



**West Lorne Welded Steel Standpipe  
Remotely Operated Vehicle Inspection and Report  
November 4, 2020**



December 4<sup>th</sup>, 2020

**Ontario Clean Water Agency**

17 Myrtle Street

Aylmer, ON

N5H 2H1

**Att: Mike Taylor, Senior Operations Manager**

[mtaylor@ocwa.com](mailto:mtaylor@ocwa.com)

**Tel: 226.545.0414**

**Re: LMS Job #LM20119**

**Remotely Operated Vehicle Inspection and Report (ROV) – West Lorne Standpipe (SP)**

Mr. Taylor,

An ROV underwater camera tank inspection was performed at the above-mentioned potable water storage facility on November 4<sup>th</sup>, 2020. The ROV unit and tether cable were disinfected in accordance with AWWA-C652-19 Method #2 guidelines (200ppm solution) prior to entry into the tank interior. Landmark's ROV equipment is designated for potable water use only.

A thorough inspection of the structure including the protective coating & lining system, tank components, ladders, landings, handrails and appurtenances was completed.

Please find a comprehensive report enclosed as follows;

- |   |              |
|---|--------------|
| 1) Welded Steel Standpipe Inspection Report   | Pages 1 – 5  |
| 2) Photographic Record of Report  | Pages 6 – 25 |
| <i>Photographs are numbered in accordance with the corresponding numbers throughout the report.</i> |              |
| 3) Protective Coatings & Linings Report   |              |
| 4) Quotation #Q20267 for all recommended upgrades and repairs                                       |              |
| 5) ROV Video  |              |

Should you have any questions or comments regarding the content of this quotation, please contact us at 905.319.7700.

Yours sincerely,

**LANDMARK MUNICIPAL SERVICES**



**David Baker,**

NACE Certified Coating Inspector – Level 2, CIP #329173





## **Fall Arrest Update**

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 #Q20267 for pricing to remove and replace the existing fall arrest system with Honeywell Safety Products – “Soll GlideLoc” which is compliant with the new 2016 Standard.





This report has been prepared by Landmark Municipal Services for the Ontario Clean Water Agency 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 Known Inspection Date</b>
LM20119	4-Nov-20	Unknown
<b>Inspector</b>	<b>Report Date</b>	<b>Inspected By</b>
P. Furtado	4-Dec-20	Unknown

## OWNER / CONTACT

<b>Owner</b>	<b>Village of West Lorne</b>	<b>Contact</b>	<b>Mr. Mike Taylor</b>
<b>Project Location</b>	West Lorne Standpipe	<b>Title</b>	Senior Operations Manager
<b>Address</b>	1171 Jane Street West Lorne, ON	<b>Phone</b>	226-545-0414
		<b>Cell:</b>	--
		<b>Email</b>	<a href="mailto:mtaylor@ocwa.com">mtaylor@ocwa.com</a>

## TANK DESCRIPTION

<b>Constructor</b>	ETS Towers (Landmark)	<b>Tank Capacity</b>	645,900 Imperial Gallons / 2,936.32 m <sup>3</sup>
<b>Tank Type</b>	Welded Steel Standpipe	<b>Year Built</b>	1984
<b>Dwg's Available</b>	Yes	<b>Tank Diameter</b>	32 ft. / 9.75 m
<b>Dwg's Reviewed</b>	Yes	<b>HWL</b>	127 ft. / 38.71 m - AGL
<b>Coating System</b>	Epoxy / Urethane	<b>Tank Height</b>	129 ft. / 39.32 m - AGL
<b>Lining System</b>	Epoxy	<b>Grade Elev.</b>	704 ft. / 214.58 m - ASL
<b>Age of Paint</b>	Unknown	<b>Roof Type</b>	Welded Steel Umbrella Roof



# REPORT SUMMARY

Repairs performed during inspection		Photo No.	Photo No.
Aircraft Warning Light bulbs changed	110-111		--
	--		--
	--		--
Recommended Repairs			
<u>Siteworks</u>		<u>Mixing System</u>	
	--	Design, supply and install passive or active mixing system	154
	--		--
	--		--
<u>Security</u>		<u>Fall Arrest System</u>	
Remove ladder cages to permit safe and effective rescue	72	<b>*Please review cover letter for latest information regarding CSA Standard CSA-Z259.2.4-15 (Fall arresters and Vertical Rigid Rails)</b>	
Straighten ladder gate at bottom of ladder	64		
	--		
		Remove and replace fall arrest system on vertical ladder	65-73
<u>Valve Chamber / Pit</u>		'D' Ring required at bottom of ladder	65
Surface prep and paint valve building door, valves, and piping	26-34	Replace 4pcs corroded 'D' rings with S.S.	69, 74, 79, 85
Supply and install 20 L.F. of aluminum kickplate on valve pit handrail	23		--
Repair broken downspout on valve building	12		--
Replace corroded baseboard heater in valve pit	34		--
<u>Foundations</u>			--
Repair 25 L.F. of loose parging around tank perimeter and touch-up	38-49		--
	--		--
	--		--
<u>Support Structure</u>		<u>Confined Space &amp; Rescue System</u>	
	--	Rescue port base required at hatch to tank interior	106
	--	Rescue port base required beneath top landing	87
	--		--
<u>Anchorage</u>			--
	--		--
	--		--
<u>Accessories</u>		<u>Coatings, Linings and Metal Condition</u>	
Apply anti-slip coating to smooth ladder rungs	65-85	Refer to Protective Coatings & Linings Report	--
Install 60 L.F. of additional 2" kickplate on intermediate landings	71, 75, 80, 86		--
Permanently seal blowout panel with aluminum plate	104-105		--
Replace mushroom vent with 16" S.S. Frostproof combination vent / vacuum relief unit	106-107		--
Install 60 L.F. of 5" kickplate on roof handrail	89-91		--
Perform chlorine analysis / stratification test	--		--
Inspect, repair, test, and calibrate impressed current cathodic protection system	16, 155-156		--
Supply and install L.E.D. aircraft warning light c/w new controller	110		--

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)

2021

Clean, Inspect and Report (CIR)

2021

\*SIR included in CIR\*

Remote Inspection & Report (RIR)

2024

\*3 yrs after CIR\*



SITWORKS			Photo No.
EXTERIOR VALVE CHAMBER	Good		8-34
DRIVEWAY / WALKWAYS	Good		3-5
OVERFLOW SPILLWAY	Fair - Concrete pad is cracked		50-53
<b>REPAIRS OR MAINTENANCE REQUIRED</b>			

SECURITY			Photo No.
FENCE & GATES	Good		1-7
LADDER / LADDER CAGE	Ladder cage present on ladder; Ladder gate bent		63-65
HATCH LOCKS	Good		112
<b>REPAIRS OR MAINTENANCE REQUIRED</b>			
Remove ladder cages to permit safe and effective rescue			
Straighten ladder gate at bottom of ladder			

VALVE CHAMBER & PIT			Photo No.
CONDITION OF VALVE CHAMBER	Good		13-34
CONDITION OF PIPING	Fair - moderate corrosion throughout*		26-34
CONDITION OF VALVES	Fair - moderate corrosion throughout*		26-34
ARE THERE ANY INDICATIONS OF SETTLEMENT (Exterior)?	No		--
IS THE CONCRETE IN THE CHAMBER CRACKED, SPALLED OR LEAKING?	No		--
IS THERE ANY INDICATION OF PIPE MOVEMENT?	No		--
<b>REPAIRS OR MAINTENANCE REQUIRED</b>			
Repair broken downspout on valve building			
Supply and install 20 L.F. of aluminum kickplate on valve pit handrail			
Replace corroded baseboard heater in valve pit			
Surface prep and paint valve building door, valves, and piping			

FOUNDATIONS			Photo No.
ARE THERE ANY INDICATIONS OF FOUNDATION SETTLEMENT?	No		38-49
IS CONCRETE CHIPPED OR CRACKED	Yes - Approximately 25 L.F. of loose parging		38-49
IS THE SOIL AT THE BASE SATURATED OR IS THERE PONDED WATER?	No		38-49
IS THERE ANY INDICATION OF UNDERGROUND PIPE LEAKAGE?	No		38-49
IS SOIL AT BASE ERODED?	No		38-49
HOW FAR DOES THE FOUNDATION EXTEND OUT OF GROUND?	0" - 6"		38-49
<b>REPAIRS OR MAINTENANCE REQUIRED</b>			
Repair 25 L.F. of loose parging around tank perimeter and touch-up			

