTS OF THIS REPORT.  
 CLIENT REPRESENTATIVE: (PRINT): Glen Hannah (SIGN): [Signature]

**RADIOGRAPHIC EXAMINATION REPORT**

2507 - 84 Avenue, Edmonton, Alberta T6P 1K1  
Phone (780) 417-7777 Fax: (780) 417-1185

**RT-5019-1871-05TT**

CLIENT: Canalta Controls INVOICE ADDRESS: Red Deer, Ab DATE: Oct-04-2019  
 WORK LOCATION: Red Deer, AB TEAM PROCEDURE: RT.ASME.EDM.1 R2  
 EXAMINATION STANDARD: ASME V Article 2 - 2017 ACCEPTANCE STANDARD: ASME B31.3 NFS -2016  
 EXAMINATION OF: NWP  
460RFDC80

TEAM JOB NO. 5019-1871  
 Branch # 5301  
 PO #: 30436  
 RP # 23033-1  
 PAGE: 5 OF 5

<b>DEFECT LEGEND:</b>	UC - UNDERCUTTING S - SLAG IP - INCOMPLETE PENETRATION EP - EXCESSIVE PENETRATION	P - POROSITY IC - INTERNAL CONCAVITY LC - LOW COVER HB - HOLLOW BEAD	FM - FILM MARK CR - CRACK AB - ARC BURN	<b>TECHNIQUES</b>	TYPE OF ENERGY: <u>Ir192 30Ci</u> PHYSICAL SIZE: <u>3.2 mm</u> IQI TYPE: <u>ISO 19232 EN Wire</u>	INTENSIFYING SCREENS In mm: <u>0.28 ft. / 0.25 bck, Pb</u> FILM PER CASSETTE: <u>1</u> WELD MATERIAL: <u>CS</u>	FILM MANUFACTURER: <u>Agfa</u>
				EXPOSURE 1. SINGLE WALL 2. DOUBLE WALL	VIEWING 3. SINGLE WALL 4. DOUBLE WALL		

RADIOGRAPH IDENTIFICATION				RADIOGRAPH GEOMETRY									RADIOGRAPH RESULTS		
WELD ID	WELD SIZE	LOCATION	WELDER	TECHNIQUE	EXPOSURES PER WELD	WELD DEPOSIT THICKNESS	BASE MATERIAL THICKNESS	REINFORCE THICKNESS	SOURCE-OBJECT DISTANCE	OBJECT-FILM DISTANCE	FILM	IQI SIZE	INTERPRETATION 1 - SLIGHT, 2 - MEDIUM, 3 - SEVERE	COMMENTS	STATUS
x-1	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-2	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-3	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-4	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-5	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-6	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-7	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-8	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-9	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-10	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-11	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN		S-1	Accept
x-12	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept

INTERPRETATION IS IN ACCORDANCE WITH THE ABOVE MENTIONED STANDARD, TO THE BEST OF MY PROFESSIONAL ABILITY

TECHNICIAN (PRINT): Ted Todd TECHNICIAN (SIGN): Ted Todd CGSB/SNT LV: II REG NO. 4056 ASSISTANT: J Coffin

THE ABOVE REPRESENTATION IS A PROFESSIONAL OPINION, FINAL INTERPRETATION IS THE RESPONSIBILITY OF THE CLIENT. I HAVE REVIEWED AND AM IN FULL AGREEMENT WITH THE CONTENTS OF THIS REPORT.

CLIENT REPRESENTATIVE (PRINT): Glen Harris CLIENT REPRESENTATIVE (SIGN): Glen Harris DATE: Oct-07-2019

**Certificate of NACE Compliance**

Company Name: NWP Industries LP

Purchase Order No.: 746211

Canalta Sales Order No.: SO027111

Serial Number (s): D0405960, D0405978

All Canalta parts conform to the general requirements as specified in NACE Standard MR0175/ISO 15156:2009. All wetted internal parts conform to AISI 4130 or AISI 316. External parts conform to the requirements of AISI 1018.

The undersigned certifies that the above statements are true and accurate.



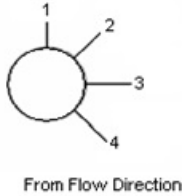
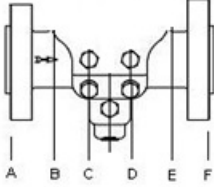
**Steven Nielsen**  
Mechanical Engineer  
Canalta Controls Ltd.



Dated this 24 Day of October, 2019

Serial No: D0405978 Tag Number: \_\_\_\_\_ Date: 16-Sep-2019 Edition: 00  
 Body Heat Number: 95M9 Top Housing Heat Number: 80E6 Overall Length: 13.250 "  
 Line Size: 4 Schedule: 80 ANSI Class: 600 Configuration: W x RF Material: A216WCB/A352LCC

**ORIFICE FITTING INTERNAL DIAMETER (inches)**



**PLEASE NOTE:**

This drawing may not accurately represent the model ordered, it is intended as a reference of the spots checked for bore diameter only. Not all points may be applicable to all models.

Plane	Upstream Points					Downstream Points		
	A	B	C			D	E	F
			0.5D	0.25D	0D			
1	3.825	3.827	3.827	3.828	3.829	3.829	3.828	3.828
2	3.825	3.827	3.827	3.828	3.829	3.829	3.828	3.828
3	3.825	3.827	3.827	3.828	3.829	3.830	3.828	3.828
4	3.825	3.827	3.828	3.828	3.829	3.829	3.828	3.828
Temp (°F)	62	62	62	62	62	62	62	62
Roughness (µin)	80	80	80	80	80	80	80	80
Average of Column C (D <sub>m</sub> ): <b>3.828</b>						Average of Downstream Columns: <b>3.828</b>		
"D <sub>r</sub> " at 68°F: 3.828								

\*\*\* Inspected to AGA Report 3 \*\*\*

**Upstream 0D - 2D**

**Downstream 0D - 2D**

**Roughness**

	Measured	Allowed (± 0.25%)	
Max:	3.829	3.838	<b>PASS</b>
Min:	3.825	3.818	<b>PASS</b>

	Measured	Allowed (± 0.5%)	
Max:	3.830	3.847	<b>PASS</b>
Min:	3.828	3.809	<b>PASS</b>

Min	Max	Measured (Avg. A-D)	
34.0	250.0	80.0	<b>PASS</b>

Inspector: Ricardo

**PRESSURE TAP TESTS (inches)**

Tap Size:  0.125  0.250  0.375  0.500 Instrument Type:  Depth Gauge  Caliper

	Top				Bottom			
	U/S RIGHT	U/S LEFT	D/S RIGHT	D/S LEFT	U/S RIGHT	U/S LEFT	D/S RIGHT	D/S LEFT
Tap Size	0.497	0.497	0.497	0.497	0.498	0.495	0.497	0.497
Tap Location	0.992	0.990	0.993	0.991	0.993	0.996	0.993	0.993
Pressure Test	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Tap Size is ± 0.016 (0.484 to 0.516): **PASS**

Tap Location within ±0.035: **PASS**

Inspector: RL TA

**ECCENTRICITY (inches)**

	RIGHT	LEFT		TOP	BOTTOM
HORIZONTAL	0.005	-0.002	VERTICAL	0.009	-0.005
HORIZONTAL TOLERANCE	0.012		VERTICAL TOLERANCE	0.046	
HORIZONTAL ECCENTRICITY	0.004		VERTICAL ECCENTRICITY	0.007	

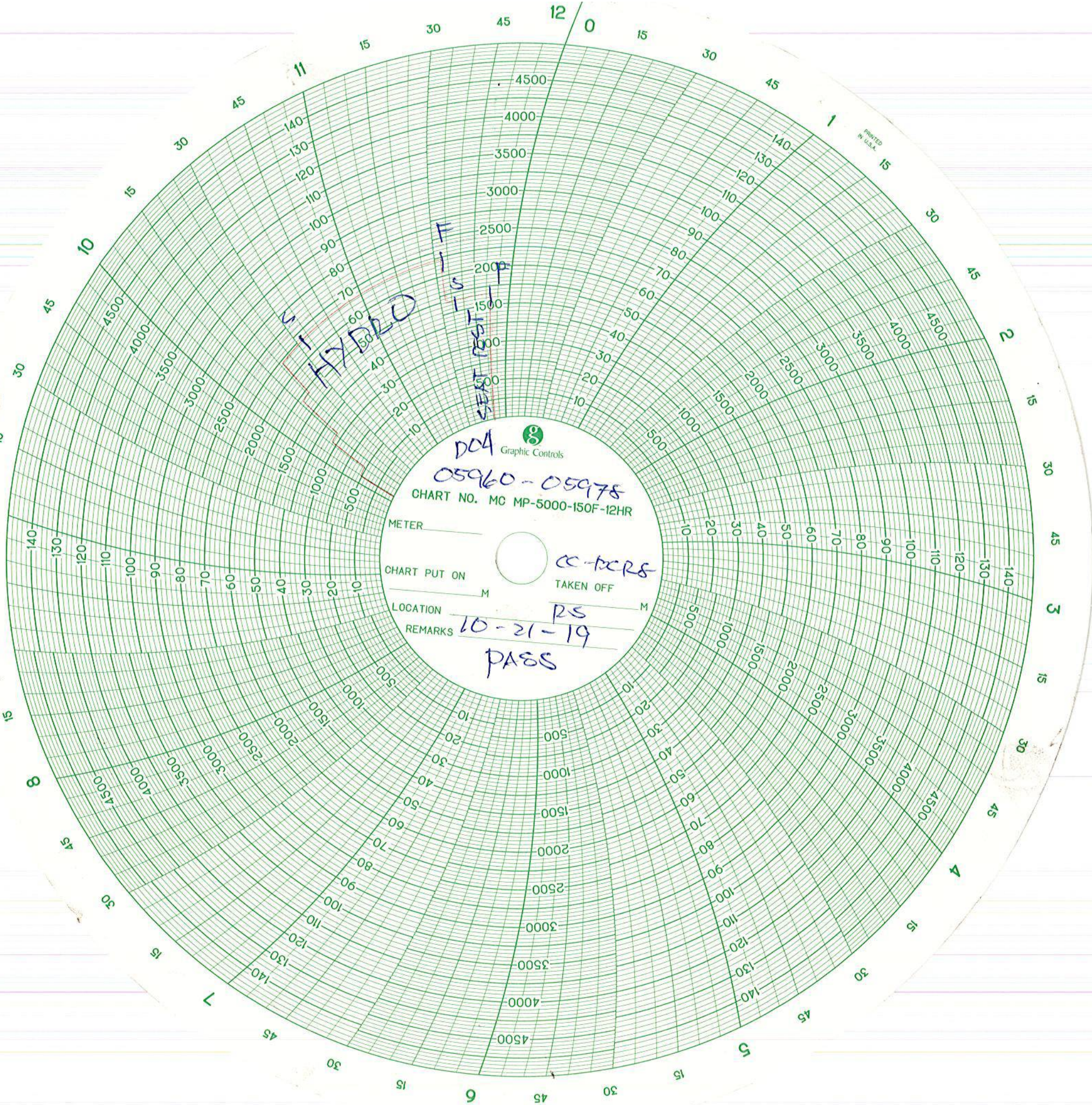
Inspector: JS

**PLATE SEAL GAP (inches)**

Target Seal Gap:  0.562  0.688  0.700  0.813  0.875

	Top	Bottom	Right	Left
Seal Gap Width	0.562	0.562	0.562	0.562

Inspector: TA



PRINTED IN U.S.A.

004 Graphic Controls

05960-05978  
CHART NO. MC MP-5000-150F-12HR

METER \_\_\_\_\_  
CHART PUT ON \_\_\_\_\_ M  
LOCATION \_\_\_\_\_ M  
REMARKS \_\_\_\_\_

CC-PCRS  
TAKEN OFF

RS  
10-21-19  
PASS

HYDRO  
WEST POINT

Serial           D0405978           Top Serial No.:           T0403814            
Chart Recorder #:           CC-BCR8           Gauge Serial #:           PG-5000-12          

**HYDROSTATIC SHELL INTEGRITY TEST REPORT**

TEST PRESSURE (PSI):           2225            
DURATION (MINUTES):           60            
TECHNICIAN:           RS            
WITNESS:           JA            
DATE:           21-Oct-2019          

**Result:**  
 PASS     FAIL

**VALVE SEAT TEST REPORT**

GREASE SEAT     SOFT SEAT

TEST PRESSURE (PSI):           1650            
DURATION (MINUTES):           15            
TECHNICIAN:           RS            
WITNESS:           JA            
DATE:           21-Oct-2019          

EQUALIZER VALVE OPERATIONAL  
 GREASE GUN OPERATIONAL

**Result:**  
 PASS     FAIL

**BLANK PLATE REPORT**

PRESSURE APPLIED:           15PSI            
SEAL MATERIAL:           HNBR            
FLOW CONDITIONER HEAT #:           N/A            
TECHNICIAN:           RS            
WITNESS:           JA            
DATE:           21-Oct-2019          

VACUUM APPLIED TO D/S  
 PRESSURE APPLIED TO D/S

**Result:**  
 PASS     FAIL

Standard Test Parameters:

SC FITTINGS: 30 MINUTE HYDRO AND BLANK PLATE TEST  
DC & DBB FITTINGS: 60 MINUTE HYDRO, SEAT TEST WITH WATER AND BLANK PLATE TEST  
PRESSURE PIPING: 10 MINUTE HYDRO

REVIEW DATASHEET FOR ALTERNATE CUSTOMER SPECIFICATIONS



# Dual Chamber Orifice Fitting Datasheet

6759 - 65th Avenue, Red Deer, Alberta T4P 1X5  
 Ph:(403)342-4494 Fax:(403)346-7110  
 Email: canalta@canaltaflow.com

General	1	Tag No.	
	2	Line No.	
	3	Line Size/Schedule	4" SCH80 (XS) ✓
	4	Inside Diameter	3.826 "
	5	Measurement Standard	AGA2000 Ed. ✓
	6	Quantity	2 ✓
	7	Paint	Canalta Standard Ship Coat
Orifice Plate	1	Orifice Plates	Qty Provided (per): 1 <input checked="" type="checkbox"/> Installed
	2	Material	316 SS
	3	Thickness(Inches)	0.125
	4	Beta(b) = d/D (installed)	0.52
	5	Bore Diameter (d) (Inches)	2.000 ✓
	6	Max Allowable Beta (b) = d/D	0.75
	7	Max Allow. Orifice Bore Diam. (d) (Inches)	2.75
	8	Vent   Drain	
	9	Seal Assembly	Teflon - Snap Style, 00Ed. ✓
	10	Plate Holder	Standard, CF8M Stainless
Orifice Fitting	1	Body Material	A216WCB (NACE) ✓
	2	Body Size / Rating	4" 600 ✓
	3	Body Connections	Up:Weld Down:RF Dwl Pin: <input type="checkbox"/>
	4	Seal Gap	.56200
	5	Trim Material	Corrosive 316 SS
	6	Seat Style	Grease
	7	Tap Hole Diameter	0.5
	8	Body Stud Bolt/Nut Special Coating	S: A193 B7M N: A194 2HM ✓ Special Coating: None
	9	Engineering Design Standard	ASME B16.34-2017
	10	Tap Location	1.000" from plate face
	11	Tap Connection Style	1/2" NPT
	12	Sets of Taps	4
	13	Shaft Orientation	Dual ✓
	14	Valve Lockout Mechanism	None ✓
Meter Tube	1	Tube Material	A106B-A333GR6-API5LX42 ✓
	2	Pipe Grade	Cold Drawn
	3	Pipe (Outer) Connection Types	Up:RF Down:RF
	4	Pipe Connection Size / Rating	4" 600
	5	Flange Material	A105N
	6	Stud Bolt / Nut Material	S: A193 B7M N: A194 2HM ✓ Special Coating: None
	7	Gasket	316 Spiral Wound Flex CGI ✓
	8	Pipe Measurement Standard	AGA2000 Catch All
	9	Engineering Design Standard	ASME B31.3-2016
Flow Conditioner	1	Flow Conditioner Type	Contour ✓
	2	Material	AISI 316SS
	3	Spacer	Included: <input type="checkbox"/>
	4	Connection Style	RF Dwl Pin: <input type="checkbox"/>

Customer:	NWP Industries LP
Customer PO#:	
Ref#:	746211 ✓
Sales Quote:	SQ033008 Line: 10000
Sales Order:	Line:
Sales Contact:	Aixandra Veno

Drawing Name:  
 Dimensions (Inches)  
 OAL: 91 ✓ N1: 16 ✓  
 UL1: 20 ✓ N2: 12 ✓  
 UL2: 31 ✓ N3: 8 ✓  
 DL: 40 ✓ N4:  
 FC1: N5:  
 N6:  
 N7:  
 N8:

Overall Length Tolerance +/- 1/4"  
 Weld Bevels: 37.5° +/- 15°

### Non-Destructive Testing

- Fitting Radiography Testing (Critical Locations)
- Fitting Radiography Testing (Weldneck Only)
- Weld Radiography Testing: 100% by shop rate  
ASME B31.3 - Normal ✓
- MPI ✓
- Liquid Penetrant
- Hardness 10% ✓
- PWHT - Minimum: 1 hour(s) ✓
- Ultrasonic
- Ferrite

Seat Test:	1650 PSIG
Hydro Test:	1 Hour(s) @ 2225 PSIG
Corr. Allow.:	1/8
CWP:	1480 PSIG @ -20°F to 100°F

### Weld Procedures

- GMAW, FCAW, or SAW  
(CCL5 may also be used on outlets of large runs)
- CCL-1N Rev 1(RT/LT-FCAW)
- CCL8 (STAINLESS-GMAW(RMD)/FCAW)
- CCL5 (RT/LT-SMAW) ✓
- CCL-10N/11N (RT/LT-MCAW)
- Subcontractor (refer to attachment)

### Branch Connection Details

	N1	N2	N3	N4	N5	N6	N7	N8
Style	TOL	TOL	TOL	---	---	---	---	---
Size (Inches)	3/4 ✓	3/4 ✓	1 ✓	---	---	---	---	---
Schedules	---	---	---	---	---	---	---	---
Rating	6000 ✓	6000 ✓	6000 ✓	---	---	---	---	---
Orientation	0	0	0	---	---	---	---	---
Material	A105N	A105N	A105N	---	---	---	---	---

### Other Applicable Customer Specifications

- All information complies with our registered CRN.

- Built to Encana spec ECA-C-GEN-R-003 ✓
- No Incomplete Penetration, No undercut ✓
- Hardness 225 BHN Max ✓
- Latest NACE Requirements ✓
- PWHT: 1150-1175 F (1 Hour Mn) ✓
- 100% Xray Per Meter ✓
- 100% MPI on TOLs ✓

Rev	Description	By	Date
0	Issued for quotation	AV	09.18.19

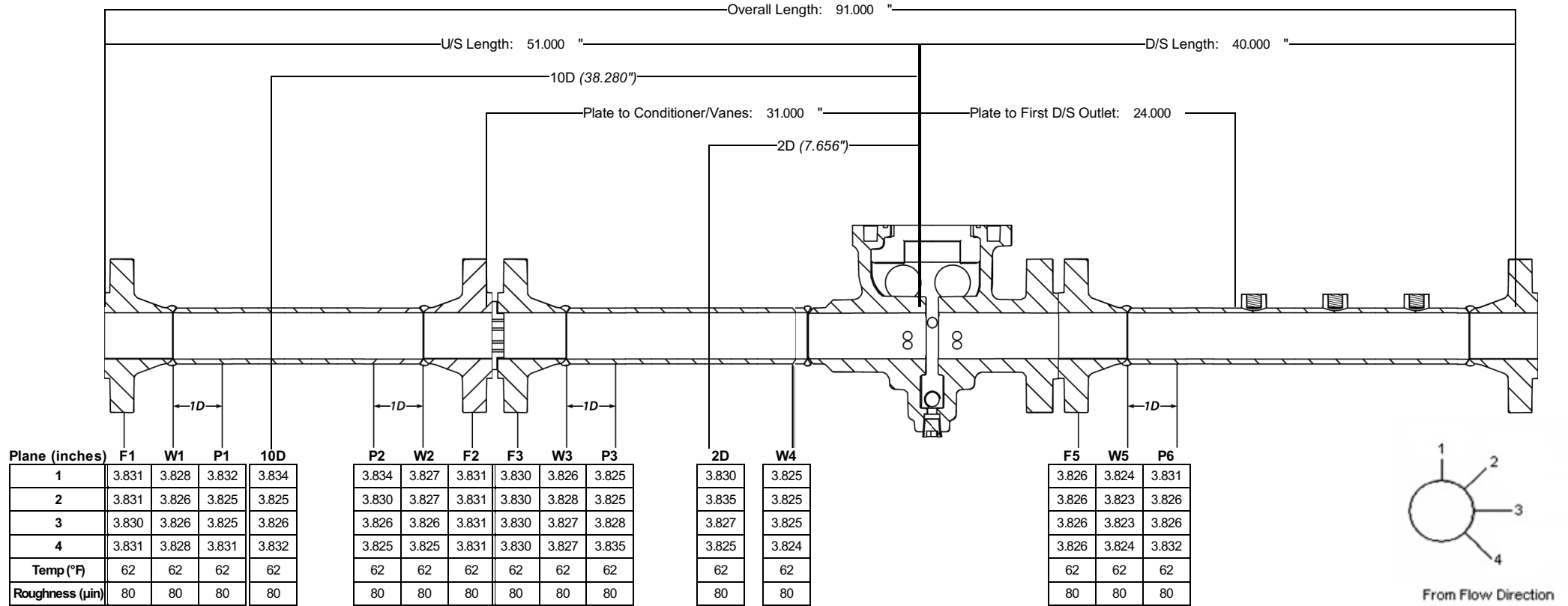
Customer Approval  
 Signature:   
 Printed Name: Carter Freschette

SEP 18 2019



Serial           D0405978          

**PLEASE NOTE:** This drawing may not accurately represent the model ordered; it is intended as a reference of the spots checked for bore diameters only. Not all points may be applicable

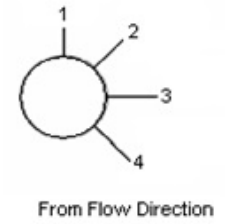


Plane (inches)	F1	W1	P1	10D
1	3.831	3.828	3.832	3.834
2	3.831	3.826	3.825	3.825
3	3.830	3.826	3.825	3.826
4	3.831	3.828	3.831	3.832
Temp (°F)	62	62	62	62
Roughness (µin)	80	80	80	80

P2	W2	F2	F3	W3	P3
3.834	3.827	3.831	3.830	3.826	3.825
3.830	3.827	3.831	3.830	3.828	3.825
3.826	3.826	3.831	3.830	3.827	3.828
3.825	3.825	3.831	3.830	3.827	3.835
62	62	62	62	62	62
80	80	80	80	80	80

2D	W4
3.830	3.825
3.835	3.825
3.827	3.825
3.825	3.824
62	62
80	80

F5	W5	P6
3.826	3.824	3.831
3.826	3.823	3.826
3.826	3.823	3.826
3.826	3.824	3.832
62	62	62
80	80	80



**ROUNDNESS CHECKS (inches)**

From Fitting Inspection Sheet: Dm:           3.828           Largest Value OD - 1D Upstream:           3.829           Smallest Value OD - 1D Upstream:           3.825          

**Upstream**

	Tolerance		Measured		
	%	Value	%	Value	
Max Diff between Values	0.5	0.019	0.287	0.011	<b>PASS</b>

**Upstream OD - 1D**

	Tolerance		Measured		
	%	Value	%	Value	
Minimum	-0.250	3.818	-0.078	3.825	<b>PASS</b>
Maximum	0.250	3.838	0.026	3.829	<b>PASS</b>

**Downstream**

	Tolerance		Measured		
	%	Value	%	Value	
Minimum	-0.500	3.809	-0.131	3.823	<b>PASS</b>
Maximum	0.500	3.847	0.104	3.832	<b>PASS</b>

Pin Type Flow Conditioner Clearance Checked:  Yes  N/A

Inspector:           Ricardo           Date:           18-Oct-2019

Serial No:           T0403814           Heat No:           80E6          

- EQ AND GREASE PORT DRILLED
- EQ PORT: BALL SEAT AND PORT HOLE ARE CENTERED
- TAG HOLES DRILLED CORRECTLY
- SEAL BAR SURFACE PASSES (ROUGHNESS AND NO POROSITIES)
- TOP AND BOTTOM PLATE CARRIER SLOTS ARE BEVELED ON INTERIOR AND EXTERIOR
- SQUARE FLANGE SURFACE IS FLAT
- BOLT UP FLANGE PASSES (ROUGHNESS AND NO POROSITIES)
- ALL THREAD SIZES AND FINISH PASSES
- CLEARANCE ON TOP OF FLANGE FOR NUTS
- PINION SEAL SURFACES PASS (ROUGHNESS AND NO POROSITIES)
- FITTING DEGREASED AND NO SHAVING INSIDE
- WALL THICKNESS PASSES, NO FLAWS ON INTERIOR OR EXTERIOR

T-SLOT WIDTH:           1.807          

FLANGE THICKNESS:           0.814          

Inspector:           DNW MH           Date:           08-May-2019



**MATERIAL TEST REPORT  
IN ACCORDANCE WITH  
EN 10204 - 3.1**

DATE	2019.07.26
PURCHASE ORDER NO.	
CERTIFICATE NO.	3ZMQ19060501
DATE OF POURING	2019.06.05
VENDOR MARK	C3Z

**COMPANY NAME & ADDRESS:**  
CCI Global - S. Korea  
161 Bodeum-Ro, 16bl-18lot, Geomdan Industrial Park, Oryu, Sugu, Incheon, South Korea  
Telephone +82-32-562-0161

**SPECIFICATION REFERENCE:**  
1. STANDARD: ASTM A216 & A352  
GRADE: WCB / LCC  
YEAR: 2008  
2. NACE MR 0175

SERIAL NO. (If applicable)	DESCRIPTION	DRAWING REV. NO.	PART NO.	QUANTITY
	4" DUAL CHAMBER		460RFDC04	60

**CHEMICAL COMPOSITION %**

ELEMENT	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu				*RE	*CE
<b>Minimum</b>														0.000	0.000
<b>Maximum</b>	0.25	0.60	0.045	0.040	1.20	0.50	0.50	0.20	0.03	0.30				1.530	0.649

HEAT NUMBER	QTY	ACHIEVED														
9534	10	0.19	0.32	0.01	0.01	1.04	0.21	0.014	0.012	0.001	0.001				0.238	0.383
95C6	10	0.17	0.29	0.01	0.01	1.05	0.19	0.009	0.002	0.001	0.001				0.203	0.360
95D8	10	0.17	0.30	0.01	0.01	1.14	0.19	0.114	0.007	0.001	0.001				0.313	0.397
95E5	10	0.17	0.31	0.01	0.01	1.08	0.23	0.018	0.004	0.001	0.001				0.254	0.370
95M1	10	0.18	0.29	0.01	0.01	1.07	0.19	0.004	0.007	0.001	0.001				0.203	0.373
95M9	10	0.17	0.32	0.01	0.01	1.16	0.20	0.003	0.006	0.001	0.001				0.211	0.379
															0.000	0.000

**HEAT TREATMENT:**  
QUENCHING Temperature raised to 900°C, soaked for 6.1 hours and then water cooled. TEMPERING Temperature raised to 620°C, soaked for 6.3 hours and then air cooled.

**MECHANICAL PROPERTIES**

SPECIFICATION	Y.S. ( MPa )	UTS ( MPa )	% ELONGATION IN 50mm (4d)	% REDUCTION IN AREA	NOTCH TOUGHNESS J (at -46.0 °C)		BEND TEST		HARDNESS ( HB )	PROOF LOAD ( )
					VALUES	AVERAGE	ANGLE	D		
<b>Minimum</b>	275	485	22	35	16	20				
<b>Maximum</b>		655							237	

HEAT NUMBER	QTY	ACHIEVED								
9534	10	328	523	32	60	41.57.64	54			159
95C6	10	329	531	33	59	42.59.65	55			161
95D8	10	331	533	33	58	44.54.67	55			158
95E5	10	332	526	33	57	45.55.68	56			156
95M1	10	336	531	33	59	45.61.74	60			162
95M9	10	339	522	32	59	42.61.63	55			165

**REMARKS :**  
1. \*RE = Ni + Cr + Mo + V + Cu  
2. \*CE = C + [Mn/6] + [(Cr + Mo + V)/5] + [(Ni + Cu)/15]

**OTHER COMMENTS:**

**CERTIFIED THAT:**  
1. THE ABOVE GIVEN DETAILS ARE CORRECT.  
2. THE MATERIAL CONFORMS TO ABOVE SPECIFICATION.  
3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION.  
THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1

*Umix*

<b>PREPARED BY:</b> 	<b>CHECKED BY:</b> 	<b>AUTHORISED WORK INSPECTOR: QUALITY CONTROL MANAGER / MANUFACTURER'S AUTHORIZED INSPECTOR</b>
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**MATERIAL TEST REPORT  
IN ACCORDANCE WITH  
EN 10204 - 3.1**

DATE	2018. 12. 18
PURCHASE ORDER NO.	
CERTIFICATE NO.	43ZMQ18110501
DATE OF POURING	2018.11.05
VENDOR MARK	C3Z

**COMPANY NAME & ADDRESS:**  
CCI Global - S. Korea  
161 Bodeum-Ro, 16bl-18lot, Geomdan Industrial Park, Oryu, Sugu, Incheon, South Korea  
Telephone +82-70-4848-4205

**SPECIFICATION REFERENCE:**  
1. STANDARD: ASTM A216 & A352  
GRADE: WCB / LCC  
YEAR: 2008  
2. NACE MR 0175

SERIAL NO. (If applicable)	DESCRIPTION	DRAWING REV. NO.	PART NO.	QUANTITY
	4" TOP HOUSING		460DC14R	140

**CHEMICAL COMPOSITION %**

ELEMENT	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu				*RE	*CE
<b>Minimum</b>														0.000	0.000
<b>Maximum</b>	0.25	0.60	0.045	0.040	1.20	0.50	0.50	0.20	0.03	0.30				1.530	0.649

HEAT NUMBER	QTY	ACHIEVED														
8053	20	0.16	0.31	0.01	0.01	1.03	0.21	0.013	0.008	0.001	0.001				0.233	0.350
80E3	20	0.17	0.39	0.01	0.01	1.13	0.20	0.003	0.008	0.001	0.001				0.213	0.374
80E6	20	0.18	0.37	0.01	0.02	1.09	0.19	0.001	0.008	0.001	0.001				0.201	0.376
80H1	20	0.17	0.37	0.01	0.02	1.15	0.21	0.034	0.008	0.001	0.001				0.254	0.384
80K7	20	0.17	0.31	0.01	0.01	1.08	0.20	0.001	0.007	0.001	0.001				0.210	0.365
80N3	20	0.17	0.34	0.01	0.01	1.11	0.19	0.001	0.006	0.001	0.001				0.199	0.369
80P4	20	0.18	0.31	0.01	0.02	1.11	0.21	0.001	0.008	0.001	0.001				0.221	0.381

**HEAT TREATMENT:**  
QUENCHING Temperature raised to 901°C, soaked for 4.0 hours and then water cooled.    TEMPERING Temperature raised to 626°C, soaked for 4.0 hours and then air cooled.

**MECHANICAL PROPERTIES**

SPECIFICATION	Y.S. ( MPa )	UTS ( MPa )	% ELONGATION IN 50mm (4d)	% REDUCTION IN AREA	NOTCH TOUGHNESS J (at -46.0 °C)		BEND TEST		HARDNESS ( HB )	PROOF LOAD (       )
					VALUES	AVERAGE	ANGLE	D		
<b>Minimum</b>	275	485	22	35	16	20				
<b>Maximum</b>		655							237	


HEAT NUMBER	QTY	ACHIEVED								
8053	20	342	543	34	60	46.54.67	56			162
80E3	20	340	542	34	60	48.56.69	58			165
80E6	20	340	540	34	60	50.58.70	59			167
80H1	20	341	539	34	60	41.56.71	56			166
80K7	20	343	537	34	61	49.55.69	58			164
80N3	20	342	535	35	61	47.56.67	57			162
80P4	20	344	536	35	61	45.57.72	58			160


**REMARKS :**  
1. \*RE = Ni + Cr + Mo + V + Cu  
2. \*CE = C + [Mn/6] + [(Cr + Mo + V)/5] + [(Ni + Cu)/15]

**OTHER COMMENTS:**

**CERTIFIED THAT:**  
1. THE ABOVE GIVEN DETAILS ARE CORRECT.  
2. THE MATERIAL CONFORMS TO ABOVE SPECIFICATION.  
3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION.  
THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1

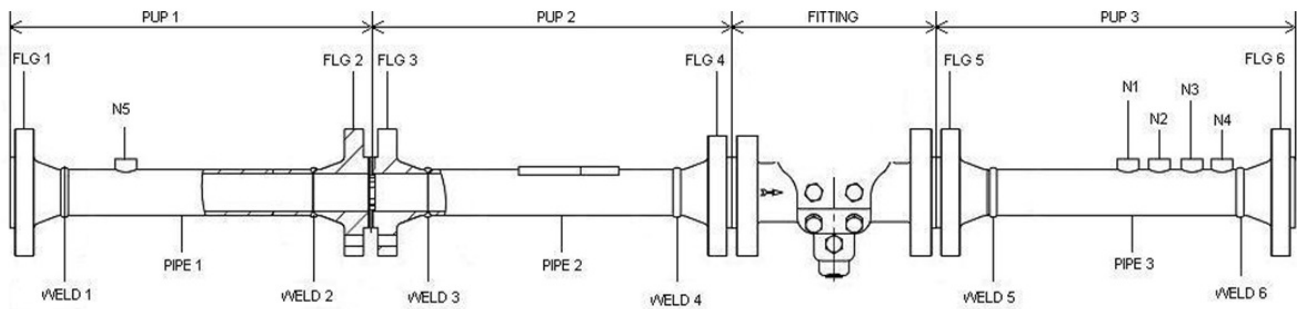
*Umix*

**PREPARED BY:** 

**CHECKED BY:** 

**AUTHORISED WORK INSPECTOR: QUALITY CONTROL MANAGER /  
MANUFACTURER'S AUTHORIZED INSPECTOR**

Serial No : D0405978



**PLEASE NOTE:**  
This drawing may not accurately represent the model ordered, not all points may be applicable.

**HEAT NUMBERS**

**FLANGES**

FLG1: 180577 FLG2: 180577 FLG3: 180577 FLG4: \_\_\_\_\_ FLG5: 180577 FLG6: 180577

**FLANGE TAP CONNECTIONS HEAT NUMBERS**

NIPPLE: \_\_\_\_\_ ELBOW: \_\_\_\_\_ FLANGE: \_\_\_\_\_

**PIPE AND FLOW CONDITIONER**

PIPE 1: D05016 PIPE 2: D05016 PIPE 3: D05016 FC 1: \_\_\_\_\_

**OUTLETS**

N1: 50196 N2: 50196 N3: 50457 N4: \_\_\_\_\_ N5: \_\_\_\_\_ N6: \_\_\_\_\_

**OUTLET NIPPLES**

N1: \_\_\_\_\_ N2: \_\_\_\_\_ N3: \_\_\_\_\_ N4: \_\_\_\_\_ N5: \_\_\_\_\_ N6: \_\_\_\_\_

**OUTLET FLANGES / VALVES**

N1: \_\_\_\_\_ N2: \_\_\_\_\_ N3: \_\_\_\_\_ N4: \_\_\_\_\_ N5: \_\_\_\_\_ N6: \_\_\_\_\_

Inspector : RENZ BALANOBA Date : 09-Oct-2019

**NON-DESTRUCTIVE TESTING**

**RADIOGRAPHIC TESTING NUMBERS (IF APPLICABLE)**

WELD 1: 6 WELD 2: 5 WELD 3: 1 WELD 4: 2 WELD 5: 3 WELD 6: 4

N1: \_\_\_\_\_ N2: \_\_\_\_\_ N3: \_\_\_\_\_ N4: \_\_\_\_\_ N5: \_\_\_\_\_ N6: \_\_\_\_\_

**WELDER'S STAMP**



WELD 1: F WELD 2: F WELD 3: F WELD 4: F WELD 5: F WELD 6: F

N1: F N2: F N3: F N4: \_\_\_\_\_ N5: \_\_\_\_\_ N6: \_\_\_\_\_

**OTHER TESTS APPLIED**

- POST WELD HEAT TREAT
- MAG PARTICLE
- ULTRASONIC
- LIQUID DYE
- 10% HARDNESS
- 100% HARDNESS
- OTHER: \_\_\_\_\_

Inspector : Tyler Hannah Date : 10-Oct-2019

		<b>MATERIAL TEST REPORT</b>								Date: :DEC 13 , 2018			
		IN ACCORDANCE WITH EN 10204-3.1											
		SPECIFICATION REFERENCE:								PURCHASE ORDER NO.:027160			
		1.Standard:		ASTM A105/A105M									
		Year:		2013						CERTIFICATE NO.: MTRZH18398			
		Grade:								VENDOR MARK: 			
		2.NACE MR 0175								DATE OF POURING: 2018-12-13			
SERIAL NO. (If applicable)	DESCRIPTION							HEAT NUMBER	DRAWING NO./PART NO.		QTY		
1	FLANGE 4" 600LBS RF SCH80 WN A105							180577			600		
CHEMICAL COMPOSITION%													
ELEMENT	C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu	Al	*RE	*CE
MIN		0.100			0.600								
MAX	0.350	0.350	0.040	0.035	1.050	0.400	0.300	0.120	0.080	0.400			
HEAT NUMBER	QTY	ACHIEVED											
180577	600	0.190	0.210	0.006	0.013	0.930	0.017	0.019	0.008	0.003	0.016		
HEAT TREATMENT: NORMALIZED AT 900°C FOR 2 HOURS, COOLED IN STILL AIR													
MECHANICAL PROPERTIES													
SPECIFICATION	Y.S. (MPa)	UTS (Mpa)	%ELONG in 50mm (4d)	%RED. IN AREA	Notch Toughness(at -46°C)J		BEND TEST		HARDNESS (HB)	PROOF LOAD			
					Values	Avg.	ANGLE	D					
MIN	250	485	22	30									
MAX									187				
HEAT NUMBER	QTY	ACHIEVED											
180577	600	307	545	32.5	72							159/161/163	
REMARKS:													
1.*RE=Ni+Cr+Mo+V+Cu							OTHER COMMENTS:						
2.*CE=C+【Mn/6】+【(Cr+Mo+V)/5】+【(Ni+Cu)/15】													
CERTIFIED THAT:													
1.THE ABOVE GIVEN DETAILS ARE CORRECT										Manager-Quality Control Manufacturer's Authorized Inspector  			
2.THE MATERIAL CONFORMS TO ABOVE SPECIFICATION													
3.THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION													
THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1													
Prepared by:							Checked by:						
GU							JIANGWEIZENG						



**REVIEWED**  
By Daniel Fielder at 4:14 pm, Jan 11, 2018



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

Page 3 of 3

Sold To:

MTR #: 335,250

PO #: CI-17-737

Sales Order #: C001711221

Date: 11/03/2017

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

**Certified Material Test Report**

Heat Code: 50196

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

Material: A/SA105N 14

Item	Quantity	Description
9		36 - 1 1/2 X 3/4 6M THP A/SA105N
10		FLT X 3/4 6M THP A/SA105N

**Chemical Composition**

Ladle	C	Co	CR	CU	MN	MO	Nb	NI
	0.2000	0.002	0.04	0.03	1.050	0.003	0.014	0.020
	P	S	SI	V				
	0.005	0.019	0.270	0.003				
Carbon Equivalency:	Ladle		0.39					

Product	C	Cr	Cu	Mn	Mo	Ni	P	S
	0.0000	0.00	0.00	0.000	0.000	0.000	0.000	0.000
	Si	V						
	0.000	0.000						

Product	Tensile PSI	Yield PSI	Elong %	RA %	Hardness
	71,610	47,449	36.85	57.04	135 BHN
					135 BHN

MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#D117358/BONNEY FORGE (USA) - LOT#50196

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

1. IN ACCORDANCE WITH ANSI/NACE MR0175 / ISO 15156-2015

Marie Dehmer  
Quality Assurance Representative



**REVIEWED**  
By Virglyn Manliguez at 8:06 am, Dec 17, 2018



Manufacturer of Piping and Pressure Vessel Components

4404 Haygood St - Houston, TX 77022

Phone: 713-695-3633 Fax: 713-695-3528

A Bonney Forge Company

MTR #: 351,635

Date: 11/02/2018

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

**Certified Material Test Report**

Heat Code: 50457

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

Material: A/SA105N 14

Item	Description
14	36 - 3 X 1 6M THP A/SA105N

**Chemical Composition**

Ladle	C	Co	CR	CU	MN	MO	NB	NI
	0.2000	0.002	0.03	0.03	1.040	0.004	0.012	0.020
	P	S	SI	V				
	0.003	0.019	0.230	0.003				
Carbon Equivalency:	Ladle			0.38				

Product	B	C	Co	Cr	Cu	Mn	Mo	Nb
	0.0002	0.1870	<0.001	0.03	0.04	1.090	0.007	0.014
	Ni	P	S	Si	V			
	0.016	0.003	0.013	0.251	0.001			
Carbon Equivalency:	Product			0.38				

Product	Tensile PSI	Yield PSI	Elong %	RA %	Hardness
	76,033	51,933	36.80	65.84	144 BHN

MILL/COUNTRY OF ORIGIN: ARCELORMITTAL (CANADA) - HEAT#D123049/  
BONNEY FORGE (USA) - LOT#50457

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

I. IN ACCORDANCE WITH ANSI/NACE MR0175/ISO 15156-2015 & ISO 17945/MR0103-2015

Marie Dehmer  
Quality Assurance Representative

Serial D0405978

Top Housing Serial: T0403814

**FITTING VISUAL TESTS**

- |   |  |   |
|---|--|---|
| <input checked="" type="checkbox"/> TAGS CORRECT          | <input checked="" type="checkbox"/> WATER DRAINED OUT                | <input checked="" type="checkbox"/> ALL HEAT NUMBERS CORRECT      |
| <input checked="" type="checkbox"/> PAINT / FINISH PASSES | <input checked="" type="checkbox"/> PAPERWORK                        | <input checked="" type="checkbox"/> OUTER END FLANGES / THREADING |
| <input checked="" type="checkbox"/> RUST INHIBITOR        | <input checked="" type="checkbox"/> FITTING CLEAN AND FREE OF DEBRIS |   |

**SEAL MATERIAL INSTALLED**

- HNBR    TEFLON    NONE                       NOTCHED

**RETAINER INSTALLED**

- TYPE 'K'    TYPE 'H'    BONDED PLATE    NONE

**ORIFICE PLATE INSTALLED**

MATERIAL:  316 SST    304 SST  
BORE SIZE: 2.000                      HEAT NO: 21800126  
EDGE SHARPNESS (AGA2.4.2):  PASS    FAIL

**METER RUN VISUAL TESTS**

- |  |   |   |
|--|---|---|
| <input checked="" type="checkbox"/> TAGS CORRECT                 | <input checked="" type="checkbox"/> WATER DRAINED OUT     | <input checked="" type="checkbox"/> ALL HEAT NUMBERS CORRECT      |
| <input checked="" type="checkbox"/> PAINT / FINISH PASSES        | <input checked="" type="checkbox"/> RUST INHIBITOR        | <input checked="" type="checkbox"/> OUTER END FLANGES / THREADING |
| <input checked="" type="checkbox"/> VANES SECURED                | <input checked="" type="checkbox"/> METER RUN STRAIGHT    | <input checked="" type="checkbox"/> PIPE LENGTHS CHECKED          |
| <input checked="" type="checkbox"/> RADIOGRAPHIC TESTING APPLIED | <input checked="" type="checkbox"/> T.O.L PLACED PROPERLY | <input checked="" type="checkbox"/> RUN CLEAN AND FREE OF DEBRIS  |

**VANE TYPE INSTALLED**

HEAT NO.: JS262  
 FLOW CONDITIONER    VANE    NONE  
 PIN STYLE    FLANGE STYLE

**SHAFT ORIENTATION**

ORIENTATION:  RIGHT    LEFT    DUAL    N/A

**DUAL CHAMBER CHECK**



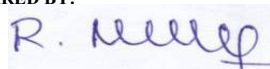
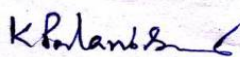
- ACCESSORY BAG
- SEAL PROTRUSION INSIDE THE BORE (no seal protrusion is allowed):  PASS    FAIL  
PLATE WITH SEAL RUNS SMOOTHLY WITHOUT CUTTING OR BUCKLING:  PASS    FAIL  
PLATE CARRIER AND VALVE CARRIER RUN WITHOUT OBSTRUCTION:  PASS    FAIL

**BLIND FLANGE HEAT NUMBERS**

FIRST HEAT NO.: \_\_\_\_\_                      SECOND HEAT NO.: \_\_\_\_\_

**METER RUN AND/OR FITTING MEET OR EXCEED CANALTA STANDARDS AND CUSTOMER APPROVED DRAWINGS**

Inspector: ED/PAK/MDC                      Date: 22-Oct-2019

		<b>MATERIAL TEST REPORT IN ACCORDANCE WITH EN 10204 - 3.1</b>				DATE: 17-06-2019										
						PURCHASE ORDER NO. PO026155										
<b>COMPANY NAME &amp; ADDRESS:</b> M/S ACCURA INDUSTRIES 15 C1,10TH STREET GANAPATHYPUDUR,COIMBATORE-641006 TAMILNANU,INDIA		SPECIFICATION REFERENCE:				CERTIFICATE NO.: AI/TC/864										
		1. STANDARD: ASTM A240				DATE OF POURING										
		GRADE: SS316				VENDOR MARK : A										
		YEAR: 2013														
		2. NACE MR 0175														
SERIAL NO. (If applicable)		DESCRIPTION				DRAWING R		PART NO.		QUANTITY						
		O-PLT 2"X1/8" Various Bores, 316SS				3		260DC13-316-XXXX-125		210						
		O-PLT 3"X1/8" Various Bores, 316SS				3		360DC13-316-XXXX-125		200						
		O-PLT 4"X1/8" Various Bores, 316SS				3		460DC13-316-XXXX-125		247						
		O-PLT 6"X1/8" Various Bores, 316SS				3		660DC13-316-XXXX-125		10						
<b>CHEMICAL COMPOSITION %</b>																
ELEMENT		C	Si	S	P	Mn	Ni	Cr	Mo	V	Cu			*RE	*CE	
Minimum							10.00	16.00	2.00					28.00	4.27	
Maximum		0.08	1.00	0.03	0.045	2.00	14.00	18.00	3.00					35.00	5.55	
HEAT NUMBER		QTY	ACHIEVED													
21800126		210	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05					28.53	4.59
21800126		200	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05					28.53	4.59
21800126		247	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05					28.53	4.59
21800126		10	0.02	0.23	0.004	0.037	1.22	10.03	16.45	2.05					28.53	4.59
														0.00	0.00	
														0.00	0.00	
														0.00	0.00	
HEAT TREATMENT: SOLUTION ANNEALED																
<b>MECHANICAL PROPERTIES</b>																
SPECIFICATION		Y.S. (MPa)	UTS (MPa)	% ELONGATION IN 50mm (4d)	% REDUCTION IN AREA	NOTCH TOUGHNESS J (at °C)		BEND TEST		HARDNESS (BHN)	PROOF LOAD ( )					
						VALUES	AVERAGE	ANGLE	D							
Minimum		205	515	40	50					215						
Maximum																
HEAT NUMBER		QTY	ACHIEVED													
21800126		210	336	601	55						147-150					
21800126		200	336	601	55						147-150					
21800126		247	336	601	55						147-150					
21800126		10	336	601	55						147-150					
REMARKS :						OTHER COMMENTS:										
1. *RE = Ni + Cr + Mo + V + Cu 2. *CE = C + [Mn/6] + [(Cr + Mo + V)/5] + [(Ni + Cu)/15]																
CERTIFIED THAT: 1. THE ABOVE GIVEN DETAILS ARE CORRECT. 2. THE MATERIAL CONFORMS TO ABOVE SPECIFICATION. 3. THE MATERIAL IS FREE OF CONTAMINATION FROM RADIOACTIVE ELEMENT OR RADIATION. THE PARTS WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND CERTIFIED IN ACCORDANCE WITH EN 10204-3.1						For ACCURA INDUSTRIES 										
PREPARED BY:			CHECKED BY:			AUTHORISED WORK INSPECTOR: QUALITY CONTROL MANAGER / MANUFACTURER'S AUTHORIZED INSPECTOR										
																



# 泰州市恒达新型复合材料有限公司

JIANGSU STEEL GROUP CO.,LIMITED

编号: JSSG201903017007D

## 质量证明书 (TEST REPORT)

订货单位 CUSTOMER	APS Machining	产品名称 PRODUCT	STAINLESS STEEL ROUND BAR	交货状态	POLISHED
收货单位 PURCHASER	APS Machining	代 号 CUSTOMER'S NO.	HD100289	DELIVER STATE	
技术标准 SPECIFICATION	ASTM A276-06	客户订单编号 CUSTOMER ORDER NO	HD5328		
		签发日期 DATE OF ISSUE	2019.04.17	交货日期 DATE OF DELIVERY	2019.04.17

序号 NO.	钢号 TYPE	炉号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION		化学成分 CHEMICAL COMPOSITION % (熔炼分析 HEAT ANALYSIS)											拉伸试验 TENSILE TEST (G.L=L3)			F.M. (Kg/m)	BEN D TES T	*02 HARD NESS	试样热处理
			SIZE	Qty(Kgs)	C	Si	Mn	P	S	Ni	Cr	Mo	Ti	N	Cu	屈服 Y.S.	抗拉 T.S.	EL %				
3	316L	JS257	1"	120	0.024	0.75	1.69	0.027	0.001	10.03	16.52	2.01	---	---	---	208	521	35				
4	316L	JS258	2"	202	0.026	0.65	1.81	0.023	0.001	10.17	16.21	2.03	---	---	---	211	535	35				
5	316L	JS259	2.75"	287	0.025	0.65	1.82	0.024	0.001	10.11	16.17	2.05	---	---	---	212	537	35				
6	316L	JS260	4.75"	597	0.027	0.67	1.74	0.027	0.001	10.01	16.23	2.05	---	---	---	212	537	35				
7	316L	JS261	5.0"	1707	0.028	0.66	1.75	0.027	0.001	10.07	16.27	2.07	---	---	---	213	535	35				
8	316L	JS262	6.25"	1222	0.028	0.65	1.72	0.025	0.001	10.12	16.57	2.04	---	---	---	218	545	35				
9	316L	JS263	8.5"	1124	0.029	0.54	1.65	0.021	0.001	10.02	16.78	2.11	---	---	---	218	545	35				
10	316L	JS264	10.75"	1543	0.022	0.68	1.77	0.026	0.001	10.12	16.58	2.01	---	---	---	218	545	35				

判 定 员 :  
SURVEYOR TO 刘鑫  
质检部长: 胡海龙  
QC MANAGER

本产品已按上述要求进行制造和检验,其结果符合要求,特此证明。  
This product has been manufactured and tested accordingly, I hereby certify that



Treatment Type: Meter Tube Date: Oct-07-2019  
 Furnace Record Number: 191007 Operator: Tyler Hannah

**Component Description**

1	BROMLEY RP#23014#1. 260RFSC80. S0233420, S0233461, S0233593, S0233600, S0233607.											
M.T.												
1	Qty	10	Diameter	2.375	Thickness	0.218	Material	A216WCB	Length	48"	Weight	825.Lbs
2	NWP RP#23033#1. 460RFDC80. D0405960, D0405978.											
M.T.												
6	Qty	6	Diameter	4.5	Thickness	0.337	Material	A216WCB	Length	91"	Weight	728.Lbs
3	Qty		Diameter		Thickness		Material		Length		Weight	
4	Qty		Diameter		Thickness		Material		Length		Weight	
5	Qty		Diameter		Thickness		Material		Length		Weight	
6	Qty		Diameter		Thickness		Material		Length		Weight	
7	Qty		Diameter		Thickness		Material		Length		Weight	

**Instruction**

Ramp Up: 600°F ► 1150°F @ Max 600°F/Hr  
 For Meter Tube, above 600°F, heating rate is 1200°F/h divided by the maximum weld thickness and never more than 600°F/h.

Hold For: 30Min @ 1100°F to 1200°F  
 Soak time= 15 Min every 1/4" Unless max thickness is > 2" than Soak Time= 2Hr for the first 2" + 15 Min every extra inch

Ramp Down: 1150°F ► 600°F @ Max 600°F/Hr  
 For Meter Tube, above 600°F, cooling rate is 1200°F/h divided by the maximum weld thickness and never more than 600°F/h.

**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.
- If Capacitor discharge welding is used to attach thermocouples an ASME Section IX welding procedure 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<sup>2</sup> = W-Sec.]

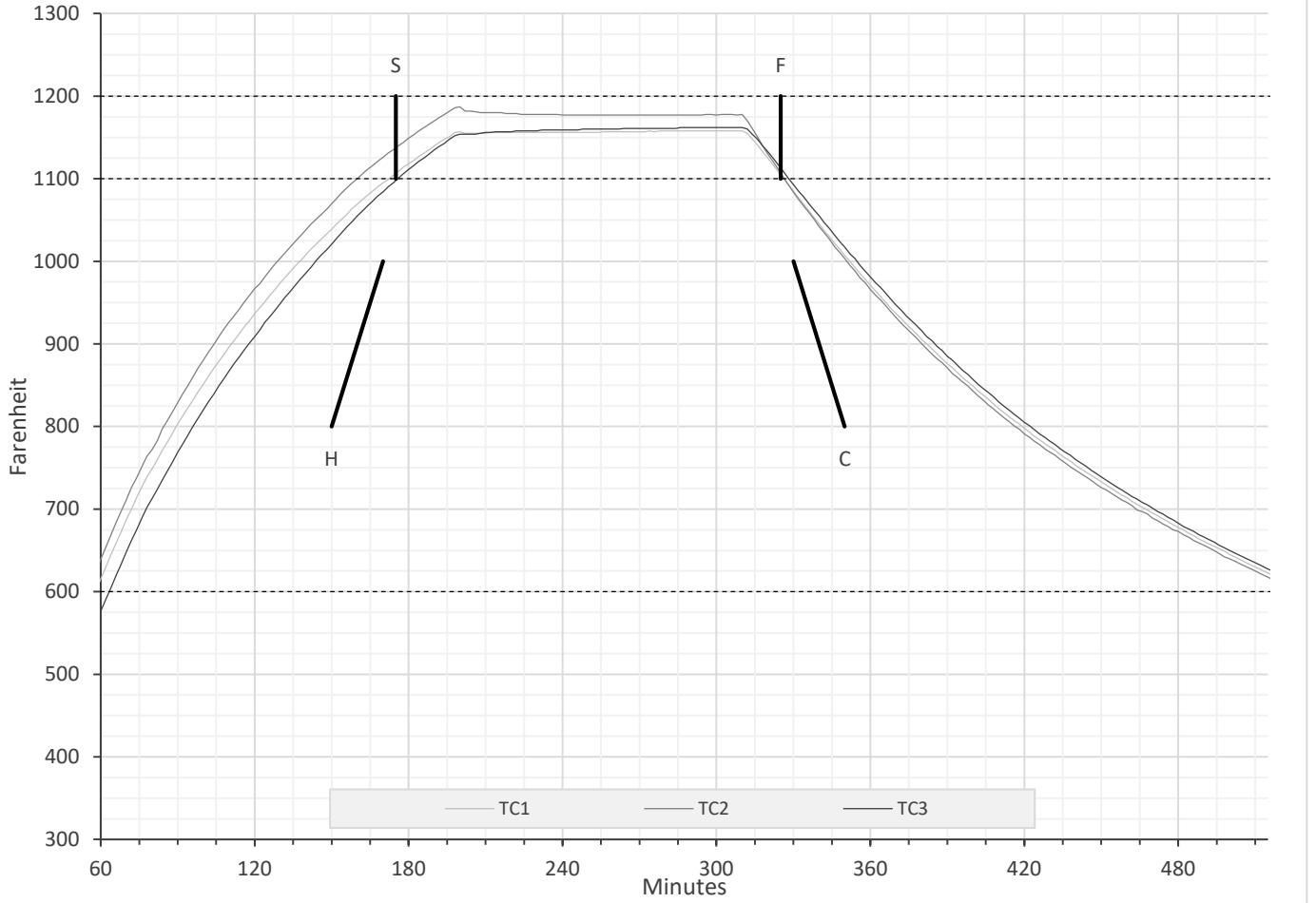
TC Location: Furnace diagonals & center.  
 TC Attachment Methode: Direct Contact

Furnace Operator Signature:  (Tyler Hannah) Date: Oct 09, 2019

Q.C. Inspector Signature: \_\_\_\_\_ (Francis Dumas) Date: Oct 09, 2019



Canalta Heat Treatment Chart | Furnace Record Number: 191007



Holding Time: 150 Minutes


Operator: Tyler Hannah  
Recorder: OMEGA OM-DAQPRO-5300

Date: Oct-07-2019  
Serial No. 7014168

### Content

BROMLEY RP#23014#1. 260RFSC80. S0233420, S0233461, S0233593, S0233600, S0233607.

