

**Canadian Natural Resources Limited
GENERAL PRESSURE VESSEL INFORMATION**

Job # 10.112250

District: BC and North	Skid No.
Facility: Chinchaga Battery	Location (LSD): 13-20-96-09 W6M

Tank Name / Equipment Number: **1000 bbl Produced Water Tank**

Orientation: **Vertical**

Status: **In Service**

Regulatory Inspection

PRESSURE VESSEL NAMEPLATE DATA

"A" or "G" or "S" (Sask.) or BC Registration Number. C50088		CRN Number: Not Required	
Tank serial number: 16805		Size: 17.0 ft. 3.0 in. X 24.0 ft.	
Shell thickness: 4.8mm		Shell material: SA 36	
Bottom thickness: 6.4mm		Bottom material: SA 36	
Deck thickness: 4.8mm		Deck material: SA 36	
Tube diameter:		Tube length:	
Channel thickness:		Channel material:	
Design pressure	Shell: 4 oz	Operating pressure	Shell:
	Tubes:		Tubes:
Design Temp.	Shell:	Operating temperature	Shell:
	Tubes:		Tubes:
X-ray: As per API 12F requirements		Heat treatment: Nil	
Code parameters: API 12 F		Coated: Yes	
Manufacturer: Platinum Energy Services		Year built: 2005	
Corrosion allowance: Not Stated		Manway: Yes	

PRESSURE SAFETY VALVE NAMEPLATE DATA

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

SERVICE CONDITIONS-INDICATE ALL THAT APPLY

Sweet	Sour X	Oil	Gas	Water X
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. All information 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 man way, nozzles, no damage present, and there is no egress of moisture.			X		Foam insulated – Two large open sections on shell. No signs of water ingress.
External Condition Assess paint condition, areas peeling, record any corrosion, damage, etc (record location, size and depth of corrosion or damage)		X			Mechanical damage to lower shell (evident internally).
Leakage Record any leakage at flanges, threaded joints, weep holes on repads, etc.	X				No leaks observed.
Base Assess condition of paint, fire protection, concrete. Look for corrosion, buckling, dents, etc. Is tank mounted above ground water level – on pilings? Ground wire attached?	X				Set above ground on pilings -tank is welded to skid frame and frame is welded to piling plates. No buckling or dents. No sign of leakage at attachment welds to tank. Grounded trough pilings.
Anchor Bolts Hammer tap to ensure secure. Look for cracking in treads or signs of deformation. Is tank resting on deck – welded to supports?	X				Tank welded to piling supports.
Concrete foundation There may be a concrete ring under the tank. Check for cracks, spalling, etc.				X	
Ladder / Platform Describe general condition, ensure support is secure to vessel, describe any hazards.	X				Ladder firmly attached to vessel – no missing sections. Paint in good overall condition. No loose or broken sections.
Nozzle Assess paint, look for leakage, and ensure stud threads are fully engaged. Record any damage, deflection, etc. Are nozzles gusseted?	X				All studs fully engaged to nuts – no short bolts. No signs of deflection – no leaks. No gussets.
Gauges Ensure gauges are visible, working, no leakage, and suitable for range of MAWP/ Temp. Remember some tanks require fuel gas or other positive protection so a pressure gauge may be installed.	X				High level shut down in place. Level indicator intact. Temp gauge clear and intact.
External Piping Ensure pipe is well supported. All clamps, supports, shoes, etc. in place. Look for evidence of structural overload, deflection, etc. Paint condition, insulation condition, any wet insulation, any external corrosion?	X				Well supported, no deflection. Piping is insulated – no open or torn sections.
Valving Ensure no leaks are visible. Valves are properly supported and chained if necessary.			X		Hole through corrosion on 4 inch nozzle. Stainless steel flange mated to carbon steel flange with no CP isolation kit installed.
PSV Ensure PSV is set at pressure at or below that of vessel.				X	No PSV on tank system. Vacuum breaker installed.
NDE methods Was UT/ MPI done on vessel (MI coordinator to review results)				X	None at this time.
Secondary Containment: This may be a double wall tank with a pressure gauge or level gauge indicator. Also a concrete or steel dike with vinyl liner – describe.	X				Steel ring wall around tank with vinyl liner – no leaks.
<p>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: 1.Replace corroded nozzle and install CP isolation kit. 2. Repair open sections of open insulation. 3. Install ground wire. Summary: Vessel is in overall good condition. Visual external inspection carried out.</p>					