SUPPORT STRUCTURE			Photo No.
SKETCH PLATE CONDITION (TANK FLOOR)	N/I - covered in sediment		148-151
IS CYLINDER STRAIGHT?	Yes		57-62
ROOF CONDITION	Good		94-101
<b>REPAIRS OR MAINTENANCE REQUIRED</b>			

ANCHORAGE			Photo No.
ARE BASE PLATES DETERIORATED OR IN POOR CONDITION?	N/A		--
ARE ANCHOR BOLTS & NUTS DETERIORATED OR IN POOR CONDITION?	N/A		--
ARE ANCHOR BOLT CHAIRS DETERIORATED OR IN POOR CONDITION?	N/A		--
ARE ANCHOR BOLTS TIGHT?	N/A		--
CONDITION OF STRAP ANCHORS?	Good		37-48
<b>REPAIRS OR MAINTENANCE REQUIRED</b>			



ACCESSORIES			
LADDERS	* To Roof	Fair* - Smooth round rungs	65-85
	* On Roof	None - Stair treads	88
LANDINGS (x 4)		Kickplate only 3" - 60 ft of 2" required	71, 75, 80, 86
REST SEATS		N/A	--
VALVE PIT HATCH	* Size	N/A	--
	* Condition	--	--
ROOF HATCHES	* Size	36" dia. steel hatch	106, 113-115
	* Condition	Hatch does not fully open because of antenna structure*	113
VENT	* Type	12" Aluminum mushroom vent	106-107
	* Condition	Poor - Coarse screen only - Replace with 16" S.S. Frostproof combination vent / vacuum relief unit	106-107
VACUUM RELIEF	* Type	30" blowout panel	104-105
	* Condition	Poor - Not self resetting - Cap with aluminum plate	104-105
PAINT RAIL ACCESS (Inspect couplings by P.Eng prior to each use)		Roof couplings - Inspect prior to use	95-101
PAINT RAIL		None - Use roof couplings	--
ROOF HANDRAIL		Poor* / 60 ft. kickplate required	89-91
GROUND LEVEL TANK ACCESS		2 pc - 36" bolted manways	38, 56
RISER AND OVERFLOW PIPING	12" inlet/outlet, 8" overflow	Good	52-53, 154
CATHODIC PROTECTION	* Type	Impressed Current - Corrpro Canada Inc.	16, 137
	* Condition	Poor - Broken ice guard inside tank / Survey recommended	155-156
TANK GROUNDING		None	--
LIGHTNING PROTECTION		None	--
OBSTRUCTION LIGHTING		Good - Bulbs changed; Upgrade to L.E.D. recommended	110-111
ANTENNAE	* Cable Routing	Good	68, 92, 108
	* Anchorage / Mounting		
	* Surveys / Warning Signage as per Safety Code 6: Health Canada	None	--
CHLORINE ANALYSIS / STRATIFICATION TESTING		Recommended	--
MIXING SYSTEM		None - Recommended	154

**REPAIRS OR MAINTENANCE REQUIRED**

\*See Separate Coatings and Linings Report

Apply anti-slip coating to smooth ladder rungs

Install 60 L.F. of additional 2" kickplate on intermediate landings

Permanently seal blowout panel with aluminum plate

Replace mushroom vent with 16" S.S. Frostproof combination vent / vacuum relief unit

Install 60 L.F. of 5" kickplate on roof handrail

Perform chlorine analysis / stratification test

Inspect, repair, test, and calibrate impressed current cathodic protection system

Supply and install L.E.D. aircraft warning light c/w new controller

Design, supply and install passive or active mixing system

FALL ARREST SYSTEM			
LADDER LOCATION	SYSTEM TYPE	COMMENTS	
* To Valve Pit	None	Less than 9ft	25, 27
* To Roof	Aluminum TS Rail	Remove and replace fall arrest system	65-84

**REPAIRS / UPGRADES OR MAINTENANCE REQUIRED**

Remove and replace fall arrest system on vertical ladder

\*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	Yes	Corroded - Replace with S.S.	69, 74, 79, 85
* On Roof	N/A - Handrail	--	--
* At Bottom of Vertical Ladder	No	Required	65

**REPAIRS OR MAINTENANCE REQUIRED**

Replace 4pcs corroded 'D' rings with S.S.

'D' Ring required at bottom of ladder



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

LOCATION	YES / NO	CONDITION	
* At Top of Vertical Ladder	No	Required	87
* At Hatch to Tank Interior	No	Required	106

**REPAIRS OR MAINTENANCE REQUIRED**

Rescue port base required at hatch to tank interior

Rescue port base required beneath top landing





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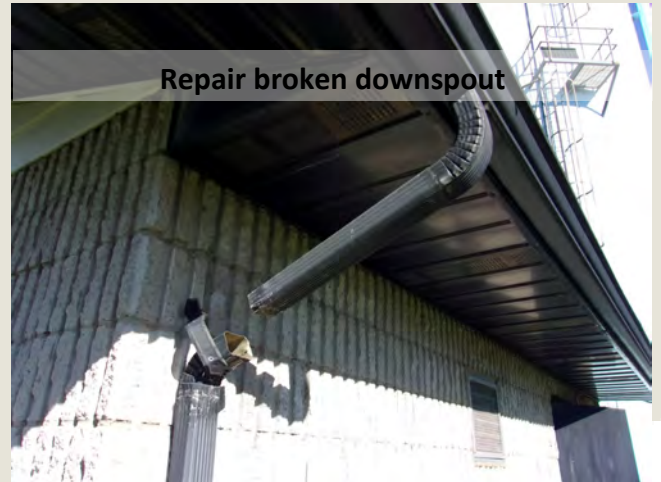
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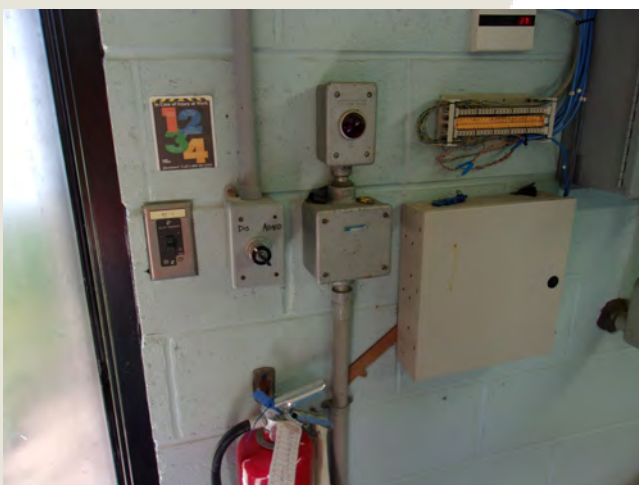
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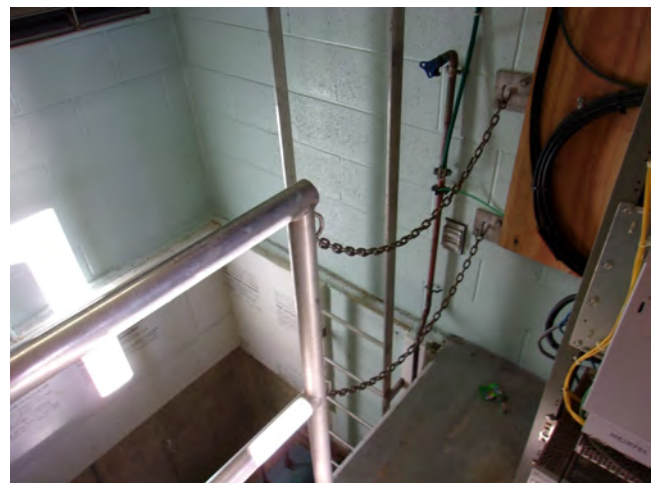


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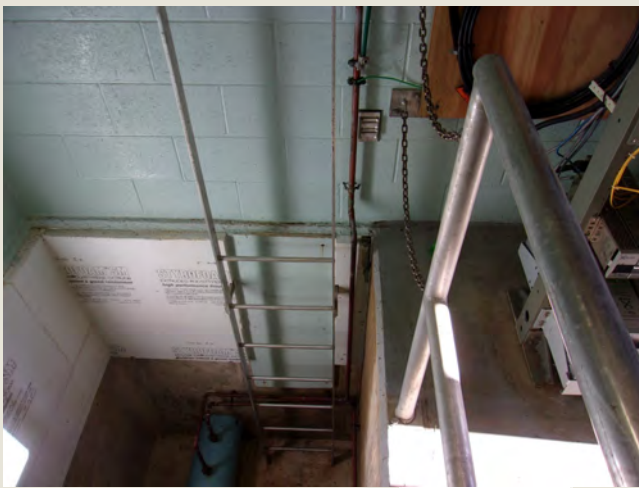
Kickplate required