NWP RP#23033#1. 460RFDC80. D0405960, D0405978.

Furnace Operator Signature:  (Tyler Hannah)

Date: Oct 09, 2019

Q.C. Inspector Signature: \_\_\_\_\_ (Francis Dumas)

Date: Oct 09, 2019

# MAGNETIC PARTICLE EXAMINATION REPORT

CLIENT: CANALTA CONTROLS DATE: 8-Oct-19 PAGE: 1 OF 1  
 INVOICE ADDRESS: Red Deer, AB WORK LOCATION: Red Deer, AB  
 EXAMINATION STANDARD: ASME V Article 7 - 2017 ACCEPTANCE STANDARD: ASME B31.3 - 2016  
 TEAM PROCEDURE: MT.ASME.EDM.1 R3 EXAMINATION OF: NWP INDUSTRIES

**MT - 50191885- 01 JC**

SURFACE CONDITION:  AS GROUND  MACHINED  PAINTED  SAND BLAST  BASE METAL  AS WELDED  
 MATERIAL: P1 THICKNESS: Not Supplied TEMPERATURE: 21 °C

TEAM JOB NO.: 5019 1885  
 BRANCH NO.: 5301  
 PO NO.: 30457  
 RP NO.: 23033 #1

**TEST EQUIPMENT AND MATERIALS:**

EQUIPMENT	MODEL AND SERIAL NO.	MAGNETIZING CURRENT	TEST MEDIUM/CONSUMABLES	MANUFACTURER /BATCH NO./CONCENTRATION
<input checked="" type="checkbox"/> DC YOKE	Electro Spec ESX Ferrous, Serial#7708- 4AMP	<input checked="" type="checkbox"/> AC	<input checked="" type="checkbox"/> WET VISIBLE	Black Particles -- Magnaflux 7HF
<input checked="" type="checkbox"/> DAILY LIFT TEST	10 lbs. SN: A511 Status: Pass	<input type="checkbox"/> DC	<input type="checkbox"/> DRY POWDER	Batch# 03109
<input checked="" type="checkbox"/> WHITE LIGHT	Shop Hi Intensity Fluorescent	<input type="checkbox"/> N/A (Permanent Magnet)	<input checked="" type="checkbox"/> CONTRAST PAINT	White Contrast -- Magnaflux WCP-2
<input checked="" type="checkbox"/> LIGHT INTENSITY	> 100 foot candles	<input checked="" type="checkbox"/> CONTINUOUS	<input checked="" type="checkbox"/> WET FLUORESCENT	Batch# 04093
<input type="checkbox"/> BLACKLIGHT		<input type="checkbox"/> RESIDUAL	<input type="checkbox"/> SETTLEMENT TEST	

BLACK LIGHT INTENSITY BEFORE EXAMINATION:           $\mu\text{w}/\text{CM}^2$  BLACK LIGHT INTENSITY AFTER EXAMINATION:           $\mu\text{w}/\text{CM}^2$  WHITE LIGHT/BACKGROUND: 120 fc

Wet / Black Magnetic Particle Inspection Performed on:  
**02, 1" & 04, 3/4" TOL'S**

MT #	Size #	Control #	Welder	Status
MT-1	1" TOL	<b>D0405960</b>	F	Accept
MT-2	3/4" TOL	v	F	Accept
MT-3	3/4" TOL	v	F	Accept
MT-4	1" TOL	<b>D0405978</b>	F	Accept
MT-5	3/4" TOL	v	F	Accept
MT-6	3/4" TOL	v	F	Accept

All above Listed Welds are in Accordance With The Examination / Acceptance Standards

**TECHNICIANS:**

INTERPRETATION IS IN ACCORDANCE WITH THE ABOVE MENTIONED STANDARDS, TO THE BEST OF MY PROFESSIONAL ABILITY  
 (PRINT): James Coffin CGSB/SNT LEVEL: II REG. NO.: 11281 (SIGN):   
 (PRINT): Craig Olsen CGSB/SNT LEVEL: I REG. NO.: 12504 (SIGN):

THE ABOVE REPRESENTATION IS A PROFESSIONAL OPINION. FINAL INTERPRETATION IS THE RESPONSIBILITY OF THE CLIENT. I HAVE READ AND AM IN FULL AGREEMENT WITH THE CONTENTS OF THIS REPORT.

CLIENT REPRESENTATIVE: (PRINT): *Yusef Hossain* (SIGN):

# HARDNESS TESTING REPORT

2507 - 84 Avenue, Edmonton, Alberta T6P 1K1  
Phone (780) 417-7777 Fax: (780) 417-1185

CLIENT: Canalta Controls DATE: 2019-10-08 PAGE: 1 OF 1  
 INVOICE ADDRESS: Red Deer Shop WORK LOCATION: Red Deer  
 EXAMINATION STANDARD: ASTM A1038 ACCEPTANCE STANDARD: ASTM A1038  
 TEAM PROCEDURE: HT.EDM.2 R7 EXAMINATION OF: NWP INDUSTRIES

**HT - 50191885-02 CO**

TEAM JOB NO.: 5019-1885  
 BRANCH NO.: 5301  
 RP #: 23033 #1  
 PO #: 30457

SURFACE CONDITION:  AS GROUND  MACHINED  PAINTED  SHOT BLASTED  BASE METAL  AS WELDED

**TEST EQUIPMENT AND MATERIALS:**

<b>SCALE</b> <input checked="" type="checkbox"/> BRINELL <input type="checkbox"/> ROCKWELL B <input type="checkbox"/> ROCKWELL C <input type="checkbox"/> VICKERS <input type="checkbox"/> OTHER	INSTRUMENT: <u>Krautkramer</u>	INSTRUMENT CALIBRATION DUE DATE: <u>Mar. 21 2020</u>	COMMENTS:
	MODEL: <u>Mic-10</u>	CALIBRATION BLOCK: <u>SN 156161 - 63.3 HRC</u>	
	SERIAL No.: <u>1-1228</u>	MANUAL / DIGITAL READINGS: <u>DIGITAL</u>	

TEST No.	SPOOL/LINE No.	WELD No.	DIAMETER	THICKNESS	WELDER(S)	BAR	PM (P)	HAZ (P)	WELD	HAZ (F)	PM (F)	ACC.	REJ.
HT -1	D0405960	X - 9	4"	8.56mm	F	n/a	171	174	189	184	191	Accept	
HT -2	D0405678	X - 3	4"	8.56mm	F	n/a	168	176	182	168	175	Accept	

**TECHNICIANS** A044 HTE R1  
 INTERPRETATION IS IN ACCORDANCE WITH THE ABOVE MENTIONED STANDARDS, TO THE BEST OF MY PROFESSIONAL ABILITY  
 (PRINT): Craig Olsen CGSB/SNT LEVEL: I REG. NO.: 12504 (SIGN): [Signature]  
 (PRINT): James Coffin CGSB/SNT LEVEL: II REG. NO.: 11281 (SIGN): [Signature]  
 THE ABOVE REPRESENTATION IS A PROFESSIONAL OPINION, FINAL INTERPRETATION IS THE RESPONSIBILITY OF THE CLIENT. I HAVE READ AND AM IN FULL AGREEMENT WITH THE CONTENTS OF THIS REPORT.  
 CLIENT REPRESENTATIVE: (PRINT): Glen Hannah (SIGN): [Signature]



**RADIOGRAPHIC EXAMINATION REPORT**

2507 - 84 Avenue, Edmonton, Alberta T6P 1K1  
Phone (780) 417-7777 Fax: (780) 417-1185

**RT-5019-1871-05TT**

CLIENT: Canalta Controls INVOICE ADDRESS: Red Deer, Ab DATE: Oct-04-2019  
 WORK LOCATION: Red Deer, AB TEAM PROCEDURE: RT.ASME.EDM.1 R2  
 EXAMINATION STANDARD: ASME V Article 2 - 2017 ACCEPTANCE STANDARD: ASME B31.3 NFS -2016  
 EXAMINATION OF: NWP  
460RFDC80

TEAM JOB NO. 5019-1871  
 Branch # 5301  
 PO #: 30436  
 RP # 23033-1  
 PAGE: 5 OF 5

<b>DEFECT LEGEND:</b>		UC - UNDERCUTTING	P - POROSITY	FM - FILM MARK	<b>TECHNIQUES</b>		TYPE OF ENERGY: Ir192 30Ci	INTENSIFYING SCREENS In mm		0.28 ft. / 0.25 bck, Pb	FILM MANUFACTURER: <u>Agfa</u>
IF - INCOMPLETE FUSION	S - SLAG	IC - INTERNAL CONCAVITY	CR - CRACK	EXPOSURE	VIEWING	PHYSICAL SIZE: 3.2 mm	FILM PER CASSETTE: 1		WELD MATERIAL: <u>CS</u>		
IP - INCOMPLETE PENETRATION	BT - BURN THROUGH	LC - LOW COVER	AB - ARC BURN	1. SINGLE WALL	3. SINGLE WALL	IQI TYPE: ISO 19232 EN Wire					
EP - EXCESSIVE PENETRATION	SH - SHRINKAGE	HB - HOLLOW BEAD		2. DOUBLE WALL	4. DOUBLE WALL						

RADIOGRAPH IDENTIFICATION				RADIOGRAPH GEOMETRY									RADIOGRAPH RESULTS		
WELD ID	WELD SIZE	LOCATION	WELDER	TECHNIQUE	EXPOSURES PER WELD	WELD DEPOSIT THICKNESS	BASE MATERIAL THICKNESS	REINFORCE THICKNESS	SOURCE-OBJECT DISTANCE	OBJECT-FILM DISTANCE	FILM	IQI SIZE	INTERPRETATION 1 - SLIGHT, 2 - MEDIUM, 3 - SEVERE	COMMENTS	STATUS
x-1	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-2	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-3	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-4	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-5	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-6	4" sch 80	D0405978	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-7	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-8	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-9	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-10	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept
x-11	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN		S-1	Accept
x-12	4" sch 80	D0405960	F	2 / 3	3	0.462"	0.337"	0.125"	4.29"	0.462"	D4 / ISO-C3	10-FE-EN			Accept

INTERPRETATION IS IN ACCORDANCE WITH THE ABOVE MENTIONED STANDARD, TO THE BEST OF MY PROFESSIONAL ABILITY

TECHNICIAN (PRINT): Ted Todd TECHNICIAN (SIGN): Ted Todd CGSB/SNT LV: II REG NO. 4056 ASSISTANT: J Coffin

THE ABOVE REPRESENTATION IS A PROFESSIONAL OPINION, FINAL INTERPRETATION IS THE RESPONSIBILITY OF THE CLIENT. I HAVE REVIEWED AND AM IN FULL AGREEMENT WITH THE CONTENTS OF THIS REPORT.

CLIENT REPRESENTATIVE (PRINT): Glen Harris CLIENT REPRESENTATIVE (SIGN): Glen Harris DATE: Oct-07-2019

**Certificate of NACE Compliance**

Company Name: NWP Industries LP

Purchase Order No.: 746211

Canalta Sales Order No.: SO027111

Serial Number (s): D0405960, D0405978

All Canalta parts conform to the general requirements as specified in NACE Standard MR0175/ISO 15156:2009. All wetted internal parts conform to AISI 4130 or AISI 316. External parts conform to the requirements of AISI 1018.

The undersigned certifies that the above statements are true and accurate.



**Steven Nielsen**  
Mechanical Engineer  
Canalta Controls Ltd.



Dated this 24 Day of October, 2019

# Certificate of Calibration NOV 28 2018

**Harvie Instruments Ltd.** Certifies that this instrument was calibrated using measurement standards traceable to the National Research Council, Institute for National Measurement Standards, the National Institute of standards and technology, or derived from accepted values of natural physical constants.

**Certificate No: 18570**

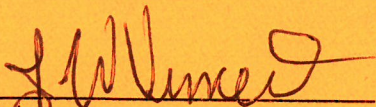
Pressure Standard #1 TB-1 Hydraulic Dead Weight Tester 573

<b>Client:</b> NWP Industries LP	<b>Date:</b> November 23, 2018
<b>Device:</b> Wet Pressure Gauge Marsh	<b>Cal Due:</b> November 22, 2019
<b>Serial #:</b> NWP 10000-18	<b>Device Accuracy Rating:</b> 1.00 % of Full Span
<b>Pressure Range:</b> 10,000 PSI	

Final Comparison Results					
Step #	% Scale	Standard PSI	Gauge PSI	Deviation PSI	% Span
1	0	0	0	0	0
2	10	1,000	970.0	-30.0	-0.3
3	20	2,000	1,965.0	-35.0	-0.4
4	40	4,000	3,980.0	-20.0	-0.2
5	60	6,000	5,995.0	-5.0	-0.1
6	80	8,000	7,981.0	-19.0	-0.2
7	100	10,000	9,950.0	-50.0	-0.5
8	50	5,000	4,985.0	-15.0	-0.2
9	0	0	0	0	0.0
Maximum Deviation				50.0	0.5

ACCEPTED AT STATED ACCURACY

Calibrated / Certified by or under the direct supervision of:



J. Vincent  
Calibration Technician

Remarks: <i>Date of first use: Jan 24, 2019.</i>
Any number of factors can cause the gauge to drift out of tolerance at any time following its calibration.



6879A - 52 Ave  
Red Deer, AB. Canada T4N 4L2  
Ph: 403-347-6001

#55

# Certificate of Calibration

NOV 28 2018

Harvie Instruments Ltd. Certifies that this instrument was calibrated using measurement standards traceable to the National Research Council, Institute for National Measurement Standards, the National Institute of standards and technology, or derived from accepted values of natural physical constants.

**Certificate No: 18571**

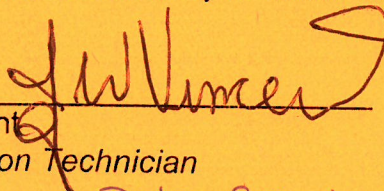
Pressure Standard #1 TB-1 Hydraulic Dead Weight Tester 573

<b>Client:</b> NWP Industries LP	<b>Date:</b> November 23, 2018
<b>Device:</b> Wet Pressure Gauge Marsh	<b>Cal Due:</b> November 22, 2019
<b>Serial #:</b> NWP 10000-19	<b>Device Accuracy Rating:</b> 1.00 % of Full Span
<b>Pressure Range:</b> 10,000 PSI	

Final Comparison Results					
Step #	% Scale	Standard PSI	Gauge PSI	Deviation PSI	% Span
1	0	0	0	0	0
2	10	1,000	984.0	-16.0	-0.2
3	20	2,000	1,984.0	-16.0	-0.2
4	40	4,000	3,980.0	-20.0	-0.2
5	60	6,000	5,970.0	-30.0	-0.3
6	80	8,000	7,961.0	-39.0	-0.4
7	100	10,000	10,000.0	0.0	0.0
8	50	5,000	4,970.0	-30.0	-0.3
9	0	0	0	0	0.0
Maximum Deviation				39.0	0.4

ACCEPTED AT STATED ACCURACY

Calibrated / Certified by or under the direct supervision of:

  
 J. Vincent  
 Calibration Technician

*Date of First use: March 21, 2019.*

Remarks:

---

Any number of factors can cause the gauge to drift out of tolerance at any time following its calibration.



6879A - 52 Ave  
 Red Deer, AB, Canada T4N 4L2

Ph: 403-347-6001

# Certificate of Calibration

**Harvie Instruments Ltd.** Certifies that this instrument was calibrated using measurement standards traceable to the National Research Council, Institute for National Measurement Standards, the National Institute of standards and technology, or derived from accepted values of natural physical constants.

Pressure Standard #1 TB-1 Dead Weight Tester 573  
 Pressure Standard #2 TB-2

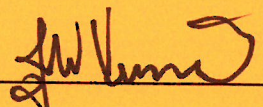
JUL 11 2018

<b>Client:</b> NWP Industries	<b>Date:</b> June 12, 2018
	<b>Cal Due:</b> June 11, 2019
<b>Device:</b> Wet Pressure Gauge      GT	
<b>Serial #:</b> NWP 5000-35	<b>Device Accuracy Rating</b>
<b>Pressure Range:</b> 5,000    PSI	1.00 % of Full Span

Final Comparison Results					
Step #	% Scale	Standard psi	Gauge psi	Deviation psi	% Span
1	0	0	0	0.0	0
2	10	500	470.0	-30.0	-0.60
3	20	1,000	968.0	-32.0	-0.64
4	40	2,000	1,970.0	-30.0	-0.60
5	60	3,000	2,987.0	-13.0	-0.26
6	80	4,000	4,000.0	0.0	0.00
7	100	5,000	4,975.0	-25.0	-0.50
8	50	2,500	2,475.0	-25.0	-0.50
9	0	0	0	0.0	0.00
Maximum Deviation				32.0	0.64

**ACCEPTED AT STATED ACCURACY**

Calibrated / Certified by or under the direct supervision of:

  
 \_\_\_\_\_  
 J. Vincent  
 Calibration Technician

Date of first use: NOV 21, 2019

Remarks:
Any number of factors can cause the gauge to drift out of tolerance at any time following its calibration.



6879A - 52 Ave  
 Red Deer, AB. Canada T4N 4L2

Ph: 403-347-6001

#77

# Certificate of Calibration FEB 07 2019

**Harvie Instruments Ltd.** Certifies that this gauge was calibrated using measurement standards traceable to the National Research Council, the National Institute of standards and technology, or derived from accepted values of natural physical constants.

Pressure Standard #1 TB-1 Dead Weight Tester 573  
 Pressure Standard #2 TB-2

<b>Client:</b> NWP Industries	<b>Date:</b> February 6, 2019
	<b>Cal Due:</b> February 5, 2020
<b>Device:</b> Wet Pressure Gauge      GT	<b>Device Accuracy Rating</b> 1.00 % of Full Span
<b>Serial #:</b> NWP-5000-40	
<b>Pressure Range:</b> 5,000    PSI	

Final Comparison Results					
Step #	% Scale	Standard psi	Gauge psi	Deviation psi	% Span
1	0	0	0	0.0	0
2	10	500	510.0	10.0	0.20
3	20	1,000	997.0	-3.0	-0.06
4	40	2,000	1,999.0	-1.0	-0.02
5	60	3,000	2,991.0	-9.0	-0.18
6	80	4,000	3,970.0	-30.0	-0.60
7	100	5,000	4,966.0	-34.0	-0.68
8	50	2,500	2,498.0	-2.0	-0.04
9	0	0	0	0.0	0.00
Maximum Deviation				34.0	0.68

ACCEPTED AT STATED ACCURACY  
 Calibrated / Certified by or under the direct supervision of:

*J. Vincent*

J. Vincent  
 Calibration Technician


DATE OF FIRST USE: JULY 16, 2019

Remarks:	New Gauge
Any number of factors can cause the gauge to drift out of tolerance at any time following its calibration.	



6879A - 52 Ave  
 Red Deer, AB. Canada T4N 4L2  
 Ph: 403-347-6001

#10

Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: June 14, 2016 Rev Status: 3		FORM-Certificate of Calibration Form

Page 1 of 1

**NWP Industries LP.** Certifies this instrument was calibrated using measurement standards traceable to the National Research Council, Institute for National Measurement Standards. **SEP 27 2018**

Calibration Equipment Used: Hydraulic Dead Weight Tester S/N: 2798160

Date:	<u>SEPT. 19/18</u>
Cal Date:	<u>SEPT. 19/18</u>
Device:	<u>WET GAUGE</u>
Serial #:	<u>NWP-600-7</u>
Pressure Range:	<u>0-600</u> PSI
Device Accuracy Rating	1.0 % of Span

Final Comparison Results					
Step #	% Scale	DW PSI	Gauge PSI	Deviation PSI	% Span
1	10	57.3	60	2.7	.45
2	20	119.2	120	.8	.13
3	30	179.7	180	.3	.05
4	40	239.7	240	.3	.05
5	50	299.8	300	.2	.03
6	60	360	360	0	0
7	70	420	420	0	0
8	80	480	480	0	0
9	90	538.8	540	1.2	.2
10	100	598	600	2	.3
Maximum Deviation				2.7	.45

Temperature Range: °C / °F – choose applicable		
Temperature Bath	Recorder	Deviation


\*Note needs to be ± 1°C or ± 1.8°F

**ACCEPTED AT STATED ACCURACY**

Calibration/Certified by or under the direct supervision of:

[Signature]  
Calibration Technician

Remarks:
Date of first use: <u>JULY 30, 2019</u>

Issuing Authority: QA/QC Manager		Quality Control
Date of Issue: June 14, 2016 Rev Status: 3		FORM-Certificate of Calibration Form

Page 1 of 1

**NWP Industries LP.** Certifies this instrument was calibrated using measurement standards traceable to the National Research Council, Institute for National Measurement Standards. **SEP 27 2018**

Calibration Equipment Used: Hydraulic Dead Weight Tester S/N: 2798160

Date: <u>SEPT. 19/18</u>	<b>Device Accuracy Rating</b> 1.0 % of Span
Cal Date: <u>SEPT. 19/18</u>	
Device: <u>WET GAUGE</u>	
Serial #: <u>NWP-600-8</u>	
Pressure Range: <u>0 - 600</u> PSI	

Final Comparison Results					
Step #	% Scale	DW PSI	Gauge PSI	Deviation PSI	% Span
1	10	58.6	60	1.4	.23
2	20	118.8	120	1.2	.2
3	30	178.7	180	1.3	.22
4	40	238.6	240	1.4	.23
5	50	298.7	300	1.3	.22
6	60	358.5	360	1.5	.25
7	70	417.3	420	2.7	.45
8	80	477.4	480	2.6	.43
9	90	536.6	540	3.4	.56
10	100	596.3	600	3.7	.61
Maximum Deviation				3.7	.61

Temperature Range: °C / °F – choose applicable		
Temperature Bath	Recorder	Deviation

\*Note needs to be ± 1°C or ± 1.8°F

ACCEPTED AT STATED ACCURACY

Calibration/Certified by or under the direct supervision of:

  
\_\_\_\_\_  
Calibration Technician

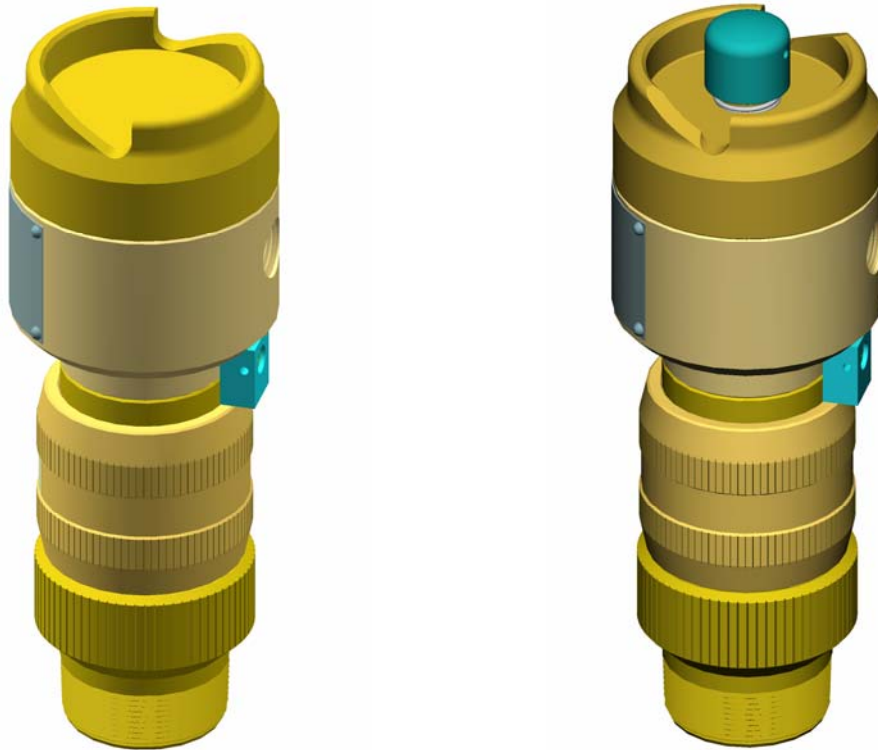
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Date of first use: <u>JULY 30, 2019</u>



# Instrument Operations & Maintenance Manual

# PRESSURE SWITCHES (DUAL SEAL)

## Installation, Operation, and Maintenance Manual



**Dedicated to Improving Your Operations for Over 45 Years**

Argus Machine Co. Ltd. • 5820 – 97 Street, Edmonton, Alberta T6E 3J1

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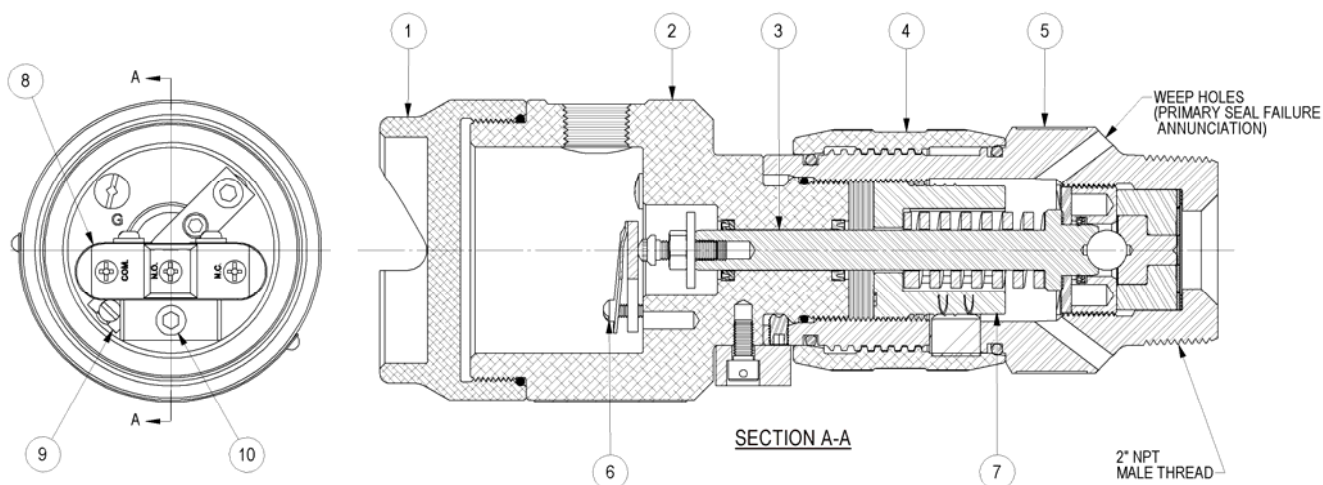
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## Argus Pressure Switch (Automatic Reset - Model 'AEF')

<u>Item</u>	<u>Description</u>	<u>Item</u>	<u>Description</u>
1	Cap	6	Adjusting Screw, Leaf Spring
2	Switch Housing	7	Spring Adjustment Nut
3	Main Stem	8	Microswitch
4	Access Collar	9	Leaf Spring
5	Bottom Sub	10	Locking Screw, Switch Block

### 1.0 SCOPE

Argus Machine Co. Ltd. manufactures pressure switches (automatic or manual reset) used to make or break an electrical circuit (an electric motor, a gas engine, etc.) upon sensing either 'high' or 'low' flow line pressure. This manual details the procedures for installation, operation and maintenance of Argus Pressure Switch Models 'AEF' and 'MBF' which are certified and marked for "Dual Seal" applications (September 2007).

### 2.0 GENERAL

The Argus Pressure Switch (automatic or manual reset) is designed to make or break an electrical circuit (an electric motor, a gas engine, etc.) upon sensing either 'high' or 'low' flow line pressure. Installation, operation, and maintenance of Argus Pressure Switches shall comply with procedures as described in this manual. The Argus Pressure Switch (automatic or manual reset) is designed for:

- 1) Rated Maximum Operating Pressure of 5000 PSI (34,475 kPa).
- 2) Ambient temperature range of  $-50^{\circ}\text{F}$  ( $-46^{\circ}\text{C}$ ) to  $+104^{\circ}\text{F}$  ( $+40^{\circ}\text{C}$ ); Switch Housing temperature range of  $-50^{\circ}\text{F}$  ( $-46^{\circ}\text{C}$ ) to  $+212^{\circ}\text{F}$  ( $+100^{\circ}\text{C}$ ); Process Media temperature range of  $-50^{\circ}\text{F}$  ( $-46^{\circ}\text{C}$ ) to  $+675^{\circ}\text{F}$  ( $+357^{\circ}\text{C}$ );
- 3) Manufactured for sweet and sour service
- 4) Certified by CSA and have the NRTL/C mark signifying that they are suitable for use in Canada and the United States for Class I, Group D, Hazardous Locations (Division 1 and 2), Dual Seal
- 5) NEMA 4 and 7 enclosure



### 3.0 APPLICABLE STANDARDS

Argus Type 'F' Pressure Switches are designed to meet the following standards:

- 1) **ABSA:** CRN No. OF2161.2134
- 2) **ASME:** B31.3
- 3) **CSA:** C22.2 No. 30
- 4) **ANSI/ISA:** 12.27.01
- 5) **NACE:** MR0175

### 4.0 SAFETY

Many routine procedures are potentially hazardous if executed incorrectly or in unsafe conditions, particularly when toxic/flammable product is present. Caution must be exercised when high temperature and/or pressure exists in the system. Other precautions should be observed are listed below:

- 1) Disconnect power supply before opening cap.
- 2) Avoid getting moisture inside cap; keep all electrical components dry.
- 3) Pressure Switches must meet the service requirements for the application.
- 4) Always follow government and site safety regulations.
- 5) Use of appropriate safety equipment and clothing is mandatory. Eye protection should be used when operating Pressure Switches.
- 6) Never Strike the Pressure Switch or attached equipment.
- 7) Do not stand on the Pressure Switch, or use it as a step.
- 8) Any fittings or accessories must meet the service requirements for the application.
- 9) Always use Argus O.E.M. parts for service or repair.

### 5.0 HANDLING AND STORAGE

#### 5.1 HANDLING

- 1) Care must be taken to prevent the Pressure Switch from being damaged.

#### 5.2 STORAGE

- 1) Pressure Switches should be stored in a dry environment and should be left in the original packaging prior to installation.
- 2) Thread protectors should remain in place until the Pressure Switch is to be installed.

### 6.0 INSTALLATION

#### 6.1 GENERAL NOTES

Argus Pressure Switches may be supplied alone or with a CSA approved Argus Wiring Harness assembly. (Refer to Argus Pressure Switch brochure for more information).



On request, Argus technicians can attach the Argus Wiring Harness assembly to the Pressure Switch in the factory. This eliminates the need to remove the Cap when installing an Argus Pressure Switch in the field.

Argus Pressure Switches are adjusted through a window in the Bottom Sub (it is not necessary to open the Cap when adjusting the pressure setting), hidden under the Access Collar.

Argus Pressure Switches are normally supplied with a 2" NPT male threaded connection on the Bottom Sub. Other connections may be available on special request. Ask your Argus representative for special application connections.

## 6.2 INSTALLATION INSTRUCTIONS

- 1) Every Argus Pressure Switch is shipped in its own cardboard packaging carton and contains an Installation and Operation instruction sheet (Bulletin No. TB-PS-001). Remove this sheet and verify that the shipment description at the bottom of the page is correct. This contains information regarding the Pressure Switch Model Number, Serial Number, factory settings and pressure setting range. Please keep this instruction sheet for future reference.
- 2) Check female threads in the flow line fitting for any burrs, dirt, debris, or visible signs of damage before installing the Pressure Switch.
- 3) Remove thread protectors from the end of the Pressure Switch as well as the 1/2" NPT port (if applicable).
- 4) Check all threads for any signs of damage, dirt or debris.

**CAUTION:** Do not attempt to install the Pressure Switch if there is any evidence of damage to any threads.

- 5) If any of the Pressure Switch threads are damaged, return to Argus for repair or replacement.
- 6) Apply a thin coat of a suitable thread sealant to male threads and hand-tighten bottom connection into the female flow line fitting.
- 7) When placing a wrench onto the bottom sub of the Pressure Switch, avoid contact with threads.

**CAUTION:** Do not wrench on the aluminum access collar.

- 8) Tighten with wrench until proper make-up is achieved. If make-up is difficult to achieve, remove the Pressure Switch and check for any foreign matter, thread damage or galling and repeat above procedure.
- 9) Check the female (box) threads on the Switch Housing for damage, dirt or debris. In the event of serious damage please return the Pressure Switch complete with the instruction sheet and packaging carton to your Argus representative. Do not attempt to install the electrical conduit if there is serious damage to the female (box) threads on the Switch Housing.
- 10) Remove the Cap from the Switch Housing (use a screwdriver in the break-out slots provided in the Cap if necessary).
- 11) The male (pin) threads on the electrical conduit must be dry (do not use any lubricant, teflon tape or thread dope). Feed the electrical wires through the port and screw the conduit into the Switch Housing female (box) port hand-tight only.
- 12) Use a pipe wrench on the electrical conduit to tighten it into the female (box) port until proper make-up is achieved. If this appears to be difficult to achieve, remove the conduit and check for any foreign matter, thread damage or galling.
- 13) Attach electrical wires to the Microswitch as per Argus Wiring Instruction sheet (Bulletin No. TB-PS-002).



**Microswitch Manufacturer's Recommended Torque (Maximum)**

Mounting Screws.....	3 in-lbs
Terminal Screws.....	4 in-lbs
Panel Mount Bushing.....	4-6 in-lbs

**CAUTION:** Tightening mounting screws above 3 in-lbs changes operating characteristics and increases the possibility of cracking the case. Applying excessive torque to the terminal screws when attaching the wires may cause damage to the Microswitch.

- 14) Install the Cap on the Switch Housing and hand-tighten only. When properly installed, the Cap should meet the shoulder on the Switch Housing. It is not necessary to wrench tighten the Cap to ensure a seal.

**CAUTION:** Do not over-tighten the Cap, as damage may occur.

- 15) Once installation is complete, the Argus Pressure Switch should be operated two (2) or three (3) times to verify the factory settings.

## **7.0 OPERATION**

### **7.1 OPERATING INSTRUCTIONS**

- 1) Once installation is complete, the Argus Pressure Switch will trip automatically.
  - a) If it is an automatic reset switch, it will reset automatically when the pressure returns to within normal operating range.
  - b) If it is a manual reset switch, it will reset when the operator pushes the reset button in top of the switch.

### **7.2 PRESSURE SETTING**

- 1) Rotate Access Collar counter-clockwise until it hits the upper shoulder of the Switch Housing. This allows access to the port in the Bottom Sub. The slotted Spring Adjustment Nut should now be visible.
- 2) Using a flat blade (Standard) screwdriver, insert the blade into one of the slots and rotate the Spring Adjustment Nut to either increase or decrease the pressure setting as required. Rotating the Spring Adjustment Nut clockwise increases the set point, counter-clockwise decreases the set point. Continue adjusting until the desired set point is achieved. Refer to the Argus Pressure Switch brochure for the available pressure ranges as per the model number.
- 3) Rotate the Access Collar clockwise until it hits the lower shoulder of the Bottom Sub. The access port should now be covered to keep out moisture and debris. (In conditions of severe vibration, the optional Vibration Lock may be purchased and used. Install the Vibration Lock with the pins in one slot of the Spring Adjustment Nut prior to screwing the Access Collar down).

**CAUTION:** Leave the Access Collar in the “down” position after adjustments have been completed.

- 4) The optional Tamper Seal Block may be purchased and used to prevent anyone from tampering with the set point once it has been established. To use, simply install the Tamper Seal Block with the capscrew provided into the hole in the Switch Housing. Run a wire through the holes in both the Tamper Seal Block and the capscrew and fix with a leaded seal. If the seal is broken, tampering may have occurred and the set point should be checked.



### 7.3 MICROSWITCH REPLACEMENT

If the Microswitch should fail during normal operation it can be easily replaced in the field using the following procedure:

- 1) Make sure that the power supply to the Pressure Switch is turned off.
- 2) Remove the Cap from the Switch Housing (use break-out slots in the Cap if required).
- 3) Disconnect all of the electrical wires from the Microswitch and tuck them out of the way.
- 4) Using a 3/16" T-Handle hexagonal wrench, loosen and remove the Switch Block Locking Screw.
- 5) Lift out the entire Microswitch sub-assembly.
- 6) Place the new Microswitch sub-assembly in the Switch Housing and tighten the Switch Block Locking Screw with the 3/16" T-Handle hexagonal wrench.

**CAUTION:** Do not over-tighten, as damage may occur.

- 7) Re-attach all the electrical wires to the Microswitch as they were before. (Refer to Argus Wiring Instructions Bulletin No. TB-PS-002).
- 8) If necessary, make adjustments to the Leaf Spring. Use a flat blade screwdriver to tighten the Leaf Spring Adjusting Screw clockwise until it shoulders. Turn the Adjusting Screw counter-clockwise until you hear the Microswitch trip off (approximately 3 turns). Turn the Adjusting Screw 1 1/2 turns clockwise to set.
- 9) Install the Cap on the Switch Housing and tighten until the Cap shoulders with the Switch Housing.
- 10) Turn on the power supply to the Pressure Switch.

### 8.0 MAINTENANCE

Argus recommends that a preventive maintenance program be implemented to ensure the longevity of the Argus Pressure Switch.

- 1) Argus recommends that the operator periodically (quarterly) test each Pressure Switch to ensure that it is working properly.
- 2) Tests may consist of a pressure test and verification of unit shutdown.
  - a) For a Pressure Switch that is set for increasing pressure the operator may close a valve downstream and check that the Switch trips off at the appropriate set point. If the set point is incorrect, the operator should adjust it to the original setting. (See **7.2 Pressure Setting**).
  - b) For a Pressure Switch that is set for decreasing pressure the operator may close a valve upstream and check that the Switch trips off at the appropriate set point. If the set point is incorrect, the operator should adjust it to the original setting. (See **7.2 Pressure Setting**).
  - c) The Pressure Switch may also be taken off the line and sent to an Argus Service Center for testing and adjustment.
- 3) Visually check for excessive moisture in the Bottom Sub, by looking in the Access Port. If excessive moisture is present the Pressure Switch should be cleaned and serviced by Argus or one of their approved Service Centers.
- 4) Argus also recommends that the Pressure Switch be tested after a service rig has done any work on the well site.
- 5) The operator should visually check the Pressure Switch for any leaks or physical damage each time that he/she works on it. The Bottom Sub has two weep holes that will indicate when the internal gasket or diaphragm has failed. Ensure these weep holes are free of debris or foreign material. If excessive leaking (small amounts of moisture that is trapped inside the Bottom Sub may leak out normally) is evident the Pressure Switch should be replaced as soon as possible. The Pressure Switch may then be sent to an Argus Service Center for assessment and/or repair.
- 6) Argus recommends that due to the sensitivity of the Microswitch the customer should consider carrying one (1) spare Microswitch sub-assembly in inventory for every ten (10) Pressure Switches in the field.





## 9.0 TROUBLESHOOTING

Problem	Possible Causes	Possible Solutions
Switch does not trip at proper pressure, or does not trip at all	<ul style="list-style-type: none"> <li>a) Faulty electrical cable or connections</li> <li>b) Pressure set point needs adjustment</li> <li>c) Microswitch needs to be recalibrated</li> <li>d) Microswitch failure</li> </ul>	<ul style="list-style-type: none"> <li>a) Check for damaged cable and/or loose connections</li> <li>b) Adjust pressure set point using the Spring Adjustment Nut, see Section 7.2</li> <li>c) Adjust switch using the Leaf Spring Adjusting Screw, see Section 7.3</li> <li>d) Replace Microswitch, see Section 7.3</li> </ul>
Leaking from weep holes	<ul style="list-style-type: none"> <li>a) Pressure Switch gasket or diaphragm failure</li> </ul>	<ul style="list-style-type: none"> <li>a) Remove switch from line and send for servicing</li> </ul>

## 10.0 CONTACT INFORMATION

For Ordering Argus Pressure Switches or for Service please contact us at:

Argus Machine Co. Ltd.  
**Order Desk (Assembly Division)**  
 5820-97 Street,  
 Edmonton, Alberta, Canada  
 T6E 3J1

Toll Free: 1-888-434-9451  
 Phone: (780) 434-9451  
 Fax: (780) 434-9909



# ARGUS MACHINE CO. LTD.

5820 – 97 Street  
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[www.argusmachine.com](http://www.argusmachine.com)

Technical Bulletin : TB-PS-001  
 Effective Date : October 17, 2005

## Pressure Switch ( Type 'F' ) - Installation and Operation

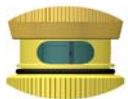


NRTL/C

Certified for Class I, Group D, Hazardous Locations (Division 1 and 2)



MODEL 'AEF'  
(AUTOMATIC RESET)



INCREASE ←  
 → DECREASE

CIRCUITRY		ELECTRICAL DATA	
SINGLE POLE	N.O.	1/2 AMP	125 VDC
COM.		1/4 AMP	250 VDC
DOUBLE THROW	N.C.	SEE NOTE 1	125, 250 OR 480 VAC

(1) HONEYWELL AUTOMATIC RESET MICROSWITCH P/N: BZ-2R-A2 15 AMPS  
 HONEYWELL MANUAL RESET MICROSWITCH P/N: BZ-RX 15 AMPS  
 HONEYWELL AUTOMATIC RESET MICROSWITCH P/N: BZ-2R244-A2 5 AMPS



MODEL 'MBF'  
(MANUAL RESET)



**Remove Top Cap ONLY for installing electrical wiring.**

**CAUTION**

**Power must be OFF before removing Top Cap.**

It is not necessary to remove the Top Cap to adjust Set Point. If microswitch replacement or adjustment is required, please refer to the label inside Top Cap or the Calibration Procedure in the Installation, Operation and Maintenance Manual.

← Access Collar

→ Tamper Seal (optional)

← Vibration Lock (optional)

→ Access Collar

**IMPORTANT**  
**ACCESS COLLAR TO BE UP ONLY WHEN ADJUSTING PRESSURE SETTING.**

**IMPORTANT**  
**ACCESS COLLAR MUST BE DOWN WHEN OPERATING. (Seals out weather)**

**ADJUSTING PRESSURE SETTING**

Shown at 60% of Max. Pressure Setting (Three bands are showing).  
 NOTE: Max. Pressure Setting is with five bands showing (20% per band).  
 Adjust Pressure Setting with Screwdriver blade.

### SHIPMENT DESCRIPTION

S/N : PS

Automatic Reset - Model AEF -

Manual Reset - Model MBF -

2" NPT Male Thread (Bottom Connection)

Other (Specify) : \_\_\_\_\_

Factory Set  
 Increasing Pressure \_\_\_\_\_ PSI \_\_\_\_\_ kPa

OR

Decreasing Pressure \_\_\_\_\_ PSI \_\_\_\_\_ kPa

OR

Field Set

1.0 Range 20-100 PSI (140 - 690 kPa)

2.0 Range 40-200 PSI (275 - 1380 kPa)

8.0 Range 80-800 PSI (550 - 5515 kPa)

14 Range 150-1400 PSI (1035 - 9650 kPa)

20 Range 250-2000 PSI (1720 - 13790 kPa)

50 Range 1500-5000 PSI (10340 - 34470 kPa)

\* TRIM SUITABLE FOR SOUR, CORROSIVE SERVICE

\*\* MAXIMUM WORKING PRESSURE 5000 PSI (34475 kPa)

**TEMPERATURE RANGE**

**Model 'AEF'**

**Model 'MBF'**

Ambient	-50° F to +104° F (-46° C to +40° C)	-50° F to +104° F (-46° C to +40° C)
Switch Housing	-50° F to +212° F (-46° C to +100° C)	-50° F to +212° F (-46° C to +100° C)
Process Media	-50° F to +675° F (-46° C to +357° C)	-50° F to +675° F (-46° C to +357° C)

**Note : See reverse side for IMPORTANT NOTICE**

## **IMPORTANT NOTICE**

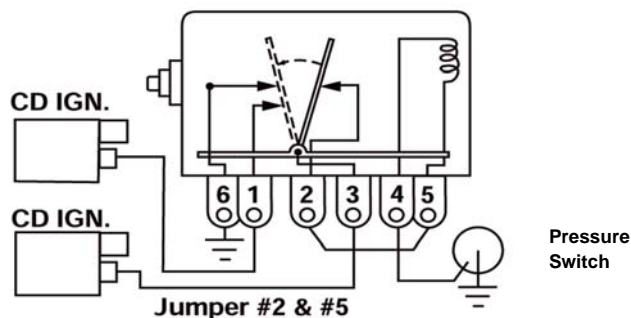
If the Argus Pressure Switch is being used in conjunction with a gas engine that has a CD (Capacitor Discharge) ignition (eg. : Kubota), precautions should be taken to eliminate any high (spiking) DC voltage from interfering with the operation of the microswitch.

High (spiking) DC voltage may cause premature failure of the microswitch.

See diagram below for one possible solution. This configuration may not work in all cases. Every application should be addressed by the installer at the time of installation.

### **TYPICAL WIRING DIAGRAM**

**MS 2100**



Argus Pressure Switches are designed and manufactured to meet the requirements of:

ASME	B31.3	Process Piping
CSA	C22.2 No. 30	Explosion-Proof Enclosures for Hazardous Locations
NACE	MR0175	Standard Material Requirements for Sour Service
ABSA	CRN No.: OF2161.2134	Alberta Boiler's Safety Association

Argus Pressure Switches are covered by the following patents:

Canada 2,129,290  
2,158,623  
2,178,401

United States 5,554,834  
5,670,766

**Note : For information on Product Warranty, please reference our website**

[www.argusmachine.com/terms.htm](http://www.argusmachine.com/terms.htm)



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Technical Bulletin: TB – PS – 002

Revision: 00

Effective Date: May 27, 2003

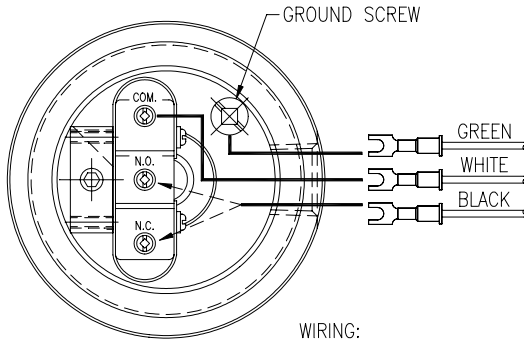
Prepared By: R. Chetram

Approved By: R. Wiltermuth

## Pressure Switch Wiring Harness Wiring Instructions

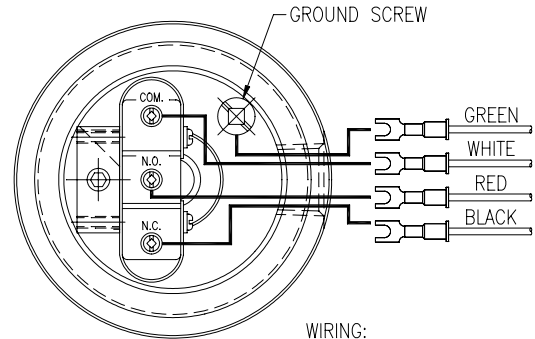
### General Notes:

1. The installer shall be responsible to ensure that after installation the Sealing Fitting (Wiring Harness) and Switch Housing (Pressure Switch) connection (1/2"-14 NPT) is tight and leakproof.
2. Manual Cap Assemblies may NOT be substituted for Automatic Caps (Microswitches are different).
3. If you experience any problems when installing an Argus Pressure Switch or Wiring Harness please call the manufacturer, or your local representative.



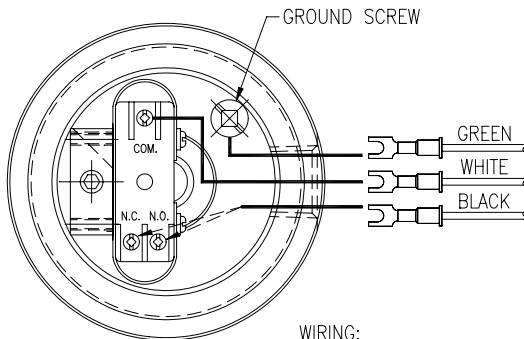
WIRING:  
 GREEN – GROUND SCREW  
 WHITE – COMMON  
 BLACK – NORMALLY CLOSED (ELECTRIC MOTOR)  
 BLACK – NORMALLY OPEN (MAGNETO GROUND)

**AUTOMATIC RESET  
3-WIRE**



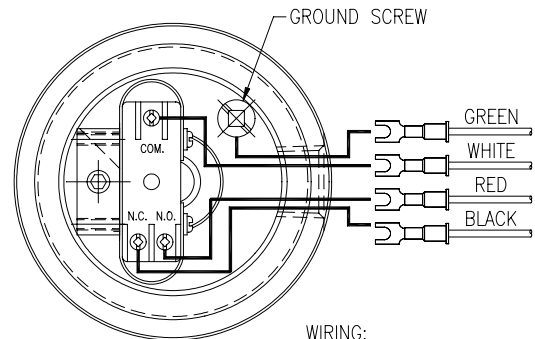
WIRING:  
 GREEN – GROUND SCREW  
 WHITE – COMMON  
 BLACK – NORMALLY CLOSED  
 RED – NORMALLY OPEN

**AUTOMATIC RESET  
4-WIRE**



WIRING:  
 GREEN – GROUND SCREW  
 WHITE – COMMON  
 BLACK – NORMALLY CLOSED (ELECTRIC MOTOR)  
 BLACK – NORMALLY OPEN (MAGNETO GROUND)

**MANUAL RESET  
3-WIRE**



WIRING:  
 GREEN – GROUND SCREW  
 WHITE – COMMON  
 BLACK – NORMALLY CLOSED  
 RED – NORMALLY OPEN

**MANUAL RESET  
4-WIRE**



Certified for Class I, Group D, Hazardous Locations (Division 1 and 2)

### Features

- Molded one-piece solenoid with highly efficient solenoid cartridge and special low wattage coil
- Increased ambient temperature capabilities up to 175°F (80°C)
- Designed for use in automation of plant control systems to provide:
  - PLC compatibility
  - Reduced battery drain
  - Reduced heat rise
  - Reduced wiring cost
- Wide selection includes 2/2 normally closed, 3/2 normally closed (including Quick Exhaust), 3/2 universal, 4/2, 5/2, & 5/3
- Air or inert gas only
- Lower-cost alternative to intrinsically safe valves in critical applications not requiring a safety barrier

### Construction

Valve Parts in Contact with Fluids			
Body	Aluminum	Brass	Stainless Steel
Seals and Discs	PUR, NBR, CR, as listed		
Sleeve	304L Stainless Steel		
Core and Plugnut	430F Stainless Steel		
Core Springs	302 Stainless Steel		
Pilot Seat Cartridge (Series 8316 & 8344 only)	POM		
Rider Rings	PTFE		
Spring Retainer	POM		

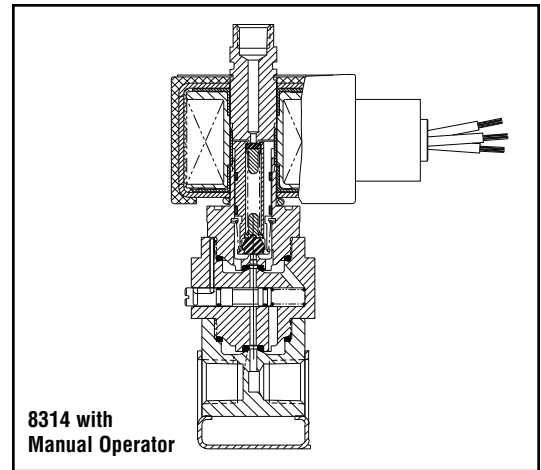
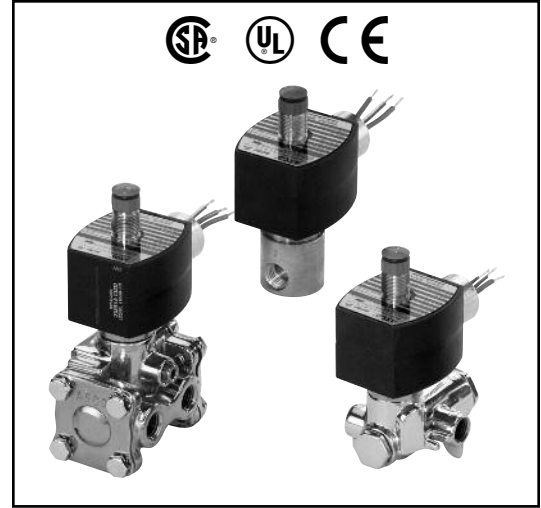
### Electrical

Description	Wattage	Max. Ambient Temp.	T Code	Insulation Class	TPL
Standard Ambient Version	1.4 W	140°F (60°C)	T6	F	-
High Ambient Version	1.8 W	179°F (80°C)	T5	F	#23033
Surge Suppression Version	1.7 W	140°F (60°C)	T6	F	-
Surge Suppression High Ambient Version	2.0 W	179°F (80°C)	T5	F	#23033

ⓘ **IMPORTANT:** Supervisory and leakage current above the drop out current listed will cause improper operation. Consult your local ASCO sales office for additional assistance.