Inspected By: Mike Dutcher, API Cert. # 37254

Date: September 28, 2012

Internal Inspection Items	G	F	P	N/A	Comments
Coating Assess coating. Describe area coated, general condition of coating.			X		Coating failures resulting in hole through pitting/corrosion to floor. Coating is cracked in several locations along floor to shell weld location.
Anodes. How many, type, condition. % consumed. Are they being replaced?				X	A anode should be installed inside this tank during the re work in March / April 2012.
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				Oil skimmer piping is firmly attached. No signs of leaking. No deflection noted.
Baffles, deflector plates, etc. If present, describe condition. Look closely at welds attached to vessel wall.				X	No baffles or deflectors.
Bottom Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head) Exchanger may have 2 pancake covers instead.			X		3 coating failures resulting in hole through pitting/corrosion to floor. Pitting/corrosion exists at floor to shell weld.
Deck Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head) Exchanger may have 2 pancake covers instead.	X				Coating intact. No signs of damage or distortion.
Shell Sections Record number of shell sections. Record location, size and depth of all erosion, corrosion or mechanical damage. Describe general condition.			X		4 shell courses. Pitting/corrosion exists at floor to shell weld. Upper courses have tightly adhered to product. No signs of coating damage behind product scale.
Thermal Wells If present, describe condition and location.				X	No thermal wells
Heat Medium Coil Note all corrosion, erosion or mechanical damage.				X	None.
Fire Tube Note all corrosion, erosion or mechanical damage. Take thickness readings on selected areas of tube and carry out Magnetic Particle Inspection on tube welds.			X		Corrosion and pitting exists. Pitting depths measured to 0.200 inches. Product covered.
Welds Inspect all welds, including attachment welds. Record all service-related damages and if there is any discuss with Chief Inspector before closing.			X		Pitting/corrosion exists at floor to shell weld. Coating is cracked in several locations along floor to shell weld location.
Repairs Required. If yes, ensure procedure and copy of AB 40 is on file, and one sent to local ABSA, and Chief Inspector	X				<ol style="list-style-type: none"> 1. Blast coating and complete thorough visual inspection. 2. Install patch plates at identified hole through locations. 3. Remove and clean fire tube to complete thorough visual inspection. Perform Magnetic Particle (MPI) inspection to check for cracking at corroded/pitted locations and welds. Perform weld fill repair where required. 4. Perform MPI at deflected areas to confirm no cracking exists.
NDE Was any NDE done. (MI coordinator to review results) Include tubular inspections in document and results.	X				Ultrasonic thickness surveys were carried out at hole through locations to establish repair patch locations and dimensions.
<p>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)</p> <p>Recommendations: See above required repairs.</p> <p>Summary: This tank is poor condition, visual external and internal carried out. Several corroded/pitted locations on floor and shell to floor weld require repair. The fire tube has is pitted/corroded to greater than half wall n some locations.</p> <p>Tank is not fit for service</p> <p>Inspected By: Mike Dutcher, API Cert. # 37254</p> <p style="text-align: right;">Date: Sept 28, 2012</p>					

Nov 22 – 2012 // Repairs

Summary:

Nov 21: Premier coatings sand blasted all suspect areas for repairs – a number of new areas were found with corrosion along the shell to bottom area.

Nov 22: Inspections carried out on areas to ensure no further unbounded area existed.

Nov 22: Weld repairs to shell to bottom weld in 3 areas and 7 patches were installed by REED Energy.

Nov 22: Weld repairs inspected with Magnetic Particle Inspection method – no cracking detected.

Nov 22: The 8 inch fire tube was sand blasted for inspection by Premier Coatings.

Nov 22: The 8 inch fire tube was inspected for pitting – pitting detected to near through holes along the upper section of the tube – large diameter pits – deepest to 8.0 mm / tube was built at 9.3 mm.

Nov 22: Deepest pits were weld built up using E 7018-1 by REED Energy. (This was a stop gap only as the tank had to be put back into production – operations stated that the tank would again be opened in March / April time frame and a new tube could be built) Ultrasonic thickness on unpitted areas showed some corrosion – min thickness was 8.3 mm – so tube has some internal problems as well as external problems.

Nov 22: Welded areas inspected with Magnetic Particle Inspection method – no cracking detected.

Nov 23: Premier coatings coat the patched areas with Devco 142 C grout (Hand laid up).

Note: An anode will be required during the re work of this site in March / April time frame.

