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Ultrasonic Inspection Report

UT_Knopcik Sour_nov2011

Page 1 of 1

Client: Canadian Natural Resources				Equipment Owner: Canadian Natural Resources				Date: Nov 2011	
Item Inspected: Pressure Vessel and piping					Acceptance Code: ASME VIII & B31.3			Job #	
Location: Knopcik Sour				LSD: see below				WO#	
Procedure: ASME-UT-03		Surface Preparation: Painted		Method: Contact Scanning		Temperature: 0 to 20'C		AFE:	
Ultrasonic Inspection Equipment: Digital Flaw Detector				Manufacturer: Panametrics		Serial # 060024009		Cal. Due: Apr 16, 2012	
Transducer	Angle	Type	Size	Frequency	Manufacturer	Serial #	Range	Ref dB	Scan dB
1.	0'	Dual	0.250"	5.0 MHz	Stresstel	01PWRJ	25 mm	50	56
2.	0'	P/E	0.500"	5.0 MHz	Panametrics	72754	50 mm	48	54
3.	0'	Dual	0.250"	5.0 MHz	Panametrics	504002	25 mm	54	58
Cal. Standard 1		Step Wedge	5 to 20mm	Serial # 3750	Cable 1	BNC to Microdot x 1.83m		Couplant: K.K / UTX	

Job Scope: To perform an ultrasonic thickness survey on various pressure vessels and associated piping at 03-21-74-10, 03-29-74-10, 04-27-74-10, 05-25-74-12, 07-23-74-10, 09-29-74-10, 11-28-74-10, 12-23-74-10, 12-26-74-10, 14-24-74-10, 14-27-74-10 and 16-15-74-12 w6m.

Results: See attached UTS drawing and data sheets for all point locations and recorded thickness measurements.

Client Representative: Terry Aickelin	Contractor Representative:
Technician: Lance Smith	Assistant: Nathan Hubert



Canadian Natural Resources
Knopcik Sour

LSD	Drawing #	Item Description	Reg A#	Serial #	Manufacturer	Flagged Items
03-21-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	105
	2	Line Heater Piping	3129054	95-C3163-3001	Maloney Steel	
	3	Vertical Separator	3129023	95-C3163-3002	Maloney Steel	
03-29-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	
	2	Line Heater Piping	439083	H02828A/B	Opsco Ind.	220, 225
	3	Vertical Separator	439118	V-2828	Opsco Ind.	
	4	Fuel Gas Scrubber	C 75802	04-2902-14	Opsco Ind.	
04-27-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	120
	2	Line Heater Piping	3113855	95-C3162-3001-B	Maloney Steel	
	3	Vertical Separator	3113848	95-C3162-3002-B	Maloney Steel	
05-25-74-12 w6m	1	Wellhead Piping	n/a	n/a	n/a	120
07-23-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	
09-29-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	
	2	Line Heater Piping	3113862	98-C3162-3001-C	Maloney Steel	
	3	Vertical Separator	3121609	95-C3162-3002-D	Maloney Steel	305, 345, 355
11-28-74-10 w6m (wellsite)	1	Wellhead Piping	n/a	n/a	n/a	
	2	Line Heater Piping	3113305	95-C3162-3001-A	Maloney Steel	
	3	Vertical Separator	3113635	95-C3162-3002-A	Maloney Steel	360
11-28-74-10 w6m (central)	1	Horizontal Inlet Separator	433615	V-2699A	Opsco Ind.	185, 190
	2	Vertical Blowcase	433616	V-2699B	Opsco Ind.	205, 207
	3	Inlet Scrubber	482859	97-3202F-1	Petro Equip.	380
	4	1st Stage Suction Bottle	466698	050393-02	EFX Compression	
	5	1st Stage Discharge Bottle	466699	050393-03	EFX Compression	
	6	2nd Stage Suction Scrubber	466697	050393-01	EFX Compression	605
	7	2nd Stage Suction Bottle	466700	050393-04	EFX Compression	
	8	2nd Stage Discharge Bottle	433602	97025-05	Enerflex Mfg.	
	9	Compressor Coolers	n/a	see drawing	Air X Changers	
	10	Fuel Gas Scrubber	421802	972589-13	Enerflex Mfg.	
12-23-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	
	2	Line Heater Piping	420492	HO-2612-A/B	Opsco Ind.	220
	3	Fuel Gas Scrubber	C 75803	FGS.2681.1	Opsco Ind.	