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*Refer to Protective Coatings and Linings report for recommendations*

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Repair loose parging

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Repair loose parging

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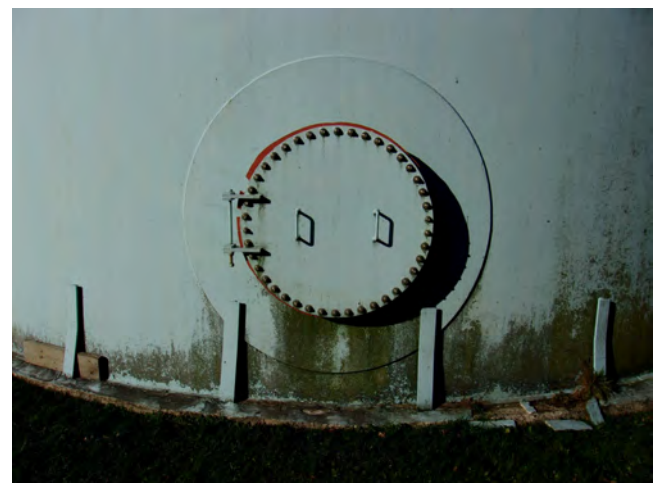


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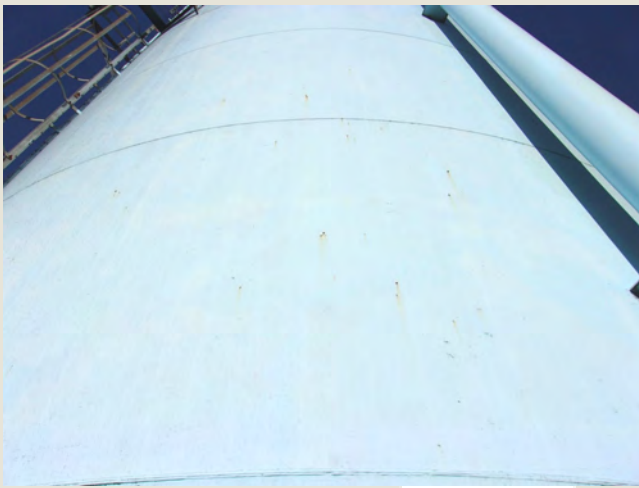
Refer to Protective Coatings and Linings report  
for recommendations

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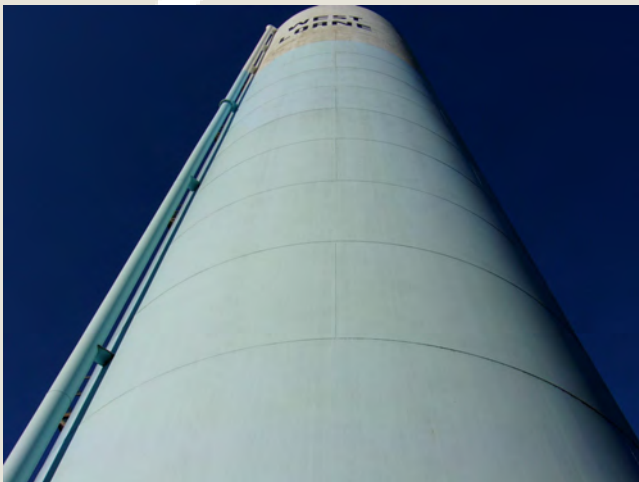
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Apply anti-slip coating on vertical ladder rungs



'D' ring required at bottom of ladder

65

Remove and replace fall arrest system



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

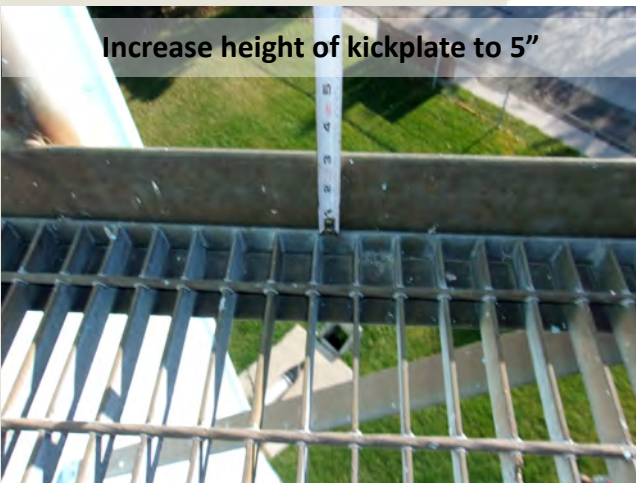
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Replace corroded 'D' rings with S.S.



69

Increase height of kickplate to 5"



71

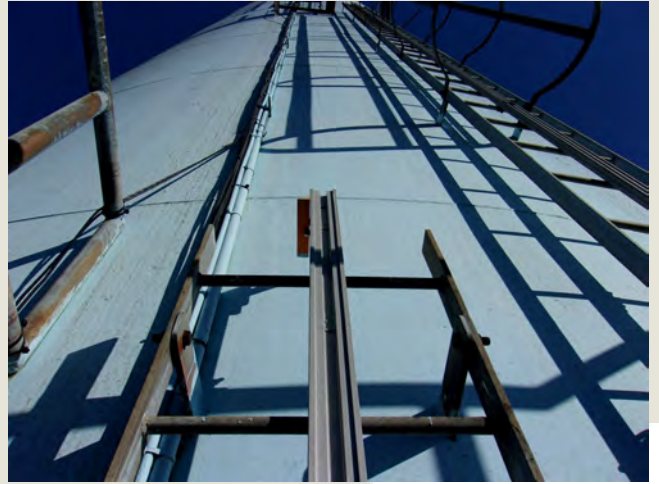
Remove ladder cage to permit safe & effective rescue



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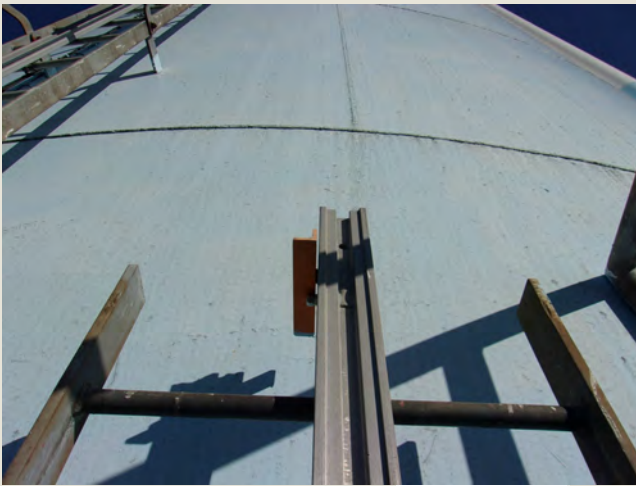


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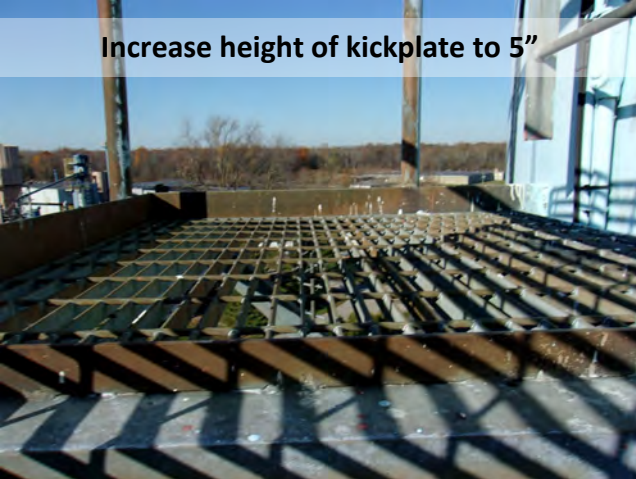


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Replace corroded 'D' rings with S.S.

