Canadian Natural Resources Limited
GENERAL PRESSURE VESSEL INFORMATION **Job: 10.113559**

District: **Fort St. John BC**	Skid No.
Facility: **Graham Gas Plant**	Location (LSD): **c-76-K-94-B-08**
Vessel Name Equipment Number: **Low Pressure Flare Knockout Drum**	
Orientation: **Horizontal**	
Status: **In Service**	**Regulatory Inspection**

PRESSURE VESSEL NAMEPLATE DATA

"A" or "G" or "S" (Sask.) or BC Registration Number. **C34220**		CRN Number: **P 6164.2**	
Vessel serial number: 40-94-M051-2		Size: 72 in. X 10 ft.	
Shell thickness: 9.5mm		Shell material: SA 36	
Head thickness: 9.5mm		Head material: SA 36	
Tube wall thickness:		Tube material:	
Tube diameter:		Tube length:	
Channel thickness:		Channel material:	
Design pressure	Shell: 14 PSI	Operating pressure	Shell:
	Tubes:		Tubes:
Design Temp.	Shell:	Operating temperature	Shell:
	Tubes:		Tubes:
X-ray: Nil		Heat treatment: Nil	
Code parameters: ASME VIII, Div. 1		Coated: Yes	
Manufacturer: Pyramid Electric Corp.		Year built: 1994	
Corrosion allowance: not stated		Manway: Yes	

PRESSURE SAFETY VALVE NAMEPLATE DATA

PSV Tag #	Manufacture / Model / Serial	Set Pressure (PSI / kPa)	Capacity (scfm)	Size	Block Valve	Location	Service by Date

SERVICE CONDITIONS-INDICATE ALL THAT APPLY

Sweet	Sour X	Oil	Gas X	Water
Amine	LPG	Condensate	Air	Glycol
Other (Describe):				

Inspection Interval _____ **PSV Service Interval** _____

(Determined by MIC in conjunction with Chief Inspector following guidelines of CNRL's Owner-User Inspection Program)

Reports reviewed and accepted by:

Mechanical Integrity Coordinator _____ **Date** _____

Fill out all forms as completely as possible. <u>All information</u> is important! Use back of sheets to record additional information or sketch if required.
Copy of report to be filed by MIC at site, and copy sent to Chief Inspector

External Inspection Items	G	F	P	N/A	Comments
Insulation Verify sealed around manways, nozzles, no damage present, and there is no egress of moisture.	**X**				**No damage present – sealed around saddles and nozzles. All straps in place and secure.**
External Condition Assess paint condition, areas peeling, record any corrosion, damage, etc (record location, size and depth of corrosion or damage)	**X**				**Paint in good condition– no exposed metal.**
Leakage Record any leakage at flanges, threaded joints, weep holes on repads, etc.	**X**				**No leaks observed.**
Saddle/skirt Assess condition of paint, fire protection, and concrete. Look for corrosion, buckling, dents, etc. Look at vessel surface area near supports. Verify no signs of leakage at attachment to vessel and attachment welds are acceptable. Ground wire attached?	**X**				**Saddles: Bolted directly to Concrete foundation. No buckling or dents.** **No corrosion at attachment welds to vessel.** **Ground wire attached to vessel.**
Anchor Bolts Hammer tap to ensure secure. Look for cracking in treads or signs of deformation.	**X**				**Vessel saddles bolted firmly to concrete foundation – no deformation.**
Concrete foundation Check for cracks, spalling, etc.	**X**				**In good condition – no spalling.**
Ladder / Platform Describe general condition, ensure support is secure to vessel, and describe any hazards.				**X**	
Nozzle Assess paint, look for leakage, and ensure stud threads are fully engaged. Record any damage, deflection, etc. Are nozzles gusseted?	**X**				**Flanged and threaded nozzle joints are fully engaged.** **No damage or deflections – no leaks.** **Nozzles are not gusseted.**
Gauges Ensure gauges are visible, working, no leakage, and suitable for range of MAWP/ Temp.				**X**	**None.**
External Piping Ensure pipe is well supported. All clamps, supports, shoes, etc. in place. Look for evidence of structural overload, deflection, etc. Paint condition, external corrosion?	**X**				**Piping is well supported; no deflection, all clamps and supports are in place.** **Piping insulated – no damage or open sections. no exposed metal.**
Valving Ensure no leaks are visible. Valves are properly supported and chained if necessary.	**X**				**Valves are supported properly – no leaks.**
PSV Ensure PSV is set at pressure at or below that of vessel.				**X**	**Vessel vent to flare.**
NDE methods Was UT/ MPI done on vessel (MI coordinator to review results)	**X**				**Ultrasonic corrosion survey carried out April 2013 – shell metal thickness detected below nominal minus corrosion allowance. Thickness calculations carried out:** **UT point 4525 (Bottom Shell) – nominal thickness is 9.5mm / min thickness is 4.7mm / T min thickness is 1.6mm.**
Other					

Recommendations or corrective actions : Vessel is Fit for Service or describe corrective actions required)
(MIC to review corrective actions with Operations, discuss with Chief Inspector where necessary, and get remedial action implemented)
Recommendations: No recommendations.
Summary: See Internal
Vessel is fit for service.

