

November 1<sup>st</sup>, 2019

**Ontario Clean Water Agency**  
Northeastern Ontario Hub  
213 Whitewood Avenue West  
Norland Building, Unit B5  
New Liskeard ON. P0J 1P0

Att: **Mr. Bryce Logan**  
[blogan@ocwa.com](mailto:blogan@ocwa.com)

Re: **LMS Job #LM19081**  
**Remotely Operated Vehicle Inspection & Report (ROV) – Temagami North Standpipe (SP)**

Mr. Logan,

A comprehensive inspection was performed at the above-mentioned potable water storage facility on August 15<sup>th</sup>, 2019. Tank interior surfaces were inspected with a remotely operated vehicle (ROV). The ROV unit and tether cable were disinfected in accordance with AWWA-C652-11 Method #2 guidelines (200ppm solution) prior to entry into the tank interior. Landmark's ROV equipment is designated for potable water use only.

Please find a comprehensive report enclosed as follows;

- |   |              |
|---|--------------|
| 1) Composite Elevated Tank Inspection Report  | Pages 1 – 4  |
| 2) Photographic Record of Report  | Pages 5 – 24 |
| <i>Photographs are numbered in accordance with the corresponding numbers throughout the report.</i> |              |
| 3) Protective Coatings & Linings Report   |              |
| 4) Quotation #Q19133 for all recommended upgrades and repairs                                       |              |
| 5) ROV Video – Electronic Copy on USB Flash Drive   |              |

Should you have any questions or comments regarding the content of this report, please contact us at 905-319-7700.

Yours sincerely,  
**LANDMARK MUNICIPAL SERVICES**



**Caelan Murray-Leung**  
**Project Coordinator**

Encl.



Effective December 1<sup>st</sup>, 2016, the CSA Group updated its standards relating to fall arresters and rigid rail systems. The update has resulted in the previous standard, Z259.2.1-98 (2011) (the “2011 CSA Standard”), being separated into two new standards: (a) CSA-Z259.2.4-15 – Fall Arresters and Vertical Rigid Rails; and (b) CAN/CSA-Z259.2.5-12(2016) – Fall Arresters and Vertical Lifelines.

The impetus for the changes to the 2011 CSA Standard was driven by an incident in which a worker was critically injured while using a rigid rail type of fall protection system in 2014 – a copy of this notice is included at the end of this report. The Ontario Ministry of Labour’s investigation into the matter revealed a weakness in the design of some Class Frontal-Fixed Rail Ladder Fall Protection Systems, which may not adequately protect workers who fall backwards or who squat and roll backwards into a fall while connected by a body harness to the trolley which slides along the vertical rail.

Particular to our review of the subject potable water storage facility is CSA-Z259.2.4-15 – Fall Arresters and Vertical Rigid Rails (“2016 CSA Standard”). Generally, the revisions included in the 2016 Standard fall into 3 categories: (i) increased compatibility requirements between fall arresters, harnesses, and vertical rigid rail systems. These changes can primarily be found in sections 4.3.5, 4.4, and 4.5; (ii) the addition of 4 new mandatory testing requirements for rigid rail systems, which can be found in sections 5.3 through 6.4; and (iii) new marking requirements in sections 7.1, 7.2, and 7.3.

As per section 5.3.1, all new testing requirements must be met in order for the rigid rail system to be certified as compliant under the 2016 CSA Standard.

Landmark has followed up with the CSA Group in an attempt to determine the status of the exiting FRL’s system compliance. In the case of fall arresters and vertical rigid rails, it appears that the current system has not been certified by the CSA Group with respect to the new 2016 Standard.

Please refer to quotation #Q19133 for pricing to remove and replace the existing fall arrest system with Honeywell Safety Products – “Soll GlideLoc” who are compliant with the new 2016 Standard.



This report has been prepared in order to provide the facility owner with a detailed description of the following:

The present condition of interior and exterior coatings, any pitting and/or corrosion on the interior of the water retaining vessel, the apparent condition of exposed foundations and the status of and recommendations for upgrades on safety equipment and other facility appurtenances.

Landmark Municipal Services has not performed a design review, an ultrasonic, x-ray, or destructive and/or non-destructive testing unless stated in the report. Comments and recommendations are based on visual inspection only and represent Landmark's professional judgement in reference to industry standards and best practices. This report may be based on information provided to Landmark which has not been independently verified. Its accuracy is limited to the time period and circumstances in which it was made. It was prepared for the specific purposes described in the report.

Any estimates regarding construction costs represent Landmark's judgement in light of our experience. Since Landmark has no control over market conditions, we do not make any representations or guarantees whatsoever with respect to such estimates or their potential variance from actual construction costs or schedules. Landmark accepts no responsibility for any potential losses.

In the case of subsurface, environmental or geotechnical conditions, the report may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time. Landmark makes no other representations or warranties whatsoever and accepts no responsibility for any events that may have occurred since the report was prepared.





## WELDED STEEL STANDPIPE INSPECTION REPORT

<b>Landmark Contract No.</b>	<b>Inspection Date</b>	<b>Last Inspection Date</b>
LM19081	15-Aug-19	Unknown
<b>Inspector</b>	<b>Report Date</b>	<b>Inspected By</b>
P. Furtado	12-Oct-19	Unknown

## OWNER / CONTACT

<b>Owner</b>	<b>Municipality of Temagami</b>	<b>Contact</b>	<b>Mr. Bryce Logan</b>
<b>Project Location</b>	Temagami Standpipe	<b>Title</b>	Ontario Clean Water Agency - Northeastern Hub
<b>Address</b>	43 Birch Crescent Temagami, ON	<b>Phone</b>	705.648.4082
		<b>Fax:</b>	--
		<b>Email</b>	<a href="mailto:blogan@ocwa.com">blogan@ocwa.com</a>

## TANK DESCRIPTION

<b>Constructor</b>	Horton/ CBI	<b>Tank Capacity</b>	161,000 Imperial Gallons
<b>Tank Type</b>	Welded Steel Standpipe	<b>Year Built</b>	1972
<b>Dwg's Available</b>	No	<b>Tank Diameter</b>	24 ft.
<b>Dwg's Reviewed</b>	No	<b>HWL</b>	54 ft.
<b>Coating System</b>	Unknown	<b>Tank Height</b>	58 ft.
<b>Lining System</b>	100% solids polyurethane	<b>Grade Elev.</b>	--
<b>Age of Paint</b>	Exterior Coating - Unknown Interior Lining - within 5-7 years	<b>Roof Type</b>	Rafter supported Welded steel dome