74



Increase height of kickplate to 5"

75



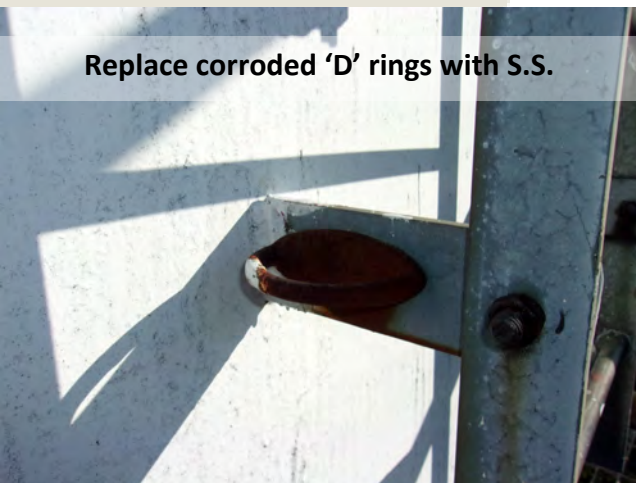
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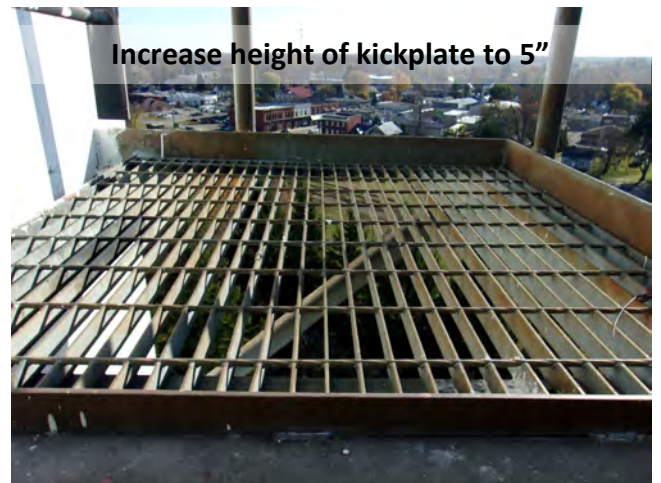


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Replace corroded 'D' rings with S.S.

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Increase height of kickplate to 5"

80





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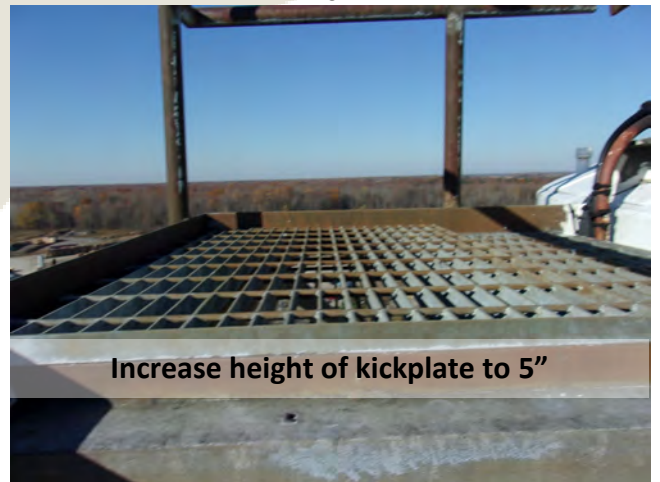


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Replace corroded 'D' rings with S.S.

85



Increase height of kickplate to 5"

86



Rescue port base required  
beneath top landing

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Install 60 ft. of kickplate on roof handrail

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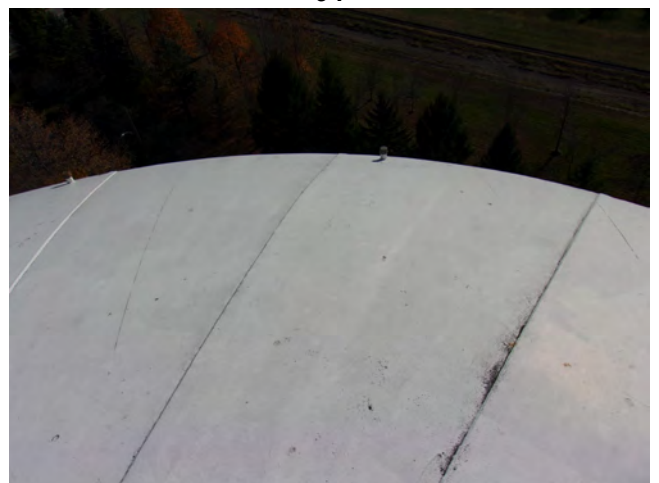
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Permanently seal blowout panel  
with aluminum plate

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Rescue port base required at hatch  
to tank interior

106



Replace non-compliant vent with 16" frost  
proof combination vent / vacuum relief unit

107



*Refer to Protective Coatings and Linings report  
for recommendations*

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Aircraft warning light bulbs replaced; Upgrade  
to L.E.D. recommended

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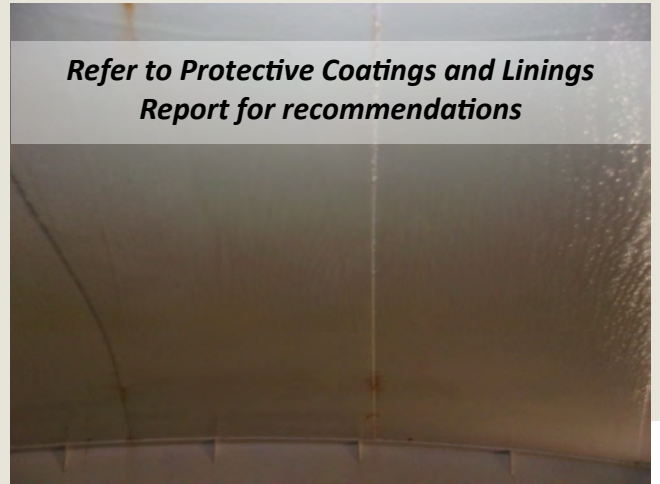
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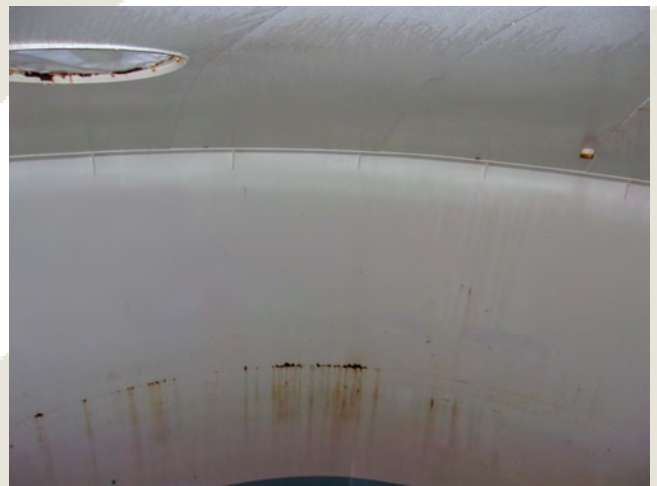


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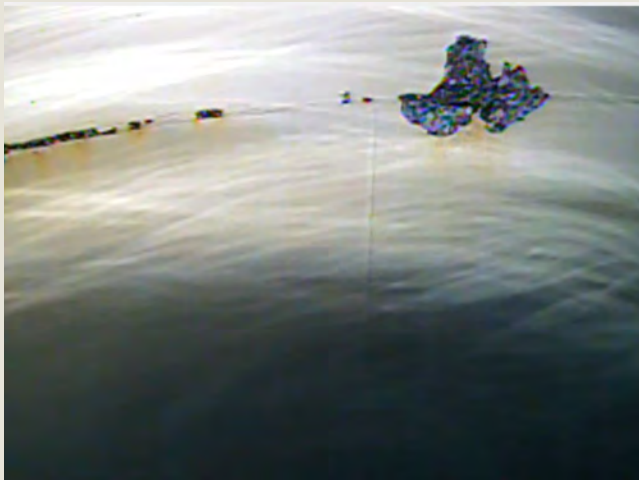
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***Refer to Protective Coatings and Linings report  
for recommendations***