Inspected By: Dellas Wiedman

Date: Nov 22, 2012



LSD: 13-20-96-09 W6M

Overview



Data Plate

Piling supports



Foam insulation - Open sections



Foam insulation - Open sections



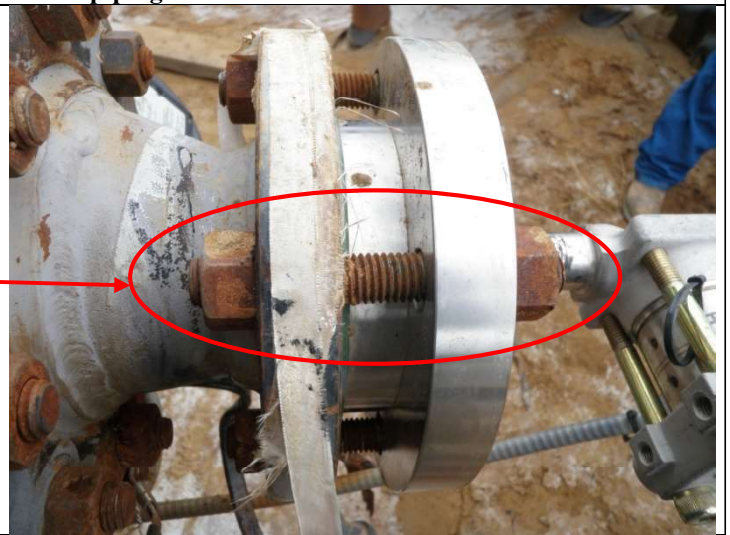
Piping



Deck - piping - Vacuum breaker



Transmitter valving - signs of leaking



Stainless to carbon flanges - no CP isolation kit installed



New carbon steel piping spool – coated with Devco 142 C grout to replace leaking spool identified below.



1 inch hole through corrosion



Overview



Manway



Door plate



Overview



Overview



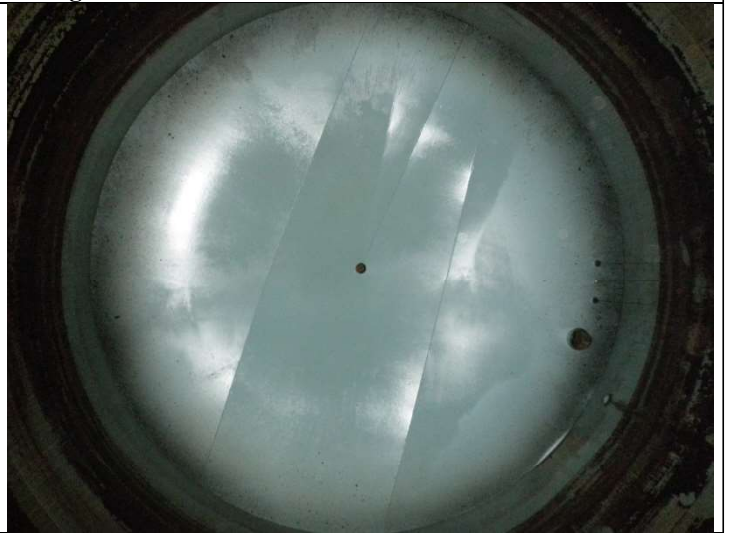
Overview



Float guide wire broken



Shell – tightly adhered product scale



Deck



Through hole at weld



Through hole at weld 2.0 inches



Through hole on bottom



Through hole 2.5 inches dia.



Through hole on bottom of tank.



Through hole - 3.0 inches dia.



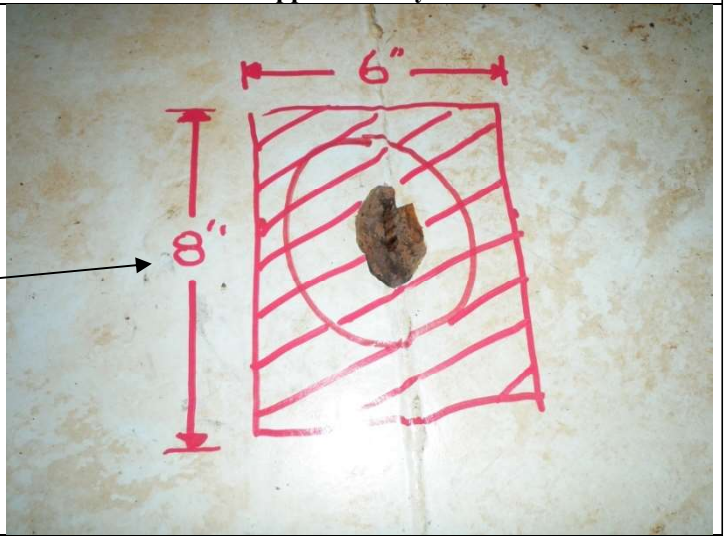
Corrosion/pitting at shell to floor weld