# REPORT SUMMARY

Repairs Made During Inspection	Photo No.		Photo No.
	<div>---</div> <div>---</div> <div>---</div>		<div>---</div> <div>---</div> <div>---</div>
<b>Recommended Repairs</b>			
<b>Siteworks</b>		<b>Mixing System</b>	
Gravel driveway recommended	9	Replace corroded boltsets on mixing system	151
Install flap valve at end of overflow	37	Inspect / repair damaged mixing system brackets (2)	149
	--		--
<b>Security</b>		<b>Fall Arrest System</b>	
Maintain vegetation / overgrowth at fence line	2	<b>*Please review cover letter for latest information regarding CSA Standard CSA-Z259.2.4-15 (Fall arresters and Vertical Rigid Rails)</b>	
Security gate required at bottom of vertical ladder	51	Remove and replace fall arrest system on vertical ladder	51
Padlock required on 1 roof hatch	95	2pc 'D' rings required	68, 49
<b>Valve Chamber / Pit</b>			
Surface prep and paint pipes and valves	18 - 23		--
Replace entrance door and frame	9		--
Rescue port base, 'D' ring, and fall arrest system required	13, 14		--
Cleanout valve pit	19		--
<b>Foundations</b>			
	<div>---</div> <div>---</div> <div>---</div>		<div>---</div> <div>---</div> <div>---</div>
<b>Support Structure</b>		<b>Confined Space &amp; Rescue System</b>	
	<div>---</div> <div>---</div> <div>---</div>	Rescue port base required at top of vertical ladder	67
			--
			--
<b>Anchorage</b>			
	<div>---</div> <div>---</div> <div>---</div>		--
			--
			--
<b>Accessories</b>		<b>Coatings, Linings and Metal Condition</b>	
Galvanized top landing assembly recommended	67	Refer to protective coatings and linings report	--
1pc aluminum rest seat required on ladder	52	Clean and remove tank sediment	141
Remove and replace original 30" roof hatch and curb	99 - 101	Exterior overcoat required	--
Surface prep and re-paint existing couplings / anchors (or replace)	84 - 88	Interior lining repairs required	--
Remove handrail and paint steel support brackets	72 - 84		--

Thank you for allowing Landmark Municipal Services to assist you in the maintenance of your water storage facility. To maintain the integrity of your facility, we recommend that you schedule your next inspection per the following:

Safety Inspection and Report (SIR)	2020	
Clean, Inspect and Report (CIR)	2020	*SIR included in CIR*
Remote Inspection & Report (RIR)	2023	*3 yrs after CIR*



**SITEWORKS**

EXTERIOR VALVE CHAMBER	Separate building with below grade valve pit	5 - 25
DRIVEWAY / WALKWAYS	Fair - gravel driveway recommended	1 - 2
OVERFLOW SPILLWAY	Fair - maintenance required to overflow pipe	35 - 37

**REPAIRS OR MAINTENANCE REQUIRED**

Gravel driveway recommended

Install flap valve at end of overflow

**SECURITY**

FENCE & GATES	Fair - Minor overgrowth throughout	2
VERTICAL LADDER	None	51
HATCH LOCKS	2 roof hatches present; padlock required on 1 of them	71, 94

**REPAIRS OR MAINTENANCE REQUIRED**

Maintain vegetation / overgrowth at fence line

Security gate required at bottom of vertical ladder

Padlock required on 1 roof hatch

**VALVE BUILDING / PIT**

CONDITION OF VALVE CHAMBER / PIT	Fair - Minor damage to insulation in pit	24 - 25
CONDITION OF PIPING	Moderate surface corrosion	18 - 23
CONDITION OF VALVES	Moderate surface corrosion	18 - 23
ARE THERE ANY INDICATIONS OF SETTLEMENT (Exterior)?	No	18 - 23
IS THE CONCRETE IN THE CHAMBER CRACKED, SPALLED OR LEAKING?	No	18 - 23
IS THERE ANY INDICATION OF PIPE MOVEMENT?	No	18 - 23

**REPAIRS OR MAINTENANCE REQUIRED**

Surface prep and paint pipes and valves

Replace entrance door and frame

Rescue port base, 'D' ring, and fall arrest system required

Cleanout valve pit

**FOUNDATIONS**

ARE THERE ANY INDICATIONS OF FOUNDATION SETTLEMENT?	No	39 - 46
IS CONCRETE CHIPPED OR CRACKED	No	39 - 46
IS THE SOIL AT THE BASE SATURATED OR IS THERE PONDED WATER?	No	39 - 46
IS THERE ANY INDICATION OF UNDERGROUND PIPE LEAKAGE?	No	39 - 46
IS SOIL AT BASE ERODED?	No	39 - 46
HOW FAR DOES THE FOUNDATION EXTEND OUT OF GROUND?	6" - 16"	39 - 46

**REPAIRS OR MAINTENANCE REQUIRED****SUPPORT STRUCTURE**

CONDITION OF SHELL PLATE	Structurally - Good; Coatings - Poor	26 - 32
ROOF CONDITION	Structurally - Good; Coatings - Poor	92 - 115
FLOOR PLATE CONDITION	N/I due to sediment accumulation	133 - 143

**REPAIRS OR MAINTENANCE REQUIRED**

Refer to protective coatings and linings report

**ANCHORAGE**

IS BASE PLATE DETERIORATED OR IN POOR CONDITION?	Moderate corrosion	39 - 46
ARE ANCHOR BOLTS & NUTS DETERIORATED OR IN POOR CONDITION?	Moderate corrosion	39 - 46
ARE ANCHOR BOLT CHAIRS DETERIORATED OR IN POOR CONDITION?	Moderate corrosion	39 - 46
ARE ANCHOR BOLTS TIGHT?	Yes	39 - 46
CONDITION OF STRAP ANCHORS?	N/A	--

**REPAIRS OR MAINTENANCE REQUIRED**

Refer to protective coatings and linings report





**ACCESSORIES**

<b>LADDER TO TANK ROOF</b>		Minor to moderate surface corrosion throughout	14 - 16
<b>TOP LANDING</b>		None - galvanized top landing assembly recommended to ensure safe transition to roof surface	67
<b>REST SEATS</b>		None - 1pc recommended	52
<b>ROOF HATCHES</b>	* Size	1pc - 36" x 36" aluminum hatch 1pc - 30" diameter steel hatch	71, 94
	* Condition	30" - remove and replace original hatch system 36" x 36" - Hatch does not open fully due to recent handrail installation; padlock required	71, 94
<b>VENT</b>	* Type	16" S.S. Frostproof Combination vent / vacuum relief unit	89 - 91
	* Condition	Good - Minor surface corrosion to steel collar	89 - 91
<b>VACUUM RELIEF</b>	* Type	16" S.S. Frostproof Combination vent / vacuum relief unit	89 - 91
	* Condition	Good - Minor surface corrosion to steel collar	89 - 91
<b>PAINT RAIL ACCESS</b> (Must be inspected prior to each use by. P.Eng)		The contractor who installed the couplings and anchors did not paint them upon completion of the interior re-painting. Existing couplings and anchors are corroded and likely require replacement	83 - 85
<b>ROOF HANDRAIL</b>		The contractor who installed the aluminum handrail did not paint the carbon steel support brackets. Handrail sections will need to be removed in order to properly paint these areas	69 - 86
<b>GROUND LEVEL TANK ACCESS</b>		1pc - 24" Bolted Manway - Coating repairs required	47
<b>RISER AND OVERFLOW PIPING</b> (8" dia. Inlet / outlet, 6" dia. Overflow)		Overflow pipe is corroded - repaint required	26 - 28, 36 - 37
<b>ANTENNAE</b>	* Cable Routing	Fair	52, 64, 70
	* Anchorage / Mounting	Fair	73 - 74
<b>CHLORINE ANALYSIS / DEAD ZONE TESTING</b>		Recommended	--
<b>MIXING SYSTEM</b>		Hydrodynamic system present. 2 stand-off brackets are damaged; corroded hardware should be replaced during next shutdown	148 - 154

**REPAIRS OR MAINTENANCE REQUIRED**

Galvanized top landing assembly recommended

1pc aluminum rest seat required on ladder

Remove and replace original 30" roof hatch and curb

Surface prep and re-paint existing couplings / anchors (or replace)