Description	Wattage	Voltage (DC)	Min. Pull In (mA)	3-Way Drop Out (mA) ⓘ	2-Way Drop Out (mA) ⓘ	Coil resistance @ 68°F (20°C) (ohms)
Standard Ambient Version	1.4 W	12V	83.5	13.9	3.2	102
		24V	42.0	7.0	1.6	410
		48V	21.4	3.6	0.8	1640
		120V	8.7	1.4	0.3	10000
High Ambient Version	1.8 W	12V	94.3	15.7	3.6	80
		24V	47.9	8.0	1.8	320
		48V	24.0	4.0	0.9	1260
Surge Suppression Version	1.7 W	12V	94.3	15.7	3.6	80
		24V	47.9	8.0	1.8	320
		48V	22.7	3.8	0.9	1470
Surge Suppression High Ambient Version	2.0 W	12V	105.3	17.6	4.0	64
		24V	54.1	9.0	2.1	270
		48V	24.0	4.0	0.9	1260

24VDC Spare Coil P/N	Standard Ambient Temp. Version	High Ambient Temp Version
General Purpose	238710-902-D*	238710-908-D*
Explosion Proof	238714-902-D*	238714-905-D*
Explosion Proof, Corrosion Resistant	274714-902-D*	274714-905-D*
Explosion Proof, Surge Suppression	276006-006-D*	276006-106-D*
Explosion Proof, Corrosion Resistant, Surge Suppression	276007-006-D*	276007-106-D*



SPECIAL SERVICE PILOT

### Ordering

#### Normal Ambient Version

EV8551G322 24VDC

#### High Ambient Version (always add TPL #23033)

EFX8316G301-23033 24VDC

### Solenoid Enclosures

**Standard:** Watertight, Types 1, 2, 3, 3S, 4, and 4X.

**Optional:** Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9.

(To order, add prefix "EF" to catalog number. For explosionproof with 316 Stainless Steel hub and trim, specify prefix "EV".) Surge suppression coils also available "MF" prefix.

See *Optional Features Section* for other available options.

### Approvals

UL listed General Purpose Valves (Hazardous Location Classified). EV8345G381 solenoid only UL listed. CSA certified; nonincendive for Class I, Division 2 UL E25549. Meets applicable CE directives.

SIL 3 capable per IEC 61508 on 8314 and 8316 const. Third party certification provided by EXIDA.

Refer to *Engineering Section* for details.

ATEX/IECEx certified with prefix "EV" as listed. Refer to *Optional Features Electrical Section* for details.

### Nominal Ambient Temp. Ranges

Series	Body Material	Normal Temperature Range	High Ambient Temp Version
8553	Stainless Steel	-40°F to 140°F (-40°C to 60°C)	Not Available
8551	Brass	-40°F to 140°F (-40°C to 60°C)	
8553	Aluminum	-13°F to 140°F (-25°C to 60°C)	
8551		5°F to 140°F (-15°C to 60°C)	
8551	Stainless Steel	-40°F to 140°F (-40°C to 60°C)	Low Limit is the same as Normal Temperature Ratings, but High Limit is 176°F (80°C)
8262	Brass / Stainless Steel	-40°F to 140°F (-40°C to 60°C)	
8314		-40°F to 140°F (-40°C to 60°C)	
8317		-20°F to 140°F (-29°C to 60°C)	
8316*		-20°F to 140°F (-29°C to 60°C)	
8223	Brass only	-4°F to 140°F (-20°C to 60°C)	
8344		-4°F to 140°F (-20°C to 60°C)	
8316G334		-4°F to 140°F (-20°C to 60°C)	

\*Does not include 8316G334; Includes 8316H374. **Note:** 8553 not available in brass

### Important

These solenoid valves are intended for use on clean dry air or inert gas, filtered to 40 micrometres or better. The dew point of the media should be at least 10°C (18° F) below the minimum temperature to which any portion of the clean air/inert gas system could be exposed to prevent freezing. If lubricated air is used, the lubricants must be compatible with Nitrile elastomers. Diester oils may cause operational problems. Instrument air in compliance with ANSI/ISA Standard 7.0.01-1996 exceeds the above requirements and is, therefore, an acceptable media for these valves.

### Specifications (English units)

Pipe Size (in)	Orifice Size (in)	Cv Flow Factor		Operating Pressure Differential (psi)		Max. Fluid and Ambient Temp. °F	Brass Body		Stainless Steel Body	
				Air-Inert Gas			Catalog Number	Const. Ref.	Catalog Number	Const. Ref.
		Pressure to Cylinder	Cylinder to Exhaust	Min.	Max.					
<b>2/2 VALVES, NORMALLY CLOSED, with NBR Disc</b>										
1/4	1/16	.08		0	150	140	8262G320	18	8262G386 ⑥⑨	18
3/8	5/16	1.5		10	150	140	8223G323	19	-	-
1/2	3/8	3.2		25	150	140	8223G303 ⑨	20	8223G310 ⑥⑨	20
<b>3/2 VALVES, UNIVERSAL OPERATION (Normally Closed or Normally Open) with NBR Disc – SIL 3 Capable, Certified by Exida ⑦ ⑧</b>										
1/4	1/16	.08	.08	0	150	140	8314G300	1	8314G301 ⑥⑨	2
<b>3/2 VALVES, NORMALLY CLOSED (Closed when de-energized) with NBR Disc – SIL 3 Capable, Certified by Exida ⑦</b>										
1/4	5/16	1.5	1.5	⑤	150	140	8316G301 ③⑨	3	EV8316G381 ⑥⑨	3
3/8	5/16	1.8	1.8	⑤	150	140	8316G302 ③⑨	3	EV8316G382 ⑥⑨	3
3/8	5/8	4	4	⑤	150	140	8316G303 ③⑨	3A	-	-
1/2	5/8	4	4	⑤	150	140	8316G304 ③⑨	3A	EV8316G384 ⑥⑨	3A
3/4	11/16	5.5	5.5	10	150	140	8316H374 ③	4	-	-
1	1	13	13	10	150	140	8316G334 ③⑨	5	-	-
<b>3/2 VALVES, UNIVERSAL (Normally Closed or Normally Open) "Quick Exhaust" with CR Diaphragm and NBR Disc</b>										
1/4	②	.08	.73	5	150	140	8317G307 ①	6	8317G308 ①⑥	7
<b>4/2 VALVES, with NBR Disc and Seals</b>										
1/4	1/16	.08	.08	10	150	140	8345G301 ①③	6	EV8345G381 ①③⑥	8
<b>4/2 VALVES, Brass Body with NBR Disc</b>										
Pipe Size (in)	Orifice Size (in)	Cv Flow Factor		Operating Pressure Differential (psi)		Max. Fluid and Ambient Temp. °F	Single Solenoid		Dual Solenoid	
				Air-Inert Gas			Catalog Number	Const. Ref.	Catalog Number	Const. Ref.
		Pressure to Cylinder	Cylinder to Exhaust	Min.	Max.					
1/4	1/4	.80	1	10	150	140	8344G370 ①③	9	8344G344 ③	12
3/8	3/8	1.4	2.2	10	150	140	8344G372 ①③⑨	11	8344G380 ③⑨	10
1/2	3/8	1.4	2.2	10	150	140	8344G374 ①③⑨	11	8344G382 ③⑨	10
3/4	3/4	5.2	5.6	10	150	140	8344G376 ①③	13	8344G354 ③	14
1	3/4	5.2	5.6	10	150	140	8344G378 ①③	13	8344G356 ③	14

① There are two exhaust flows in the exhaust mode (pilot and main). The pilot exhaust must be connected to the main exhaust when the air or inert gas cannot be exhausted to atmosphere.  
 ② For "Quick Exhaust" valves, pressure port is 1/16", exhaust port is 1/4".  
 ③ **IMPORTANT:** A Minimum Operating Pressure Differential must be maintained between the pressure and exhaust ports. Supply and exhaust piping must be full area, unrestricted. ASCO flow controls and other similar components must be installed in the cylinder lines only.  
 ⑤ Zero minimum when valve selection gasket is in external position and proper auxiliary air pressure is applied. Minimum 15 psi Operating Pressure Differential when selection gasket is in the internal position.  
 ⑥ Can be used for *dry* natural gas service with the EF or EV prefix.  
 ⑦ Safety manual and FMEDA (Failure Modes Effects and Diagnostic Analysis) report available.  
 ⑧ SIL 3 Capable, Certified by Exida, only valid when used as Normally Closed.  
 ⑨ ATEX/IECEx certified with prefix "EV".

## Specifications (English units)

Body Material	Pipe Size (in)	Orifice Size (in)	Cv Flow Factor	Single Solenoid					Dual Solenoid				
				Operating Pressure Differential (psi)		Max. Fluid Temp. °F	Catalog Number	Const. Ref.	Operating Pressure Differential (psi)		Max. Fluid Temp. °F	Catalog Number	Const. Ref.
				Air-Inert Gas					Air-Inert Gas				
				Min.	Max.	Min.	Max.						
<b>3/2, 5/2, 5/3 VALVES, with NBR and PUR Seals</b>													
Aluminum 3/2	1/4	1/4	.86	30	150	140	8551G305 ⑦	21	30	150	140	8551G306 ⑦	21
Aluminum 5/2							8551G317 ⑦	22				8551G318 ⑦	22
Aluminum 5/3 Center Closed							-	22				8551G367 ⑦	22
Aluminum 5/3 Center Open							-	22				8551G368 ⑦	22
Brass 3/2							EF8551G307 ②⑦	21				EF8551G308 ②⑦⑧	21
Brass 5/2							EF8551G319 ②⑦⑧	22				EF8551G320 ②⑦	22
316L Stainless Steel 3/2							EV8551G313 ③⑥⑦⑧	21				EV8551G314 ③⑥⑦⑧	21
316L Stainless Steel 5/2	EV8551G321 ③⑥⑧	22	EV8551G322 ③⑥⑧	22									
Aluminum 3/2	1/2	1/2	3.7	30	150	140	8553G305 ⑦	21	30	150	140	8553G306 ⑦	21
Aluminum 5/2							8553G317 ⑦	22				8553G318 ⑦	22
316L Stainless Steel 3/2							EV8553G313 ③⑥⑦⑧	21				EV8553G314 ③⑥⑦⑧	21
316L Stainless Steel 5/2							EV8553G321 ③⑥⑦⑧	22				EV8553G322 ③⑥⑦⑧	22

② Brass construction supplied standard with EF solenoid. ③ Stainless steel construction supplied standard with EV solenoid.  
 ④ Can be used for **dry** natural gas service with the EF or EV prefix. ⑦ Solenoid only approvals with EF of EV prefix, no approvals with general purpose coil (no prefix).  
 ⑧ ATEX/IECEx certified with prefix "EV".

SPECIAL SERVICE PILOT

Body Material	Pipe Size (in)	Orifice Size (in)	Cv Flow Factor	Single Solenoid					Dual Solenoid				
				Operating Pressure Differential (psi)		Max. Fluid Temp. °F	Catalog Number	Const. Ref.	Operating Pressure Differential (psi)		Max. Fluid Temp. °F	Catalog Number	Const. Ref.
				Air-Inert Gas					Air-Inert Gas				
				Min.	Max.	Min.	Max.						
<b>3/2, 5/2, 5/3 VALVES, with NBR and PUR Seals, NAMUR Mount</b>													
Aluminum 3/2, 5/2	1/4	1/4	.86	30	150	140	8551G301 ①	23	30	150	140	8551G302 ①	23
Aluminum 5/3 Center Closed							-	-				8551G365 ⑦	24
Aluminum 5/3 Center Open							-	-				8551G366 ⑦	24
Brass 3/2, 5/2							EF8551G303 ②①⑦	23				EF8551G304 ②①⑦	23
316L Stainless Steel 3/2, 5/2	1/2	1/2	3.7	30	150	140	EV8551G309 ③⑥⑧	24	30	150	140	EV8551G310 ③⑥⑧	24
Aluminum 3/2, 5/2							8553G301 ⑦	24				8553G302 ⑦	24
316L Stainless Steel 3/2, 5/2							EV8553G309 ③⑥⑦⑧	24				EV8553G310 ③⑥⑦⑧	24

① 1/8" NPT exhaust for 1/4" aluminum and brass. ② Brass construction supplied standard with EF solenoid. ③ Stainless steel construction supplied standard with EV solenoid.  
 ④ Can be used for **dry** natural gas service with the EF or EV prefix. ⑦ Solenoid only approvals with EF of EV prefix, no approvals with general purpose coil (no prefix).  
 ⑧ ATEX/IECEx certified with prefix "EV".

### Specifications (Metric units)

Pipe Size (in)	Orifice Size (mm)	Kv Flow Factor (m3/h)		Operating Pressure Differential (bar)		Max. Fluid and Ambient Temp. °C	Brass Body		Stainless Steel Body	
				Air-Inert Gas			Catalog Number	Const. Ref.	Catalog Number	Const. Ref.
		Pressure to Cylinder	Cylinder to Exhaust	Min.	Max.					
<b>2/2 VALVES, NORMALLY CLOSED, with NBR Disc</b>										
1/4	2	.07		0	10	60	8262G320	18	8262G386 ⑥⑨	18
3/8	8	1.29		0.7	10	60	8223G323	19	-	-
1/2	10	2.74		1.7	10	60	8223G303 ⑨	20	8223G310 ⑥⑨	20
<b>3/2 VALVES, UNIVERSAL OPERATION (Normally Closed or Normally Open) with NBR Disc – SIL 3 Capable, Certified by Exida ⑦ ⑧</b>										
1/4	2	.07	.07	0	10	60	8314G300	1	8314G301 ⑥⑨	2
<b>3/2 VALVES, NORMALLY CLOSED (Closed when de-energized) with NBR Disc – SIL 3 Capable, Certified by Exida ⑦</b>										
1/4	8	1.29	1.29	⑤	10	60	8316G301 ③⑨	3	EV8316G381 ⑥⑨	3
3/8	8	1.37	1.37	⑤	10	60	8316G302 ③⑨	3	EV8316G382 ⑥⑨	3
3/8	16	2.57	2.57	⑤	10	60	8316G303 ③⑨	3A	-	-
1/2	16	3.43	3.43	⑤	10	60	8316G304 ③⑨	3A	EV8316G384 ⑥⑨	3A
3/4	17	4.71	4.71	0.7	10	60	8316H374 ③	4	-	-
1	25	11.14	11.14	0.7	10	60	8316G334 ③⑨	5	-	-
<b>3/2 VALVES, UNIVERSAL (Normally Closed or Normally Open) "Quick Exhaust" with CR Diaphragm and NBR Disc</b>										
1/4	②	.07	.63	0.3	10	60	8317G307 ①	6	8317G308 ①⑥⑨	7
<b>4/2 VALVES, with NBR Disc and Seals</b>										
1/4	2	.07	.07	0.7	10	60	8345G301 ①③	6	EV8345G381 ①③⑥⑨	8
<b>4/2 VALVES, Brass Body with NBR Disc</b>										
Pipe Size (in)	Orifice Size (mm)	Kv Flow Factor (m3/h)		Operating Pressure Differential (bar)		Max. Fluid and Ambient Temp. °C	Single Solenoid		Dual Solenoid	
				Air-Inert Gas			Catalog Number	Const. Ref.	Catalog Number	Const. Ref.
		Pressure to Cylinder	Cylinder to Exhaust	Min.	Max.					
1/4	6	0.69	0.86	0.7	10	60	8344G370 ①③	9	8344G344 ③	12
3/8	10	1.20	1.89	0.7	10	60	8344G372 ①③⑨	11	8344G380 ③⑨	10
1/2	10	1.20	1.89	0.7	10	60	8344G374 ①③⑨	11	8344G382 ③⑨	10
3/4	19	4.46	4.80	0.7	10	60	8344G376 ①③	13	8344G354 ③	14
1	19	4.46	4.80	0.7	10	60	8344G378 ①③	13	8344G356 ③	14

① There are two exhaust flows in the exhaust mode (pilot and main). The pilot exhaust must be connected to the main exhaust when the air or inert gas cannot be exhausted to atmosphere.  
 ② For "Quick Exhaust" valves, pressure port is 1/16", exhaust port is 1/4".  
 ③ **IMPORTANT:** A Minimum Operating Pressure Differential must be maintained between the pressure and exhaust ports. Supply and exhaust piping must be full area, unrestricted. ASCO flow controls and other similar components must be installed in the cylinder lines only.  
 ④ Zero minimum when valve selection gasket is in external position and proper auxiliary air pressure is applied. Minimum 1.0 bar Operating Pressure Differential when selection gasket is in the internal position.  
 ⑤ Can be used for *dry* natural gas service with the EF or EV prefix.  
 ⑥ Safety manual and FMEDA (Failure Modes Effects and Diagnostic Analysis) report available.  
 ⑦ SIL 3 Capable, Certified by Exida, only valid when used as Normally Closed.  
 ⑧ ATEX/IECEx certified with prefix "EV".

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## Specifications (Metric units)

Body Material	Pipe Size (in)	Orifice Size (mm)	Kv Flow Factor (m3/h)	Single Solenoid					Dual Solenoid				
				Operating Pressure Differential (bar)		Max. Fluid Temp. °C	Catalog Number	Const. Ref.	Operating Pressure Differential (bar)		Max. Fluid Temp. °C	Catalog Number	Const. Ref.
				Air-Inert Gas					Air-Inert Gas				
				Min.	Max.				Min.	Max.			
<b>3/2, 5/2, 5/3 VALVES, with NBR and PUR Seals</b>													
Aluminum 3/2	1/4	6	.7	2	10	60	8551G305 ⑦	21	2	10	60	8551G306 ⑦	21
Aluminum 5/2							8551G317 ⑦	22				8551G318 ⑦	22
Aluminum 5/3 Center Closed							-	22				8551G367 ⑦	22
Aluminum 5/3 Center Open							-	22				8551G368 ⑦	22
Brass 3/2							EF8551G307 ②⑦	21				EF8551G308 ②⑦⑧	21
Brass 5/2							EF8551G319 ②⑦⑧	22				EF8551G320 ②⑦	22
316L Stainless Steel 3/2							EV8551G313 ③⑥⑦⑧	21				EV8551G314 ③⑥⑦⑧	21
316L Stainless Steel 5/2							EV8551G321 ③⑥⑧	22				EV8551G322 ③⑥⑧	22
Aluminum 3/2	1/2	13	3.15	2	10	60	8553G305 ⑦	21	2	10	60	8553G306 ⑦	21
Aluminum 5/2							8553G317 ⑦	22				8553G318 ⑦	22
316L Stainless Steel 3/2							EV8553G313 ③⑥⑦⑧	21				EV8553G314 ③⑥⑦⑧	21
316L Stainless Steel 5/2							EV8553G321 ③⑥⑦⑧	22				EV8553G322 ③⑥⑦⑧	22

② Brass construction supplied standard with EF solenoid. ③ Stainless steel construction supplied standard with EV solenoid.  
 ⑥ Can be used for **dry** natural gas service with the EF or EV prefix. ⑦ Solenoid only approvals with EF of EV prefix, no approvals with general purpose coil (no prefix).  
 ⑧ ATEX/IECEx certified with prefix "EV".

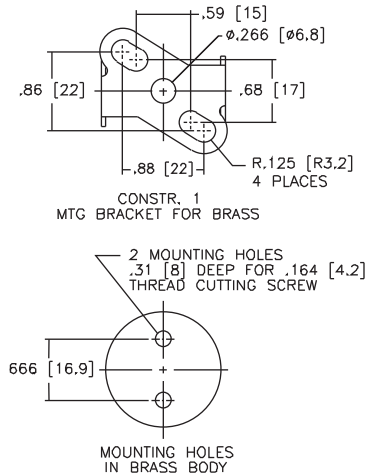
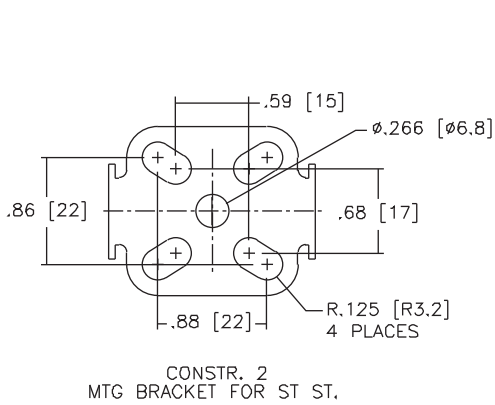
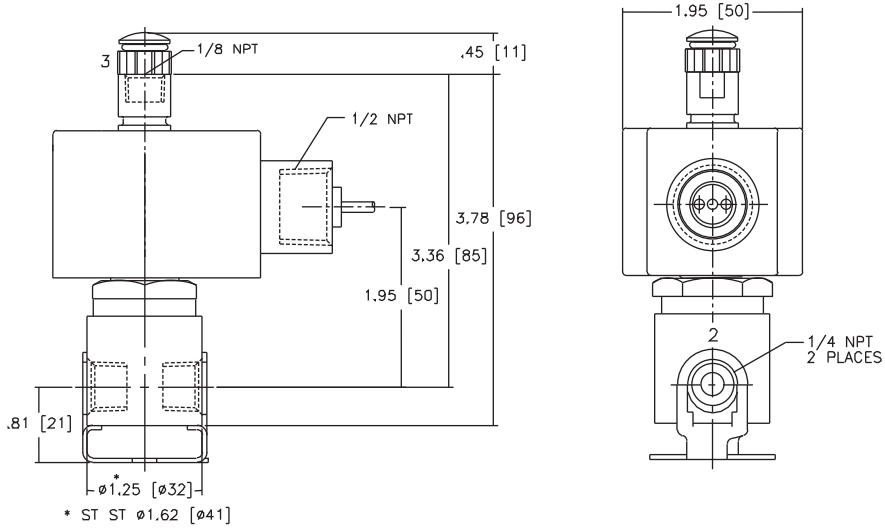
SPECIAL SERVICE  
PILOT

Body Material	Pipe Size (in)	Orifice Size (mm)	Kv Flow Factor (m3/h)	Single Solenoid					Dual Solenoid				
				Operating Pressure Differential (bar)		Max. Fluid Temp. °C	Catalog Number	Const. Ref.	Operating Pressure Differential (bar)		Max. Fluid Temp. °C	Catalog Number	Const. Ref.
				Air-Inert Gas					Air-Inert Gas				
				Min.	Max.				Min.	Max.			
<b>3/2, 5/2, 5/3 VALVES, with NBR and PUR Seals, NAMUR Mount</b>													
Aluminum 3/2, 5/2	1/4 ①	6	.7	2	10	60	8551G301 ①	23	2	10	60	8551G302 ①	23
Aluminum 5/3 Center Closed							-	-				8551G365 ⑦	24
Aluminum 5/3 Center Open							-	-				8551G366 ⑦	24
Brass 3/2, 5/2							EF8551G303 ②①⑦	23				EF8551G304 ②①⑦	23
316L Stainless Steel 3/2, 5/2	1/2	13	3.15	2	10	60	EV8551G309 ③⑥⑧	24	2	10	60	EV8551G310 ③⑥⑧	24
Aluminum 3/2, 5/2							8553G301 ⑦	24				8553G302 ⑦	24
316L Stainless Steel 3/2, 5/2							EV8553G309 ③⑥⑦⑧	24				EV8553G310 ③⑥⑦⑧	24

① 1/8" NPT exhaust for 1/4" aluminum and brass. ② Brass construction supplied standard with EF solenoid. ③ Stainless steel construction supplied standard with EV solenoid.  
 ⑥ Can be used for **dry** natural gas service with the EF or EV prefix. ⑦ Solenoid only approvals with EF of EV prefix, no approvals with general purpose coil (no prefix).  
 ⑧ ATEX/IECEx certified with prefix "EV".

Dimensions: inches (mm)

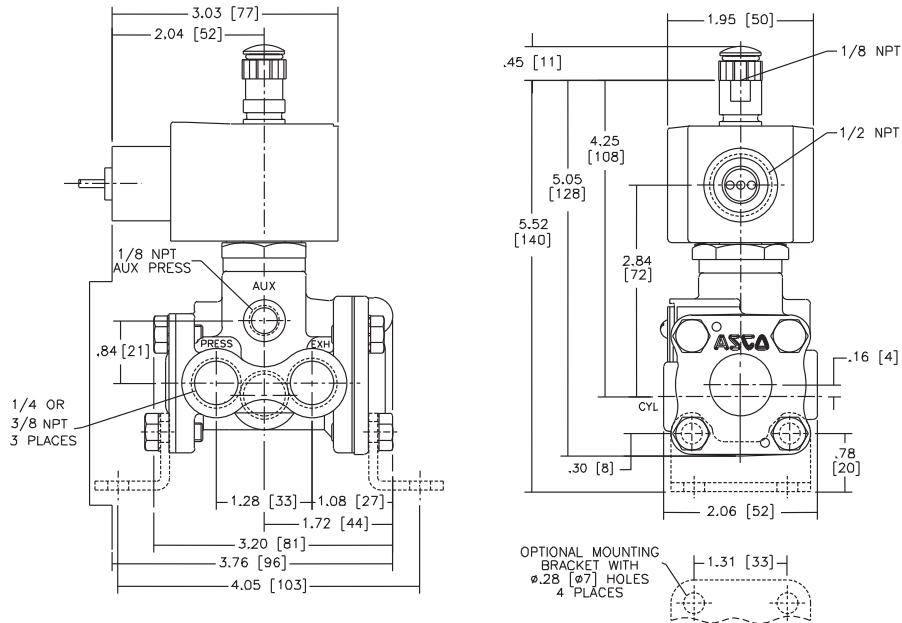
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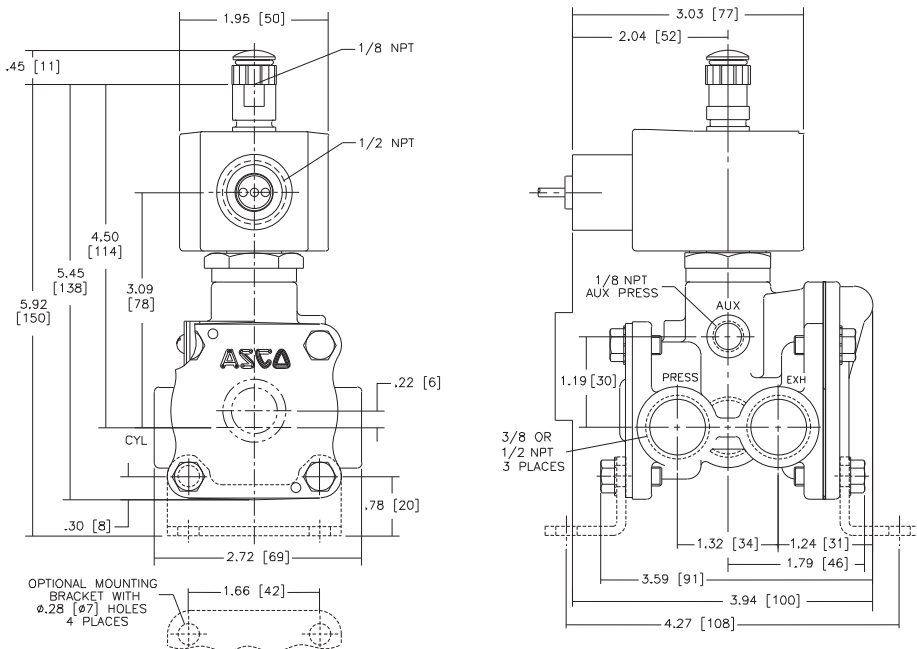
SPECIAL SERVICE  
PILOT

Dimensions: inches (mm)

Const. Ref. 3



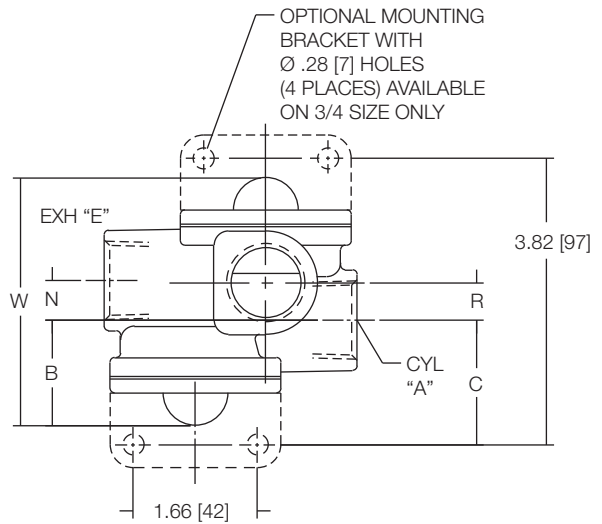
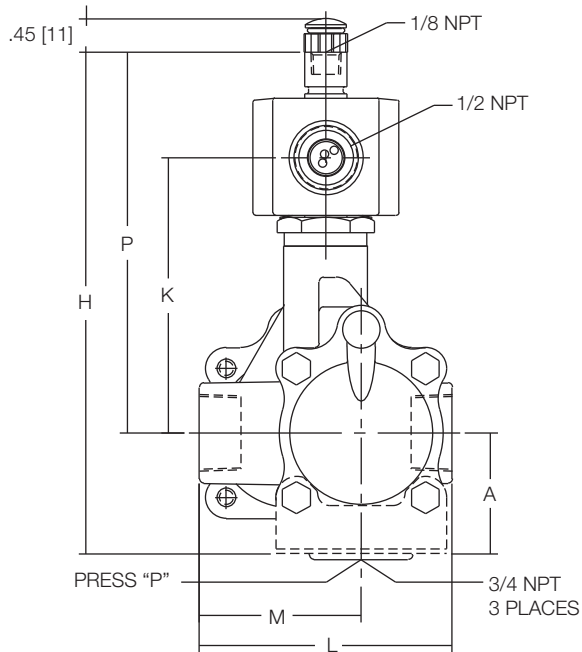
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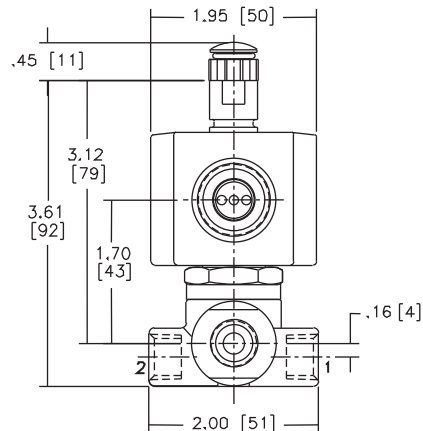
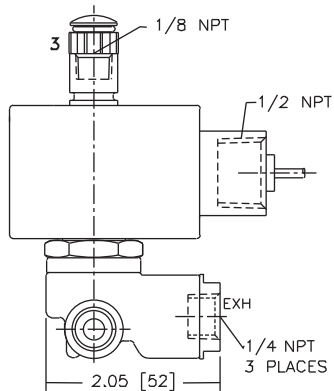
Dimensions: inches (mm)

Const. Ref.		A	B	C	H	K	L	M	N	P	R	W
4	in	1.61	1.41	1.66	6.78	3.68	3.38	2.16	.53	5.09	.50	3.31
	mm	41	36	42	172	93	86	55	13	129	13	84
5	in	X	1.78	X	7.40	3.93	4.44	2.81	.87	5.34	1.74	5.31
	mm	X	45	X	188	100	113	71	22	136	44	135

Const. Ref. 4, 5



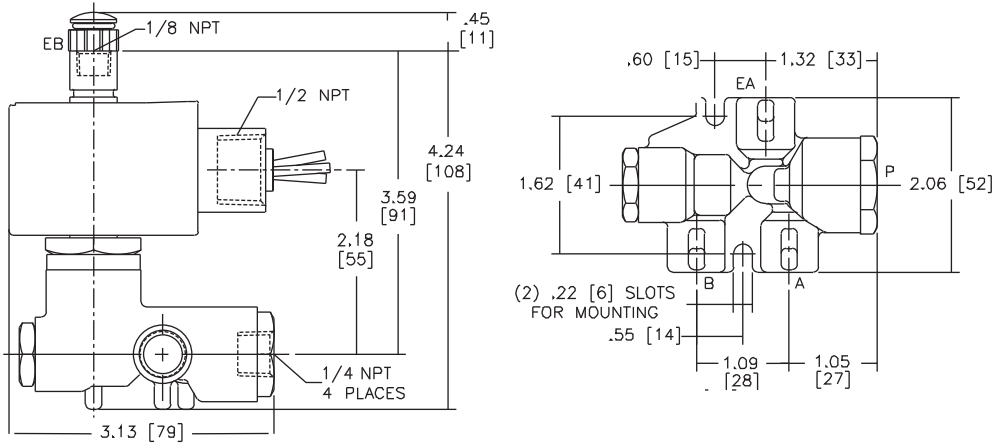
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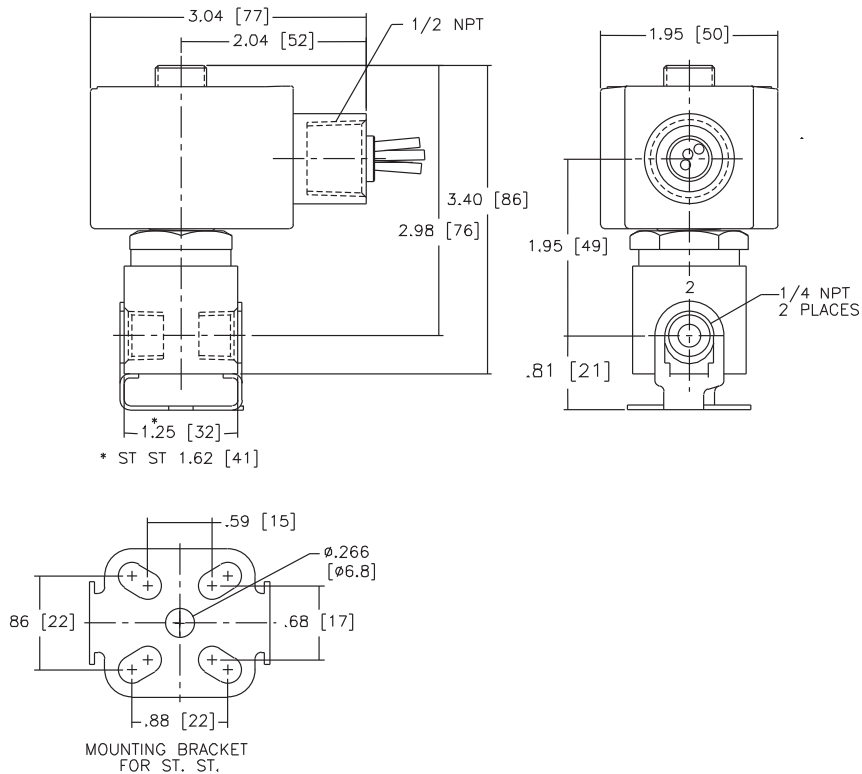
SPECIAL SERVICE  
PILOT

**Dimensions: inches (mm)**

**Const. Ref. 8**



**Const. Ref. 18**

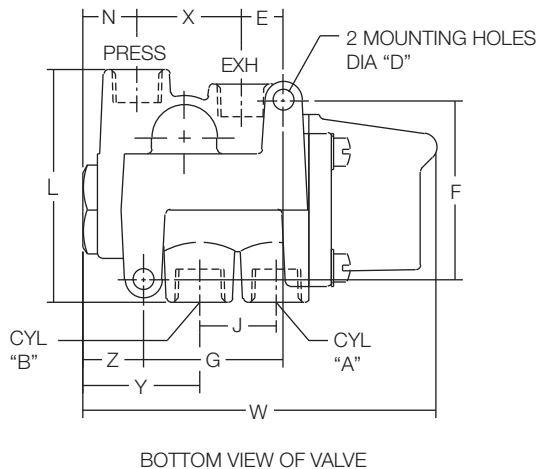
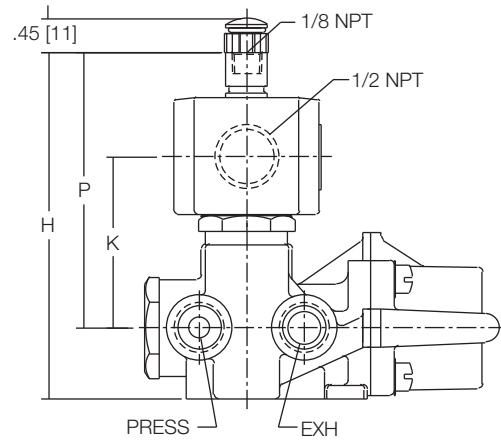
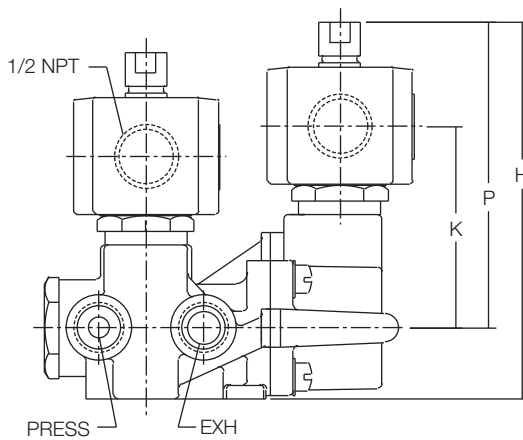


SPECIAL SERVICE  
PILOT

Dimensions: inches (mm)

Const. Ref.		Dia "D"	E	F	G	H	J	K	L	N	P	W	X	Y	Z	Exhaust Pipe Size
9	in	Ø .28	.56	2.41	1.88	4.67	1.03	2.30	3.12	.72	3.72	4.75	1.41	1.56	.81	3/8
	mm	7	14	61	48	119	26	58	79	18	95	121	36	40	21	
10	in	Ø .34	.76	3.12	2.62	4.89	1.50	2.11	3.18	.83	3.77	6.06	1.86	1.89	.83	1/2
	mm	9	16	79	67	118	38	70	81	21	90	154	48	49	21	
11	in	Ø .34	.76	3.12	2.62	4.65	1.50	2.11	3.18	.83	3.53	6.06	1.86	1.89	.83	1/2
	mm	9	35	97	99	138	53	54	116	40	99	210	54	67	30	
12	in	Ø .28	.56	2.41	1.88	5.06	1.03	2.71	3.12	.72	4.12	4.81	1.41	1.56	.81	3/8
	mm	7	14	61	48	129	26	69	79	18	105	122	36	40	21	
13	in	Ø .34	.78	3.12	2.62	5.27	1.50	2.49	3.19	.84	4.16	6.06	1.88	1.91	.84	1
	mm	9	16	79	67	134	38	63	81	21	106	154	48	49	21	
14	in	Ø .34	1.38	3.81	3.88	6.09	2.09	3.18	4.56	1.56	4.59	8.25	2.12	2.62	1.16	1
	mm	9	35	97	99	155	53	81	116	40	117	210	54	67	30	

Const. Ref. 9, 10, 11, 12, 13, 14

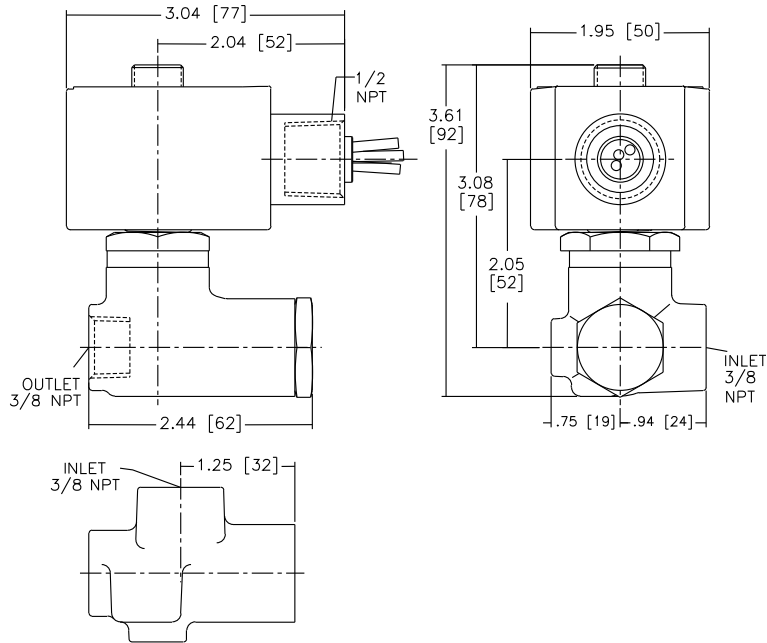


BOTTOM VIEW OF VALVE

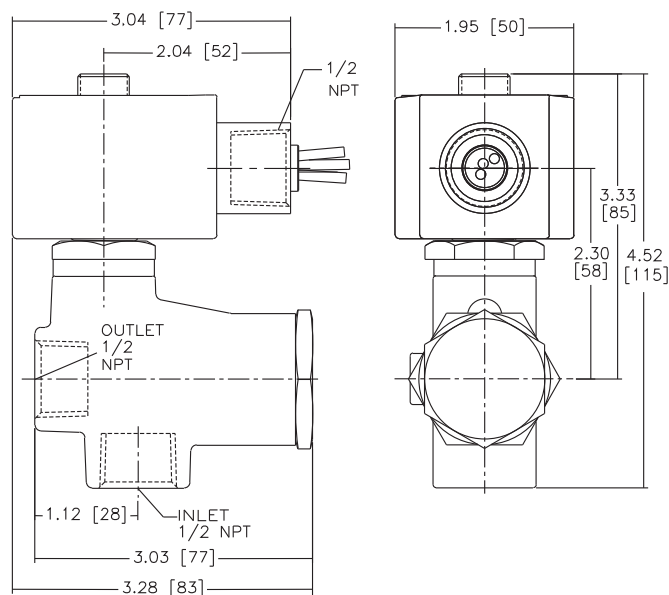
SPECIAL SERVICE  
PILOT

**Dimensions: inches (mm)**

**Const. Ref. 19**







**Const. Ref. 20**



Dimensions: inches (mm)





Series	8551	8553
NPT	1/4	1/2
L1 ①	5.12 (132)	6.00 (153)
L2 ①	6.73 (171)	7.80 (198)
H2	4.38 (111)	4.77 (121)
H1	1.10 (28)	1.58 (40)
W	1.77 (45)	2.85 (72)

① Manual override option MH adds .250" (6.4),  
MS option adds .468" (11.9) to each solenoid endcap.

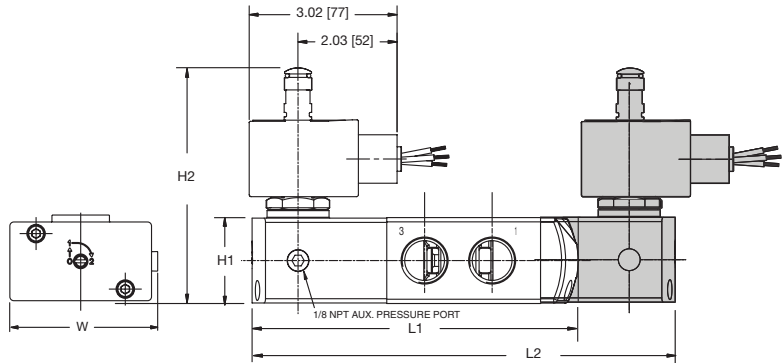
Optional Manual Operators		
Add Suffix		Description
MO		Push and turn to lock with flat head screwdriver slot
MI		Momentary push in with flat head screwdriver slot
MH		Momentary push in by hand
MS		Push and turn to lock by hand

Series	8551	8553
NPT	1/4	1/2
L1 ①	5.63 (144)	7.06 (180)
L2 ①	7.20 (183)	8.86 (225)
H2	4.38 (111)	4.77 (121)
H1	1.10 (28)	1.58 (40)
W	1.77 (45)	2.85 (72)

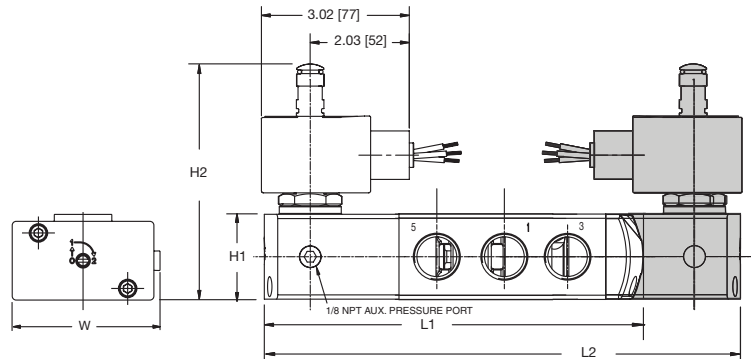
① Manual override option MH adds .250" (6.4),  
MS option adds .468" (11.9) to each solenoid endcap.

Optional Manual Operators		
Add Suffix		Description
MO		Push and turn to lock with flat head screwdriver slot
MI		Momentary push in with flat head screwdriver slot
MH		Momentary push in by hand
MS		Push and turn to lock by hand

Const. Ref. 21



Const. Ref. 22





## Dimensions: inches (mm)

Series	8551 (Aluminum, Brass)
NPT	1/4
L1 ①	4.96 (126)
L2 ①	6.49 (165)
H2	4.38 (111)
H1	1.57 (40)
W	1.77 (45)

① Manual override option MH adds .250" (6.4),  
MS option adds .468" (11.9) to each solenoid endcap.

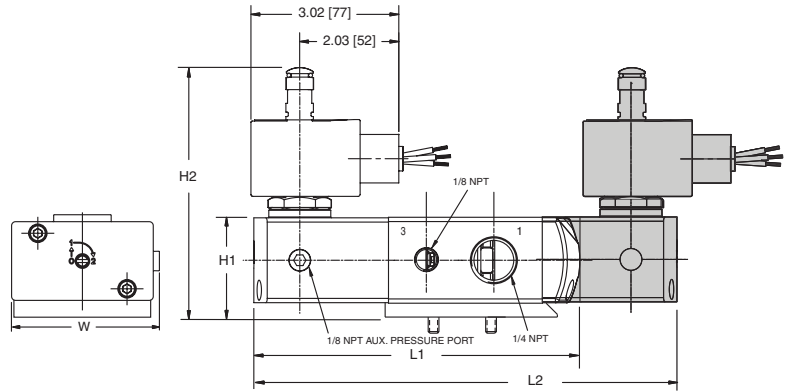
Optional Manual Operators		
Add Suffix		Description
MO		Push and turn to lock with flat head screwdriver slot
MI		Momentary push in with flat head screwdriver slot
MH		Momentary push in by hand
MS		Push and turn to lock by hand

Series	8551 (316L SS)	8551 (5/3)	8553
NPT	1/4	1/4	1/2
L1 ①	5.20 (132)	-	7.08 (180)
L2 ①	6.73 (171)	7.44 (189)	8.85 (225)
H2	4.38 (111)	4.38 (111)	4.77 (121)
H1	1.57 (40)	1.57 (40)	2.08 (53)
W	1.77 (45)	1.77 (45)	2.87 (73)

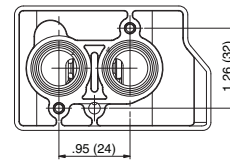
① Manual override option MH adds .250" (6.4),  
MS option adds .468" (11.9) to each solenoid endcap.

Optional Manual Operators		
Add Suffix		Description
MO		Push and turn to lock with flat head screwdriver slot
MI		Momentary push in with flat head screwdriver slot
MH		Momentary push in by hand
MS		Push and turn to lock by hand

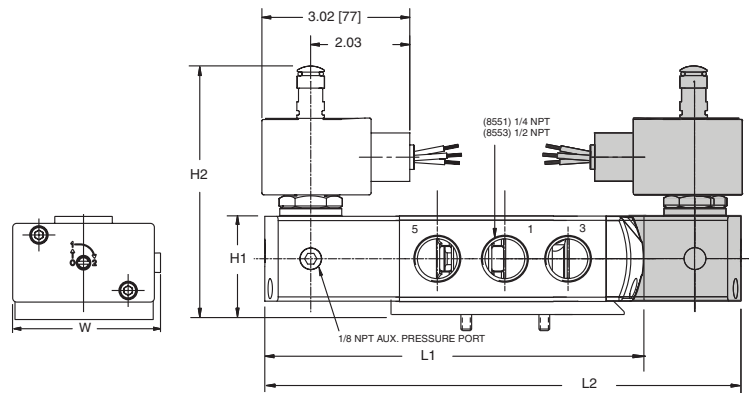
Const. Ref. 23



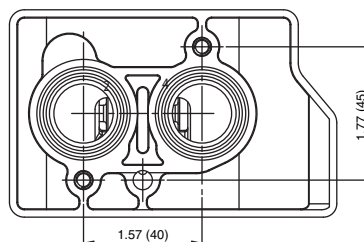
8551 NAMUR Footprint



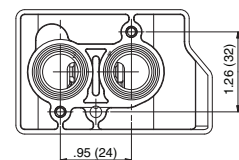
Const. Ref. 24



8553 NAMUR Footprint



8551 NAMUR Footprint



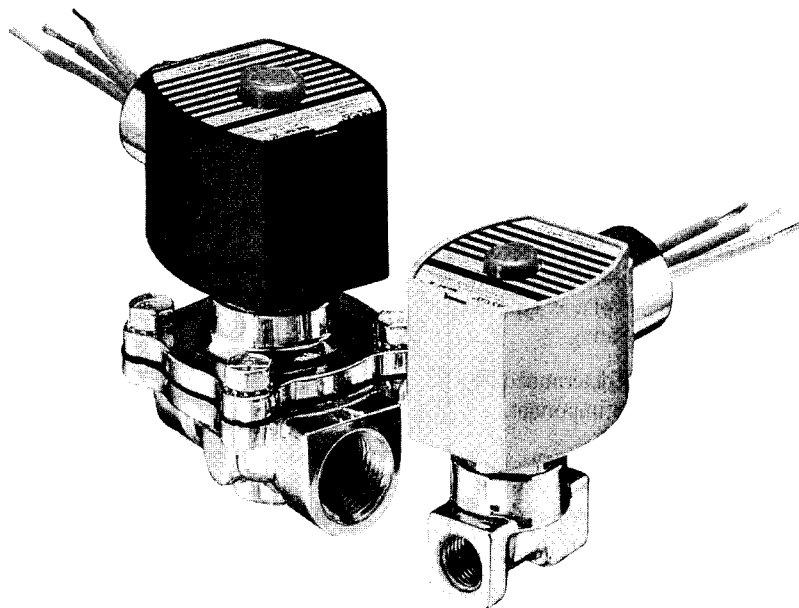


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**ASCO<sup>®</sup> Red-Hat<sup>®</sup> and Red-Hat II<sup>®</sup>**

# **Solenoid Valves**

**SELECTION  
INSTALLATION/MAINTENANCE  
TROUBLESHOOTING**



**ASCO<sup>®</sup>**

**ASCO Valve Canada**

# HOW TO SELECT ASCO® Red-Hat and Red-Hat II Solenoid Valves

ASCO Red-Hat and Red Hat II<sup>①</sup> 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.

<sup>①</sup> 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

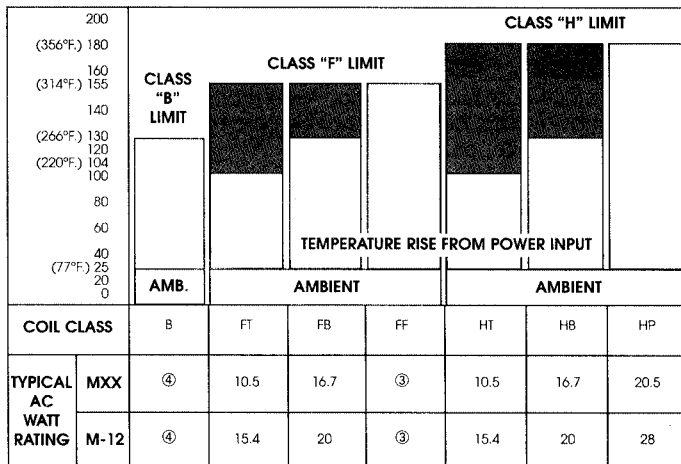
Power consumption can be determined from the ratings shown for each valve series shown in the ASCO catalogue. For AC valves, the watts, volt-ampere "inrush" (the high, momentary surge occurring at coil energization) and volt-ampere "holding" (the continuous draw following inrush) are given.

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.)



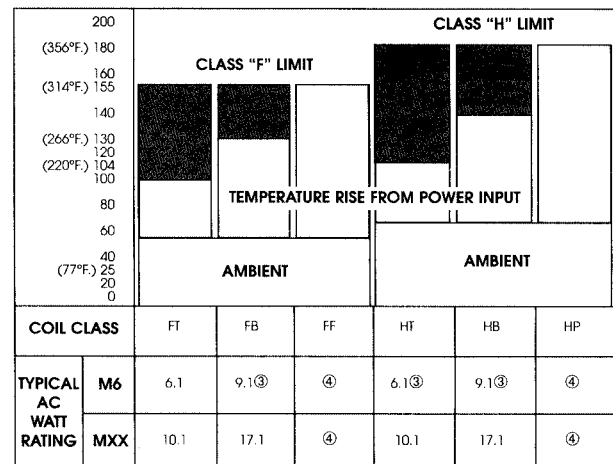
#### INDUSTRIAL TEMPERATURE LIMITATIONS<sup>①</sup> AND THERMAL CHARACTERISTICS OF ASCO RED-HAT SOLENOIDS AND COILS

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.<sup>⑤</sup>

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.

#### FINAL TEMP. (°C.)



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dividing the volt-ampere rating by the voltage:

$$\frac{\text{Inrush Amps}}{\text{voltage}} = \text{volt-amp inrush}$$

$$\frac{\text{Holding Amps}}{\text{voltage}} = \text{volt-amp holding}$$

DC valves have no inrush current. The amp rating can be determined by dividing the voltage into the DC watt rating:

$$\frac{\text{Amps}}{\text{voltage}} = \text{watts (DC)}$$

#### Solenoid Enclosures

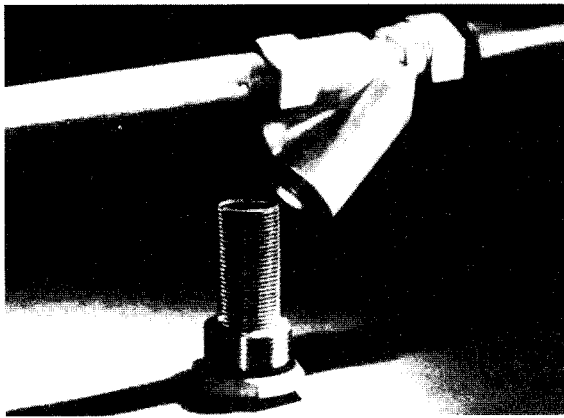
ASCO Red-Hat II solenoid enclosures have one-piece molded epoxy construction with an integral 1/2" N.P.T. conduit hub. The epoxy encapsulation serves as the enclosure. The magnetic frame is molded into the coil.

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.

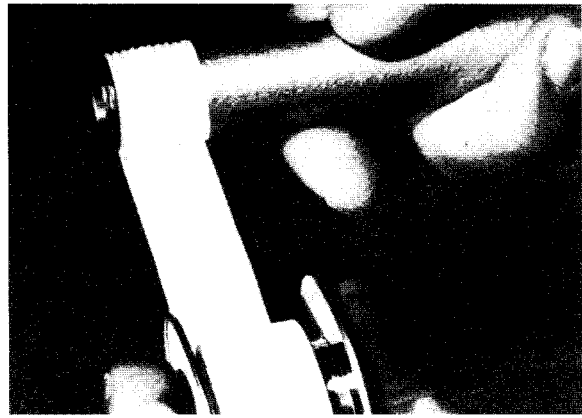
For optional electrical features such as junction boxes, spade and screw terminal coils, and DIN-type connections, consult ASCO catalogue.