Canadian Natural Resources
Knopcik Sour

LSD	Drawing #	Item Description	Reg A#	Serial #	Manufacturer	Flagged Items
12-26-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	110, 120
	2	Line Heater Piping	3113879	95-C3162-3001-D	Maloney Steel	
	3	Vertical Separator	3124509	95-C3162-3002-C	Maloney Steel	345
14-24-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	
14-27-74-10 w6m	1	Wellhead Piping	n/a	n/a	n/a	
16-15-74-12 w6m	1	Wellhead Piping	n/a	n/a	n/a	120
	3	Line Heater Piping	3151624	HC-48-2000-2334-AB	Opsco Ind.	
	4	Fuel Gas Scrubber	C 75806	FGS-2329-4	Opsco Ind.	
	5	Inlet Filter Separator	525825	04.338	Sunwell Ind.	
	6	Horizontal Blowcase	522640	04.339	Sunwell Ind.	
	7	Vertical Discharge Separator	525826	04.340	Sunwell Ind.	
	8	Fuel Gas Scrubber	C 75808	8600.21	Lo Tech Mfg.	



Customer: CANADIAN NATURAL RES.

Description: WELLHEAD & INLET PIPING

Facility: KNOPCIK SOUR

Location: 04-27-74-10 W6M

Reg A#: _____

Serial #: _____

Drawing#: 1

CRN #: _____

Manufacturer: _____

Unit #: _____

Year Built: _____

Shell MAWP: _____

Shell MAWT: _____

Shell Material: _____

Nominal: _____

CA: _____

Tube "A" MAWP: _____

Tube "A" MAWT: _____

Head Material: _____

Nominal: _____

CA: _____

Tube "B" MAWP: _____

Tube "B" MAWT: _____

Tube Material: _____

Nominal: _____

CA: _____

Size: _____

Manway: _____

MDMT: _____

Boot Shell Mat: _____

Nominal: _____

CA: _____

Insulated: _____

C Stamp: _____

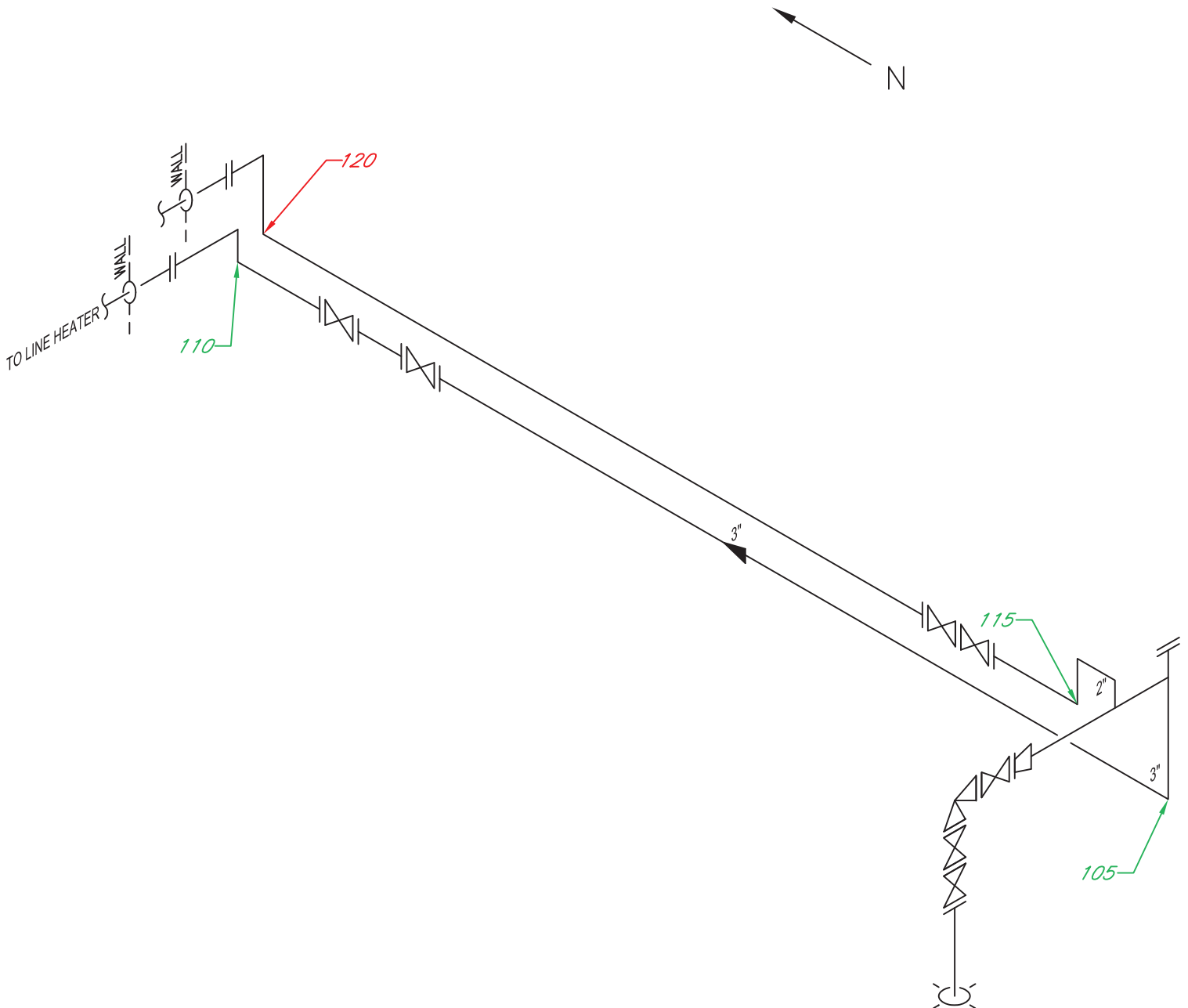
RT: _____

PWHT: _____

Boot Head Mat: _____

Nominal: _____

CA: _____





UTS Data Sheet

Client: **Canadian Natural Resources**

Facility: **Knopcik Sour**

LSD: **04-27-74-10 w6m**

Equip Description: **Wellhead & Inlet Piping**

Reg A#: **n/a**

Drawing #: **1**

			Nominal Thickness (mm)	Corrosion Allowance (mm)	Flag Thickness (mm)
105					
Description:	3" 90° Elbow				
Date:	Nov 14, 11				
Minimum:	10.5				
Average:	11.2				
Comments:					
			11.1	1.4	9.7
110					
Description:	3" 90° Elbow				
Date:	Sept 22, 08 Nov 14, 11				
Minimum:	11.1 11.1				