Remove handrail and paint steel support brackets

Replace corroded boltsets on mixing system

Inspect / repair damaged mixing system brackets (2)

**FALL ARREST SYSTEM**

LADDER LOCATION	SYSTEM TYPE	COMMENTS	
* To Roof	Tube System	Remove and replace fall arrest system	51
* To Valve Pit	None	--	14

**REPAIRS / UPGRADES OR MAINTENANCE REQUIRED**

Remove and replace fall arrest system on vertical ladder

Fall arrest system required on ladder to valve pit

\*Please review cover letter for latest information regarding CSA Standard CSA-Z259.2.4-15 (Fall arresters and Vertical Rigid Rails)

**TRANSFER STATION 'D' RINGS**

LOCATION	YES / NO	CONDITION	
* To Roof	No	--	68
* On Roof	Yes	Good	93
* At bottom of Vertical Ladder	No	--	49

**REPAIRS OR MAINTENANCE REQUIRED**

2pc 'D' rings required

**CONFINED SPACE & RESCUE****RESCUE PORT BASE**

LOCATION	YES / NO	CONDITION	
* At Top of Vertical Ladder	No	--	67
* At Hatch to Tank Interior	No	--	92

**REPAIRS OR MAINTENANCE REQUIRED**

Rescue port base required at top of vertical ladder





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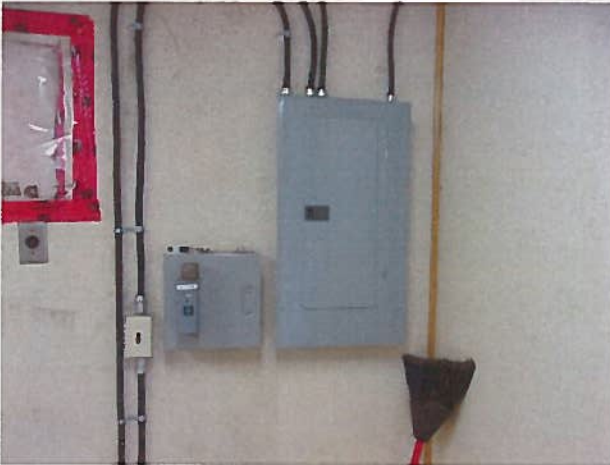


Replace damaged door frame

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Rescue port base required

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'D' ring required

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Fall arrest system required

Anti-slip tape required on smooth ladder rungs

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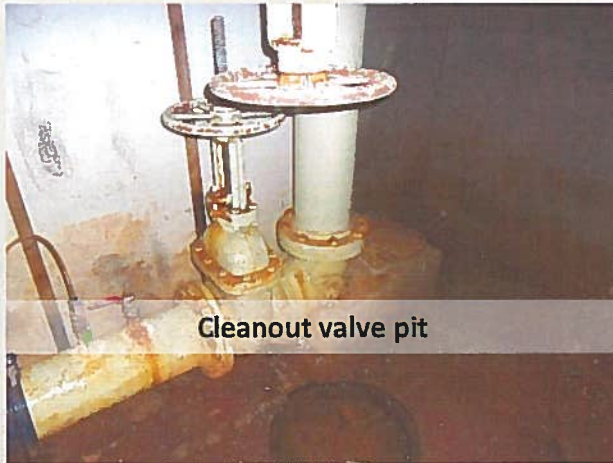


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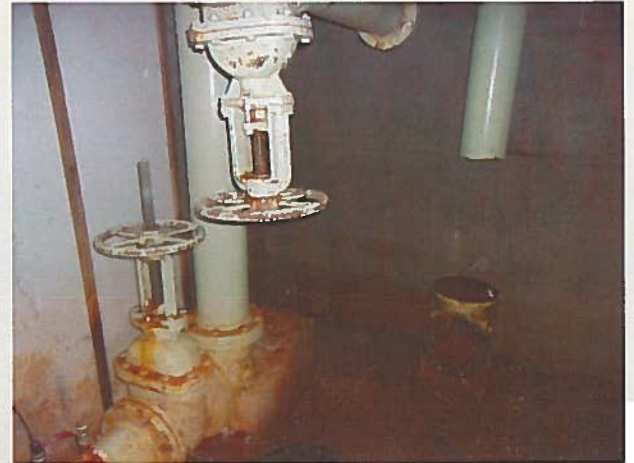
Surface prep and re-paint valves and piping

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Cleanout valve pit

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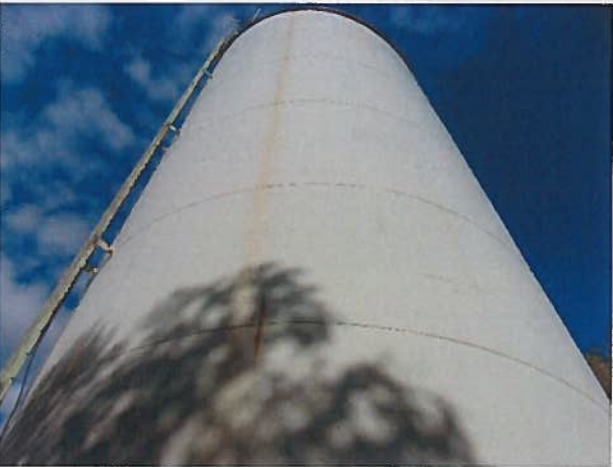


*Refer to Coatings & Linings Condition Letter for recommendation*

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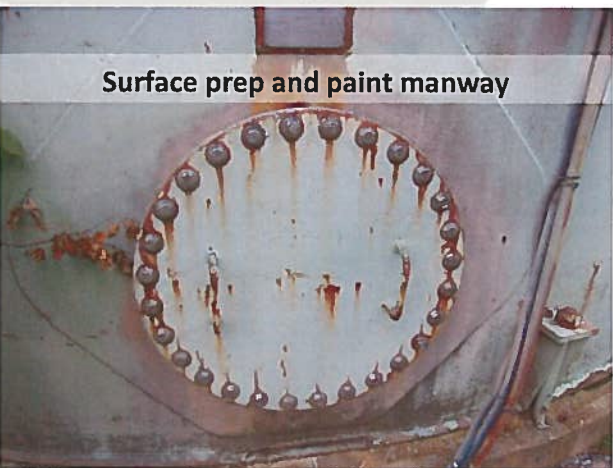
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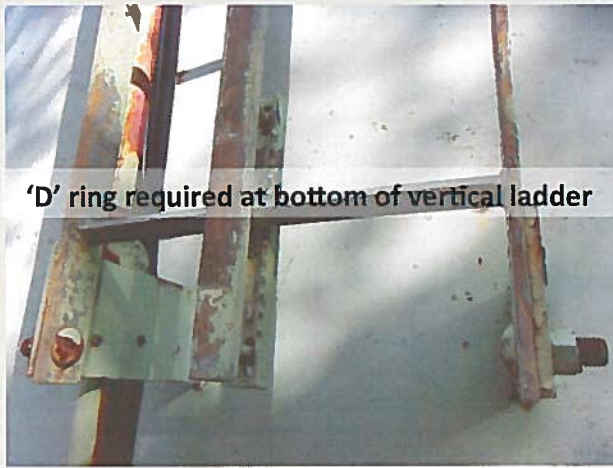


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**'D' ring required at bottom of vertical ladder**