#### 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.

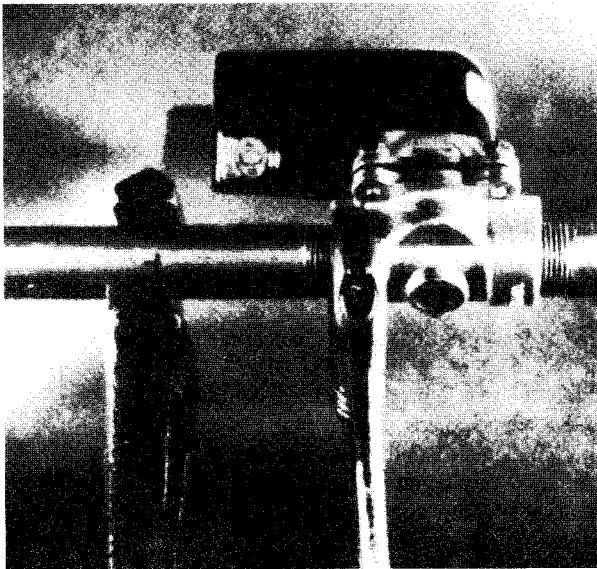
A considerable amount of foreign matter can collect in a system,

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.

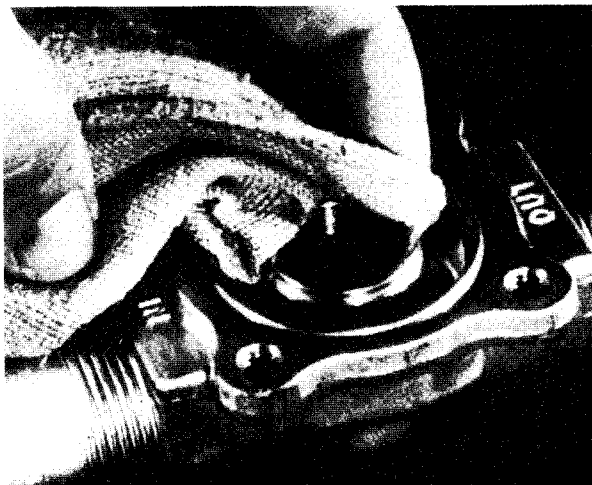
### Maintenance Procedures

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.

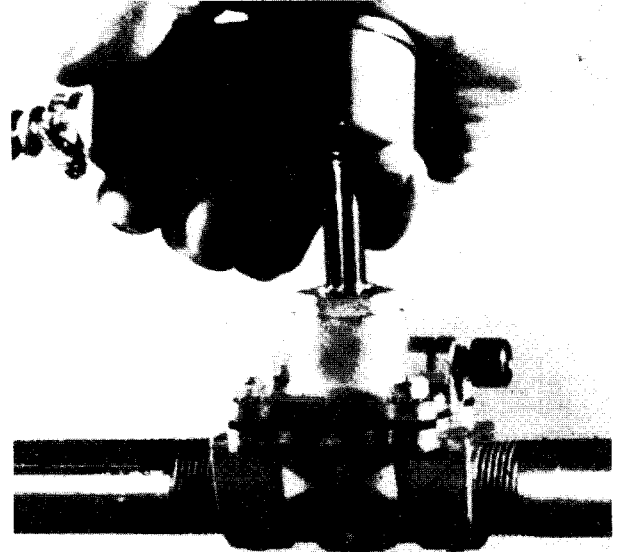
Before disassembling the valve, it's always best to have on hand those parts subject to wear which are most likely to require replacement. ASCO offers rebuild kits containing all the internal parts needed to restore the valve to its like-new condition.

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.

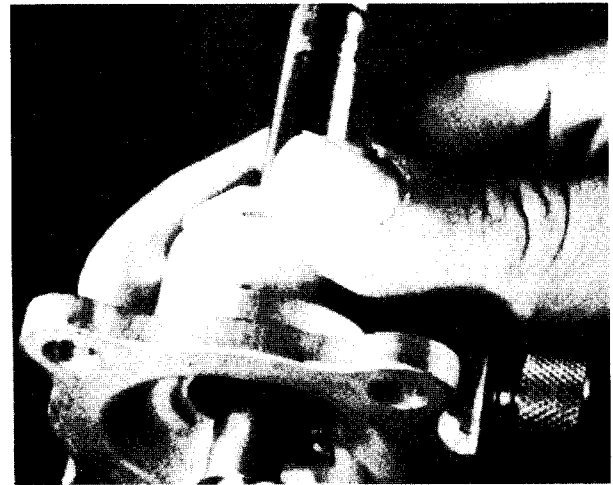
### Maintenance Tips

#### 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 plugnut 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 plugnut face
- Worn core or plugnut 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.

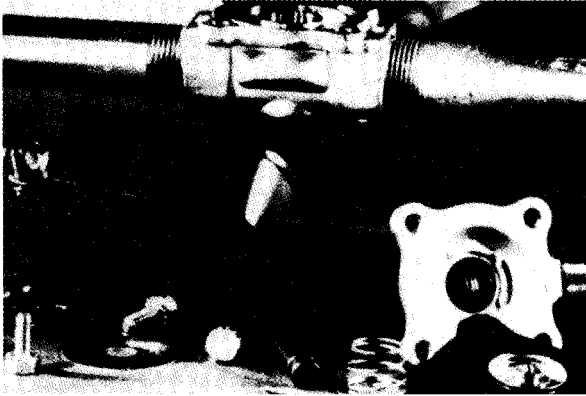
Pilot-activated 4 way valves normally require full-size piping for pressure inlet and exhaust. In some of these valves, restrictive speed control devices should be installed in the cylinder connections.

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.

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:

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- 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.

#### 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.
Valve will not close or shift when valve circuit is de-energized (direct-acting valve)	Plugged or restricted pilot orifice	Clean valve and pilot orifice.
	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	
Valve will not close or shift when valve circuit is de-energized (pilot-operated valve)	Damaged spring	Replace with new spring. Never elongate or shorten spring.
	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.
Wire drawing	Insufficient pressure drop across the valve	Valve might be oversized; replace valve with one having a smaller orifice. Increase pressure, if possible.
	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 *	Replace valve body or install new valve; install suitable strainer close to inlet of valve.	
	Overtoltage	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-Hat 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.



# **ASCO Valve Canada** a division of Emerson Electric Canada Limited

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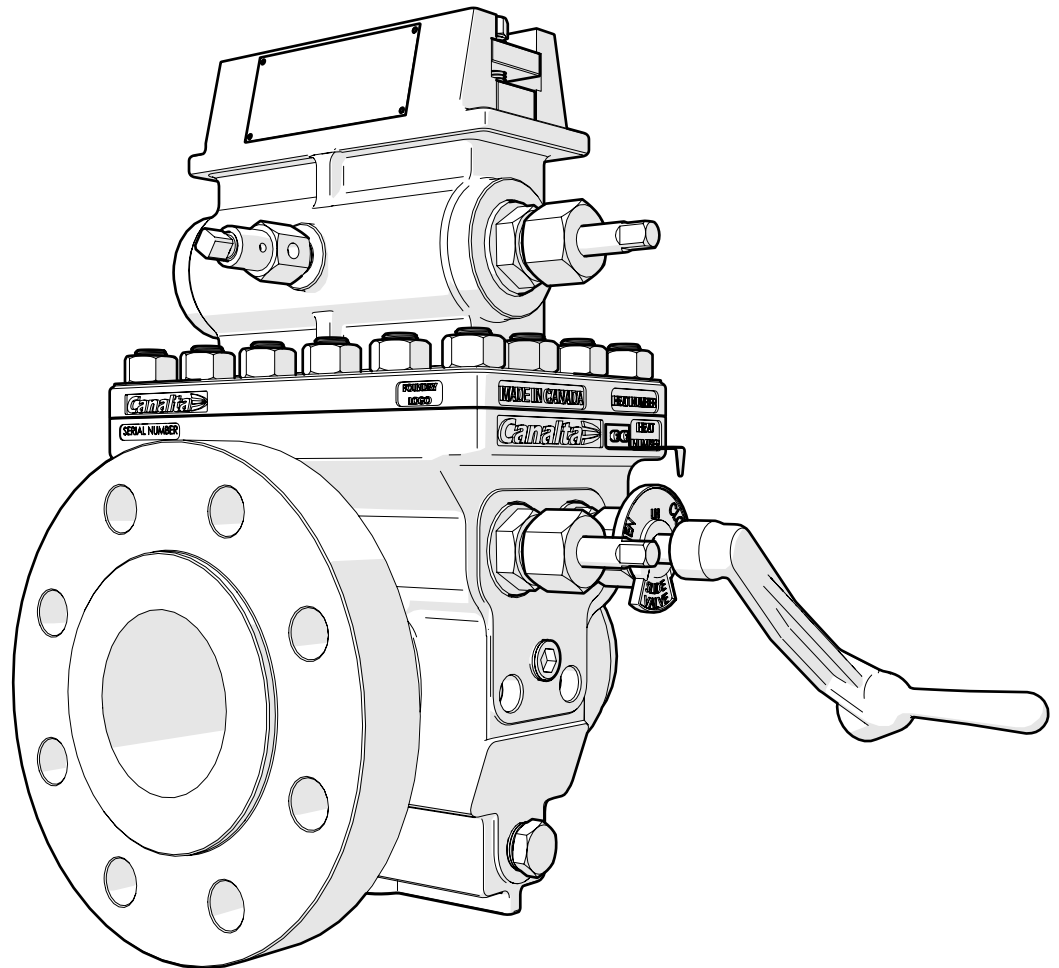
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**CAT.: #SIMT**  
SS-Printed in Canada  
1M-02-99

# **Canalta**

**Flow Measurement**

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## **OPERATIONS AND MAINTENANCE GUIDE**

**FOR DUAL CHAMBER ORIFICE FITTINGS**

Call Us Toll Free: 1-855-CANALTA  
An ISO 9001:2008 registered company

Phone: (+1) 403.342.4494  
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## WARNINGS



**WARNING: PRESSURIZED UNIT.**

Ensure all operating staff are trained in the safe operation of this and all other pressurized equipment. SAFETY FIRST.



Orifice fittings and their components can present both heavy lifting and tip over hazards. Workers should wear suitable PPE at all times and have strategies in place for safely lifting, moving and storing orifice fittings and their components.



The soft seat valve seal design *does not* require lubrication through the grease port. Attempting to lubricate a Canalta DC Orifice fitting equipped with a soft seat slide valve will cause the inner O-ring seal to be ejected from the dovetail groove resulting in valve failure.

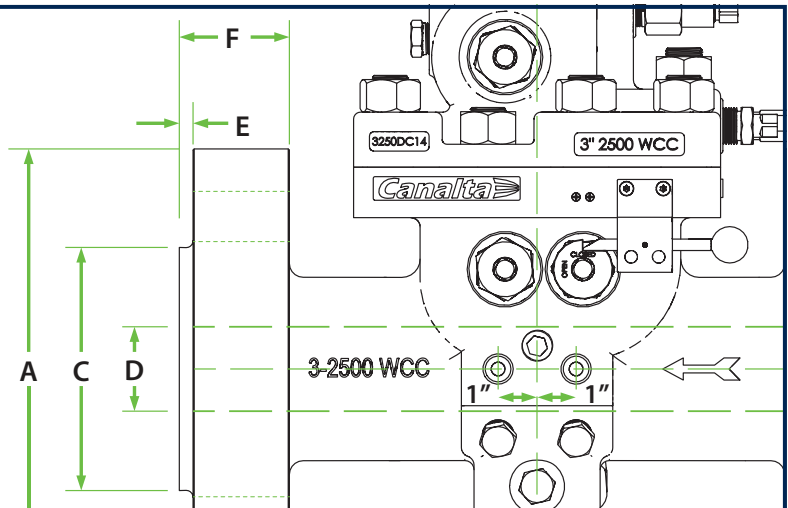
## CHANGE OF OWNERSHIP

By purchasing meters/meter runs from Canalta, a client would have entered into a binding contract. At the point of delivery/receiving of goods, the ownership of the purchased goods is then transferred to the client.

It is the responsibility of the client to ensure that any practices carried out after transfer of ownership are to be in compliance with manufacturing codes, standards and governing statutory legislation. Moreover, any activities need to be approved by the relevant Notified Bodies where applicable.

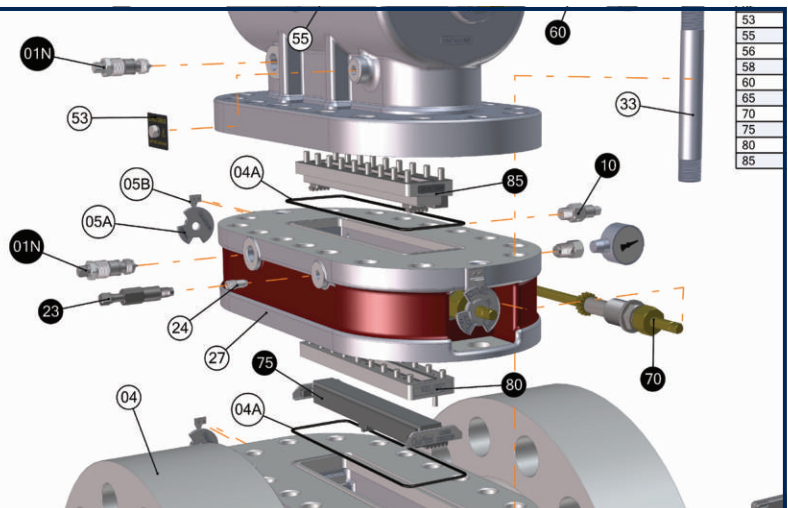
Complete dimensions tables for all of our orifice fitting models are available by contacting your nearest Canalta Flow Measurement sales representative.

Find a list of our offices and global distribution partners at [www.canaltaflow.com/global](http://www.canaltaflow.com/global)



Looking for general assembly diagrams? Contact your nearest Canalta Flow Measurement sales representative to get all of the technical documents you need.

Find a list of our offices and global distribution partners at [www.canaltaflow.com/global](http://www.canaltaflow.com/global)



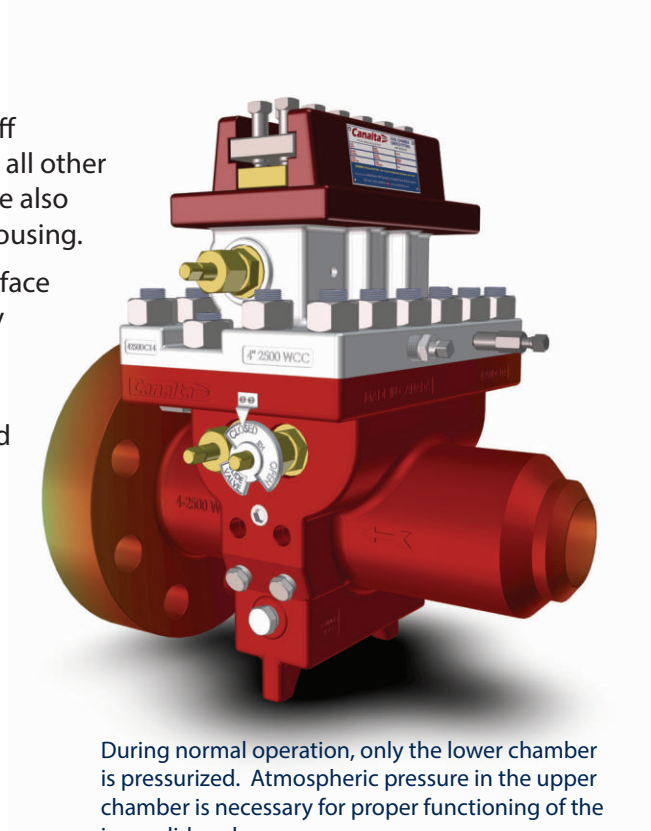
Canalta supplies a complete lineup of quality orifice fitting replacement parts and accessories - many of them compatible with other industry leading brands.

Find a list of our offices and global distribution partners at [www.canaltaflow.com/global](http://www.canaltaflow.com/global)



## GENERAL OPERATING NOTES

- It is the responsibility of the end user to ensure all operating staff are competent and properly trained in the operation of this and all other pressurized equipment. The following operating instructions are also given on the operating plate attached to each flow meter top housing.
- It is the responsibility of the end user to assess the expected surface temperature of the unit while in service, and to take the necessary precautions to avoid operator injury.
- It is the responsibility of the end user to account for all vented process fluids, and to develop the necessary procedures to avoid operator injury and environmental damage.



During normal operation, only the lower chamber is pressurized. Atmospheric pressure in the upper chamber is necessary for proper functioning of the inner slide valve.

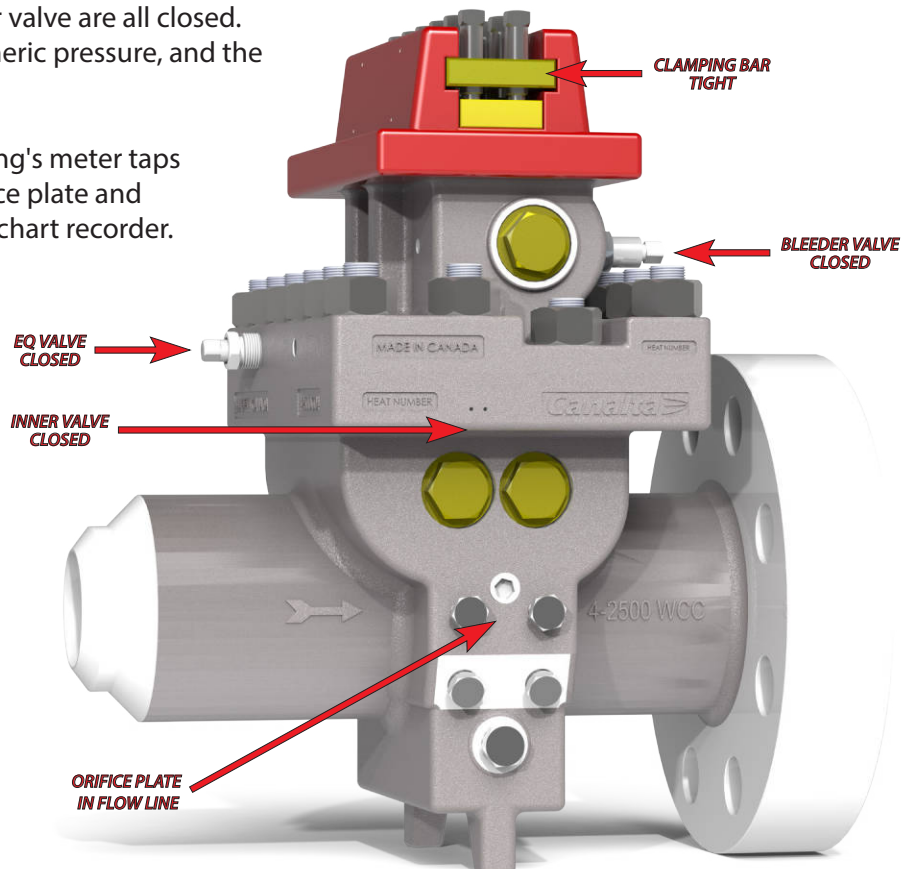
## NORMAL OPERATION

The Canalta Dual Chamber Orifice Fitting allows for accurate placement of an orifice plate in the flow line, along with easy removal and replacement, without interrupting the flow or dismantling the pipeline. Flow of the gas or liquid through the orifice plate creates the differential pressure which is measured and used for the calculation of the flow rate through the pipeline.

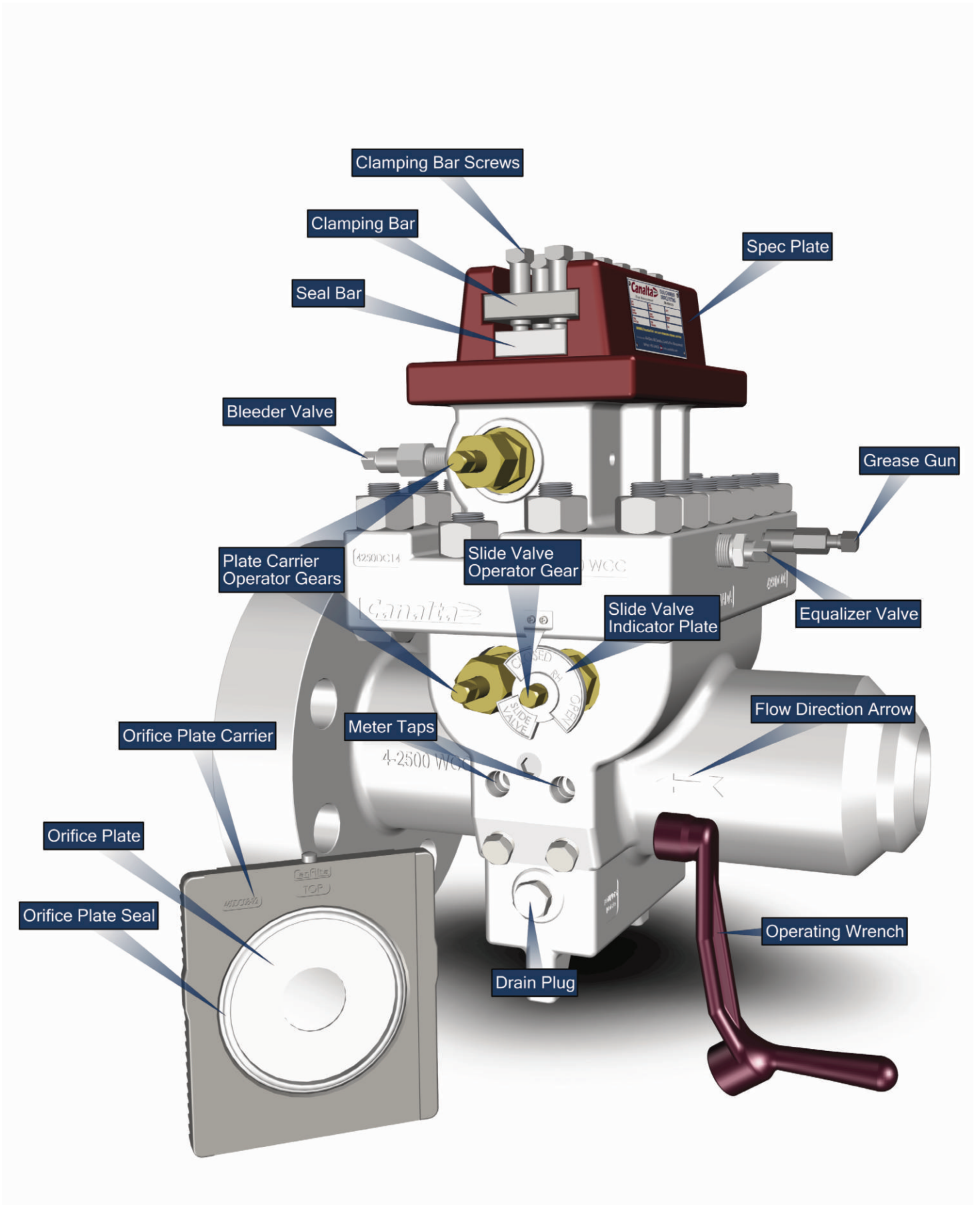
The unit is in normal metering status when the plate carrier and orifice plate are in the lower chamber, concentric to the flow line, and the inner slide valve, equalizer valve and bleeder valve are all closed. The upper chamber of the unit is at atmospheric pressure, and the clamping bar at the top of the unit is tight.

Pressure sensors installed in the lower housing's meter taps read the differential pressure across the orifice plate and transmit the readings to a flow computer or chart recorder.

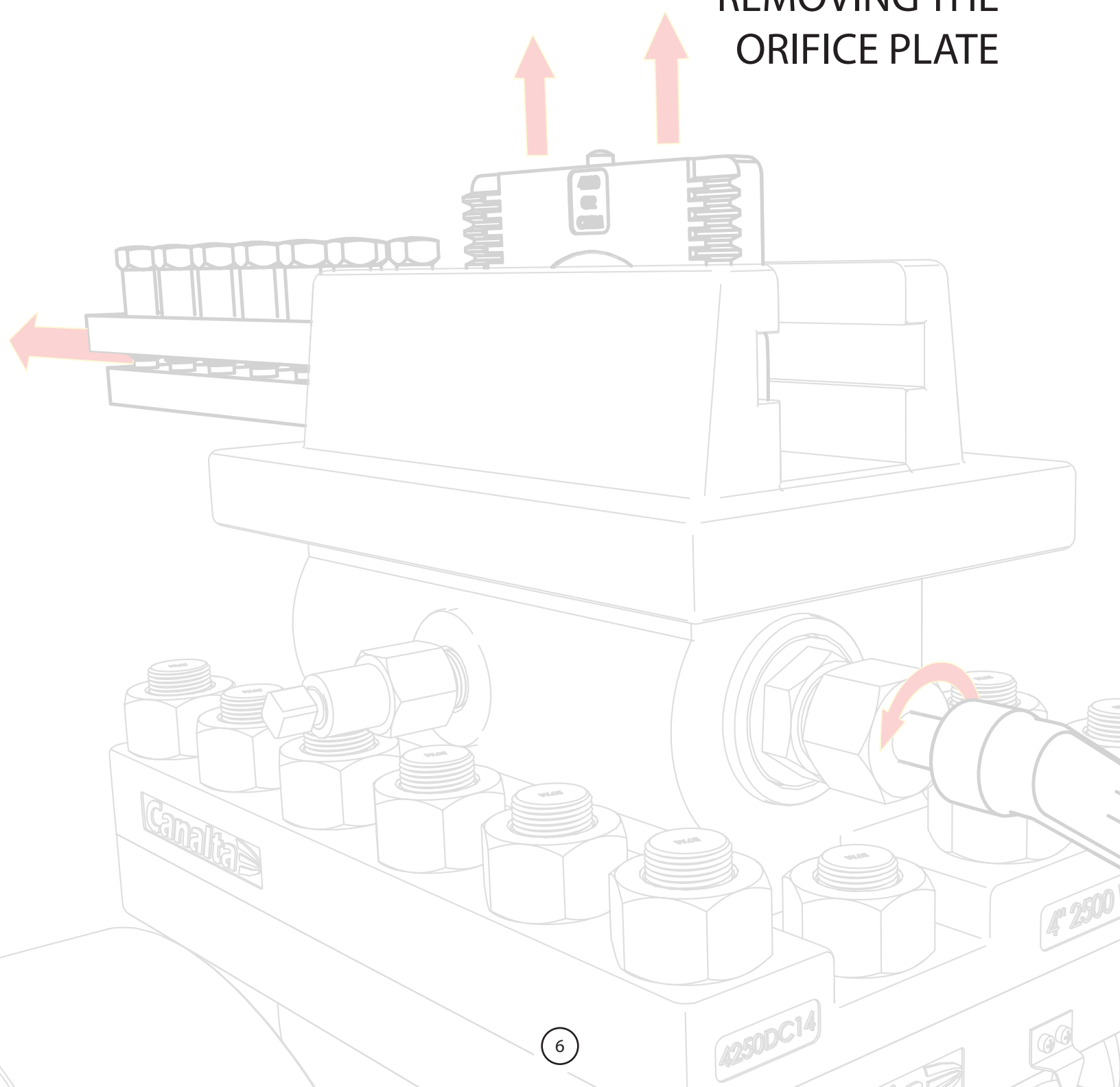
Orifice plate condition is critical to accurate metering. The orifice plate must be removed and inspected for damage, general wear and particulate build-up regularly. Prior to beginning the orifice plate removal procedure, the operator must confirm that the clamping bar is tight and that the bleeder valve is fully closed.



# KEY OPERATING PARTS AT A GLANCE



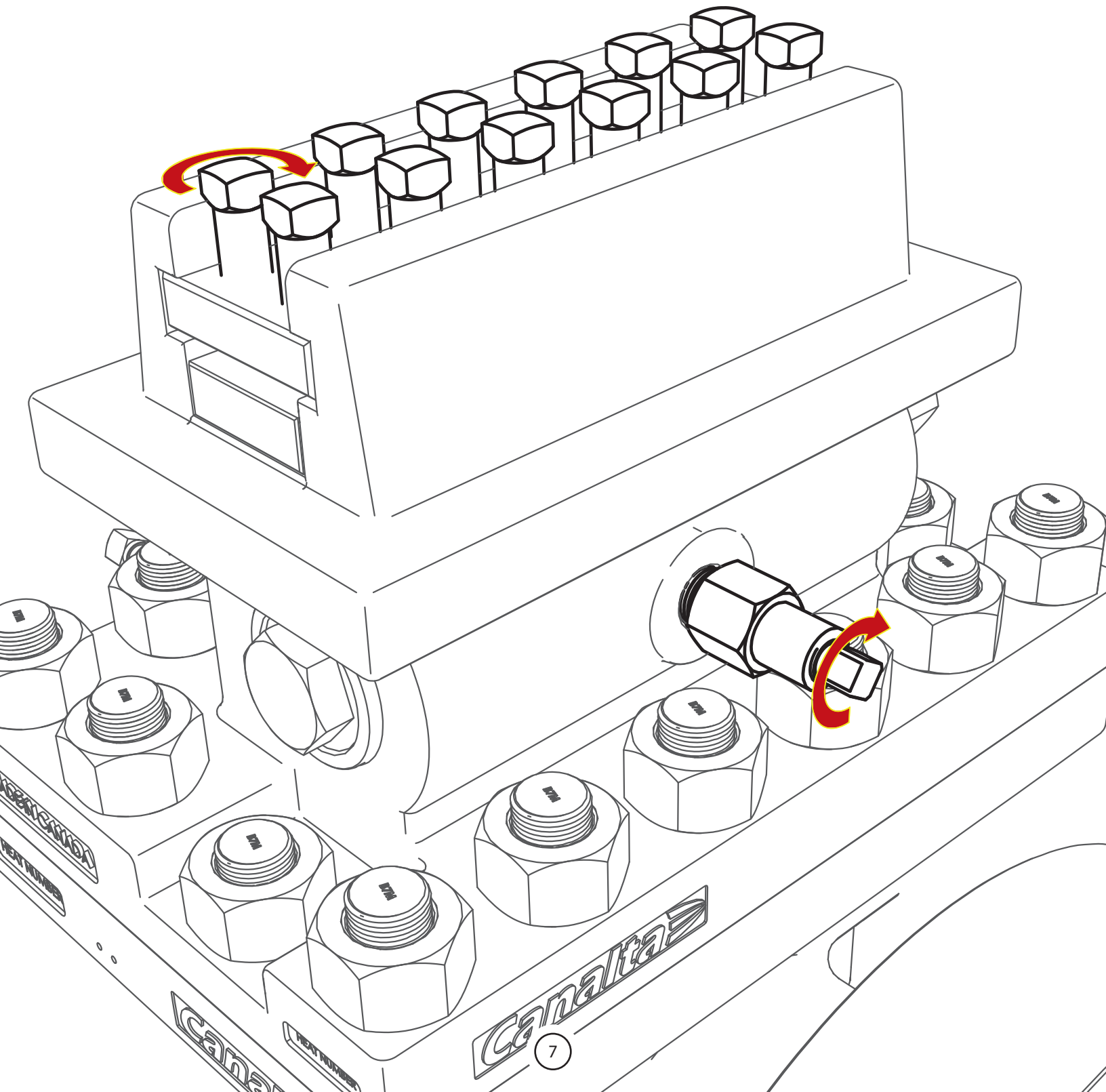
# REMOVING THE ORIFICE PLATE



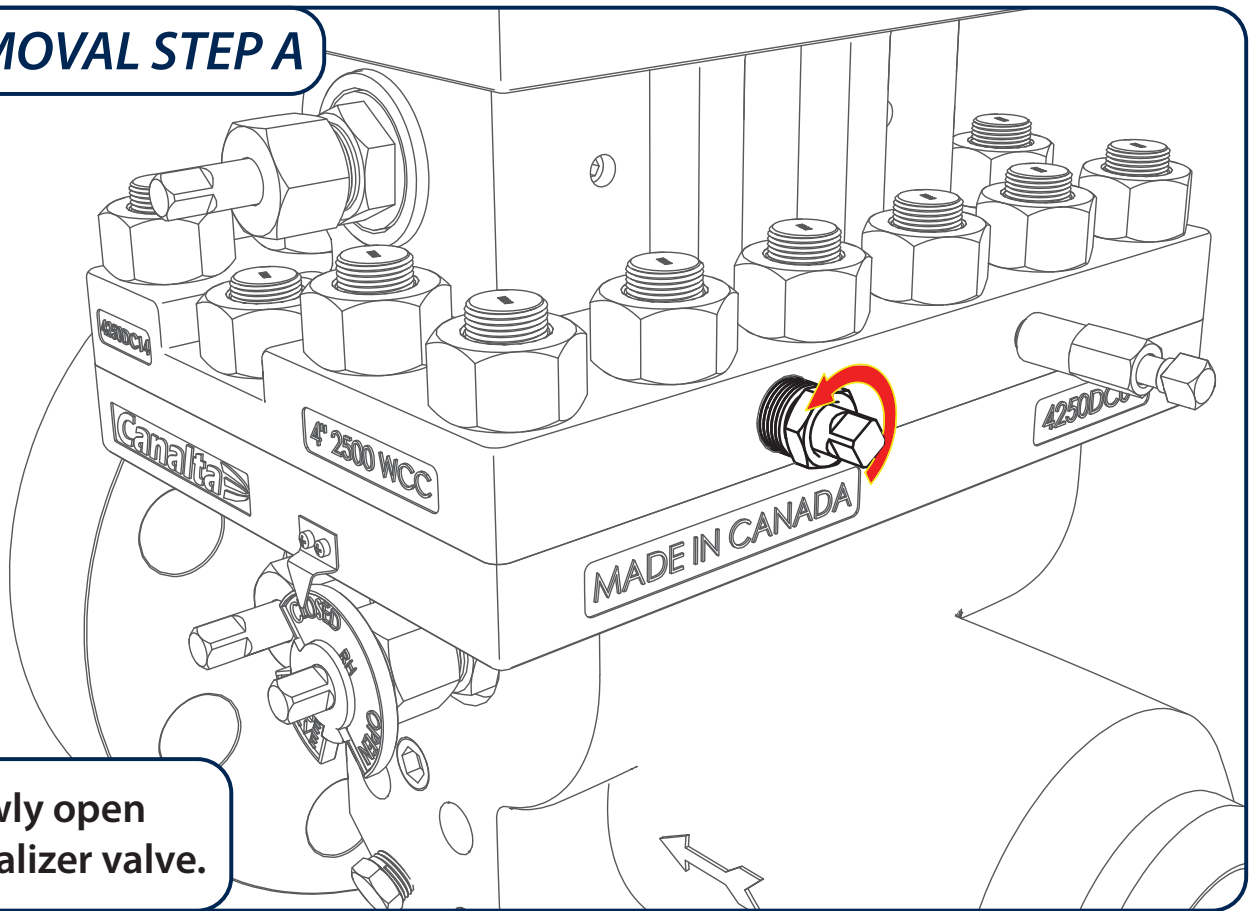




Ensure the bleeder valve is closed and clamping bar tight before beginning.

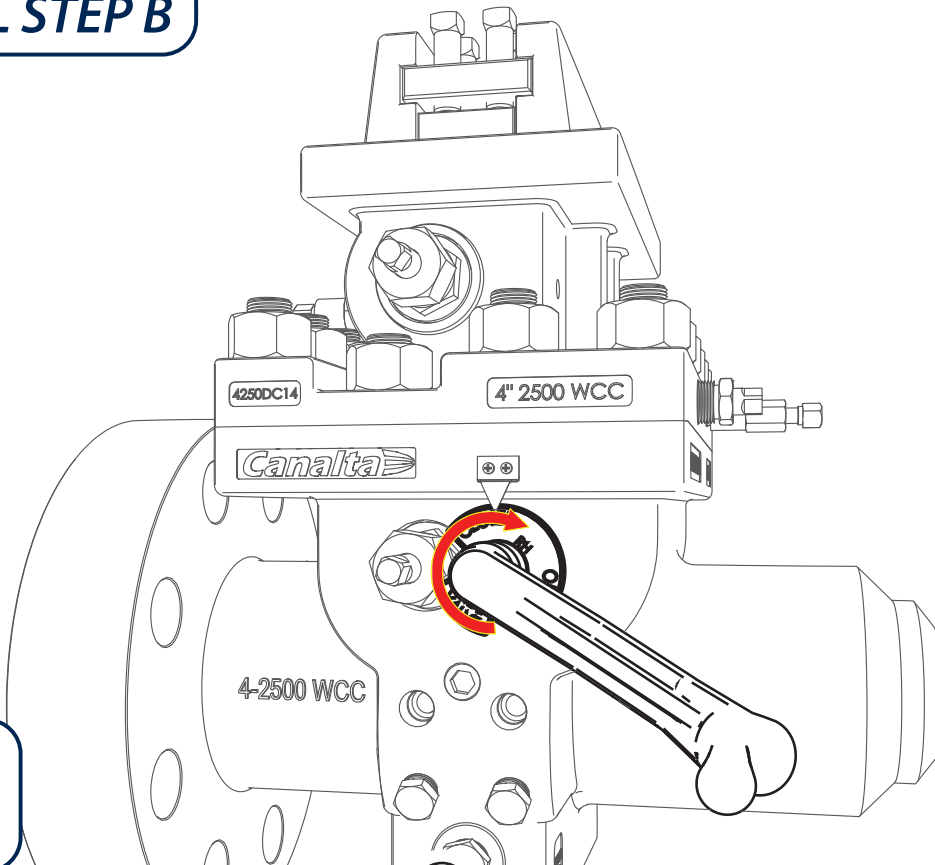


## REMOVAL STEP A



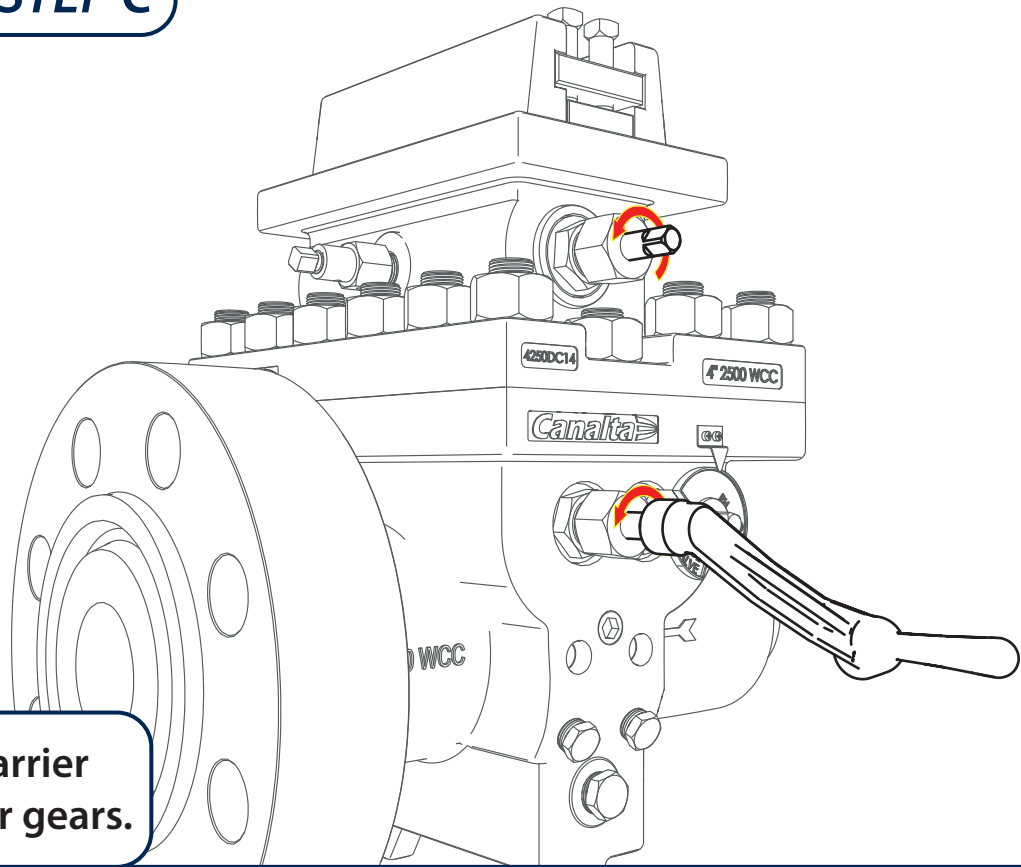
Slowly open  
equalizer valve.

## REMOVAL STEP B



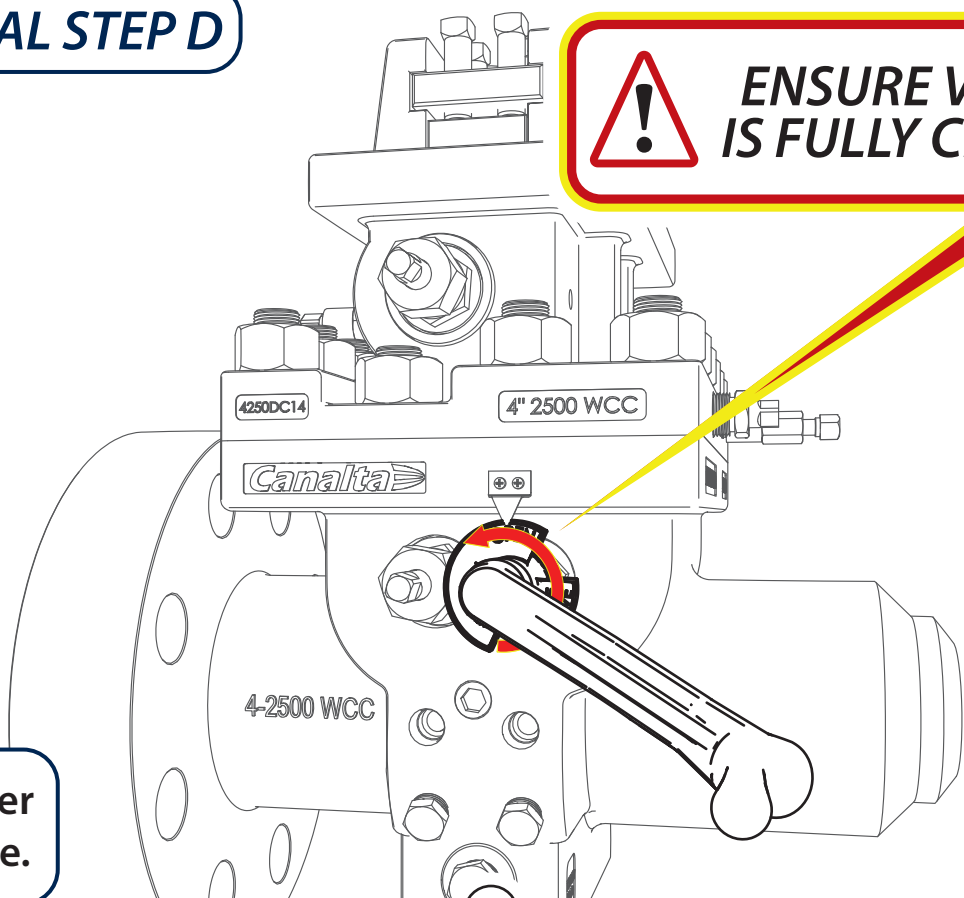
Open inner  
slide valve.

## REMOVAL STEP C



Raise plate carrier  
with operator gears.

## REMOVAL STEP D



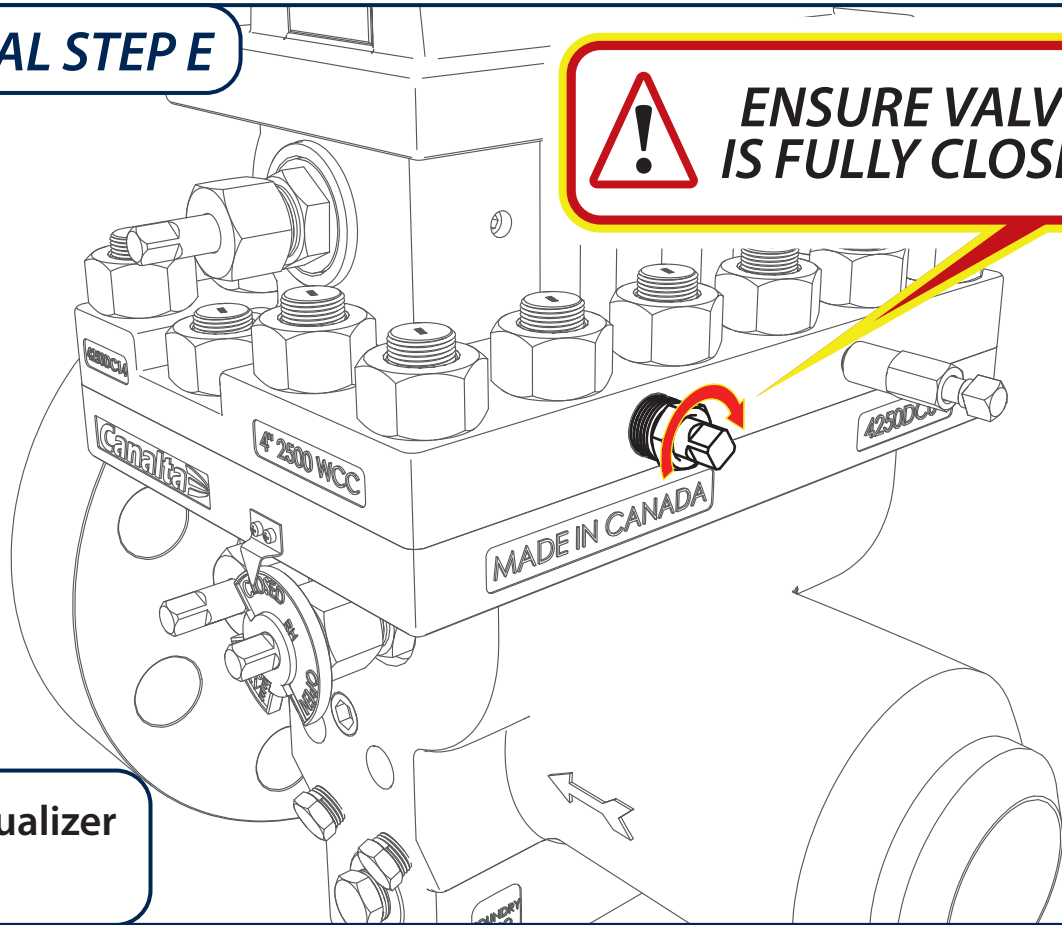
**ENSURE VALVE  
IS FULLY CLOSED**

Close inner  
slide valve.

## REMOVAL STEP E

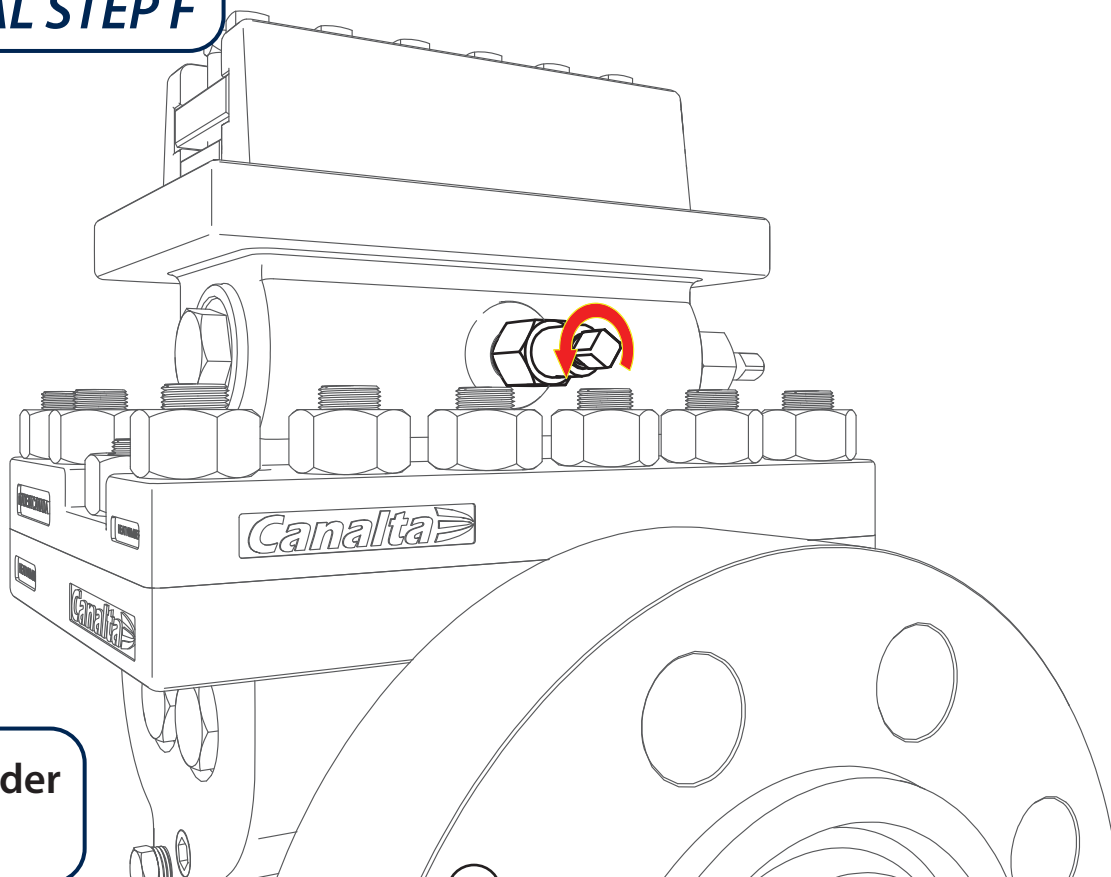


**ENSURE VALVE  
IS FULLY CLOSED**



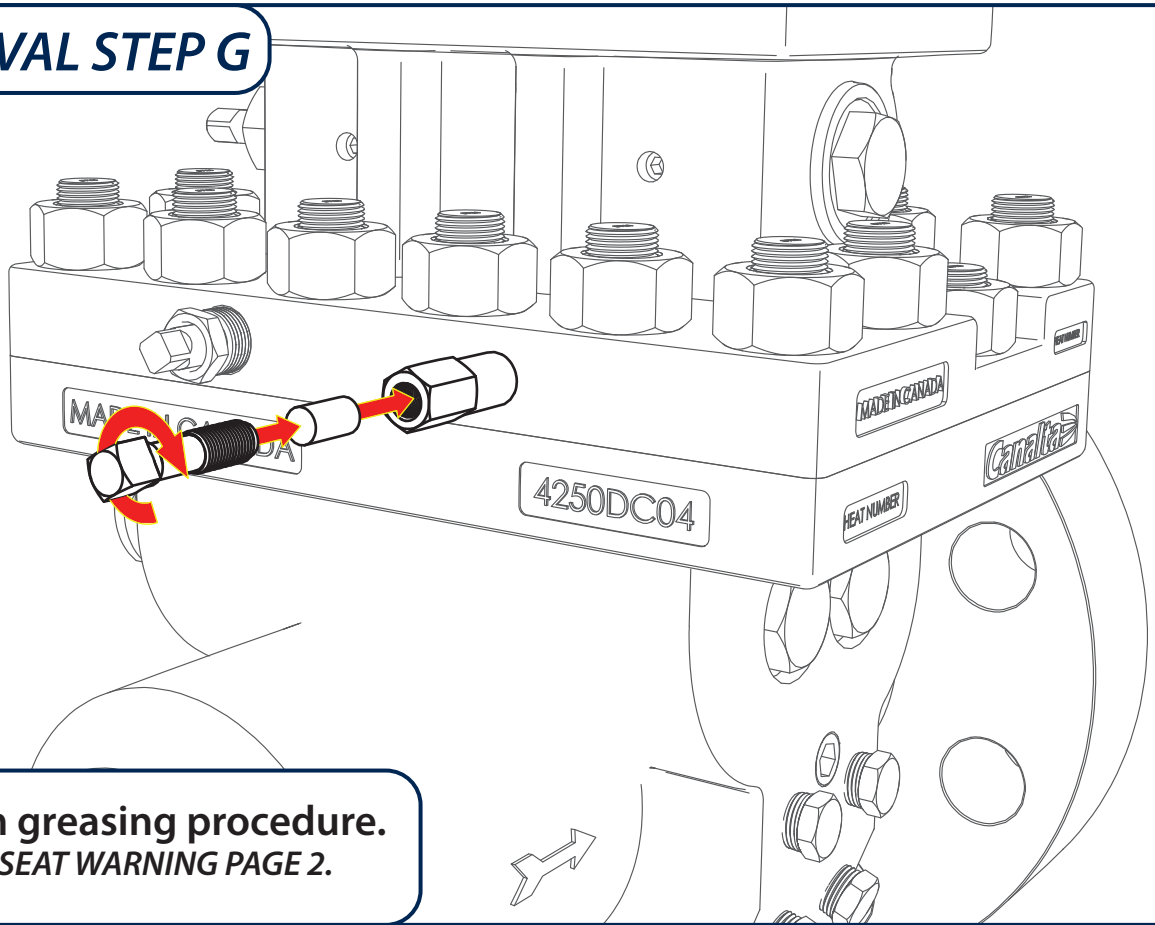
**Close equalizer  
valve.**

## REMOVAL STEP F



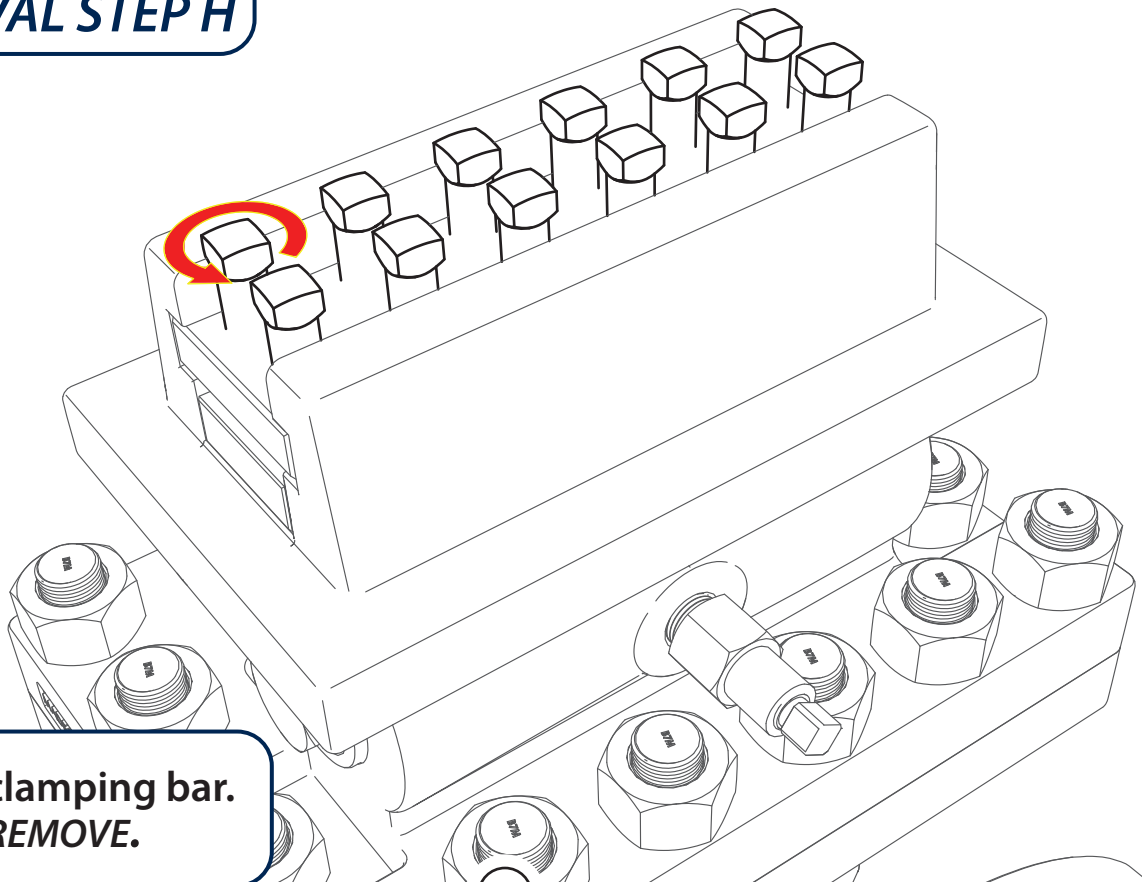
**Open bleeder  
valve.**

## REMOVAL STEP G



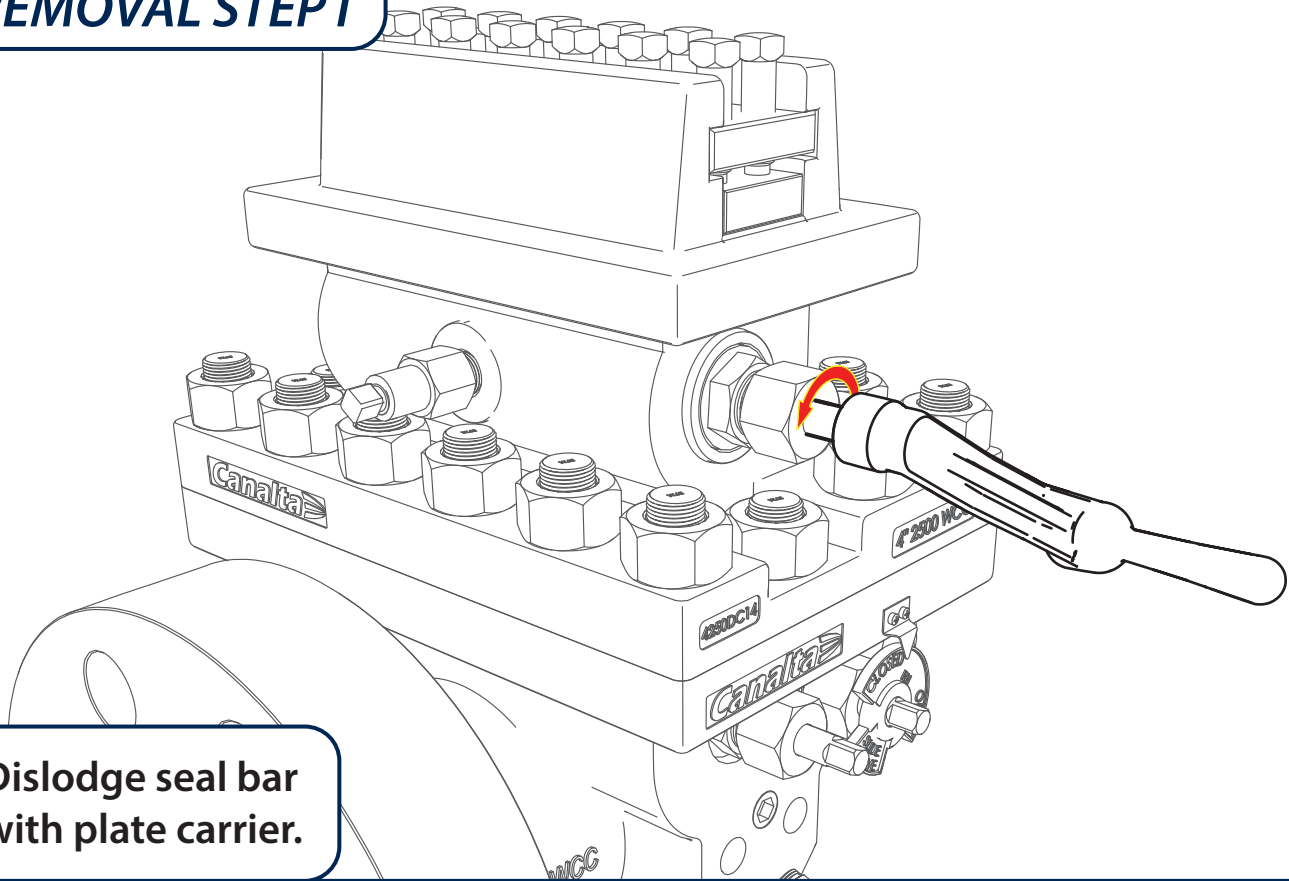
**Perform greasing procedure.**  
*SEE SOFT SEAT WARNING PAGE 2.*

## REMOVAL STEP H



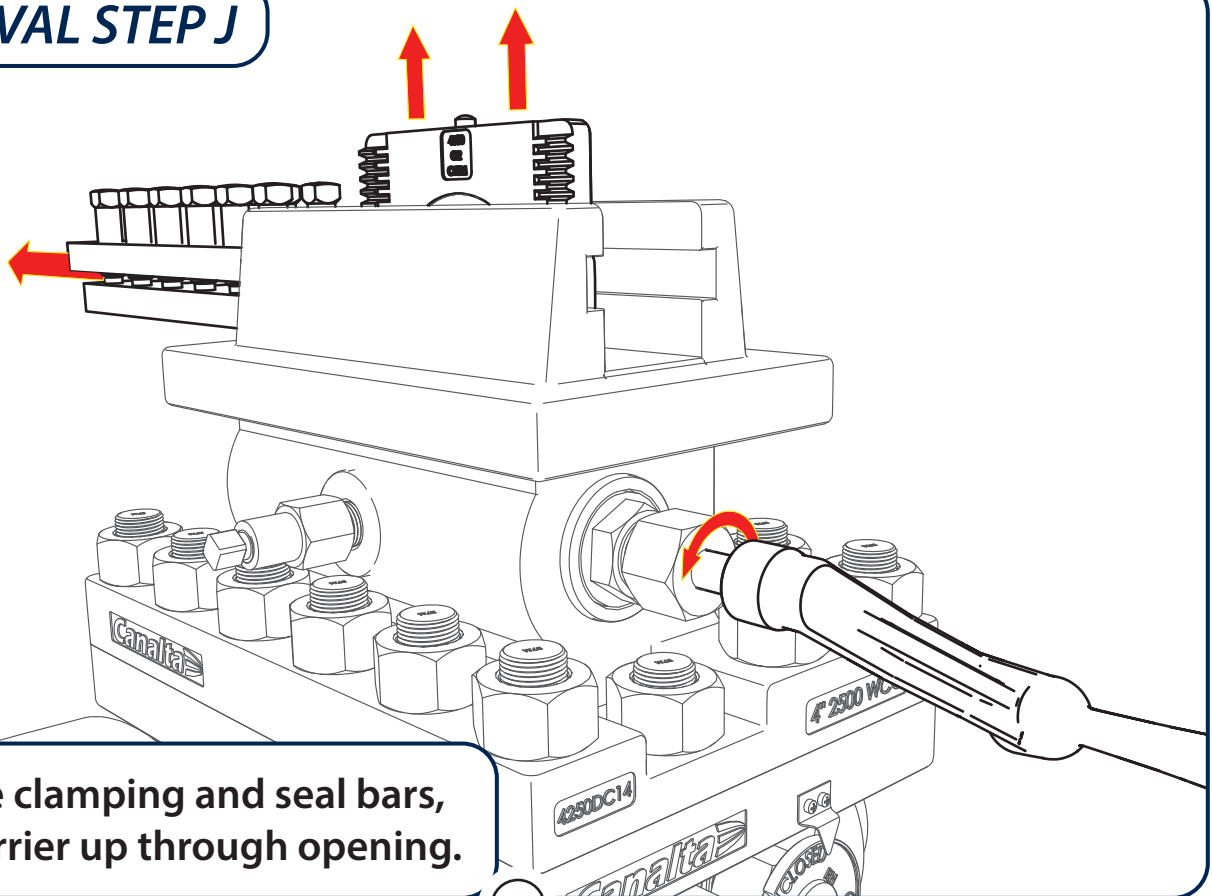
**Loosen clamping bar.**  
**DO NOT REMOVE.**

## REMOVAL STEP I



Dislodge seal bar  
with plate carrier.