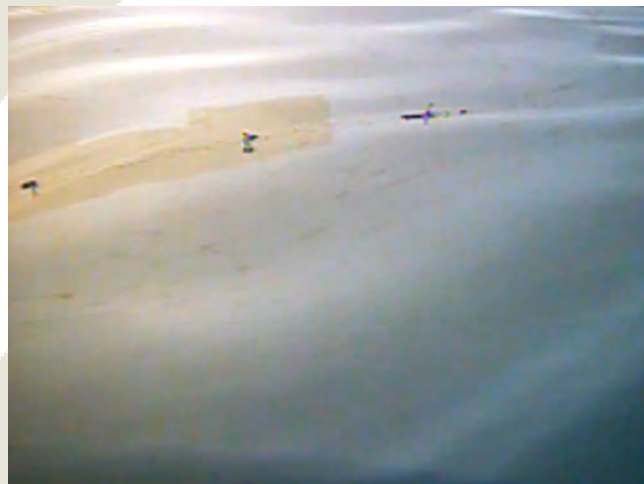


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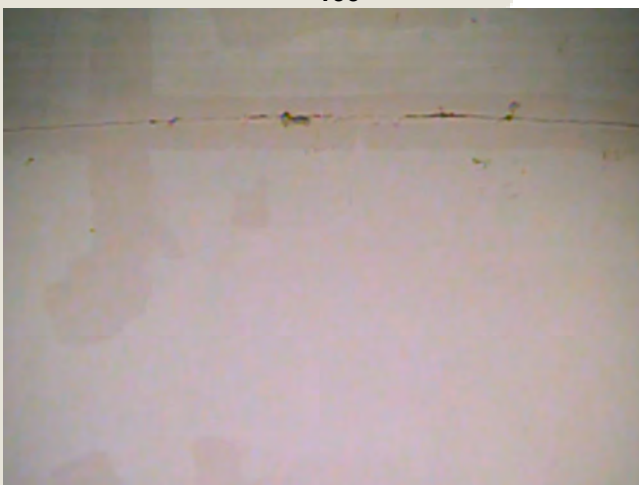
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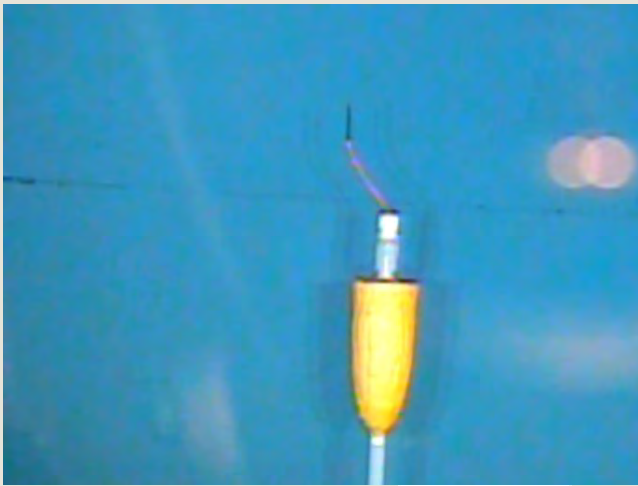


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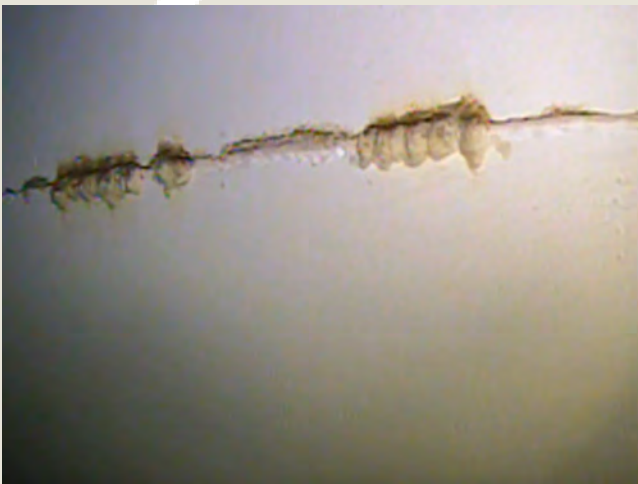


*Refer to Protective Coatings and Linings  
Report for recommendations*

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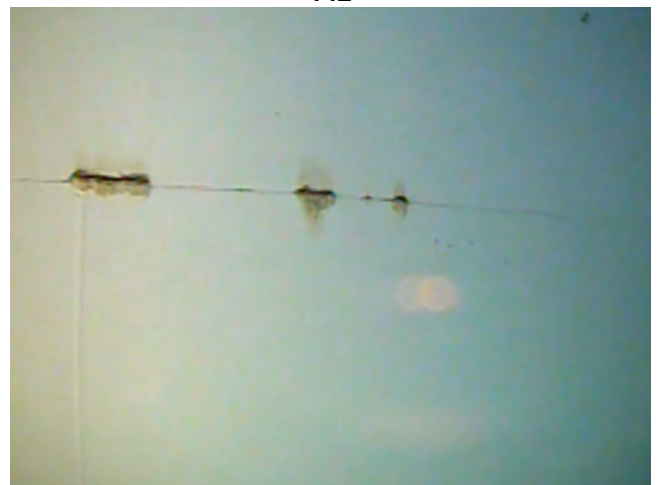
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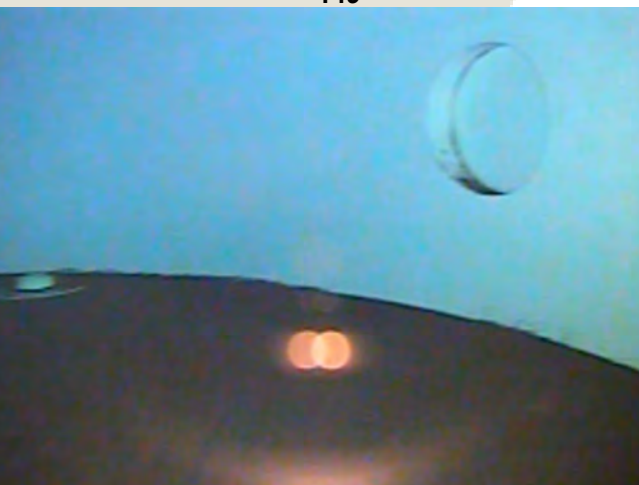
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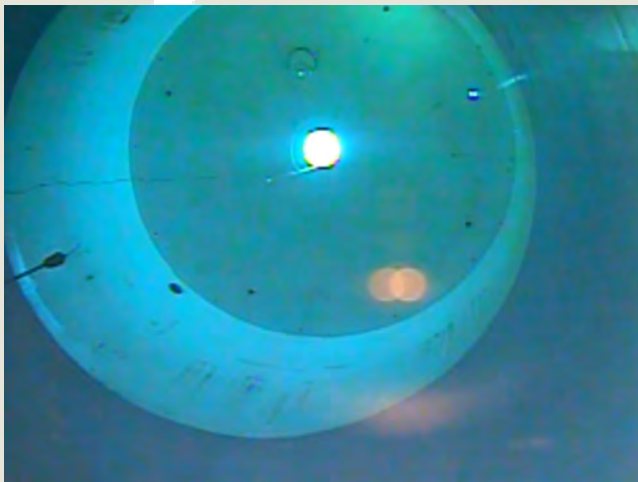
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157

Design, supply and install Passive or Active mixing system

Inspect and repair cathodic protection system



December 4<sup>th</sup>, 2020

**Ontario Clean Water Agency**

17 Myrtle Street  
Aylmer, ON  
N5H 2H1

**Att: Mike Taylor, Senior Operations Manager**

[mtaylor@ocwa.com](mailto:mtaylor@ocwa.com)

**Tel:** 226.545.0414

**Re: LMS Job #LM20119**

**Remotely Operated Vehicle Inspection and Report (ROV) – West Lorne Standpipe (SP) –  
Protective Coatings and Linings Report**

Mr. Taylor,

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Note: Possible issues and defects can only be visually assessed with the ROV. The following are our findings in relation to the current condition of the coating and lining system:

## **Exterior**

The exterior of this tower is coated with what appears to be an epoxy / urethane type of system. The shell is fairly sound but has considerable chalking and loss of sheen. There are some stone chips from grass cutting operations on the lower sections, but otherwise there is little to no appreciable corrosion, delamination or mud cracking.

The roof has a few large areas of delamination between the topcoat and the previous coat, likely the result of insufficient surface preparation or improper conditions during application. The handrail and other appurtenances such as vent and hatch frames have considerable surface corrosion.

The valve chamber piping and valves have moderate corrosion over much of their surfaces, and the entrance door exterior is very weathered.

- Adhesion testing Adhesion was performed in accordance with ASTM D3359 - 97 Method A – Standard Test Methods for Measuring Adhesion by Tape Test and results were: 4A Trace peeling or removal along incisions or at their intersection.