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**Remove and replace fall arrest system**

**Refer to cover letter for latest update on FRL  
Fall Arrest system compliance under CSA**

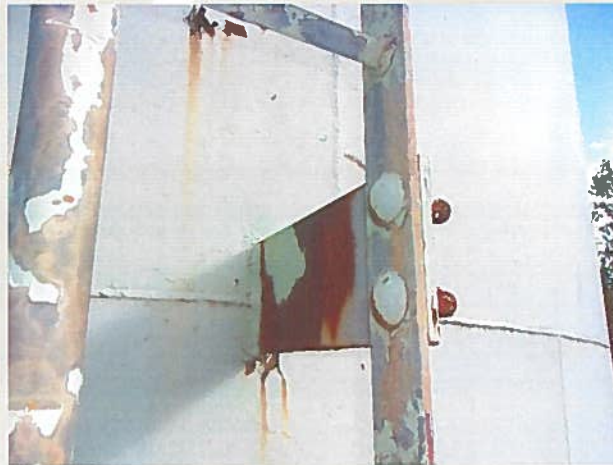
**Ladder gate required**

51



**1pc aluminum rest seat required.**

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**Refer to protective coatings and linings report  
for recommendation**

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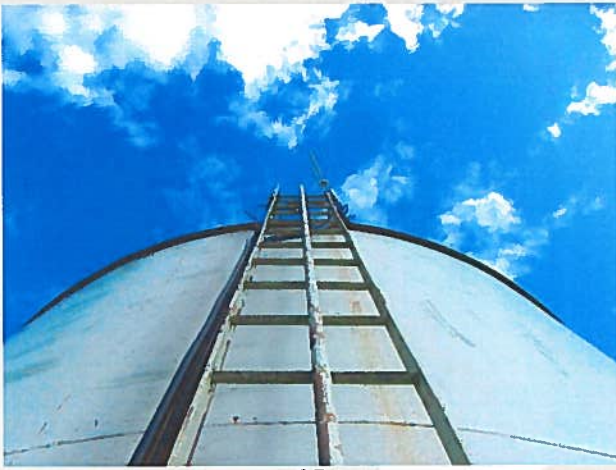


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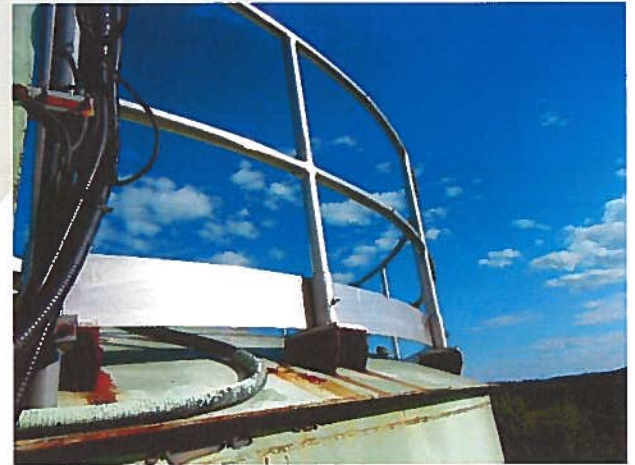
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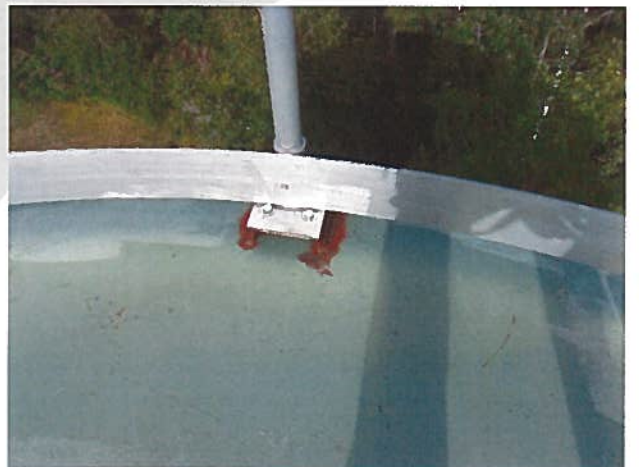
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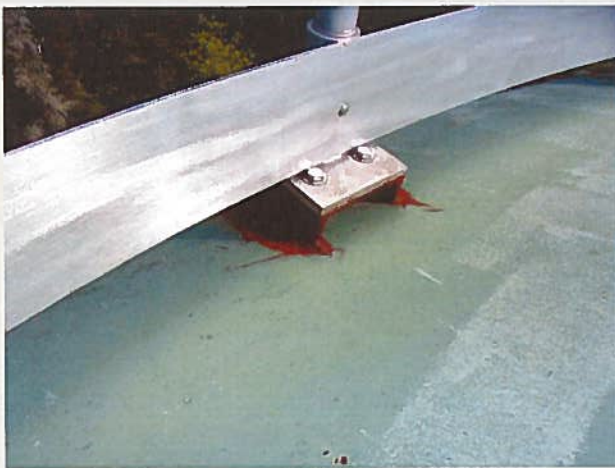
Baseplates for handrail need to be painted

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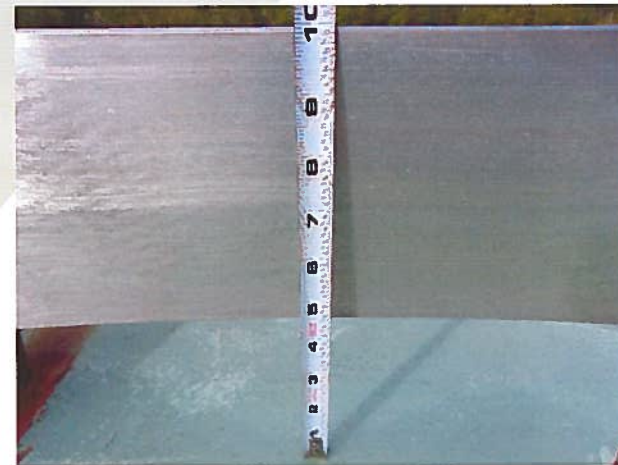
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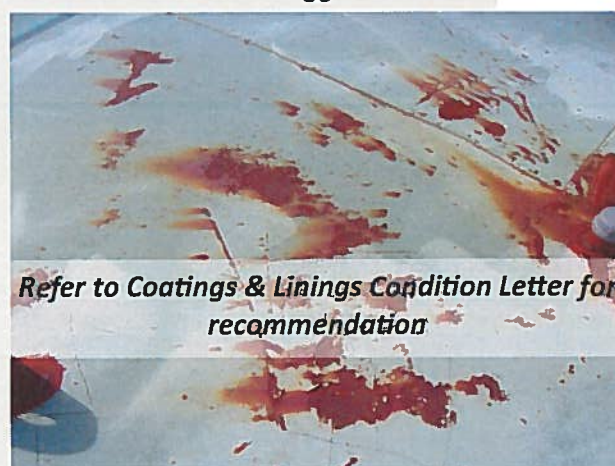
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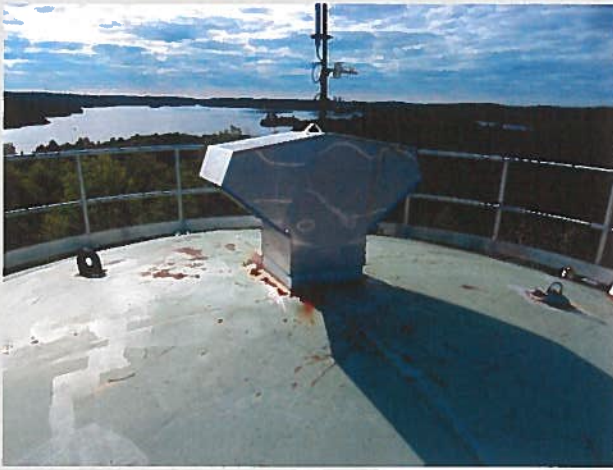
Refer to Coatings & Linings Condition Letter for recommendation