## REMOVAL STEP J



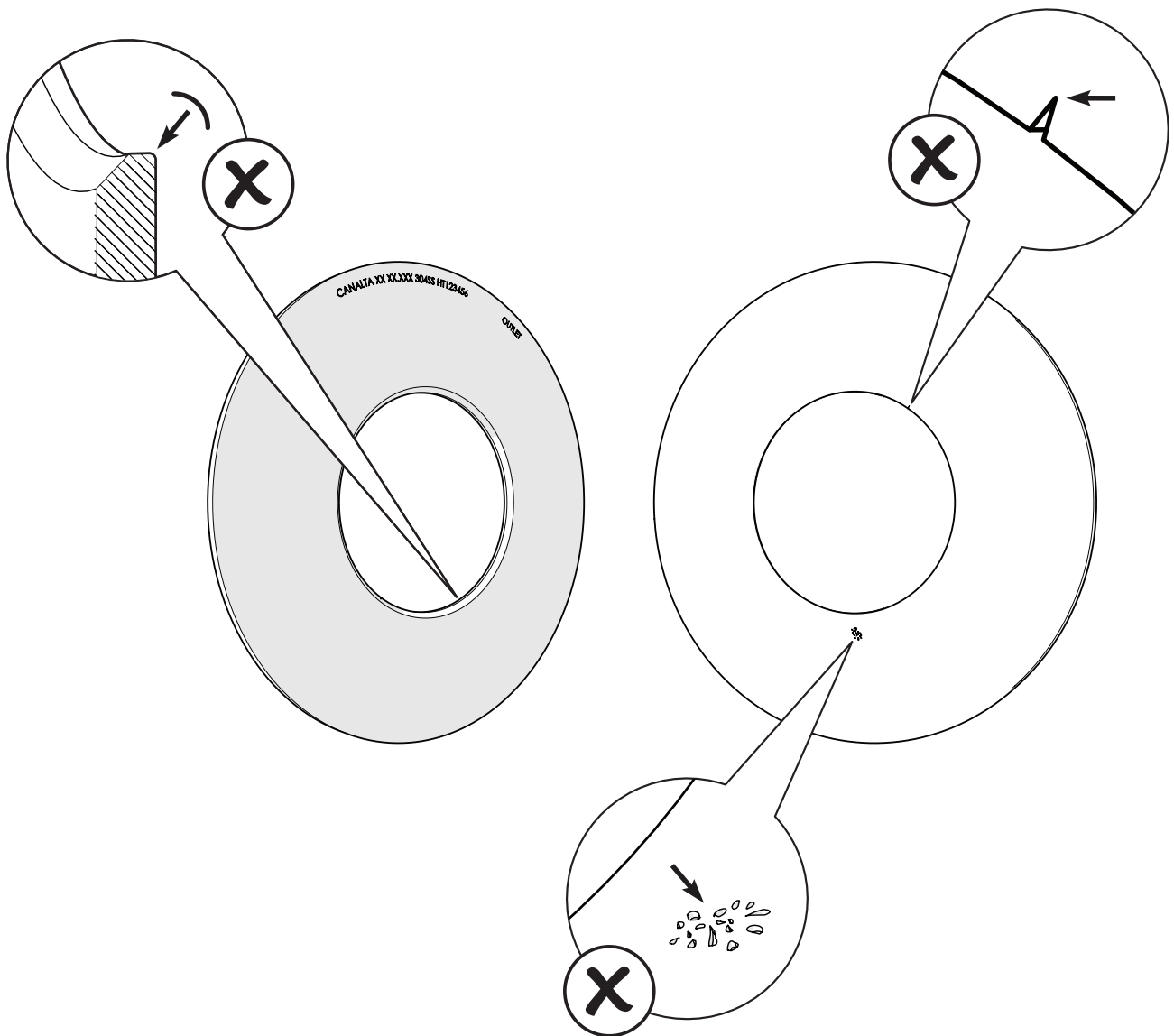
Remove clamping and seal bars,  
raise carrier up through opening.

## ORIFICE PLATE INSPECTION

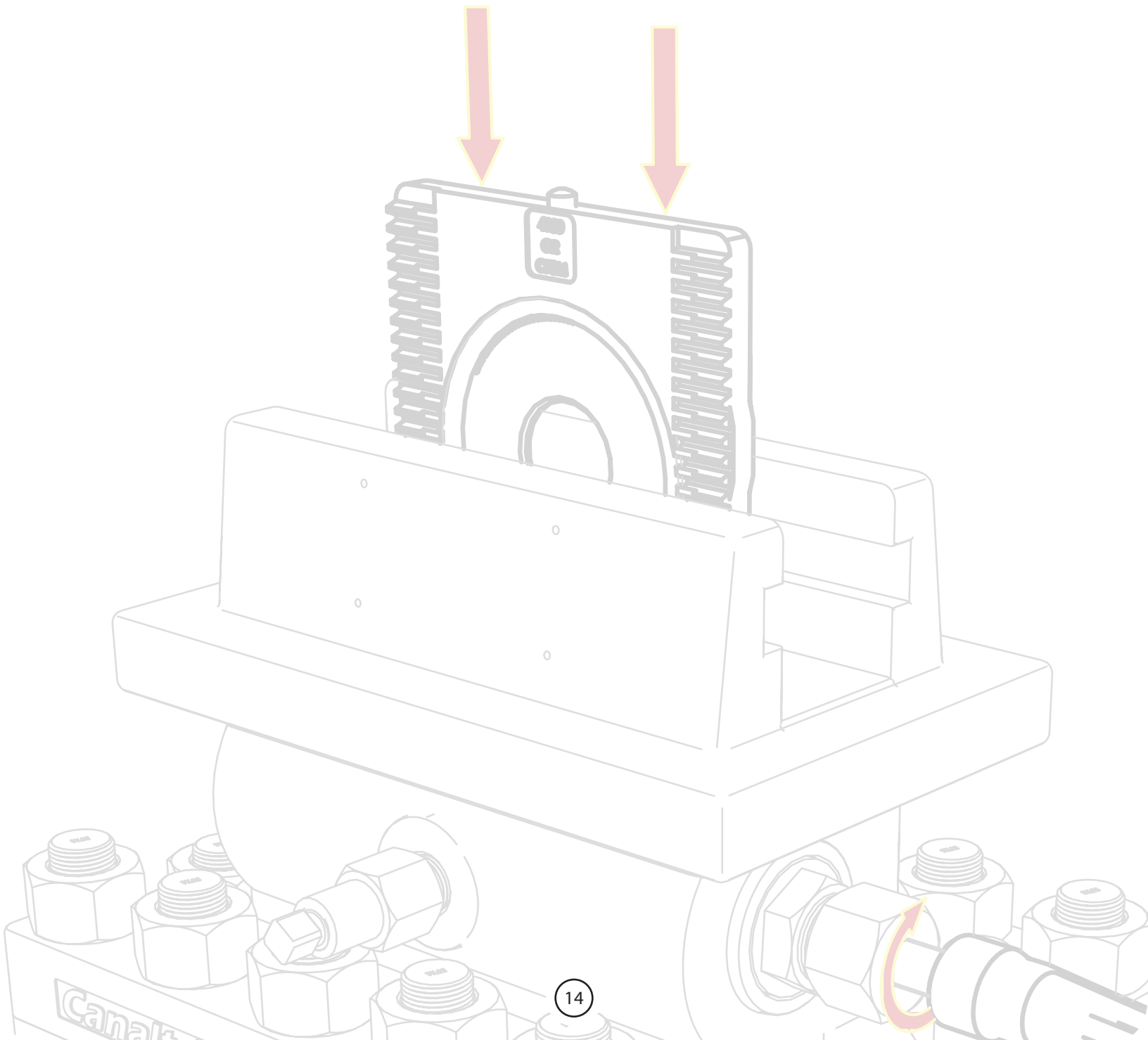
Regular orifice plate inspections are crucial to measurement accuracy. Canalta recommends that the orifice plate be removed from the flow line and inspected at least monthly. AGA-3 / API 14.3 sections 2.4.1 and 2.4.2 outline orifice plate parameters that can be affected by service conditions. Damage, excessive wear and build-up can lead to a reduction in flow meter accuracy.

Pay particular attention to dirt, grease or ice accumulation, pitting due to corrosion, nicks, dings and other impact damage, as well as general wear and erosion of the normally sharp bore edges. Replace the orifice plate as necessary.

Orifice plate seals should also be inspected to reduce the possibility of bypass. Pay attention to dirt or grease accumulation, cracks, tears or cuts and swelling. Replace seals as necessary.

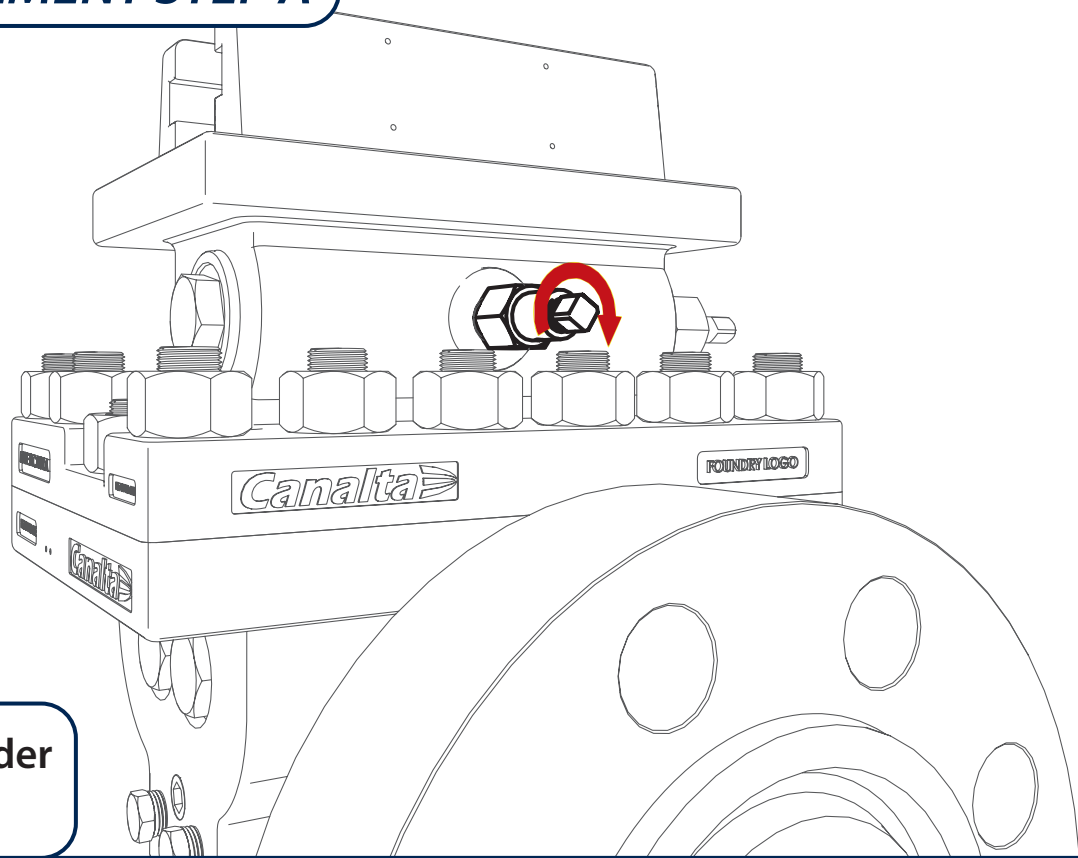


# REPLACING THE ORIFICE PLATE



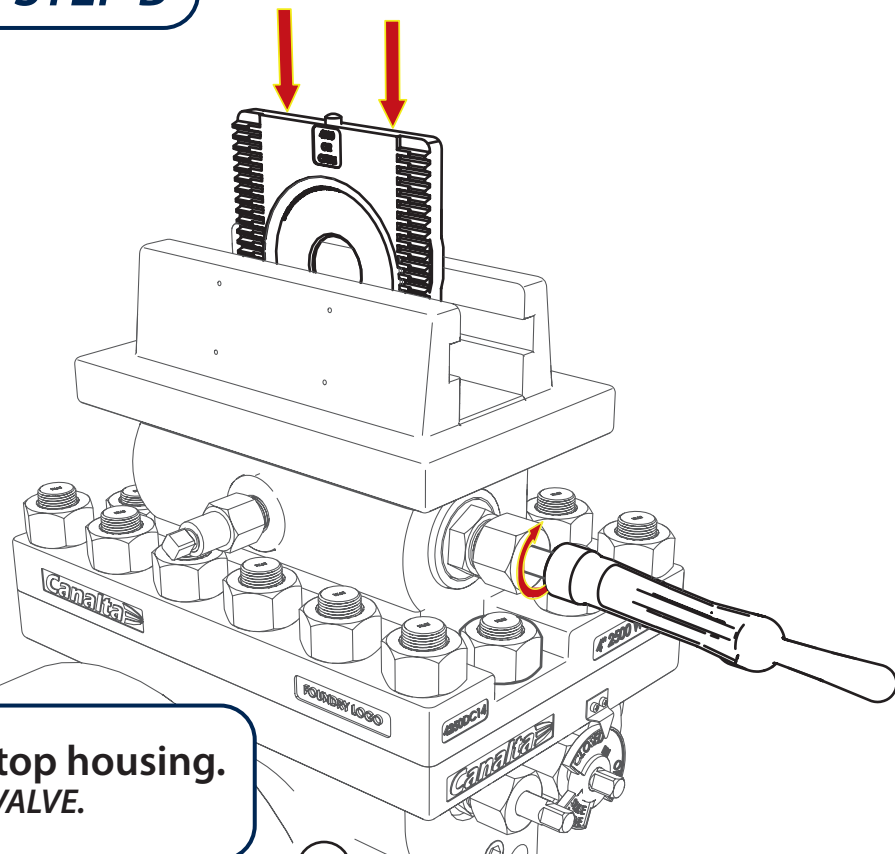


## REPLACEMENT STEP A



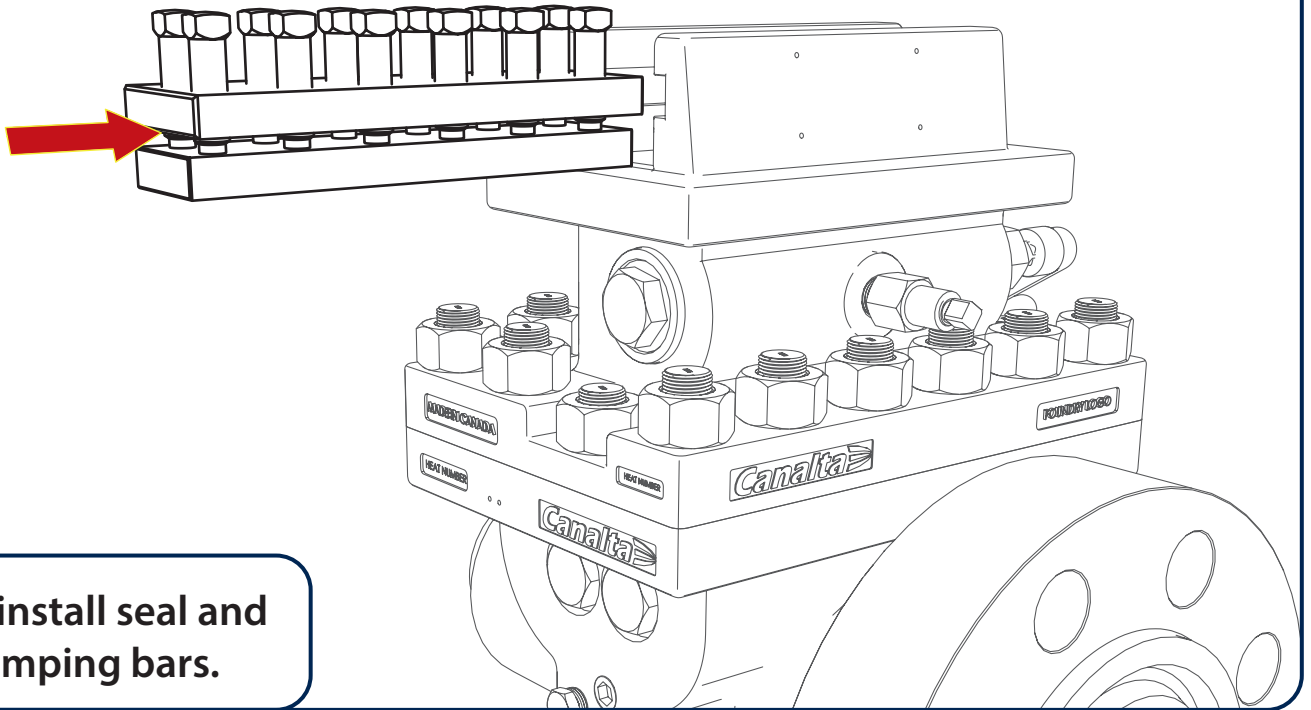
Close bleeder valve.

## REPLACEMENT STEP B



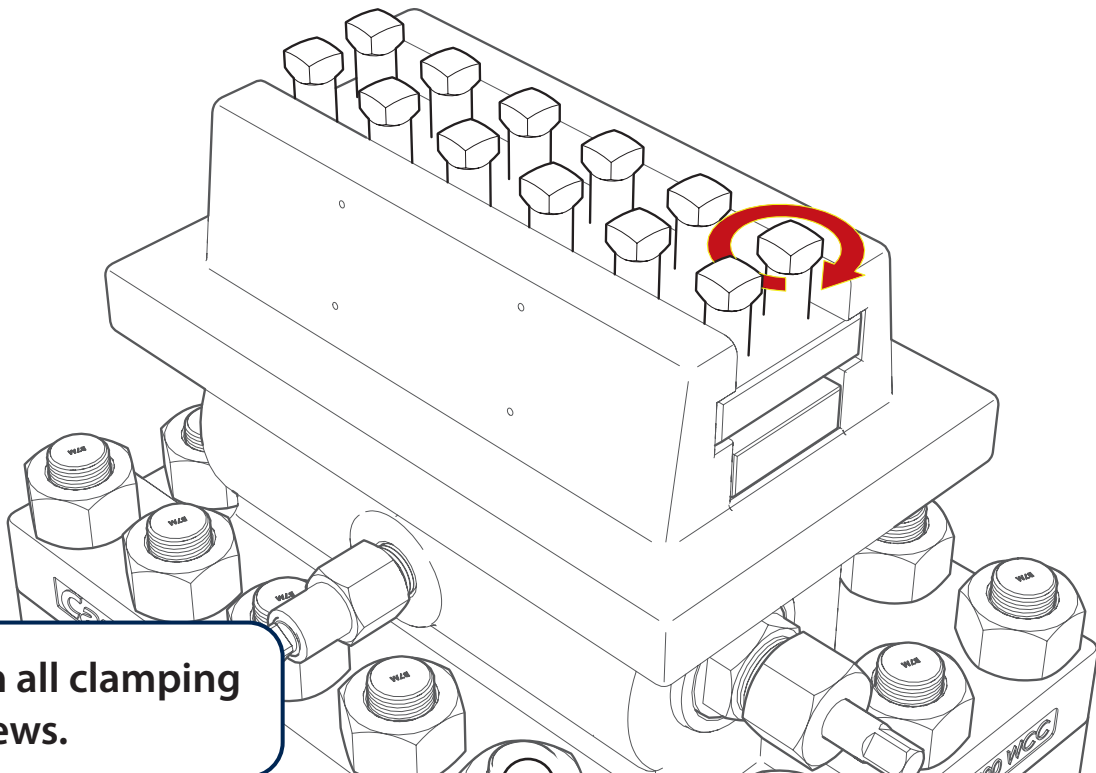
Lower carrier into top housing.  
DO NOT LOWER ONTO VALVE.

## REPLACEMENT STEP C



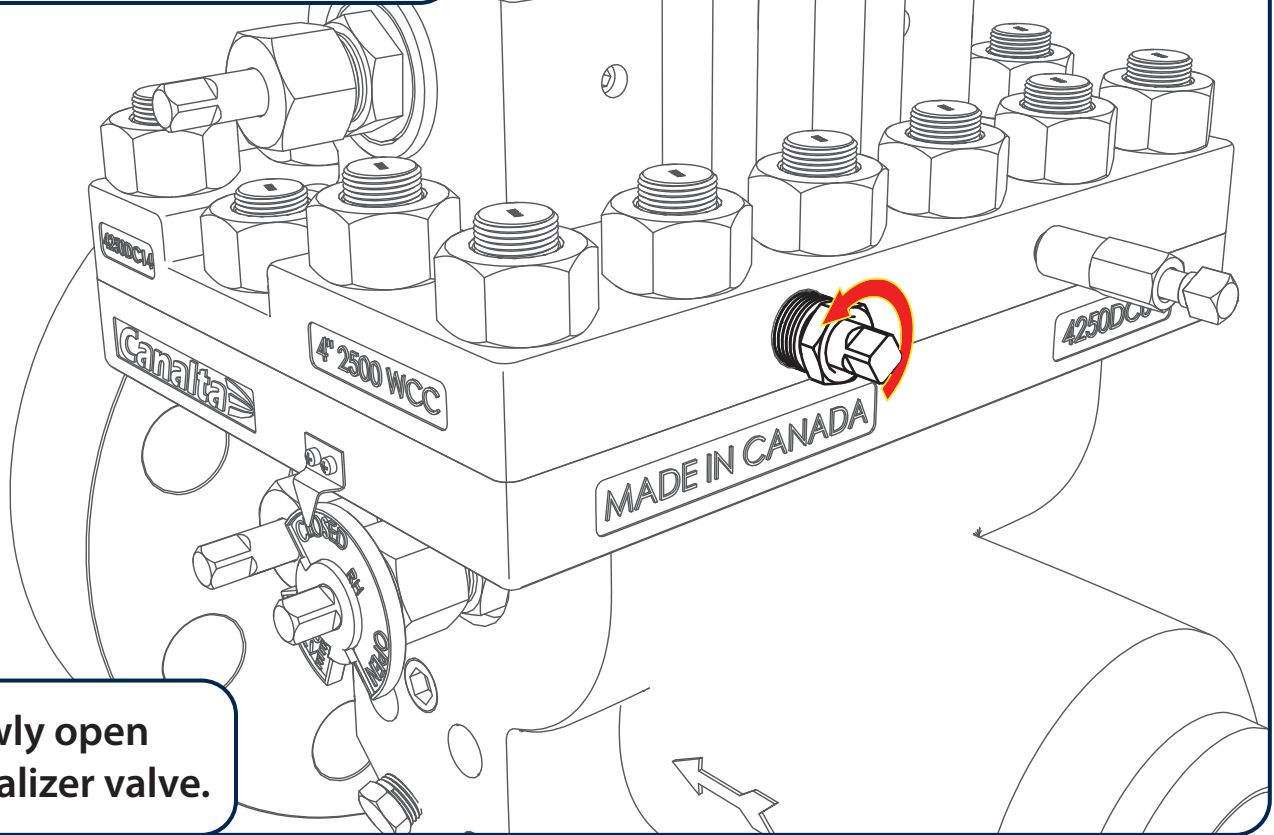
Reinstall seal and clamping bars.

## REPLACEMENT STEP D



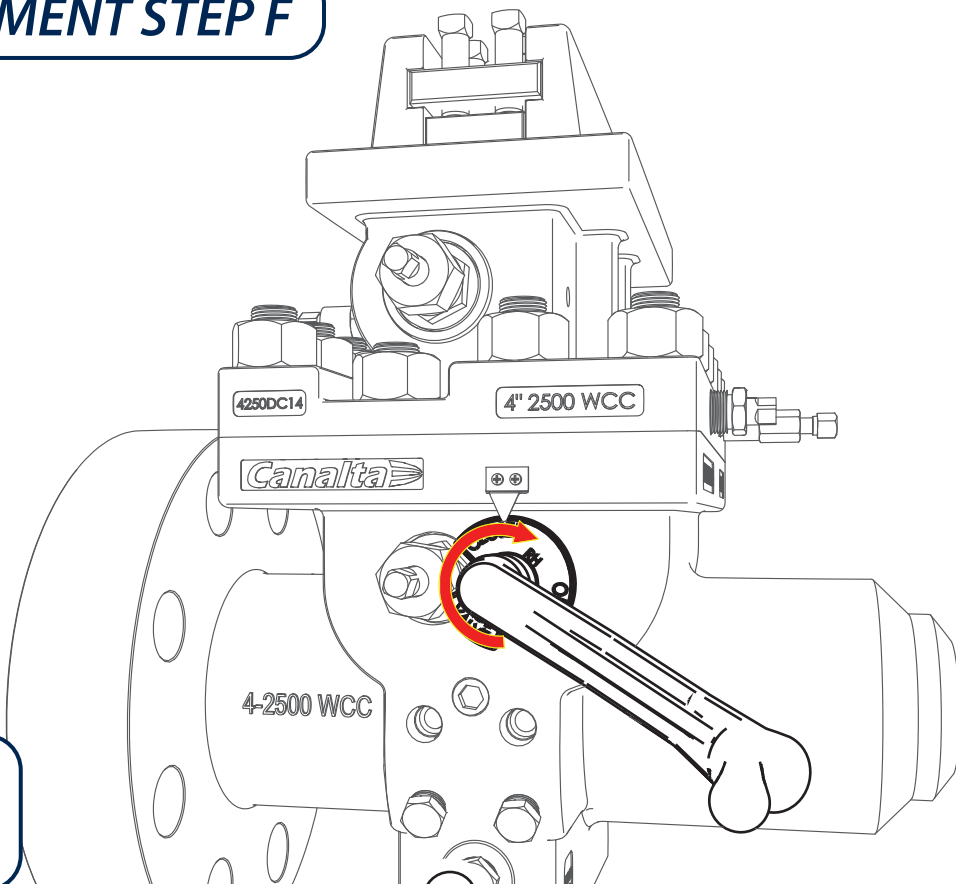
Tighten all clamping bar screws.

## REPLACEMENT STEP E



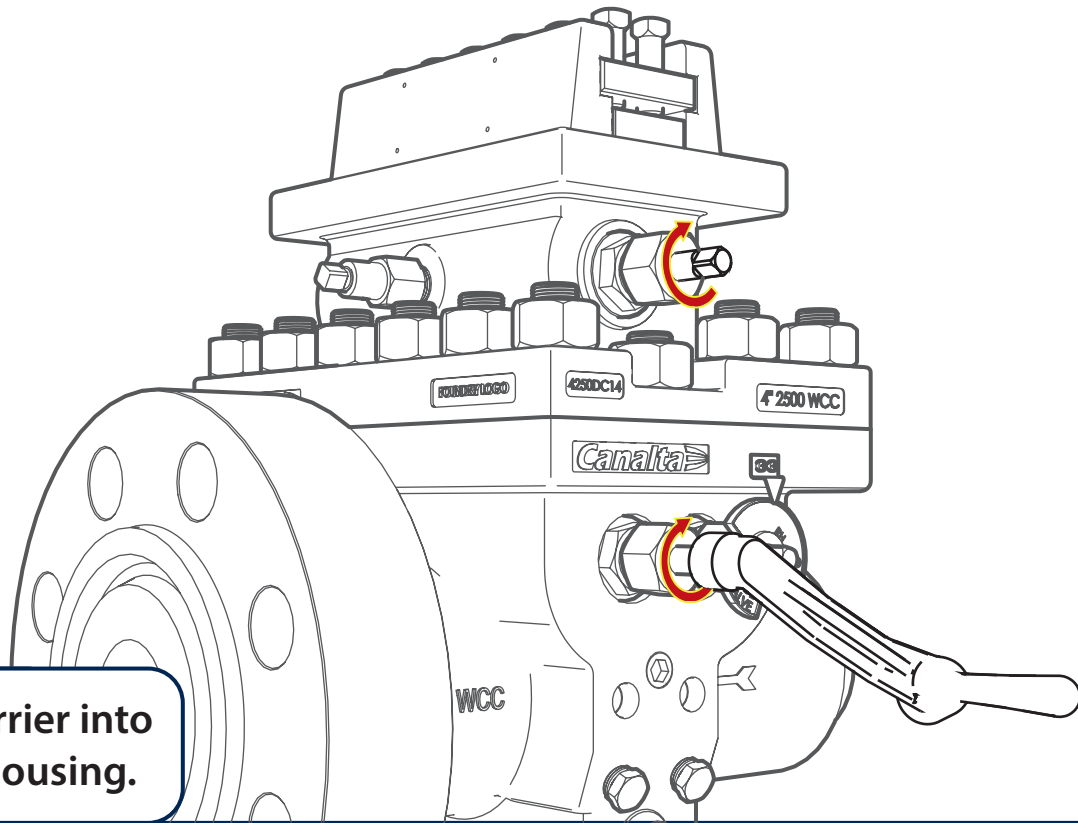
Slowly open  
equalizer valve.

## REPLACEMENT STEP F



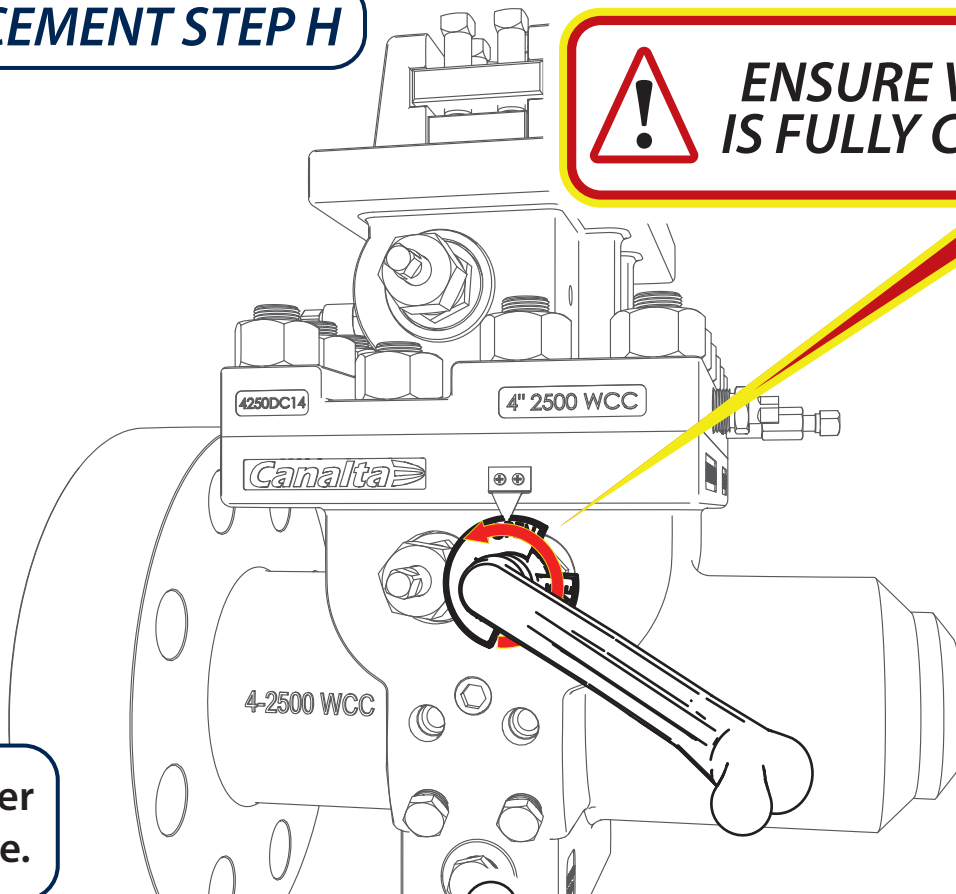
Open inner  
slide valve.

## REPLACEMENT STEP G



Lower carrier into bottom housing.

## REPLACEMENT STEP H



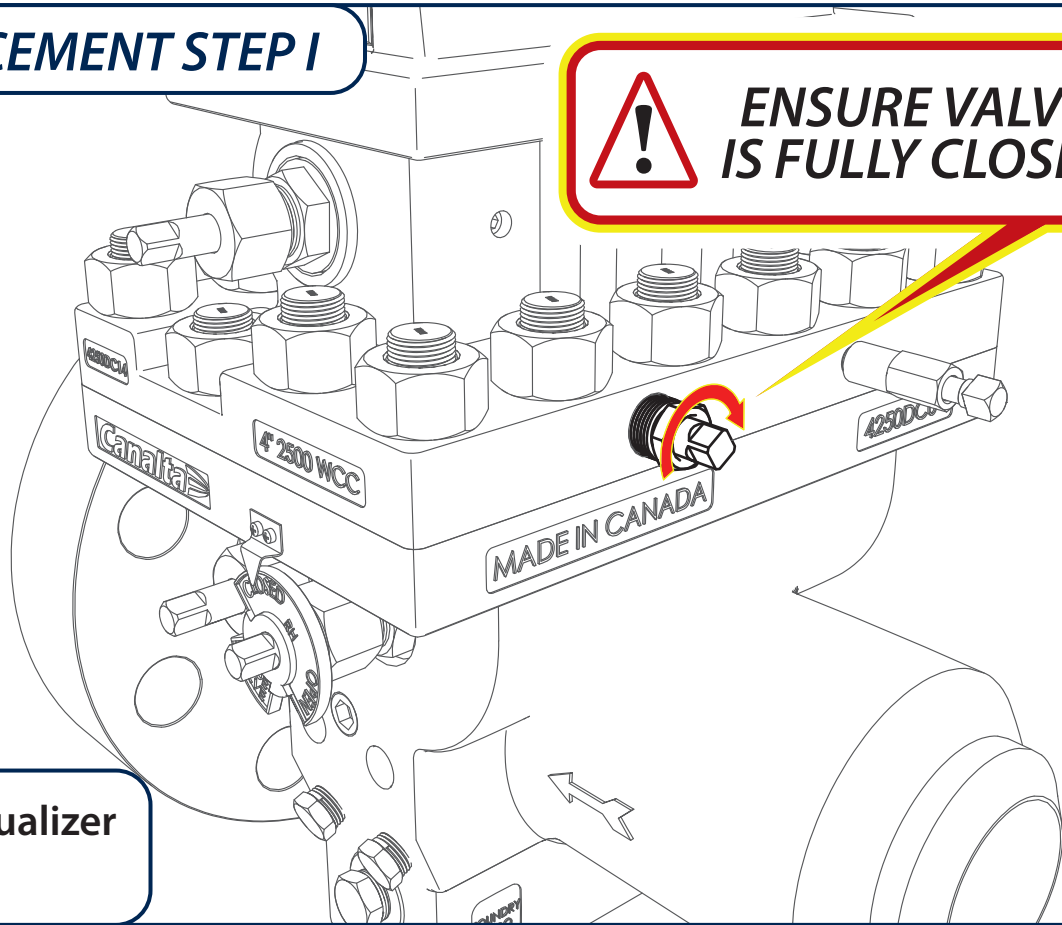
**ENSURE VALVE IS FULLY CLOSED**

Close inner slide valve.

## REPLACEMENT STEP I

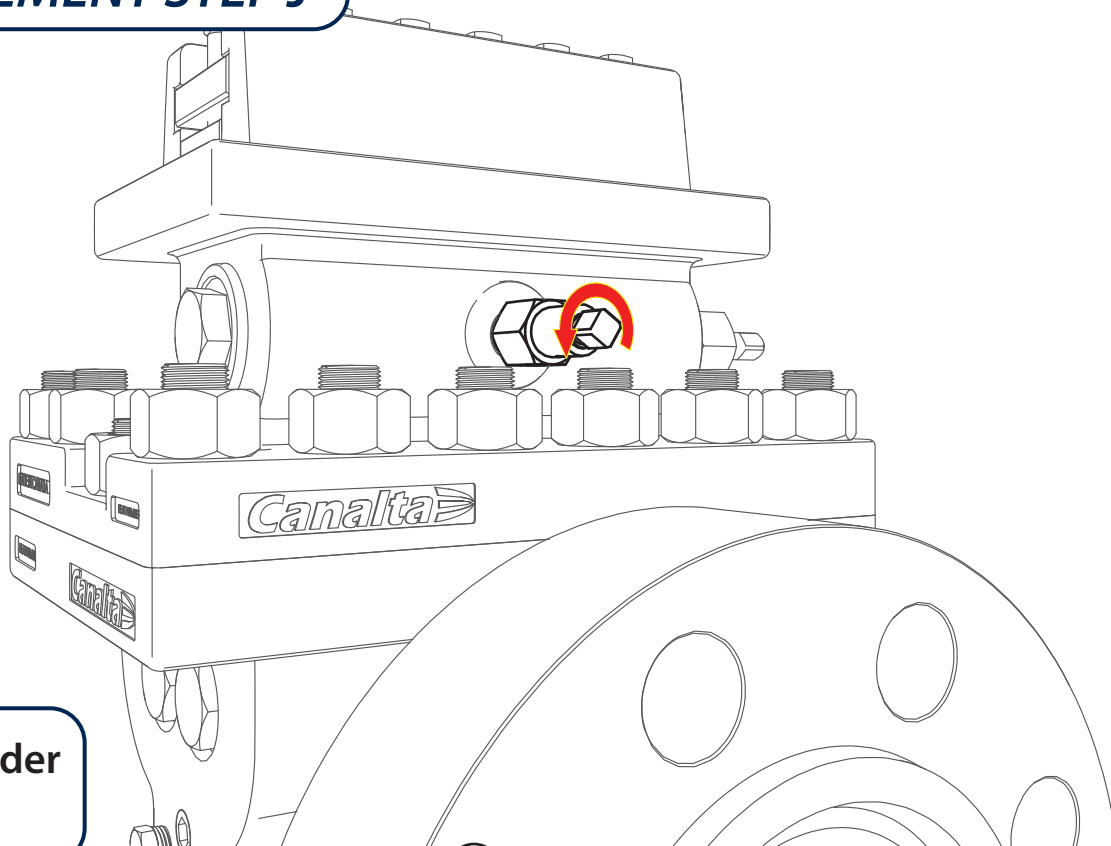


**ENSURE VALVE  
IS FULLY CLOSED**



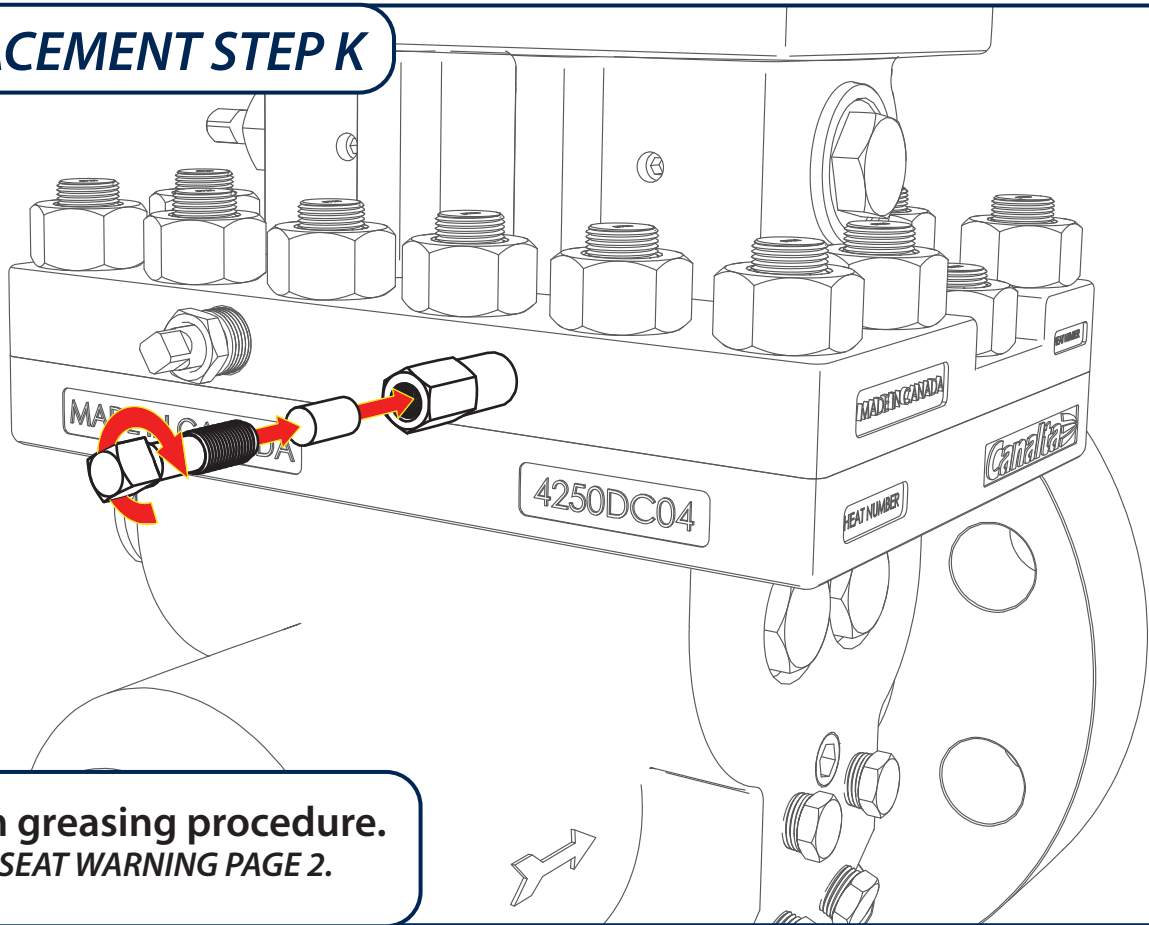
Close equalizer  
valve.

## REPLACEMENT STEP J



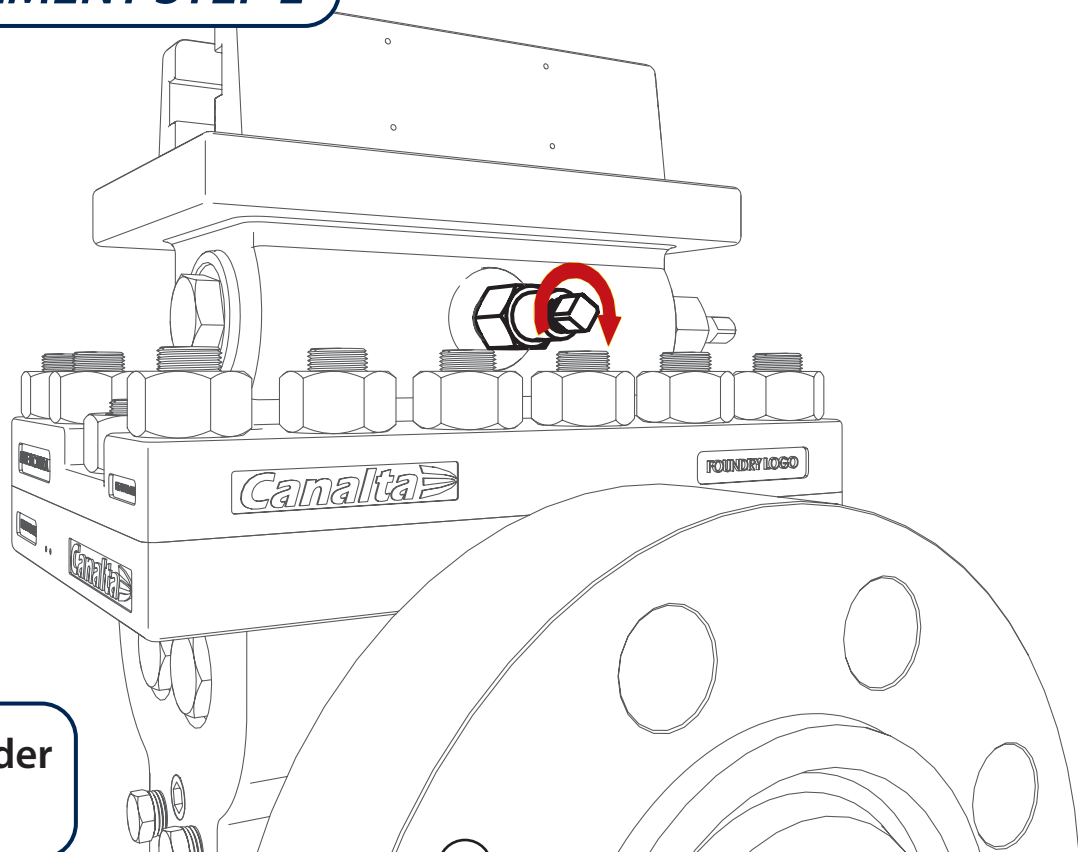
Open bleeder  
valve.

## REPLACEMENT STEP K



Perform greasing procedure.  
SEE SOFT SEAT WARNING PAGE 2.

## REPLACEMENT STEP L

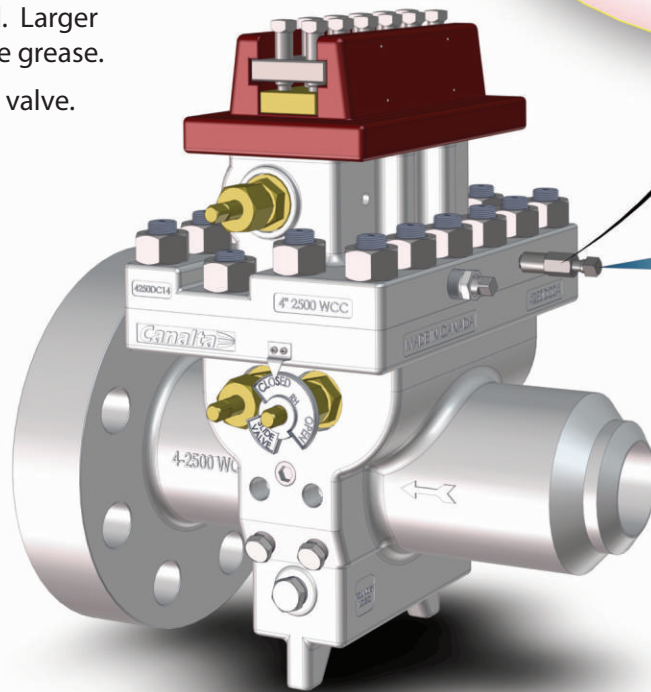
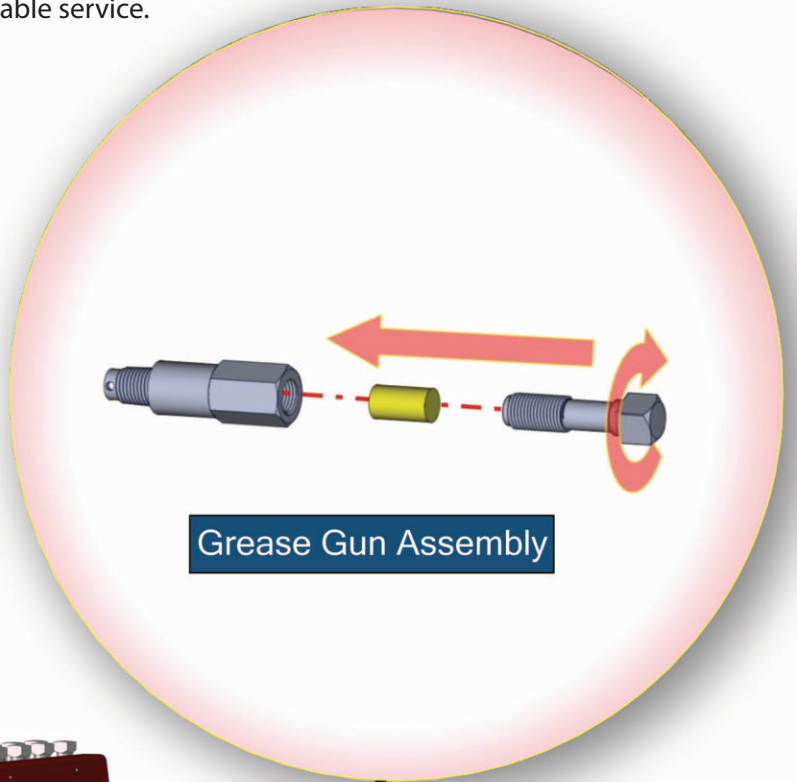


Close bleeder  
valve.