## Interior

The interior of this tank is lined with what appears to be an epoxy which is in fair condition. There are numerous areas of corrosion and delamination and it appears that the lining is becoming porous with age and is no longer providing good barrier protection. This damage has likely been exacerbated by ice movement, especially near the high-water level where ice capping occurs, as most of these areas are along weld seams.

The condition of the cathodic protection system is not known, but it is obvious by the mineralization of some of the damaged areas that it was at least operational at one time. This should be tested to ensure correct calibration and repaired accordingly (if required).

The video shows that ice sheeting has damaged the wire protection conduit on the floor of the tank, and the wire appears to be continuous, but it may be shorted.

The floor could not be inspected because of 1 – 2cm of fine sediment build-up. A tank cleaning should be conducted in order to further assess the floor surface.

## Recommendations – Exterior Surfaces

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 2 to 4 years.

This would extend the life of the existing coating for approximately another **8 – 10 years** with less expenditure than a full removal and replacement. Eventually the edges of the existing system will curl





up, taking the new overcoat with it. It is difficult to estimate how long this would take to happen, and it is largely dependent on the surface tension applied by the new paint.

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 application to the entire tank (surface tolerant epoxy at 2 to 6 mils DFT).
6. Finish coat application to the entire tank (aliphatic polyurethane at 2 to 3 mils DFT).

**Alternatively, the exterior of this tank could be completely removed and replaced in order to provide a 25 to 30 year solution that would be on the same lifecycle as the interior lining system (refer to below recommendation for Tank Interior Surfaces) – See Quote #Q20267 for details.**

## **Recommendations – Tank Interior Surfaces**

The interior of this tank should be completely removed via abrasive blast cleaning to SSPC-SP10 Near White Metal Clean, and then re-lined with an AWWA – D102 ICS-3 (zinc primer, 100% solids epoxy – preferred system) or ICS-4 (optional zinc primer, 100% solids polyurethane) system.

All pitting should be repaired by pool welding, welding of patch plates or epoxy filler on the shallow pits. This should be completed within the next 3 to 6 years before leaks start to occur as a result of localized corrosion. At this time, the cathodic protection system should be assessed and repair accordingly.

The interior re-lining should coincide with the exterior painting to save on extra mobilization costs and reduce down time.

Yours Sincerely,  
**Landmark Municipal Services**



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





December 4<sup>th</sup>, 2020

**Ontario Clean Water Agency**

17 Myrtle Street

Aylmer, ON

N5H 2H1

**Att: Mike Taylor, Senior Operations Manager**

[mtaylor@ocwa.com](mailto:mtaylor@ocwa.com)

**Tel: 226.545.0414**

**Re: LMS Job #LM20119**

**Remotely Operated Vehicle Inspection and Report (ROV) – West Lorne Standpipe (SP) –  
Recommended Upgrades #Q20267**

Mr. Taylor,

Landmark Municipal Services is pleased to provide budgetary pricing for the following repairs & upgrades at the above-mentioned potable water storage facility.

**Security**

- |  |                     |
|--|---------------------|
| 1) Remove ladder cages to permit safe and effective rescue | <b>\$ 2,400</b>     |
| 2) Straighten ladder gate at bottom of vertical ladder     | <b>\$ No Charge</b> |

**Valve Chamber / Pit**

- |   |                      |
|---|----------------------|
| 3) Surface prep and repaint door, valves and piping                       | <b>\$ 3,500</b>      |
| 4) Supply and install 20 L.F. of aluminum kickplate on valve pit handrail | <b>\$ 800</b>        |
| 5) Repair broken downspout  | <b>\$ No Charge</b>  |
| 6) Replace corroded baseboard heater                                      | <b>\$ On Request</b> |

**Foundation**

- |  |                 |
|--|-----------------|
| 7) Repair loose parging around tank perimeter and touch-up – approx. 70 L.F. | <b>\$ 5,000</b> |
|--|-----------------|

**Accessories**

- |  |                 |
|--|-----------------|
| 8) Apply anti-slip coating to ladder rungs   | <b>\$ 2,800</b> |
| 9) Supply and install 16" S.S. combination vent / vacuum relief unit and cap existing blowout panel. New vent curb to be combination hatch lid to allow proper hatch opening | <b>\$ 7,500</b> |





- |   |                      |
|---|----------------------|
| 10) Install approx. 60 L.F. of 5" steel kickplate on roof handrail and 60 L.F. of 2" kickplate on 4pcs landings | <b>\$ 8,800</b>      |
| 11) Perform chlorine residual / thermal stratification study.   | <b>\$ 4,400</b>      |
| 12) Inspect, test, and calibrate impressed cathodic protection system   | <b>\$ On Request</b> |
| 13) Upgrade ACWL to L.E.D. c/w new controller   | <b>\$ 6,700</b>      |

#### **Mixing System**

- |  |                      |
|--|----------------------|
| 14) Design, supply and install passive or active mixing system |                      |
| a. Passive mixing system                                       | <b>\$ On Request</b> |
| b. Active mixing system  | <b>\$ On Request</b> |

*Landmark's sales associates can provide further information on the types of mixing systems available and the options that would be most suitable for this style of tank*

#### **Fall Arrest System**

- |  |                 |
|--|-----------------|
| 15) Replace fall arrest system on vertical ladders<br><i>Fall arrest trolleys are available for \$950 each</i> | <b>\$ 9,200</b> |
| 16) Install 1pc S.S. 'D' ring at bottom of ladder and replace 4pcs corroded 'D' rings with S.S.                | <b>\$ 1,200</b> |

#### **Confined Space & Rescue System**

- |   |                 |
|---|-----------------|
| 17) Rescue port base required at hatch to tank interior and under top landing | <b>\$ 7,000</b> |
|---|-----------------|

#### **Budgetary Pricing – Coatings & Linings – Refer to Landmark Coatings & Linings Report**

#### **EXTERIOR SURFACES**

##### **18) Option #1 – OVERCOAT (8 – 10 year solution)**

- |   |                 |
|---|-----------------|
| Clean and remove tank sediment.   | <b>\$ 5,000</b> |
| - Disinfect tank interior per AWWA C652-11 Method #2. Vacuum truck / off-site disposal, if required, is extra |                 |

Site Restoration, Site Facilities, General Conditions, etc.	<b>\$ 30,000</b>
---	------------------

<b>System Type:</b>	Epoxy / Polyurethane
<b>Surface Preparation:</b>	WJ4 Power Wash / Spot Prepare to SSPC-SP 2, 3, and 11
<b>Intermediate Coat:</b>	Epoxy
<b>Finish Coat:</b>	High Solids Polyurethane
<b>Logo:</b>	As Existing

<b>Budget Price:</b>	<b><u>\$ 220,000 - \$ 295,000</u></b>
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<b>Exterior Overcoat Total:</b>	<b>\$ 255,000 - \$ 330,000</b>
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**19) Option #2 – FULL REMOVAL AND REPLACEMENT (25 – 30 year solution)**

Clean and remove tank sediment.	\$ 5,000
- <i>Disinfect tank interior per AWWA C652-11 Method #2. Vacuum truck / off-site disposal, if required, is extra</i>	
Scaffold and enclosure system	\$ 350,000
Site Restoration, Site Facilities, General Conditions, etc.	\$ 65,000
<b>System Type:</b>	Outside Coating System No. 4 (OCS-4)
<b>Surface Preparation:</b>	SSPC-SP10
<b>Prime Coat:</b>	Zinc-Rich Primer
<b>Intermediate Coat:</b>	Aliphatic Polyurethane
<b>Finish Coat:</b>	Fluoropolymer
<b>Logo:</b>	As Existing
<b>Budget Price:</b>	<u>\$ 350,000 - \$ 435,000</u>
<b>Exterior Replacement Total:</b>	<b>\$ 770,000 - \$ 855,000</b>