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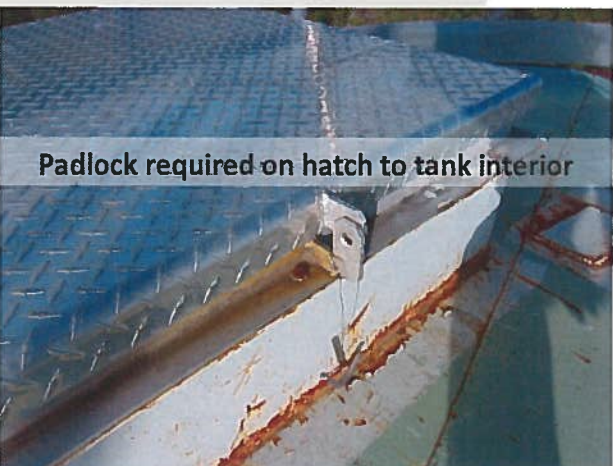
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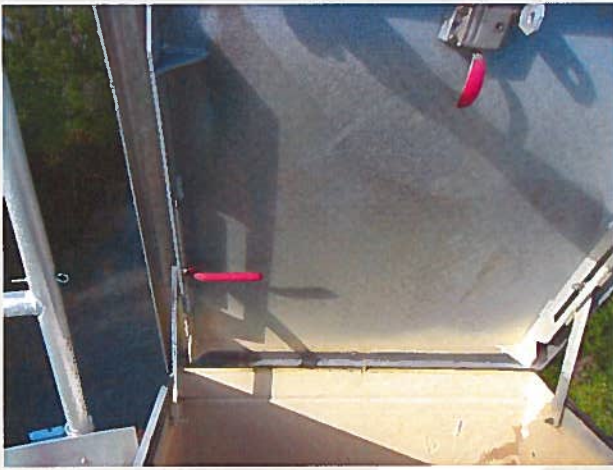


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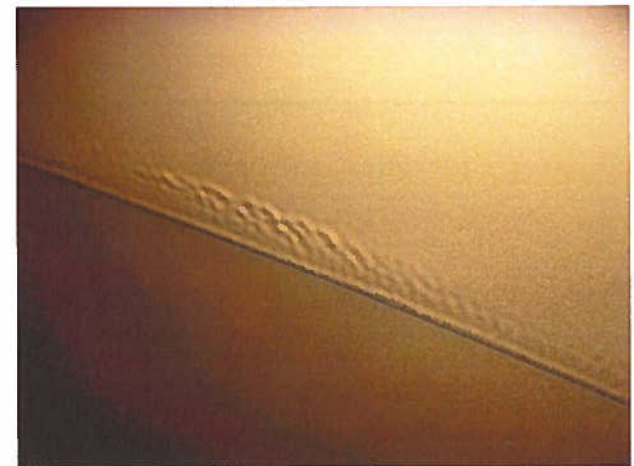
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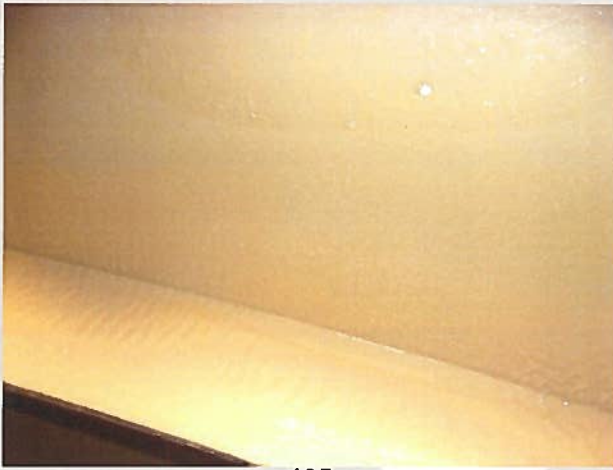


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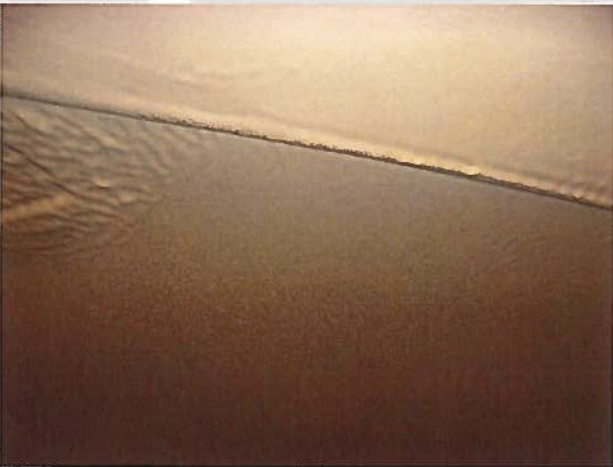
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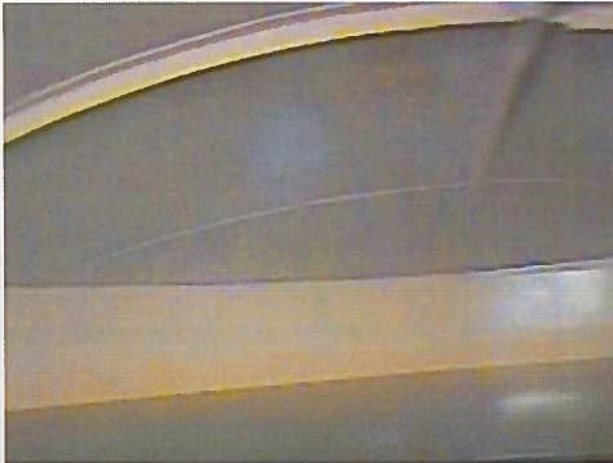
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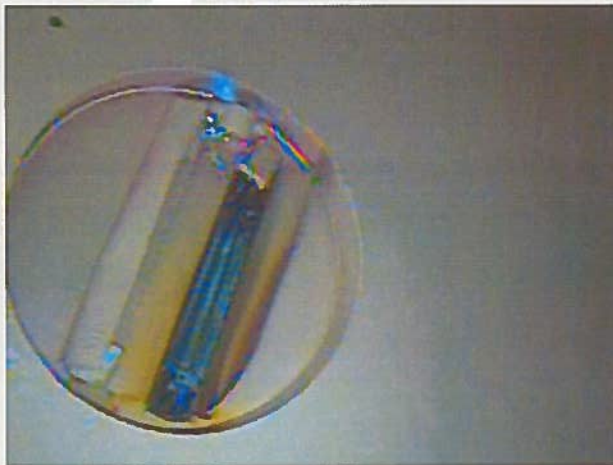
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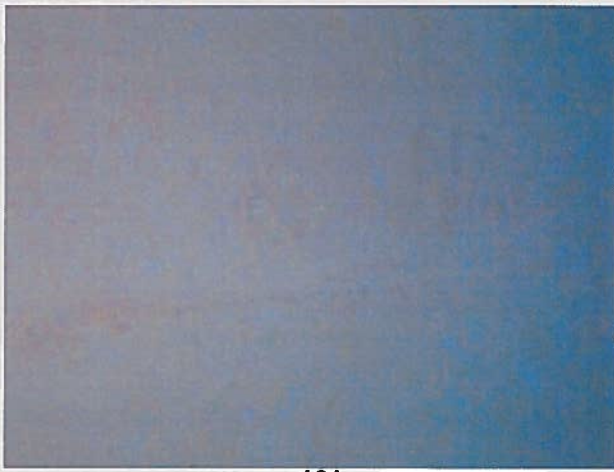