## GREASING PROCEDURE

The metal-to-metal grease seal design requires lubrication on a regular basis. For the procedure to be successful, a pressure differential across the slide valve being serviced is required, with the chamber immediately below the valve having a higher pressure and forcing the valve strip up against the seat. The double ball grease check valve prevents process pressure from coming through the grease port. For best results, use only valve seal grease supplied by Canalta and recommended for the applicable service.

1. Ensure that the inner slide valve and equalizer valve are fully closed, and that the upper chamber is de-pressurized.
2. Open the bleeder valve and allow the top chamber to de-pressurize. A pressure differential now exists between the lower and upper chambers, and the slide valve is ready to be greased.
3. Remove the threaded stem from the grease gun assembly. Insert one stick of grease.
4. Replace the grease gun stem and turn in slowly so as not to rupture the grease channel seal.
5. Repeat steps 3 and 4 if additional grease is required. Larger units require more grease.
6. Close the bleeder valve.



Grease Gun

NOTE: use only Canalta supplied grease guns to apply grease to the slide valve.

NOTE: DO NOT perform greasing procedure on units equipped with soft seat slide valves. See warning page 2.

## INSTALLATION RECOMMENDATIONS

The DC Dual Chamber Orifice Fitting is typically installed in conjunction with upstream and downstream meter run sections (tubes). This is essential to meet the recommendations of both AGA Report 3 and ISO 5167. To obtain the best measurement results, follow the recommended piping configurations and installation requirements of either of these two standards, as well as the recommendations below.

1. Always ensure that operating staff are competent and properly trained to operate this and all other pressurized equipment.
2. When installing the fitting or meter run, ensure that the flow arrow on the outer surface of the fitting corresponds to the direction of flow in the line.
3. Attention to clearances is essential. Users should refer to the appropriate Weights and Dimensions brochure and any order specific General Arrangement drawings for details. Ensure there is operating clearance above the top of the fitting for removal of the plate carrier. For 8" - 30" DC Dual Chamber Orifice Fitting models, additional clearance at the sides of the fitting is necessary for pinion gear rotation and operating wrench removal.
4. When used to measure wet gas, the vertical mount is recommended to prevent dam formation against the orifice plate.
5. Instrument tap lines should be installed sloping upwards to the differential pressure measurement instrument. Where this cannot be accomplished, use seal pots to chemically seal the sensing lines eliminate hydrostatic head errors.
6. To avoid damage to the orifice plate, ensure that the orifice plate and plate carrier are removed from the fitting prior to pressure testing the system.
7. Before inserting the orifice plate and plate carrier into the fitting, always ensure that the lower cavity of the fitting is free of debris. If debris has accumulated, remove the lower drain plugs and rod-clean the lower section.

## PRESERVATION & STORAGE

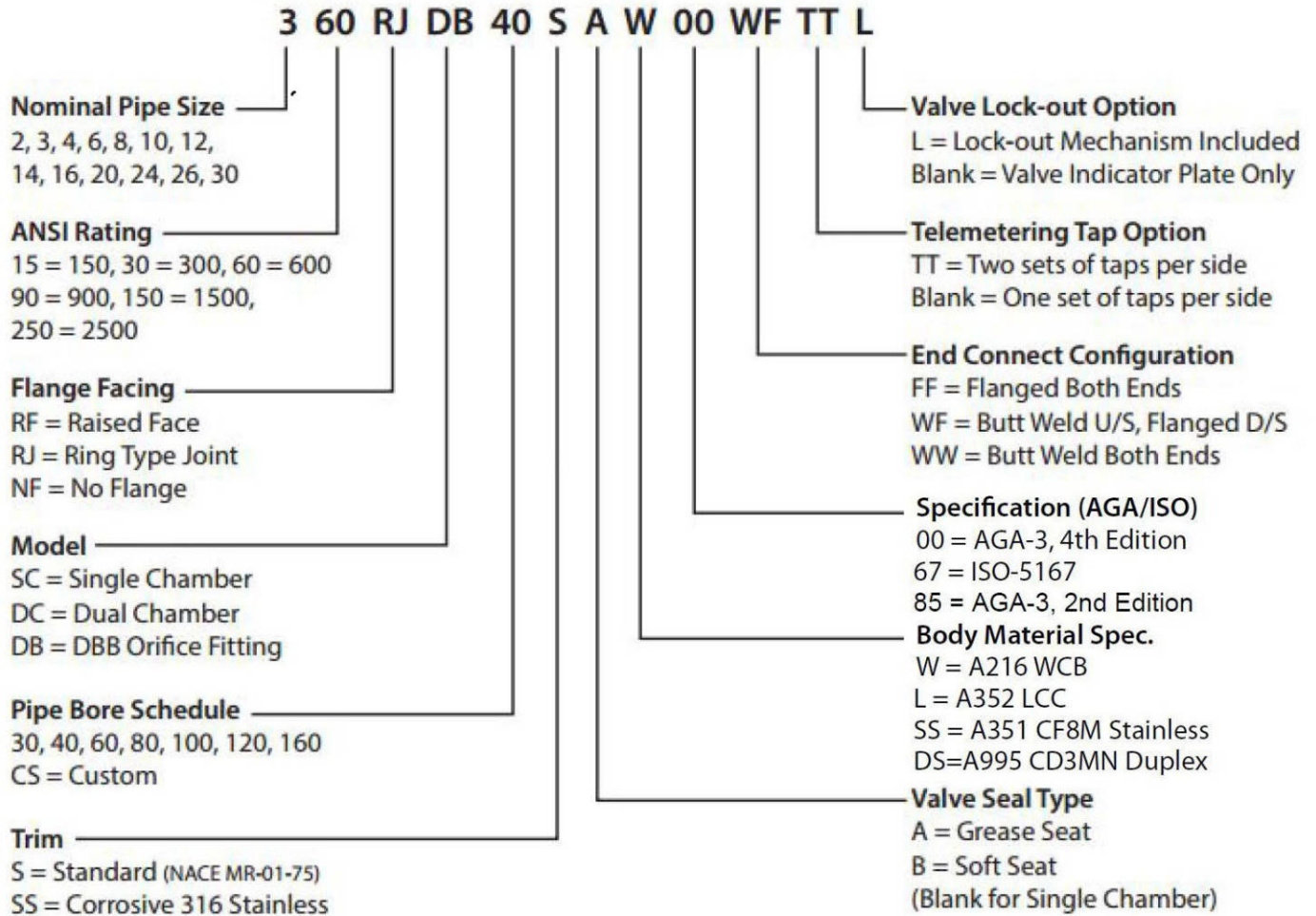
The following measures should be taken to preserve and store all orifice fittings and meter runs that are not currently in service:

- Hydrostatic testing is required before entering service if stored for more than 1 year;
- Apply rust inhibitor every 3-6 months inside the bore to prevent rust and corrosion;
- Store in dry conditions, preferably indoors to prevent rust and corrosion;
- The end caps shipped with the meter run or fitting should be left in place during storage.



# MODEL NUMBERING SYSTEM

Each individual Canalta Orifice Fitting is assigned a model number which can be found on the unit's sales and quality control documentation. These model numbers facilitate quick identification of specific features of an orifice fitting, such as pipe schedule, body material and applicable standard. To understand the model number on your Canalta Orifice Fitting, use the legend below.



Note: the orifice fitting model number may deviate slightly from this legend in cases where exotic materials or other custom features are included. Please contact us directly for any questions or concerns regarding your Canalta Orifice Fitting.

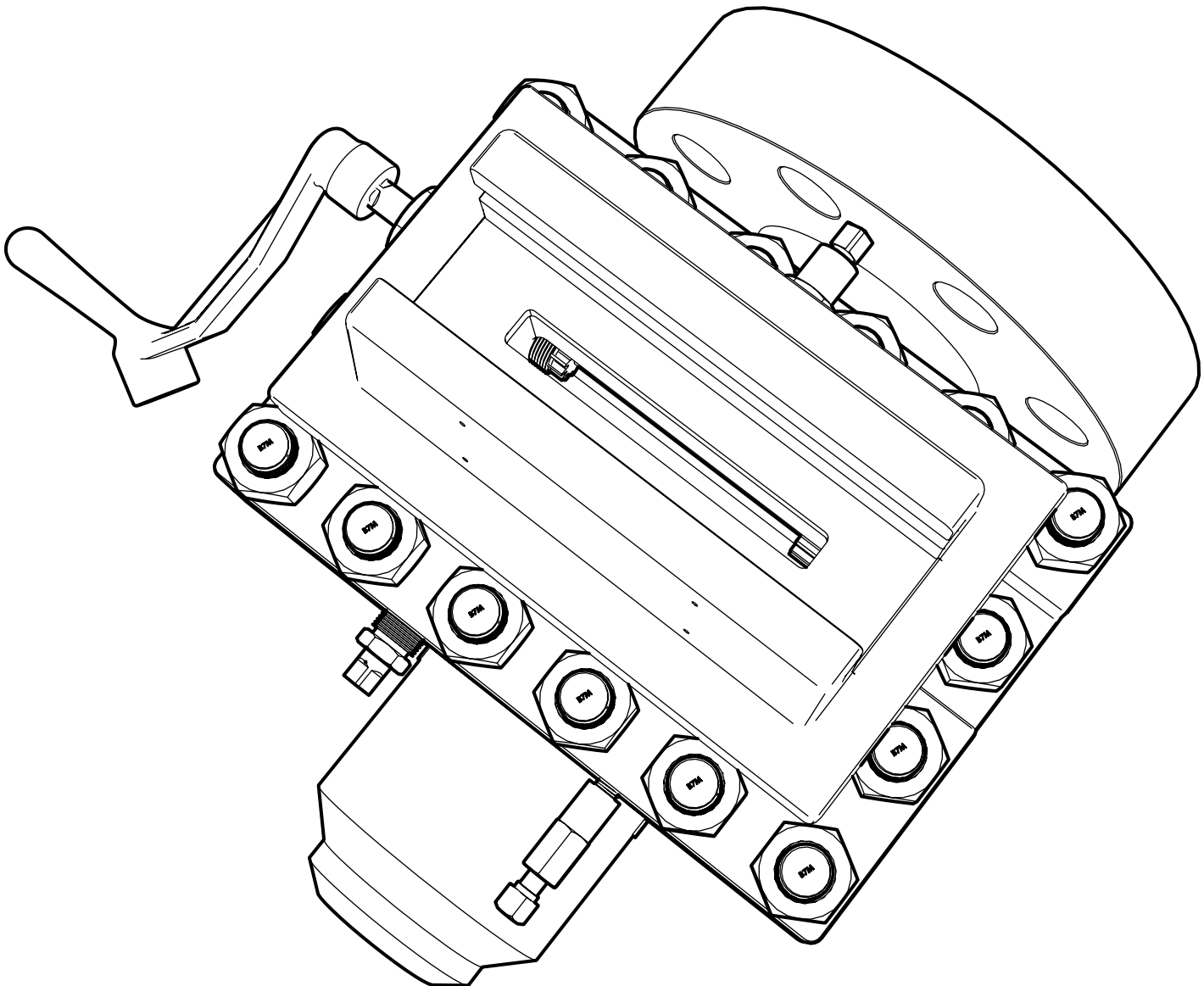
## ORIFICE FITTING QUICK INSPECTION & ASSESSMENT

While the seal and clamping bars are off of the orifice fitting and the top housing is open, visually inspect the interior of the unit.



DO NOT OPEN SLIDE VALVE TO INSPECT LOWER HOUSING WHILE TOP HOUSING IS OPEN AND UNIT IS UNDER PROCESS PRESSURE.

Pay attention to the condition of the interior surfaces of the orifice fitting, the pinion gear, seal bar face and O-ring. Excessive corrosion, fluid build-up or other visible damage may indicate the need for more extensive maintenance and replacement of parts. Similarly, excessive resistance when turning gear shafts during operation may indicate the need for the replacement of parts.



## SCHEDULED TEARDOWN MAINTENANCE

Both measurement accuracy and orifice fitting performance in general can benefit from periodic teardown maintenance. Canalta recommends teardown maintenance be performed every two years or earlier if deemed necessary. The appropriate Disassembly/Assembly can be requested from Canalta if required.

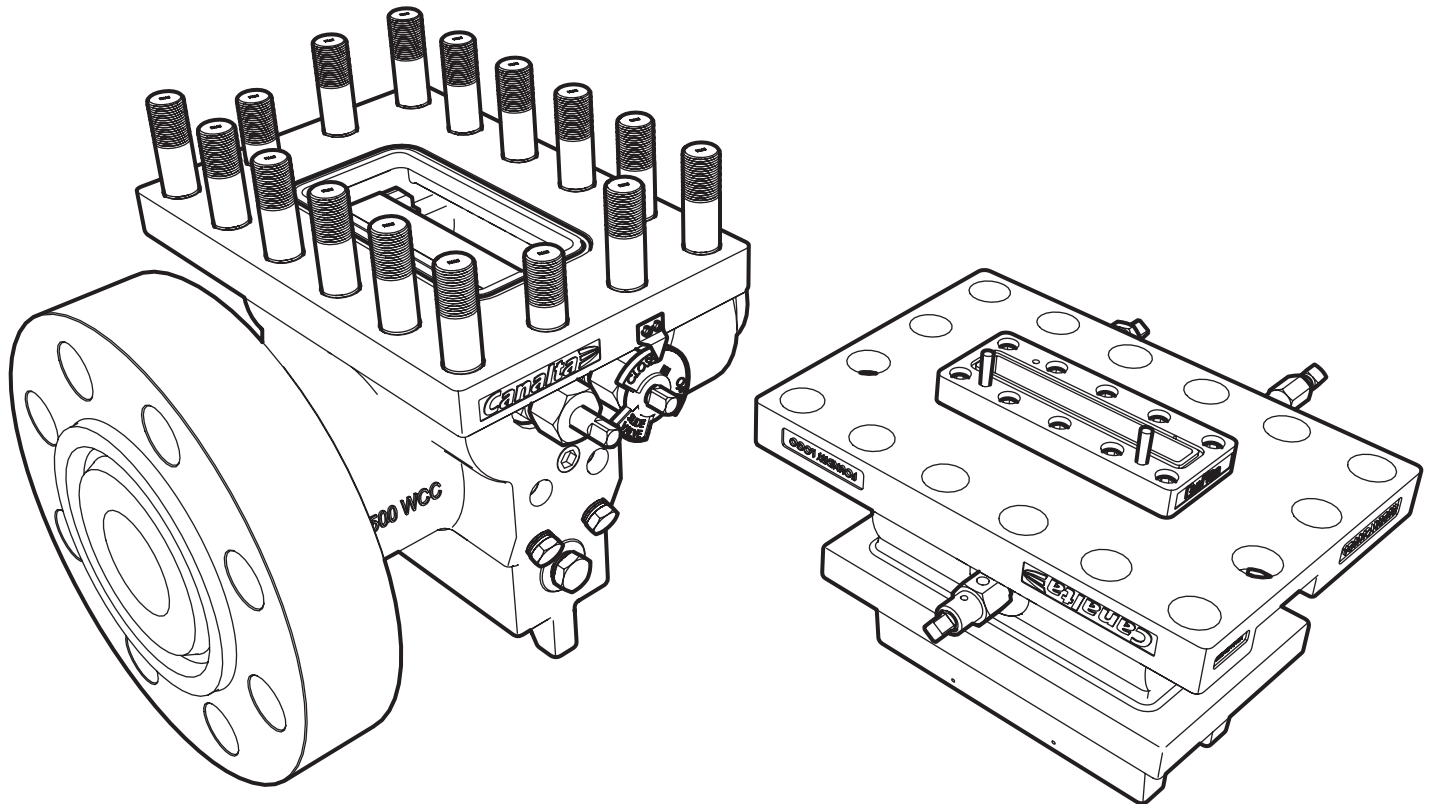


ENSURE FLOW LINE IS DE-PRESSURIZED BEFORE REMOVING TOP HOUSING FROM ORIFICE FITTING BODY. FAILURE TO DE-PRESSURIZE COULD RESULT IN SERIOUS INJURY OR DEATH.

After de-pressurizing the line and removing the top housing, perform the following inspections and parts replacements:

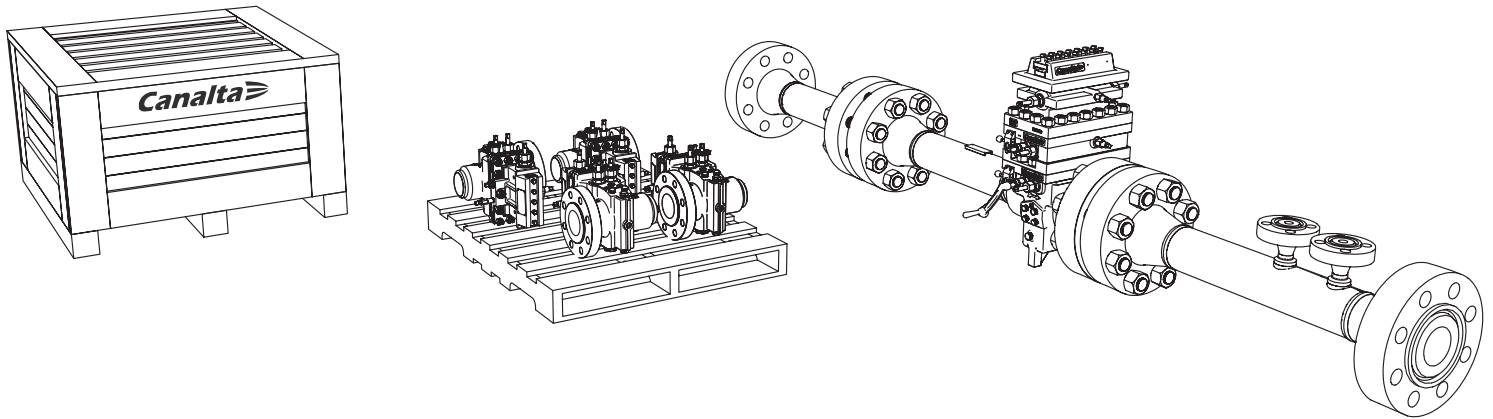
- Visually inspect all interior surfaces of the orifice fitting body for excessive build-up or corrosion;
- Inspect gear shafts for broken or bent teeth. Replace as necessary.
- Inspect valve seat surfaces for abrasion or corrosion. Replace as necessary.
- Manually change out valve seat grease in the grease track (for grease-type units only).
- Replace the valve strip and all accessible O-rings (including valve seat O-rings on soft seat units).
- Remove the drain plugs and rod-clean the lower section of all accumulated debris.
- Inspect all differential pressure tap holes for build-up. Clean out as necessary.

When returning the line to service, ensure that the orifice plate is in the top housing during re-pressurization, the slide valve is in the closed position, the EQ and bleeder valves are closed, and the seal and clamping bars are in place and tightened down.



## LIFTING AND HANDLING

Canalta Flow Measurement products generally require mechanical lifting devices and techniques. All safety activities associated with lifting techniques and equipment shall be in accordance with local laws and the receiving company's HSE policies and procedures, and shall be followed without exception. Extreme care shall be exercised throughout the operation to prevent both injury to personnel and damage to the meter. Proper rigging and lifting techniques should be followed. Do not stand under suspended load. Improper handling may cause injury and/or damage. SAFETY FIRST.



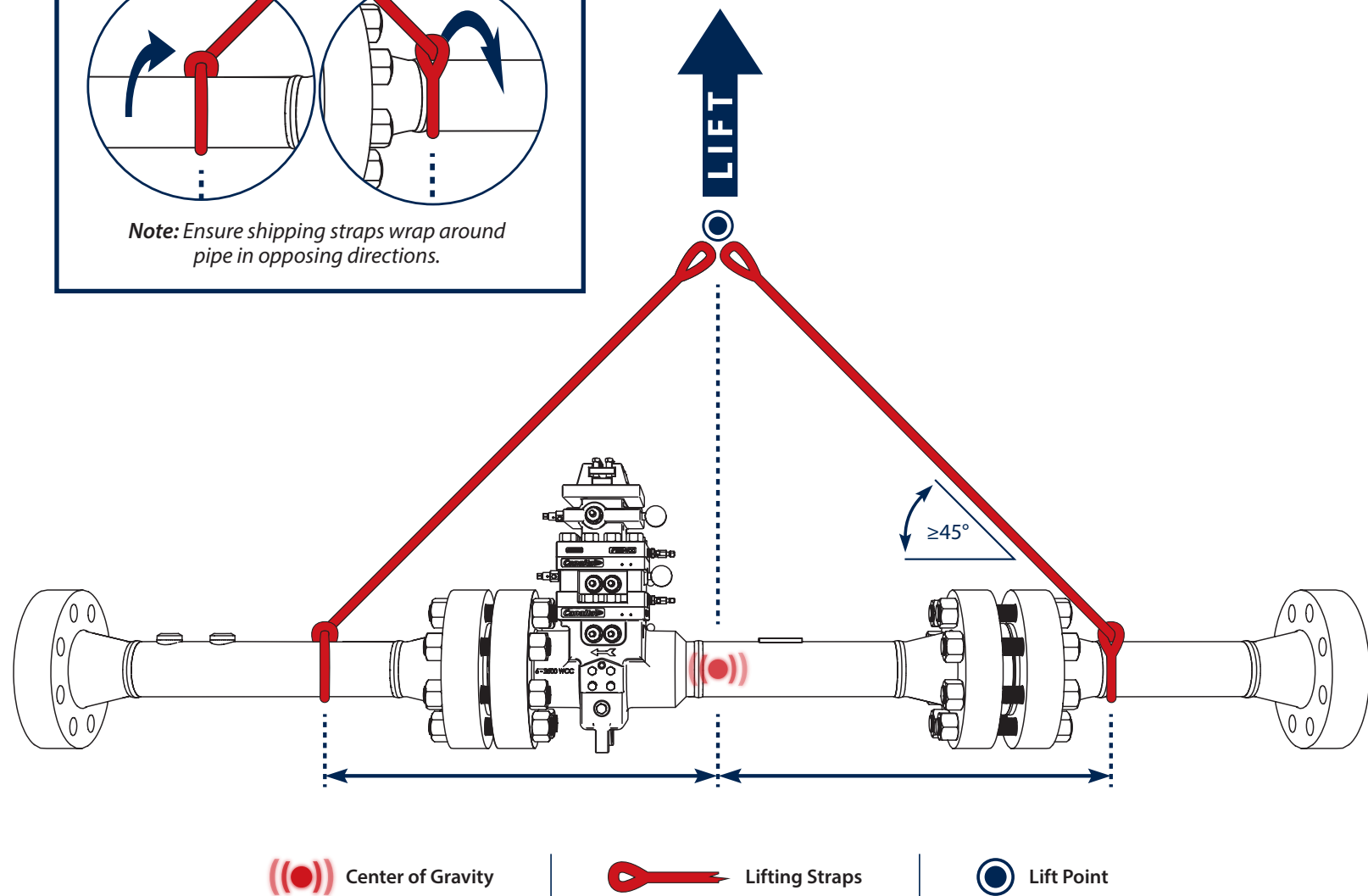
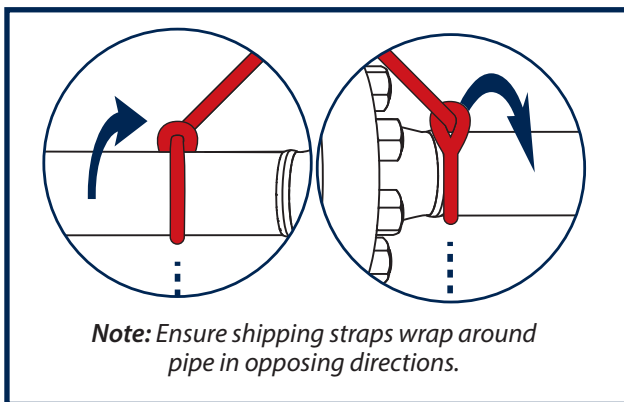
Most Canalta products arrive at their destination in a wooden crate or strapped to a wooden pallet, and are therefore easily moved using a standard forklift. There are scenarios, however, where a meter run or fitting only unit must be moved without the aid of a frame. In either case, care must be taken to assess the weight of the package and ensure that the machinery and lifting aids are appropriate to the items being handled. Crate, pallet and/or meter run weights are documented on the commercial invoice or packing slip accompanying the shipment.

## MOVING UNITS IN CRATES AND ON PALLETS

- Select an appropriate forklift based on the weight of the package being handled. Use fork extensions if necessary.
- Center the forks so the load is evenly distributed. Ensure the load is balanced and secure prior to lifting. Use extra strapping to secure any unstable loads.
- Drive the forks into the load as far as possible. Avoid contact with any parts of the load that may extend past the edge of the pallet. Tilt the load back slightly, then lift.
- Keep the load as low as possible while traveling, keeping an even pace, avoiding fast starts and sudden stops.

## MOVING METER RUNS

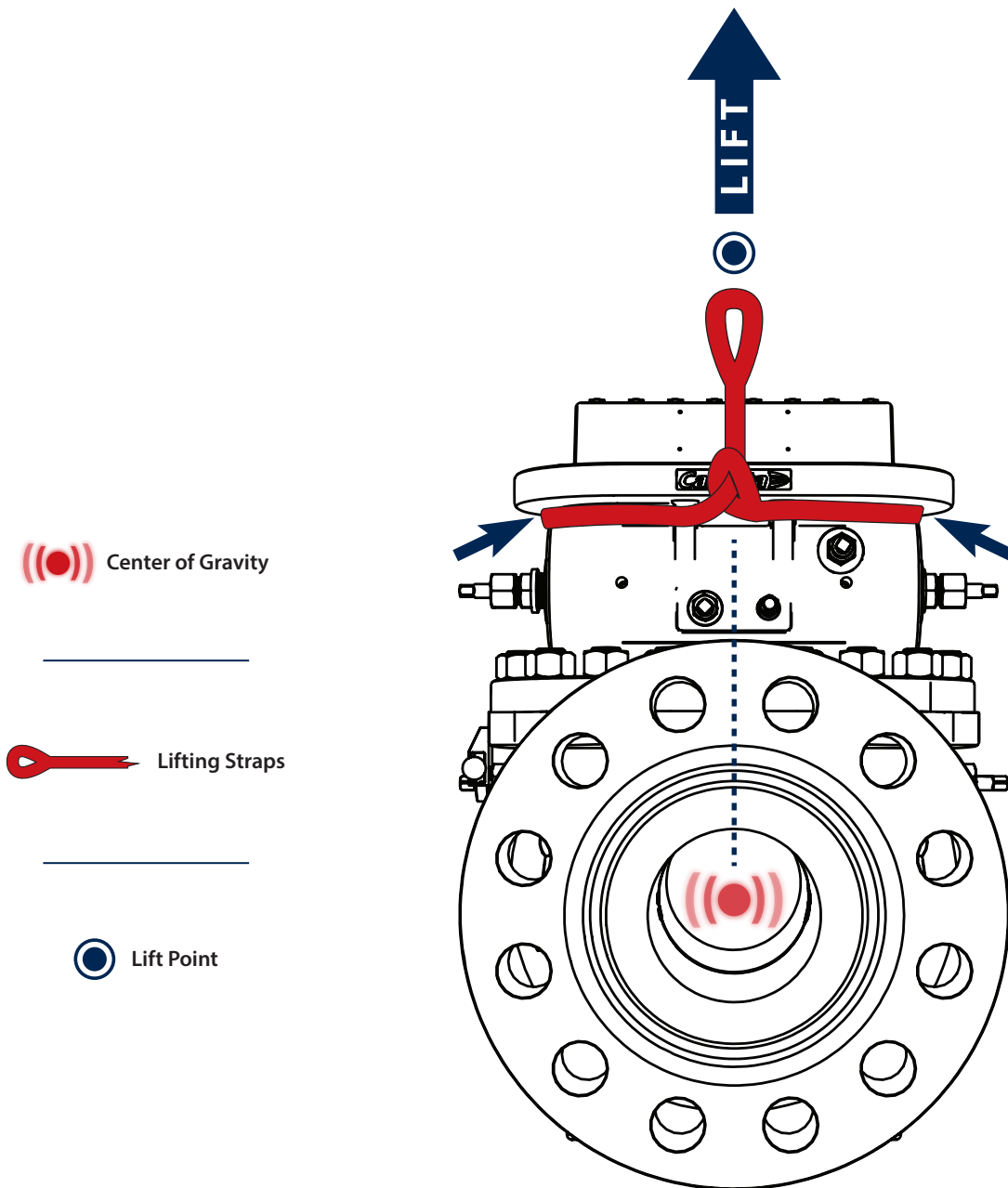
- Select an appropriate forklift and lifting straps based on the weight of the meter run being handled. Position the forks as narrowly as possible to create a single lifting point.
- Determine the meter's fulcrum and position the straps so the unit is balanced when lifted. Ensure the slings are wrapped in opposing directions to prevent the unit from rotating and swinging.
- Slide the ends of the straps over the forks, positioning the slings as close to the forklift body as possible without having the meter run make contact with the forklift.
- Tilt the load back slightly, then lift. Keep the forks as low as possible while traveling, keeping an even pace, avoiding fast starts and sudden stops.



Note: Lifting diagrams may not reflect all configurations. Centers of gravity not exactly as shown.

## MOVING DUAL CHAMBER FITTING ONLY UNITS

- Select an appropriate forklift and slings based on the weight of the meter being handled. Position the forks as narrowly as possible to create a single lifting point.
- Wrap the lifting strap around the fitting, under the shoulder of the top housing. *Do not position the lifting strap under the plate carrier operator gears - lifting from this position may result in significant damage and inoperability.*
- Slide the end of the lifting strap over the forks, positioning the strap as close to the forklift body as possible without having the unit make contact with the forklift. Adjust as necessary.
- Tilt the load back slightly, then lift. Keep the forks as low as possible while traveling, keeping an even pace, avoiding fast starts and sudden stops.



Note: Lifting diagrams may not reflect all configurations. Centers of gravity not exactly as shown.

# NOTES

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# Catalytic Heater Applications

## Installation & Operation Instructions



### WARNING

Improper installation adjustment, alteration, excessive vibration, service, or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installation or servicing this equipment.

### Special Notes

The following special notices highlight important information in the installation and maintenance sections. Each serves a special purpose and is displayed in the format shown:



This symbol indicates a potentially hazardous situation, which, if not avoided, can result in personal injury or damage to the equipment.



This symbol indicates a potentially hazardous situation, which, if not avoided, may be a shock hazard.



This symbol indicates an imminently hazardous situation, which, if not avoided, could result in death or serious injury.

# Certification & Intended Use

## • Certification

1. Model WX (Series X) & MKII (Series X) Cata-Dyne™ explosion-proof, flameless infrared catalytic gas heaters are certified by the Canadian Standards Association (CSA) for use in Class I, Divisions 1 and 2, Group D hazardous locations temperature code T2C, at a maximum ambient temperature of 40°C (104°F).
2. Model WXS (Series X) is FM certified for Class I, Division I, Group D, temperature code T2B at a maximum ambient temperature of 40°C (104°F). Model BX (Series X) and Model MKII (Series X) are FM certified for Class I, Division I, Group D, temperature code T2C at a maximum ambient temperature of 40°C (104°F).
3. Models WX (Series X) are certified CE for use in gas environments, Category 2, Zone 1 & 2, Group IIA.

4. The Model BX (Series G) Cata-Dyne™ heater is certified by CSA and FM for use in general industrial non-hazardous locations. Models listed are certified for industrial use only, for either natural gas or propane gas.
5. CSA approved models are equipped for high altitudes: 0 to 4500 ft (0 m to 1370 m) above sea level. FM approved models are equipped for high altitudes: 0 to 6000 ft (0 m to 1829 m) above sea level.

## • Intended Use

The Cata-Dyne™ heater can be used in all industrial indoor locations where a source of infrared radiant heat is required, where adequate ventilation is available.

# Specifications

To ensure the maximum efficiency of your Cata-Dyne™ heater, it should be installed with the heating surface positioned plus or minus 45° from the vertical plane at a height of no more than 8 ft (2.44 m). All heaters must be installed in accordance with the latest revisions of the codes described in Table 1, page 2 and in accordance with any local codes and regulations. Before installing the heater, all information on the heater nameplate must be carefully reviewed. The nameplate lists all the fuel and electrical requirements for the heater.

Table 1 – National Code Requirements

For Cata-Dyne™ Heaters Installed in:		
Canada	USA	Internationally
- CSA/CAN-C22.1-02 Canadian Electrical Code	- NFPA 70, National Electrical Code	- Install according to local and national/international fuel and electrical codes
- CSA/CAN-B149.1 Natural Gas and Propane Installation Code	- NFPA 54, National Fuel Gas Code	

## • MKII Model (Series X)

CSA and FM approved for use in Class I, Division 1 and 2, Group D hazardous (classified) locations, T-Code T2C.

Table 2.1 – MKII Model (Series X)

Model Number	Specifications Btu/hr Input Ratings) For Both Natural and Propane Gas	
	Max. Btu/hr	Max. kW
MKII 12x12	5,000	1.464
MKII 12x24	10,000	2.929
MKII 18x24	15,000	4.393
MKII 18x48	30,000	8.786
MKII 24x24	20,000	5.857
MKII 24x48	40,000	11.715

## • BX Model (Series G)\*

CSA approved for use in general industrial non-hazardous locations.

Table 2.2 – BX Model (Series G)

Model Number	Specifications Btu/hr Input Ratings) For Both Natural and Propane Gas			
	Max. Btu/hr		Max. kW	
	LPG	NAT	LPG	NAT
BX 6x6	1,250	1,500	0.366	0.439
BX 6x12	2,500	3,000	0.732	0.879
BX 6x24	5,000	6,000	1.464	1.757
BX 8x8	2,222	2,667	0.651	0.781
BX 10x12	4,167	5,000	1.220	1.464
BX 12x12	5,000	6,000	1.464	1.757
BX 12x24	10,000	12,000	2.929	3.514
BX 12x36	15,000	18,000	4.393	5.272
BX 12x48	20,000	24,000	5.857	7.029
BX 12x60	25,000	30,000	7.322	8.786
BX 12x72	30,000	36,000	8.786	10.543
BX 18x24	15,000	18,000	4.393	5.272
BX 18x30	18,750	22,500	5.491	6.590
BX 18x36	22,500	27,000	6.590	7.908
BX 18x48	30,000	36,000	8.786	10.543
BX 18x60	37,500	45,000	10.983	13.179
BX 18x72	45,000	54,000	13.179	15.815
BX 24x24	20,000	24,000	5.857	7.029
BX 24x30	25,000	30,000	7.322	8.786
BX 24x36	30,000	36,000	8.786	10.543
BX 24x48	40,000	48,000	11.715	14.058
BX 24x60	50,000	60,000	14.644	17.572

\*Model available for CSA only.

# Specifications (Cont'd)

- **WX Model (Series X)**

CSA and FM approved for use in Class I, Division 1 and 2, Group D hazardous (classified) locations, T-Code T2C.

Table 2.3 – WX Model (Series X)

Model Number	Specifications Btu/hr Input Ratings) For Both Natural and Propane Gas	
	Max. Btu/hr	Max. kW
WX 6x6	1,250	0.366
WX 6x12	2,500	0.732
WX 6x24	5,000	1.464
WX 6x60	12,500	3.661
WX 8x8	2,222	0.651
WX 10x12	4,167	1.220
WX 12x12	5,000	1.464
WX 12x24	10,000	2.929
WX 12x36	15,000	4.393
WX 12x48	20,000	5.857
WX 12x60	25,000	7.322
WX 12x72	30,000	8.786
WX 18x24	15,000	4.393
WX 18x30	18,750	5.491
WX 18x36	22,500	6.590
WX 18x48	30,000	8.786
WX 18x60	37,500	10.983
WX 18x72	45,000	13.179
WX 24x24	20,000	5.857
WX 24x30	25,000	7.322
WX 24x36	30,000	8.786
WX 24x48	40,000	11.715
WX 24x60	50,000	14.644
WX 24x72	60,000	17.572

- **WXS Model (Series X)\*\***

FM approved for use in Class I, Division 1, Group D hazardous (classified) locations, T-Code T2B.

Table 3.4 – WXS Model (Series X)

Model Number	Specifications Btu/hr Input Ratings) For Both Natural and Propane Gas	
	Max. Btu/hr	Max. kW
WXS 6x6	1,750	0.513
WXS 6x12	3,500	1.025
WXS 6x24	7,000	2.050
WXS 8x8	3,111	0.911
WXS 10x12	5,833	1.709
WXS 12x12	7,000	2.050
WXS 12x24	14,000	4.101
WXS 12x36	21,000	6.151
WXS 12x48	28,000	8.201
WXS 24x24	28,000	8.201
WXS 24x36	42,000	12.302
WXS 24x48	56,000	16.402

- **BX Model (Series X and G)\*\***

Series X: FM approved for use in Class I, Division 1, Group D hazardous (classified) locations, T-Code T2C.

Series G: Approved for general industrial non-hazardous locations by FM.

Table 3.3 – BX Model (Series X and G)

Model Number	Specifications Btu/hr Input Ratings) For Both Natural and Propane Gas	
	Max. Btu/hr	Max. kW
BX 6x6	1,500	0.439
BX 6x12	3,000	0.879
BX 6x24	6,000	1.757
BX 8x8	2,667	0.781
BX 10x12	5,000	1.464
BX 12x12	6,000	1.757
BX 12x24	12,000	3.514
BX 12x36	18,000	5.272
BX 12x48	24,000	7.029
BX 12x60	30,000	8.786
BX 12x72	36,000	10.543
BX 18x24	18,000	5.272
BX 18x30	22,500	6.590
BX 18x36	27,000	7.908
BX 18x48	36,000	10.543
BX 18x60	45,000	13.179
BX 18x72	54,000	15.815
BX 24x24	24,000	7.029
BX 24x30	30,000	7.322
BX 24x36	36,000	10.543
BX 24x48	48,000	14.058
BX 24x60	60,000	17.572
BX 24x72	72,000	21.087

\*\*Model available for FM only.

# Installation

## • Clearances

Appropriate clearances from the heating surface must be observed during the installation of the Cata-Dyne™ heaters (Figure 1 and Table 4.1–4.4, page 4). Maintain nameplate clearances from combustible materials such as wood, cloth, paper, etc. If the heater is to be installed overhead maintain clearances as stated in Figure 1 and Table 4.1–4.4, page 4 from vehicles parked below.

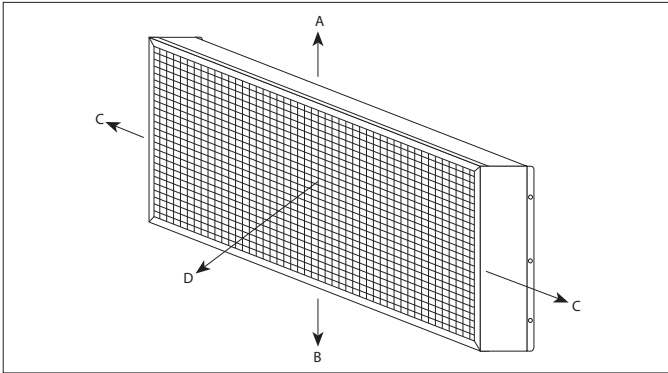


Figure 1 – Heater Clearance

Table 4.1 – A: Top (Heater Clearance)

Radiant Surface Position	Up to 12,000 Btu/hr (3.514 kW)		12,000 to 48,000 Btu/hr (14.058 kW)		Over 48,000 Btu/hr (17.572 kW)	
	in	mm	in	mm	in	mm
Vertical (0°)	18	457	18	457	42	1067
0–45° up	18	457	32	813	54	1372
0–45° down	18	457	18	457	18	457

Table 4.2 – B: Bottom (Heater Clearance)

Radiant Surface Position	Up to 12,000 Btu/hr (3.514 kW)		12,000 to 48,000 Btu/hr (14.058 kW)		Over 48,000 Btu/hr (17.572 kW)	
	in	mm	in	mm	in	mm
Vertical (0°)	7	178	12	305	18	457
0–45° up	0	0	12	305	18	457
0–45° down	22	559	24	610	42	1067

Table 4.3 – D: Radiant Surface (Heater Clearance)

Radiant Surface Position	Up to 12,000 Btu/hr (3.514 kW)		12,000 to 48,000 Btu/hr (14.058 kW)		Over 48,000 Btu/hr (17.572 kW)	
	in	mm	in	mm	in	mm
Vertical (0°)						
0–45° up	28	711	42	1067	60	1524
0–45° down						

Table 4.4 – C: Sides (Heater Clearance)

Radiant Surface Position	All Heaters Up to 60,000 Btu/hr (17.572 kW)	
	in	mm
Vertical (0°)		
0–45° up	12	305
0–45° down		

Note: Maintain nameplate clearances from combustible materials such as wood, cloth, paper, as well as any vehicles parked in the area of the heater.

## • Fuels

1. The Cata-Dyne™ flameless gas heater is designed to operate on clean, dry natural gas, or propane as specified on the heater nameplate.
2. **Natural Gas** - these heaters are designed to use natural gas (1,000 Btu/ft<sup>3</sup>, 37 MJ/m<sup>3</sup>) at 7" w.c. (1.73 kPa), 4.5" w.c. (1.12 kPa) or 3.5" w.c. (0.86 kPa).
3. **Propane** - these heaters are designed to use propane gas (2,500 Btu/ft<sup>3</sup>, 92 MJ/m<sup>3</sup>) at 11" w.c. (2.72 kPa).

## • Piping

1. A main shut-off valve must be installed upstream of all auxiliary heater controls.
2. The ASV375 100% safety shut-off valve (SSOV) and appliance regulator (natural gas heaters only) can be installed in the horizontal or vertical position. Older model heaters with the H17 safety shut-off valve must be installed in the upright position (horizontally) ONLY.
3. The thermostatic temperature controller can be installed in the horizontal or vertical position.
4. The maximum inlet pressure to the 100% safety shut-off valve (SSOV), thermostatic temperature control and appliance regulator is 1/2 psi (3.4 kPa). If the inlet pressure is higher than this, a low pressure service regulator must be installed upstream of these components.
5. The maximum inlet pressure to the low pressure service regulator (available from CCI Thermal) is 250 psi (1.7 MPa). If the inlet pressure is higher than this, a high-pressure regulator must be installed upstream.
6. For installation, see figure 2 for typical Cata-Dyne™ Heater and figure 3 for natural gas MKII model.

Note: Gas appliance regulators and manual shut-off valves are required standard components for all CSA approved heaters; they are available as optional accessories for FM approved heaters

# Installation (Cont'd)

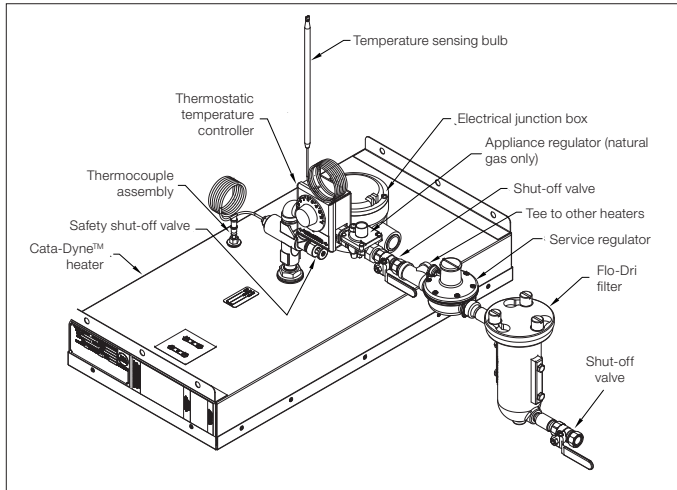


Figure 2 – Typical natural gas Cata-Dyne™ Heater installation

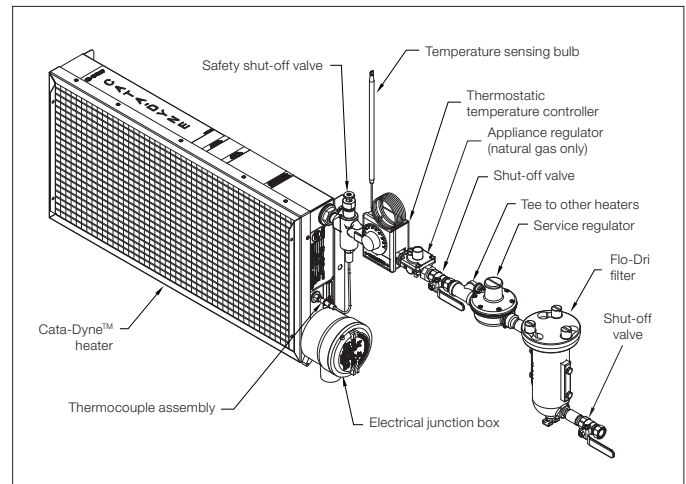


Figure 3 – Typical natural gas installation (MKII model only)

## • Electrical

Note: Ensure that the heater is not operational in an excessive vibration environment or premature failure of the heater may occur.

1. All wiring is to be installed in accordance with the latest revisions of the Canadian Electrical Code (CEC)/National Electrical Code (NEC) and any applicable local codes.
2. It is desirable to install an indicating light on all starting systems. This will reduce the possibility of the power being left on once the heater is started, which can severely reduce the lifespan of the heater.
3. Ground connections for 120V and higher voltage heaters are required as indicated in Figure 4 and 5, page 5.
4. The number of terminals in the junction box can be two or four depending on the number of elements used in the fabrication of the heater. All MKII models incorporate a single element and therefore have only two terminals. The connection procedure for the different combinations is as described in Figure 4 and 5, page 5.



**CAUTION** Install MKII Series heaters with controls on sides or bottom of heater ONLY.

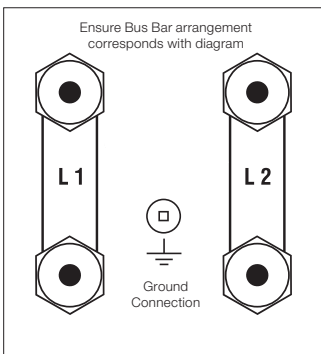


Figure 4 – Elements in parallel

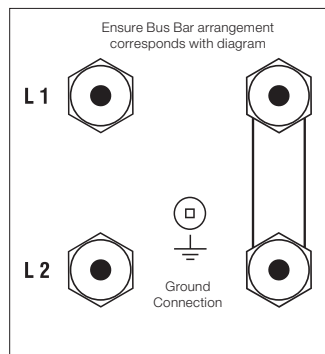


Figure 5 – Elements in series

## • Ventilation

1. The catalytic reaction in Cata-Dyne™ heaters occurs when natural gas or propane reacts with oxygen to produce water vapor, carbon dioxide and infrared energy. Ventilation must be provided to allow adequate supply of oxygen for the reaction.
2. For every 1.0 ft<sup>2</sup> (0.093 m<sup>2</sup>) of heater surface, 50 ft<sup>3</sup>/hr (1.42 m<sup>3</sup>/hr) of air supply is required. For example, a WX 24 x 24 heater (20,000 Btu/hr / 5.857 kW) would require 200 ft<sup>3</sup>/hr (5.66 m<sup>3</sup>/hr) of air to ensure proper operation of the Cata-Dyne™ heater. See Table 5, page 5 for air requirements.
3. To reduce the carbon dioxide and water vapor concentrations in the building, a vent hood assembly can be installed to provide positive ventilation from the heater (Figure 6, page 5).

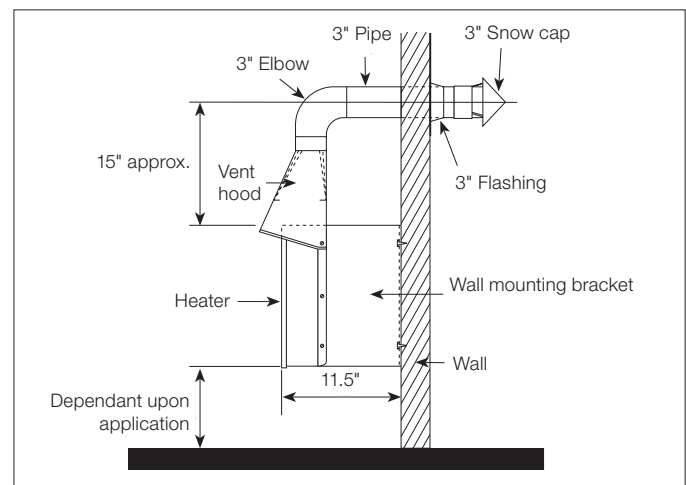


Figure 6 – Ventilation from heater

Table 5 – Ventilation from heater

Heater Series	Cu. Ft/hr of air per Square Ft of Heater Surface	Cu. M of air per Square Meter of Heater surface
WX/MKII (CSA/FM)	50	15.3
BX (CSA)	50	15.3
BX (FM)	60	18.3
WXS (FM)	70	21.3

# Operation

All Cata-Dyne™ heaters are supplied with a safety shut-off valve/ Thermocouple assembly to ensure the safe operation of the heater. Under no circumstances should the reset button be held or locked into the depressed position by use of a mechanical restraint. A tamper resistant model safety shut-off valve is available if desired.

## • Start-up

1. Ensure the heater has been installed according to all instructions and relevant codes.
2. Turn on the main gas supply to the system.
3. If the heater is equipped with a low-flow thermostatic temperature controller (capable of flow capacities below 30,000 Btu/hr), rotate the dial completely clockwise to the fully open position.
4. If the heater is equipped with a high-flow thermostatic temperature controller (capable of flow capacities above 30,000 Btu/hr), rotate the dial completely counterclockwise to the fully open position.
5. Turn on the power to the electrical elements.
6. After 15 minutes, depress the reset button on the top of the 100% safety shut-off valve. The button should return to the

original position and internally open the valve and allow gas to flow to the heater. If the valve does not stay open when the reset button is released, it may be necessary to wait an additional few minutes and then depress the reset button again. This will allow the electrical elements additional time to warm up.

7. When the catalytic reaction is well established, turn off the electrical power to the elements, and wait for an additional amount of time, and wait an additional amount of time.
8. If the heater is equipped with a thermostatic temperature controller, it can be set to the desired setting after the catalytic reaction has been established for at least one hour.

## • Shut Down

Turn off the gas supply to the heater.

## • Multi-Heater Start-up

Cata-Dyne™ heaters can also be purchased/installed in multi-heater assemblies. If these assemblies are 12V, each heater must be started individually. This ensures the correct voltage and current will be reaching the heater from the power supply.

# 12V Hazardous Electrical Installations

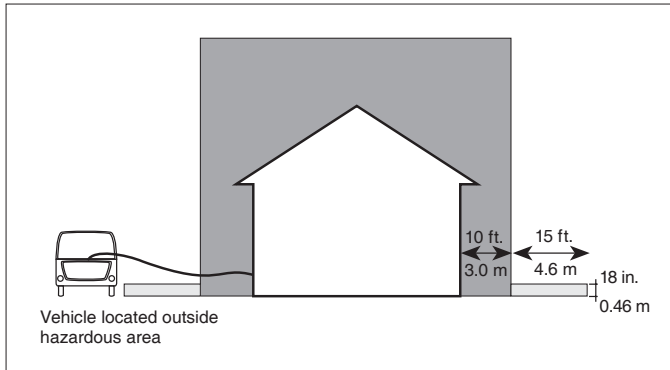


Figure 7 – Vehicle location

## • Most oil and gas production buildings have an area classification as follows:

1. Class I, Division 1 (Zone 1), within the building. Refer to Figure 7 and 8, page 6.
2. Class I, Division 2 (Zone 2), up to 10 ft (3 m) from the building in any direction. Refer to Figure 7 and 8, page 6.
3. Class I, Division 2 (Zone 2), between 10 ft (3 m) and 25 ft (7.6 m) from the building in all directions at an elevation of 18" (0.45 m) above the ground. Refer to Figure 7 and 8, page 6.
4. Connection to the power supply must be outside of the Class I, Division 2 location (Figure 9, page 6). All electrical apparatus and wiring within this area must conform to the appropriate codes.

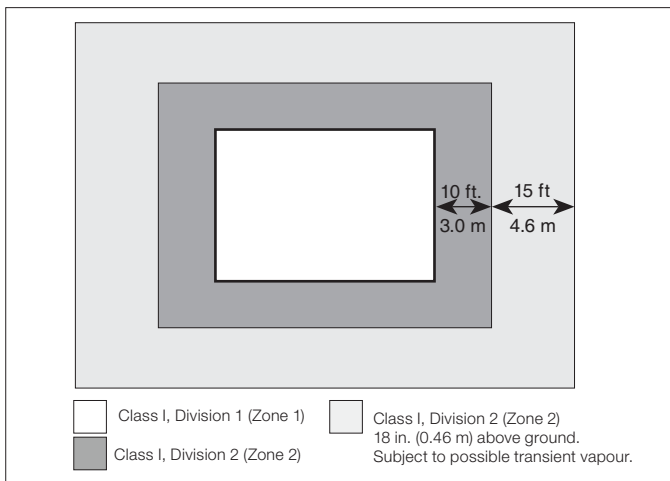


Figure 8 – Classes and divisions

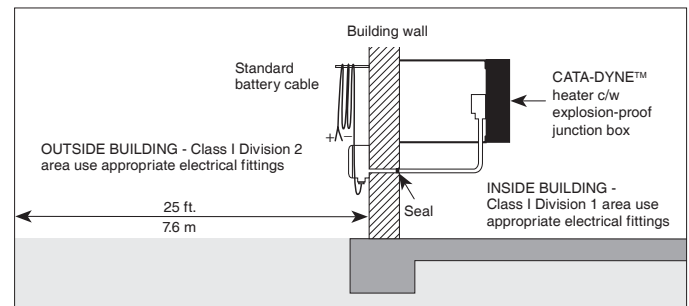


Figure 9 – Power supply connection (see Caution below).



**CAUTION** Connect battery outside 25 ft (7.6 m) in non-hazardous area

# Space & Spot Heating

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## • Space Heating

1. A separate heat load calculation should be done for each building in which a Cata-Dyne™ heater will be installed for space heating purposes.
2. The heat load calculation determines the building heat losses through the structure and allows for air infiltration. For sample Heat Load Calculation, visit: [www.ccithermal.com](http://www.ccithermal.com).
3. Cata-Dyne™ heaters produce low intensity infrared heat that is absorbed by objects within the range of the heat source. The closer the object is to the source of heat the more heat the object will absorb. Cata-Dyne™ heaters should be placed close to the floor level within the building to heat objects close to the floor.
4. Ideally, Cata-Dyne™ heaters should be mounted 1 ft to 3 ft (0.3 m to 1 m) from the floor and equally spaced around the building perimeter for space heating applications.
5. If low mounting is not practical, then overhead mounting may be utilized. Overhead mounted heaters should be sloped face down to a maximum 45° angle to direct the infrared energy towards the floor. Overhead mounting should be restricted to heaters of 30,000 Btu/hr (8.8 kW) capacity and larger.
6. If the building requires only one heater, place the Cata-Dyne™ heater as close as possible to the center of the longest wall.
7. For multiple heater installations, space the Cata-Dyne™ heaters as evenly as possible around the perimeter of the building.