**INTERIOR SURFACES**

**20) REMOVAL AND REPLACEMENT**

Clean and remove tank sediment.	\$ 5,000
- <i>Disinfect tank interior per AWWA C652-11 Method #2. Vacuum truck / off-site disposal, if required, is extra</i>	
<b>System Type:</b>	Inside Coating System No. 3 (ICS-3)
<b>Surface Preparation:</b>	SSPC-SP10
<b>Prime Coat:</b>	Zinc-Rich Urethane
<b>Finish Coat:</b>	100% Solids Epoxy
OR	
<b>System Type:</b>	Inside Coating System No. 4 (ICS-4)
<b>Surface Preparation:</b>	SSPC-SP10
<b>Prime Coat:</b>	<b>Optional</b> - Zinc Rich Urethane
<b>Finish Coat:</b>	100% Solids Polyurethane
<b>Budget Price:</b>	<u>\$ 390,000 - \$ 470,000</u>
Allowance for unknown steel repairs (identified / quantified post-sandblast)	<u>\$ 25,000 - 30,000</u>
<b>Interior Replacement Total:</b>	<b>\$ 420,000 - \$ 505,000</b>

*\*H.S.T. not included in above pricing*

\*Quotation is confidential and shall not be distributed without Landmark's knowledge and written approval. Landmark inspections, reporting format and qualifications are in accordance with AWWA manual M42, chapters 8 and 9. All employees of Landmark Municipal Services have been trained and certified in Working At Heights, Fall Arrest and High Level Rescue, Confined Space Work and Rescue, WHMIS Worker Training, St. John Ambulance Safety Oriented First Aid and Cardiopulmonary Resuscitation. In addition, all activities conducted at heights by staff of LMS are fulfilled under strict guidelines based on involvement with the Ontario Ministry of Labour requirements outlined in the current Ontario Occupation Health & Safety Act, R.R.O. 1990, Regulation 851 amended to O.Reg. 629/05, and Section 26, O. Reg. 213/91.





## 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 backwards 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.

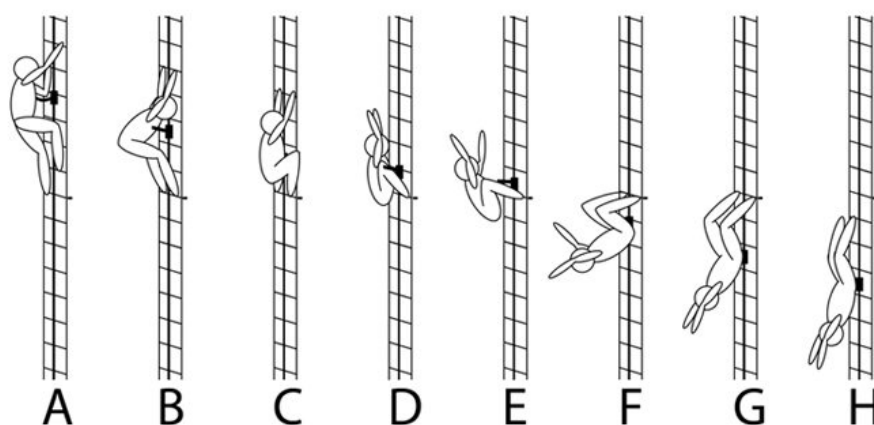


Figure 1: How the water tower worker fell

- 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

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

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

Please photocopy Ministry of Labour Alerts, distribute them widely and post them where people will see them.

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# Municipal Services

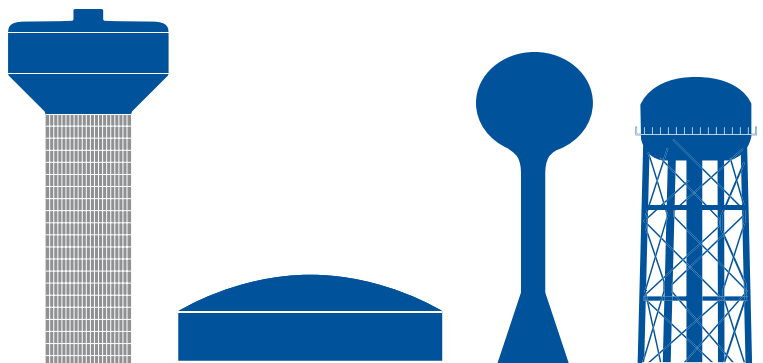
**Storage Tank Maintenance**

**Extend Service Life**

**Single Source Responsibility**



Expert Inspection, Maintenance And Repairs  
For All Types Of Water Storage Tanks





## Expert inspection, maintenance, and repairs for all types of water storage tanks

- Safe, efficient, issue-free operation of your water storage infrastructure
- Full compliance with all applicable regulations across Canada

Landmark Municipal Services (LMS) brings more than 30 years of insight and innovation in water storage to owners and operators of tanks and systems of all types. Our complete range of services and packages provide predictability, continuity and flexibility for this essential function of municipal governments.

### Inspections

Regular, scheduled inspections are critical for long-term efficiency. LMS conducts various types of inspections, all with comprehensive reports detailing repairs performed or recommended and upgrade requirements, with photo documentation and related cost estimates.

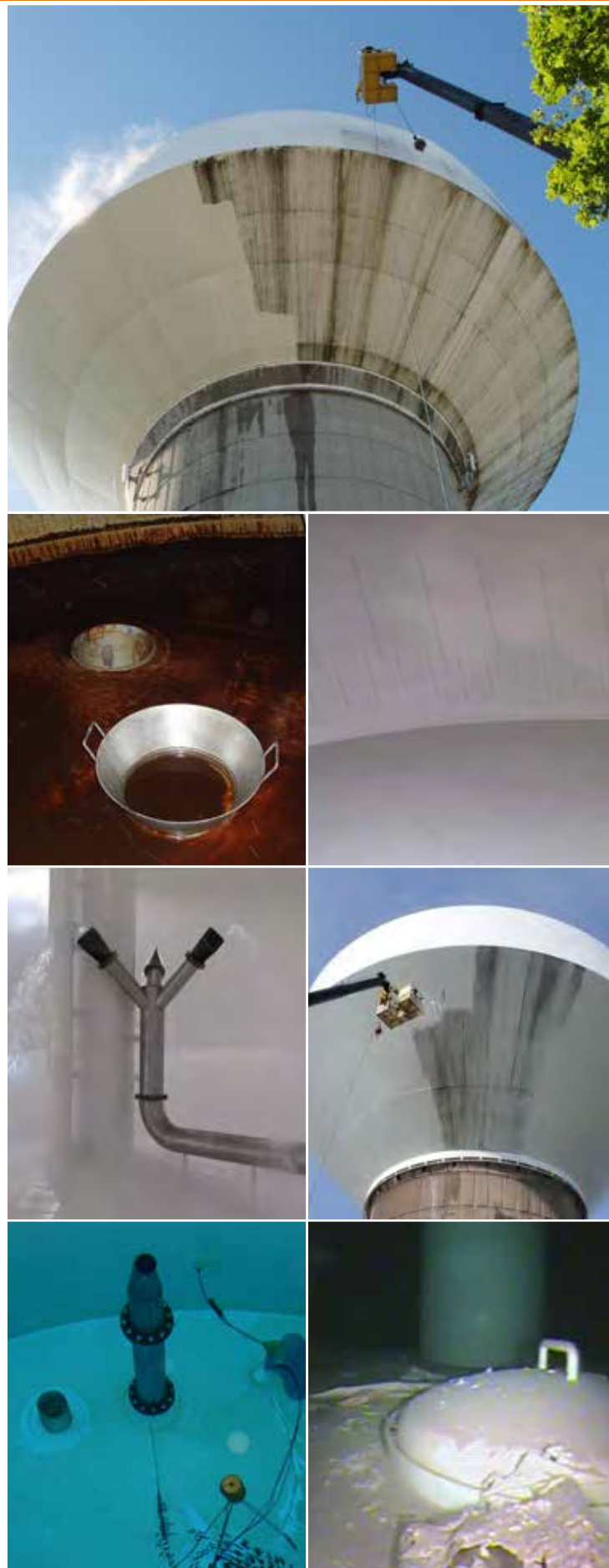
**CIR: Clean, Inspect & Report:** AWWA (American Water Works Association) recommends that water storage tanks be washed out and inspected on a minimum three-year cycle.

**SIR: Safety Inspection & Report:** A thorough interior and exterior review of structure and operations for compliance with applicable government regulations.

**ROV: Remotely Operated Vehicle:** ROV inspections eliminate the inconvenience and expense of taking your tank out of service. LMS provides real-time, in-water evaluations with a remotely operated vehicle.

