1060-04

Canadian Natural Resources Limited

Production - Facilities Engineering
A0510882 and A0510883 Raw Water Filtration Vessel Coating Inspection

Content Date Range: 8/16/2004 to 8/16/2004

Vessel Integrity

Inspection Data

Open: 6/5/2006 Close:

CC+2 0P P

Vital: Yes
Original: Yes
Confidential No

00698851

Coating Inspection
2 Raw Water Filtration Vessels
North Brimthell
11-26-82-21 W4 M.
August 16, 2004.

CHARTER INSPECTION SERVICES
Daily Shop / Field Inspection Report

Date:	August 16, 2004	Report:	1
Client:	CNRL	Vendor Job No.:	3497
Project Engineer:		CNRL Contact:	Ted Hanscom
Purchasing Agent:		Vendor P.O. No	
Inspector:	Charter Coating Service (2000) Ltd.	Tag Number:	3497-1 & 3497-2
Vendor:	Moss Fabrication / ProCoat Coatings	AFE Number:	
Equip. Description:	(2) Raw Water Filtration Vessels	Hours Expended:	8.0
Location:	Wabasca, AB.	Hours Allotted:	
Field Proj:	North Brintnell, LSD 11-26-82-21-W4M	Original Completion:	
Estimated Completion:		**Charter Coating Job#:**	**1356-04-09**

Date: August 16, 2004 **(Duration of Activities: 8.0 hrs.)**

Report Details: 1.0 **Job Status Reports:**

1.0 INTRODUCTION: CNRL requested Charter Coating Service (2000) Ltd. to inspect two (2) internally coated filtration vessels. One of the vessels, 3497-2 was briefly put into service and the coating has failed. The vessels are located at North Brintnell LSD 11-26-82-21-W4M. Contact person on site was Ted Hanscom of CNRL. Charter Coating inspector Chris Hook and Ted Hanscom viewed vessel 3497-1 (serial number A510882) that has not been in service and vessel 3497-2 (serial number A510883) that has been in service for approximately two (2) weeks.

1.1 HISTORY: Both filtration vessels were built in 2004 by Moss Fabrication Ltd., Calgary Alberta. Coating for the vessels and associated 8" fabricated spools was subcontracted to ProCoat Coatings Ltd., Calgary. CNRL received both vessels on site on June 04, 2004 and installed them shortly after. Only one vessel was put into service. There are a total of four (4) filtration vessels on the order from Moss Fabrication with two (2) of the vessels still in Moss shop slated for a later delivery date.

Service Environment:	Water filtration
Temperature:	15°C
Internally Coated:	May, 2004 for items on site, June 2004 for items in Moss Yard
Internal Coating:	Enviroline 375 Chemical Resistant Lining – shop applied
Coating Applicator:	ProCoat Coatings Ltd., Calgary, Alberta
External:	Alkyd Primer/Topcoat

1.2 OBSERVATIONS ON EXISTING COATING:

Vessel 3497-2 (number A510883)

- This vessel was exposed to the service environment for less than two (2) weeks. The coating surface was discolored and the coating had blistered throughout.
- The blisters were found to extend to the first coat in all cases. The coating system consisted of a two-coat application with the first coat being light grey in color and the second coat, (finish coat) being green discolored by the service to a grey-brown.
- Upon removing the finish coat and viewing the back of the coating chip there was no primer (first coat) attached.
- The first coat in all cases was well bonded to the metal and did not give any evidence of having been deteriorated by the service.
- Coating thickness readings indicate that the primer (first coat) was 4-5 mils thick and the finish coat was applied to 5-7 mils. Total coating thickness was at 10-14 mils d.f.t.

Vessel 3497-1 (number A510882)

- Vessel 3497-1, which has not been in service to date, had a few chips in the coating caused by the installation of the metal ring, which holds the 10 filters, see Figure 1.
- Coating appearance in Vessel 3497-1 was uniform and consistent with a well-applied coating in that there were no visible defects.
- Charter inspector using the point of a sharp knife was able to pry, with very little effort, the finish coat from the first coat. The lack of bond between first and second coats appears to be an identical condition in both vessels.
- The first coat is well bonded to the substrate.
- Both vessels appear to be in identical condition. The chips were only in the finish coat (color green) and cleanly released from the (light grey) first coat. The backside of the released chips showed no primer attached.

1.3 ACTION TAKEN: Collected coating chips to forward to Charter Coatings -- Calgary for examination. Photo's taken of both vessels.

1.4 RECOMMENDATION: All of the available evidence points to an inter-coat adhesion problem existing prior to placing the coating into service. Review Q.C. documents of applicator – determine lack of bonding between finish coat and primer.