8. Make sure the piping is large enough to handle the gas load (refer to the sample Piping Calculation in the Cata-Dyne™ catalog for sizing information).
9. Make sure the electrical starting system has sufficient current carrying capacity and conforms to all applicable electrical codes.
10. It is advisable to install an indicator light in the electrical circuit to reduce the possibility of the power being left on once the heater is started.

## • Spot Heating

1. There are several factors to consider when Cata-Dyne™ heaters are utilized for spot heating.
2. Infrared energy travels in straight lines from the face of the Cata-Dyne™ heater covering approximately 160° of an arc and is inversely proportional to the square of the distance. The heater should therefore be mounted as close as practical to the object requiring heat for maximum temperature rise. A minimum of 28" (710 mm).
3. Match the shape of the object requiring heat with the appropriate Cata-Dyne™ heater, e.g. WX/BX 6x24 for long narrow objects or WX/BX 12x12 for a square object.
4. Objects requiring heat should be painted dull, dark colors for maximum infrared absorption and objects not requiring heat should be painted light or reflective colors.
5. Insulate and protect plastic, rubber and similar materials from direct intense infrared heat.

# Cleaning & Personal Safety

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## • Cleaning

The Cata-Dyne™ heater box may be cleaned but only once it has been allowed to cool. If your Cata-Dyne™ catalytic pad (white pad) is dirty it should never be contacted in order to avoid damaging it. This means that it should not be wiped down, sprayed with water or blown with compressed air. Any contact with the catalytic pad may damage the surface requiring the owner to return the unit to the factory for repair.

## • Personal Safety

The Cata-Dyne™ heater does not produce harmful carbon monoxide gas when used with natural gas or propane. Adequate ventilation must be incorporated in any building design to ensure oxygen replenishment and removal of any carbon dioxide. Protective grills should be used on any installation where personnel may come in contact with the face of the heater.

# Repairs

---

If the Cata-Dyne™ heater malfunctions, and is no longer operating, send the heater to the factory for servicing. Do not attempt to service the unit.

When returning the heater you can fill out the online repair form at <http://www.ccithermal.com/online-repair-form.php> or include the following information with the heater when shipping:

1. Company name and address
2. Contact name
3. Telephone/fax number/email
4. Product model and serial numbers
5. Tagging codes
6. Advise if an estimate is required prior to starting the repair
7. P.O. Number
8. Description of problem(s) and/or required repairs
9. Special instructions (if applicable)
10. Return shipping instructions

# Ordering Information

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1. Quote requests can be made using our Online RFQ process found at: [www.cata-dyne.com](http://www.cata-dyne.com)
2. Order any of CCI Thermal's products by telephone, fax, mail, e-mail, or on-line at: [www.cata-dyne.com](http://www.cata-dyne.com)
3. To assist us in processing your order as quickly and efficiently as possible, please provide us with the following information:
  - a. Cata-Dyne™ product name
    - i. Cata-Dyne™ model number
  - b. Fuel gas: natural gas or propane
  - c. Starting voltage: 12, 24, 120, 208, 240, 480, or 600
  - d. Accessories required:
    - i. Protection Grill
    - ii. Wall Mount Brackets
    - iii. Thermostat
  - e. Company name and contact
  - f. Billing address and phone number
  - g. Shipping instructions
  - h. Special tagging instructions
  - i. Date required
  - j. Method of payment:
    - i. On account: P.O. number required
    - ii. Credit card: VISA or Mastercard number
    - iii. Cash or cheque
  - iv. Regulator
  - v. Start Up Leads (12V system only)
  - vi. Vent Hood
  - vii. Other

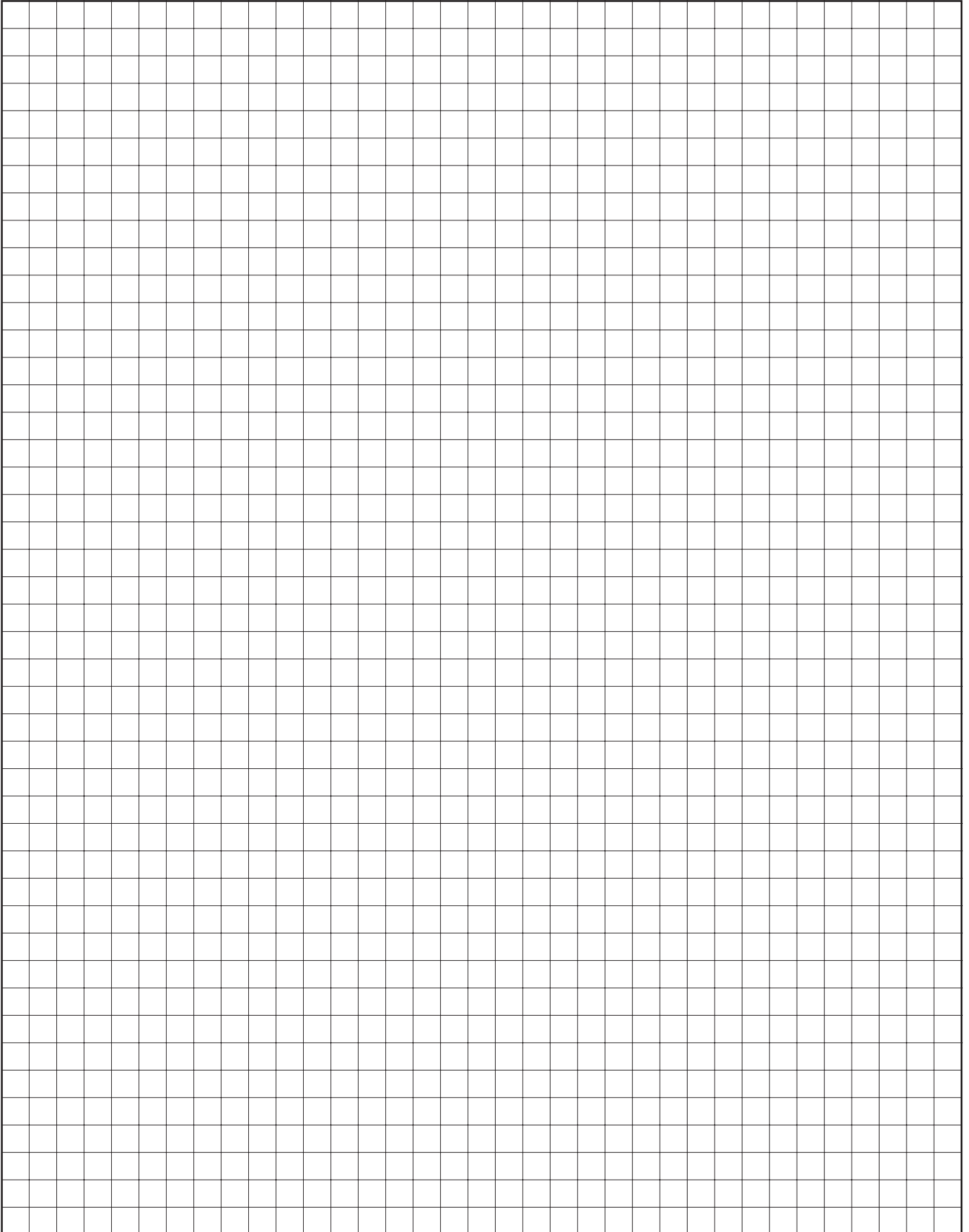
# Troubleshooting

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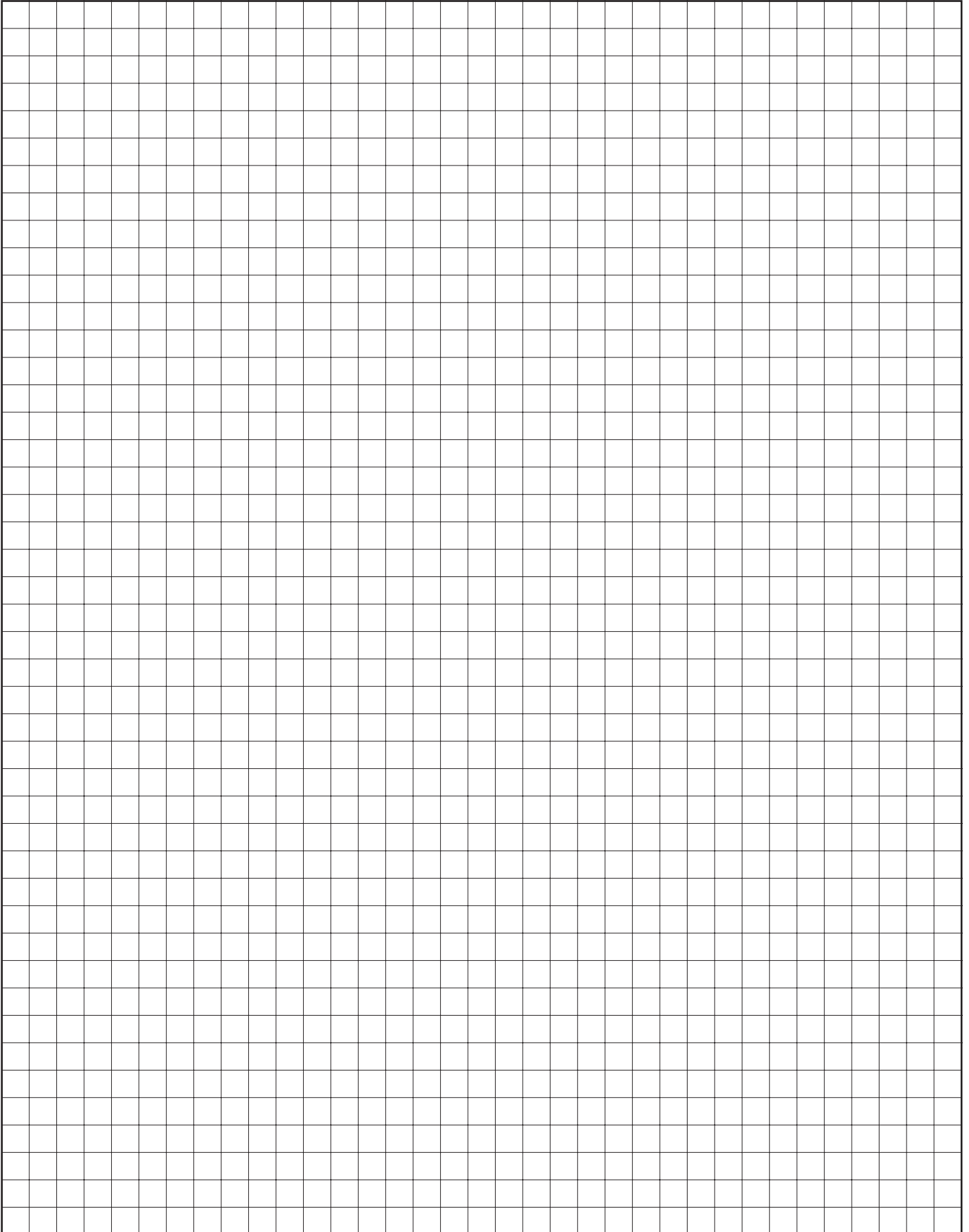
1. Ensure that the fuel matches that listed on the nameplate.
2. Ensure that the voltage matches that listed on the nameplate.
3. Check for any physical damage. All signs of physical damage to the catalyst pad such as holes, tears or a general deterioration of the catalyst bed indicate that it is time to have the heater repaired. Excessive vibration may cause damage to the inner catalysts structure which may cause premature failure.
4. Check the gas supply pressure at the heater – 7" w.c. (1.73 kPa), 4.5" w.c. (1.12 kPa) or 3.5" w.c. (0.86 kPa) for natural gas and 11" w.c. (2.72 kPa) for propane.
5. Check the gas orifice for obstructions or dirt and ensure the size matches that listed on the nameplate. It may be necessary to install a filter upstream of the heater or regulator if the gas supply is dirty. If the fuel supply is constantly dirty and/or wet it would be advisable to use bottled propane fuel.
6. Check the mounting position of the heater. The face of the heater should be preferably in the vertical position and should not vary more than 45° from the vertical position for maximum efficiency.
7. Check for saturation of the catalyst face caused by condensation or rain running down the face of the heater. If the heater has been exposed to water, it is advisable to place the unit in a warm area for a period of a few hours or longer if required. Once the moisture is removed, the heater can be re-installed and re-started.
8. Check the start-up leads cable size to ensure that the resistance of the cable is not reducing the current to the heater. This would not allow sufficient power to the electrical element to preheat the catalyst to the activity temperature. It is recommended to run the service vehicle at fast idle while starting the heater.
9. Cata-Dyne™ heaters are designed to use clean fuel and to be used in non-contaminated atmospheres. Sulphur compounds in the fuel or atmosphere will poison the catalyst bed over a period of time and render the heater inoperative. If the heater has been exposed to sulphur compounds, it should be sent to the factory for service.
10. Avoid spraying the face of the heater with high-pressure air, steam or water because this can damage the catalyst bed, if physical damage is visible, return the heater to the factory for servicing.
11. Ensure that the thermostat is correct for the model size, fuel, and pressure specifications for the heater it is fitted to. If the thermostat is too low, the heater will not have sufficient fuel rating to operate and will stop.



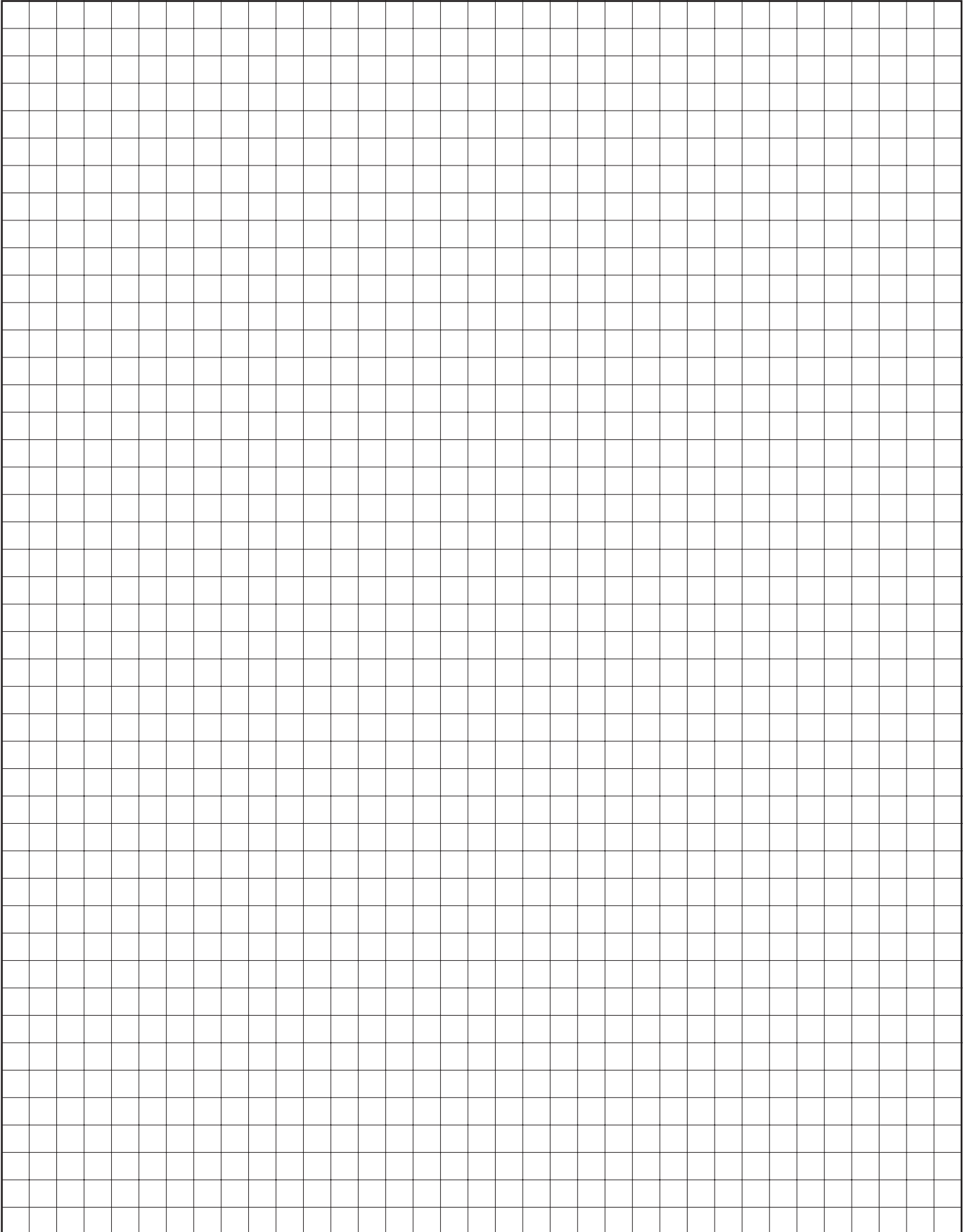
# Notes



# Notes



# Notes



**For further assistance, please call 24hr hotline: 1.800.661.8529 (U.S.A. and Canada)**

**Please have model and serial numbers available before calling.**

**WARRANTY:** Under normal use the Company warrants to the purchaser that defects in material or workmanship will be repaired or replaced without charge for a period of 18 months from date of shipment, or 12 months from the start date of operation, whichever expires first. Any claim for warranty must be reported to the sales office where the product was purchased for authorized repair or replacement within the terms of this warranty.

Subject to State or Provincial law to the contrary, the Company will not be responsible for any expense for installation, removal from service, transportation, or damages of any type whatsoever, including damages arising from lack of use, business interruptions, or incidental or consequential damages.

The Company cannot anticipate or control the conditions of product usage and therefore accepts no responsibility for the safe application and suitability of its products when used alone or in combination with other products. Tests for the safe application and suitability of the products are the sole responsibility of the user.

This warranty will be void if, in the judgment of the Company, the damage, failure or defect is the result of:

- Vibration, radiation, erosion, corrosion, process contamination, abnormal process conditions, temperature and pressures, unusual surges or pulsation, fouling, ordinary wear and tear, lack of maintenance, incorrectly applied utilities such as voltage, air, gas, water, and others or any combination of the aforementioned causes not specifically allowed for in the design conditions or,
- any act or omission by the Purchaser, its agents, servants or independent contractors which for greater certainty, but not so as to limit the generality of the foregoing, includes physical, chemical or mechanical abuse, accident, improper installation of the product, improper storage and handling of the product, improper application or the misalignment of parts.

No warranty applies to paint finishes except for manufacturing defects apparent within 30 days from the date of installation.

The Company neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the product(s).

The Purchaser agrees that all warranty work required after the initial commissioning of the product will be provided only if the Company has been paid by the Purchaser in full accordance with the terms and conditions of the contract.

The Purchaser agrees that the Company makes no warranty or guarantee, express, implied or statutory, (including any warranty of merchantability or warranty of fitness for a particular purpose) written or oral, of the Article or incidental labour, except as is expressed or contained in the agreement herein.

**LIABILITY:** Technical data contained in the catalog or on the website is subject to change without notice. The Company reserves the right to make dimensional and other design changes as required. The Purchaser acknowledges the Company shall not be obligated to modify those articles manufactured before the formulation of the changes in design or improvements of the products by the Company.

The Company shall not be liable to compensate or indemnify the Purchaser, end user or any other party against any actions, claims, liabilities, injury, loss, loss of use, loss of business, damages, indirect or consequential damages, demands, penalties, fines, expenses (including legal expenses), costs, obligations and causes of action of any kind arising wholly or partly from negligence or omission of the user or the misuse, incorrect application, unsafe application, incorrect storage and handling, incorrect installation, lack of maintenance, improper maintenance or improper operation of products furnished by the Company.

**Edmonton (Head Office)**

1-780-466-3178

F 780-468-5904

5918 Roper Road

Alberta, Canada T6B 3E1

**Oakville**

1-800-410-3131

1-905-829-4422

F 905-829-4430

**Orillia**

1-877-325-3473

1-705-325-3473

F 705-325-2106

**Houston**

1-855-219-2101

1-281-506-2310

F 281-506-2316

**Denver**

1-855-244-3128

1-303-979-7339

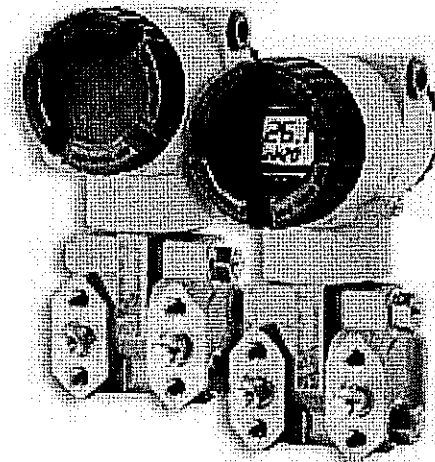
F 303-979-7350

# SCADASense 4102

## Modbus Multivariable Transmitter

### Features:

- Digital Multivariable Transmitter
- Ethernet and Serial Communications
- PID Controller
- Analog Output
- CSA Class 1, Division 1, Hazardous Area Rating
- ATEX and IECEx, Ex d IIC T6;  $-50^{\circ}\text{C} \leq T_a \leq 70^{\circ}\text{C}$
- Single Seal Compliance Certification under ANSI/ISA – 12.27.01 \*
- RTD connections rated non-incendive in Div. 2 areas
- 3 year warranty on parts and labor



The SCADASense 4102 Modbus Multivariable Transmitter is the flagship of Control Microsystems' Ethernet transmitter product line, offering precise measurement of process pressure, differential pressure and temperature. As a fully digital transmitter, the product offers a built-in choice of Modbus protocol over serial and/or Ethernet communications, along with an optional PID controller and analog output. With this choice, the 4102 can be used in a wide variety of installations including low power transmitters in remote locations or as an addressed device offering control and measurement in an extended Ethernet network.

### Overview:

#### Highly Accurate and Dependable -

The 4102 integrates a field proven, high-performance, multivariable sensor with Control Microsystems' implementation of industry-standard Modbus. As a multivariable transmitter, the 4102 can measure process temperature, process pressure and differential pressure. The unit is capable of tolerating severe overpressure conditions with no sensor degradation or zero-shift. The 4102 has an accuracy of +/- 0.05% of span, and long term drift stability of +/- 0.05% of the URL (Upper Range Limit).

**Flexible Communications** - With built-in serial and 10BaseT Ethernet ports the 4102 provides flexibility for both communications and configuration. The Serial port is RS-232/485 configurable and uses Control Microsystems' native Modbus RTU protocol. It can be used with radios, local displays or communication with other serial devices. The Ethernet port supports four Modbus protocols, two simultaneous connections and extended addressing. In addition, the Ethernet port supports a friendly IP list that enhances security through limiting IP message recognition from specific addresses or address ranges.

**Superior Design** - The 4102 sensor uses a unique biplanar design that allows the transmitter to be installed vertically, while easily integrating to horizontal process connections. Tangential draining and venting keep the sensor cavity clear without the use of side drain connections, regardless of horizontal or vertical installation. An optional integrated LCD unit provides local measurement readouts and configuration capabilities for any measurement or control variable. The unit can also be calibrated from a remote SCADAPack controller using RealFLO software.

The RTD connections are approved as non-incendive when the unit is mounted in a Div. 2 area. This allows for the use of a low cost RTD connection instead of expensive explosion proof termination boxes.

### Applications:

As a compact and accurate multivariable transmitter with built-in Serial and Ethernet ports, PID control and an analog output, the 4102 can be applied in a wide range of flow measurement and control applications. These can include natural gas flow measurement (Measurement Canada-approved) and natural gas production automation, as well as measurement of level, pressure and temperature within storage vessels and pipelines. Depending on the application the 4102 can be used in a low power serial mode or as an addressed device using Ethernet on a WAN or LAN based system. From a certification perspective, the unit's CSA Class 1, Div 1, hazardous area rating makes it an ideal product for industrial, petrochemical and below grade municipal applications and the product's Single Seal Compliance Certification, under ANSI/ISA – 12.27.01, allows for process sealing between electrical systems and flammable or combustible fluids. \*

\* With maximum working pressures up to 21MPa [3000PSI]

**Specifications**

<b>Features</b>	
Optional Analog Output	0 - 20mA, 12 bit
Optional PID Controller	Fully configurable control of analog output relative to any measured variable
LCD Interface <sup>1</sup>	Two button control, 2-line interface with 13 characters
<b>Communications</b>	
Serial Port	RS232/485 configurable, 1200 to 38400 baud
Serial Protocol	Modbus RTU
Ethernet Port <sup>2</sup>	10BaseT, terminal block connection
Ethernet Protocols <sup>2</sup>	Modbus/UDP, Modbus RTU in UDP
<b>Accuracy and Stability</b>	
Differential & Absolute Pressure Accuracy	$\pm 0.05\%$ of span (for spans 10% $\geq$ of URL) $\pm (0.005) \times \{URL / Span\} \% \text{ of Span (spans } < 10\% \text{ URL)}^3$
Process Temperature Accuracy	$\pm 0.15^\circ\text{C}$ ( $\pm 0.27^\circ\text{F}$ ) (not including RTD uncertainties)
Stability	$< \pm 0.05\%$ of URL per year over 5 years
Static Pressure Effect	The zero and span shift for a 1000psi (7MPa) static pressure change is: ZERO Shift $\pm 0.05\%$ of URL, SPAN Shift $\pm 0.1\%$ of reading
Ambient Temperature Effect	Total effect for a 100°F (55°C) change for absolute and differential pressure is: Digital Output: $\pm (0.0625\% \text{URL} + 0.125\% \text{Reading})$
<b>Physical Specifications</b>	
Power	9 to 30 VDC. 225mW with LAN (60mW with Serial communications)
Mass	7.8lb (3.5kg) without process connectors
Certifications	CSA Class 1, Div. 1 Groups B, C and D Hazardous locations CSA Class 1, Div. 2 Groups A, B, C and D Hazardous locations ATEX and IECEx, Ex d IIC T6; $-50^\circ\text{C} \leq T_a \leq 70^\circ\text{C}$ RTD connections rated non-incendive in Div. 2 areas Single Seal Compliance under ANSI/ISA – 12.27.01, with maximum working pressures up to 21MPa (3000psi)

<sup>1</sup> Button control when setup for calibration through a SCADAPack controller using RealFLO software.

<sup>2</sup> Available without a disabled Ethernet port.

<sup>3</sup> Accuracy stated includes the effects of Linearity, Hysteresis, and Repeatability.

## Model Code

4102-EA22A1010 represents a sample code for a 4102 with Ethernet

Model	Select	Product Description
-------	--------	---------------------

4102- Modbus Multivariable Transmitter

Code	Select	Communication/Serial Ports
------	--------	----------------------------

DM Digital - Modbus Protocol, Jumper selectable RS232 or RS485, de-pluggable screw-type terminal block

DA Digital - Modbus Protocol, Jumper selectable RS232 or RS485, de-pluggable screw-type terminal block, 1 Analog Output

EA Digital - [1] RS485/232 with Modbus Protocol, [1] 10 BaseT Ethernet with Modbus/UDP protocol, 1 Analog Output

Code	Process Cover	Sensor Material	Sensor Fill Fluid	Bolts
------	---------------	-----------------	-------------------	-------

22 316SS 316SS Silicone CS-B7

Code	Select	Differential & Absolute Pressure Span Limit
------	--------	---

### Differential Pressure

### Absolute Pressure (Field Configurable for Gauge)

#### Standard Sensor

A	0.5 to 30 inH2O	[0.12 to 7.5 kPa]	1 to 100 psi	[0.007 to 0.7 MPa]
B	2 to 200 inH2O	[0.50 to 50 kPa]	3 to 300 psi	[0.021 to 2.1 MPa]
C	10 to 840 inH2O	[2.5 to 210 kPa]	3 to 300 psi	[0.021 to 2.1 MPa]
D	2 to 200 inH2O	[0.50 to 50 kPa]	30 to 1500 psi	[0.21 to 10 MPa]
F	3 to 300 inH2O	[0.75 to 75 kPa]	30 to 1500 psi	[0.21 to 10 MPa]
E	10 to 840 inH2O	[2.5 to 210 kPa]	30 to 1500 psi	[0.21 to 10 MPa]
J	2 to 200 inH2O	[0.50 to 50 kPa]	30 to 3000 psi	[0.21 to 21 MPa]
K	3 to 300 inH2O	[0.75 to 75 kPa]	30 to 3000 psi	[0.21 to 21 MPa]
L	10 to 840 inH2O	[2.5 to 210 kPa]	30 to 3000 psi	[0.21 to 21 MPa]

#### Low Profile Sensor

U	0.5 to 30 inH2O	[0.12 to 7.5 kPa]	1 to 100 psi	[0.007 to 0.7 MPa]
V	2 to 200 inH2O	[0.50 to 50 kPa]	3 to 300 psi	[0.021 to 2.1 MPa]
W	10 to 840 inH2O	[2.5 to 210 kPa]	3 to 300 psi	[0.021 to 2.1 MPa]
X	2 to 200 inH2O	[0.50 to 50 kPa]	30 to 1500 psi	[0.21 to 10 MPa]
Z	3 to 300 inH2O	[0.75 to 75 kPa]	30 to 1500 psi	[0.21 to 10 MPa]
Y	10 to 840 inH2O	[2.5 to 210 kPa]	30 to 1500 psi	[0.21 to 10 MPa]
M	2 to 200 inH2O	[0.50 to 50 kPa]	30 to 3000 psi	[0.21 to 21 MPa]
P	3 to 300 inH2O	[0.75 to 75 kPa]	30 to 3000 psi	[0.21 to 21 MPa]
R	10 to 840 inH2O	[2.5 to 210 kPa]	30 to 3000 psi	[0.21 to 21 MPa]

Code	Select	Temperature Measurement
------	--------	-------------------------

1 Terminal Blocks for Connection of External 100 Ohm Platinum RTD (DIN/IEC)

Code	Select	Process Connector Type
------	--------	------------------------

0 1/4" NPT, Threaded in Process Cover, includes SS Plugs - NACE Standard MR-01-75 compliant

1 1/2" NPT, Flange Adapter c/w CS Grade B7 bolts

Code	Select	Transmitter Housing Material	Conduit Entry Sizes
------	--------	------------------------------	---------------------

1 Epoxy covered Aluminium [2] 1/2 -14 NPT

3 316 SS [2] 1/2 -14 NPT

Model Codes continue on the next page

**Model Code**

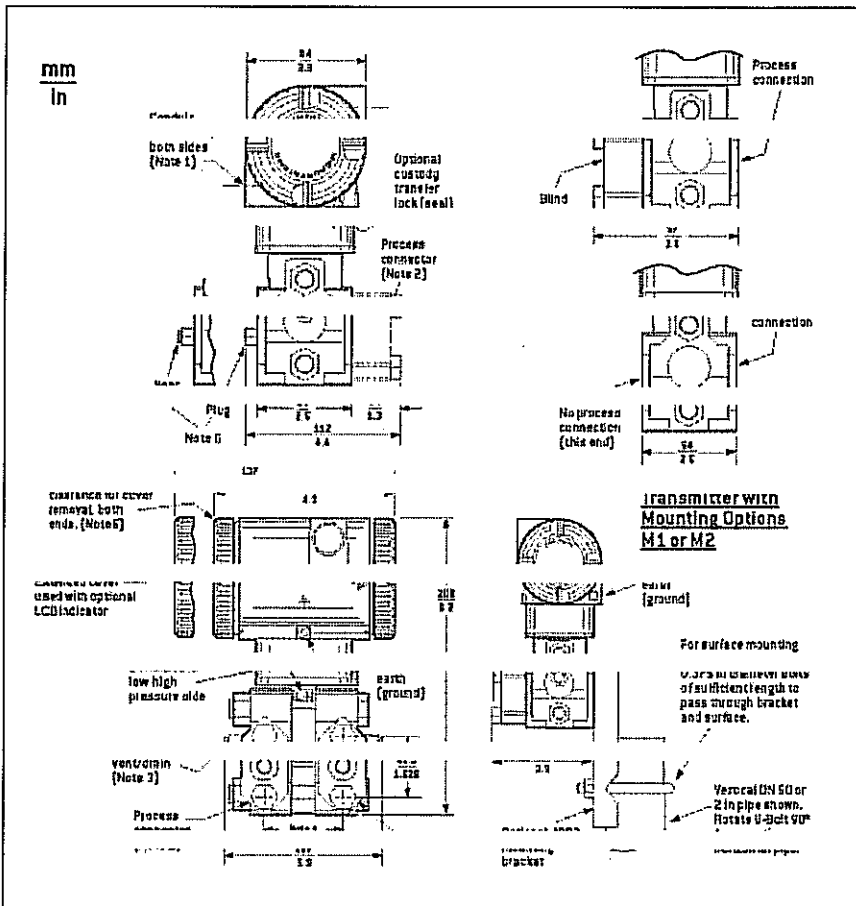
4102-EA22A1010 represents a sample code for a 4102 with Ethernet

Code	Select Approvals
U	CSA Class 1 - Div 1 (Groups B,C,D) & Div 2 (Groups A,B,C,D). Approved - Hazardous Locations
X	ATEX and IECEx, Ex d IIC T6; $-50^{\circ}\text{C} \leq T_a \leq 70^{\circ}\text{C}$

Code	Select Options
<b>DIGITAL INDICATOR - Select One Only</b>	
-L	Digital Indicator with Push Buttons and Ex-proof Window Cover (Black Epoxy)
-L1	Digital Indicator with Push Buttons and Ex-proof Window Cover (Stainless Steel)
<b>UPGRADE TO STAINLESS STEEL PROCESS COVER BOLTS AND NUTS (Replaces CS-B7) - Select One Only</b>	
-B1	316 SS Process Cover Bolts and Nuts
-B2	17-4 SS Process Cover Bolts and Nuts
<b>HIGH PRESSURE OPTION - AVAILABLE ON PRESSURE SPAN LIMIT CODES D,E,FX,Y,Z</b>	
-Y	High Static Calibration, Absolute Pressure 5300 PSI
<b>INDUSTRY CANADA APPROVAL - AVAILABLE ON 300 PSI &amp; 1500 PSI STANDARD SENSORS ONLY</b>	
-C	Industry Canada approved version, includes Custody Transfer seal kit

**Dimensions**



1. Conduit connection 1/2 NPT or PG 13.5, both sides; plug unused connection with metal plug [supplied].
2. Process connectors may be removed and connections made directly to process cover using 1/4 NPT internal thread in process cover.
3. Process cover can be inverted making optional side vents or side drains.
4. Process connectors can be inverted to give either 2.0, 2.125, or 2.25 inch (51, 54, or 57mm) center-to-center distance between high and low pressure connections.
5. Topworks can be rotated to any position within one turn counterclockwise of the fully tightened position.
6. Process cover end plugs are substituted for vent screws when optional side vents (Note 3) are specified.

**CONTROL MICROSYSTEMS**

www.controlmicrosystems.com

Within North America: (888) 267-2232 ■ Outside North America: (613) 591-1943 ■ Ottawa ■ Calgary ■ Denver ■ Houston ■ Melbourne ■ Leiden  
 Control Microsystems reserves the right to change product specifications without notice. Printed In Canada ■ V030 ■ M0101125



### Type 67CFR Instrument Supply Regulator



W7423-1

*Mounted on a Control Valve Controller*



W7412

*With Optional Pressure Gauge*

- Typically Used to Provide Reduced Pressures to Pneumatic and Electro-Pneumatic Instruments
- DN 8 or 1/4-Inch NPT Screwed Connections
- Temperatures to 149°C or 300°F
- Inlet Pressures to 17.2 Bar or 250 Psig
- Outlet Pressure Settings from 0 to 6.9 Bar or 0 to 100 Psig
- Air and Process Gas Service

Body Sizes, End Connections,  
and Materials ..... 6-28  
Flow Coefficients ..... 6-28

Temperatures ..... 6-28  
Pressures ..... 6-28  
Options ..... 6-28

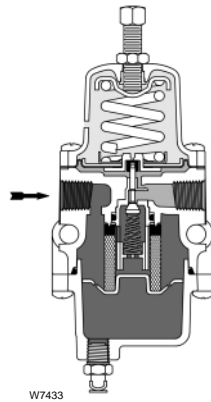


# Industrial Regulators

## 67CFR

Type 67CFR regulators are typically used to provide reduced pressures to pneumatic and electro-pneumatic instruments. These regulators have internal filters with a fee area of 12 times the pipe area. The internal relief valve has a soft seat.

Other applications include providing reduced pressure for air chucks, air jets, and spray guns.



- **Compact, Lightweight Design**
- **In-Line Maintenance**
- **Internal Relief**
- **Integral Filter**
- **Second Outlet for Gauge**
- **Pressure Gauges Available**
- **Dripwell with Drain Valve**

### Body Sizes, End Connections, and Materials

Body Sizes and End Connection	Body, Spring Case, and Dripwell	Filter	Diaphragm and Valve Plug	Gasket
1/4 NPT screwed	Aluminum	Cellulose or stainless steel or glass	Nitrile, fluoroelastomer (FKM), or silicone (do not use silicone with hydrocarbons)	Composition

## 6

### Flow Coefficients for Relief Valve Sizing

Wide-Open  $C_g$ : 11.7

Wide-Open  $C_v$ : 0.36

$C_1$ : 32.2

### Temperatures

**Nitrile:** -29 to 82°C or -20 to 180°F (Optional is -40 to 82°C or -40 to 180°F)

**Fluoroelastomer (FKM):** -18 to 149°C or 0 to 300°F

**Silicone (VMQ):** -51 to 82°C or -60 to 180°F

### Pressures

**Maximum Inlet Pressure (Body Rating):** 17.2 bar or 250 psig

**Maximum Outlet (Casing) Pressure:** 3.4 bar or 50 psi above outlet pressure setting

### Outlet Pressure Ranges

OUTLET PRESSURE RANGES		CONTROL SPRING DATA	
Bar	Psig	Part Number	Color
0 to 1.4	0 to 20	T14130T0012	Green stripe
0 to 2.4	0 to 35	T14059T0012	Silver
0 to 4.1	0 to 60	T14058T0012	Blue stripe
0 to 8.6	0 to 125	T14050T0012	Red stripe

### Options

Pressure gauge in side outlet, handwheel adjusting screw, panel mounting, NACE (National Association of Corrosion Engineers) or ammonia service construction, triple-scale outlet pressure gauge

**Only a brief overview is presented here. For more detailed information, such as capacities and dimensions, refer to the companion catalog, the Fisher Regulator Handbook.**

## Proportional Relief Valves, High Pressure


**Part No.**

SS-4R3A5

**Part Description:**

SS High-Pressure Proportional Relief Valve, 1/4 in. MNPT x 1/4 in. FNPT

## Product Specifications

General	
<b>Service Class</b>	High Pressure
<b>Size</b>	1/8in
<b>Valve Material</b>	316 Stainless Steel
<b>End Connection 1 Size</b>	1/4 in
<b>End Connection 1 Type</b>	Male NPT
<b>End Connection 2 Size</b>	1/4 in
<b>End Connection 2 Type</b>	Female NPT
<b>Approval</b>	No Approval
<b>Cleaning</b>	Swagelok SC-10
<b>Lubricant</b>	Dow Corning Molykote 55 Grease
<b>Manual Override</b>	No
<b>Seal Material</b>	Fluorocarbon FKM
<b>Testing</b>	No Optional Testing
<b>Max Temperature Pressure Rating</b>	250°F @ 4910 PSIG /121°C @ 338 BAR
<b>Room Temperature Pressure Rating</b>	6000 PSIG @ 100°F /413 @ BAR 37°C

**!** The complete catalog contents must be reviewed to ensure that the system designer and user make a safe product selection. When selecting products, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

**⚠** Caution: Do not mix or interchange valve components with those of other manufacturers.

# Technical Data Sheet

## P-5700 Tank Gauge

### Features

- 1/2 NPT Carbon Steel Connections (Stainless Available)
- Aluminum Construction for Corrosion Resistance
- Floating Sight Ball for Easy Fluid Level Indication
- Dual Calibration (Rate and Height) Standard
- Teflon Seals Standard
- Available in a Variety of Lengths
- Retractable Mounting Bracket Included

### Technical Specifications

#### Wetted Parts:

Nipple: Carbon Steel (stainless optional)

Seal: Teflon

Glass: Schott Duran

#### Other Parts:

Body: Aluminum

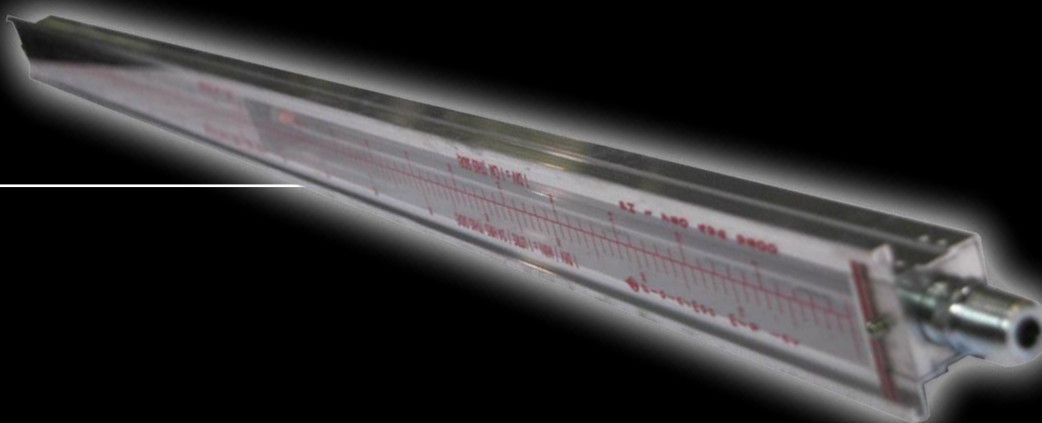
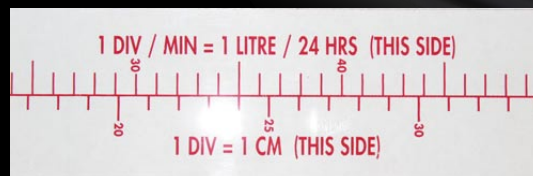
Scale: Metric Height / Rate (rate, height and clear optional)

### Ratings

Liquid

Height: 1 division = 1 cm

Rate: Measured in litre / 24 hrs, 1 division per minute.



# P-5700 tank gauge

MADE IN CANADA

ISO 9001: 2000  
Registered by  
**QUASAR**

## Ordering Information

### Stock:

1.) Order using model number from Table 1

### Custom:

- 1.) Determine height required
- 2.) Choose nipple material
- 3.) Choose scale type
- 4.) Construct model number using the following system:

### Model Numbering:

P5700-AA-BB-XYZ (i.e. P5700-52-48-CTM)

AA: overall length

BB: scale length (BB = AA - 4 in.)

X: nipple material (C - carbon steel,

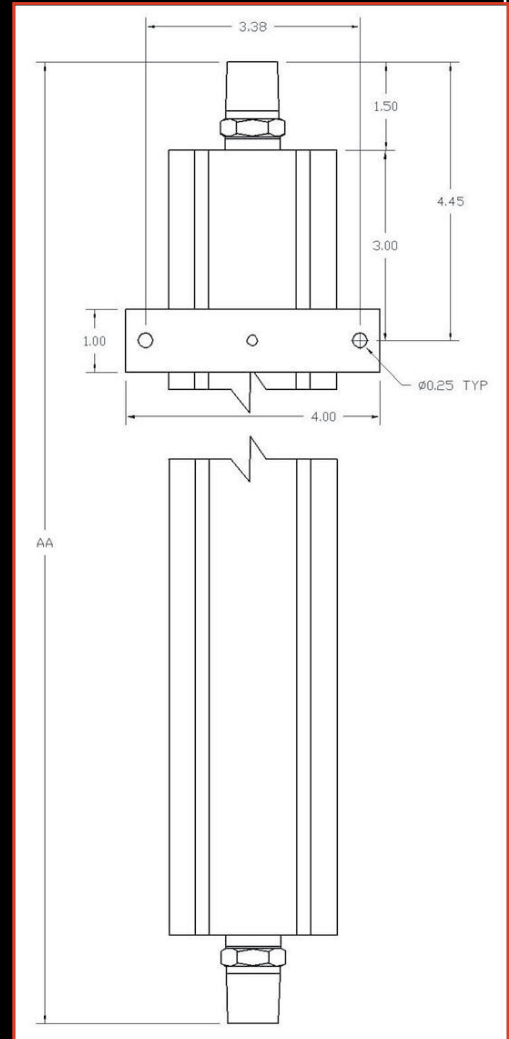
S - Stainless)

Y: seal material (T - TFE)

Z: scale type (M - Metric Rate/Height, R - Rate, H - Height,

C - Clear, X - Special)

## General Dimensions



MODEL#	LENGTH		MATERIAL		SCALE	PRESSURE RATING° (PSI)
	'AA'	SCALE	NIPPLE	SEAL		
P5700-24-20-CTM	24	20	Carbon Steel	TFE	Metric R/H	185
P5700-36-32-CTM	36	32	Carbon Steel	TFE	Metric R/H	165
P5700-52-48-CTM	52	48	Carbon Steel	TFE	Metric R/H	140
P5700-60-56-CTM	60	56	Carbon Steel	TFE	Metric R/H	130
P5700-64-60-CTM	64	60	Carbon Steel	TFE	Metric R/H	120
P5700-72-68-CTM	72	68	Carbon Steel	TFE	Metric R/H	100
P5700-88-84-CTM	88	84	Carbon Steel	TFE	Metric R/H	n/a

Pressures at 150° F Max, No Corrosion. Glass is not recommended for use in steam or superheated water applications



# BR5100

## Pneumatically Operated Chemical Injection Pump



### Product Detail

The Bruin BR5100 Chemical Injector Pump is a single acting, positive displacement plunger type pump. Powered by pneumatic pressure acting against a diaphragm, it is capable of operation with supply pressures as low as 2 psig (35 psig max.), equipped with a spring return, automatic switching mechanism and available in 4 plunger sizes, the pump can handle output volumes up to 30 gallons per day and discharge pressures up to 6000 psig. Volume is controlled, based on plunger size, by controlling the speed of the pump via a speed control valve and by the stroke length selection. Maximum discharge capability is governed by the packing selection and discharge pressure can be controlled with the supply pressure via a regulator. Conversion for handling of various chemicals is easily accomplished by the change out of the packing set and fluid end seals.

- Designed for pumping methanol, soap, chemicals and corrosion inhibitors. Packing and seals available in Buna, Viton, Teflon, Fluorosilicone and Perfluoroelastomers (Bruz)
- Single acting positive displacement plunger pump, operated with pneumatic pressure acting against a diaphragm and internal spring return
- AIR DISTRIBUTION SYSTEM allows speed adjustment between 0 - 30 strokes per minute (spm) without stalling, providing greater control of the pump stroke rate and chemical injection rate
- Adjustable speed (0 - 30 spm) and plunger sizes (3/16", 1/4", 3/8" & 1/2") provide adjustable output volume to 30 imperial gallons (136 liters) per day maximum
- Maximum supply pressure - 35 psig, (will operate with pressures as low as 2 psig, dependant on discharge pressure and pump set up)

### SPECIFICATIONS

### BR5100 SERIES

Type	Pneumatically Operated
Volume	0 - 30 Imp. Gallons per Day 0 - 136 Litres per Day
Pressure	Max. 3000 psig (standard) Max. 6000 psig (Hard Packing only)
Operating Supply Pressure	2 - 35 psig (low supply < 8 psig achievable with Low Supply Pressure Spring Option)
Plunger Sizes	3/16", 1/4", 3/8", 1/2"
Stroke Length	1/3", 1" , or adjustable up to 1" (with Low Volume Stroke Adjustment Option)
Stroke Rate	0 - 30 Strokes per Minute
Switching System	Micro Switch - Standard Rotary Pilot Valve - Optional
Gas Consumption	0.03 to 0.06 SCF per Stroke
Fluid Suction Connection	1/4" FNPT
Fluid Discharge Connection	1/4" FNPT
Supply Connection	3/8" FNPT - Standard Micro Switch 1/4" FNPT - Optional Pilot Valve
Exhaust Valve Connection	3/8" FNPT - Standard Micro Switch 1/4" FNPT - Optional Pilot Valve

### MATERIALS OF CONSTRUCTION

Fluid Head	Ductile Iron Stainless Steel - Optional
Internal Wetted Components	Stainless Steel
Plunger	Case Hardened Stainless Steel
Diaphragm	Buna w/ Nylon Reinforcement
Packing V-Style	Buna, Buna Hard, Viton, Teflon, Fluorosilicone, Perfluoroelastomer (Bruz), other material arrangements available.
Seals	Buna, Metal-Metal, Viton, Teflon, Fluorosilicone, Perfluoroelastomer (Bruz)

### APPLICATIONS

Methanol Injection, Chemical Injection, Soap Injection, Corrosion Inhibitor

### ACCESSORIES

Tanks, Bases, Regulators and Gauges

## Performance Specification

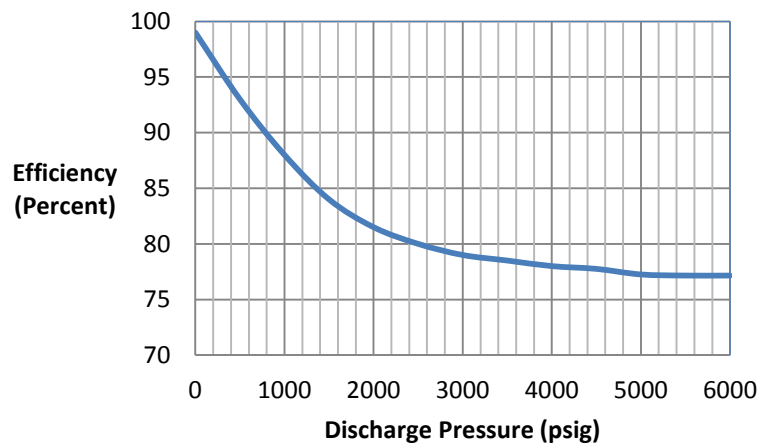
	Plunger sizes			
	3/16"	1/4"	3/8"	1/2"
<b>Standard Model</b>				
Model Number	<b>BR5104</b>	<b>BR5101</b>	<b>BR5103</b>	<b>BR5105</b>
Maximum Discharge Pressure (psig) <sup>1</sup>	3000	3000	3000	3000
Maximum Volume @ 0 psig discharge pressure*	4.2 gpd	7.5 gpd	17.0 gpd	30.2 gpd
Max. Recommended strokes/min @ 0-1500 psig discharge pressure	30	30	30	30
<b>High Pressure Model</b>				
Model Number	<b>BR5114</b>	<b>BR5111</b>	<b>BR5113</b>	<b>BR5115</b>
Maximum Discharge Pressure (psig) <sup>2</sup>	6000	6000	6000	3500
Maximum Volume @ 3000 psig discharge pressure**	3.1 gpd	5.6 gpd	12.6 gpd	22.5 gpd
Max. Recommended strokes/min above 1500 psig discharge pressure	28	28	28	28
<b>Plunger Packing - Maximum Discharge Pressure (psig)</b>				
Buna N (standard model)	3000	3000	3000	3000
Buna Hard (high pressure model)	6000	6000	6000	3500
Viton	3000	3000	3000	3000
Teflon	3000	3000	3000	3000
Fluorosilicone	3000	3000	3000	3000
Perfluoroelastomer (Breez, FFKM)	3000	3000	3000	3000

\* Volumes shown for standard model with standard packing are at zero PSIG discharge pressure

\*\* Volumes shown for high pressure model with hard packing are at 3000 PSIG discharge pressure

1. Maximum discharge pressure for standard model is shown with Buna packing, other packing types are available and may contain different maximum discharge pressures, refer to the Plunger Packing - maximum discharge pressure section of the chart
2. Maximum discharge pressure for high pressure model is shown with Buna Hard packing

### Discharge Head Efficiency



NOTE: With an increase in discharge pressure, the volumetric pumping efficiency of the pump head decreases as shown in the graph.

EXAMPLE: A 3/8" plunger will provide approximately 17 imperial gallons per day (99% efficiency) maximum at 0 psig discharge pressure running at 30 spm. If the discharge pressure increases to 1000 psig, the pump runs at approximately 88% efficiency, so the maximum volume is reduced to 15.1 imperial gallons per day running at 30 spm. If the discharge pressure is increased to 3000 psig, the pump efficiency is approximately 79% and the resulting maximum volume is reduced to 12.6 imperial gallons per day running at 28 spm.

NOTE: Discharge head efficiency is theoretically determined based on testing and may vary between applications and assemblies.

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# RTD SPECIFICATIONS

## STANDARD RTD ELEMENT SPECIFICATIONS

ELEMENT MATERIAL*	RESISTANCE @ 0°C	TEMPERATURE COEFFICIENT	OPERATING RANGE†	AVAILABLE ACCURACIES @ 0°C
Platinum	100 Ohm	.00385	-200 to 850°C	± .5% ± .1% ± .06% ± .01%
Platinum	100 Ohm	.00391	-200 to 600°C	± .1% ± .06%
Copper	10 Ohm	.00427	-200 to 204°C	± .2% ± .5%
Nickel	120 Ohm	.00672	-200 to 204°C	± .3% ± .5%

\* Sensing elements of other materials and temperature coefficients are available upon request.

† Stated operating ranges are typical values and are dependant upon the sensing element and the construction style of the sensor assembly. Assemblies to exceed the stated limits may be available upon request.