Bottom to shell weld - Approximately 0.200 inches loss



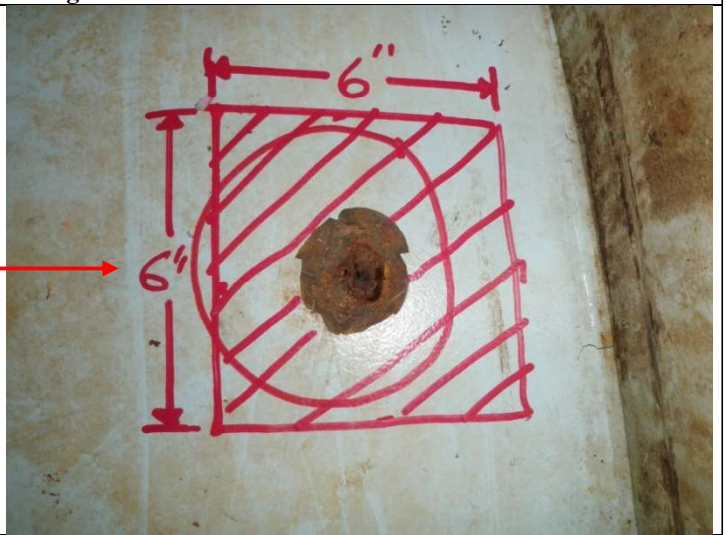
Repair patch required on bottom



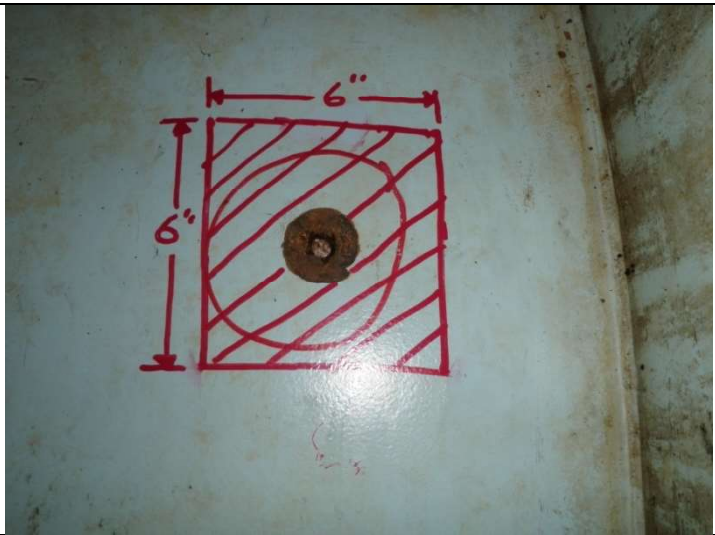
Pitting on bottom 8.0 x 6.0 inches



Repair patches required on bottom



Pitting on bottom 6.0 x 6.0 inches



Pitting on bottom 6.0 x 6.0 inches



Pitting on bottom 0.100 inch depth and 3.0 inch dia.



Areas of noted weld corrosion/pitting



Weld fill



Inward deflection – 1.5 inches



24.0 inches length



Inward deflection – 0.5 inches



Inward deflection at shell to bottom – 20.0 inches length



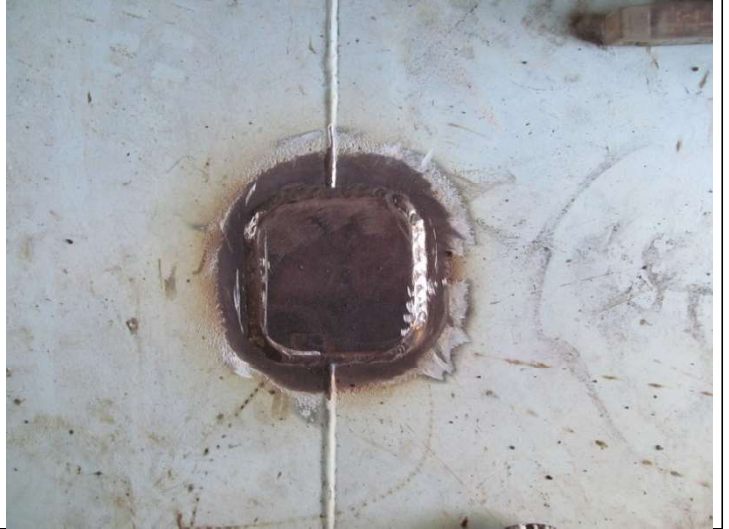
Welded patches – Nov 22 – a patch was required on the shell area where the weld from the shell to bottom was corroded through,



Shell to bottom weld repair.



Welded Patch Nov 22



Welded patch – Nov 22



Over view of patched area – Nov 22



Over view of patched areas – Nov 22.



Fire Tube – corrosion/pitting



Pitting



Pit depth 0.200 inches



Pitting/ corrosion



Fire tube after sand blasting



Clusters of pitting



General corrosion with deep pits



Weld build up on fire tube