LMS inspections provide a complete review of all critical factors:

- |                     |  |
|---------------------|--|
| • Site works        | • Metal conditions                     |
| • Foundations       | • Exterior coatings                    |
| • Support structure | • Interior linings                     |
| • Ladders/landings  | • Antenna and communications equipment |
| • Accessories       | • Safety and rescue equipment          |
| • Valves and piping |  |





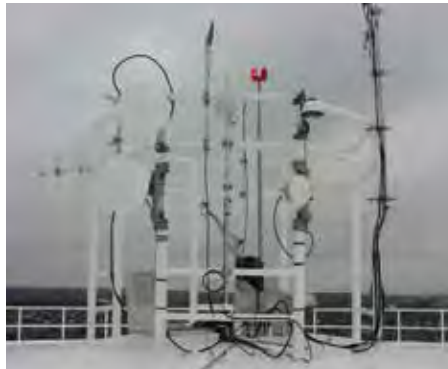
## Safety Upgrades and Training

LMS can provide safe access and rescue systems that meet or exceed the requirements of the Occupational Health & Safety Act for “vessel entry and rescue” as well as “fall arrest.”



## Tank Modifications

Skilled LMS professionals provide practical, proven and fully engineered modifications for all types of storage tanks, leveraging experience as one of the leading tank builders in North America. Our vertical integration adds design, fabrication and coatings expertise when needed, with single source management and responsibility.



## Coatings and Linings

LMS services include all surface preparation and recoating of all interior and exterior areas. Options range from spot preparation to total blast cleaning with full containment for environmental protection. All lining materials applied to interior surfaces are ANSI and NSF 61 approved.







### Inspections:

- Clean, Inspect & Report (CIR)
- Safety Inspection & Report (SIR)
- Remotely Operated Vehicle (ROV)

### Safety:

- Confined space
- Fall arrest
- Training

### Maintenance:

- Tank Asset Management Program (TAMP)
- Annual programs
- Coatings/linings

### Lightning Protection:

- Design
- Installation
- Inspection

### Antenna and Communications Systems

- Design
- Structural fabrication & installation
- Inspection

### Demolition

- Partial
- Total

### Modifications

- Engineering
- Tank hydrodynamic mixing systems
- Site works
- Balconies/handrills
- Manholes
- Hatches
- Venting and vacuum relief
- Welding and fabrication
- Electrical/instrumentation
- Heat trace
- Insulation and cladding
- Security systems

Landmark delivers consistent, high quality results.

Contact us today to discuss the best solution for your next project.



Landmark Municipal Services • 3091 Harrison Court  
Burlington, ON L7M 0W4 • 905.319.7700 Phone  
[www.teamlandmark.com](http://www.teamlandmark.com) • [info@teamlandmark.com](mailto:info@teamlandmark.com)





# Landmark Coatings

## Specialty Mobile Operations

Uncompromising commitment to safety. World class technical skill. Go-anywhere mobility. Landmark delivers factory applied quality to your site.





Developed and refined throughout 25 years of storage tank coatings and lining work, Landmark’s specialty crews work wherever you need them...on projects that we design, fabricate and build, or on existing infrastructure requiring repair and recoating. The Society for Protective Coatings (SSPC) has recognized our technical skills and processes with their prestigious QP-1 certification, so you can rely on thoroughly tested multi-craft services on the most demanding jobs, with the added benefits of uncompromising safety and nationwide mobility.

We work in a wide range of applications for the private sector, the military and municipal authorities:

- Industrial facilities
- Terminals
- Petrochemical plants
- Water and wastewater
- Oil and gas exploration and production
- Aircraft fueling facilities
- Lead abatement

Safety

Landmark’s uncompromising commitment to safety protects people, property and the environment. We apply equally rigorous standards for all locations, require ongoing training and testing for all crews, and utilize site evaluations, Hazard Identification and Risk Assessments (HIRA) and root cause analysis to continually drive performance improvement. Landmark employs the best available safeguards for the job, such as advanced, self-contained respiratory equipment on many applications. And we stay at the forefront of best practices and efficient reporting with our membership in ISNetworld. Core values and comprehensive safety and health programs, along with SSPC C-3 accreditation for de-leading steel structures, safeguards against environmental impact.

Skill

Landmark’s technical capabilities start with specification assistance, based on in-depth knowledge of industry suppliers and their latest products, and insights from our own operations. Our crews are fully equipped to perform surface preparation and coatings work on virtually any type of steel structure, utilizing a broad array of coatings including polyurethanes, 100% solids and fiberglass reinforced systems. Our crews perform all coatings work in accordance with the Landmark Quality Assurance Manual for Surface Preparation and Coating. They are trained to implement all of the required process controls and conduct workmanship inspections to meet or exceed all applicable standards and client expectations.



Routine quality evaluations include but are not limited to:

- Measurement of environmental conditions
- Verification of surface cleanliness prior to coating or lining
- Wet and dry film thickness measurement
- Holiday testing (low or high voltage, depending on lining thickness)

Daily logs track all inspection activity, and are available upon request.

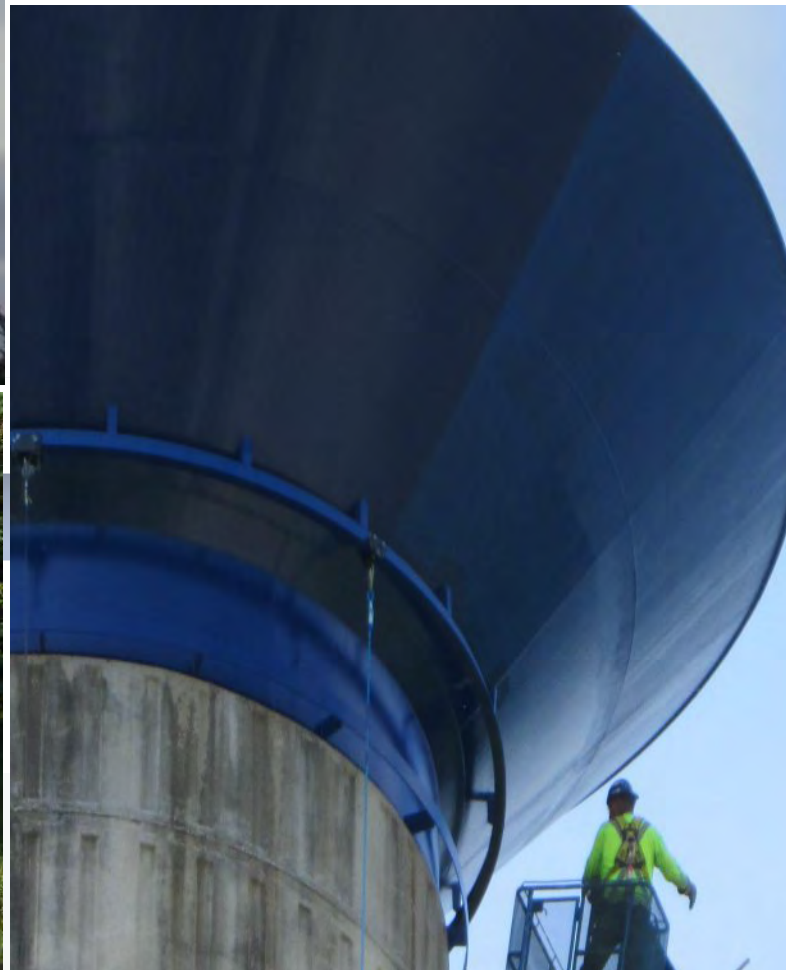
Specialized equipment enables Landmark to manage dehumidification on work in enclosed spaces such as tank lining and recoating, and to protect the environment with blast media recycling and a full or partial containment on exterior surface preparation and coating. In addition, site specific plans for environmental monitoring, hazardous material management, and disposal of wastes are developed for all tank rehabilitations where existng coatings contain toxic metals. And for high-profile projects with community impact, Landmark has perfected the art of translating even the most intricate graphics to the public stage with precise reproduction. The utilization of dust collection systems ensures complete extraction of dusts for not only a cleaner surface prior to paint application, but as well as containment of dusts generated. This provides necessary air exchanges for confined space work.

Mobility

Landmark capabilities are completely mobile for deployment nationwide or beyond, without limitations. Specially outfitted trailers move containerized equipment to the project site, and then serve as mobile command centers for the crews. All required assets are at hand, coordinated with local supply lines as appropriate.







You can count on Landmark Mobile Specialty Coatings to reliably protect your investment and extend the life of critical infrastructure. Contact us today to discuss the best solution and a quote on your next project.



Landmark Municipal Services ULC  
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Burlington, Ontario L7M 0W4  
Phone 905.319.7700 Fax 905.319.1373

[www.teamlandmark.com](http://www.teamlandmark.com)