### RTD Elements

Aircom can supply elements of several different materials, base resistances, temperature coefficients, accuracies and configurations for installation into RTD assemblies that meet customer supplied requirements. The most common element we use is Platinum with a base resistance of 100 ohms @ 0°C, accuracy of ± 0.5% and temperature coefficient of 0.00385 ohms/ohm/°C. The second most common element is a 392 curve (0.00392 ohms/ohm/°C) element found in most Japanese and a few American made assemblies. Our most common construction of these elements is a Platinum wound element enclosed in a ceramic housing. Process conditions may dictate use of other types of element construction such as Thin-Film, Glass Bulb, or Kapton insulated. The following standards dictate the specifications to which our elements are manufactured to:

#### For 0.00385 ohms/ohm/°C elements

- International Electromechanical Commission Standard IEC 751, 1995
- British Standards Institution BS 1904, 1984
- Deutsches Institut für Normung (Germany) DIN 43760, 1987

#### For 0.00392 ohms/ohm/°C elements

- Scientific Apparatus Manufacturers Association SAMA RC21-4-196
- Japanese Standards Association JIS C 1604-1989

RESISTANCE/TEMPERATURE		
	Copper	Nickel
Base resistance:	10 Ω at 25°C	120 Ω at 0°C
TCR (Ω/Ω°C)	.00427	.00672
Sensitivity (Average Ω/°C)	0.039	0.806
Temperature (°C)	Resistance (ohms)	
-100	5.128	120.00
-80	5.923	66.60
-60	6.712	79.62
-40	7.490	92.76
-20	8.263	106.15
0	9.035	120.00
20	9.807	134.52
40	10.580	149.79
60	11.352	165.90
80	12.124	182.84
100	12.897	200.64
120	13.669	219.29
140	14.442	238.85
160	15.217	259.30
180	15.996	280.77
200	16.776	303.46
220	17.555	327.53
240	18.335	353.14
260	19.116	380.31

RESISTANCE/TEMPERATURE			
Platinum Elements			
Resistance at 0°C: TCR (Ω/Ω°C)	100 Ω .00392	100 Ω .00391	100 Ω .00385
Sensitivity (Average Ω/°C)	0.392	0.391	0.385
Temperature (°C)	Resistance (Ohms)		
-200	17.00	17.26	18.52
-180	25.72	25.97	27.10
-160	34.31	34.54	35.54
-140	42.80	43.01	43.88
-120	51.19	51.37	52.11
-100	59.49	59.64	60.25
-80	67.71	67.83	68.32
-60	75.87	75.96	76.33
-40	83.96	84.03	84.27
-20	92.01	92.04	92.16
0	100.00	100.00	100.00
20	107.95	107.92	107.79
40	115.85	115.78	115.54
60	123.70	123.60	123.24
80	131.50	131.38	130.90
100	139.26	139.11	138.51
120	146.97	146.79	146.07
140	154.64	154.42	153.58
160	162.25	162.01	161.05
180	169.82	169.55	168.48
200	177.35	177.04	175.86
220	184.82	184.49	183.19
240	192.25	191.89	190.47
260	199.64	199.24	197.71
280	206.97	206.55	204.90
300	214.26	213.81	212.05
320	221.50	221.02	219.15
340	228.70	228.19	226.21
360	235.85	235.31	233.21
380	242.95	242.38	240.18
400	250.00	249.41	247.09
420	257.01	256.39	253.96
440	263.97	263.32	260.78
460	270.88	270.21	267.56
480	277.75	277.04	274.29
500	284.57	283.84	280.98
520	291.34	290.58	287.62
540	298.06	297.28	294.21
560	304.74	303.93	300.75
580	311.37	310.54	307.25
600	317.96	317.09	313.71
620	324.49	323.60	320.12
640	330.98	330.07	326.48
660	337.43	336.49	332.79
680	343.82	342.86	339.06
700	350.17	349.18	345.28
720			351.46
740			357.59
760			363.67
780			369.71
800			375.70
820			381.65
840			387.54
850			390.48

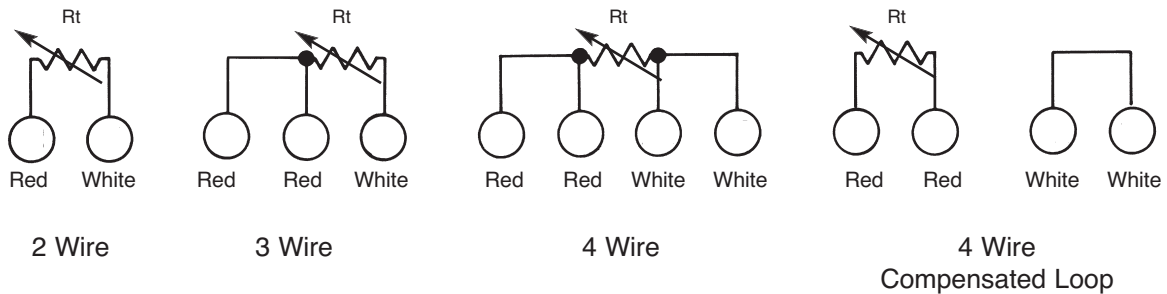


## RTD SPECIFICATIONS


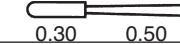

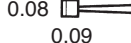
RTD INTERCHANGEABILITY			
Temperature °C	Platinum RTD		
	±0.06% at 0°C	±0.1% at 0°C	±0.5% at 0°C
-200	±0.55°C	±1.3°C	±2.1°C
-100	±0.35°C	±0.8°C	±1.7°C
0	±0.15°C	±0.3°C	±1.3°C
20	±0.19°C	±0.4°C	±1.6°C
100	±0.35°C	±0.8°C	±2.9°C
200	±0.55°C	±1.3°C	±4.4°C
260	±0.67°C	±1.6°C	±5.5°C
300	±0.75°C	±1.8°C	
400	±0.95°C	±2.3°C	
500	±1.15°C	±2.8°C	
600	±1.35°C	±3.3°C	
700		±3.8°C	
800		±4.3°C	
850		±4.6°C	

Temperature °C	Copper RTD		Nickel RTD	
	±0.02% at 25°C	±0.5% at 25°C	±0.3% at 0°C	±0.5% at 0°C
-100	±1.5°C	±2.2°C		
0	±0.7°C	±1.5°C	±0.5°C	±0.8°C
20	±0.5°C	±1.3°C	±0.8°C	±1.2°C
100	±1.5°C	±2.5°C	±1.8°C	±2.2°C
150	±2.2°C	±3.3°C	±2.5°C	±3.0°C
200	±2.8°C	±4.1°C	±3.1°C	±3.7°C
260	±3.6°C	±5.1°C	±3.4°C	±4.0°C

### WIRING CONFIGURATIONS:



### ELEMENT DIMENSIONS:

Dimensions in inches	R (0°C)	Temperature Range	Leads	63% response time Sec. in water, 0.4 m/s
<b>550°C wire-wound elements</b>				
0.060 $\phi$ 	100 $\Omega$	-100 to 550°C	0.010" (0.25 mm) $\phi$ Platinum alloy	0.14
0.080 $\phi$ 	100 $\Omega$	-100 to 550°C	0.010" (0.25 mm) $\phi$ Platinum alloy	0.18
0.100 $\phi$ 	100 $\Omega$	-100 to 550°C	0.014" (0.35 mm) $\phi$ Platinum alloy	0.22
<b>400°C and 600°C thin-film elements</b>				
0.055 THICK 	100 $\Omega$	-70 to 400°C	0.010" $\phi$ Ag 0.004 $\Omega$ /mm/lead	0.2
0.08 0.09 Lead Length: 0.4	100 $\Omega$	-70 to 600°C	0.008" (0.20 mm) $\phi$ Pd 0.036 $\Omega$ /mm/lead	0.2



## *Welker<sup>®</sup> Sample Probe*

*Model*

*SP-1, SP-1W, SP-2, SP-3, & SP-5*

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker equipment described above. Correct operating and/or installation techniques, however, are the responsibility of the end user. Welker reserves the right to make changes to this and all products in order to improve performance and reliability.

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# SPECIFICATIONS

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## 1. GENERAL

### 1.1 INTRODUCTION

We appreciate your business and your choice of Welker products. The installation, operation, and maintenance liability for this product becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance (IOM) Manual* prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use.\*

If you have any questions, please call 1-800-776-7267 in the USA or 1-281-491-2331.

#### **Notes, Warnings, and Cautions**

**N** NOTE

Notes emphasize information or set it off from the surrounding text.

**!** CAUTION

Caution messages appear before procedures that, if not observed, could result in damage to equipment.

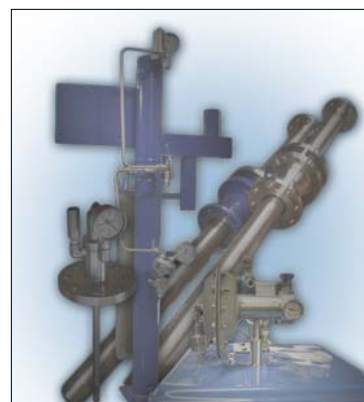
**W** WARNING

**Warnings alert users to a specific procedure or practice that, if not followed correctly, could cause personal injury.**

\*The following procedures have been written for use with standard Welker Engineering parts and equipment. Assemblies that have been modified may have additional requirements and specifications that are not listed in this manual.\*

### 1.2 DESCRIPTION OF PRODUCT

Welker Sample Probes (SP-1, -2 & -3) are designed to extract a sample of the fluid in a process from a designated point in the process. The SP-1 series sample probe is supplied as a probe with a specified process connection. The SP-2 series sample probe is a SP-1 series sample probe with a Welker Valve. The SP-3 series sample probe is a SP-1 series sample probe with a quarter-turn valve.



# SPECIFICATIONS

---

## 1.3 IMPORTANT INFORMATION

### **N** NOTE

For accurate sampling results, probe should not be installed in a header or blow-down stack and should be away from obstructions, elbows or partially closed valves.

## 1.4 SPECIFICATIONS

### **N** NOTE

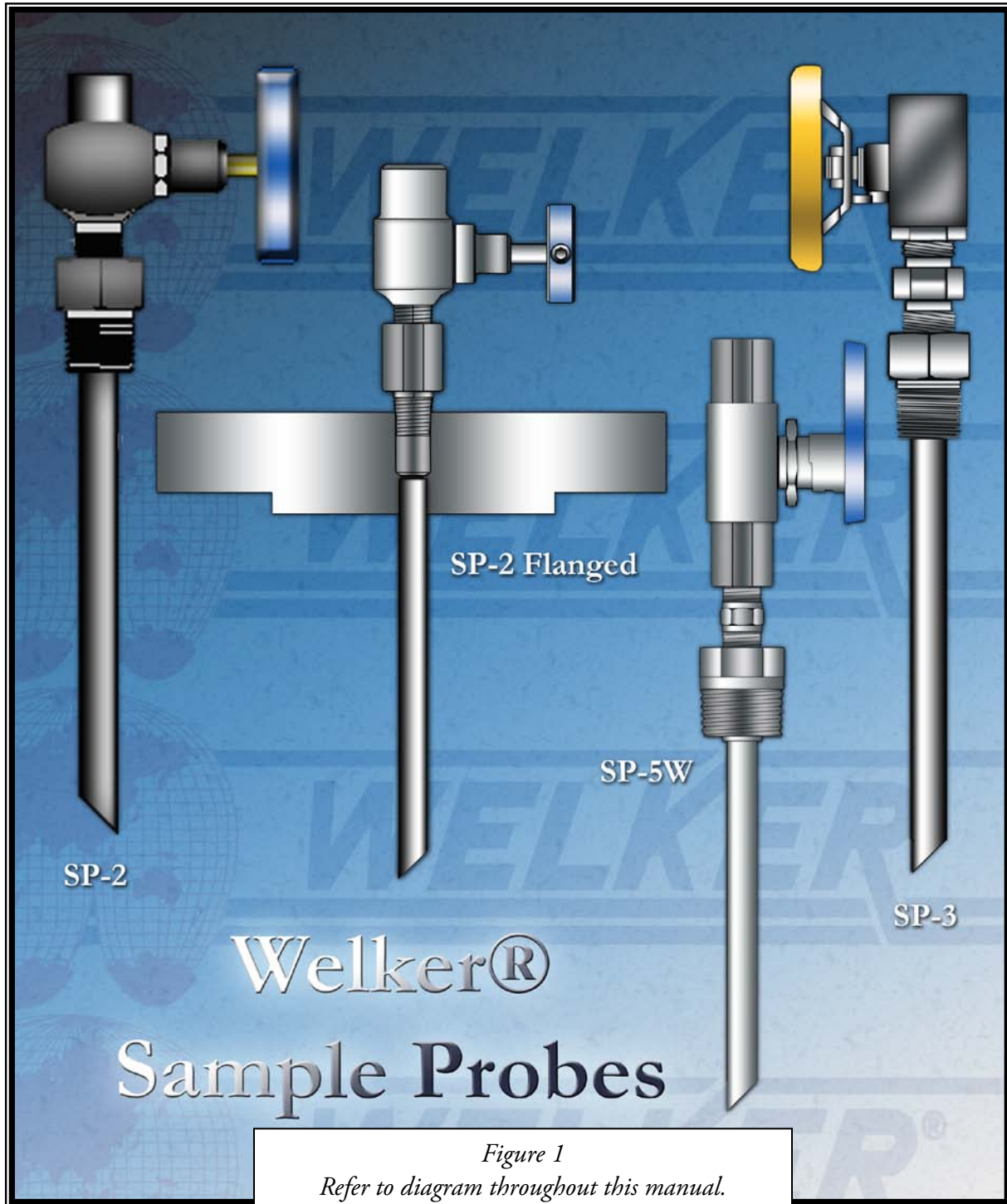
The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. However, please note that **the specifications may vary depending on the customization of your product.**

Table 1

<b>Specifications</b>	
<b>Materials of Construction:</b>	PTFE, Stainless steel and Viton <sup>®</sup> with others available.
<b>Maximum Allowable Operating Pressure:</b>	MAOP will vary according to customer specifications of probe, please see assembly drawing for product, or contact Welker for this information.
<b>Pipeline Connection:</b>	Flanged or NPT
<b>Outlet Ports:</b>	¼" NPT with others available
<b>Products Sampled:</b>	Non-toxic natural gas or other gases or liquids compatible with the materials of construction.

# SPECIFICATIONS

## 1.5 SYSTEM DIAGRAM



# INSTALLATION & OPERATIONS

---

## 2. INSTALLATION & OPERATION INSTRUCTIONS

### 2.1 GENERAL

After unpacking the unit, check it for compliance and for any damages that may have occurred during shipment.

**N** NOTE

Claims for damages caused during shipping must be initiated by the receiver and directed to the shipping carrier. Welker is not responsible for any damages caused from mishandling by the shipping company.

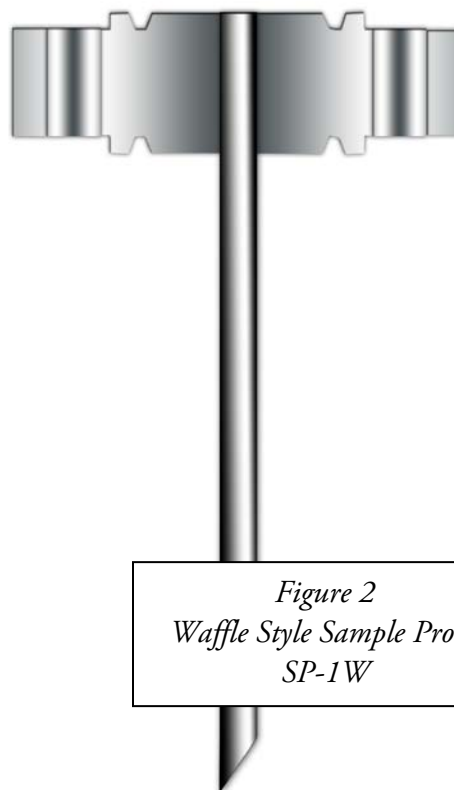
### 2.2 INSTALLATION OF PROBE WITH FLANGE CONNECTION

*(Refer to Figure 1 on page 5 & Figure 2 below)*

**W** WARNING

**Before installing the probe, make sure that the pipeline is depressurized.**

1. Use the appropriate size gasket and position it properly for the connection being used.
2. Mount the probe to the mating flange connection on the pipeline. (If the sample probe is a wafer style (SP-1W see figure to right), then mount the probe between the correct mating flanges on the pipeline.)
3. Install the bolts and nuts to the flanges.
4. Tighten the nuts to the proper torque specification for the particular flange size.
5. Close the valve on the probe.
6. Pressurize the pipeline and check for leaks.
7. The probe is now in service.



# INSTALLATION & OPERATIONS

---

## 2.3 INSTALLATION OF PROBE WITH NPT CONNECTION

(Refer to Figure 2)

**W** WARNING

**Before installing the probe, make sure that the pipeline is depressurized.**

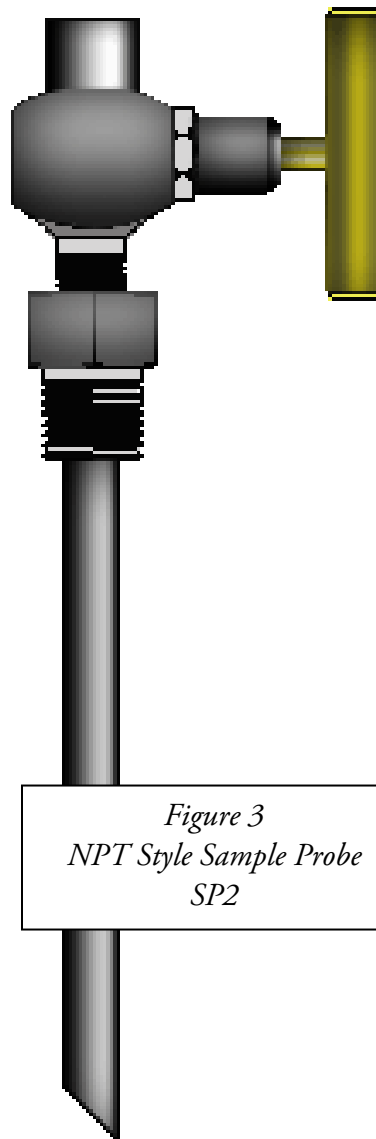
**N** NOTE

When sealing fittings with PTFE tape, refer to the proper sealing instructions for the tape used.

1. Mount the probe to the mating NPT connection on the pipeline.
2. Tighten the probe to the proper NPT gauge depth.
3. Close the valve on the probe.
4. Pressurize the pipeline and check for leaks.
5. The probe is now in service.

## 2.4 OPERATION

1. The only operation of the probe is to open and close the valve as needed when the appropriate equipment is connected to it.



*Figure 3  
NPT Style Sample Probe  
SP2*



# MAINTENANCE

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## 3. MAINTENANCE

### 3.1 GENERAL

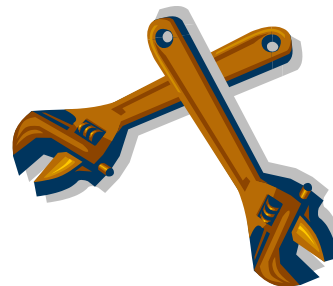
Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit handy for the system in case of encountering unexpected wear or faulty seals. All maintenance and cleaning of the unit should be done on a smooth, clean surface.

### 3.2 MAINTENANCE

#### **Recommended Tools**

It would be advisable to have the following tools available for maintenance of the unit:

- Two adjustable wrenches (size of wrenches will depend on customer specifications of probe).



1. Maintenance needs to be performed to a probe only if the probe valve is leaking.
2. Depressurize the pipeline before performing any maintenance on the probe.
3. Close the probe valve.
4. Remove any equipment that is attached to the probe valve.
5. Remove the probe valve from the probe.
6. Rebuild or replace the probe valve.
7. Reattach the probe valve to the probe.
8. The probe is now ready for service.

# TROUBLESHOOTING

---

## 4.1 Troubleshooting Guide

The following is a troubleshooting table of issues most commonly associated with the Welker® Sample Probe models. If you are having a problem that is not listed, or if the solution provided does not repair the problem, please call Welker for service options.

PROBLEM	POSSIBLE → CAUSE →	SOLUTION
Valve leaking	<ul style="list-style-type: none"><li>· Debris in valve</li><li>· Worn or damaged O-rings and seat</li></ul>	<ul style="list-style-type: none"><li>· Disassemble valve and clean and replace O-rings if needed. (<i>See Section 3.2 maintenance for instructions</i>).</li><li>· Replace valve.</li></ul>



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# STORAGE TANK MAINTENANCE R-111

ISSUED: JULY 2011

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## **PREFACE**

The Steel Tank Institute (STI), formed in 1916, is a not-for-profit organization whose purpose is to secure co-operative action in advancing, by all lawful means, the common purposes of its members; and to promote activities designed to enable the industry to conduct itself with the greatest economy and efficiency. It is further the purpose of STI to cooperate with other industries, organizations, and government bodies in the development of reliable standards which advance industry manufacturing techniques to solve market-related problems.

This Standard is intended for use by organizations and/or individuals who are knowledgeable and experienced in tank maintenance. Note that the recommendations included in this standard are minimum recommendations. When applicable federal, state and local laws are more stringent than the requirements of this standard, then these laws and regulations shall apply.

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**1. RECORD KEEPING**  
Facility Description

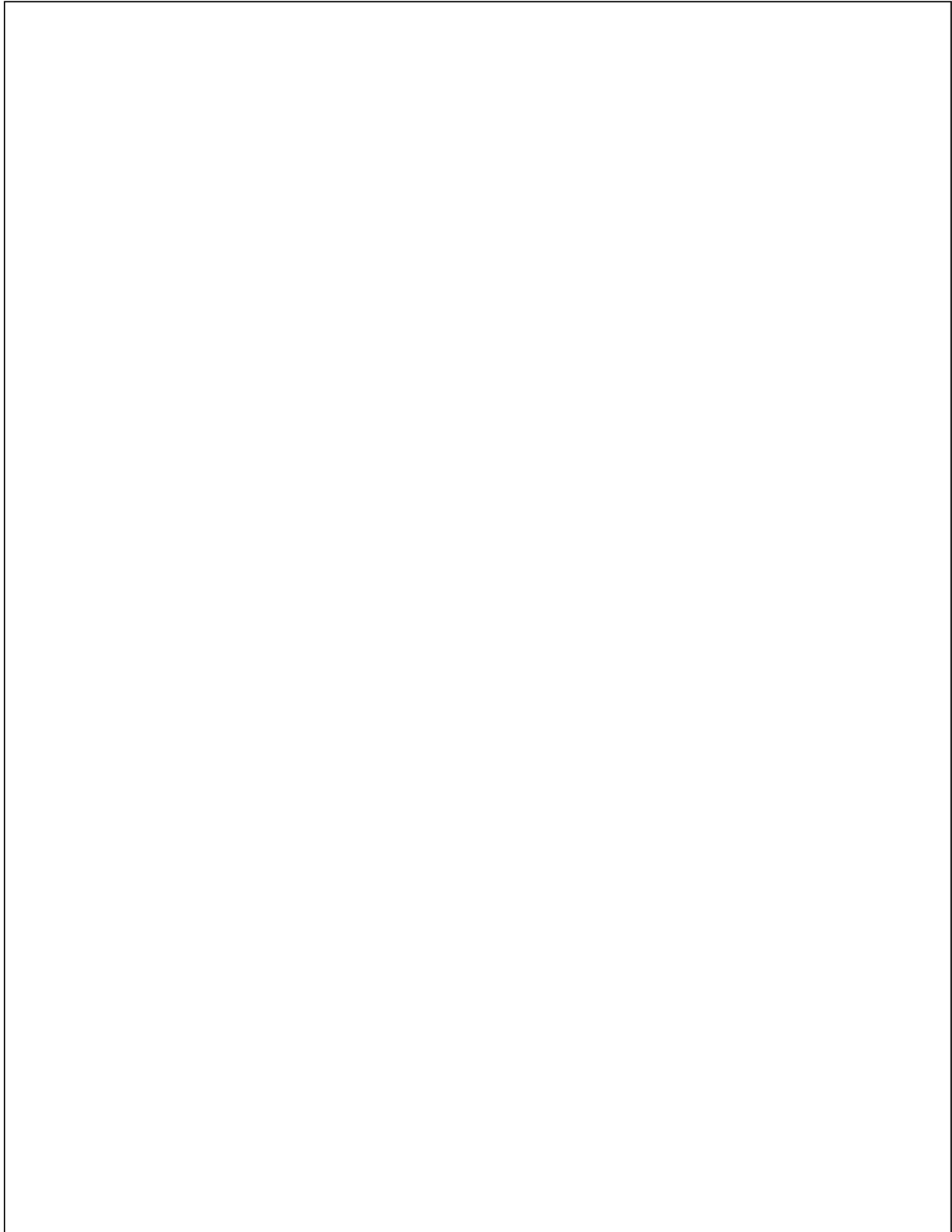
Company Name \_\_\_\_\_

Company Address  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

<b>Tank #</b>			
<b>Capacity</b>			
<b>Vessel Dimensions</b>			
<b>Contents</b>			
<b>Construction</b>			
<b>Orientation</b>			
<b>Date of Installation</b>			
<b>Tank Manufacturer</b>			
<b>UL Number</b>			
<b>Piping</b>			
<b>Ancillary Equipment</b>			
<b>Venting System</b>			

**Site Map**

In this area, draw a map of all main roads, buildings, emergency evacuation routes, and locations of tanks and fire extinguisher.





## 2. **BACKGROUND**

Operations and maintenance procedures for water monitoring and removal have been a recommended practice for over thirty years. However, a number of things have changed over the past few years that have increased the risk for water entry and accumulation in the storage system - and subsequent microbial growth if water is not removed.

- Today's distribution/delivery infrastructure is different from only a few years ago. Terminal capacity in the United States has been shrinking, yet fuel consumption has continued to grow. As a result, more fuel is moving through distribution at a faster rate, leaving less time for water to settle out before the product moves from step-to-step in the distribution process. Also, as the industry has moved from proprietary to shared delivery infrastructures, individual companies have less control over the process and product.
- Gasoline chemistry has changed significantly, from the removal of lead and MTBE, to additives such as ethanol. Most of these changes were made to comply with standards set by Fuel and Fuel Additive Regulations (40 CFR 79) that became effective in 1996. These new fuels are more susceptible to moisture accumulation, separation, and potential biodegradation accelerated by water. For example, lead was a natural poison to the microbes that can grow in a moist environment, but in today's lead-free fuels, microbial growth can more readily occur. With alcohol-enhanced fuels, "phasing" can more easily occur, separating water, gasoline, and alcohols into three distinct layers.
- Common installation procedures—including open vents, low fill areas, and sloped tank installations—contribute to water accumulation.

Most of these are conditions did not exist in the 1970s, 1980s, or even much of the 1990s—certainly not to the extent that they exist today. Furthermore, microbial activity is better understood today and has been found to be a much more common phenomenon than previously realized. Owners and operators of storage systems need to be aware of these problems and immediately implement operations and maintenance practices to monitor for and remove any water from storage tanks.

### **a. Water and contaminate impacts on fuels and fueling distribution equipment.**

Water may enter the storage system through the delivered product. Fuel may be delivered warm. As it cools, water that is naturally in the fuel condenses out and collects at the bottom of the tank. High throughput in the fuel distribution/delivery infrastructure allows less time for water to settle out of the product before it's delivered into the distribution system from the refinery or as it's moved along the shipping process. Certain fuels are also more prone to moisture attraction and subsequent separation when subject to temperature swings. A fuel's composition and temperature affect the amount of water it can hold. Generally, the higher in aromatic content and the warmer the fuel, the more water it can hold in solution. That's usually not a problem until the fuel is cooled, causing the water to be released and settle at the bottom of a storage tank.

Water can also enter a storage system via damaged fill boxes or fill cap gaskets, loose fittings or plugs, poor practices relating to spill buckets, rainwater accumulated within tank sumps, entry and which enter via any tank orifices that are not water/vapor tight, condensation in the storage system caused by temperature swings or air entering via vents or may enter the tank if the tank is not tight.

## **b. Changing Fuels**

### **i. Traditional Gasoline**

Overall, fuels have had to become cleaner to accommodate newer, cleaner burning engines. While carburetors were common in the past, today fuel injection systems are used. A fuel injection system atomizes the fuel by forcibly pumping it through a small nozzle under high pressure. That's why a fuel injection system is more sensitive to particle contamination, thus requiring cleaner fuel systems.

### **ii. Ethanol Blended Gasoline**

Seventy percent of all gasoline sold today in the U.S. is blended with ethanol. Most of the gasoline sold is blended with 10% ethanol. In October 2010, the US EPA approved the use of E15 in 2007 automobiles and younger. Currently, only about 1% of today's vehicles are capable of running on E85 (85% ethanol/15% gasoline).

Fuel grade ethanol must meet ASTM standards 4806, Standard Specification for Denatured Fuel Ethanol for Blending with Gasoline for Use as Automotive Spark-Ignition Engine Fuel, or ASTM D5798, Standard Specification for Fuel Ethanol for Automotive Spark-Ignition Engines.

### **iii. Ultra Low Sulfur Diesel**

ULSD fuel was developed with the goal of reducing air emissions. ULSD fuel enables the use of cleaner technology diesel engines and vehicles, thus promoting cleaner air. ULSD became mandatory at retail facilities as of Dec 1, 2010.

All diesel fuels must meet ASTM D975, Standard Specification for Diesel Fuel Oils. Up to 5% biodiesel may be added to diesel fuel and still labeled as only diesel fuel.

### **iv. Biodiesel**

Biodiesel blend stock (B100) must meet ASTM D6751, Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels. Diesel fuel containing up to 20% biodiesel must meet ASTM D7467-08, Specification for Diesel Fuel Oil, Biodiesel Blend (B6 to 20); home heating oil applications must comply with ASTM D396-08b, Specification for Fuel Oils, which includes requirements for up to 5 percent biodiesel.

Biodiesel also serves as a lubricant, a common additive in diesel fuels.

## **c. Microbial Contamination**

Reddish, scaly, gritty deposits may indicate corrosion and/or silt introduction into the tank. Black or brown deposits may indicate that water contamination has degraded the fuel.

Contaminants such as salts in the water may cause the fuel to degrade its chemical structure to components that may be detrimental to system components or may cause fuel additives, necessary for maintaining the quality of the fuel distribution system, to leave the fuel and enter the water.

Sludge build-up is the breakdown of the fuel itself, which naturally occurs over time, and may include externally introduced contaminants that enter the tank during construction or maintenance activities, or an accumulation of contaminants contained in delivered fuel.

A number of service providers can help you evaluate your tanks for microbial contamination. There are also field detection kits available from petroleum equipment suppliers (see discussion in section 3). But there may be simple signs of microbial growth evident in day-to-day operations, e.g. plugged fuel filters. As microorganisms begin to thrive and grow, these "bugs" form into slime, which breaks off and clogs small openings throughout the entire system,

especially filters. Filter life shorter than six months is a warning signal (when flow slows to 3-5 gpm, something is amiss).

It may be helpful to compare this phenomenon with mold, which also thrives in a moist environment, begins growing microscopically unseen to the human eye, but eventually becomes a visible, tangible substance.

Other indicators of contamination include plugged fuel lines, erratic tank gauge readings, and frequent replacement of other components such as valves, rubber seals, and hoses. You might even smell a foul rotten-egg odor because as the bugs digest fuel, they alter it chemically to produce sludge and other materials that attack metal, rubber, fiberglass reinforced plastic, tank linings and coatings. If the slimy bugs reach engine fuel systems, they can plug fuel filters and cause build-up around the injection nozzles, resulting in inefficient combustion (or none at all) and unusual exhaust smoke.

So what do you do if microbial growth is suspected or detected? Contact a qualified, reputable professional with expertise in microbial contamination control (see References and Resources section). They will work with you to develop the best plan of attack. Heavily contaminated storage systems will most likely require cleaning to remove the slime and sludge, followed by treatment with a biocide.

### **3. HOW TO MONITOR TANKS FOR THE PRESENCE OF WATER AND CONTAMINANTS**

#### **a. Traditional Gasoline and Diesel**

An automatic tank gauging (ATG) system with water monitoring capability is an ideal method, as long as the sensors are maintained to remain functional. However, simple manual monitoring with alcohol-compatible water paste on a gauge stick is a quick, easy, and inexpensive way to check for the presence of a water bottom in your storage tank.

Use water-sensitive fuel filters and watch for slowed-down fueling – this may be a sign of a problem.

You should check your storage tank(s) for water as frequently as possible. In fact, some proactive tank owners require station operators to check daily for water bottoms. If one inch or more of water is found, the water should be removed within 30 days of discovery.

In addition to the simple procedures outlined above, you should also pull periodic product samples from the inside tank bottom and inspect them. Check with your petroleum equipment dealer or fuel supplier for guidance on sampling devices and procedures. Some basic guidelines include:

- Pull samples from the low end of the tank—tanks are often installed with a slight tilt to allow for water to collect in the sump.
- Be aware of the pitfalls of using the fill tube as the sampling port—if it is not located at the low end of the tank, sludge or water may not be detected. Also, if the fill tube is not installed straight, water and sludge may not be detected or it may appear that there is less quantity than there really is.
- If possible, samples should be taken from more than one location in the tank.
- When taking samples, wait at least two hours after the last fuel delivery to make sure water and contaminants have had adequate time to settle to the bottom of the tank.

If the fuel sample looks hazy, or waxy in cold weather, water is probably present. A field detection kit, available from petroleum equipment suppliers, can then be used to check the fuel for the presence of microbes and whether the fuel meets the appropriate fuel specification, such as ASTM D396 or D975. Independent labs can conduct in-depth analysis to determine the extent of any microbial contamination.

**b. Ethanol**

Ethanol is incompatible with some plastic materials, lining materials, and older adhesives, sealants, and gaskets. In addition, ethanol blended fuels have reduced tolerance for water and therefore, water bottoms can be more problematic.

Water reacts differently in ethanol-blended fuels than it does in fuels that were oxygenated with MTBE. With MTBE, water immediately falls to the bottom of the tank. Ethanol-blended fuels can hold much more water – once the fuel is saturated with water, excess water will separate and cause two distinct layers of product. The top layer will be mostly gasoline that is lower in octane and perhaps out of specification, while the bottom layer is a mix of ethanol and water that will not work as fuel in an internal combustion engine. Further, it is in that water bottom where microbes can grow and proliferate and where the storage system is exposed to greater than 10% of ethanol.

Ethanol also tends to loosen any sludge, slime and scale that may already be present in a tank. Therefore, if these tanks are not cleaned before the ethanol-blended fuel is introduced, dissolved materials may cause excessive filter clogging or result in damage to engines that receive the contaminated fuel.

The bottom line when it comes to storage tanks and ethanol:

- Check for compatibility with all compositions of ethanol.
- Clean the tanks before introducing ethanol-blended fuels.
- Monitor for water and contaminants frequently.
- Remove water and contaminants from the tank when identified.

**c. Biodiesel**

There are some material incompatibility issues with both diesel and biodiesel fuels:

- Brass, bronze, copper, lead, tin, or zinc oxidize in both diesel and biodiesel fuels and creates sediments, which in turn can result in plugged fuel filters.
- Pure biodiesel (B100) or blends higher than B20 cause more problems with rubber seals, gaskets, and hoses – make sure biodiesel resistant materials are used.
- For additional information, go to the National Biodiesel Board at [www.biodiesel.org](http://www.biodiesel.org).

Biodiesel can create further problems if it is introduced into a storage tank that previously held diesel. Number 2 diesel tends to form sediments that stick to and accumulate in storage systems, forming layers of sludge or slime; the older the system and the poorer the maintenance, the thicker the accumulation. Biodiesel, being a good cleaning agent, will dissolve these sediments and carry the dissolved solids into the fuel systems of vehicles. Fuel filters will catch most of it, but in severe cases the dissolved sediments can rupture filters and can cause fuel injector failure. B20 generally doesn't create problems as much as higher blends or B100 biodiesel, but tanks should be cleaned before switching to any biodiesel.

Industry experts recommend that biodiesel meet ASTM D6751 and be used within six months of manufacture to ensure that the quality of the fuel meets specifications. Fuel degradation

pathways for biodiesel are more likely with higher concentration blends due to the higher presence of the biodiesel, so stability concerns and issues are likely to be higher and may occur faster as the blend level is increased.

The bottom line when it comes to storage tanks and biodiesel is:

- Check for compatibility (steel is compatible).
- Clean the tanks before introducing biodiesel fuels.
- Monitor for water and contaminants frequently.
- Remove water and contaminants from the tank when identified.

**d. Heating Oil**

Storage tanks containing oil for heating a building, whether installed inside or outside, must be checked for water annually, at a minimum. Tanks should be sloped  $\frac{1}{4}$  inch per foot towards the supply end of the tank. Sometimes it is not possible to slope tanks and in that case, they should be checked for water at both ends. If greater than one inch of water is found, it should be removed within 30 days. Many fuel dealers recommend, in tanks with recurring water problems, to treat fuel with a biocide after removing water.

**e. Back Up Generator Tanks**

The directions above should be followed. In addition, you should discuss shelf life of fuel with your supplier. Fuel should be changed or polished (see section 5) every two years if not used.

**f. Heated Oil Tanks (No. 6)**

Heated oil tanks should be monitored for temperature. In most instances, over one-half of the oil is returned to the tank through circulation, often at temperatures exceeding 160° F. If oil is circulated continuously during low boiler demand times, energy is wasted. The resulting excessive heat can cause sulfurs and other chemicals to be cooked out of the oil and cause chemical reactions in the area above the liquid level. Excess heat in the tanks can be reduced by limiting circulation when oil in the tank exceeds 140°F or a temperature determined by the system designer. Auxiliary in-tank steam coils should also be controlled by a similar thermostat. High temperature coating should be used on these tanks.

**4. MONITORING AND DETECTION**

Traditional methods of monitoring tanks for water and contamination may not be adequate for modern day fuels. In traditional fuels, when water entered a tank it would settle to the bottom of the tank and was relatively easy to identify through Automatic Tank Gauge readings or dipping the tank with water finding paste. In fuels containing alcohol blends and in some biodiesel blends, the water may combine with the fuel and make water detection difficult.

A variety of different water pastes have been developed to check for water in different fuels. Special pastes to be used in ethanol fuels and biodiesel can be purchased from your fuel or fuel service provider. Make sure that you are using the correct paste for the fuel. Read the directions provided with the paste to insure that you are using the paste per manufacturer specifications. Not properly following the use instructions may lead to false or missed detections. If the paste indicates spotty or inconsistent water detection, this may be a sign of suspended water or accumulated sludge residing in the tank. It is recommended to check the tank for water at all available access points. Some of the more common water finding paste products are Kolor Kut, Sar-Gel, and Gasolia.

- Tank bottom sampling – Tank bottom sampling tools, such as “bacon bombs” are available to collect samples directly from the bottom of the storage tank. Typically, samples are collected and placed in a glass container for visual analysis. In some cases, it is advisable to allow the sample to settle overnight to allow water and contaminants to separate from the fuel. The sample may show a clear separation of water and fuel, a clear separation of contaminant and fuel, or in some cases, three or more separate phases. If the fuel maintains a cloudy appearance, it is a good indicator that water or other contaminants have been absorbed into the fuel. If possible, bottom samples should be taken from multiple points across the bottom of the tank. When taking samples, wait at least 2 hours after the last fuel delivery to make sure water and contaminants have had adequate time to settle to the bottom of the tank.
- Fuel Filters – Most manufacturers of dispenser filters offer a fuel filter that will contain water and most contaminants. Water absorbing filters catch water, causing the filter to expand and reduce fuel dispensing rates. If slow fuel flows are being encountered, an investigation for in-tank water or contaminants should occur.
- Fuel samples from the nozzle – Visual evaluation of fuel quality can be accomplished by dispensing small samples of fuel from the nozzle into a clear glass container. It is recommended that these samples are taken during or immediately after a fuel deliver when the fuel in the tank has been stirred up and the likelihood of dispensing water or contaminants is high.
- Recommended maintenance and inspection schedules: Tanks using Automatic Tank Gauges with water level sensors should be monitored daily. If a tank shows water one day and not the next, it may be an indication that water has been absorbed into an alcohol blend fuel or bio-diesel. If inconsistent water levels are observed by the ATG records, additional water paste or bottom sample investigation should occur. Upon testing, if 1 inch or more of water is discovered within a tank, the water must be removed with 30 days of discovery.
- Biodiesel and ethanol are both water miscible fuels and have similar considerations.

## 5. HOW TO REMOVE WATER AND CONTAMINANTS FROM STORAGE TANKS

When it is determined that water or contaminants are present in a tank, then action must be taken to remove them before the problems escalate. Uncontrolled water or contaminants can lead to phase separation, which may result in losing the entire tank of fuel or dispensing fuel that causes damage to internal combustion engines.

### a. Multipoint water pumping

In traditional fuels, a clear separation of fuel and tank bottom water is typical. Your service contractor can readily insert a suction tube to the bottom of the tank and pump the water from the bottom of the tank. It is advisable to pump water at all available access points from the tank. If it is determined that the pump or suction is at the lower end of the tank, the pump should be removed to facilitate water pumping at that point. Some specialty service contractors offer methods that use flexible suction tubes to remove water and loose contaminants from the entire length of the tank bottom. Care should always be taken to insure that tank bottom waste is disposed of properly.

### b. Fuel Filtration/Polishing

Fuel filtration and polishing include methods that remove water and contaminants from the fuel without removing the fuel from the tank. There are many vendors that offer fuel filtration services. Some vendors use fiber-optic technology or remote video cameras to visually locate and observe the contaminant removal progress. Others use a variety of fuel circulation techniques to filter the water and contaminants out of the fuel.

**c. Non-entry tank cleaning**

There are a number of vendors that offer services to clean a tank without physical entry. Typically these techniques require the fuel to be removed from the tank and equipment is lowered into the tank to remotely pressure wash the tank. Some vendors supplement the washing process by using a remote video camera to monitor the progress. These techniques require contaminated wash liquids and solids to be disposed of properly.

**d. Physical entry tank cleaning**

In cases where it is determined that the amount or severity of the tank contaminants is extreme, a manned entry cleaning may be required to clean the tank adequately. Manned entry allows for the entrant to physically scrub contaminants from the tank wall.

**6. PREPARING TANKS FOR CHANGES IN FUEL TYPE**

**a. Preparation for first time ethanol blended fuels**

Special attention needs to be given to tanks prior to introducing alcohol-based products for the first time. Specifically, ethanol acts as a cleaning agent. Once introduced to the tank, ethanol may loosen or dissolve contaminants from the tank wall. These contaminants will typically collect in the tank bottom and may result in excessive dispenser filter clogging and damage to engines if the contaminate reaches the fuel system. There are numerous vendors that offer "ethanol preparation" services.

Conversion without proper tank cleaning often results in the loosening of prior deposited sludge and debris that will reduce flow and plug screens and filters. Some fuels, such as ethanol and biodiesel blends, will have a cleansing effect on the storage system which will likely result in more frequent filter changes for a short period of time, even if the tank system is cleaned.

**b. Changing between gasoline and diesel fuels**

If a tank is to be converted to service from some other fuel service, the tank and its related dispensing equipment must be thoroughly cleaned, inspected, and verified compatible with the new fuel to be stored. Care should also be taken to make sure gasoline is not commingled with any diesel product.

Tank Number: \_\_\_\_\_

Facility Name: \_\_\_\_\_

Date/Time: \_\_\_\_\_

**Storage Tank System  
Monthly Inspection Checklist**

	Yes	No	N/A
Tank visually inspected			
Piping visually inspected			
Monthly monitoring method for tank is performed			
Monthly monitoring method for piping is performed			
Operations and Maintenance Plan in place and is being followed			
Spill containment free of fuel, water and debris*			
Overfill alarm is operational			
Overfill prevention equipment is operational			
Normal vents(s) operational			
Emergency vent(s) lift freely			
Tank coating in serviceable condition			
Secondary containment is free of cracks, holes, tears, or other damage			
Secondary containment free of fuel, water, and debris*			
Concrete secondary containment coating is free of cracks, flaking, or other damage			
Secondary containment drain valve is closed			
Tank checked for water. Height in inches, if found:			
Interstice of double-walled tank checked for liquid. Height in inches, if found:			
If greater than 1" water found, water removed within 30 days.			
Regulated substance found in interstice of tank. Height in inches, if found: If measurable amount of liquid found, contact your service provider.			
Transition sump free of fuel, water and debris*			
Transition sump liner in serviceable condition. Transition sump sensor at proper height & orientation.			
Dispenser sump free of fuel, water, and debris*			



	Yes	No	N/A
Dispenser sump liner in serviceable condition			
Dispenser sump sensor at proper height and orientation			
All fuel, water and debris removed from tank system have been disposed of properly			

*\*Sumps should be checked within one week of a rainfall event.*

Comments and Follow Up Needed:

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**Operator Name (Print):**

**Operator Certification Class:**

**Signature**

## RESOURCES UPDATE

### **American Petroleum Institute (API)**

1220 L Street, NW

Washington, DC 20005-4070

Phone: 202-682-8000

Web: [www.api.org](http://www.api.org)

*The Filtration and Dehydration of Aviation Fuels - Sources of Dirt and Water - Methods of Detection and Removal - Maintenance of Equipment* (API 1501, Revision 65). Recommended Practices relevant to water monitoring and removal for aviation fuel systems.

*Bulk Liquid Stock Control at Retail Outlets* (API RP 1621). Recommended Practices applying to underground storage of motor fuels and used oil at retail and commercial facilities, involving controlling stock losses, safety & pollution control to maximize profits.

*Design, Construction, Operation, Maintenance & Inspection of Terminal and Tank Facilities* (API Standard 2610). Includes standards on pollution prevention and waste management, safe operations, fire prevention and protection, tanks, mechanical systems, product transfer and corrosion protection.

### **ASTM International**

100 Barr Harbor Drive

PO Box C700

West Conshohocken, PA 19428-2959

Phone: (610) 832-9585

Web: [www.astm.org](http://www.astm.org)

*Standard Guide to Microbial Contamination in Fuels and Fuel Systems* (D-6469). This guide provides an understanding of the symptoms, occurrence, and consequences of chronic microbial contamination and the control of microbial contamination in fuels and fuel systems. Applies primarily to gasoline, aviation, boiler, industrial gas turbine, diesel, marine, and furnace fuels.

*Fuel and Fuel System Microbiology: Fundamentals, Diagnosis, and Contamination Control* (MNL-47). A guide providing sampling strategies and techniques, recommendations for disinfecting and removing microbial contamination from fuels and fuel systems, and a variety of diagnostic tests. This guide is designed to complement Guide D-6469.

*Practice for Manual Sampling of Petroleum and Petroleum Products* (D-4057). Recommended procedures for sampling fuel that should become an integral part of a fuel quality program. Among other things, D-4057 states that (a) samples should be analyzed visually for water, dirt and other solids; (b) fuel should be clear and bright, not dirty or cloudy.

*D7464, Standard Practice for Manual Sampling of Liquid Fuels, Associated Materials and Fuel System Components for Microbiological Testing*. These practices for microbiological sampling decrease the risk of contaminating samples with extraneous microbes.

*D7463, Standard Test Method for Adenosine Triphosphate (ATP) Content of Microorganisms in Fuel, Fuel/Water Mixtures and Fuel Associated Water*. This test method provides a protocol for capturing, extracting, and quantifying the adenosine triphosphate (ATP) content associated with microorganisms found in conventional liquid fuels.

*Standard Specification for Diesel Fuel Oil (D-975)*. A specification which references that "contamination levels in fuel can be reduced by storage in tanks kept free of water."

**Gas Technology Institute**

1700 S Mount Prospect Road  
Des Plaines, IL 60018-1804  
Phone: 847-768-0500  
Web: [www.gastechnology.org](http://www.gastechnology.org)

*Characterization of Microbial Communities in Gas Industry Pipelines*, June 2003. A technical study about microbial contamination pertaining to natural gas infrastructure.

**National Oilheat Research Alliance (NORA)**

211 N Union Street, Suite 100  
Alexandria, VA 22314  
Phone: 703-519-4204  
Web: [www.nora-oilheat.org](http://www.nora-oilheat.org)

*Oilheat Technician's Manual*. A manual pertaining to the heating oil industry that includes guidelines for water monitoring and removal.

*The Oilheat Research Program - Fuel Technology*. Ongoing research into the issue of heating oil fuel quality during transportation and storage, including the development of field monitoring/test procedures for water and other quality indicators which service technicians can implement.

**Petroleum Equipment Institute**

PO Box 2380  
Tulsa, OK 74101-2380  
Phone: (918) 494-9696  
Web: [www.pei.org](http://www.pei.org)

*Recommended Practices for Installation of Underground Liquid Storage Systems*. (RP100). Provides information on engineering and construction practices regarding proper installation of underground liquid storage systems, including excavating, piping, cathodic protection, secondary containment, and other aspects of tank system installation.

*UST Inspection and Maintenance* (PEI RP900). This recommended practice was written to promote proper inspection, operation, and maintenance of underground storage systems.

*Recommended Practices for Inspection and Maintenance of Motor Fuel Dispensing Equipment* (PEI RP500). PEI produced this recommended practice to minimize the possibility of fuel-dispensing system failure, to reduce fire hazards, promote fueling safety, and minimize environmental problems.

**United States Department of Energy (DOE)**

*Maintenance and Storage of Fuel Oil for Residential Heating Systems* (BNL 48406). Guideline addressing residential heating oil that includes recommendations to monitor the fuel during prolonged storage as "an essential part of maintaining good fuel quality...Contaminants in the old fuel, such as sludge and water in the tank, can degrade the quality of the new fuel."

BNL 48406 further recommends that "fuel specifications should become an integral part of the contractual agreements between the fuel supplier and the purchaser. In other words, a bulk sample of fresh fuel oil used for heating, should at least meet all of the limits in specification ASTM D-396."

**United States Environmental Protection Agency (EPA)**

Ariel Rios Building  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460  
Phone: 202-272-0167  
Web: <http://www.epa.gov/oust>

*Operating and Maintaining Underground Storage Tank Systems: Practical Help and Checklists (EPA 510-B-00-008).*, A booklet describing quality operations and maintenance practices, compiled by State and Federal environmental regulators.

**States**

Check with your state authorities, commonly the Department of Weights and Measures, for regulations controlling the quantity of water allowed in fuel tanks at service stations.

# Bourdon Tube Pressure Gauges Industrial Stainless Steel Gauge Type 232.54 - Dry Case Type 233.54 - Liquid-filled Case

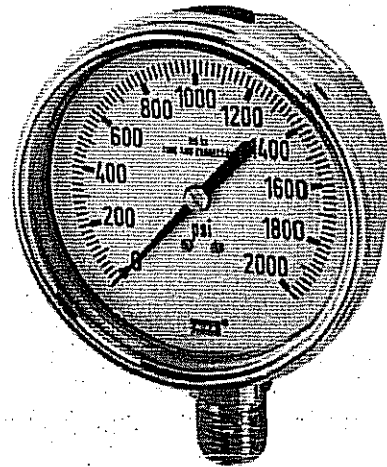
WIKA Datasheet 23X.54

## Applications

- Intended for adverse service conditions where pulsating or vibration exists
- Process industry: chemical/petrochemical, power stations, mining, on and offshore, environmental technology, mechanical engineering and plant construction
- Suitable for gaseous or liquid media that will not obstruct the pressure system

## Special features

- Vibration and shock resistant (with liquid filling)
- All stainless steel construction
- Pressure ranges up to 15,000 psi



**Bourdon Tube Pressure Gauge Model 232.54**

## Standard Features

### Design

ASME B40.100 & EN 837-1

### Sizes

2½" & 4" (63 & 100 mm)

### Accuracy class

2½": ± 2/12% of span (ASME B40.100 Grade A)

4": ± 1% of span (ASME B40.100 Grade 1A)

### Ranges

Vacuum / Compound to 200 psi

Pressure from 15 psi to 15,000 psi

or other equivalent units of pressure or vacuum

### Working pressure

2½": Steady: 3/4 scale value

Fluctuating: 2/3 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) - dry

-4°F to +140°F (-20°C to +60°C) - glycerine filled

-40°F to +140°F (-40°C to +60°C) - silicone filled

Medium: +212°F (+100°C) maximum

### 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.

### Weather protection

Weather resistant (NEMA 3 / IP 54) - dry case

Weather tight (NEMA 4X / IP 65) - liquid-filled case

### Pressure connection

Material: 316L stainless steel

Lower mount (LM) or center back mount (CBM) - 2½"

Lower mount (LM) or lower back mount (LBM) - 4"

1/4" NPT or 1/2" NPT limited to wrench flat area

### Bourdon tube

Material: 316L stainless steel

2" & 2½": ≤ 1,000 PSI: C-type,

≥ 1,500 PSI: helical type

4": ≤ 1,500 PSI: C-type,

≥ 2,000 PSI: helical type

### Movement

300-series stainless steel

### Dial

White aluminum with black lettering; 2½" size with stop pin

**Pointer**  
Black aluminum, friction adjustable

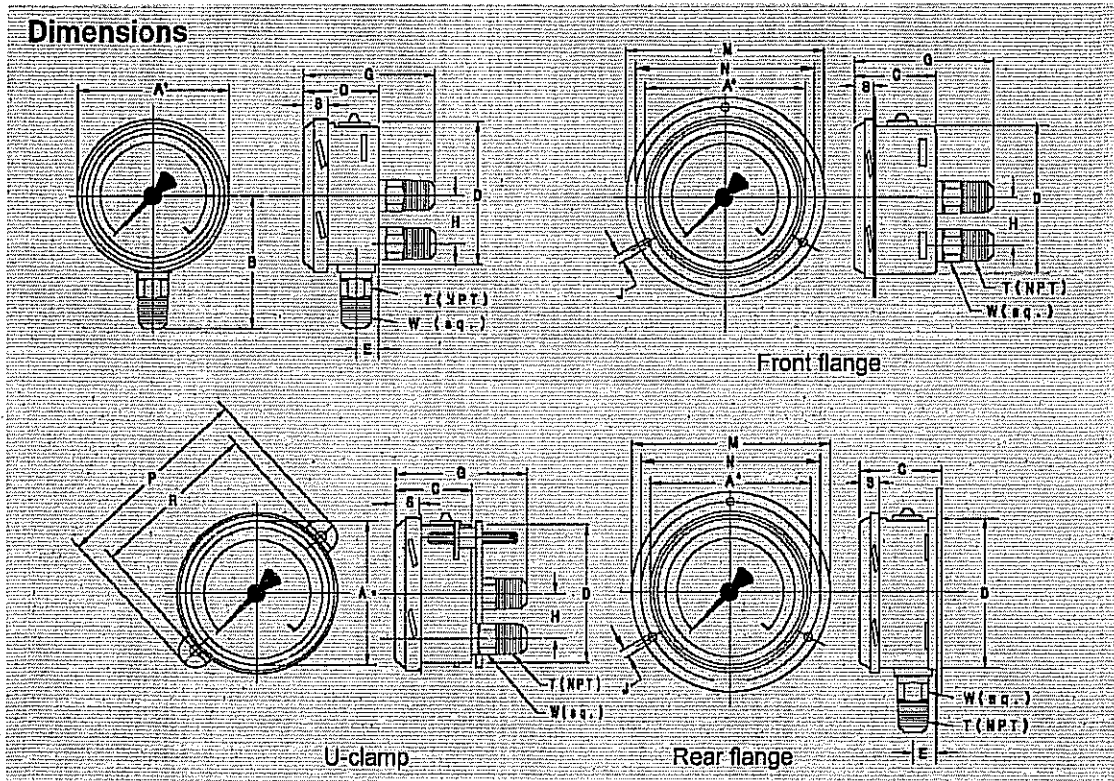
**Case**  
304 stainless steel with vent plug and polished stainless steel bayonet ring. Suitable for liquid filling. Welded case/socket connection

**Window**  
Laminated safety glass with Buna-N gasket

**Case fill**  
Glycerine 99.7% - Type 233.54

**Optional extras**

- 316SS restrictor
- Accuracy  $\pm 1.0\%$  of full scale ( $2\frac{1}{2}$ " size)
- Stainless steel front or rear flange
- Zinc-plated steel or SS u-clamp bracket (field installable)
- Red drag pointer or mark pointer
- Silicone or fluorolube case filling
- Special connections limited to wrench flat area
- Custom dial layout
- Other pressure scales available  
bar, kPa, MPa, kg/cm<sup>2</sup> and dual scales



Size	A	B	C	D	E	G	H	J	M	N	P	R	S	T	W	Weight
2.5" mm	70	54	33.5	62	13	55.5	-	3.6	85	75	87	72	12	14	0.36 lb. dry	
in	2.75	2.13	1.32	2.44	0.51	2.19	-	0.14	3.35	2.95	3.43	2.83	0.47	1/4"	0.55	0.44 lb. filled
4" mm	110	87	49.5	100	15.5	81	30	4.8	132	116	125	110	15	22	1.10 lb. dry	
in	4.30	3.43	1.95	3.94	0.61	3.19	1.18	0.19	5.20	4.57	4.92	4.33	0.59	1/2"	0.87	1.76 lb. filled

Recommended panel cutout is dimension D + 1 mm.

**Ordering information**  
Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required  
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.  
Modifications may take place and materials specified may be replaced by others without prior notice.



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