Photographic documentation follows:

PHOTOGRAPHIC DOCUMENTATION

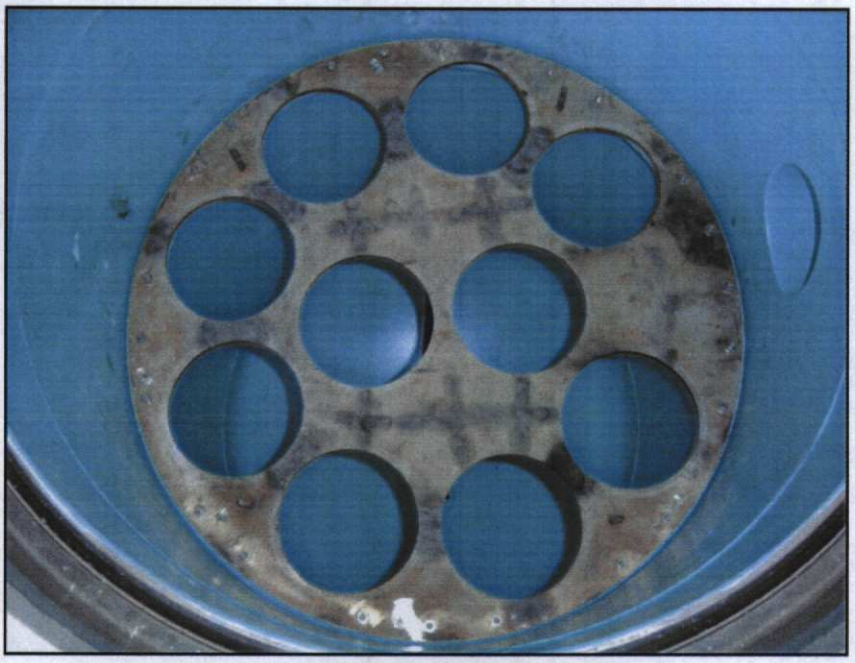

FIGURE 1. VESSEL 3491-1: SHOWS BAG HOLDER THAT CHIPPED INTERNAL OF VESSEL.

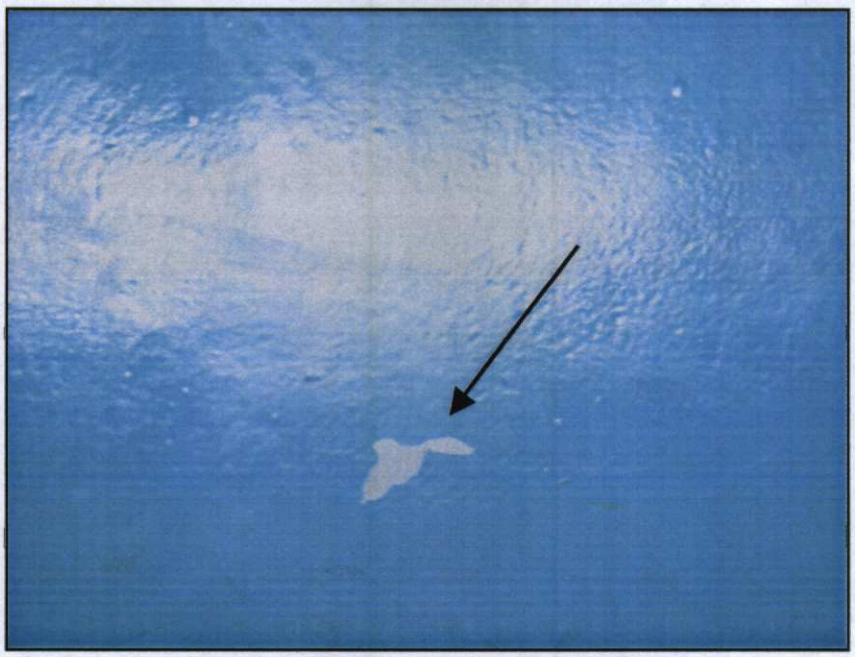

FIGURE 2. CHIP CAUSED BY INSTALLATION OF METAL RING. THE CHIP DOES NOT EXTEND TO THE METAL, RATHER IS A CLEAN BREAK AT THE INTERFACE BETWEEN THE FIRST AND SECOND COATS. THIS AREA COULD BE EXPANDED BY PROBING WITH THE TIP OF A SHARP KNIFE AND INDICATED THAT THE POOR BOND BETWEEN COATS WAS GENERALIZED IN NATURE.

PHOTOGRAPHIC DOCUMENTATION CONT'D.

FIGURE 3. VESSEL 3497-2: SHOWS BLISTERS THAT OCCURRED BETWEEN THE FIRST AND SECOND COATS.

FIGURE 4. VESSEL 3497-2: SHOWS DISCOLORATION DUE TO SERVICE AND THE EXTENT OF THE POOR ADHESION BETWEEN BLISTERED FINISH COAT AND WELL-BONDED FIRST COAT.

PHOTOGRAPHIC DOCUMENTATION CONT'D.

FIGURE 5. VESSEL 3497-2: SHOWS INTACT FIRST COAT BENEATH REMOVED BLISTER. THE AREAS OF DARKENING LIKELY CORRESPOND TO THE INGRESS OF FLUIDS DURING SERVICE EXPOSURE.