Inspected By: Gerry Avery // D. Wiedman **Date: August 23, 2013**

Internal Inspection Items	G	F	P	N/A	Comments
Coating Assess coating. Describe area coated, general condition of coating.		X			Blisters and peeling around man way attachment weld to top of vessel. Peeling and corrosion on head to shell welds. Coating peeling in side man way – corrosion to attachment welds – cap weld corroded – 12 " of root weld exposed and pitting. Peeling coating on inlet nozzle and outlet nozzle.
Anodes. How many, type, condition. % consumed. Are they being replaced?	X				2 anodes – being replaced.
Internal Piping Is there any? If so, carbon or stainless steel. Describe condition, dents, corrosion, erosion, etc. Ensure supports are secure and any bolts are suitable for future use.	X				Level gauge piping in place – no mechanical damage. Drain piping elbow corroded- pitting on apex. Elbow on exterior is corroded with scaling.
Trays How many? Type of material. Are valves in place? Check for erosion/ corrosion; wear on tray valve legs. Cleanliness?				X	
Baffles, deflector plates, etc. If present, describe condition. Look closely at welds attached to vessel wall.		X			Inlet deflector plate welded to top shell – corrosion to support braces and plate – coating peeling.
Top Head Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head)	X				No mechanical damage – corrosion to attachment welds to shell –corrosion staining on coating. Coating bonded to head.
Bottom Head Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head)	X				No mechanical damage or peeling coating on head – head attachment welds peeling corrosion under coating.
Shell Sections Record number of shell sections. Record location, size and depth of all erosion, corrosion or mechanical damage. Describe general condition. If any corrosion greater than corrosion allowance is observed in either shell or head, discuss with Chief Inspector before closing vessel.	X				1 sheet sections- nozzles are clean – Man way on top shell – corrosion and peeling coating on attachment welds. Pitting under coating on bottom shell - .170" above coating. Coating bonded in pits. Outlet nozzle coating peeling – surface corrosion on exposed metal.
Demister pad Is it in place? Is it clean? If any corrosion is apparent in vessel, lift pad and check top head for corrosion.				X	
Welds Inspect all welds, including attachment welds. Record all service-related damages and if there is any discuss with Chief Inspector before closing.	X				All welds are coated –corrosion staining on welds on both heads and around man way.
Repairs Required. If yes, ensure procedure and copy of AB 40 is on file, and one sent to local ABSA, and Chief Inspector	X				Sandblast and re-coat vessel.
NDE Was any NDE done. (MI coordinator to review results)					

Recommendations or corrective actions : Vessel is Fit for Service or describe corrective actions required)
(MIC to review corrective actions with Operations, discuss with Chief Inspector where necessary, and get remedial action implemented)

Recommendations: Replace drain elbow – and sandblast and recoat vessel.
Note: vessel being replaced in future.

Summary: This vessel is in good condition, visual external and ultrasonic thickness inspection carried out – shell metal thickness detected below nominal minus corrosion allowance. Thickness calculations carried out to ensure sufficient metal exists for safe operation.

Corrosion rate based on greatest thickness loss (shell) 0.258mm per year. Retirement Date to "T"min is year 2025.
Vessel is fit for service.

Inspected By: Gerry Avery//D. Wiedman **Date: August 23, 2013**

	
Vessel data plate	Top man way
	
Vessel overview	Anode nozzle
	
overview	Drain corrosion in elbow

Head nozzle

Inlet nozzle peeling

Corroded inlet deflector

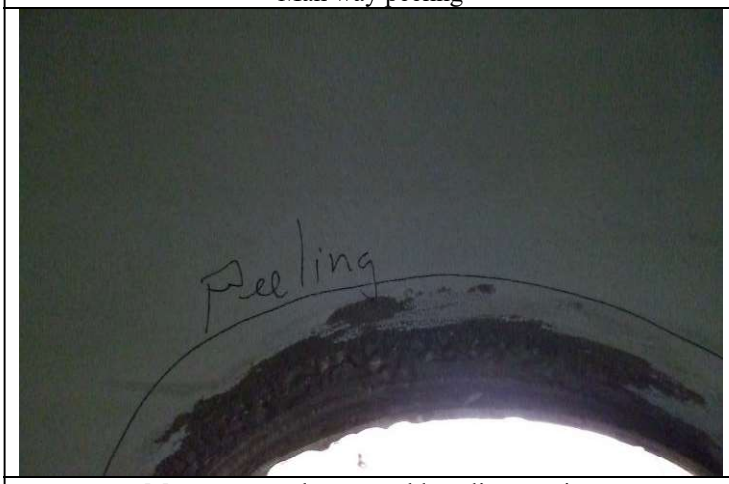
Level piping

Pit corrosion on floor coated

Peeling in man way

Man way peeling

Head to shell weld blistered and peeling



Man way attachment weld peeling coating

Blisters and peeling on shell weld

Outlet nozzle peeling

Peeling coating in man way

	
Pitting on floor up to .170” - .180”	