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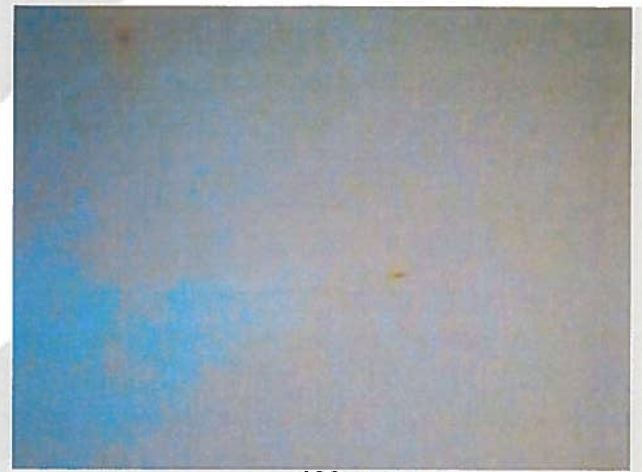


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*Refer to Coatings & Linings Condition Letter for recommendation*

123



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*Refer to Coatings & Linings Condition Letter for recommendation*

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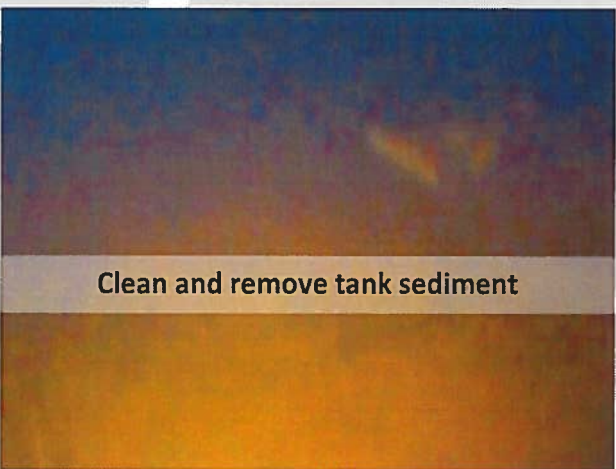
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Clean and remove tank sediment

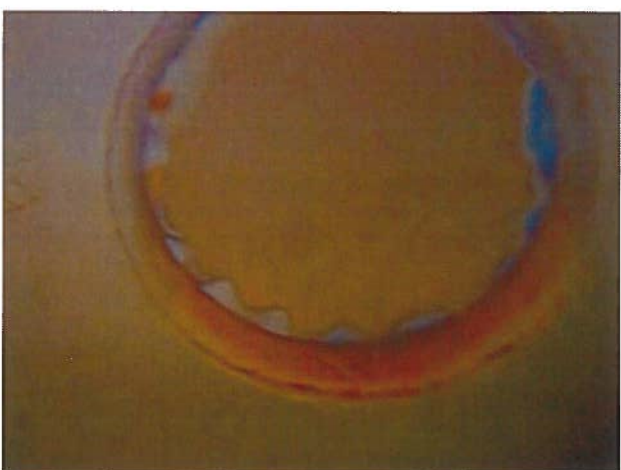
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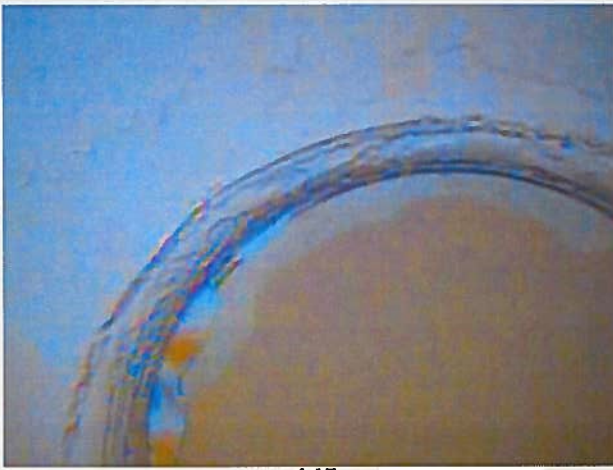


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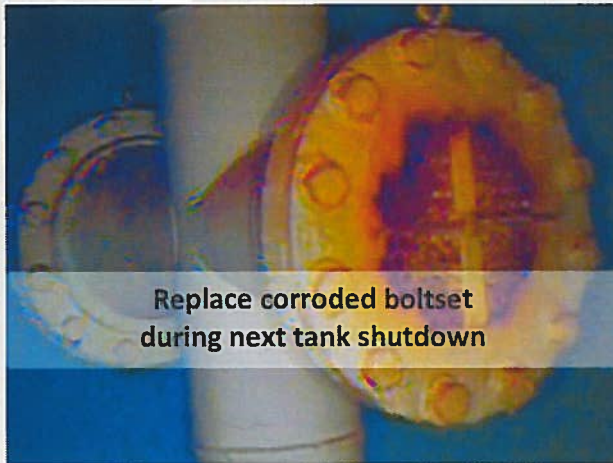
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Replace corroded boltset  
during next tank shutdown

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150



Inspect / repair damaged brackets

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November 1<sup>st</sup>, 2019

**Ontario Clean Water Agency**  
Northeastern Ontario Hub  
213 Whitewood Avenue West  
Norland Building, Unit B5  
New Liskeard ON. P0J 1P0

Att: **Victor Legault**  
[VLegault@ocwa.com](mailto:VLegault@ocwa.com)

Ph: 705-647-1397  
Cell: 705-679-4164

Re: **LMS Job #LM19081**  
**Remotely Operated Vehicle Inspection & Report (ROV) – Temagami North Standpipe (SP) –**  
**Protective Coatings & Linings Report**

A tank inspection was performed at the above-mentioned potable water storage facility on August 15<sup>th</sup>, 2019.

*Note: Possible issues and defects can only be visually assessed with the ROV.*

This letter is a summary of our findings and recommendations for the above-noted water storage tank regarding the general condition of the structure.

## Exterior

The exterior of this standpipe appears to be painted with an epoxy / urethane type of system. It is likely that the original alkyd paint was either replaced or over-coated with an epoxy / urethane type of system at some point in time. The resulting film is now brittle and is blistering and under-cutting in many areas. There is also general chalking and thinning of the paint as a result of ultraviolet and atmospheric degradation.

The roof of the tank is especially thin, with large areas of general corrosion.

Dry Film Thickness (DFT) readings were taken according to ASTM D1186, Method B or SSPC PA2 Type B Magnetic Fixed Probe Gauge, results as follows:

- Exterior roof dry film thickness (DFT) readings of the tank roof range from a low of 8 mils to a high of 12 mils.
- Exterior shell dry film thickness (DFT) readings ranged from a low of 10 to a high of 13 mils.