Average:	11.3 11.3				
Comments:					
			11.1	1.4	9.7
115					
Description:	2" 90° Elbow				
Date:	Nov 14, 11				
Minimum:	7.7				
Average:	8.2				
Comments:					
			8.7	1.1	7.6
120					
Description:	2" 90° Elbow				
Date:	Sept 22, 08 Nov 14, 11				
Minimum:	4.6 4.3				
Average:	5.1 5.0				
Comments:	<i>Min scan at mid elbow.</i>				
			5.5	0.7	4.8

Pipe and Tube Flagged UTS Point Data Sheet



Date: November 1, 2011

Tech: Lance Smith

Client: Canadian Natural Resources

Location

Area: Knopcik Sour

LSD: 04-27-74-10 w6m

Item: Piping

Point Description

Point #: 120

MAWP (PSI): 1348

Material: SA 106 B (assumed)

Fitting Type: 90° Elbow

Head Type: N/A

Outside diameter: 2.375

Inside Radius: 0.971

Thicknesses (mm)

Nominal: 0.217"

Schedule: 80

Minimum: 0.169"

Calculation Information

MAWP obtained by: Vessel data plate

ANSI Flange Rating: 600lb

Stress Value: 17142 Stress Value calculated by tensile strength / 3.5

Tensile Strength derived from assumed material type of SA 106B

Thickness Minimum Calculation (cylindrical shell & pipe)

Formula as per ASME sect VIII, Div 1, UG-27 [c]

$t = PR / SE - 0.6P$

t = minimum required thickness (inches)

P = internal design Pressure (Kpa)

R = inside radius (inches)

S = maximum allowable stress value as pr UG-23 & UG-24

E = appropriate joint efficiency (assumed as "1")

where:

P= 1308.9
17142.0 808.8

R=

S= 1308.9

E= 16333.2

0.08014

t (mm)= 2.0

Calculation Performed by:

sign:

Lance Smith (API 510) #28860

Customer: CANADIAN NATURAL RES.Description: LINE HEATER PIPINGFacility: KNOPCIK SOURLocation: 04-27-74-10 W6MReg A#: 3113855Serial #: 95-C3162-3001-BDrawing#: 2CRN #: M9316.2Manufacturer: MALONEY STEEL LTDUnit #: N/AYear Built: 1995

Shell MAWP: _____

Shell MAWT: _____

Shell Material: _____

Nominal: 9.5mmCA: 3.2mmTube "A" MAWP: 21374 kPaTube "A" MAWT: 93°C

Head Material: _____

Nominal: _____

CA: _____

Tube "B" MAWP: 13962 kPaTube "B" MAWT: 93°CTube Material: SA 106 BNominal: 15.2/11.1mmCA: 3.2mmSize: 3" COILSManway: NOMDMT: N/S