Adhesion testing was performed according to ASTM D 3359-97 Standard Test Methods for Measuring Adhesion by Tape Test, results as follows:

- Exterior roof paint 4A – Trace peeling or removal along incisions or at their intersection.



## Interior

The interior of this tank is lined with what appears to be a plural – component polyurethane which is in moderately good condition. There are a number of small corrosion cells on the shell and the floor to shell joint, likely the result of pin-holes (holidays) that occurred during application. There are some pieces of delaminated liner on the tank floor, but it is difficult to ascertain where these originated from looking at the video. There are also some areas where the liner has been applied too heavily, but this shouldn't affect its integrity. The tank ceiling appears to be in good condition.

The cold rolling process used to shape the shell plates has resulted in Stress-Induced Plastic Deformation (SIPD). This phenomenon appears as striations or pits running perpendicular to the crystalline stress lines and is impossible to completely avoid or circumvent without adding stress loads to other components within the structure. It is caused by the steel trying to relax back to its original hot-formed shape by displacing ions in order to form bending planes via thinner areas. It is a prime area for corrosion to begin however, because it creates a sharp edge beneath the existing coating, and because this displacement of metal atoms is more of a chain reaction than an actual physical movement, the coating follows the original bonding pattern until the edge is formed and the coating becomes too thin, in turn starting a corrosion cell. This can lead to weakening of the structure and/or perforations and is the prime source of leaks in old water towers. Many of the localized corrosion cells appear to be at these sharp edges where the coating cannot form an adequate build.

Dry Film Thickness (DFT) readings were taken as follows:

- Interior tank roof DFT measurements range from a low of 41 mils to a high of 71 mils.
- Interior tank shell DFT measurements range from a low of 39 mils to a high of 66 mils.

Adhesion testing was not performed on the interior lining.

## Recommendations – Exterior

Many factors must be considered in evaluating the existing coating system with the primary goal of assessing the existing system condition, anticipated service life and in some cases for suitability of applying an overcoat system.

These factors include:

- Amount of corrosion present
- Thickness of the existing coating
- Existing number of coats
- Adhesion of the coating to the steel
- Original level of surface preparation of the steel
- Adhesion of the coating between successive coats
- Geographical location of the tank
- Degree of blistering of existing coating

Candidates for overcoating consideration usually have 4 common characteristics:

- Adhesion rating of 3A or better in accordance with ASTM D3359 Method A



- Less than 12 mils dry film thickness
- Few layers of paint
- Rust or corrosion rating of 5,6,7,8,9 or 10 in accordance with SSPC-VIS 2 / ASTM D610

Subject to further evaluation and confirmation, we suspect that this tank can be considered for a maintenance overcoat consisting of power washing at 5,000 psi, mechanically clean (grind, power tool) and locally touch-up all rust spots followed by a complete overcoat of epoxy / polyurethane finish, if completed within the next **1 to 2 years**.

If overcoating is to be considered, it should be completed in the near term. This would extend the life of the existing coating for approximately another **7 – 10 years** with less expenditure than a full removal and replacement.

Methodology for this procedure would include:

1. Pressure wash cleaning of the exterior surfaces with 5,000 psi pressure including a rotating spray tip with a minimum 6" stand-off from the surface.
2. Power tool and hand tool preparation of rust spots to bare metal in accordance with SSPC SP2 and SSPC SP3 with mandatory HEPA vacuum and filters on power tool attachments.
3. Primer application to the prepared repair areas (surface tolerant epoxy at 2 to 6 mils DFT) with a minimum tie-over to intact coating of 1-inch overlap.
4. Stripe coating application to all sharp edges and welds (handrail edges and all welds on tank).
5. Overcoat primer installation to the entire tank (surface tolerant epoxy at 2 to 6 mils DFT).
6. Finish coat installation to the entire tank (aliphatic polyurethane at 2 to 3 mils DFT).

## Recommendations – Interior

The interior lining of this tank should be touched up within the next one to two years. This would consist of power-tool abrading any corroded areas and feathering back to sound material, then applying an NSF-61 approved epoxy according to the manufacturer's recommendations.

Should you have any questions or comments regarding the content of this report, please contact us at 905-319-7700.

Landmark Municipal Services



David Baker  
NACE Certified Coating Inspector – Level 2, CIP #329173



November 1<sup>st</sup>, 2019

**Ontario Clean Water Agency**  
Northeastern Ontario Hub  
213 Whitewood Avenue West  
Norland Building, Unit B5  
New Liskeard ON. P0J 1P0

Att: **Mr. Bryce Logan**  
[blogan@ocwa.com](mailto:blogan@ocwa.com)

Re: **LMS Job #LM19081**  
**Remotely Operated Vehicle Inspection & Report (ROV) – Temagami North Standpipe (SP) – Recommended Upgrades (Q19133)**

Mr. Logan,

Landmark Municipal Services is pleased to provide budgetary pricing for the following repairs & upgrades at the above-mentioned potable water storage facility. *Please note that H.S.T. is not included.*

#### **Security**

- |  |                      |
|--|----------------------|
| 1) Maintain vegetation / overgrowth at fence line            | <b>\$ On Request</b> |
| 2) Security gate required at bottom of vertical ladder       | <b>\$ 1,500</b>      |
| 3) Keyed padlock required on 1 (of 2) hatch to tank interior | <b>\$ 250</b>        |

#### **Valve Chamber**

- |  |                      |
|--|----------------------|
| 4) Surface prepare and repaint valves and pipes & cleanout valve pit | <b>\$ 6,250</b>      |
| 5) Replace entrance door and frame                                   | <b>\$ On Request</b> |
| 6) Install rescue port base, D ring and fall arrest system on ladder | <b>\$ 4,500</b>      |

#### **Accessories**

- |   |                 |
|---|-----------------|
| 7) Galvanized top landing assembly recommended to ensure safe transition on to Tank roof. | <b>\$ 7,500</b> |
| 8) 1pc aluminum rest seat required  | <b>\$ 1,500</b> |
| 9) Remove and replace 30" dia. roof hatch   | <b>\$ 4,800</b> |
| 10) Anti-slip tape required on smooth ladder rungs  | <b>\$ 1,200</b> |
| 11) Siderails required to rungs in access tube  | <b>\$ 3,500</b> |



- |   |          |
|---|----------|
| 12) Supply and install fixed access ladder from top landing to floor manhole    | \$ 2,100 |
| 13) Remove vacuum relief panel (blowout panel) and install aluminum cover plate | \$ 950   |
| 14) Install gin wheel and rope system accessible from top landing               | \$ 3,900 |
| 15) Replace ACWL fixture with new L.E.D. type. Replace corroded mast            | \$ 3,000 |
| 16) <b><u>Riser Pipe Investigation – Budget price: \$50 – 65,000</u></b>        |          |

- Design, supply and install swing stage access system
- Remove and dispose of existing insulation and heat trace system
- Thoroughly examine the existing riser pipe for any leaks – repair all areas
- Supply and install new heat trace system
- Supply and install new insulation and cladding system
- Demobilize
- Tank should be off-line for 1-2 weeks

#### **Ladders / Fall Arrest System**

- |  |          |
|--|----------|
| 17) Fall Arrest System Replacement recommendations   | \$ 8,600 |
| <ul style="list-style-type: none"> <li>- Replace Aluminum TS Rail on ladder to top landing</li> <li>- Replace Aluminum TS Rail on ladder on tank roof</li> </ul> |          |

*Fall arrest trolleys are available for \$875 ea.*

- |  |          |
|--|----------|
| 18) 3pc 'D' rings required at the following locations:   | \$ 3,300 |
| <ul style="list-style-type: none"> <li>- Ladder to top landing, at hatch to tank roof and tank interior</li> </ul> |          |

#### **Confined Space / Rescue System**

- |   |          |
|---|----------|
| 19) Design, supply and install rescue port base beneath top landing grating | \$ 3,500 |
| 20) Design, supply and install rescue port base on tank roof                | \$ 2,750 |



**Coatings and Linings – (Refer to Protective Coatings and Linings Report)**

Tank Exterior – Overcoat **\$ 95,000**

Including:

- Surface prepare and paint roof couplings and anchors
- Remove aluminum handrail, surface prep and paint support brackets; reinstall handrail

Tank Interior

- |  |                  |
|--|------------------|
| 21) Clean and remove tank sediment<br><i>Disinfect tank interior per AWWA C652-11 Method #2. Vacuum truck / off-site disposal (if required) is extra</i> | <b>\$ 4,000</b>  |
| 22) Replace corroded bolt sets on mixing system  | <b>\$ 1,400</b>  |
| 23) Inspect / repair damaged mixing system brackets (2pc)  | <b>\$ 2,000</b>  |
| 24) Surface prepare and touch-up corroded areas within tank  | <b>\$ 15,000</b> |



## Fixed Rail Ladder (FRL) Fall Protection System

Issued: May 20, 2014

Content last reviewed: May 2014

**Disclaimer:** This resource has been prepared to help the workplace parties understand some of their obligations under the Occupational Health and Safety Act (OHSA) and regulations. It is not legal advice. It is not intended to replace the OHSA or the regulations. [FOR FURTHER INFORMATION PLEASE SEE FULL DISCLAIMER](#)

### Hazard summary

A worker descending a vertical ladder on a water tower in 2014 was critically injured after falling five metres while properly using a Class Frontal-Fixed Rail Ladder (Class FRL) Fall Protection System. A Class FRL Fall Protection System is a type of vertical fall protection using a permanently installed metal rail anchoring system with an automatic fall arresting device called the "trolley" or "carriage".

The investigation revealed a weakness in the design of some Class FRL Fall Protection Systems, which may not adequately protect workers who fall backward or who squat and roll backwards into a fall while connected by a body harness to the trolley which slides along the vertical rail. If a worker leans back, the trolley's internal braking system can be pulled off the rail, allowing the trolley to slide down the rail. If a worker falls backward or squats and rolls backward into a fall (as opposed to falling straight down or inwards towards the ladder) the trolley may not lock, allowing a worker to fall freely. In the 2014 incident, the worker fell from a water tower ladder as shown in Figure 1.

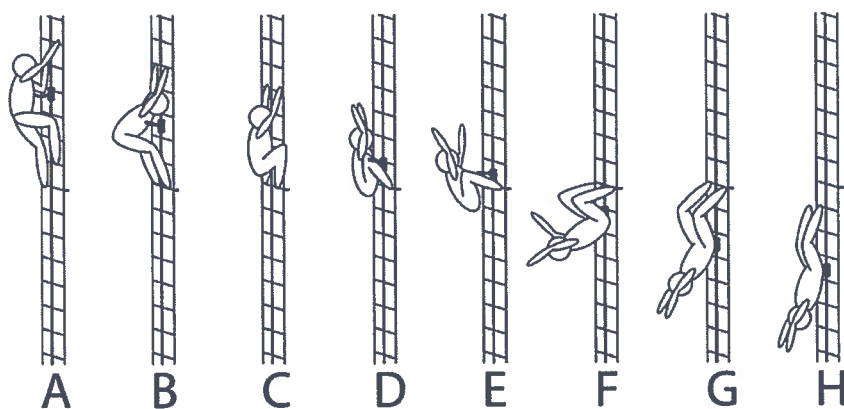


Figure 1: How the water tower worker fell

- A. The worker is descending properly using the fall protection system.
- B. The worker bends at the waist.
- C. The worker's legs fold into a squat position while the worker's hands catch the next rung. The squat position allows the trolley to travel below the height of the worker's knees.
- D. As the worker begins to roll backward their hands release from rung, and the tension in the trolley connection increases enough to remove all the slack out of the full body harness and slide the chest D-ring towards the waist.
- E. This tension in the connection to the trolley forces the worker into a tight squatting position while rotating around the rung that the worker's feet are on.
- F. The trolley connection remains in tension as the trolley travels below the rung that the worker's feet are on.
- G. The connection to the trolley, now in tension between the worker's legs prevents the engagement of the braking mechanism that would stop the workers motion.
- H. The worker, with back to the ladder, continues to fall head first while still attached to the fall protection system.

In 2010, the Ministry of Labour published a similar Alert, Class Frontal Fixed Rail Ladder (FRL) Fall Protection System, Alert #26/0510, after a worker was injured after falling back, then down 20 metres from a ladder attached to a tower while using a Class FRL Fall Protection System. In 2010, the investigation determined that the Class FRL Fall Protection System might not adequately protect workers who fall backward in a standing position.

### Locations and sectors



Class FRL Fall Protection Systems are used on vertical access ladders which normally do not have a cage, such as the ladders on communication towers, chimneys and water tanks (towers).

## Precautions

Even though a Class FRL Fall Protection System may be currently certified to CSA standards and/or have a CSA standards stamp on the side of the trolley unit, this should not be interpreted to guarantee worker safety and employers should not rely on such a stamp. Further investigations into the system are needed to ensure the system protects against a squatting position/rollback fall or a fall backwards.

Class FRL Fall Protection Systems whose design characteristics require the connection between the worker and the trolley to be in tension and where the trolley remains disengaged regardless of the tension force applied should not be used. Employers must take reasonable precautions to protect workers in these circumstances. This may include using alternative fall protection or access systems, as appropriate, for the adequate protection of the health and safety of workers using vertical access ladders.

Employers who own or rent structures which have a Class FRL Fall Protection System installed must ensure that the Class FRL Fall Protection System is capable of protecting a worker in the case of a squatting position/rollback fall or a fall backwards. The Ministry recommends that employers contact the manufacturer to ensure that the particular Class FRL Fall Protection System is capable of protecting a worker from any type of fall (including a backward fall and falling from a squatting position) before it is used.

**Note:** This Alert replaces the Class FRL Fall Protection System, Alert #26/0510 published in 2010 by the Ministry of Labour.

## Resources

For more information contact:

[Infrastructure Health and Safety Association](http://www.ihsa.ca)  
[www.ihsa.ca](http://www.ihsa.ca)

Or contact the Ministry of Labour Health & Safety Contact Centre toll-free at 1-877-202-0008.

For further reference see also:

[Ministry of Labour](http://Ontario.ca/labour)  
[Ontario.ca/labour](http://Ontario.ca/labour)

[ServiceOntario e-laws](http://www.e-laws.gov.on.ca)  
[www.e-laws.gov.on.ca](http://www.e-laws.gov.on.ca)

Remember that while complying with occupational health and safety laws, you are also required to comply with applicable environmental laws.

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