Boot Shell Mat: _____

Nominal: _____

CA: _____

Insulated: YESC Stamp: NORT: 100% PWHT: YES

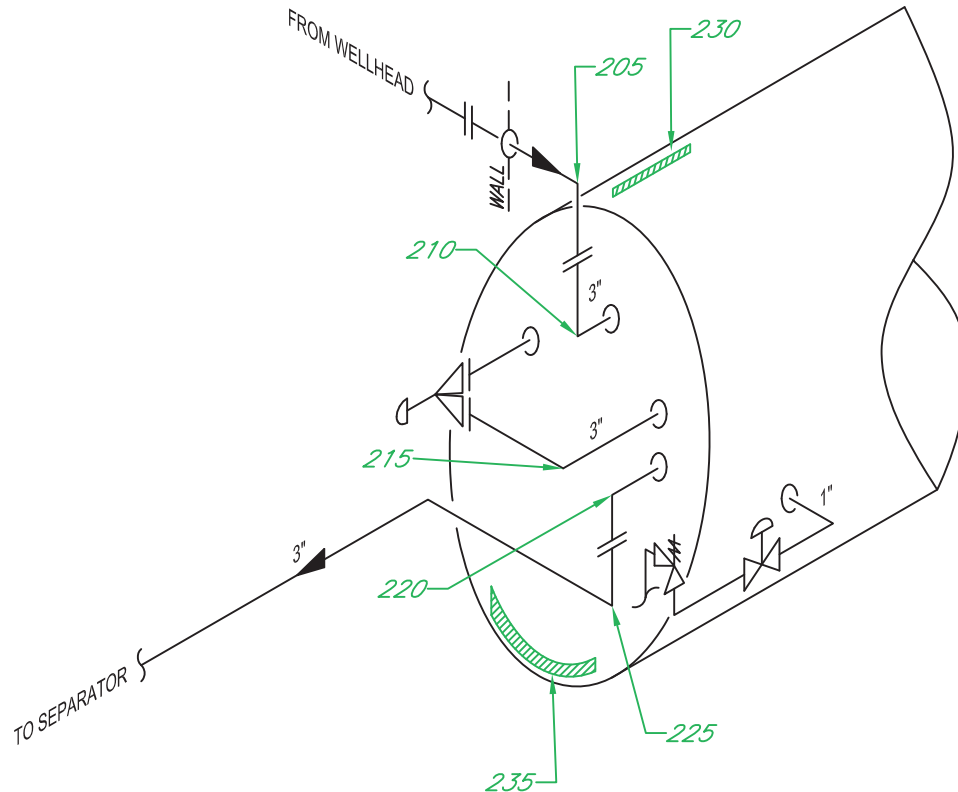
Boot Head Mat: _____

Nominal: _____

CA: _____

PSV DATAManufacturer: FARRISServed By: TYCOModel: 1850Service Date: 06/08Serial: CE-24250-R1Code Stamp: UVSet Pressure: 1034 kPaCRN: OG2367.5CCapacity: 516 scfmLocation: LP FUEL GAS PIPINGTag: EK-14Inlet Size: 3/4" M.TFlows To: FLAREOutlet Size: 1" F.T

NOTE: SHELL NOMINAL AND CORROSION ALLOWANCE ASSUMED.





UTS Data Sheet

Client: **Canadian Natural Resources**

Facility: **Knopcik Sour**

LSD: **04-27-74-10 w6m**

Equip Description: **Line Heater & Piping**

Reg A#: **3113855**

Drawing #: **2**

			Nominal Thickness (mm)	Corrosion Allowance (mm)	Flag Thickness (mm)
205	Description: 3" 90° Elbow		15.2	1.9	13.3
	Date: Sept 22, 08	Nov 14, 11			
	Minimum: 16.8	16.8			
	Average: 17.4	17.4			
	Comments:				
210	Description: 3" 90° Nozzle		15.2	3.2	12.0
	Date: Sept 22, 08	Nov 14, 11			
	Minimum: 15.1	15.0			
	Average: 15.6	15.5			
	Comments:				
215	Description: 3" 90° Nozzle		15.2	3.2	12.0
	Date: Sept 22, 08	Nov 14, 11			
	Minimum: 15.6	15.4			
	Average: 16.2	16.1			
	Comments:				
220	Description: 3" 90° Nozzle		11.1	3.2	7.9
	Date: Sept 22, 08	Nov 14, 11			
	Minimum: 11.0	10.8			
	Average: 11.4	11.3			
	Comments:				
225	Description: 3" 90° Elbow		7.6	1.0	6.6
	Date: Sept 22, 08	Nov 14, 11			
	Minimum: 7.2	7.2			
	Average: 7.5	7.5			
	Comments:				
230	Description: Top Shell		9.5	3.2	6.3
	Date: Sept 22, 08	Nov 14, 11			
	Minimum: 10.4	10.2			
	Average: 10.5	10.5			
	Comments:				
235	Description: Bottom Shell		9.5	3.2	6.3
	Date: Sept 22, 08	Nov 14, 11			
	Minimum: 10.2	10.2			
	Average: 10.3	10.3			
	Comments:				